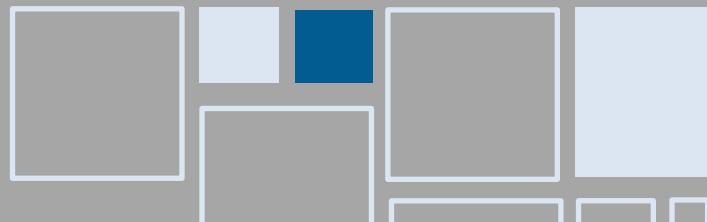




CITY OF LAGO VISTA

WATER
MASTER PLAN



2 0 2 5

PREPARED BY:

Freese and Nichols, Inc.
10431 Morado Circle, Suite 300
Austin, Texas 78759
512-617-3100





Innovative approaches
Practical results
Outstanding service

WATER MASTER PLAN

Prepared for:

City of Lago Vista



A handwritten signature in blue ink that reads "Jessica B. Vassar".

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Appendix A – Temporary Pressure Recording Summary

Appendix B – Hydraulic Water Model Calibration

Appendix C – Detailed Water CIP Cost Sheets

EXECUTIVE SUMMARY

The City of Lago Vista (City) is a growing community located in central Texas, within Travis County. Lago Vista currently provides water service to over 5,300 connections and counting. The service area is projected to grow by over 3,200 connections in the next 10 years and over 15,000 connections by buildout. Defining a capital improvement plan (CIP) for accommodating this growth in an efficient and cost-effective manner is the primary goal of this Water Master Plan. Freese and Nichols, Inc. (FNI) has prepared this report to provide the City of Lago Vista with a planning tool that will serve as a guide for short-term and long-term improvements to the water system.

Historical and Projected Growth

Projected development and land use are important elements in the analysis of water distribution systems. Present and future water demands determine the size and location of system improvements necessary to serve residential populations, commercial, and institutional enterprises. A variety of circumstances can influence the rate of future development within cities. Growth projections were developed in terms of water connections to the City's distribution system. **Table ES-1** presents growth projections used in the Master Plan 5-year, 10-year, and buildout planning phases.

Table ES-1. Connection Projections

Planning Year	Water Connections
2023	5,382
2028	6,819
2033	8,652
Buildout	20,386

Projected Water Demands

To determine the historical trends in system-wide average daily demand and per-connection demand needed for existing and future system analysis, FNI reviewed historical water demand data from 2015 through 2024. Future average daily water demands were calculated by applying per-connection demand rates to the total number of projected connections for each planning period. **Table ES-2** lists the water demand projections for Lago Vista in units of million gallons per day (MGD).

Table ES-2. Summary of Average Water Demand Projections

Planning Year	Water Connections	Average Day Demand (MGD)	Maximum Day Demand (MGD)
2023	5,382	1.79	3.23
2028	6,819	2.27	4.09
2033	8,652	2.88	5.19
Buildout	20,386	6.79	12.22

Water System Analysis

Lago Vista's existing water system consists of 144 miles of water mains and 8 pressure planes. Pipeline diameters range between 1-inch to 16-inches. The water system is served by two water treatment plants, each with a capacity of 2.0 million gallons per day. FNI evaluated the existing water system by utilizing a hydraulic model, as well as assessing facilities against recommended facility capacity criteria summarized in **Table ES-3**.

Table ES-3. Recommended Capacity Criteria Summary

System Component	Recommended Capacity Criteria
Production	TCEQ Minimum: 0.6 gpm/Connection (or future approved ACR)
Distribution Pumping	125% of MD Demand by Pressure Plane
Elevated Storage	200 gallons per connection
Ground Storage	6 hours of MD Demand by Pressure Plane

The hydraulic model was utilized to assess the water system during average day demand, maximum day demand, and fire flow conditions. Pump operation, tank drain and fill rates, and maximum velocities were taken into account in consideration of future system improvements. Facilities were assessed per TCEQ minimum requirements for the need of expansions to treatment, elevated storage, hydropneumatic tank storage, and pump capacity based on the number of connections served within each pressure plane. The analyses informed the decision for capital improvements recommendations.

Water System Capital Improvements

FNI developed a water capital improvement plan (CIP) that will effectively and efficiently continue to supply existing and future demands to the City's water customers. The recommended improvements will provide the required capacity and reliability to meet projected water demands through a service area buildout scenario. FNI assessed the water distribution system under average and maximum day demands, and improvements were grouped into the three phases in which they become necessary. FNI recommends that these projects be constructed generally in the order listed; however, development patterns may make it necessary to construct some projects sooner or later than anticipated. **Table ES-4** summarizes the costs, in 2024 dollars, of the recommended water system capital improvements plan for Lago Vista.

Table ES-4. Summary of Water Capital Improvements Plan

Phase	Cost
2028 (5-year)	\$37,182,300
2033 (10-year)	\$25,863,800
Buildout	\$90,287,200

1.0 INTRODUCTION

The City of Lago Vista (City) is a growing community located in central Texas, within Travis County. Lago Vista currently provides water service to over 5,300 connections and counting. The population within the service area is projected to grow by over 3,200 connections in the next 10 years and over 15,000 connections by buildout. Defining a capital improvement plan (CIP) for accommodating this growth in an efficient and cost-effective manner is the primary goal of this Water Master Plan. Freese and Nichols, Inc. (FNI) has prepared this report to provide the City of Lago Vista with a planning tool that will serve as a guide for short-term and long-term improvements to the water system.

1.1 SCOPE OF WORK

Freese and Nichols, Inc. (FNI) was retained in 2022 by the City of Lago Vista to prepare a Water Master Plan. Master Plan goals were to evaluate the integrity of the existing water system and to recommend a phased capital improvement plan (CIP) of the service area for 5-year, 10-year, and buildout planning scenarios. The recommended improvements will serve as a basis for the design, construction and financing of facilities required to meet the City's water capacity needs. The major elements of the scope of this project included:

- Water Connection Projections
- Water Demand Projections
- Water Model Build and Analysis
- Water Capital Improvement Plans
- Water Master Plan Report

1.2 LIST OF ABBREVIATIONS

Table 1-1 provides a list of abbreviations used in this report.

Table 1-1. List of Abbreviations

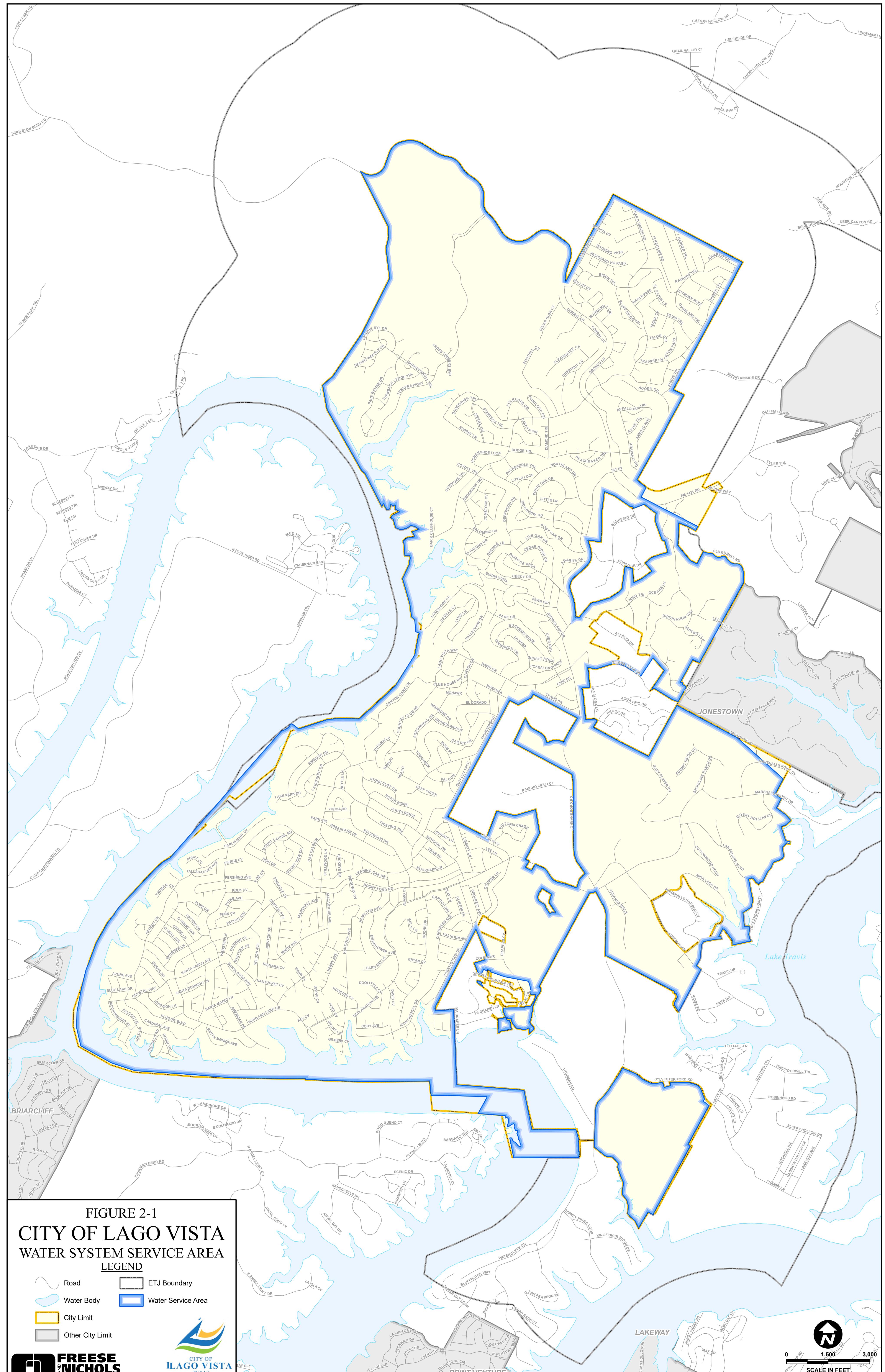
Abbreviation	Full Nomenclature
BPS	Booster Pump Station
CCN	Certificate of Convenience and Necessity
CIP	Capital Improvement Plan
EPS	Extended Period Stimulation
EST	Elevated Storage Tank
ETJ	Extra Territorial Jurisdiction
FNI	Freese and Nichols, Inc.
ft	Feet
GIS	Geographic Information System
gpm	gallons per minute
HGL	Hydraulic Grade Line
HSPS	High Service Pump Station
IFC	International Fire Code
IRC	International Residential Code
MD	Maximum Day
MG	Million Gallons
MGD	Million Gallons per Day
OPCC	Opinion of Probable Construction Cost
PP	Pressure Plane
PRV	Pressure Reducing Valve
PSI	Pounds per Square Inch
RW	Raw Water
SCADA	Supervisory Control and Data Acquisition
TAC	Texas Administrative Code
TCEQ	Texas Commission on Environmental Quality
WTP	Water Treatment Plant

2.0 HISTORICAL AND PROJECTED GROWTH

Growth projections are an important component of the master planning process. The magnitude and distribution of the growth in residential and non-residential development will dictate where future infrastructure is required. It is important to note that projecting future population is challenging, especially for relatively small geographic areas like cities because it can be difficult to predict how fast or slow development will occur when there are a variety of circumstances that can have an impact. As a part of the preceding Wastewater Master Plan, FNI assessed parcels within the City's sewer Certificate of Convenience and Necessity (CCN) and Extraterritorial Jurisdiction (ETJ) against a number of factors to locate parcels likely to develop over the next 10 years and by system buildout. For consistency with the Wastewater Master Plan, projected new sewer connections across the planning years were assumed to be new water customers. Potential master development communities with water entitlements were prioritized based on the staff's understanding on the timing and movement of developers. Fill-in growth was identified as "likely to develop" if a subdivided parcel was vacant and identified with a state tax code designation of C1 (Vacant Lot), D1 (Acreage Non-Ag), or E1 (Farm and Ranch Improved). Master developments with water entitlements identified by City staff were prioritized to develop first, followed by fill-in parcels identified by FNI. Timing and sizing of capital improvements are related to existing needs as well as the amount, location, and urgency of projected growth. The following sections describe the process used to develop water connection growth projections.

2.1 SERVICE AREA

The service area assessed for the Water Master Plan generally consists of the Water Certificate of Convenience and Necessity (CCN). A CCN is a state-regulated agreement in which the CCN holder is required to provide continuous and adequate utility service to all its retail customers, and in turn is protected from encroachment by other retail service providers. The current boundaries of Lago Vista's water CCN encompasses the entirety of the City Limits. The boundary is defined by FM 1431 to the north-northwest and the Colorado River to the west and south. The boundary to the east is less easily defined as some large areas are either incorporated (Destination Way and Shoreline Ranch) or excluded (Rancho Cielo, Lago Ranchos, and Travis Hollow) from the City Limits and CCN. **Figure 2-1** illustrates the water service area evaluated as part of the Water Master Plan.



2.2 HISTORICAL CONNECTIONS

Projecting future growth is an integral part of the master plan process. The projections serve as the basis for future water demands that will be utilized to determine needed improvements. An initial estimate of the existing number of connections to the water system was developed based on development data and geocoded water meter billing provided by the City. The historical water connections and year-over-year growth rates are summarized in **Table 2-1**.

Table 2-1. Historical Water Connections

Year	Water Connections	Average Annual Connection Growth Rate
2015	3,163	--
2016	3,250	2.7%
2017	3,407	4.8%
2018	3,647	7.0%
2019	3,981	9.2%
2020	4,263	7.1%
2021	4,567	7.1%
2022	5,062	10.9%
2023	5,567	10.0%
2024	5,633	1.2%
Average Growth Rate		6.7%

2.3 DEVELOPER ENTITLEMENTS

Growth in Lago Vista's water service area is expected to be dominated by developer entitlements. The City of Lago Vista Department for Development Services has approved multiple master development communities and allowed for the allotment of dedicated connections to be served by the City's water system. While some developer agreements have stipulations for a minimum number of constructed homes in a given time period to avoid penalty of lost entitlements, there is no standard term of limitations for the holding period of the entitlements. To aid in determining where new growth would occur, FNI utilized input from City staff on location of known future developments and associated number of residential connections of each development at buildup as well as estimated timeline of construction for each development. Consistent with the preceding 2024 Wastewater Master Plan, the developer entitlements in this Water Master Plan grow in the same number of connections per planning period.

Table 2-2 summarizes the known developments, associated number of entitled buildout connections, and assumed number of connections built by planning period.

Table 2-2. Water Entitlements

Entitlements	Entitled Connections	Active Connections	2028 Connections (5-Year)	2033 Connections (10-Year)	Buildout Connections
Firefly Cove	325	0	0	0	325
Lakeshore	70	0	0	0	70
Luna Ridge (Groseclose)	350	4	25	50	350
Montechino	495	0	50	106	495
Nature's Point	35	0	0	0	35
Peninsula	200	0	0	0	200
Shoreline Ranch	568	0	0	0	568
Tessera	2,030	541	662	1,000	2,030
The Hollows	532	132	150	200	532
Turnback Ranch	349	0	349	349	349
Villas at Keegans Crossing	151	0	0	0	151
Winn Ranch	1,350	0	200	400	1,350
Total Entitled	6,455	677	1,436	2,105	6,455

2.4 PROJECTED GROWTH

Projected connection growth, identified in the Wastewater Master Plan, was determined to grow at a rate of 5% per year between the Existing, 2028, and 2033 planning periods. Maintaining consistency with the Wastewater Master Plan, the raw number of added wastewater connections by planning year is assumed to result in an additional water customer. Because there are more water customers in the existing system, the additional connections by planning year results in a growth rate less than 5%. Summaries of these projections are in **Table 2-3**.

Table 2-3. Projected Water Connections

Year	Wastewater Connections	Water Connections
2023 (Existing)	5,200	5,382
2028 (5-Year)	6,637	6,819
2033 (10-Year)	8,470	8,652
Buildout	19,801	20,386

The parcels identified in the Wastewater Master Plan as likely to be developed in the 5-year, 10-year, and buildup growth were identified to grow in the same planning period as this Water Master Plan. Proposed master development communities with water connections entitled were assumed to develop in accordance with City staff projections and were prioritized first in a given planning period. Following the entitled areas, parcels identified by FNI based on state tax code designations and water service availability were prioritized second. Lastly, fill-in growth of pre-platted parcels were used to match the proposed future connections for each planning period.

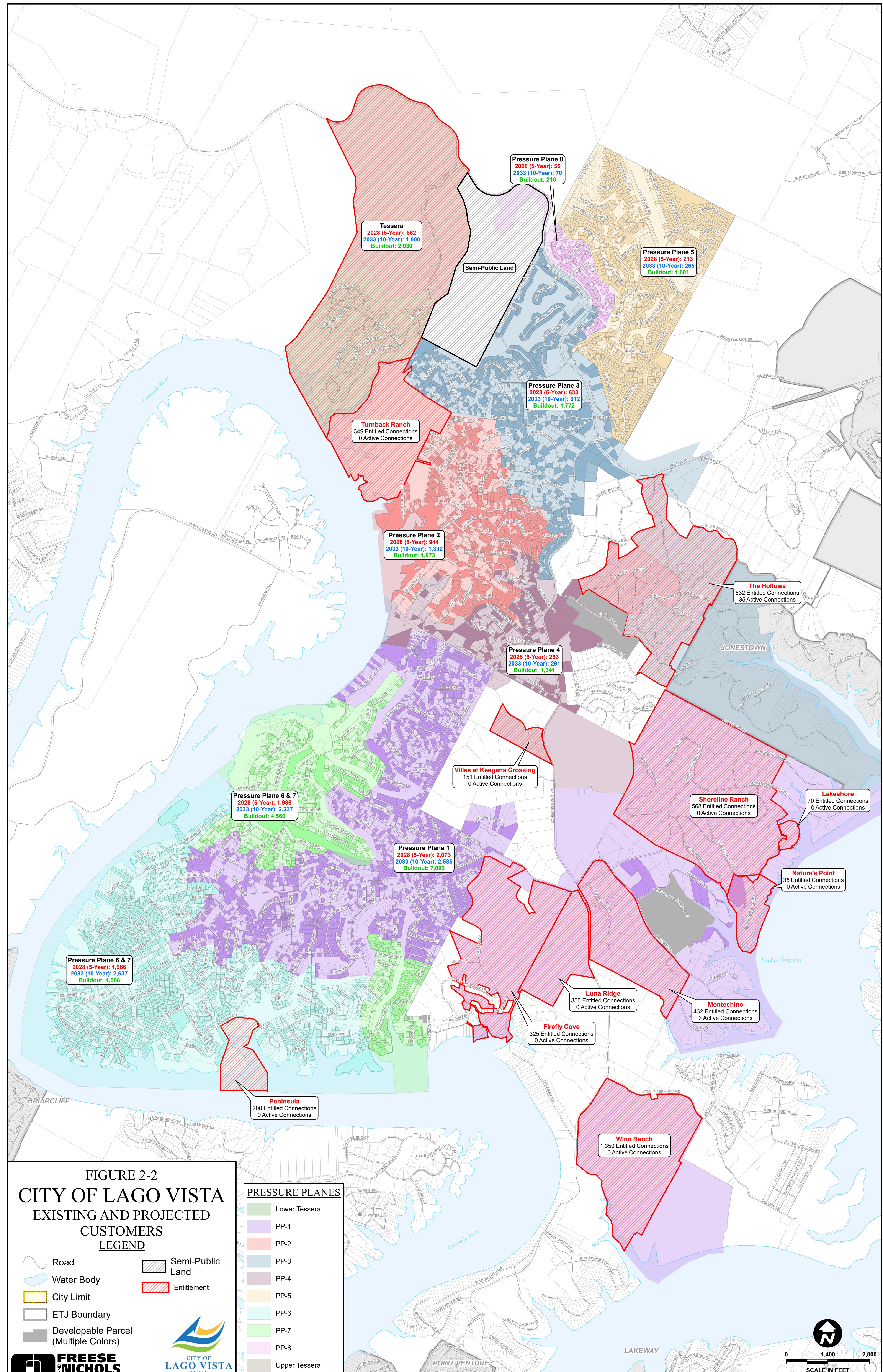
To identify large areas likely to develop in the next 10 years, parcels were selected if they were not a part of impending developments, proximity to existing water infrastructure, and likely developable land use types as identified by state tax code designations (C1, D1, or E1). Large areas were loaded with a density of 2 connections per acre. Though there are some large areas that can still be built out with multiple connections on site, much of the City of Lago Vista is pre-platted for single family residential use on a plot-by-plot basis. Pre-platted parcels with an area greater than 0.1 acre were loaded with 1 connection. Pre-platted parcels with an area greater than 1.0 acre were loaded with the density of 2 connections/acre with the assumption that the parcel could be subdivided. **Table 2-4** summarizes the anticipated additional connections per planning year for each pressure plane. **Figure 2-2** illustrates all parcels identified for growth in each of the pressure planes.

Table 2-4. Added Connections By Pressure Plane Between Planning Periods

Pressure Zone	2023 Connections	2028 Connections	2033 Connections	Buildout Connections
1	1,499	2,073	2,585	7,093
2	1,055	944	1,392	1,573
3	576	633	812	1,772
4	258	253	291	1,341
5	147	213	265	1,801
6 & 7	1,805	1,986	2,237	4,566
8	42	55	70	210
Tessera	--	662	1,000	2,030
Total	5,382	6,819	8,652	20,386

2.5 GROWTH IN THE ETJ

In addition to known growth in the City Limit there is also anticipated growth in the Extra-Territorial Jurisdiction (ETJ), which is a buffer around the city limits that grants a city the right to unilaterally annex an area within its ETJ. Excluding the Balcones Canyonlands National Wildlife Refuge, there is approximately 6,698 acres within the City's ETJ that could be incorporated into City Limits or into the City's water and water CCNs. At 2 connections per acre, the ETJ area could accommodate an additional 13,396 connections. For the purposes of this Master Plan, expansion of the CCN to areas within the City's ETJ was not considered in sizing of infrastructure.



3.0 WATER DEMANDS

Water demands in a municipal distribution system vary by time of day, time of year, and weather conditions. Average daily demand is defined as the total system demand over a one-year period divided by the number of days in that year. Average day demands are used as a basis for estimating maximum day and peak hour demands. Maximum day use is the maximum quantity of water used over a 24-hour period and is commonly used in the sizing of water lines and ground storage tanks. Peak hour is the greatest one-hour demand of the maximum day and is used to evaluate sizing of elevated storage tanks and high service pumping capacity. These demands represent the range of conditions typically encountered in water distribution system operation.

3.1 HISTORICAL WATER DEMANDS

Water production data provided by the City from 2015 to 2024 to determine the historical trends for a systemwide average daily demand and per-connection for water system customers. **Table 3-1** summarizes Lago Vista's historical demands and the maximum day to average day peaking factor. The maximum day peaking factor represents the ratio of the highest daily demand to the annual average day demand.

Table 3-1. Historical Water Demands

Year	Average Day Demand (MGD)	Maximum Day Demand (MGD)	Maximum Day Peaking Factor
2015	1.20	2.31	1.9
2016	1.20	2.32	1.9
2017	1.18	2.19	1.9
2018	1.24	1.97	1.6
2019	1.32	2.19	1.6
2020	1.32	2.30	1.7
2021	1.24	2.18	1.8
2022	1.59	2.54	1.6
2023	1.40	2.71	1.9
2024	1.39	2.20	1.6
Average	1.30	2.29	1.8
Maximum	1.59	2.71	1.9

The annual average day demands ranged from 1.18 MGD in 2017 to 1.59 MGD in 2022 and averaged 1.30 MGD. The average day water demand was converted into a per-connection demand by dividing water usage by the connections served. The average day per connection usage varied from a low of 247 gallons per connection per day in 2024 to a peak of 379 gallons per connections per day in 2015, averaging 316 gallons per connection per day. The historical average day demand and corresponding gallons per connection per day of customer demand from 2015 to 2022 is summarized in **Table 3-2**. The maximum day demand ranged from 1.97 MGD in 2018 to 2.71 MGD in 2023. The average Maximum Day peaking factor from 2015 through 2024 was 1.8. This value was chosen to evaluate capacity, facility, and pipe network sizing as it is more conservative than the average of maximum day values, and representative of recent customer demands.

Table 3-2. Historical Water Demands by Connection

Year	Water Connections	Average Day Demand (MGD)	Average Day Demand Per Connection (gpd)
2015	3,163	1.20	379
2016	3,250	1.20	371
2017	3,407	1.18	345
2018	3,647	1.24	340
2019	3,981	1.32	333
2020	4,263	1.32	310
2021	4,567	1.24	272
2022	5,062	1.59	314
2023	5,567	1.40	252
2024	5,633	1.39	247
Average	-	1.30	316
Maximum	-	1.59	379

3.2 PROJECTED WATER DEMANDS

Projected Average Day water demands were projected for the Existing, 2028, 2033, and Buildout planning scenarios by applying an average per-connection demand to the additional water connections. Historical water production data dating back to 2015 indicate a decline in average daily demands, on a per-connection basis. Despite the declining trend line, it was assumed that water efficiency gains observed over the past few years would not continue. A noticeable drop in per-connection demand is observed in

2023 and 2024, likely due to watering restrictions. The average consumption rate between 2015 and 2022 of 333 gallons per connection per day was assigned for future year projections. No historical operation records were available to determine peak hour use. In lieu of this information, a conservative peak hour peaking factor of 2.0 was used to calculate the peak hour demands for this study. A summary of the existing and projected 2028, 2033 and buildout demands are illustrated in **Figure 3-1**.

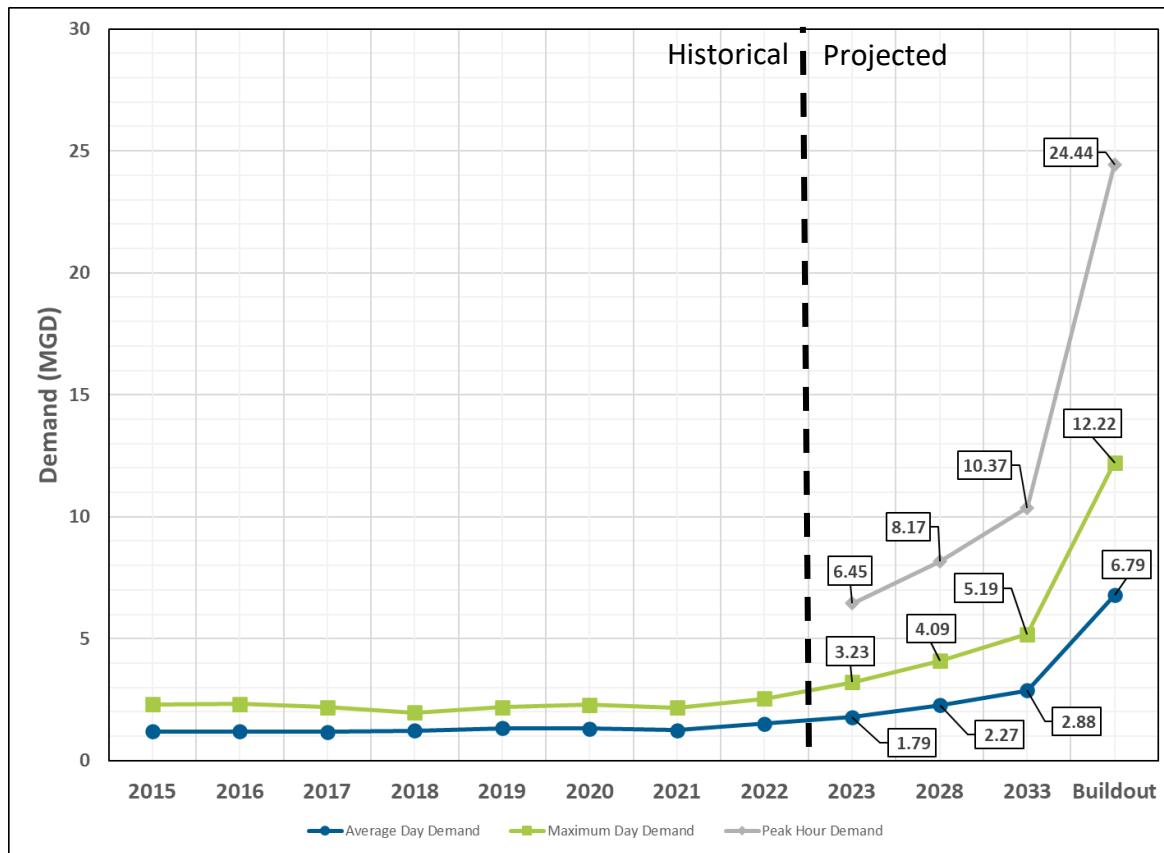


Figure 3-1. Historical and Projected Water Demands

Even though area within the City's ETJ was not considered for sizing of infrastructure in this Master Plan, it is important to note the potential impact to the ultimate sizing of the City's existing water treatment plants. Based on the projected water demand per connection and the projected growth within the ETJ of 13,396 connections, the City would result in an additional 4.46 MGD of average day demand and 8.02 MGD of maximum day demand.

4.0 EXISTING AND FUTURE WATER SYSTEM ANALYSIS

The existing water collection system consists of 144 miles of water mains, 8 pressure planes (PP), 2 elevated storage tanks (EST), 1 standpipe, 7 booster pump stations (BPS), 9 ground storage tanks (GST), and two water treatment plants (WTP). **Figure 4-1** illustrates the existing water distribution system.

4.1 EXISTING WATER SYSTEM

4.1.1 Pressure Planes

Lago Vista currently operates 8 pressure planes, named numerically 1 through 8. **Table 4-1** shows the overflow hydraulic grade line (HGL) and the maximum allowable service elevation per Texas Commission on Environmental Quality (TCEQ) for each pressure plane. **Figure 4-2** illustrates the pressure plane hierarchy and the facilities serving each pressure plane. Most PPs serve areas that include service elevations in which pressures above 80 psi are modeled. These areas are assumed to be served by individual pressure reducing valves (PRV) on the customer's side of the service water meter.

Table 4-1. Existing Pressure Plane Overview

Pressure Plane	Overflow HGL (feet)	Maximum Allowable Service Elevation (feet)
PP-1	1,055	975
PP-2	997	917
PP-3	1,079	999
PP-4	1,136	1,056
PP-5	Hydro	1,228
PP-6	943.5	864
PP-7	943.5	864
PP-8	1,213	1,133

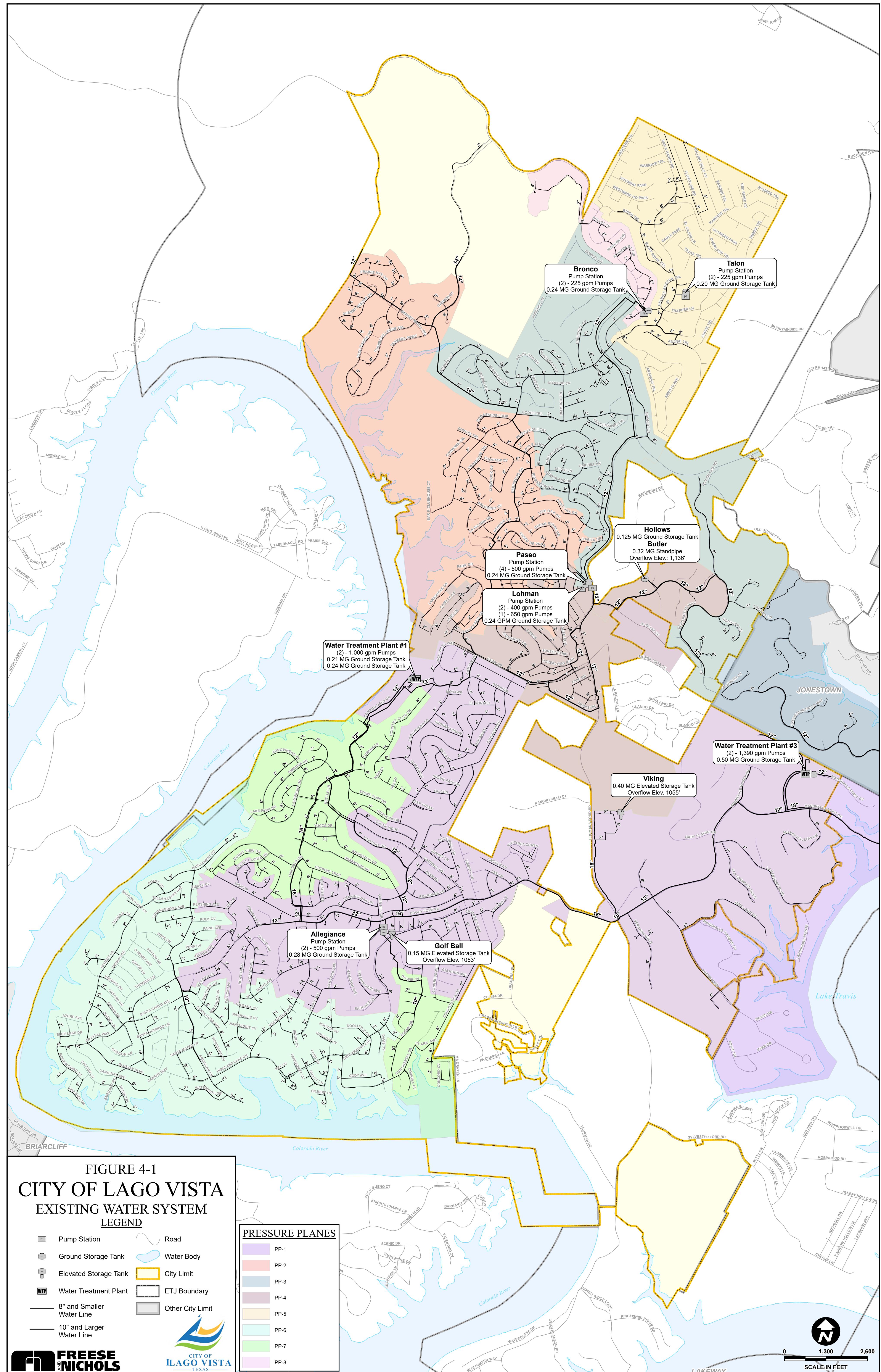
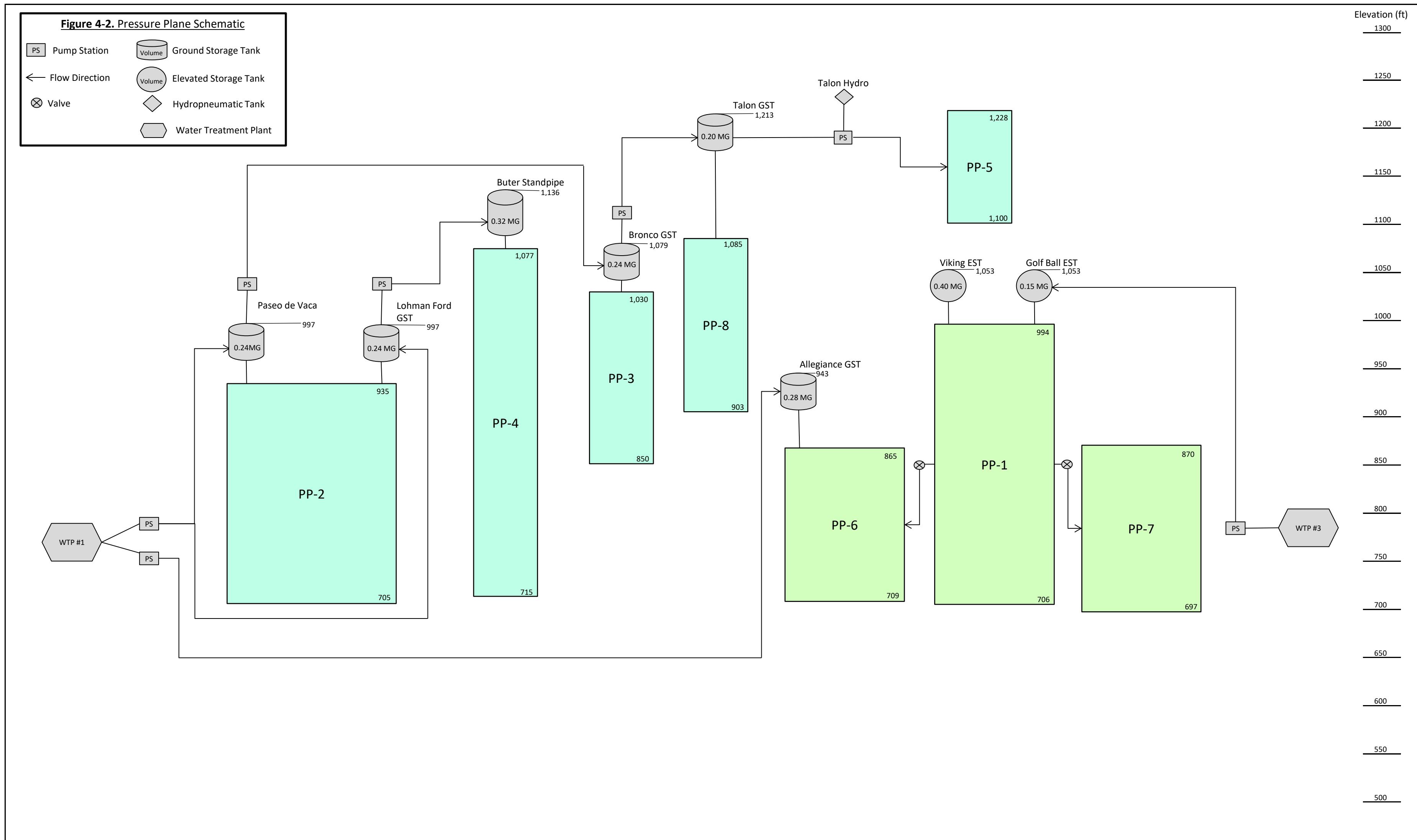


Figure 4-2. Pressure Plane Schematic



4.1.2 Water Lines

The existing water system consists of a total of 144 miles of water pipe. Pipeline diameters range in size from 1-inch to 16-inches. **Figure 4-3** illustrates the percentage of pipe length by diameter and main type.

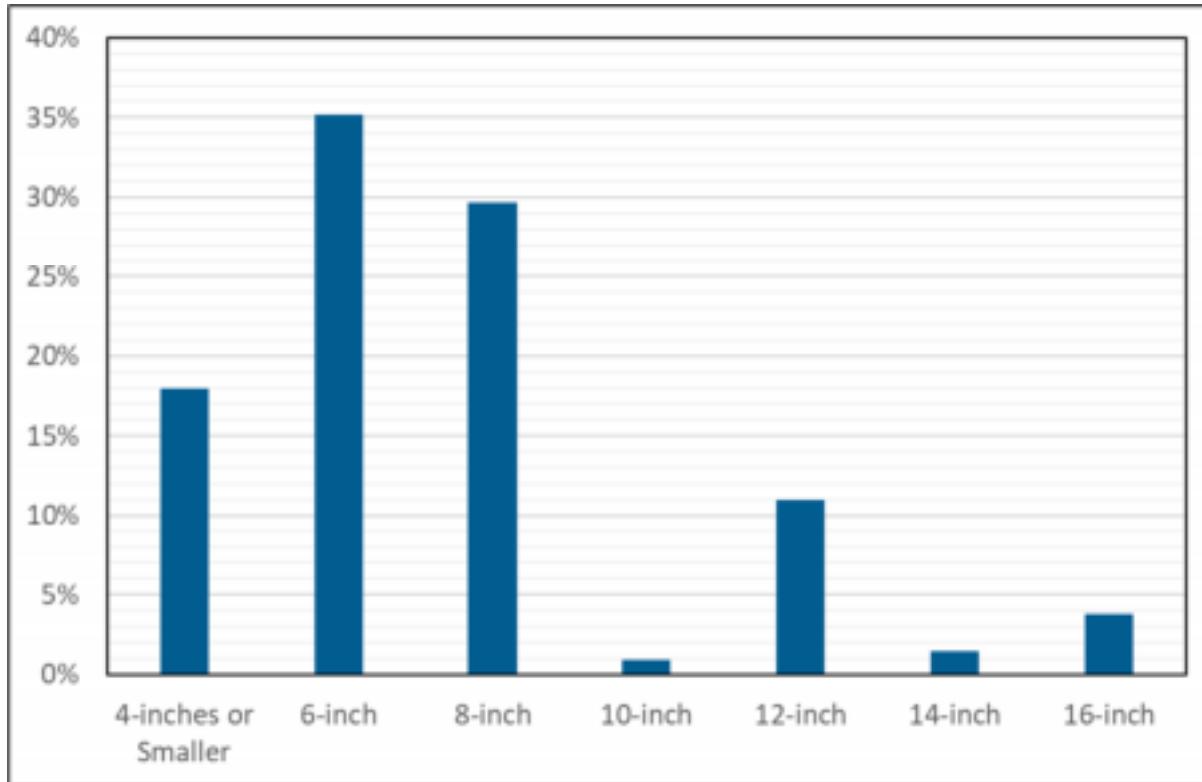


Figure 4-3. Pipeline Diameter by Length and Main Type

Approximately 24 miles, or 18%, of the water distribution system is comprised of pipelines with a diameter of less than 4-inches. The recommended International Fire Code (IFC) minimum conditions for fire flow in the water system are 1,000 gallons per minute (gpm) of available flow at each hydrant (B105.2), while maintaining a TCEQ-required minimum residual pressure of 20 psi at the fire hydrant (30 TAC 290.44 (d)). Pipelines with diameters of less than 8-inches, 6-inches if looped, are incapable of delivering fire flow above 1,000 gpm. In order to provide fire flow capacity and accommodate growth, small diameter pipelines may be upsized to either 6-inches or 8-inches. **Table 4-2** summarizes the length of small diameter pipes by pressure plane.

Table 4-2. Summary of Small Diameter Pipeline Lengths

Pressure Plane	Small Diameter Pipe Length (ft)
PP-1	31,012
PP-2	20,009
PP-3	19,958
PP-4	9,859
PP-5	7,528
PP-6	22,520
PP-7	14,600
PP-8	1,434
Total	126,921

4.1.3 Water Treatment Plants

The water system is served by two surface water treatment plants owned and operated by the City of Lago Vista. Water Treatment Plant #1 (WTP #1) is located on a 4-acre site at 21001 Seminole Drive, Lago Vista, Texas, just east of the Texas Colorado River and has a treatment capacity of 2.0 MGD. WTP #1 is located at the same site as the City's only operating wastewater treatment plant. WTP #1 is supplied by three (3) 800 gpm raw water pumps. Water Treatment Plant #3 (WTP #3) is located on a 6-acre site located at 6444 Marhsalls Point Cove, Lago Vista, Texas and has a treatment capacity of 2.0 MGD. WTP #3 is supplied by three (3) 700 gpm raw water pumps. High service booster pump stations are located at both water treatment plants to distribute water to the distribution system. Existing pipelines allow for water to be distributed from WTP #1 to all pressure planes, but only allow for water to be distributed from WTP #3 to PP-1, PP-6, and PP7. **Table 4-3** summarizes the current capacities for WTP #1 and WTP #3, as well as the demand by the pressure planes served by planning period.

Table 4-3. Historical Water Demands by Connection

Water Treatment Plant	Treatment Capacity MGD	Raw Water Pumping Capacity MGD Total (Firm)
WTP #1	2.0	3.45 (2.30)
WTP #3	2.0	3.02 (2.02)
Total		

4.1.4 Storage Facilities

Elevated storage of water generally refers to a volume of water stored at an elevation such that gravity can be utilized to maintain appropriate system pressure. Elevated storage tanks can be constructed with legs or a pedestal to achieve the desired elevation, or they can be ground storage tanks constructed at elevations higher than the service area. Standpipes are generally defined as very tall ground storage tanks constructed at similar ground elevations and with similar overflow elevations as ESTs. Standpipes can often lead to water quality issues due to the large quantity of most stagnant water required to maintain adequate pressure and are generally no longer recommended. Currently, Lago Vista operates 9 elevated storage tanks, consisting of 1 standpipe, 6 GSTs and 2 ESTs. **Table 4-4** summarizes the elevated storage tanks by pressure plane. TAC §290.38(25) defines elevated storage as “that portion of water which can be stored at least 80 feet above the highest service connection in the pressure [plane] served by the storage tank.” In **Table 4-4**, this is referred to as “effective storage.” Storage capacity and effective storage are shown in millions of gallons (MG).

Table 4-4. Existing Elevated Storage Tanks

Name	Pressure Plane(s) Served as Elevated Storage	Overflow Elevation (feet)	Sidewater Depth (feet)	Storage Capacity (MG)	Highest Service Elevation (feet)	Effective Storage (MG)
Allegiance GST	PP-6 & PP-7	944	30	0.28	909	0.28
Bronco GST	PP-3	1,079	24	0.24	1,044	0.24
Golf Ball EST	PP-1, PP-6, & PP-7	1,053	32	0.15	1,018	0.15
Hollows GST	PP-3	1,079	24	0.125	1,044	0.125
Hollows Standpipe	PP-4	1,136	81	0.32	1,101	0.32
Lohman Ford GST	PP-2	997	21	0.24	962	0.24
Paseo De Vaca GST	PP-2	997	21	0.24	962	0.24
Talon GST	PP-8	1,213	16	0.20	1,178	0.20
Viking EST	PP-1, PP-6, & PP-7	1,053	32	0.40	1,108	0.40

In addition to elevated storage, ground storage is utilized at pump stations to allow for consistent suction head and to provide a buffer for the water supply. It should be noted that some of the ESTs also serve as ground storage for pump stations. Nine ground storage tanks are utilized within Lago Vista's water system.

Table 4-5 provides a summary of the ground storage tanks.

Table 4-5. Existing Ground Storage Tanks

Name	Pressure Plane Served as Ground Storage	Overflow Elevation (feet)	Sidewater Depth (feet)	Storage Capacity (MG)
Allegiance	PP-1	944	31	0.28
Bronco	PP-8	1,079	24	0.24
Lohman Ford	PP-4	997	21	0.24
Paseo De Vaca	PP-3	997	21	0.24
Talon	PP-5	1,213	15	0.20
WTP #1 GST #1	PP-1, PP-2, PP-6, & PP-7	794	29	0.24
WTP #1 GST #2	PP-1, PP-2, PP-6, & PP-7	794	29	0.21
WTP #3	PP-1, PP-6, & PP-7	788	23	0.50

4.1.5 Pump Stations

The City operates seven booster pump stations. The pump station at WTP #1 supplies water directly to pressure planes 1, 2, 6, and 7. This water can then be repumped from secondary booster pump stations to the rest of the water distribution system. The pump station at WTP #3 supplies water to pressure planes 1, 6, and 7, the southern part of the distribution system. Because water from WTP #3 can only supply water to the southern pressure planes, WTP #1 booster pumps only pump towards Lohman and Paseo GSTs to serve pressure plane 2 directly and allow the Lohman and Paseo booster pump stations to serve the rest of the water system. **Table 4-6** provides a summary of the pumping facilities within Lago Vista's distribution system.

Table 4-6. Summary of Pumping Facilities

Pump Station Name	Pressure Planes Served	Rated Firm Capacity (gpm)	Rated Total Capacity (gpm)
WTP #1 – North	PP-2	500	1,000
	PP-1, PP-6, & PP-7	1,700	2,700
WTP #3	PP-1, PP-6, & PP-7	1,390	2,780
Allegiance	PP-1	700	1,400
Bronco	PP-8	225	450
Lohman Ford	PP-4	225	450
Paseo De Vaca	PP-3	1,500	2,000
Talon	PP-5	225	450

4.2 WATER MODEL CALIBRATION

To verify that the hydraulic model accurately represented the actual distribution system, model calibration was performed. The calibration process involved adjusting system operation, pipe roughness C-values, demand allocation, and diurnal curves to match a known condition. Calibration is an important part of building and using a hydraulic model. Achieving a good calibration to real-world conditions instills confidence that the model elements are reflective of the distribution system infrastructure. The calibration process also identifies discrepancies in the recorded data versus the modeled data that may require further investigation, such as closed valves that are intended to be open and deterioration of pumps. Lago Vista provided available Supervisory Control and Data Question (SCADA) system records during the pressure testing period with hourly readings of pump status, flow, discharge pressure and tank levels recorded for all monitored points in the system. Flow and tank level data were used to calculate a diurnal curve by examining water going into (supply) and out of (demand) the distribution system.

The allocation of demands was achieved using a geo-located water meter shapefile and historical billed consumption spreadsheet provided by Lago Vista. Geocoding is a Geographic Information System (GIS) technique used to generate a geographic location (x-y coordinates) from an address. Meter billing data included the total consumption for every customer between mid-February and mid-April in 2023.

Because InfoWater® requires demands to be allocated to junctions and not pipes, water demands were spatially joined to the nearest water point feature created in GIS. The demand for each node was assigned to the corresponding InfoWater® junction based on the GIS point feature's unique ID. The demands were then scaled to match the demand experienced during the calibration day. Diurnal patterns were applied to nodes with demands to vary the demand over the course of a day. A typical diurnal pattern includes peaks in the morning and the evening, as well as low demand in the middle of the night, to represent typical demand patterns of a customer. The timing and amplitude of peaks and troughs of demand patterns were modified in the calibration process to create a diurnal pattern specific to Lago Vista, in general, and certain pressure planes more specifically.

Temporary pressure testing was conducted to collect data for use in model calibration. Sixteen pressure recorders were installed throughout Lago Vista's service from March 13 – 27, 2023. The pressure recorder locations are illustrated in **Figure 4-4**, and a summary of the pressure recording data is shown in **Appendix A**. The 24-hour period occurring on March 20, 2023 was selected for calibration because of the quality of data and the varying pressure throughout the day.

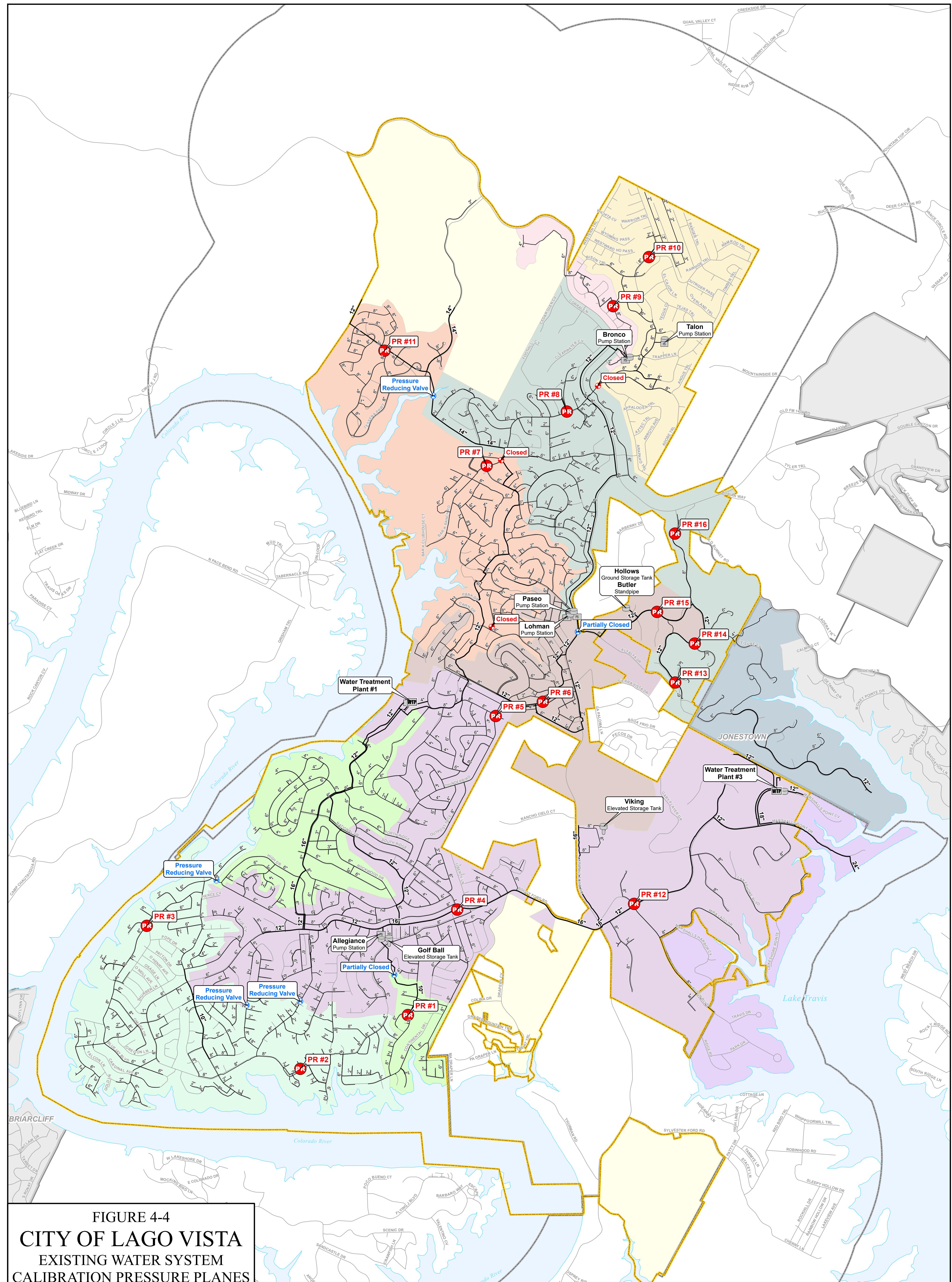


FIGURE 4-4
CITY OF LAGO VISTA
EXISTING WATER SYSTEM
CALIBRATION PRESSURE PLANES

LEGEND

Calibration Valve	— 8" and Smaller Water Line
● Closed	— 10" and Greater Water Line
● Active	— Road
PS	— Pump Station
Hydropneumatic Tank	— Water Body
Ground Storage Tank	— City Limit
Elevated Storage Tank	— ETJ Boundary
Water Treatment Plant	— Other City Limit



PRESSURE PLANES

PP-1
PP-2
PP-3
PP-4
PP-5
PP-6
PP-7
PP-8



0 1,500 3,000

SCALE IN FEET

During the extended period simulation (EPS) calibration, adjustments were made to the model to match the known conditions. FNI conducted EPS modeling to evaluate the range of pressures, the turnover of tanks, and cycling of pumps over a 24-hour period. Complete calibration results, located in **Appendix B**, include graphs showing the relationship between modeled data points versus pressure recorder data points. **Table 4-7** summarizes the percent of 30-minute timesteps in which the model results are within 5 psi of the observed condition. Pressure recorder 12 was within 5 psi 69% of modeled timesteps. Conditions at the inlets of Viking EST and Golf Ball EST create a spiking pressure condition that could not be precisely replicated. Overall, the calibration yielded a good correlation between recorded and modeled values and gave confidence in the accuracy of the model.

Table 4-7. Model Calibration Results

Pressure Recorder	% Timesteps within 5 PSI
1	100%
2	100%
3	100%
4	100%
5	92%
6	96%
7	100%
8	94%
9	100%
10	96%
11	100%
12	69%
13	90%
14	94%
15	96%
16	90%

4.3 WATER SYSTEM ANALYSIS

The existing distribution system was evaluated to assess current pumping and storage capacity, residual pressures, and fire flow capacity. This analysis is performed to determine if there are any existing system deficiencies and to provide a baseline for the current level of service. The parameters that were evaluated are discussed in the following sections. These recommended criteria, summarized in **Table 4-8** are generally greater than the TCEQ requirements and are, therefore, more conservative. However, in a case where the FNI planning criteria is lower than the TCEQ requirement, the TCEQ requirement must still be met by the system (i.e., the TCEQ requirement is a minimum that must be met regardless of the FNI planning criteria). Future connection counts should be monitored to support continued TCEQ compliance.

Table 4-8. Recommended Capacity Criteria Summary

System Component	Recommended Capacity Criteria
Production	TCEQ Minimum: 0.6 gpm/Connection
Distribution Pumping	125% of MD Demand by PP
Elevated Storage	200 gallons per connection
Ground Storage	6 hours of MD Demand by PP

4.3.1 Water Treatment Plant Capacities

To evaluate production capacity in future scenarios, FNI assumed the water system would be served, holistically, by both operating water treatment plants. As the water system is configured in the existing system, WTP #3 cannot supply water to the northern pressure planes. The City has informed FNI that they do not foresee the WTP #1 site of having adequate space for future plant expansions. For this reason, it is assumed all treatment plant expansions are to take place at the WTP #3 site. By means of both plants operating in conjunction with one another, FNI recommends that Lago Vista maintain adequate production capacity to meet 0.6 gpm/connection. **Table 4-9** provides a calculation of total required production capacity in terms of MGD for comparison with TCEQ requirements.

Table 4-9. Required Toal Production Capacity

Year	Production Capacity (MGD)	Projected Connections	Required Production Capacity (MGD) <i>0.6 gpm/connection</i>
2023	4.0	5,382	4.65
2028	4.0	6,819	5.89
2033	4.0	8,652	7.48
Buildout	4.0	20,386	17.61

Systemwide, Lago Vista is required by TCEQ rule to have a total water treatment plant capacity of 0.6 gpm per connection. Additionally, Lago Vista is required to provide a firm raw water pumping capacity of at least 0.6 gpm per connection. WTP #1 has a production and raw water pumping capacity of 2.0 MGD and 3.46 MGD (2.30 MGD firm), respectively. WTP3 has a production and raw water pumping capacity of 2.0 MGD and 3.0 MGD (2.02 MGD firm), respectively. The combined water treatment plant production and combined firm raw water pumping capacities are 4.0 MGD and 5.33 MGD, respectively. Lago Vista has a surplus of raw water pumping to meet the existing system's needs but will need additional treatment capacity to meet TCEQ requirements of 0.6 gpm. The need for additional treatment and raw water pumping is illustrated in **Figure 4-5** and **Figure 4-6**, respectively. Production and raw water pumping capacities will need to be increased across the planning scenarios based on the projected number of connections to meet the TCEQ requirement of 0.6 gpm per connection for both treatment and raw water pumping capacity.

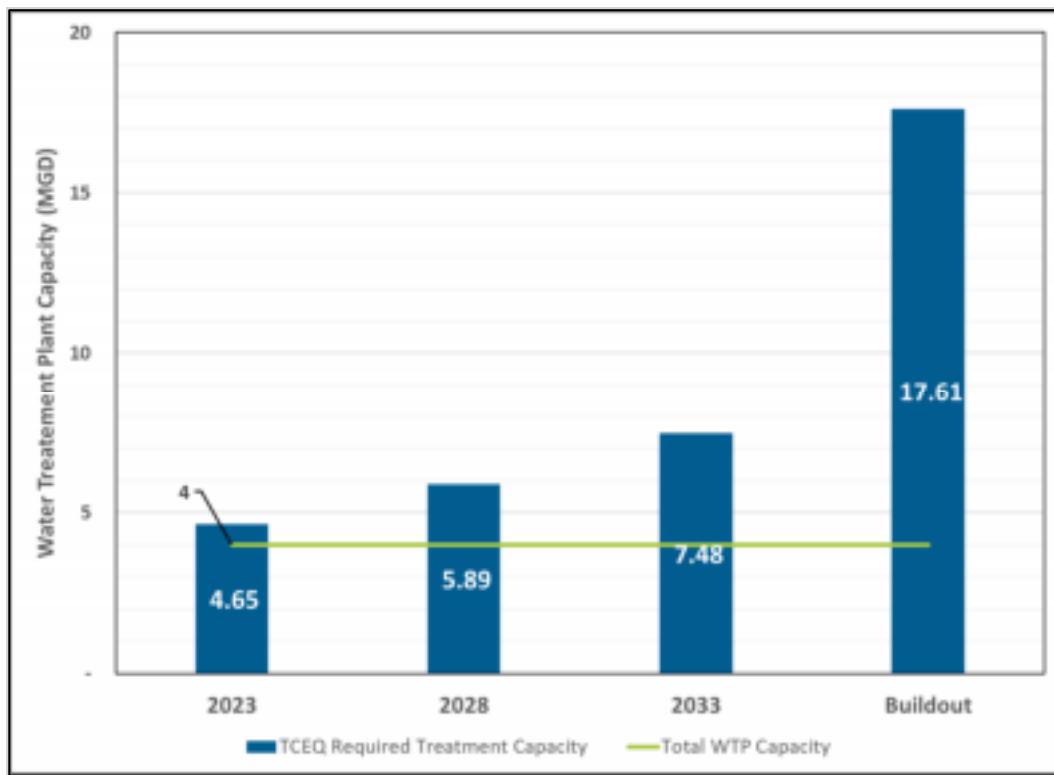


Figure 4-5. Future Water Treatment Plant Capacity Required

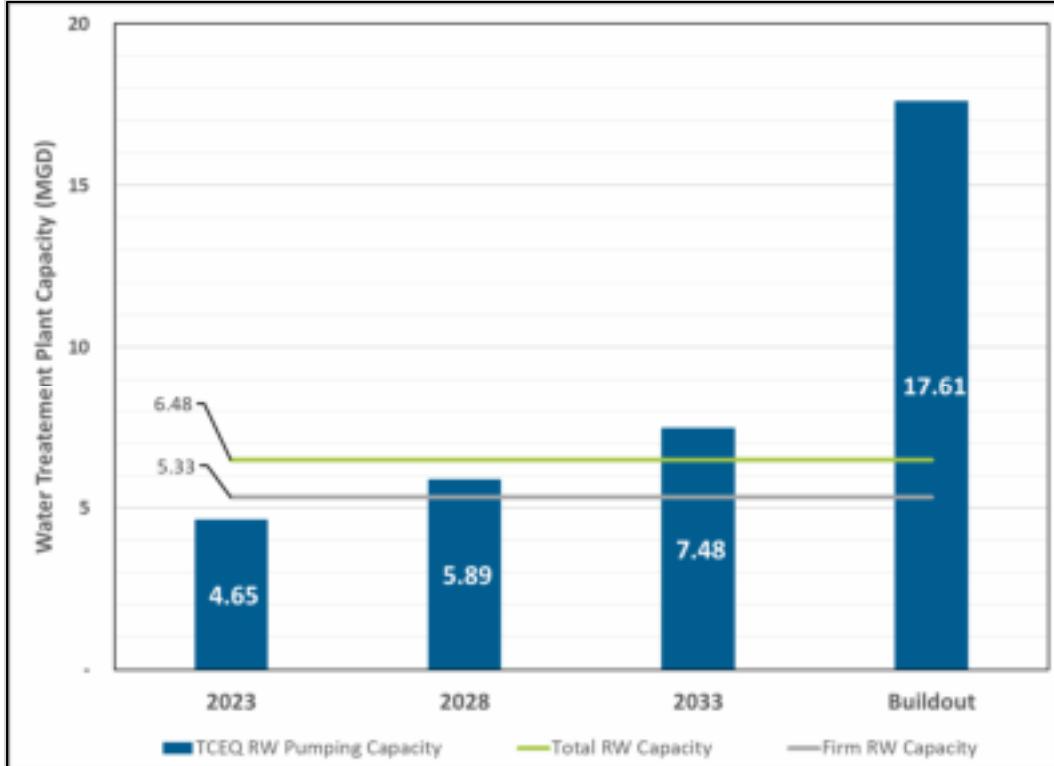


Figure 4-6. Future Raw Water Pumping Capacity Required

4.3.2 Storage and Pumping Capacities

As a public water utility, Lago Vista must comply with the rules and regulations for public water systems set forth by the Texas Commission on Environmental Quality (TCEQ) in Texas Administrative Code (TAC) Chapter 290. Lago Vista is required to meet the TCEQ total storage capacity requirement of 200 gallons per connection. Using the number of connections from the existing 2023 planning scenario, a comparison of Lago Vista's existing storage to TCEQ requirements, summarized in **Table 4-10**, revealed an excess of total storage system wide through 2033.

Table 4-10. TCEQ Total Storage Requirements

Planning Year	Connections	Total Storage (MG)		Gallons per Connection (Existing)
		Required	Existing	
2023	5,382	1.08	3.30	613
2028	6,819	1.36		484
2033	8,652	1.73		381
Buildout	20,386	4.08		162

In addition to total storage requirements, Lago Vista is also required to meet elevated storage and pumping capacity requirements. The minimum pumping requirements may be satisfied through any of the pumping-storage requirement pairs from 30 TAC 290.45 (b)(2)(F), summarized in **Table 4-11**. In pressure planes served by pressure/hydropneumatic (hydro) tanks, the pressure plane must have at least 20 gallons per connection of hydro tank storage, per 30 TAC 290.45 (b)(2)(G), and satisfy pumping requirements of Condition 2 in **Table 4-11**, below. A maximum hydro tank size of 30,000 gallons is sufficient to serve up to 2,500 connections.

Table 4-11. TCEQ High Service Pumping Requirements

Condition		Service Pumping Capacity Requirement
1	If providing at least 200 gallons per connection of elevated storage	Two or more service pumps with a minimum total combined capacity of 0.6 gpm per connection at each pressure plane
2	If providing less than 200 gallons per connection of elevated storage	<p>The lesser of (a) or (b):</p> <p>(a) Two or more service pumps with a minimum total combined capacity of 2.0 gpm per connection at each pressure plane</p> <p>(b) Total capacity of at least 1,000 gpm and the ability to meet peak hourly demands with the largest pump out of service (firm)</p>

Note: Capacity requirement from 30 TAC 290.45 (b)(2)(F)

Because the water distribution system operates on multiple pressure planes, each pressure plane must be assessed independently for pumping and elevated storage requirements. Each pressure plane can meet the pumping/storage requirements, outlined in **Table 4-11**, and summarized in **Table 4-12**. **Table 4-13** summarizes the existing high service pumping and elevated storage requirements by pressure plane and indicates the which option the existing system satisfies.

Table 4-12. TCEQ High Service Pumping/Storage Requirement Options

Option	Pumping	Elevated Storage
1	2.0 gpm/Connection	100 Gal/Connection
2	Meet Peak Hour with Firm Pumping Capacity	100 Gal/Connection
3	0.6 gpm/Connection	200 Gal/Connection
4	2.0 gpm/Connection	Hydro Tank 20 Gal/Connection

Table 4-13. TCEQ High Service Pumping/Storage Requirements By Pressure Plane

Pressure Plane	Connections	Firm Pumping Capacity (gpm)	gpm per Connection	Elevated Storage (MG)	Gallons per Connection	Option(s) Satisfied
PP-1	1,499	1,390	0.93	0.55	367	2,3
PP-2	1,055	1,000	0.95	0.48	455	2,3
PP-3	576	800	1.39	0.24	417	2,3
PP-4	258	1,500	5.81	0.32	1,256	1,2,3
PP-5	147	225	1.53	2,500 [†]	17	4
PP-6 & PP-7	1,805	1,700	0.94	0.28	156	2
PP-8	42	225	5.36	0.20	4,762	1,2,3

[†]Size of Hydropneumatic tank, gallons

The design criterion used to analyze EST capacity is 200 gallons per connection. This criterion not only lowers the pumping requirements from TCEQ, but also provides for adequate equalization storage for peak hour demands and emergency storage for fire protection. It is typically assumed that half of the elevated storage tank capacity is used to meet peak hourly demands in excess of the maximum day rate (equalization volume), while the other half of the tank is used for fire protection and emergency conditions (fire/emergency volume). **Table 4-14** summarizes the recommended elevated storage by pressure plane, by planning year.

For distribution pumping capacity, FNI recommended that each PP provide firm capacity (i.e., capacity with the largest pump in the plane out of service) to meet at least 125% of maximum day demands for all downstream pressure planes. A downstream pressure plane is defined as a plane which is fed directly by another plane via a booster pump station (e.g., PP-5 is downstream of PP-8, and both are downstream of PP-3, and all three are downstream of PP-1). PP-6 and PP-7 were considered as a single, combined PP when making distribution pumping and storage capacity recommendations, since both pressure planes are fed by Allegiance GST and PRVs from PP-1. **Table 4-15** shows a summary of the recommended distribution pumping capacity for each pressure plane. For ground storage capacity, FNI recommends that Lago Vista be able to store 6 hours of maximum day demand for the respective pressure plane at each pump station. This recommendation is reflected in the GST volumes included in the proposed water system improvements. **Table 4-16** summarizes the recommended distribution pumping capacity by WTP facility.

Table 4-14. Recommended Elevated Storage By Pressure Plane

Pressure Plane	Year	Connections	Recommended Volume (MG)	Available Elevated Storage Partial/Total (MG)
PP-1	2023	1,499	0.30	0.47/0.55
	2028	2,073	0.41	0.43/0.55
	2033	2,585	0.52	0.52/0.55
	Buildout	7,093	1.42	0.55/0.55
PP-2	2023	1,055	0.21	0.48
	2028	944	0.19	
	2033	1,392	0.28	
	Buildout	1,573	0.31	
PP-3	2023	576	0.12	0.24
	2028	633	0.13	
	2033	812	0.16	
	Buildout	1,772	0.35	
PP-4	2023	258	0.05	0.32
	2028	253	0.05	
	2033	291	0.06	
	Buildout	1,341	0.27	
PP-5	2023	147	0.03	Hydro
	2028	213	0.04	
	2033	265	0.05	
	Buildout	1,801	0.36	
PP-6 & PP-7	2023	1,805	0.36	0.36/0.28
	2028	1,986	0.40	0.40/0.28
	2033	2,237	0.45	0.31/0.28
	Buildout	4,566	0.91	0.28/0.28
PP-8	2023	42	0.01	0.20
	2028	55	0.01	
	2033	70	0.01	
	Buildout	210	0.04	
Upper Tessera	2023	--	--	--
	2028	662	0.13	0.60
	2033	1,000	0.20	
	Buildout	2,030	0.41	

Table 4-15. Recommended Pumping & Ground Storage By Pressure Plane

Pressure Plane	Year	Connections	Max Day Demand (MGD)	125% Max Day Demand (MGD)	Available Firm Pumping (MGD)	Recommended Ground Storage <i>6 hours of Maximum Day (MG)</i>	Available Ground Storage (MG)
PP-1	2023	1,499	0.90	1.12	2.00	0.22	0.50
	2028	2,073	1.24	1.55		0.31	
	2033	2,585	1.55	1.94		0.39	
	Buildout	7,093	4.60	5.75		1.15	
PP-2	2023	1,055	0.63	0.79	1.44	0.16	0.23
	2028	944	0.57	0.71		0.14	
	2033	1,392	0.83	1.04		0.21	
	Buildout	1,573	0.94	1.18		0.24	
PP-3	2023	576	0.35	0.43	1.15	0.09	0.24
	2028	633	0.38	0.47		0.09	
	2033	812	0.49	0.61		0.12	
	Buildout	1,772	1.06	1.33		0.27	
PP-4	2023	258	0.15	0.19	2.16	0.04	0.24
	2028	253	0.15	0.19		0.04	
	2033	291	0.17	0.22		0.04	
	Buildout	1,341	0.80	1.00		0.20	
PP-5	2023	147	0.09	0.11	0.32	0.02	0.20
	2028	213	0.13	0.16		0.03	
	2033	265	0.16	0.20		0.04	
	Buildout	1,801	1.08	1.35		0.27	
PP-6 & PP-7	2023	1,805	1.08	1.35	2.45	0.27	0.23
	2028	1,986	1.19	1.49		0.30	
	2033	2,237	1.34	1.68		0.34	
	Buildout	4,566	2.74	3.42		0.68	
PP-8	2023	42	0.03	0.03	0.32	0.01	0.24
	2028	55	0.03	0.04		0.01	
	2033	70	0.04	0.05		0.01	
	Buildout	210	0.13	0.16		0.03	
Tessera (Upper & Lower)	2023	--	0.00	0.00	0	0.00	0
	2028	662	0.40	0.50	2.16	0.10	0.50
	2033	1,000	0.60	0.75		0.15	
	Buildout	2,030	1.22	1.52		0.30	

Table 4-16. Recommended Pumping & Treatment Capacity By WTP

Treatment Plant	Year	Connections Served	Maximum Demand (MGD)	Treatment Capacity (MGD)	Pumping Capacity (MGD)
WTP #1	2023	2,078	1.25	2.0	North – 1.44 South – 2.45 Total – 3.89
	2028	2,760	1.65		
	2033	3,830	2.30		
	Buildout	8,727	5.23		
WTP #3	2023	3,304	1.98	2.0	2.00
	2028	4,059	2.43		
	2033	4,822	2.89		
	Buildout	11,659	6.99		
Total	2023	5,382	3.23	4.0	North – 1.44 South – 4.45 Total – 5.89
	2028	6,819	4.09		
	2033	8,652	5.19		
	Buildout	20,386	12.22		

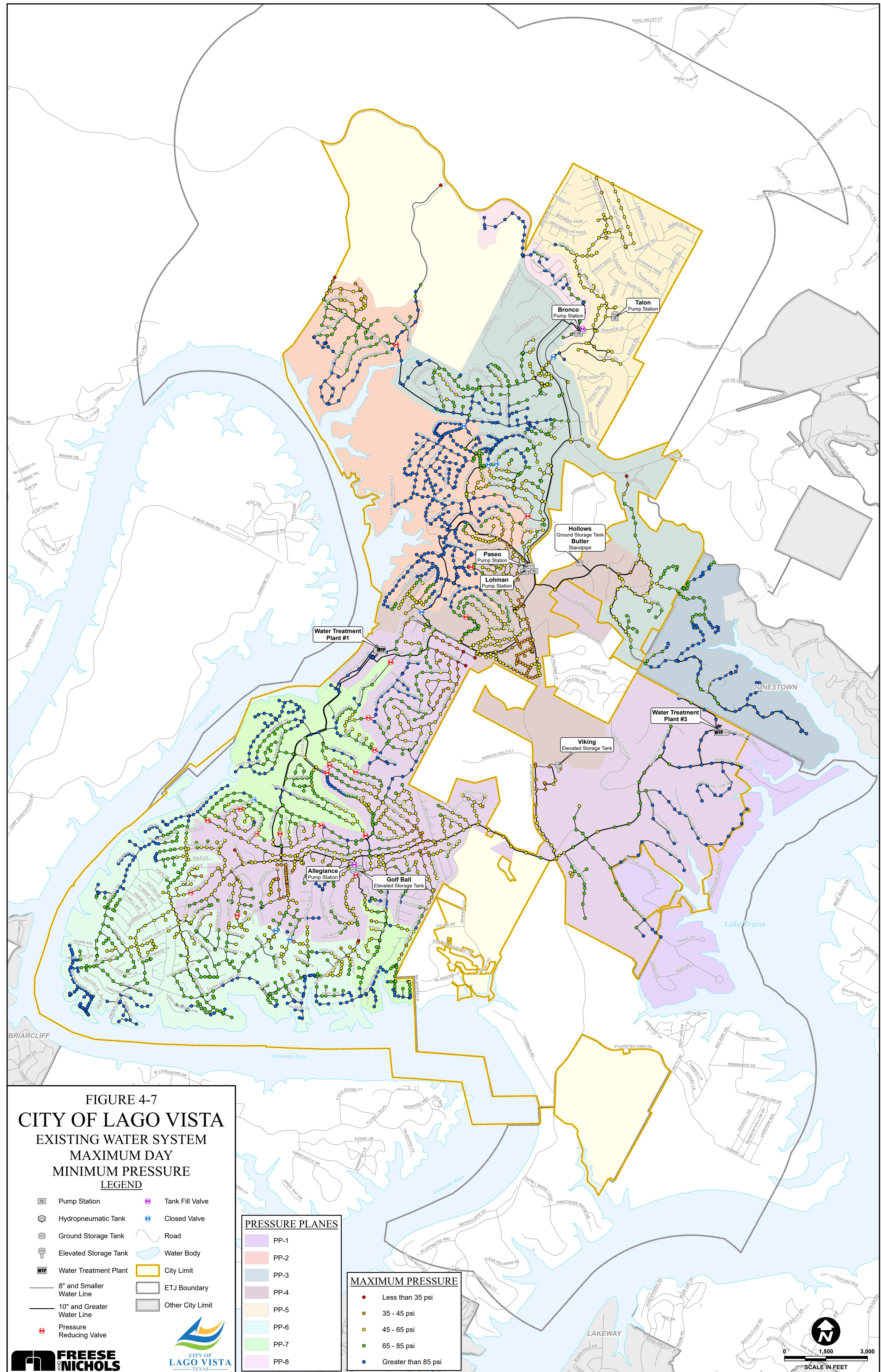
4.3.3 Hydraulic Modeling Analysis

The calibrated model was used to conduct hydraulic analyses of system operations, residual pressure, and available fire flow throughout the distribution system under existing maximum day and peak hour demand conditions. FNI conducted a 24-hour EPS analysis of the system over time to assess response to hourly changes in demand, pump cycling, and tanks filling or draining. During a maximum day EPS analysis, the peak hour demand is also simulated using hourly peaking factors based on the typical diurnal demand pattern. Peak hour demand represents the single hour of the year with the highest system demand. Peak hour simulations are used to assess the ability of the distribution system to maintain residual pressures because the highest demand period typically induces the greatest head loss and lowest pressures throughout the system. Lower demand periods throughout the day were also simulated in EPS modeling to evaluate the system's ability to replenish storage tanks.

Figure 4-7 illustrates the minimum pressures observed in the model under existing demand conditions. Minimum pressures shown on the map represent the lowest pressure experienced at each node during the 24-hour simulation, usually occurring during the peak hour. The TCEQ minimum required pressure within a distribution system is 35 pounds per square inch (psi) under non-emergency demand conditions. As illustrated on **Figure 4-7**, the model indicated pressures ranging between 20 to 165 psi. The lowest modeled pressures are located at the highest elevations at the extremities of PP-1, PP-2, PP-3, and PP-6:

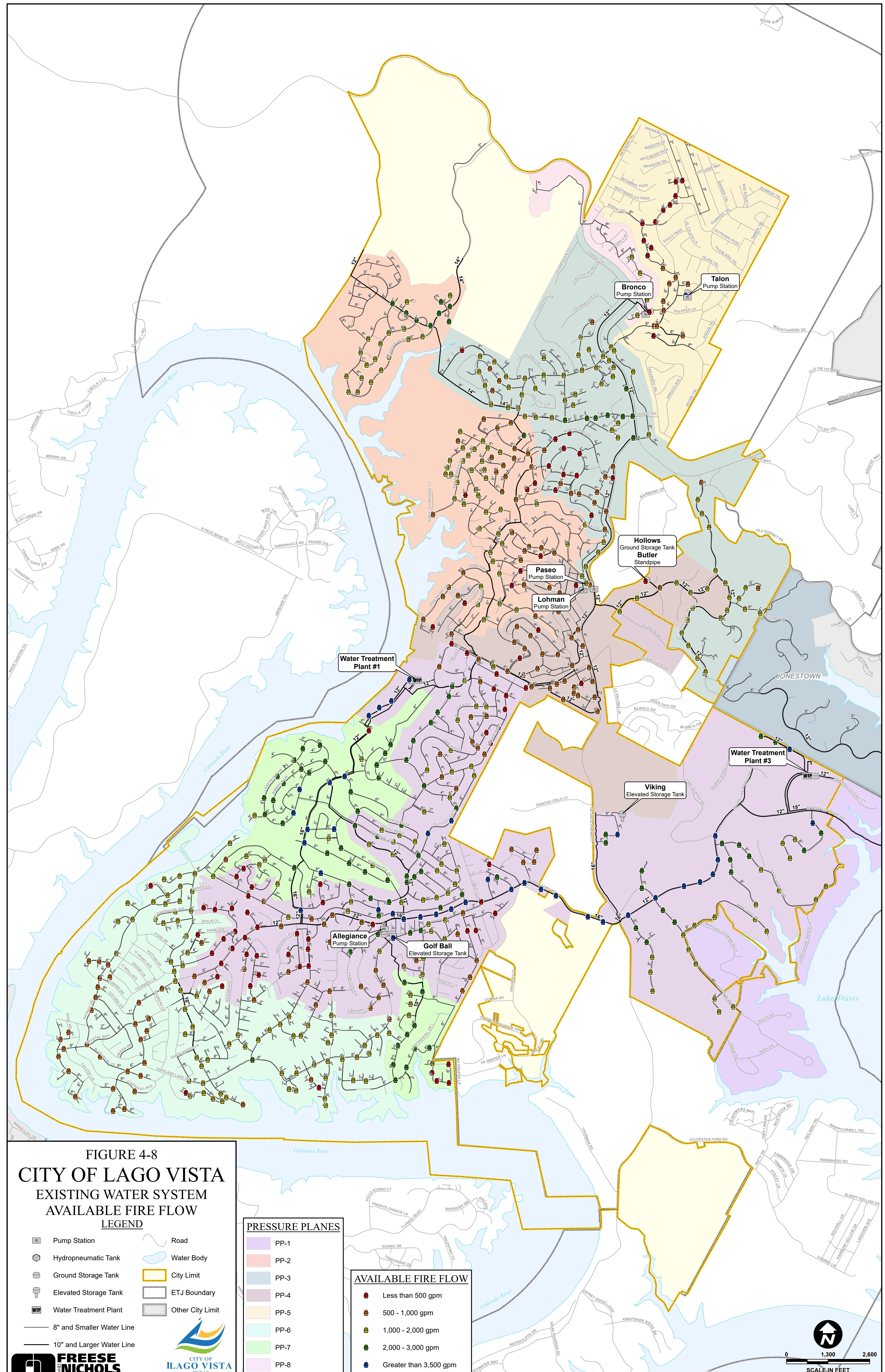
- PP-1: Pinnacle Cove cul-de-sac
- PP-1: Thunderbird Street between Bonanza and Dawn Drive
- PP-2 (Tessera): The western boundary of the Tessera development
- PP-3: Destination Way near FM 1431 Road
- PP-6: Highland Lake Drive, north of Byrd Avenue

Pressures exceed 80 psi in many pressure planes across the entire distribution, mostly along areas along the Colorado River and more broadly within PP-2. Per the International Residential Code (IRC) , the static water pressure shall be no greater than 80 psi without an approved pressure-reducing valve installed on at the customer connection. It is expected homes within the Lago Vista service area have dedicated service PRVs installed that is compliant with detail WT-25 from the City's standard details. In general, the water distribution system has sufficient looping and adequate water line sizes such that high velocities and head loss is not a concern for current conditions. Areas that can be easily converted to adjacent pressure planes or low pressures on dead-end mains will be prioritized in the CIP.



4.3.4 Fire Flow Analysis

To evaluate the system's ability to meet fire suppression demands, a fire flow analysis was conducted under maximum day demand conditions. Per the International Fire Code (IFC), the recommended minimum conditions for fire flow in the water system are 1,000 gpm of available flow at each hydrant (B105.2), while maintaining a TCEQ-required minimum residual pressure of 20 psi at the fire hydrant (30 TAC 290.44 (d)). For this analysis, a steady-state model run was conducted to calculate the available fire flow at each fire hydrant node in the system with a pressure of 20 psi. **Figure 4-8** illustrates the results of the fire flow simulation. The capability of the distribution system to deliver at least 1,500 gpm varies from pressure plane to pressure plane, with much of the deficiency occurring in the older parts of town with pipeline diameters of less than 6-inches. Areas of PP-1, PP -2, PP-3, PP-5 and PP-6 notably have high proportion of small diameter mains incapable of delivering fire flow above 1,500 gpm. Upsizing of smaller lines and looping are two methods to improve low fire flow. As areas are improved with larger diameter distribution mains (8-inches or 6-inches), it is recommended that additional fire hydrants be installed to improve fire protections. Available fire flow for commercial, multi-family, and industrial land uses should be evaluated on a case-by-case basis.



5.0 WATER SYSTEM CAPITAL IMPROVEMENT PLAN

The recommended CIP improvements presented on **Figure 5-1** will provide the required capacity and reliability to meet projected peak demands through the buildout scenario. All of the recommended projects, sans Projects #8 and #9, add capacity to the water collection system and are eligible for impact fees. Locations shown for new pipelines and other recommended improvements were generalized. Specific pipeline alignments and facility sites will need to be determined as part of the design process. All dollar values presented in this section can be assumed to be nominal values with a price base of 2024. If values are to be used in a year other than 2024, they should be adjusted for factors that affect nominal prices over time, as appropriate.

Using the hydraulic model to analyze the water distribution system, improvements were phased into the three planning periods in which they become hydraulically necessary. The order of CIP projects listed represents FNI's recommended sequence of project execution based on model analysis, field observations, and the City's communication of operational experience and perception of priorities. Project priorities may evolve as system needs, growth pressure, regulatory direction, field conditions, and funding availability dictate. Municipal water and wastewater service providers typically find the need to re-order CIP project priority, sequence, and/or timing of execution. FNI recommends that Lago Vista execute the CIP in the general order listed to address its infrastructure challenges most efficiently and cost effectively. The following sections list the projects by phase and provide a description and driver for each project. **Table 5-1** summarizes a Class 5 opinion of probable construction costs (OPCC) of the water system CIP projects. Capital costs were calculated for the major water pipelines but do not include costs for individual service connections or internal subdivision lines. Additionally, fees associated with design, surveying, environmental studies, geotechnical studies, land acquisition, legal fees, etc. are not included in OPCCs. This OPCC is a prediction based on available information at the present time to represent a forecast of conditions at some point in the future. As such, an OPCC is an approximation and thus, has an inherent level of uncertainty. Unit prices and quantities associated with each line item shown in the OPCC are subject to some variability. In addition, most large-scale construction projects encounter cost requirements during bidding and/or construction that could not have been reasonably identified during the design phase. A 30% contingency cost was assigned to the unknowns in the definition of the project. It is intended to account for construction costs that have not yet been identified due to the project's maturity and should be expected to be fully used for construction. Detailed descriptions of the projects and their associated costs are included in **Appendix C**.

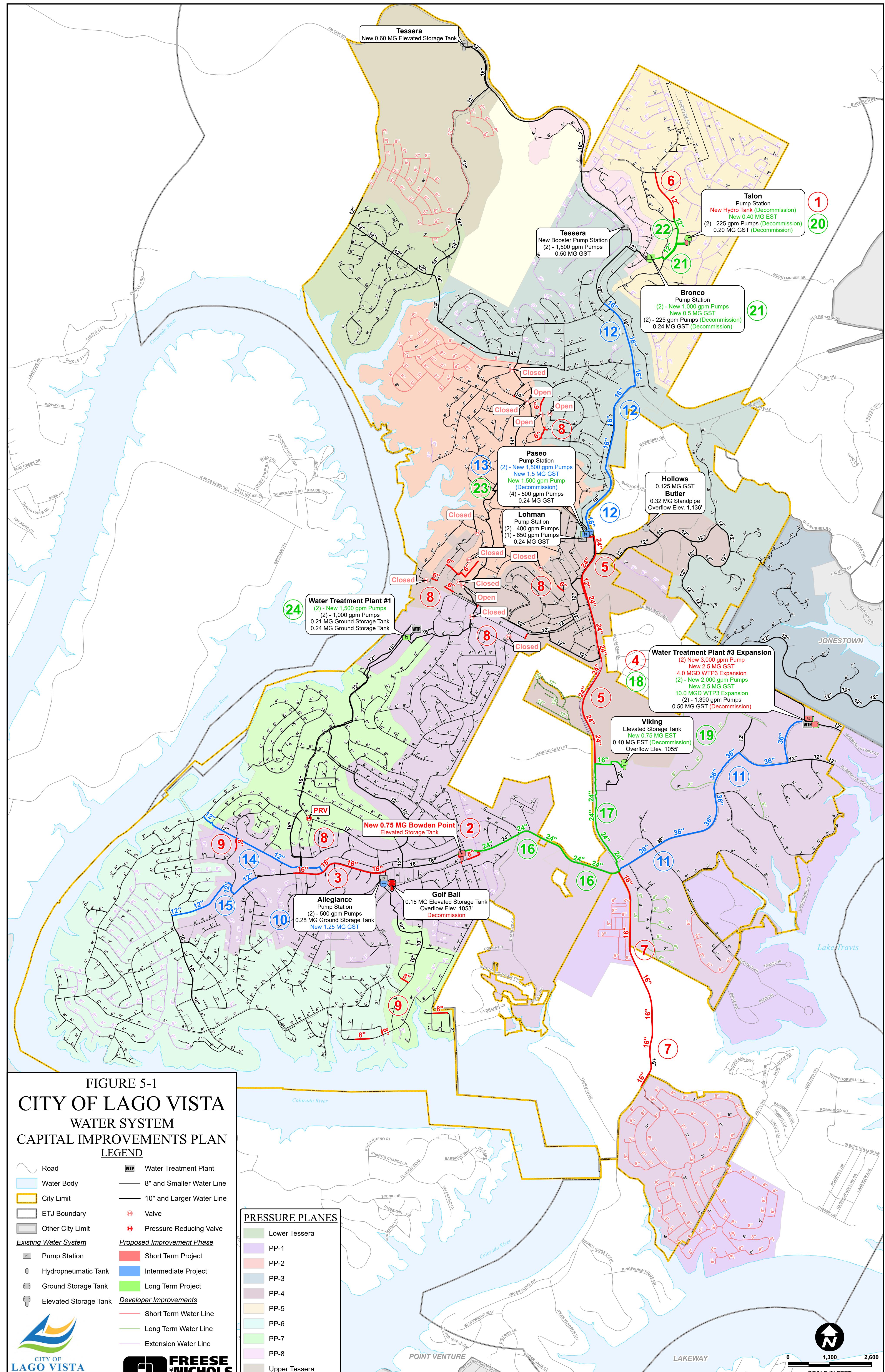


FIGURE 5-1
CITY OF LAGO VISTA
WATER SYSTEM
CAPITAL IMPROVEMENTS PLAN
LEGEND

**CITY OF LAGO VISTA
WATER SYSTEM
CAPITAL IMPROVEMENTS PLAN
LEGEND**

LEGEND

Road	WTP	Water Treatment Plant
Water Body	—	8" and Smaller Water Line
City Limit	—	10" and Larger Water Line
ETJ Boundary	✖	Valve
Other City Limit	✖	Pressure Reducing Valve
<u>Existing Water System</u>		<u>Proposed Improvement Phase</u>
PS	Pump Station	Short Term Project
○	Hydropneumatic Tank	Intermediate Project
●	Ground Storage Tank	Long Term Project
■	Elevated Storage Tank	
<u>Developer Improvements</u>		
—	Short Term Water Line	
—	Long Term Water Line	
—	Extension Water Line	



PRESSURE PLANES

Lower Tessera

PP-1

PP-2

PP-3

PP-4

PP-5

PP-6

PP-7

PP-8

Upper Tessera

SCALE IN FEET

Table 5-1. Water System Capital Improvements Capacity Projects Summary

Project No.	Project Name	Cost (\$)
1	New Talon Hydro Tank	\$710,200
2	New 0.75 MG Bowden Point EST	\$5,933,000
3	Boggy Ford Water Line	\$1,344,100
4	WTP #3 Treatment Expansion and High Service Pump Expansion - Short	\$18,251,000
5	Lohman Ford Transmission Main Extension	\$4,903,600
6	Bar K 12-inch Water Line	\$690,700
7	Lohman Ford 16-inch Water Line	\$3,056,600
8	Pressure Plane Conversion	\$1,273,400
9	Miscellaneous Water Line Connections	\$1,019,700
5-Year Total		\$37,182,300
10	New 1.0 MG Allegiance GST	\$2,803,200
11	WTP #3 Transmission Main	\$8,379,500
12	Paseo/Lohman Ford Transmission Main	\$3,641,900
13	New Paseo Pump Station and GST	\$8,357,100
14	High Drive Water Line	\$1,478,600
15	Patton Ave Water Line	\$1,203,500
10-Year Total		\$25,863,800
16	Boggy Ford Transmission Main	\$3,493,900
17	Lohman Ford Transmission Main Upsize	\$2,237,400
18	WTP #3 Treatment and Pump Expansion – Buildout	\$64,389,700
19	New 0.75 Viking EST	\$6,347,800
20	New 0.40 MG Talon EST	\$3,737,500
21	New Bronco Booster Pump Station and Transmission Main	\$5,258,000
22	PP-5 12-inch Water Line	\$786,400
23	New 1,500 gpm Paseo Pump	\$1,614,600
24	WTP #1 HSP Expansion	\$2,421,900
Buildout Total		\$90,287,200
Water Capital Improvement Plan Total		\$153,333,300

5.1 2023 THROUGH 2028 WATER SYSTEM IMPROVEMENTS

The timing of projects is based on projected demands. Some projects may be initiated sooner than indicated because of development pressure or rehabilitation urgency.

1. New Talon Hydro Tank

This project consists of a new 30,000-gallon hydro tank to replace the existing hydro tank at the Talon pump station. Pressure Plane 5 currently supplies 17 gallons per connection of pressure tank storage. The hydro tank installation is intended to provide sufficient storage capacity to satisfy TCEQ requirements beyond the 10-year planning period.

2. New 0.75 MG Bowden Point EST

This project consists of a new 0.75 MG EST to be installed near the Bowden Point Park at the intersection of Boggy Ford Road and National Drive. Upon completion of the proposed Bowden Point EST, the Golf Ball EST is to be decommissioned and demolished. Golf Ball EST and Viking EST currently serve Pressure Plane 1 directly, and Pressure Planes 6 & 7 through pressure reducing valves. Pressure Planes 6 & 7 borrow from the excess elevated storage in Pressure Plane 1 to meet TCEQ minimum elevated storage requirements. Additional elevated storage will be needed by the 10-year planning period to satisfy Pressure Planes 1, 6, and 7 minimum elevated storage requirements. Golf Ball EST is relatively small and was observed to quickly drain and fill during normal operating conditions. The replacement of this elevated storage tank with a large EST will reduce the rapid drain and fill cycle observed in existing conditions.

3. Boggy Ford Water Line

This project consists of nearly 3,100 linear feet of 16-inch water main along Boggy Ford Road between Allegiance Avenue and Mount Vernon Avenue. The purpose of this project is to move water westward within Pressure Plane 1 from the proposed Bowden Point EST (Project #2) to the existing pressure reducing valves on Patton Avenue and Norton Avenue.

4. WTP #3 Treatment Expansion and High Service Pump Expansion – Short-Term

This project consists of a 4.0 MGD expansion to the treatment capacity of WTP #3 and an expansion at the WTP #3 high service pump station to include two additional 3,000 gpm pumps. The existing combined water treatment plant capacities of WTP #1 and WTP #3 is 4 MGD. An additional 4.0 MGD of treatment plant capacity satisfies the water production

needs through the 2033 planning scenario. As WTP #1 is limited with space, future treatment improvements are assumed to take place at WTP #3. In order to distribute the treated water and supply the water system during maximum day conditions through the 2033 planning scenario, two 3,000 gpm pumps are recommended. The high service pump station (HSPS) will distribute to lower pressure planes as well as the Lohman/Paseo HSPS via project #5.

5. Lohman Ford Transmission Main

This project consists of 8,000 linear feet of 24-inch water transmission main along Lohman Ford Road, beginning at Lago Vista High School and connecting to the Lohman and Paseo Ground Storage Tanks. Pressure Planes 3, 4, 5, 8, and the Tessera development can only be supplied by WTP #1. All future WTP expansions are expected to take place at WTP #3. In order to move water to the northern pressure planes, this transmission main is required to move water from WTP #3 to the Lohman and Paseo GSTs. The 24-inch water main is recommended to serve buildout demands. Alternatively, a 16-inch main would suffice through the 10-year planning period but would need to be replaced with a 24-inch as velocities exceed 5 feet per second.

6. Bar K 12-inch Water Line

This project consists of about 1,650 linear feet of 12-inch water main along Bar K Road between Bluff Ridge Trail and Bison Trail. The purpose of this project is to increase hydraulic connectivity within Pressure Plane 5 and move water north within the pressure plane.

7. Lohman Ford 16-inch Water Line

This project consists of a 16-inch water line along Lohman Ford Road that begins at Boggy Ford Road and terminates at the Proposed Winn Ranch master planned development. This project extends water service south to the proposed Luna Ridge (Groseclose) and Winn Ranch master planned development communities. The proposed 16-inch water line is oversized from a 12-inch water line to provide excess capacity to additional potential growth in unincorporated areas not examined in this master plan. The timing and extent of this project is dependent upon the timing of construction for either of the proposed master planned developments.

8. Pressure Plane Conversion

This project consists of a collection of small-scale valve and water line improvements to convert certain areas of the distribution network to other pressure planes. The intent of this project is to convert enclaves within the water system to nearby pressure planes to improve the level of service and provide more consistent pressures during maximum day demands.

9. Miscellaneous Water Line Connections

This project consists of a collection of 12-inch and 8-inch water line improvements across multiple pressure planes. The intent of this project is to increase hydraulic connectivity across the water system and improve looping.

5.2 2029 THROUGH 2033 WATER SYSTEM IMPROVEMENTS

10. New 1.25 MG Allegiance GST

This project consists of a new 1.25 MG Allegiance GST to replace the existing 0.28 MG Allegiance GST. Pressure Planes 6 & 7 borrow elevated storage via pressure reducing valves from pressure plane 1. As growth continues in pressure planes 6 and 7, additional storage at the Allegiance pump station is required to meet TCEQ minimum standards for elevated storage.

11. WTP #3 Transmission Main

This project consists of 9,500 linear feet of 36-inch water transmission main from the WTP #3 facility, along Shoreline Ranch Drive, to the intersection of Lohman Ford Road and Boggy Ford Road. This project provides distribution capacity to move Buildout flows from WTP #3 to the rest of the water distribution network. The oversizing for this planning period will provide adequate conveyance capacity through the Buildout scenario.

12. Paseo/Lohman Ford Transmission Main

This project consists of 8,400 linear feet of 16-inch water transmission main along Lohman Ford Road and FM 1431 to add additional conveyance capacity to PP-3, PP-8, and the new Tessera HSPS. The proposed 16-inch transmission main provides additional conveyance capacity to supply multiple pressure planes through the buildout scenario under maximum day conditions.

13. New Paseo Pump Station and GST

This project expands the pumping and ground storage tank capacity of the Paseo HSPS. To meet the projected demands in Pressure Planes 3, 5, 8, and Tessera, the Paseo HSPS is recommended to be expanded to 1,500 gpm firm in the 10-year planning scenario, with the ability to add an additional pump for the buildout scenario.

14. High Drive Water Line

This project consists of 4,300 linear feet of 12-inch water main along High Drive beginning east of Rock Terrace Drive and ending east at the pressure reducing valve near Parliament Cove. The proposed 12-inch water line improvement increases conveyance west within PP-1 from the proposed Bowden Point EST and increases supply through the pressure reducing valve to PP-6.

15. Patton Avenue Water Line

This project consists of 3,500 linear feet of 12-inch water main along Boggy Ford Road and Patton Avenue to increase conveyance through the pressure reducing valve on Patton Avenue to supply PP-6. The proposed 12-inch water line improvement increases conveyance south within PP-1 from the existing 12-inch water line on Boggy Ford Road and increases supply through the pressure reducing valve on Patton Avenue to PP-6.

5.3 BUILDOUT WATER SYSTEM IMPROVEMENTS

16. Boggy Ford Transmission Main

This project consists of 5,700 linear feet of 24-inch water transmission main along Boggy Ford Road between Lohman Ford Road and Liberty Lane. The proposed 24-inch transmission main increases conveyance from WTP #3 to PP-1 and PP-6. The 24-inch transmission main is sized to convey accommodate supply from WTP #3 through the buildout scenario.

17. Lohman Ford Transmission Main – Segment 1

This project consists of 3,650 linear feet of 24-inch water transmission main along Lohman Ford Road between Boggy Ford Road and Lago Vista High School. The proposed 24-inch transmission main increases conveyance capacity from WTP #3 and the Lohman/Paseo pump station. The existing 16-inch water line has sufficient carrying capacity through the 10-year

planning period. As the water system trends towards buildout, the transmission main will need to be upsized in order to avoid high velocities.

18. WTP #3 Treatment and Pump Expansion – Buildout

This project consists of an expansion to the treatment capacity of WTP #3 to 18.0 MGD and an expansion at the WTP #3 high service pump station to include two additional 3,000 gpm pumps. The required combined water treatment plant capacities by the Buildout scenario is 17.61 MGD. An additional 9.5 MGD of treatment plant capacity satisfies the water production needs through the Buildout planning scenario. As WTP #1 is limited with space, future treatment improvements are assumed to take place at WTP #3. In order to distribute the treated water and supply the water system during maximum day conditions through the Buildout planning scenario, two 3,000 gpm pumps are recommended.

19. New 0.75 Viking EST

This project consists of a 0.75 MG Viking elevated storage tank to replace the existing 0.40 MG Viking elevated storage tank. Golf Ball EST and Viking EST serve Pressure Plane 1 directly, and Pressure Planes 6 & 7 through pressure reducing valves. Pressure Planes 6 & 7 borrow from the excess elevated storage in Pressure Plane 1 to meet TCEQ minimum elevated storage requirements. Additional elevated storage will be needed for the Buildout planning period to satisfy Pressure Planes 1, 6, & 7 minimum elevated storage requirements.

20. New 0.40 MG Talon EST

This project consists of a 0.40 MG Talon elevated storage tank to replace the proposed Hydro Tank (Project #1). Pressure Plane 5 is currently supplied by the Talon HSP and associated Talon Hydro Tank. As Pressure Plane 5 approaches buildout, the pressure plane may be better served by a standing elevated storage tank, as opposed to a large hydro tank and a pump station with long run times. The elevated storage tank will provide excess storage for power outages and allow for the pumps supplying PP-5 to rotate. The proposed elevated storage tank is within flight path considerations of the nearby airport. Consultation and approval with the FAA will be required upon design and construction.

21. New Bronco Booster Pump Station and Transmission Main

This project consists of a new 1,000 gpm Bronco booster pump station (BPS), 0.50 MG Bronco ground storage tank, and a 12-inch transmission main to connect to the proposed Talon EST

(Project #20). The proposed Talon EST (Project #20) is to be served directly by a new Bronco BPS in lieu of upsizing the Bronco BPS and upsizing the Talon BPS. The Bronco BPS is to supply PP-5 directly through the proposed 12-inch transmission main and serve PP-8 through a new PRV.

22. PP-5 12-inch Connection

This project consists of 1,800 linear feet of 12-inch water line within PP-5 along Bar K Ranch Road. The proposed 12-inch water line supports the additional supply from the new Bronco booster pump station (Project #21) and the proposed 0.40 MG Talon EST (Project #20). The added conveyance capacity connects the proposed EST to the Bar K 12-inch water line proposed in Project #6).

23. New 1,500 gpm Paseo Pump

This project consists of an additional pump at the Paseo booster pump station (BPS). Growth in the areas served by the Paseo BPS requires the addition of another pump. The additional pump will provide sufficient firm capacity to meet demands through the Buildout planning scenario.

24. WTP #1 HSPS Expansion

This project consists of an expansion to the WTP #1 HSP that provides service to the Lohman/Paseo BPS. The expansion is intended to bring the firm pumping capacity to 1,500 gpm. Expanded pumping capacity at WTP #3 (Projects #4 & #18) and associated distribution mains (Projects #11 & #16) facilitate supply to lower pressure planes, thus relieving the need for WTP #1 to supply these areas. Increasing the pumping capacity at WTP #1 in the direction of the Lohman/Paseo BPS increases the redundancy of supply to the higher pressure planes directly.

5.4 SMALL DIAMETER WATER LINE REPLACEMENTS

As discussed in **Section 4.1.2**, the existing water system has nearly 24 miles of small diameter pipelines. In order to provide adequate supply for fire protection, pipeline sizes must be upsized to at least 6-inches in diameter where looped, or 8-inches for dead end mains. **Table 5-2** summarizes cost estimates for small diameter pipelines replaced as either 6-inch or 8-inch pipelines. Cost estimates are inclusive of a 30% contingency and 20% engineering and survey cost on top of the cost of material and installation. The total estimated replacement cost ranges from \$17.8 million to \$23.8 million.

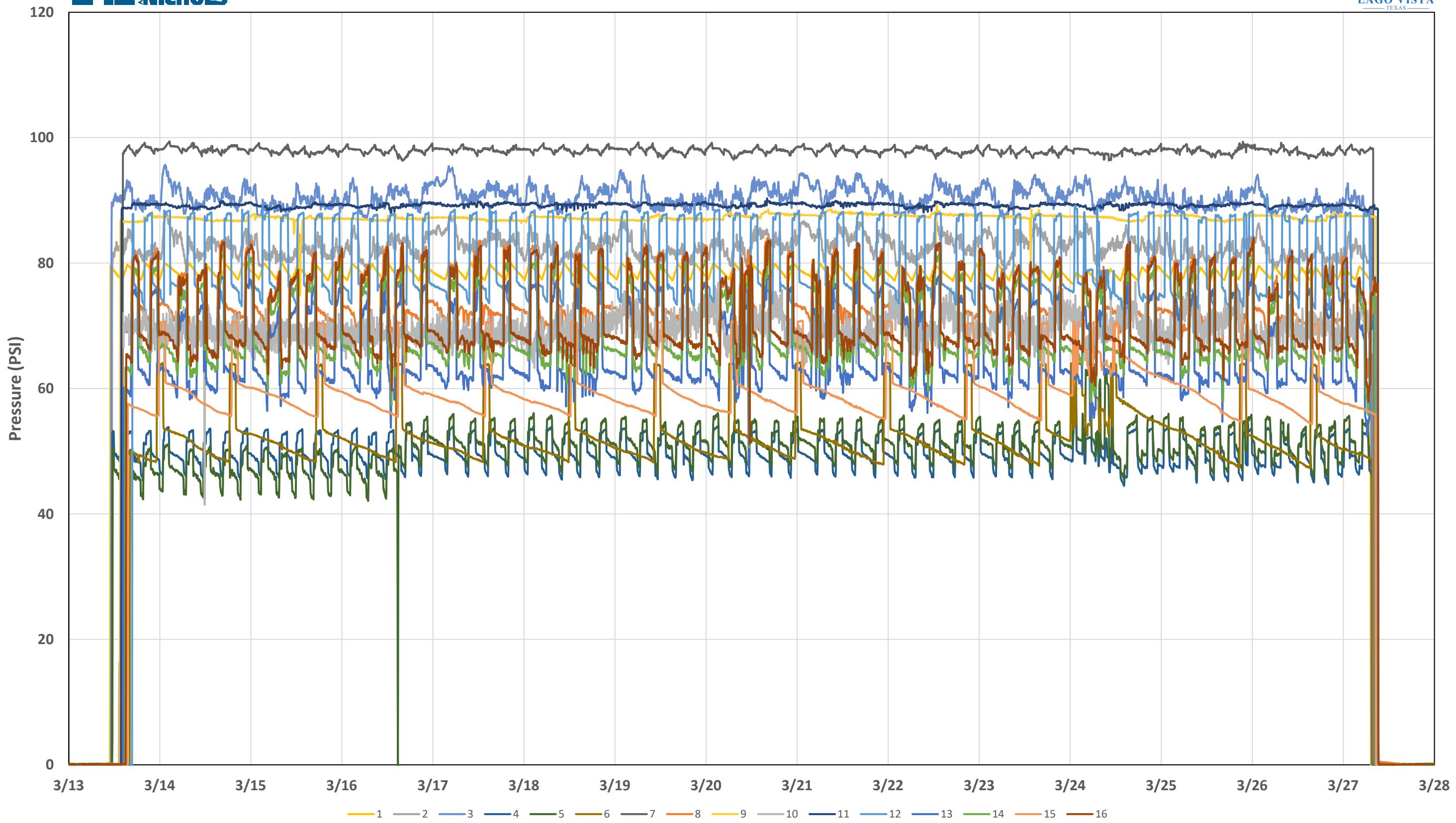
Table 5-2. Small Diameter Replacement Costs

Pressure Plane	Small Diameter Pipe Length (ft)	6-inch Water Line Replacement Cost	8-inch Water Line Replacement Cost
PP-1	31,012	\$4,352,400	\$5,803,200
PP-2	20,009	\$2,808,000	\$3,744,000
PP-3	19,958	\$2,808,000	\$3,744,000
PP-4	9,859	\$1,404,000	\$1,872,000
PP-5	7,528	\$1,053,000	\$1,404,000
PP-6	22,520	\$3,159,000	\$4,212,000
PP-7	14,600	\$2,049,900	\$2,733,200
PP-8	1,434	\$210,600	\$280,800
Total	126,921	\$17,844,900	\$23,793,200

APPENDIX A
Temporary Pressure Recording Summary



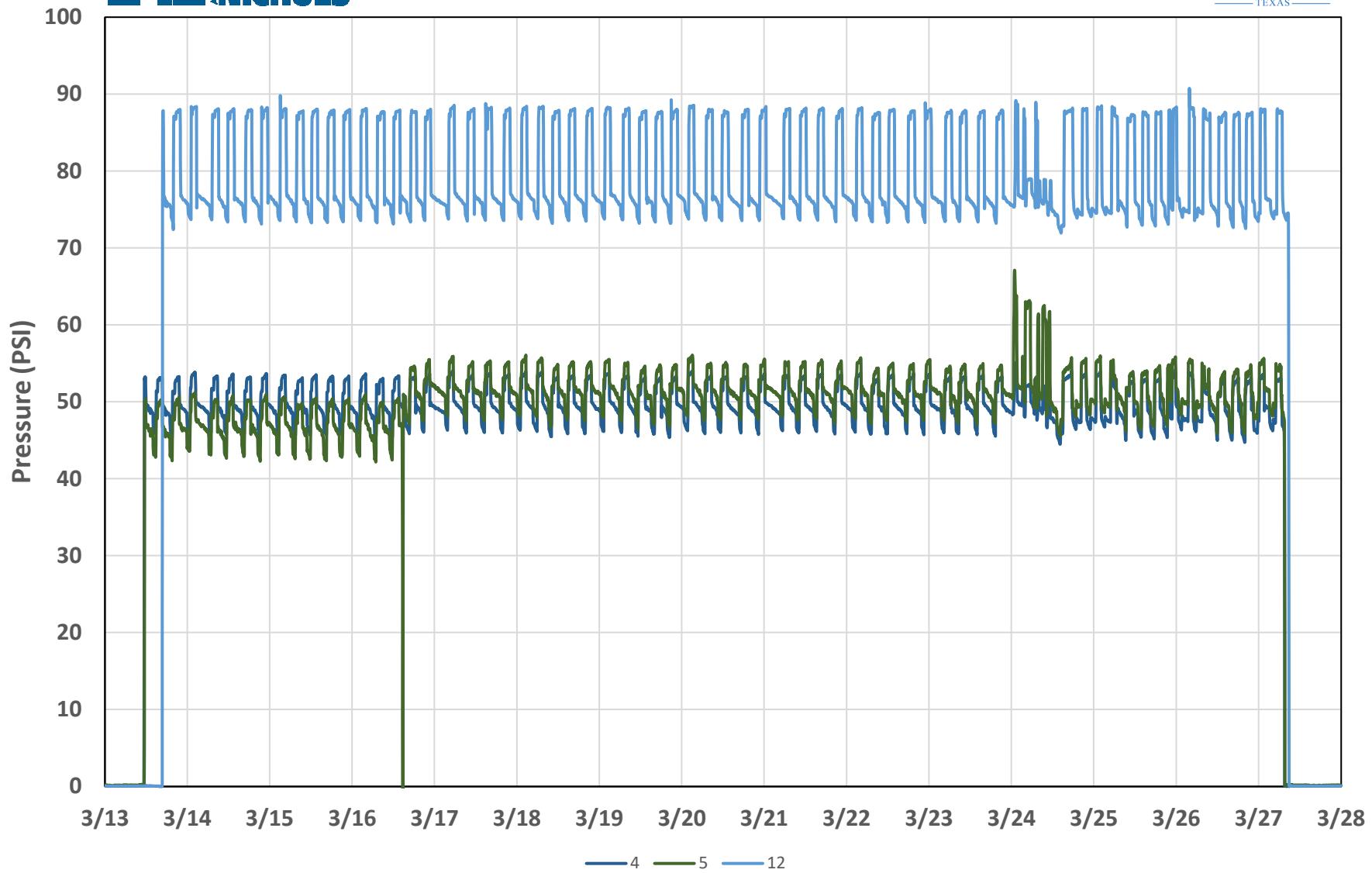
Pressure Recording
3/13/2023 - 3/27/2023



Pressure Recording

PZ-1

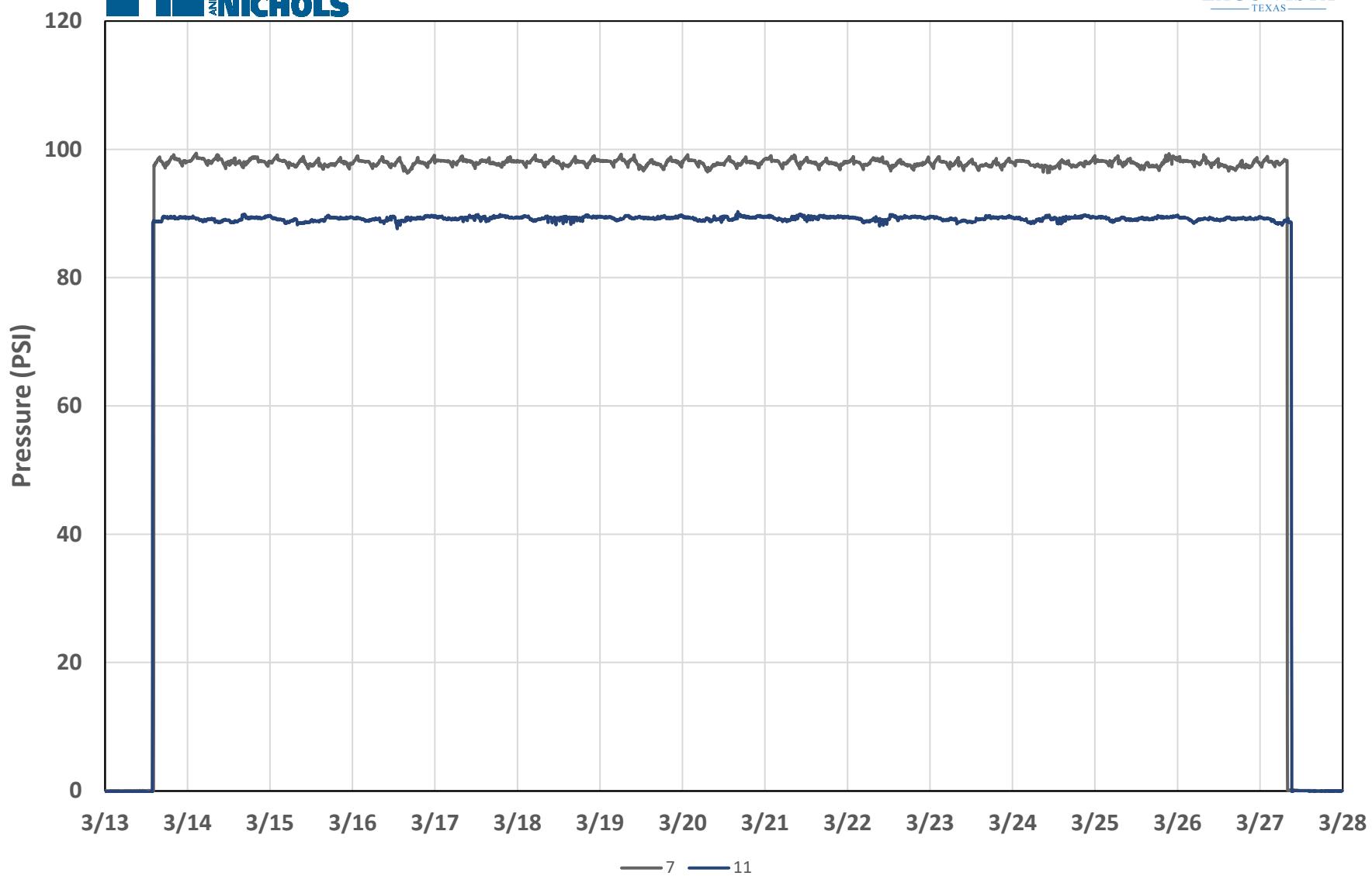
3/13/2023 - 3/27/2023



Pressure Recording

PZ-2

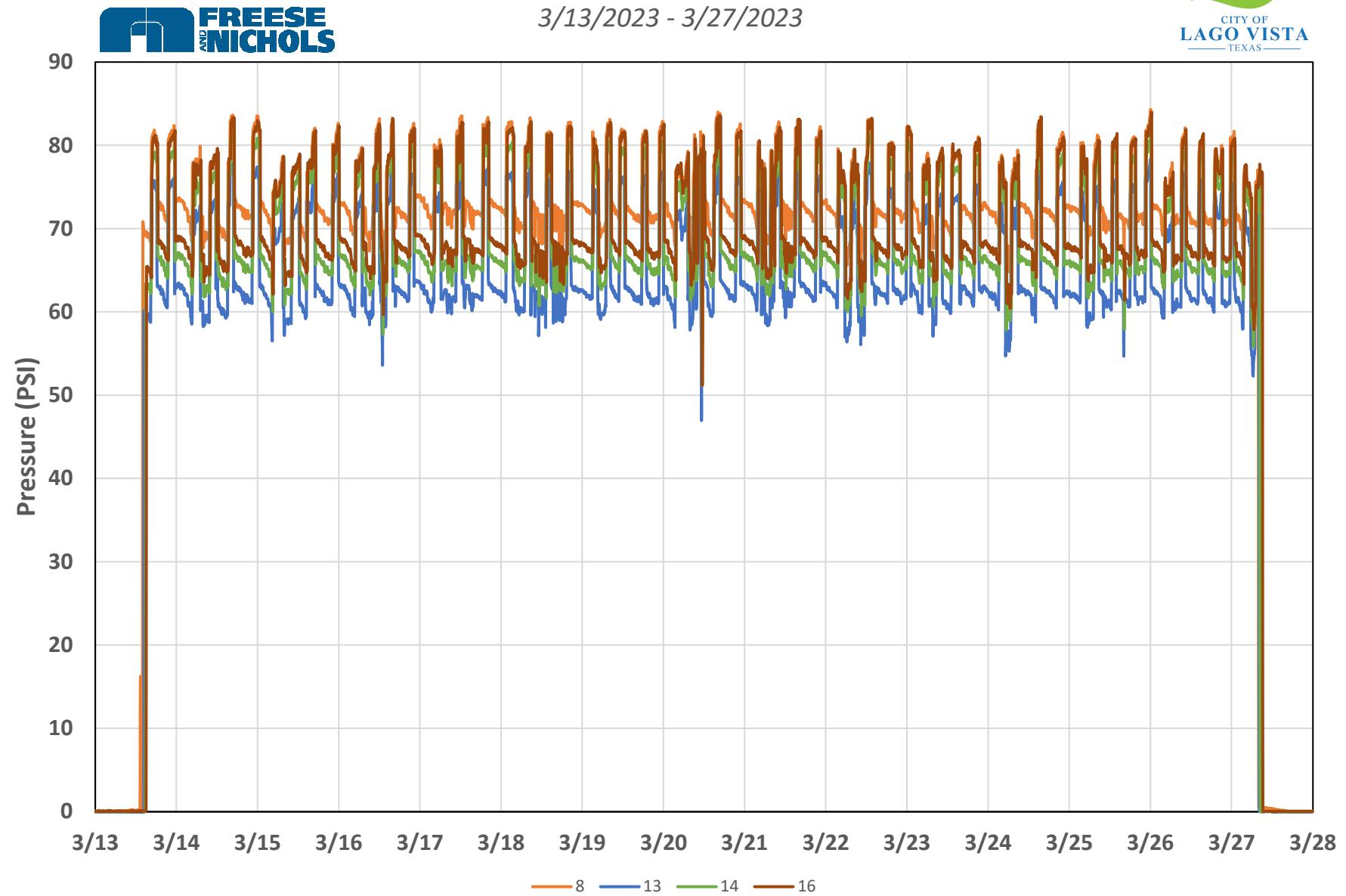
3/13/2023 - 3/27/2023



Pressure Recording

PZ-3

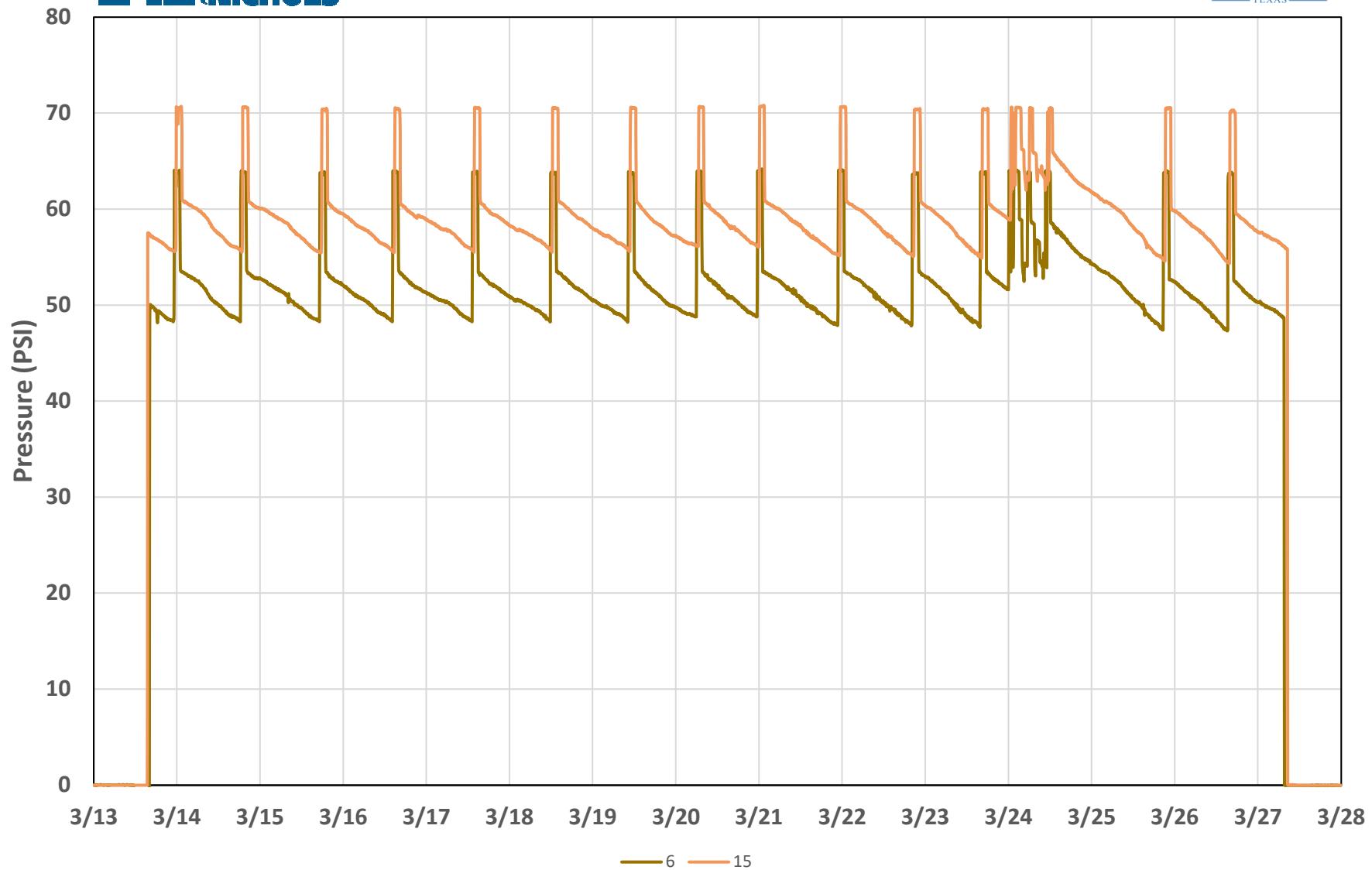
3/13/2023 - 3/27/2023



Pressure Recording

PZ-4

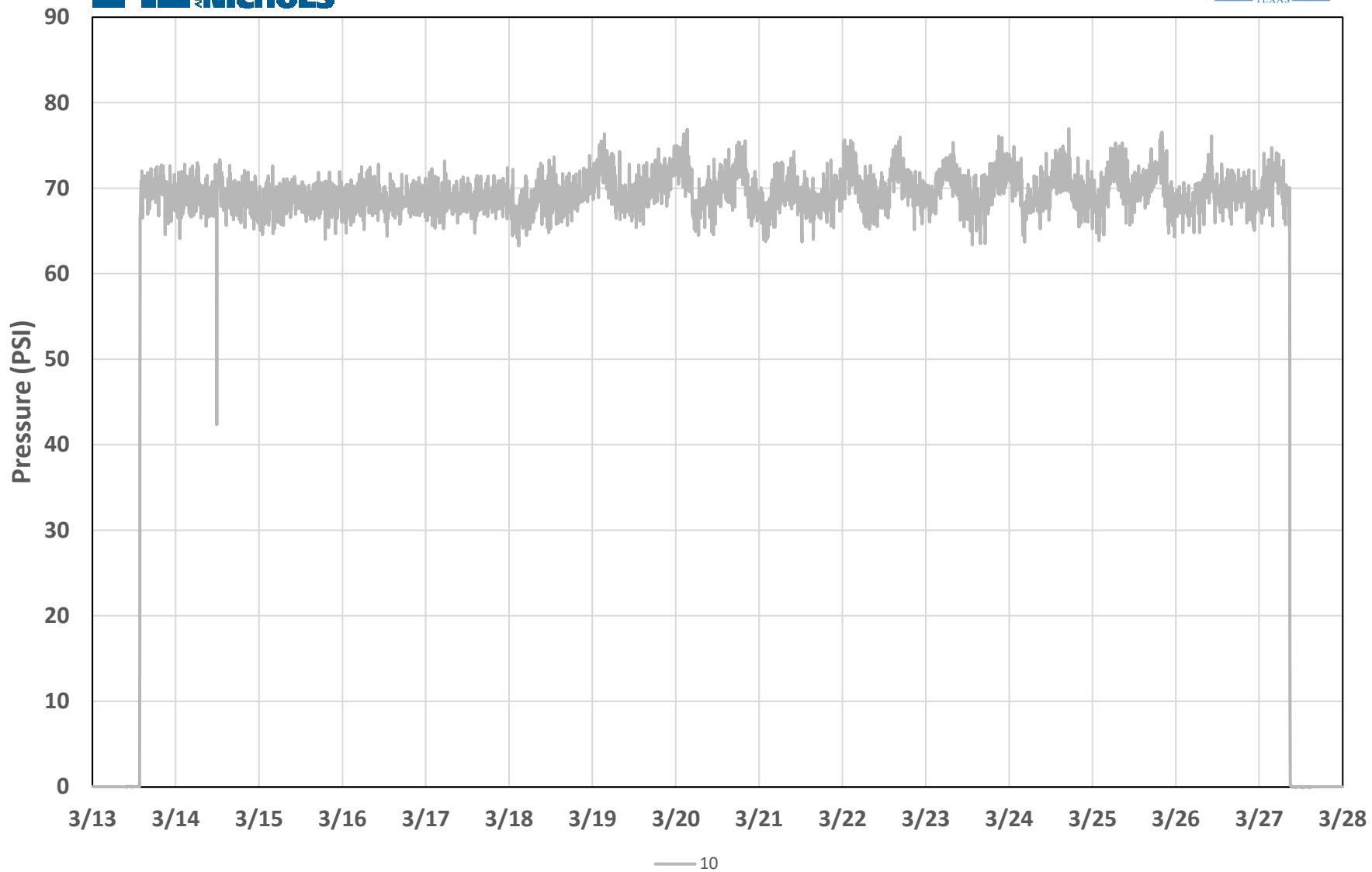
3/13/2023 - 3/27/2023



Pressure Recording

PZ-5

3/13/2023 - 3/27/2023

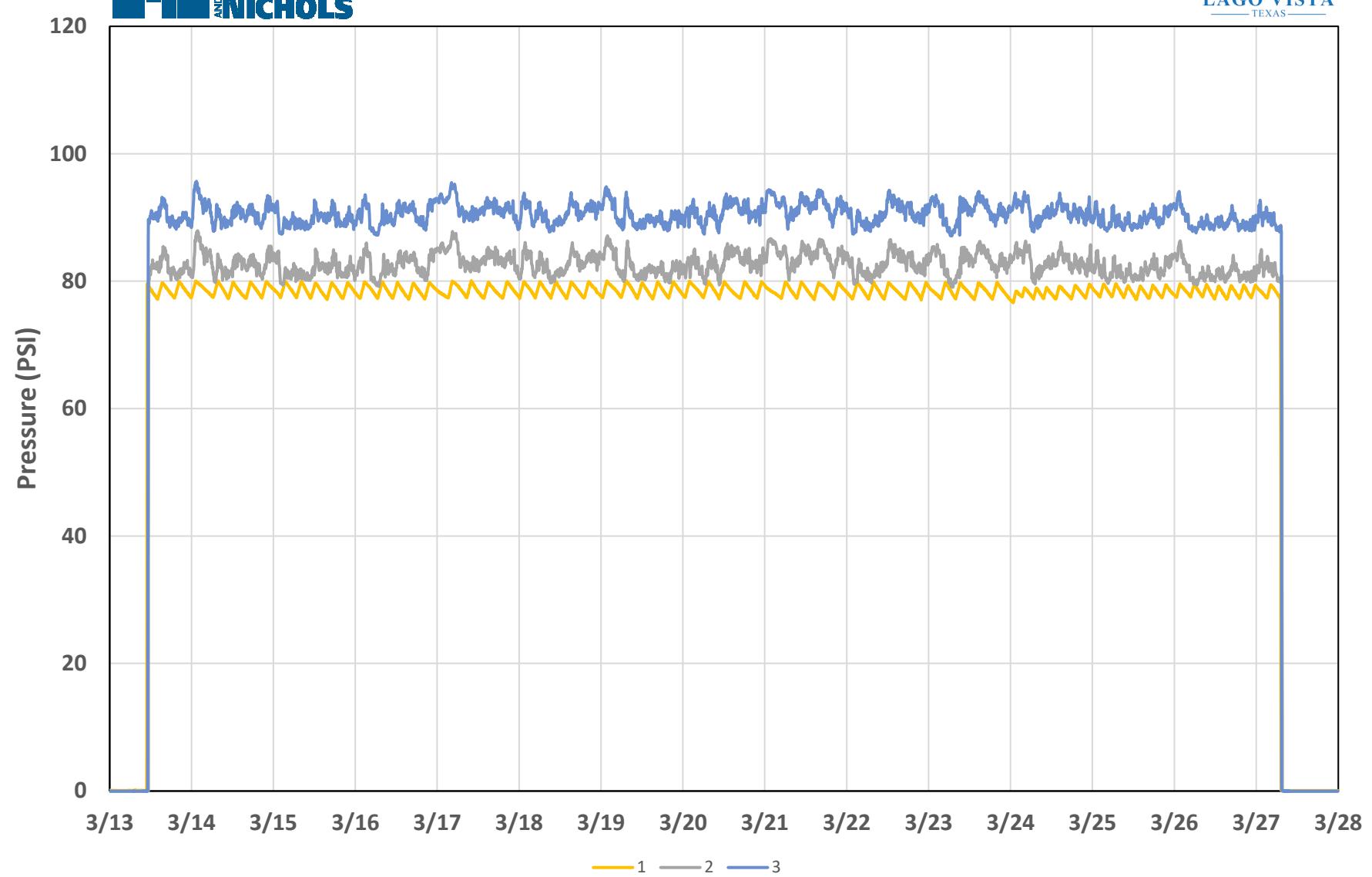




Pressure Recording

PZ-6 & PZ-7

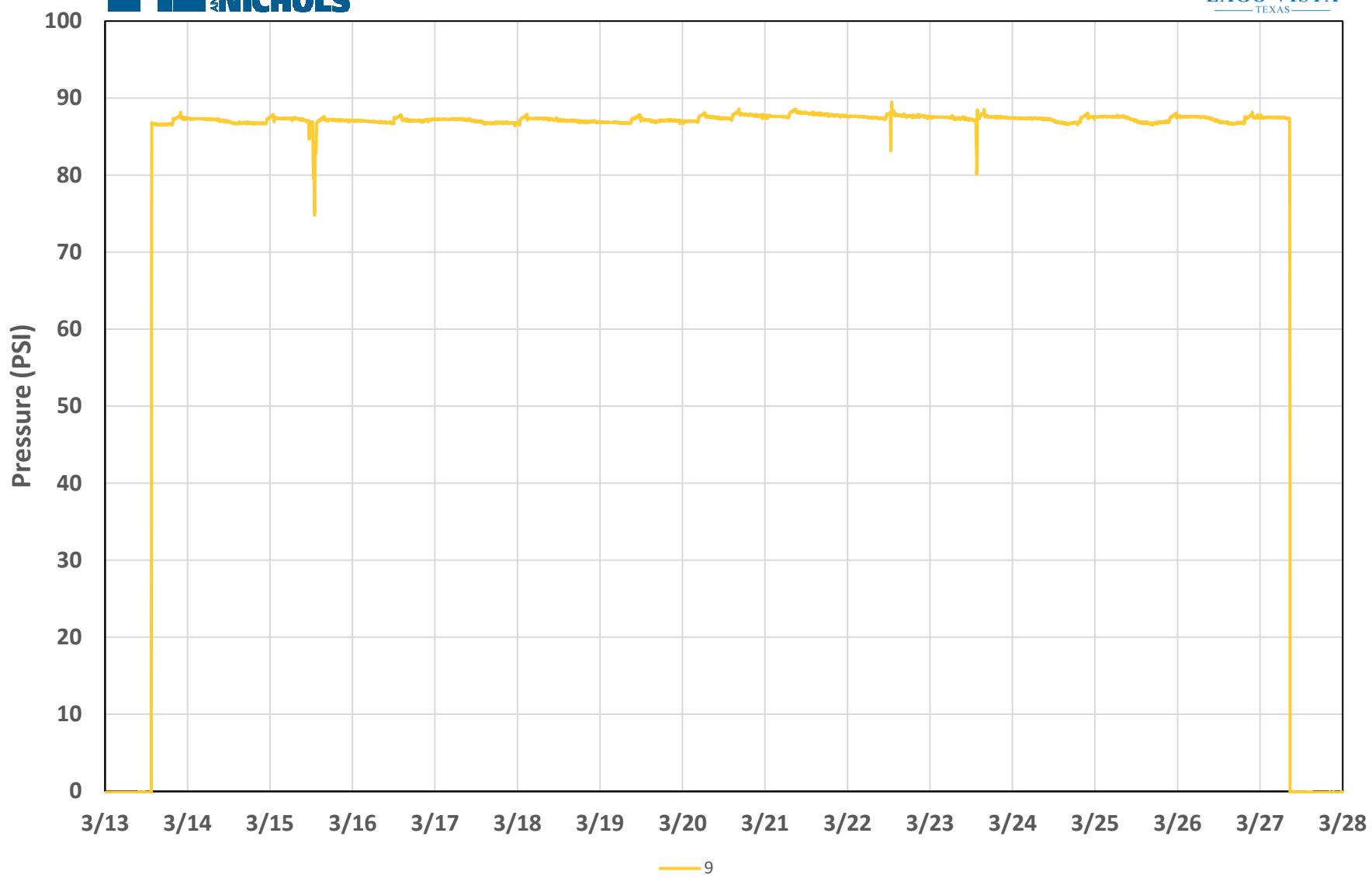
3/13/2023 - 3/27/2023



Pressure Recording

PZ-8

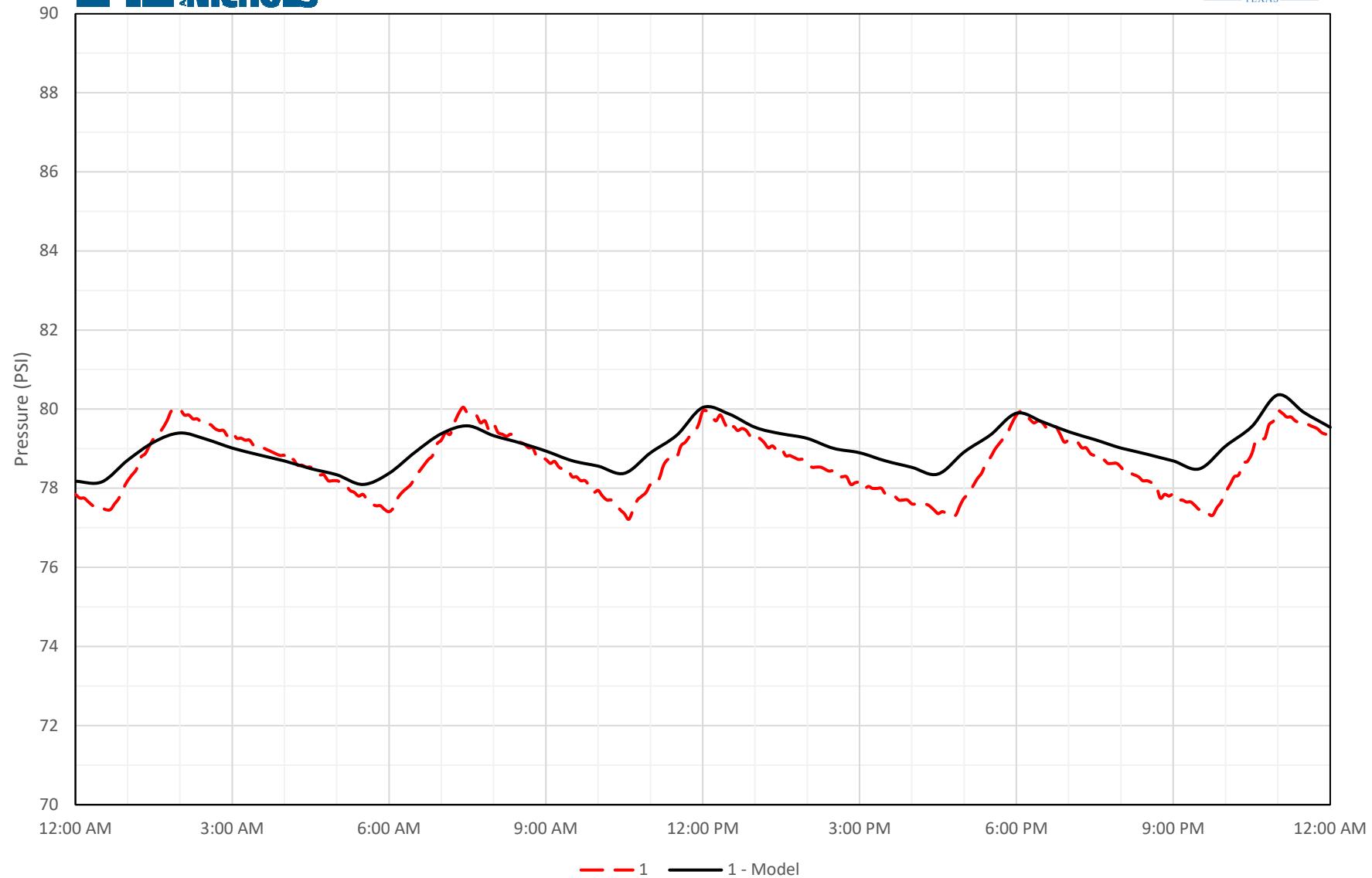
3/13/2023 - 3/27/2023



APPENDIX B
Hydraulic Water Model Calibration

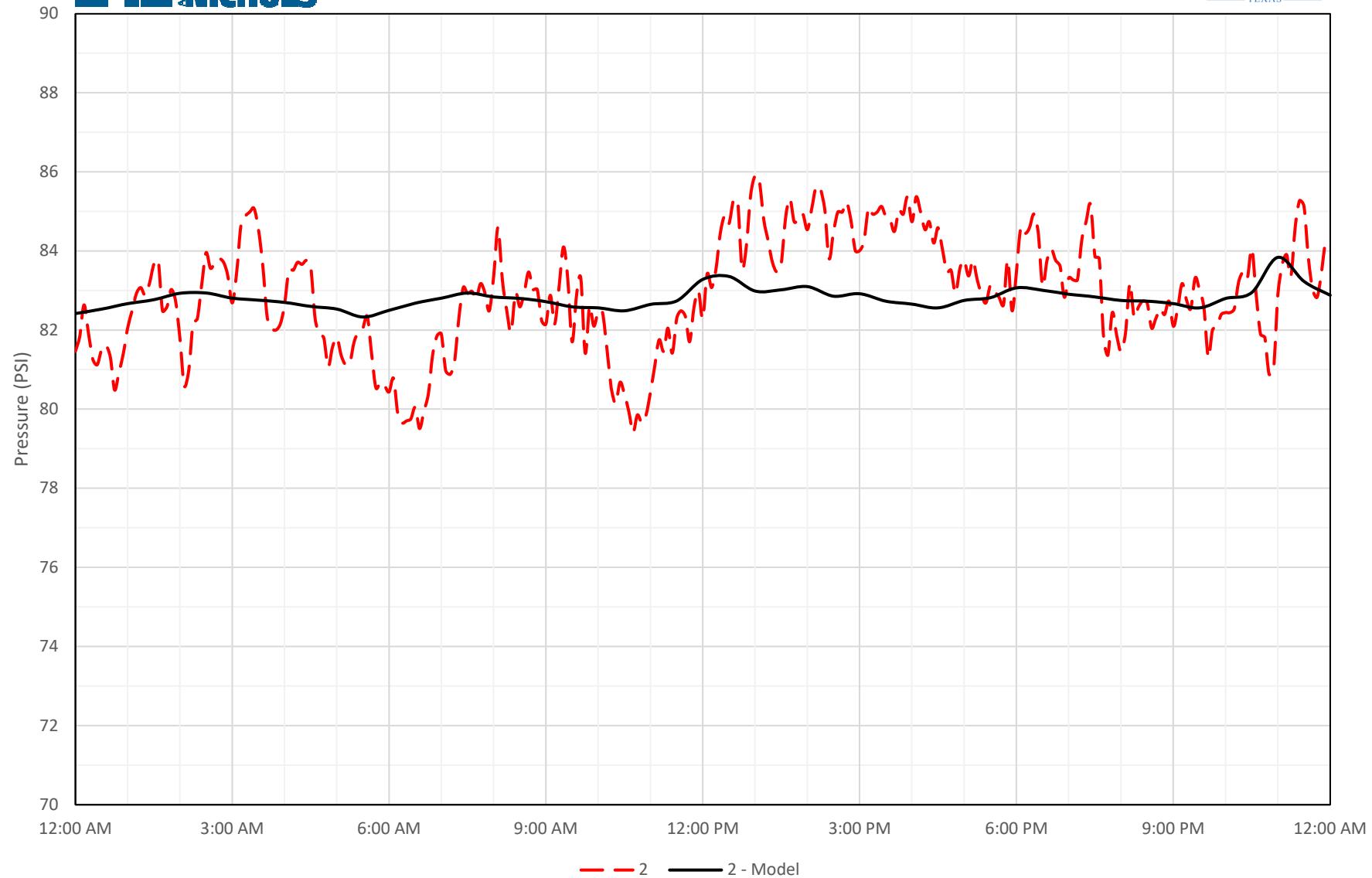


PR #1
Boone Drive and Burnside Circle, PP-7A
March 20, 2023



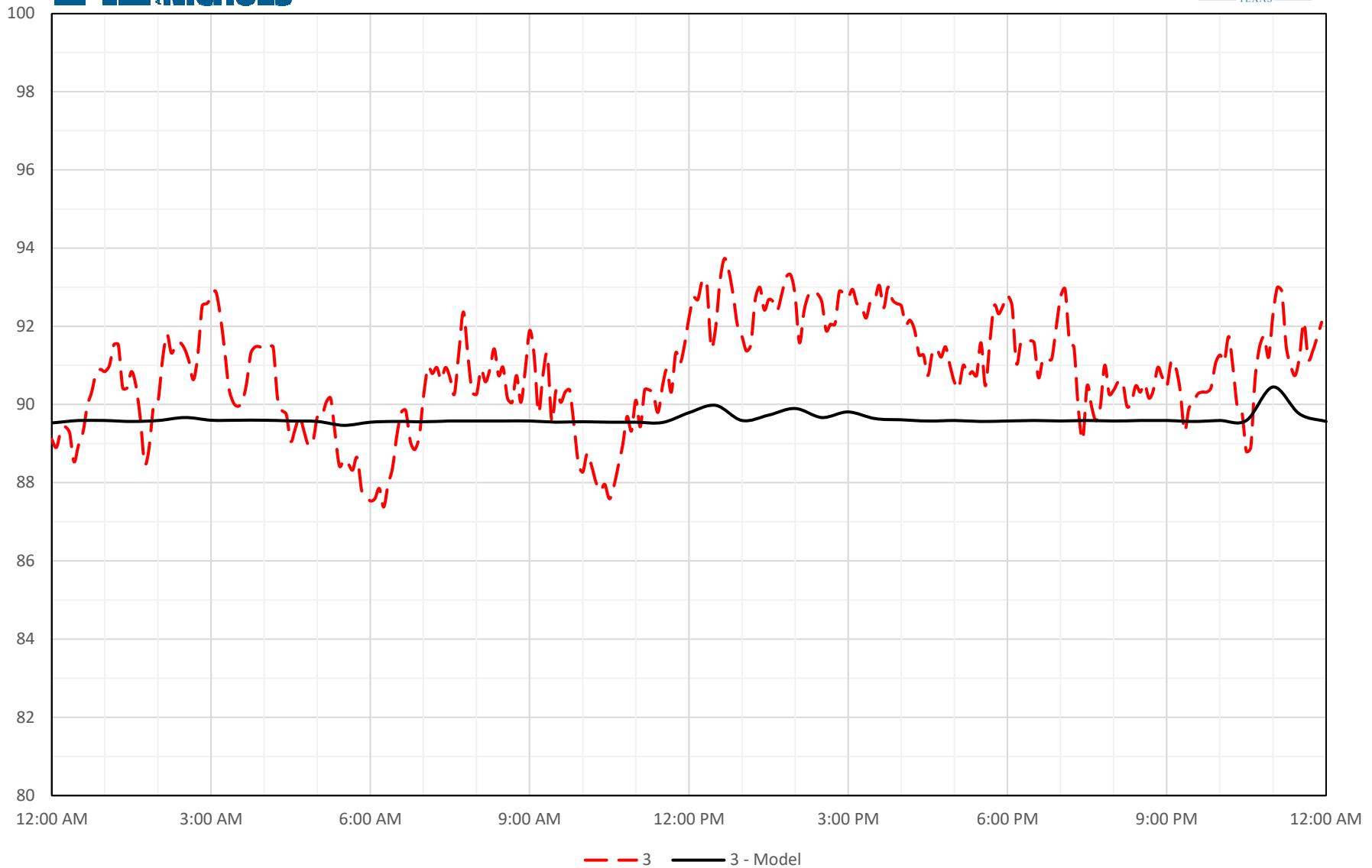


PR #2
Highland Lake Drive and Farragret Cove, PP-6
March 20, 2023



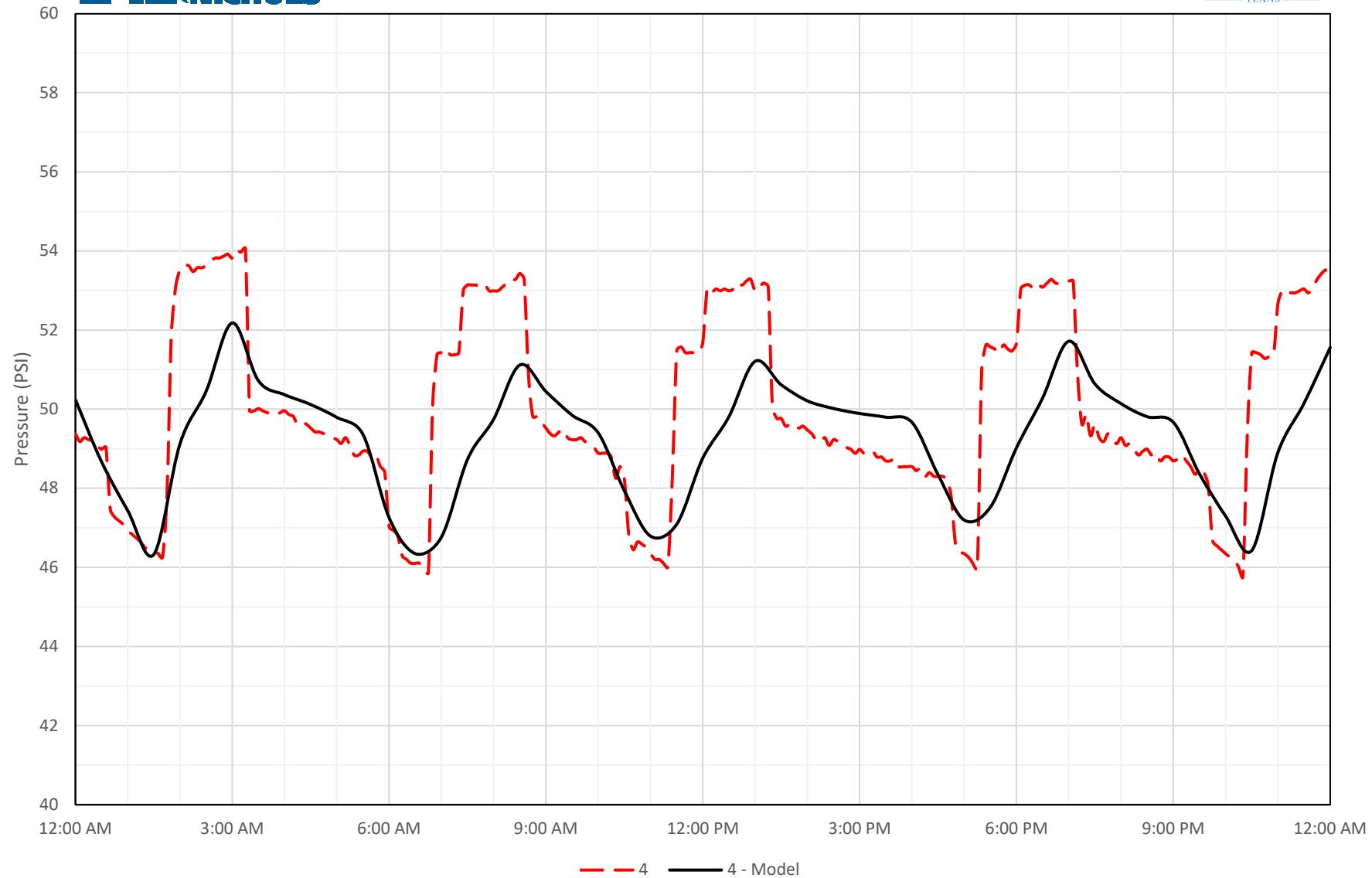


PR #3
Patriot Drive and Truman Drive, PP-6
March 20, 2023



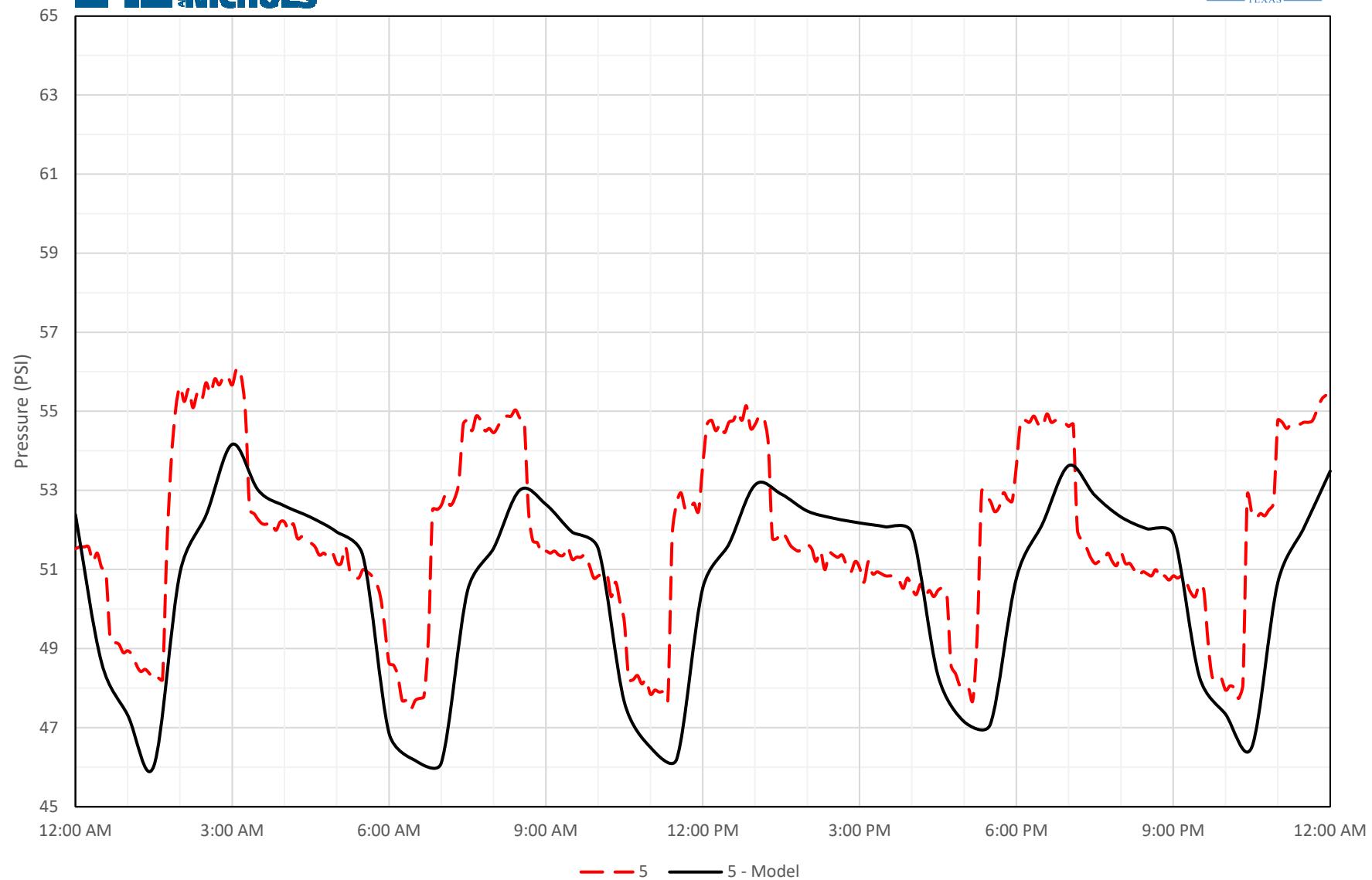


PR #4
Boggy Ford Road and National Drive, PP-1A
March 20, 2023



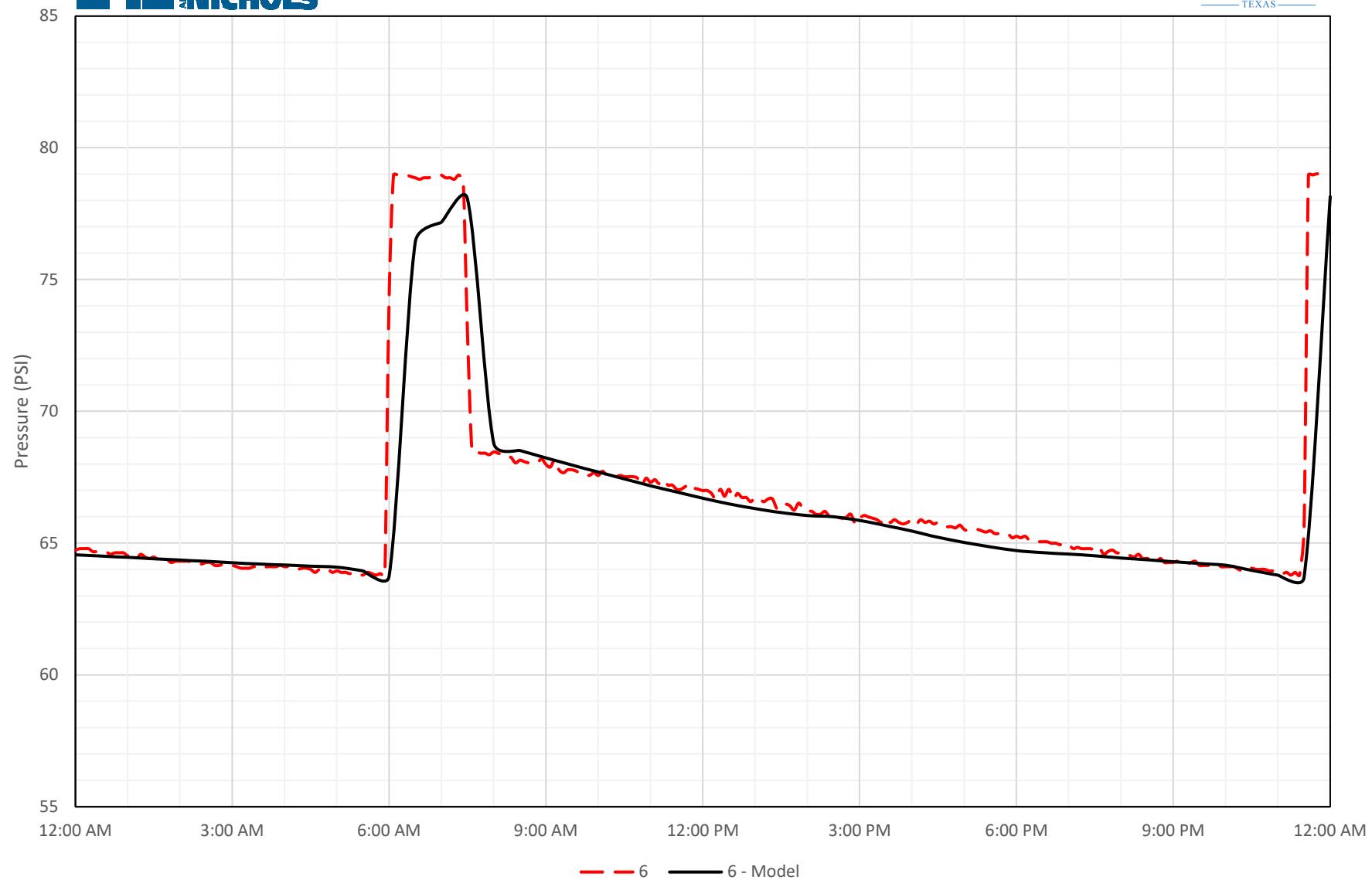


PR #5
Thunderbird Street and Bonanza, PP-1A
March 20, 2023



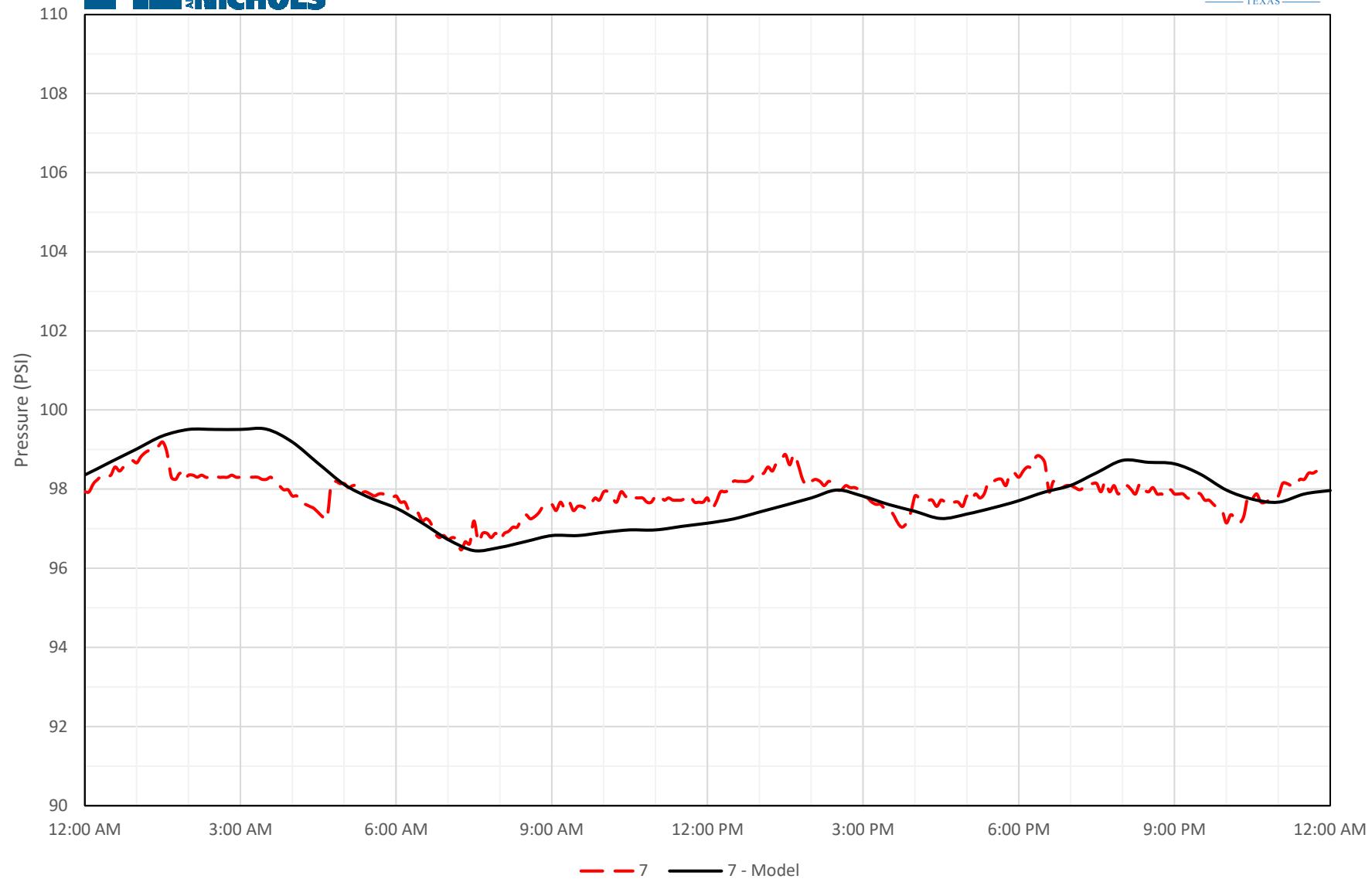


PR #6
20308 Dawn Drive, PP-4A
March 20, 2023



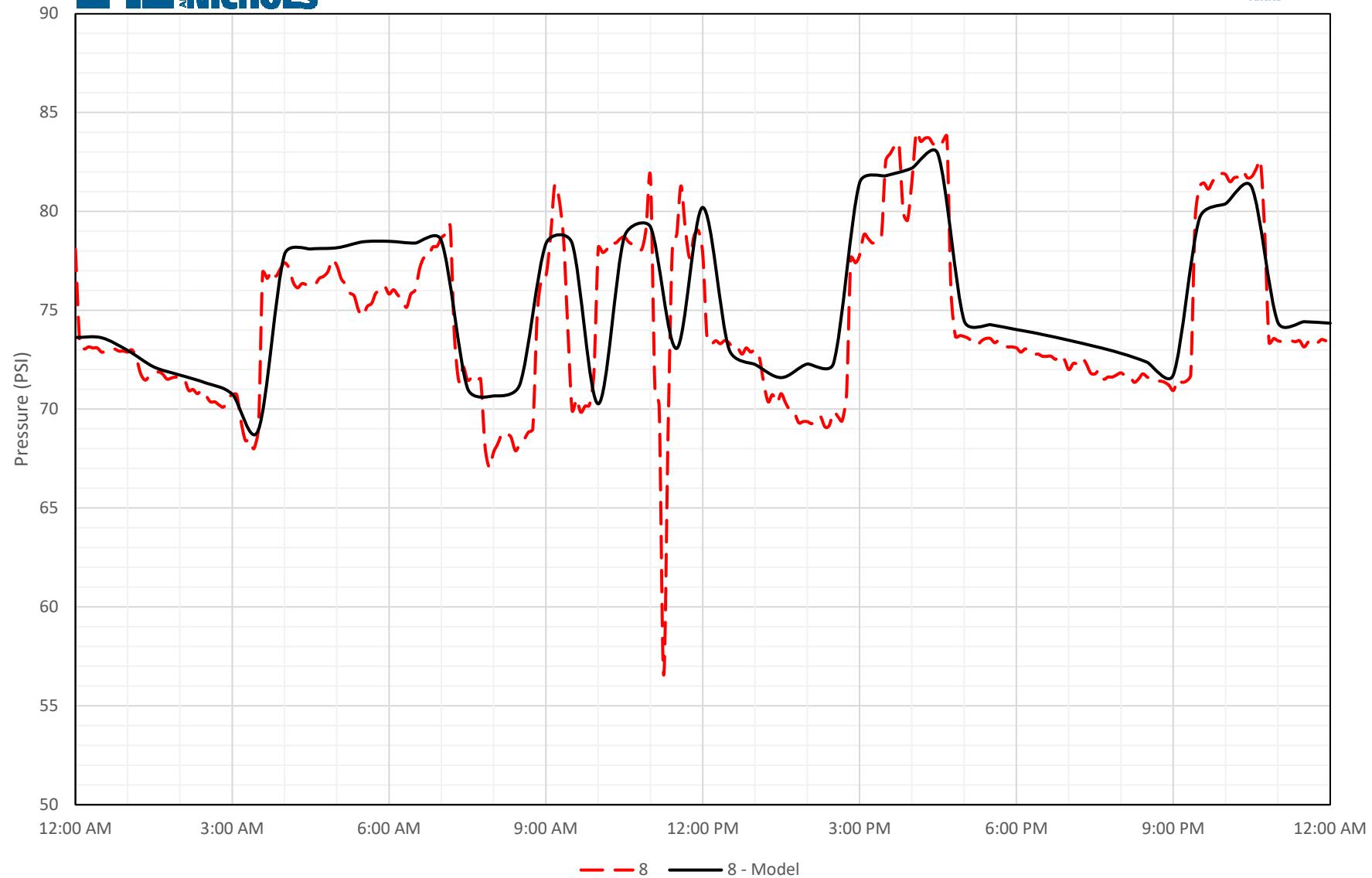


PR #7
Bar K Ranch Road and Ridgeview, PP-2A
March 20, 2023



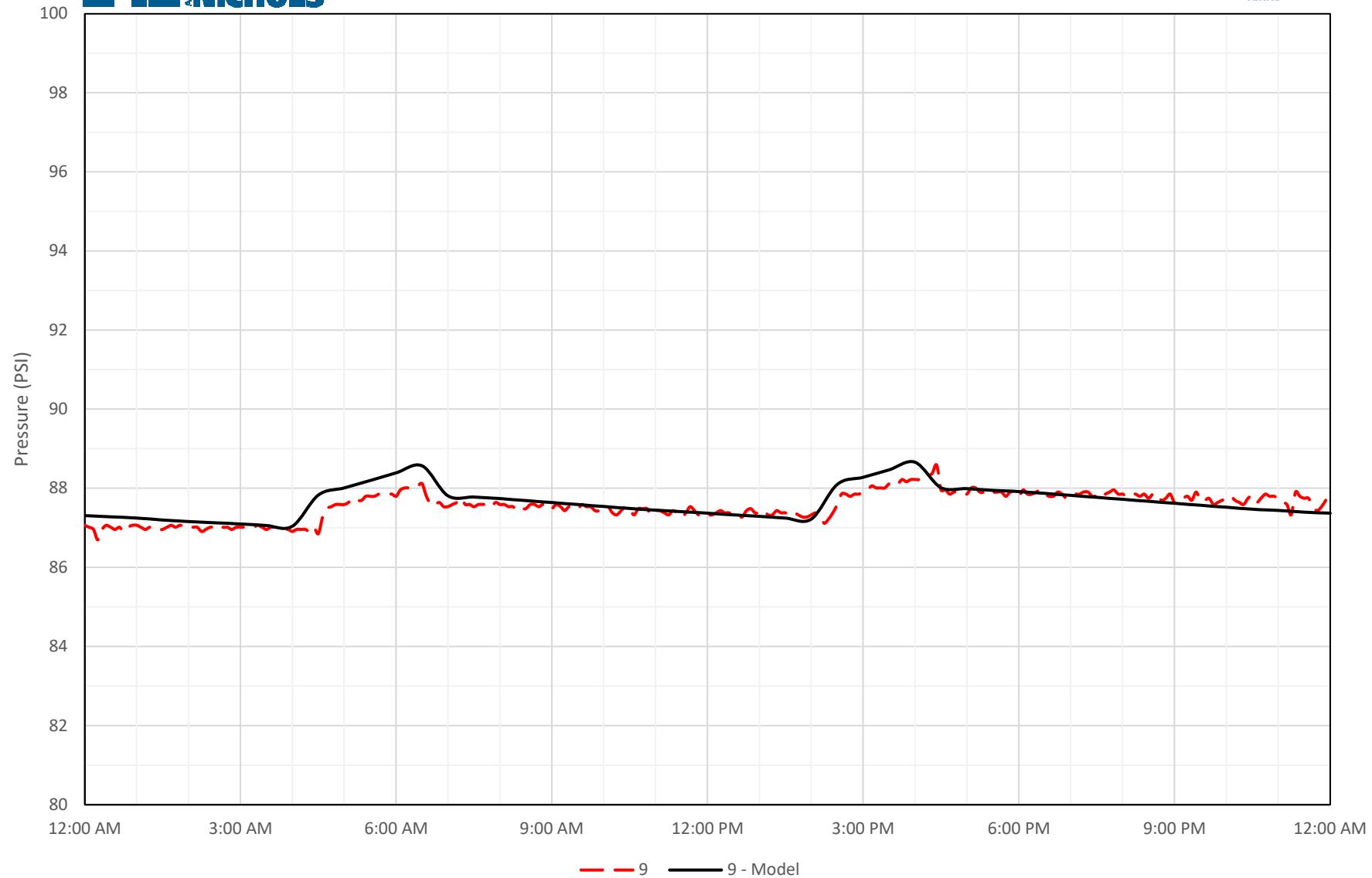


PR #8
Bar K Ranch Road and Chestnut
March 20, 2023



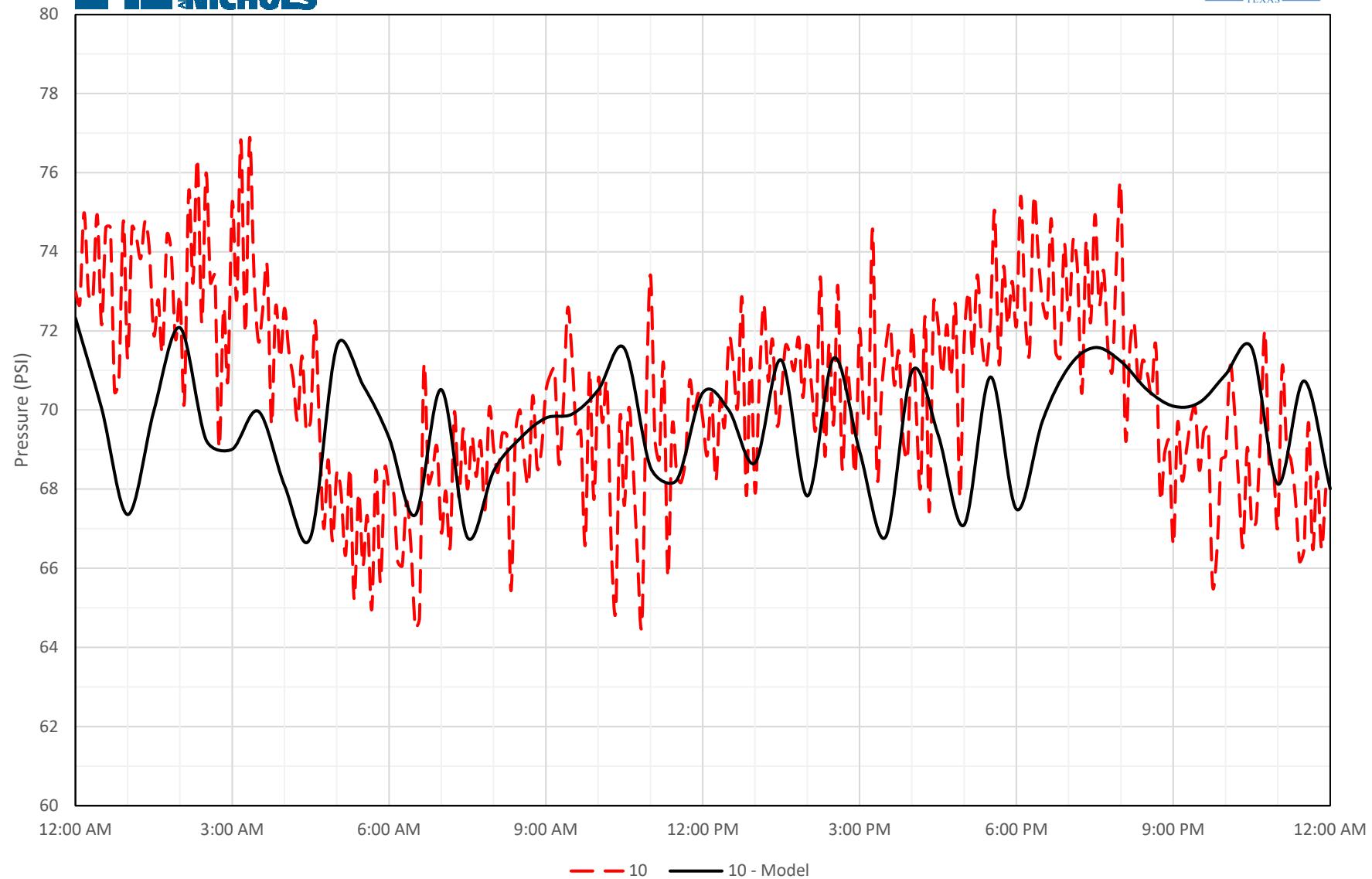


PR #9
8520 Blueberry Circle
March 20, 2023



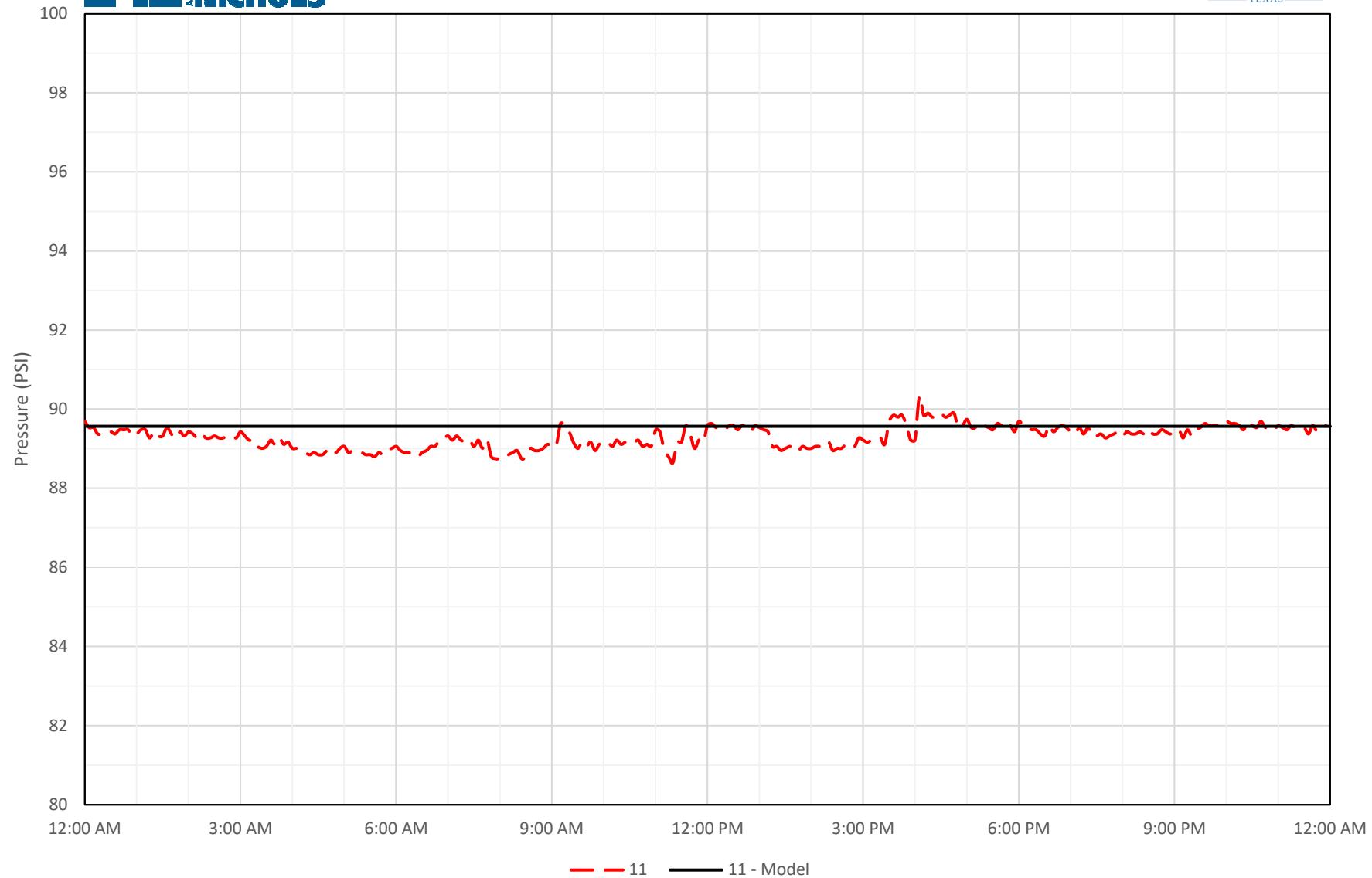


PR #10
Bar K Ranch Road and Rawhide Trail
March 20, 2023



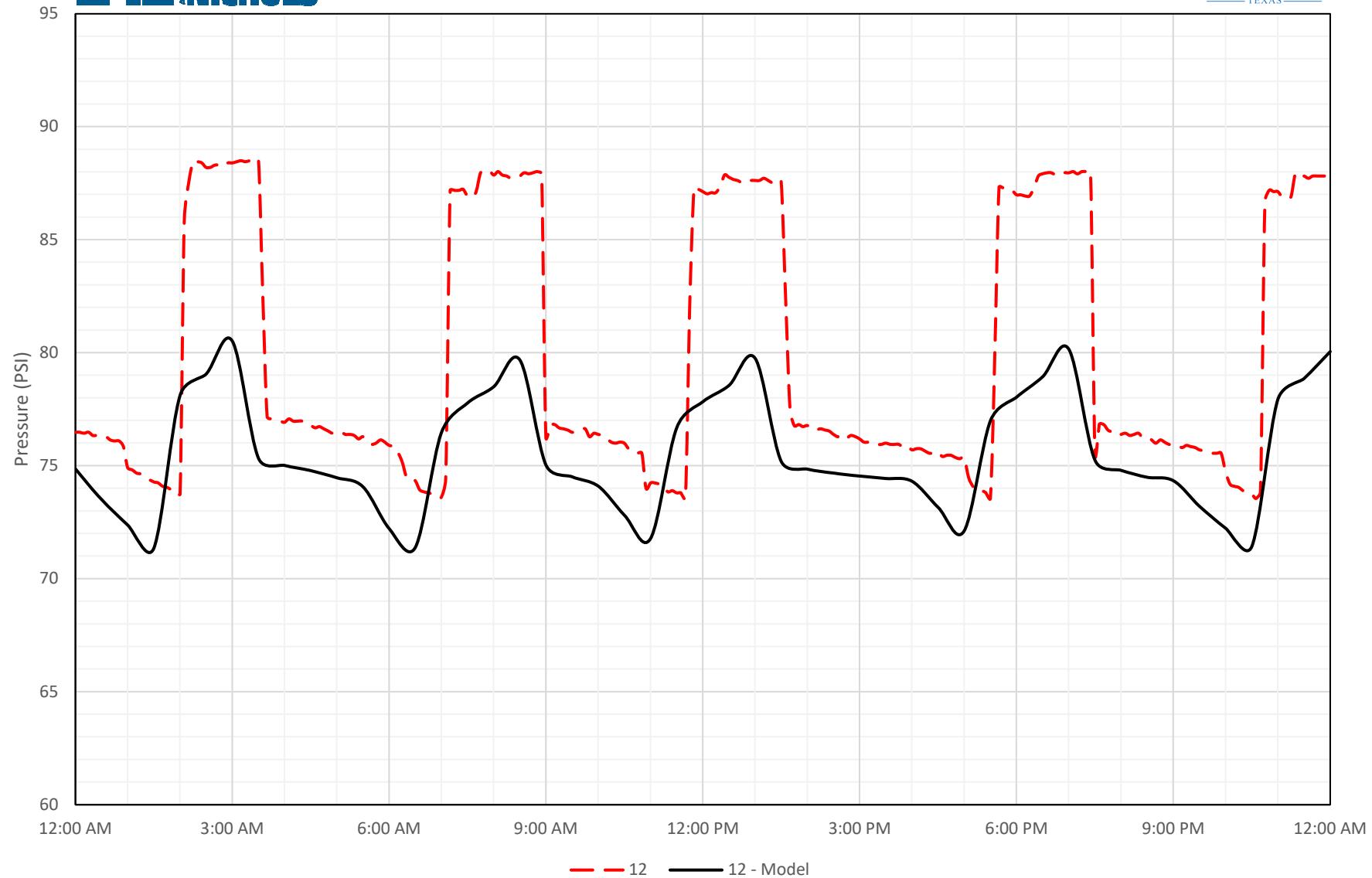


PR #11
Burnet Knoll Trail, PP-2A
March 20, 2023



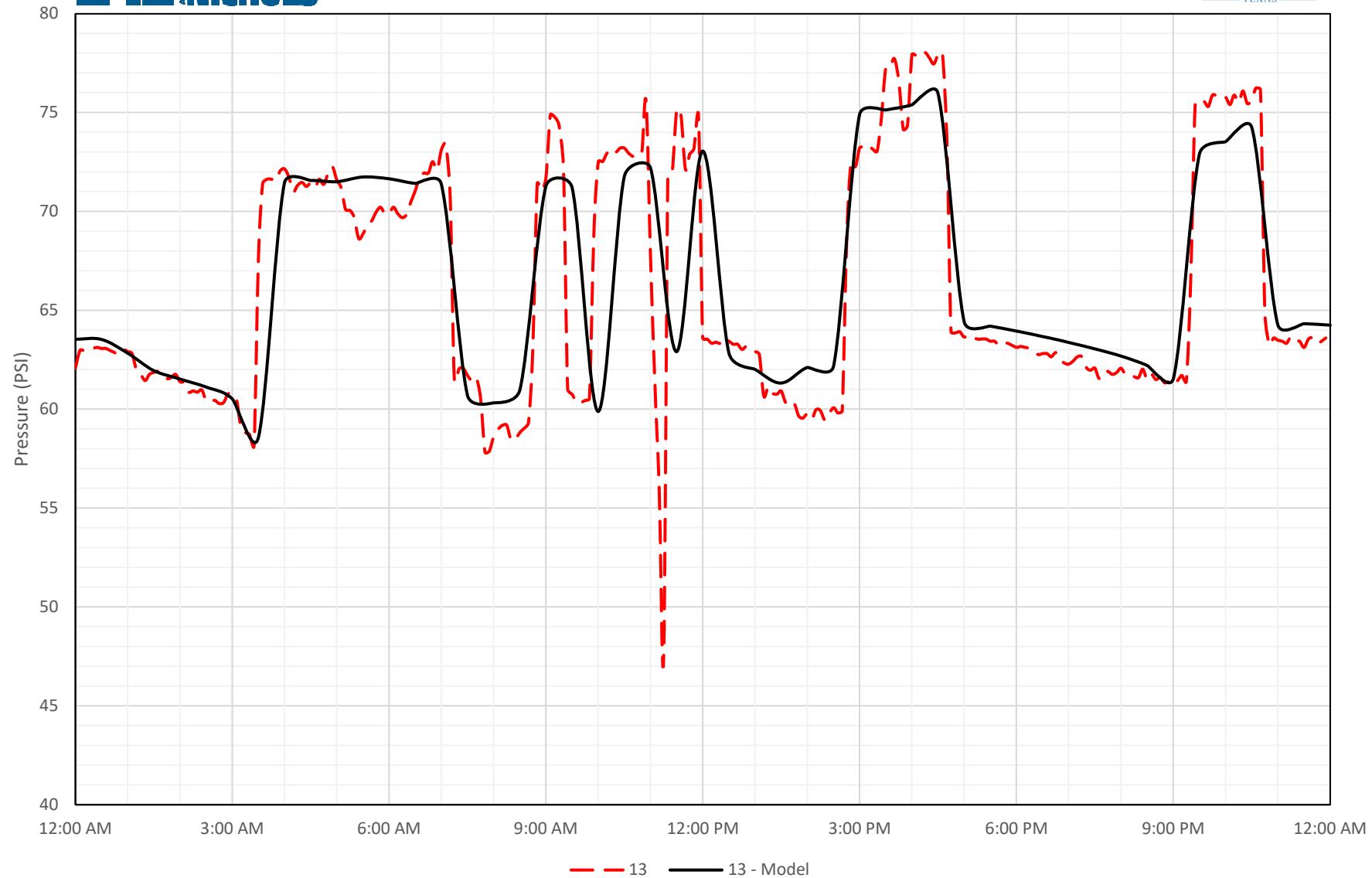


PR #12
Shoreline Ranch
March 20, 2023



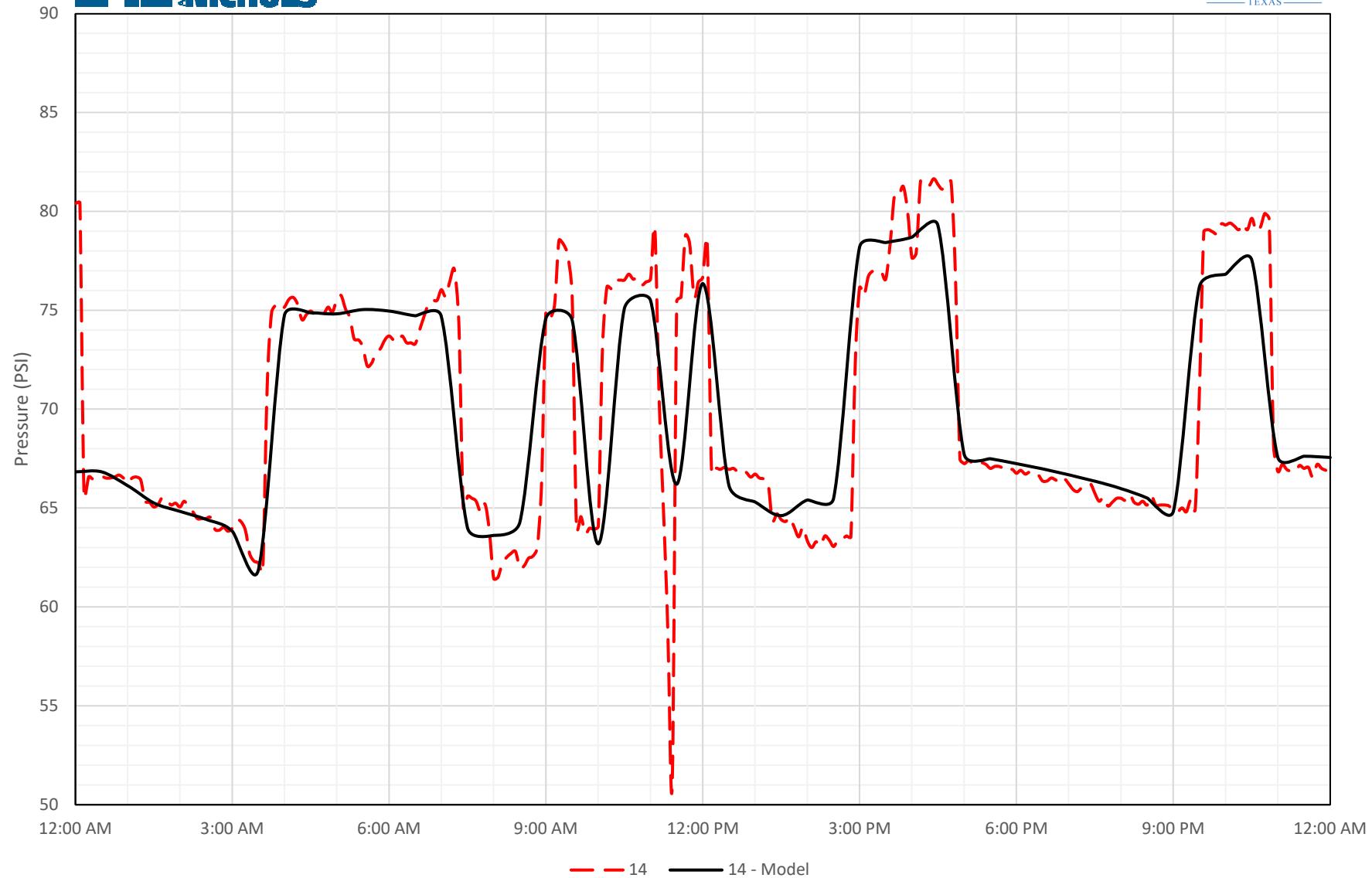


PR #13
Destination Way and Tranquility Falls
March 20, 2023



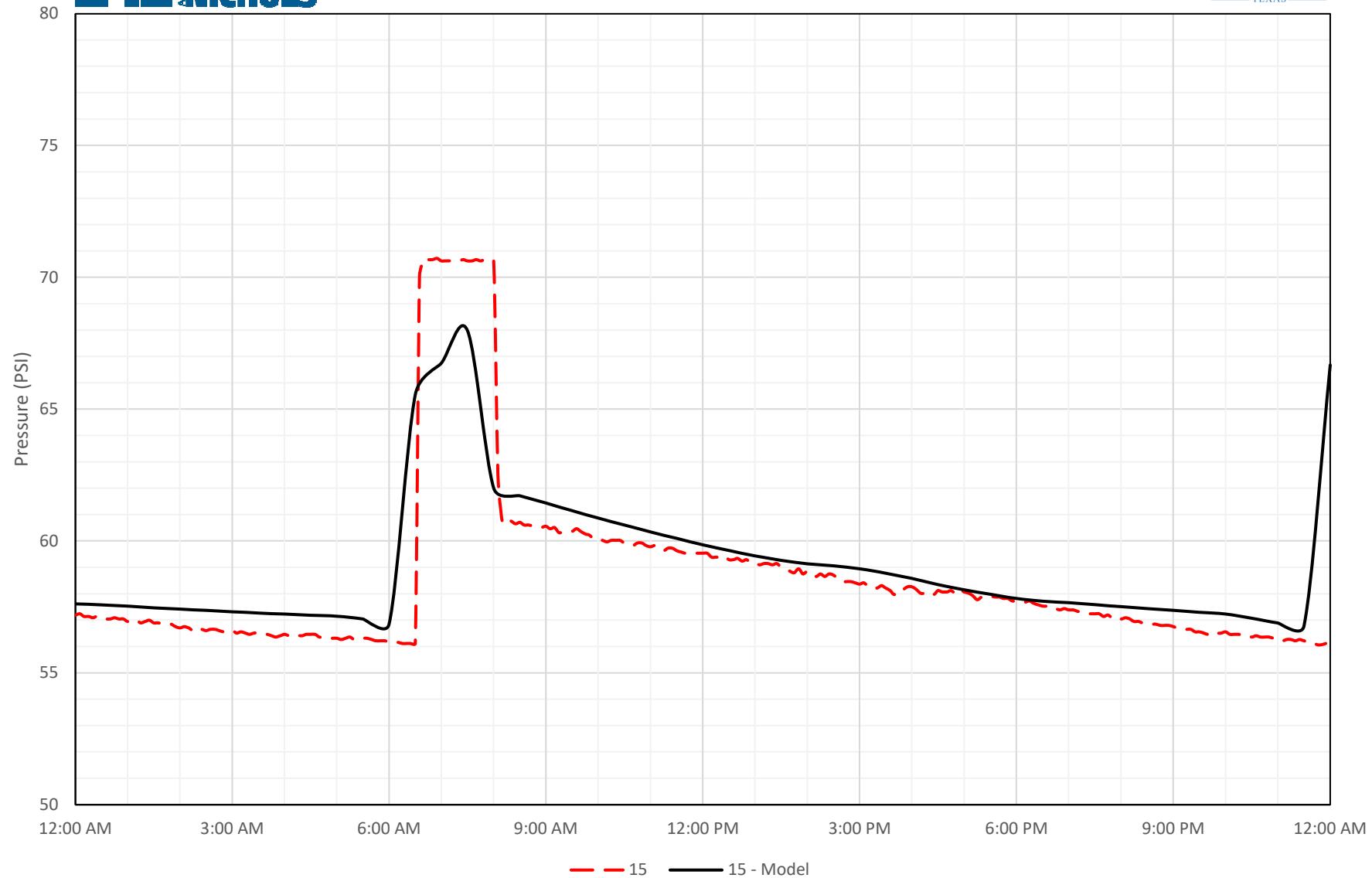


PR #14
Destination Way and Serenity Lane
March 20, 2023



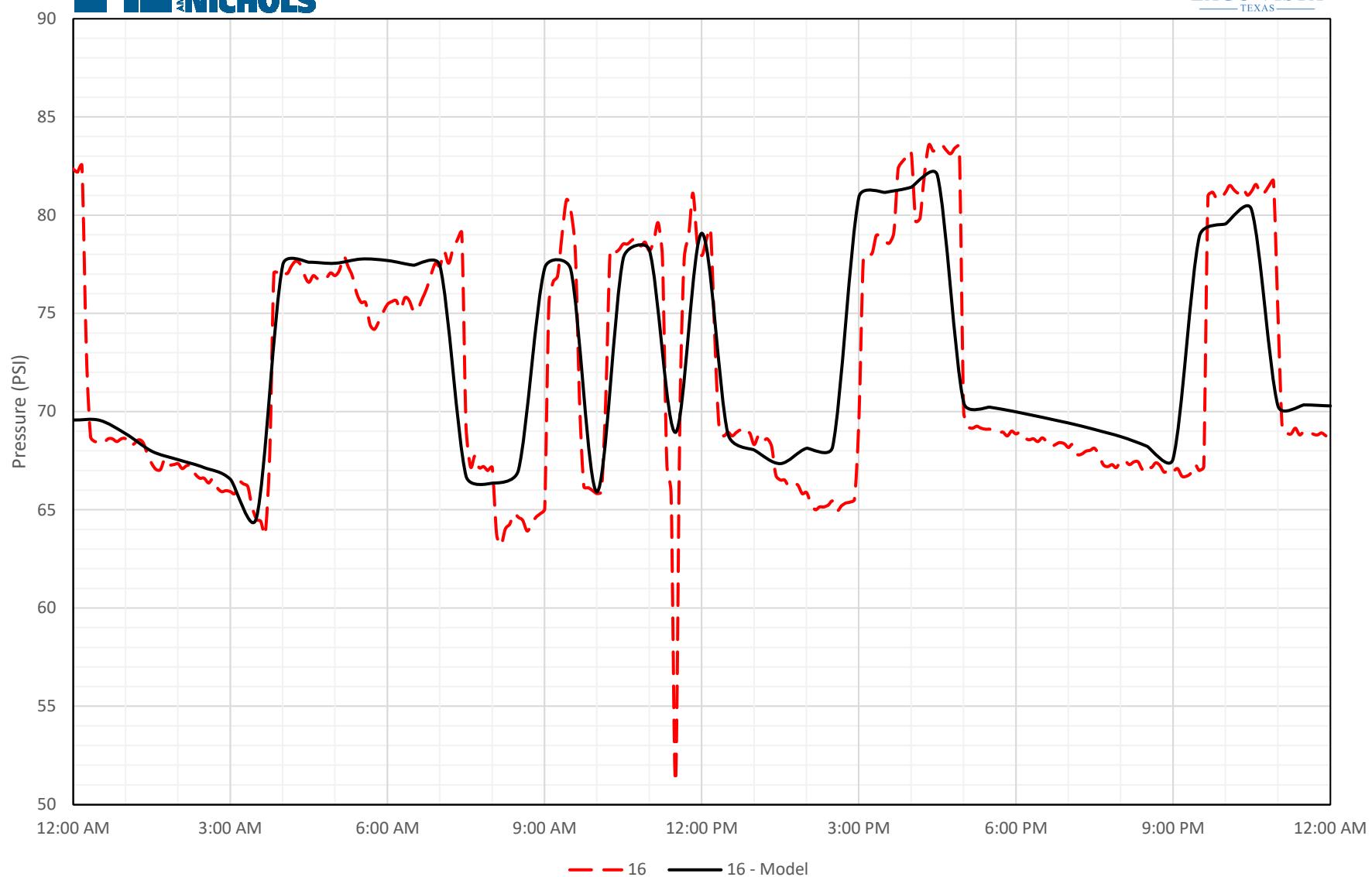


PR #15
Approximately 19800 Ming Trail
March 20, 2023





PR #16
Destination Way (Information Way)
March 20, 2023



APPENDIX C
Detailed Water CIP Cost Sheets

City of Lago Vista
CIP Cost Summary

Project Number	Project Name	Cost
Short Term Projects		
1	New Talon Hydro Tank	\$ 710,200
2	New 0.75 MG Bowden Point EST	\$ 5,933,000
3	Boggy Ford Water Line	\$ 1,344,100
4	WTP #3 Treatment Expansion and HSPS - Short Term	\$ 18,251,000
5	Lohman Ford Transmission Main Extension	\$ 4,903,600
6	Bar K 12-inch Water Line	\$ 690,700
7	Lohman Ford 16-inch Water Line	\$ 3,056,600
8	Pressure Plane Conversion	\$ 1,273,400
9	Miscellaneous Water Line Connections	\$ 1,019,700
Short Term Total		\$ 37,182,300
Intermediate Projects		
10	New 1.25 MG Allegiance GST	\$ 2,803,200
11	WTP #3 Transmission Main	\$ 8,379,500
12	Paseo/Lohman Ford Transmission Main	\$ 3,641,900
13	New Paseo Pump Station and GST	\$ 8,357,100
14	High Drive Water Line	\$ 1,478,600
15	Patton Ave Water Line	\$ 1,203,500
Intermediate Total		\$ 25,863,800
Long Term Projects		
16	Boggy Ford Transmission Main	\$ 3,493,900
17	Lohman Ford Transmission Main Replacement	\$ 2,237,400
18	WTP #3 Treatment and HSPS Expansion - Buildout	\$ 64,389,700
19	New 0.75 Viking EST	\$ 6,347,800
20	New 0.40 MG Talon EST	\$ 3,737,500
21	New Bronco BPS and Transmission Main	\$ 5,258,000
22	PP-5 12-inch Water Line	\$ 786,400
23	New 1,500 gpm Paseo Pump	\$ 1,614,600
24	WTP #1 HSPS Expansion	\$ 2,421,900
Long Term Total		\$ 90,287,200
CIP Total		\$ 153,333,300

City of Lago Vista



Capital Improvement Cost Estimate

Construction Project Number: 1

July 31, 2024

Phase: 5-Year

Project Name: New Talon Hydro Tank

Project Description:

This project consists of a new 30,000 gallon hydro tank to replace the existing hydro tank at the Talon pump station.

Project Drivers:

Pressure Plane 5 currently supplies 17 gallons per connection of pressure tank storage. The hydro tank installation is intended to provide sufficient storage capacity to satisfy TCEQ requirements beyond the 10-year planning period.

Opinion of Probable Construction Cost

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	New 30,000 Gal Hydro Tank	1	LS	\$ 375,000	\$ 375,000
2	Decommission Hydro Tank	1	LS	\$ 100,000	\$ 100,000
				SUBTOTAL:	\$ 475,000
			CONTINGENCY	30%	\$ 142,500
				SUBTOTAL:	\$ 617,500
			ENG/SURVEY	15%	\$ 92,700
				SUBTOTAL:	\$ 710,200
				Estimated Project Total:	\$ 710,200

City of Lago Vista



Capital Improvement Cost Estimate

Construction Project Number: 2

July 31, 2024

Phase: 5-Year

Project Name: New 0.75 MG Bowden Point EST

Project Description:

This project consists of a new 0.75 MG EST to be installed near the Bowden Point Park at the intersection of Boggy Ford Road and National Drive. Upon completion of the proposed Bowden Point EST, the Golf Ball EST is to be decommissioned and demolished.

Project Drivers:

Golf Ball EST and Viking EST currently serve Pressure Plane 1 directly, and Pressure Planes 6 & 7 through pressure reducing valves. Pressure Planes 6 & 7 borrow from the excess elevated storage in Pressure Plane 1 to meet TCEQ minimum elevated storage requirements. Additional elevated storage will be needed by the 10-year planning period to satisfy Pressure Planes 1, 6, and 7 minimum elevated storage requirements. Golf Ball EST is relatively small and was observed to quickly drain and fill during normal operating conditions. The replacement of this elevated storage tank with a large EST will reduce the rapid drain and fill cycle observed in existing conditions.

Opinion of Probable Construction Cost

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	New 0.75 MG Bowden Point EST	1	LS	\$ 3,712,500	\$ 3,712,500
2	12" WL & Appurtenances	200	LF	\$ 180	\$ 36,000
3	Asphalt Pavement Repair	200	LF	\$ 100	\$ 20,000
4	Decommission Elevated Storage Tank	1	LS	\$ 200,000	\$ 200,000
				SUBTOTAL:	\$ 3,968,500
			CONTINGENCY	30%	\$ 1,190,600
				SUBTOTAL:	\$ 5,159,100
			ENG/SURVEY	15%	\$ 773,900
				SUBTOTAL:	\$ 5,933,000
				Estimated Project Total:	\$ 5,933,000

City of Lago Vista



Capital Improvement Cost Estimate

Construction Project Number: 3

July 31, 2024

Phase: 5-Year

Project Name: Boggy Ford Water Line

Project Description:

This project consists of nearly 3,100 linear feet of 16-inch water main along Boggy Ford Road between Allegiance Avenue and Mount Vernon Avenue.

Project Drivers:

The purpose of this project is to move water westward within Pressure Plane 1 from the proposed Bowden Point EST (Project #2) to the existing pressure reducing valves on Patton Avenue and Norton Avenue.

Opinion of Probable Construction Cost

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	16" WL & Appurtenances	3,100	LF	\$ 240	\$ 744,000
2	Asphalt Pavement Repair	1,550	LF	\$ 100	\$ 155,000
				SUBTOTAL:	\$ 899,000
			CONTINGENCY	30%	\$ 269,700
				SUBTOTAL:	\$ 1,168,700
			ENG/SURVEY	15%	\$ 175,400
				SUBTOTAL:	\$ 1,344,100
				Estimated Project Total:	\$ 1,344,100

City of Lago Vista



Capital Improvement Cost Estimate

July 31, 2024

Construction Project Number: 4

Phase: 5-Year

Project Name: WTP #3 Treatment Expansion and HSPS - Short Term

Project Description:

This project consists of an expansion to the treatment capacity of WTP #3 to 4.0 MGD and an expansion at the WTP3 high service pump station to include two additional 3,000 gpm pumps.

Project Drivers:

The existing combined water treatment plant capacities of WTP #1 and WTP #3 is 4 MGD. An additional 4.0 MGD of treatment plant capacity satisfies the water production needs through the 2033 planning scenario. As WTP #1 is limited with space, future treatment improvements are assumed to take place at WTP #3. In order to distribute the treated water and supply the water system during maximum day conditions through the 2033 planning scenario, two 3,000 gpm pumps are recommended. The high service pump station (HSPS) will distribute to lower pressure planes as well as the Lohman/Paseo HSPS via project #5. Contingency (30%), mobilization (5%), and overhead & profit (18%) are included in the unit cost of the WTP3 expansion. General contingency and engineering & survey cost escalations for this cost estimate are only included for the ground storage tank.

Opinion of Probable Construction Cost

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	4.0 MGD WTP3 Expansion	1	LS	\$ 12,644,688.00	\$ 12,644,688
2	New 2.5 MG WTP3 Ground Storage Tank	1	LS	\$ 3,750,000	\$ 3,750,000
				SUBTOTAL:	\$ 16,394,700
				CONTINGENCY	30%
				SUBTOTAL:	\$ 1,125,000
				ENG/SURVEY	15%
				SUBTOTAL:	\$ 731,300
				Estimated Project Total:	\$ 18,251,000

City of Lago Vista



Capital Improvement Cost Estimate

Construction Project Number: 5

July 31, 2024

Phase: 5-Year

Project Name: Lohman Ford Transmission Main Extension

Project Description:

This project consists of 8,000 linear feet of 24-inch water transmission main along Lohman Ford Road, beginning at Lago Vista High School and connecting to the Lohman and Paseo Ground Storage Tanks.

Project Drivers:

Pressure Planes 3, 4, 5, 8, and the Tessera development can only be supplied by WTP #1. All future WTP expansions are expected to take place at WTP #3. In order to move water to the northern pressure planes, this transmission main is required to move water from WTP #3 to the Lohman and Paseo GSTs. The 24-inch water main is recommended to serve buildout demands. Alternatively, a 16-inch main would suffice through the 10-year planning period, but would need to be replaced with a 24-inch as velocities exceed 5 feet per second.

Opinion of Probable Construction Cost

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	24" WL & Appurtenances	8,000	LF	\$ 360	\$ 2,880,000
2	Asphalt Pavement Repair	4,000	LF	\$ 100	\$ 400,000
				SUBTOTAL:	\$ 3,280,000
				CONTINGENCY	30%
					\$ 984,000
				SUBTOTAL:	\$ 4,264,000
				ENG/SURVEY	15%
					\$ 639,600
				SUBTOTAL:	\$ 4,903,600
				Estimated Project Total:	\$ 4,903,600

City of Lago Vista



Capital Improvement Cost Estimate

Construction Project Number: 6

July 31, 2024

Phase: 5-Year

Project Name: Bar K 12-inch Water Line

Project Description:

This project consists of about 1,650 linear feet of 12-inch water main along Bar K Road between Bluff Ridge Trail and Bison Trail.

Project Drivers:

The purpose of this project is to increase hydraulic connectivity within Pressure Plane 5 and move water north within the pressure plane.

Opinion of Probable Construction Cost

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	12" WL & Appurtenances	1,650	LF	\$ 180	\$ 297,000
2	Asphalt Pavement Repair	1,650	LF	\$ 100	\$ 165,000
				SUBTOTAL:	\$ 462,000
			CONTINGENCY	30%	\$ 138,600
				SUBTOTAL:	\$ 600,600
			ENG/SURVEY	15%	\$ 90,100
				SUBTOTAL:	\$ 690,700
				Estimated Project Total:	\$ 690,700

City of Lago Vista



Capital Improvement Cost Estimate

Construction Project Number: 7

July 31, 2024

Phase: 5-Year

Project Name: Lohman Ford 16-inch Water Line

Project Description:

This project consists of a 16-inch water line along Lohman Ford Road that begins at Boggy Ford road and terminates at the Proposed Winn Ranch master planned development.

Project Drivers:

This project extends water service south to the proposed Groseclose and Winn Ranch master planned development communities. The proposed 16-inch water line is oversized from a 12-inch water line to provide excess capacity to additional potential growth in unincorporated areas not examined in this master plan. The timing and extent of this project is dependent upon the timing of construction for either of the proposed master planned developments.

Opinion of Probable Construction Cost

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	16" WL & Appurtenances	7,050	LF	\$ 240	\$ 1,692,000
2	Asphalt Pavement Repair	3,525	LF	\$ 100	\$ 352,500
				SUBTOTAL:	\$ 2,044,500
			CONTINGENCY	30%	\$ 613,400
				SUBTOTAL:	\$ 2,657,900
			ENG/SURVEY	15%	\$ 398,700
				SUBTOTAL:	\$ 3,056,600
				Estimated Project Total:	\$ 3,056,600

City of Lago Vista



Capital Improvement Cost Estimate

Construction Project Number: 8

July 31, 2024

Phase: 5-Year

Project Name: Pressure Plane Conversion

Project Description:

This project consists of a collection of small-scale valve and water line improvements to convert certain areas of the distribution network to other pressure planes.

Project Drivers:

The intent of this project is to convert encalves within the water system to nearby pressure planes to improve the level of service and provide more consistent pressures during maximum day demands.

Opinion of Probable Construction Cost

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	8" WL & Appurtenances	100	LF	\$ 120	\$ 12,000
2	6" WL & Appurtenances	3,650	LF	\$ 90	\$ 328,500
3	Pressure Reducing Valve	1	LS	\$ 10,000	\$ 10,000
4	Asphalt Pavement Repair	3,750	LF	\$ 100	\$ 375,000
				SUBTOTAL:	\$ 725,500
			CONTINGENCY	30%	\$ 217,700
				SUBTOTAL:	\$ 943,200
			ENG/SURVEY	35%	\$ 330,200
				SUBTOTAL:	\$ 1,273,400
				Estimated Project Total:	\$ 1,273,400

City of Lago Vista



Capital Improvement Cost Estimate

Construction Project Number: 9

July 31, 2024

Phase: 5-Year

Project Name: Miscellaneous Water Line Connections

Project Description:

This project consists of a collection of 12-inch and 8-inch water line improvements across multiple pressure planes.

Project Drivers:

The intent of this project is to increase hydraulic connectivity across the water system and improve looping where possible.

Opinion of Probable Construction Cost

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	12" WL & Appurtenances	700	LF	\$ 180	\$ 126,000
2	8" WL & Appurtenances	1,750	LF	\$ 120	\$ 210,000
3	Asphalt Pavement Repair	2,450	LF	\$ 100	\$ 245,000
				SUBTOTAL:	\$ 581,000
			CONTINGENCY	30%	\$ 174,300
				SUBTOTAL:	\$ 755,300
			ENG/SURVEY	35%	\$ 264,400
				SUBTOTAL:	\$ 1,019,700
				Estimated Project Total:	\$ 1,019,700

City of Lago Vista



Capital Improvement Cost Estimate

July 31, 2024

Construction Project Number: 10

Phase: 10-Year

Project Name: New 1.25 MG Allegiance GST

Project Description:

This project consists of a new 1.25 MG Allegiance GST to replace the existing 0.28 MG Allegiance GST.

Project Drivers:

Pressure Planes 6 & 7 borrow elevated storage via pressure reducing valves from pressure plane 1. As growth continues in pressure planes 6 and 7, additional storage at the Allegiance pump station is required to meet TCEQ minimum standards for elevated storage.

Opinion of Probable Construction Cost

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	New 1.25 MG Allegiance GST	1	LS	\$ 1,875,000	\$ 1,875,000
				SUBTOTAL:	\$ 1,875,000
			CONTINGENCY	30%	\$ 562,500
				SUBTOTAL:	\$ 2,437,500
			ENG/SURVEY	15%	\$ 365,700
				SUBTOTAL:	\$ 2,803,200
				Estimated Project Total:	\$ 2,803,200

City of Lago Vista



Capital Improvement Cost Estimate

July 31, 2024

Construction Project Number: 11

Phase: 10-Year

Project Name: WTP #3 Transmission Main

Project Description:

This project consists of 9,500 linear feet of 36-inch water transmission main from the WTP #3 facility, along Shoreline Ranch Drive, to the intersection of Lohmans Ford Road and Boggy Ford Road.

Project Drivers:

This project provides distribution capacity to move Buildout flows from WTP #3 to the rest of the water distribution network. The oversizing for this planning period will provide adequate conveyance capacity through the Buildout scenario.

Opinion of Probable Construction Cost

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	36" WL & Appurtenances	9,500	LF	\$ 540	\$ 5,130,000
2	Asphalt Pavement Repair	4,750	LF	\$ 100	\$ 475,000
				SUBTOTAL:	\$ 5,605,000
			CONTINGENCY	30%	\$ 1,681,500
				SUBTOTAL:	\$ 7,286,500
			ENG/SURVEY	15%	\$ 1,093,000
				SUBTOTAL:	\$ 8,379,500
				Estimated Project Total:	\$ 8,379,500

City of Lago Vista



Capital Improvement Cost Estimate

July 31, 2024

Construction Project Number: 12

Phase: 10-Year

Project Name: Paseo/Lohman Ford Transmission Main

Project Description:

This project consists of 8,400 linear feet of 16-inch water transmission main along Lohman Ford Road and FM 1431 to add additional conveyance capacity to PP-3, PP-8, and the new Tessera HSPS.

Project Drivers:

The proposed 16-inch transmission main provides additional conveyance capacity to supply multiple pressure zones through the buildup scenario under maximum day demand conditions.

Opinion of Probable Construction Cost

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	16" WL & Appurtenances	8,400	LF	\$ 240	\$ 2,016,000
2	Asphalt Pavement Repair	4,200	LF	\$ 100	\$ 420,000
				SUBTOTAL:	\$ 2,436,000
			CONTINGENCY	30%	\$ 730,800
				SUBTOTAL:	\$ 3,166,800
			ENG/SURVEY	15%	\$ 475,100
				SUBTOTAL:	\$ 3,641,900
				Estimated Project Total:	\$ 3,641,900

City of Lago Vista



Capital Improvement Cost Estimate

July 31, 2024

Construction Project Number: 13

Phase: 10-Year

Project Name: New Paseo Pump Station and GST

Project Description:

This project expands the pumping and ground storage tank capacity of the Paseo HSPS.

Project Drivers:

To meet the projected demands in Pressure Planes 3, 5, 8, and Tessera, the Paseo HSPS is recommended to be expanded to 1,500 gpm firm in the 10-year planning scenario, with the ability to add an additional pump for the buildup scenario.

Opinion of Probable Construction Cost

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	New 1,500 gpm Paseo Pump Station	1	LS	\$ 3,240,000	\$ 3,240,000
2	New 1.5 MG Lohman/Paseo Ground	1	LS	\$ 2,250,000	\$ 2,250,000
3	Decommission Ground Storage Tank	1	LS	\$ 100,000	\$ 100,000
				SUBTOTAL:	\$ 5,590,000
			CONTINGENCY	30%	\$ 1,677,000
				SUBTOTAL:	\$ 7,267,000
			ENG/SURVEY	15%	\$ 1,090,100
				SUBTOTAL:	\$ 8,357,100
				Estimated Project Total:	\$ 8,357,100

City of Lago Vista



Capital Improvement Cost Estimate

July 31, 2024

Construction Project Number: 14

Phase: 10-Year

Project Name: High Drive Water Line

Project Description:

This project consists of 4,300 linear feet of 12-inch water main along High Drive beginning east of Rock Terrace Drive, and ending east at the pressure reducing valve near Parliament Cove.

Project Drivers:

The proposed 12-inch water line improvement increases conveyance west within PP-1 from the proposed Bowden Point EST and increases supply through the pressure reducing valve to PP-6.

Opinion of Probable Construction Cost

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	12" WL & Appurtenances	4,300	LF	\$ 180	\$ 774,000
2	Asphalt Pavement Repair	2,150	LF	\$ 100	\$ 215,000
				SUBTOTAL:	\$ 989,000
			CONTINGENCY	30%	\$ 296,700
				SUBTOTAL:	\$ 1,285,700
			ENG/SURVEY	15%	\$ 192,900
				SUBTOTAL:	\$ 1,478,600
				Estimated Project Total:	\$ 1,478,600

City of Lago Vista



Capital Improvement Cost Estimate

July 31, 2024

Construction Project Number: 15

Phase: 10-Year

Project Name: Patton Ave Water Line

Project Description:

This project consists of 3,500 linear feet of 12-inch water main along Boggy Ford Road and Patton Avenue to increase conveyance through the pressure reducing valve on Patton Avenue to supply PP-6.

Project Drivers:

The proposed 12-inch water line improvement increases conveyance south within PP-1 from the existing 12-inch water line on Boggy Ford Road and increases supply through the pressure reducing valve on Patton Avenue to PP-6.

Opinion of Probable Construction Cost

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	12" WL & Appurtenances	3,500	LF	\$ 180	\$ 630,000
2	Asphalt Pavement Repair	1,750	LF	\$ 100	\$ 175,000
				SUBTOTAL:	\$ 805,000
			CONTINGENCY	30%	\$ 241,500
				SUBTOTAL:	\$ 1,046,500
			ENG/SURVEY	15%	\$ 157,000
				SUBTOTAL:	\$ 1,203,500
				Estimated Project Total:	\$ 1,203,500

City of Lago Vista



Capital Improvement Cost Estimate

Construction Project Number: 16

July 31, 2024

Phase: Buildout

Project Name: Boggy Ford Transmission Main

Project Description:

This project consists of 5,700 linear feet of 24-inch water transmission main along Boggy Ford Road between Lohman Ford Road and Liberty Lane.

Project Drivers:

The proposed 24-inch transmission main increases conveyance from WTP #3 to PP-1 and PP-6. The 24-inch transmission main is sized to convey accommodate supply from WTP #3 through the buildout scenario.

Opinion of Probable Construction Cost

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	24" WL & Appurtenances	5,700	LF	\$ 360	\$ 2,052,000
2	Asphalt Pavement Repair	2,850	LF	\$ 100	\$ 285,000
				SUBTOTAL:	\$ 2,337,000
			CONTINGENCY	30%	\$ 701,100
				SUBTOTAL:	\$ 3,038,100
			ENG/SURVEY	15%	\$ 455,800
				SUBTOTAL:	\$ 3,493,900
				Estimated Project Total:	\$ 3,493,900

City of Lago Vista



Capital Improvement Cost Estimate

July 31, 2024

Construction Project Number: 17

Phase: Buildout

Project Name: Lohman Ford Transmission Main Replacement

Project Description:

This project consists of 3,650 linear feet of 24-inch water transmission main along Lohman Ford Road between Boggy Ford Road and Lago Vista High School.

Project Drivers:

The proposed 24-inch transmission main increases conveyance capacity from WTP #3 and the Lohman/Paseo pump station. The existing 16-inch water line has sufficient carrying capacity through the 10-year planning period. As the water system trends towards buildout, the transmission main will need to be upsized in order to avoid high velocities.

Opinion of Probable Construction Cost

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	24" WL & Appurtenances	3,650	LF	\$ 360	\$ 1,314,000
2	Asphalt Pavement Repair	1,825	LF	\$ 100	\$ 182,500
				SUBTOTAL:	\$ 1,496,500
			CONTINGENCY	30%	\$ 449,000
				SUBTOTAL:	\$ 1,945,500
			ENG/SURVEY	15%	\$ 291,900
				SUBTOTAL:	\$ 2,237,400
				Estimated Project Total:	\$ 2,237,400

City of Lago Vista



Capital Improvement Cost Estimate

Construction Project Number: 18

July 31, 2024

Phase: Buildout

Project Name: WTP #3 Treatment and HSPS Expansion - Buildout

Project Description:

This project consists of an expansion to the treatment capacity of WTP #3 to 18.0 MGD and an expansion at the WTP #3 high service pump station to include two additional 3,000 gpm pumps.

Project Drivers:

The required combined water treatment plant capacities by the Buildout scenario is 17.61 MGD. An additional 10.0 MGD of treatment plant capacity satisfies the water production needs through the Buildout planning scenario. As WTP #1 is limited with space, future treatment improvements are assumed to take place at WTP #3. In order to distribute the treated water and supply the water system during maximum day conditions through the Buildout planning scenario, two 3,000 gpm pumps are recommended.

Opinion of Probable Construction Cost

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	10.0 MGD WTP3 Expansion	10,000,000	Gal	\$ 3.50	\$ 35,000,000
2	New 3,000 gpm WTP3 Pump	2	EA	\$ 2,160,000	\$ 4,320,000
3	New 2.5 MG WTP3 Ground Storage Tank	1	LS	\$ 3,750,000	\$ 3,750,000
				SUBTOTAL:	\$ 43,070,000
				CONTINGENCY	30%
				SUBTOTAL:	\$ 12,921,000
				ENG/SURVEY	15%
				SUBTOTAL:	\$ 8,398,700
				Estimated Project Total:	\$ 64,389,700

City of Lago Vista



Capital Improvement Cost Estimate

Construction Project Number: 19

July 31, 2024

Phase: Buildout

Project Name: New 0.75 Viking EST

Project Description:

This project consists of a 0.75 MG Viking elevated storage tank to replace the existing 0.40 MG Viking elevated storage tank.

Project Drivers:

Golf Ball EST and Viking EST serve Pressure Plane 1 directly, and Pressure Planes 6 & 7 through pressure reducing valves. Pressure Planes 6 & 7 borrow from the excess elevated storage in Pressure Plane 1 to meet TCEQ minimum elevated storage requirements. Additional elevated storage will be needed for the Buildout planning period to satisfy Pressure Planes 1, 6, & 7 minimum elevated storage requirements.

Opinion of Probable Construction Cost

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	New 0.75 MG Viking EST	1	LS	\$ 3,712,500	\$ 3,712,500
2	16" WL & Appurtenances	1,150	LF	\$ 240	\$ 276,000
3	Asphalt Pavement Repair	575	LF	\$ 100	\$ 57,500
4	Decommission Elevated Storage Tank	1	LS	\$ 200,000	\$ 200,000
				SUBTOTAL:	\$ 4,246,000
				CONTINGENCY	30%
				SUBTOTAL:	\$ 1,273,800
				ENG/SURVEY	15%
				SUBTOTAL:	\$ 828,000
				Estimated Project Total:	\$ 6,347,800

City of Lago Vista



Capital Improvement Cost Estimate

Construction Project Number: 20

July 31, 2024

Phase: Buildout

Project Name: New 0.40 MG Talon EST

Project Description:

This project consists of a 0.40 MG Talon elevated storage tank to replace the proposed Hydro Tank (Project #1).

Project Drivers:

Pressure Plane 5 is currently supplied by the Talon pump station and associated Talon Hydro Tank. As Pressure Plane 5 approaches buildout, the pressure plane may be better served by a standing elevated storage tank, as opposed to a large hydro tank and a pump station with long run times. The elevated storage tank will provide excess storage for power outages and allow for the pumps supplying PP-5 to rotate. The proposed elevated storage tank is within flight path considerations of the nearby airport. Consultation and approval with the FAA will be required upon design and construction.

Opinion of Probable Construction Cost

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	New 0.40 MG Talon EST	1	LS	\$ 2,400,000	\$ 2,400,000
2	Decommission Hydro Tank	1	LS	\$ 100,000	\$ 100,000
				SUBTOTAL:	\$ 2,500,000
			CONTINGENCY	30%	\$ 750,000
				SUBTOTAL:	\$ 3,250,000
			ENG/SURVEY	15%	\$ 487,500
				SUBTOTAL:	\$ 3,737,500
				Estimated Project Total:	\$ 3,737,500

City of Lago Vista



Capital Improvement Cost Estimate

Construction Project Number: 21

July 31, 2024

Phase: Buildout

Project Name: New Bronco BPS and Transmission Main

Project Description:

This project consists of a new 1,000 gpm Bronco booster pump station (BPS), 0.50 MG Bronco ground storage tank, and a 12-inch transmission main to connect to the proposed Talon EST (Project #20)

Project Drivers:

The proposed Talon EST (Project #20) is to be served directly by a new Bronco BPS in lieu of upsizing the Bronco BPS and upsizing the Talon BPS. The Bronco BPS is to supply PP-5 directly through the proposed 12-inch transmission main, and serve PP-8 through a new PRV.

Opinion of Probable Construction Cost

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	New 1,000 GPM Bronco Pump Station	1	LS	\$ 2,160,000	\$ 2,160,000
2	New 0.50 MG Bronco Ground Storage	1	LS	\$ 750,000	\$ 750,000
3	12" WL & Appurtenances	1,650	LF	\$ 180	\$ 297,000
4	Asphalt Pavement Repair	1,000	LF	\$ 100	\$ 100,000
5	Decommission Ground Storage Tank	1	LS	\$ 100,000	\$ 100,000
6	Decommission Pump Station	1	LS	\$ 100,000	\$ 100,000
7	Pressure Reducing Valve	1	LS	\$ 10,000	\$ 10,000
				SUBTOTAL:	\$ 3,517,000
			CONTINGENCY	30%	\$ 1,055,100
				SUBTOTAL:	\$ 4,572,100
			ENG/SURVEY	15%	\$ 685,900
				SUBTOTAL:	\$ 5,258,000
				Estimated Project Total:	\$ 5,258,000

City of Lago Vista



Capital Improvement Cost Estimate

Construction Project Number: 22

July 31, 2024

Phase: Buildout

Project Name: PP-5 12-inch Water Line

Project Description:

This project consists of 1,800 linear feet of 12-inch water line within PP-5 along Bar K Ranch Road.

Project Drivers:

The proposed 12-inch water line supports the additional supply from the new BroncoBPS (Project #21) and the proposed 0.40 MG Talon EST (Project #20). The added conveyance capacity connects the proposed EST to the Bar K 12-inch water line proposed in Project #6.

Opinion of Probable Construction Cost

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	12" WL & Appurtenances	1,800	LF	\$ 180	\$ 324,000
2	8" WL & Appurtenances	100	LF	\$ 120	\$ 12,000
3	Pressure Reducing Valve	1	LS	\$ 10,000	\$ 10,000
4	Asphalt Pavement Repair	1,800	LF	\$ 100	\$ 180,000
				SUBTOTAL:	\$ 526,000
			CONTINGENCY	30%	\$ 157,800
				SUBTOTAL:	\$ 683,800
			ENG/SURVEY	15%	\$ 102,600
				SUBTOTAL:	\$ 786,400
				Estimated Project Total:	\$ 786,400

City of Lago Vista



Capital Improvement Cost Estimate

Construction Project Number: 23

July 31, 2024

Phase: Buildout

Project Name: New 1,500 gpm Paseo Pump

Project Description:

This project consists of an additional pump at the Paseo booster pump station (BPS).

Project Drivers:

Growth in the areas served by the Paseo BPS requires the addition of another pump. The additional pump will provide sufficient firm capacity to meet demands through the Buildout planning scenario.

Opinion of Probable Construction Cost

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	New 1,500 gpm Paseo Pump	1	EA	\$ 1,080,000	\$ 1,080,000
				SUBTOTAL:	\$ 1,080,000
			CONTINGENCY	30%	\$ 324,000
				SUBTOTAL:	\$ 1,404,000
			ENG/SURVEY	15%	\$ 210,600
				SUBTOTAL:	\$ 1,614,600
				Estimated Project Total:	\$ 1,614,600

City of Lago Vista



Capital Improvement Cost Estimate

Construction Project Number: 24

July 31, 2024

Phase: Buildout

Project Name: WTP #1 HSPS Expansion

Project Description:

This project consists of an expansion to the WTP #1 BPS that provides service to the Lohman/Paseo BPS. The expansion is intended to bring the firm pumping capacity to 1,500 gpm.

Project Drivers:

Expanded pumping capacity at WTP #3 (Projects #4 & #18) and associated distribution mains (Projects #11 & #16) facilitate supply to lower pressure planes, thus relieving the need for WTP #1 to supply these areas. Increasing the pumping capacity at WTP #1 in the direction of the Lohman/Paseo BPS increases the redundancy of supply to the higher pressure planes directly.

Opinion of Probable Construction Cost

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	1,500 gpm WTP1 HSP Expansion	1	LS	\$ 1,620,000	\$ 1,620,000
				SUBTOTAL:	\$ 1,620,000
			CONTINGENCY	30%	\$ 486,000
				SUBTOTAL:	\$ 2,106,000
			ENG/SURVEY	15%	\$ 315,900
				SUBTOTAL:	\$ 2,421,900
				Estimated Project Total:	\$ 2,421,900