

PRELIMINARY ENGINEERING REPORT TOWN OF PALMER LAKE WATER SYSTEM IMPROVEMENTS

for

PROPOSED BUC-EE'S TRAVEL CENTER

Prepared for:

TOWN OF PALMER LAKE

PRELIMINARY ENGINEERING REPORT
TOWN OF PALMER LAKE
WATER SYSTEM IMPROVEMENTS

FOR

PROPOSED BUC-EE'S TRAVEL CENTER

PROJECT NO. 2024-079.100

DRAFT: MARCH 2025
FINAL: APRIL 2025

OWNER:

TOWN OF PALMER LAKE
28 VALLEY CRESCENT
PALMER LAKE, CO 80133

PREPARED BY:

GMS, INC.
CONSULTING ENGINEERS
611 NORTH WEBER, SUITE 300
COLORADO SPRINGS, COLORADO 80903

TELEPHONE: (719) 475-2935
TELEFAX: (719) 475-2938

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SECTION I

EXECUTIVE SUMMARY

The Town of Palmer Lake, Colorado is a statutory Town with a 2020 census population of 2,636 people. The Town operates a public drinking water system providing potable water under regulatory oversight of the Colorado Department of Public Health and Environment (CDPHE). Buc-ee's Holdings, Inc. has proposed the annexation and development of two parcels of land located in unincorporated El Paso County for a Buc-ee's Travel Center. The planned retail center will include a 74,000 square foot building with fuel pumps. The proposed development has requested potable water service from the Town. The purpose of this report is to:

- 1) Evaluate impacts of the proposed commercial development to the Town's existing water system and
- 2) Identify any needed improvements to the Town's existing water system

A comprehensive water study prepared for the Town, titled "Preliminary Engineering Report for Water System Improvements," dated November 2022 and amended in July 2023, was used as the basis of this report. The 2022 Preliminary Engineering Report (PER) recommended, among other items, the addition of a new groundwater well (Well A-1) to provide redundant supply capacity to the water system. The Town concurred with that recommendation. The 2022 PER was prepared prior to the Buc-ee's development proposal; and therefore did not consider the development. The Town's water demands presented in the 2022 report, have been updated in this report to include updated Town data, the proposed Buc-ee's development and potential future Town development adjacent to the waterline extension to the Buc-ee's development.

The proposed Buc-ee's development will increase the Town's daily water demands. In addition, the waterline extension to serve the new development will pass numerous properties along County Line Road and Beacon Lite Road, creating opportunities for additional potential customers on the Town's water system in the future. These properties, currently undeveloped or served by private wells, could benefit from connecting to the Town's water system because it could provide enhanced water reliability, fire protection, and property values. The combination of Buc-ee's Travel Center with the potential annexation customers will place increased demands on the Town's water system, necessitating upgrades to the supply, treatment and distribution capacities.

The proposed development would increase projected maximum day water demands in the Town by approximately 19%, and the potential future annexation customers could increase these demands by another 11%.

Table 1 summarizes the Town's water production rates at both water treatment plants (WTPs). For the Groundwater WTP (GW-WTP), the numbers reflect the largest existing well out of service and Well A-1 available as a redundant well per the 2022 PER. For the Surface Water WTP (SW-WTP), the numbers represent a 20-year low stream flow condition. Table 2 summarizes the projected demands of the Town, Buc-ee's, and potential future annexation customers.

TABLE 1
TOWN OF PALMER LAKE
WATER PRODUCTION CAPACITY

	Actual Production (gpd)	Maximum Available Production (gpd)
SW-WTP	60,400	60,400
GW-WTP	532,800	720,000
Total	593,200	780,400

TABLE 2
TOWN OF PALMER LAKE
2050 FUTURE WATER DEMANDS

Projected Water Demands (gpd)		
Service Area	Average Day Demand (ADD)	Maximum Day Demand (MDD)(%) ¹⁾
Town of Palmer Lake	206,300	585,900 (76%)
Buc-ee's Development	37,300	113,600 (15%)
Potential Annexation Area	22,900	65,100 (9%)
Total	266,500	764,600 (100%)

1) % = percent of Total Demand

The Town's water department staff provided input to the consultant for the Town's existing facilities. The Town's current water system relies on groundwater from the Denver basin aquifers and limited surface water. The aquifers are nonrenewable and are experiencing annual drawdown. The current A-2 and D-2R wells are capable of running at their maximum pumping rates. However, this is not sustainable for extended periods of time, as the wells require recovery

time to recharge. Therefore, their combined maximum pumping rate of 500 gpm is not sustainable due to the groundwater drawdown. To accommodate the additional demands, a new Well A-3 is recommended. Due to the new well's proximity to the existing GW-WTP, a new GW-WTP #2 is recommended in lieu of expanding the existing GW-WTP and installing nearly two miles of raw water pipeline to it.

Hydraulic modeling was conducted to size the waterline extension to the proposed site based on the development's fire flow requirements and identify potential problematic areas that limit flow delivery in the Town. A 12-inch ductile iron pipe (DIP) was sufficient for a needed fire flow (NFF) of 1,500 gpm and to maintain a minimum residual pressure of 20 psi throughout the pipeline. The pressures within the distribution system were not impacted by the waterline extension. A portion of the 6-inch pipe from Spruce Avenue along County Line Road is required to be upsized to attain adequate pressures. It is noted that Buc-ee's representatives indicated a total fire flow of 1,700 gpm may be needed for the proposed development, depending on various site and underground utility conditions. In order to accommodate a NFF of 1,700 gpm, modeling calculations show the 12" DIP waterline extension is adequate to maintain a minimum residual pressure of 20 psi throughout the pipeline.

The water system improvements required to provide adequate service to the Town and the proposed development are divided into two classifications of work: Waterline Extension and Facility Upgrades. The preliminary cost estimate for the waterline extension is approximately \$5,651,200 and generally includes:

- Replace 1,600 feet of existing 6-inch pipe with 12-inch DIP and install approximately 10,900 feet of new 12-inch DIP along County Line Road and Beacon Lite Road to the proposed development.
- Install six combination air/vacuum valve assemblies along the waterline extension.
- Install 11 new fire hydrant assemblies along the waterline extension.
- Install 14 new gate valves along the waterline extension.

The facility upgrades will be needed to the Town's water system because of the estimated increase in demands resulting from the proposed development and future potential annexations. The preliminary cost estimate for the facility upgrades is approximately \$4,771,400 and generally includes:

- Construct a new A-3 well in the Arapahoe aquifer and raw water piping to the new GW-WTP #2 to provide additional supply.
- Construct a new GW-WTP #2 to treat the new A-3 well.
- Install 1,000 feet of new 8" DIP to connect GW-WTP #2 to the distribution system.

Table 3 summarizes the preliminary estimated costs for the recommended water system improvements to accommodate the proposed development and annexation.

TABLE 3
TOWN OF PALMER LAKE
PRELIMINARY COST ESTIMATE ¹⁾

Proposed Buc-ee's Development Water System Improvements	
Waterline Extension	\$5,651,200
Facility Upgrades	\$4,771,400
Total Estimated Cost	\$10,422,600

1) Includes 20% contingencies, Engineering costs and soft costs

SECTION II INTRODUCTION

A. PURPOSE AND SCOPE

This Preliminary Engineering Report (PER) has been prepared on behalf of the Town of Palmer Lake to evaluate the necessary improvements to the Town's potable water system to serve a proposed development of two parcels of land in unincorporated El Paso County. The proposed Buc-ee's Travel Center development includes a large-scale retail store with fuel sales. The developer has requested treated water service for the development's use and fire protection should the proposed annexation of the parcels into the Town be completed.

The purpose of this report is to: 1) evaluate the water system impacts of the requested commercial development and 2) identify needed improvements for the Town's existing water system, and the estimated costs associated with the improvements. The scope of the evaluation includes a review of the Town of Palmer Lake's water rights, supply and treatment capacities, treated water storage, and water distribution system piping. The PER identifies necessary water system improvements and estimated costs to deliver a reliable and safe water supply to the proposed development. The PER also evaluates future requirements to serve adjacent properties along the service area extension. The recommended improvements are to comply with *Regulation No. 11 - Colorado Primary Drinking Water Regulations* and the *State of Colorado Design Criteria for Potable Water Systems (DW005)*.

B. BACKGROUND

The Town of Palmer Lake's government is that of a Statutory town. A Statutory town is a town that is governed by the state's general laws regarding municipalities, as opposed to having its own "home rule" charter allowing for more local autonomy. Therefore, in the case of drinking water systems, the Town of Palmer Lake is governed by the State of Colorado Primary Drinking Water Regulations and Design Criteria for Potable Water Systems. The Town has provided water service to its customers since around 1867 with the adjudication of its original water rights. The Town's current water supply consists of two active groundwater wells located within the Town limits, and the Glen Park and lower reservoirs

located west of Town. The wells draw from the Arapahoe and Denver aquifers within the Denver Basin. The reservoirs located on Monument Creek provide surface water supply for the Town. Surface water is treated at the Town's surface water treatment plant (SW-WTP). Groundwater from the wells is treated at the groundwater treatment plant (GW-WTP). The water system is operated as a single pressure zone with storage provided by two (2) 250,000-gallon gravity storage tanks, known as the High Zone Tanks. Water from the lower 500,000-gallon treated groundwater storage tank, known as the Low Zone Tank, is pumped into the distribution system. The water distribution system consists primarily of polyvinylchloride (PVC) piping with limited portions of cast-iron pipe (CIP) within the system.

In 1985, the Town passed a deemed consent ordinance to claim groundwater underlying the corporate limits of the Town. The ordinance also allowed private property owners the ability to drill a private well within the corporate limits of the Town if public water facilities are not available.

In 2024, the Town was presented a concept for a proposed annexation of two parcels of land currently located within unincorporated El Paso County. Once annexed, the property would be developed into a Buc-ee's Travel Center, a large-scale retail store with fuel sales. The two vacant parcels of land, identified by El Paso County Assessor's Office as Parcel Nos. 7102200014 and 7102200015, are comprised of 4.95 and 20.01 acres, respectively. The 4.95-acre parcel is currently zoned CC (Commercial Community), and the 20.01-acre parcel is zoned C-1 (Commercial – Obsolete) by El Paso County. The proposed commercial building is estimated to have 74,000 square feet of retail space. The latest documents submitted to the Town for the proposed annexation into the Town of Palmer Lake requested Planned Development (PD) zoning of the parcels.

Buc-ee's Holdings, Inc. is an American chain of travel centers established in 1982. This family-focused travel center features a wide range of prepared foods including custom Texas-style barbeque sandwiches, salads, fruits, baked goods, and sweets as well as a unique collection of gifts, housewares, clothing, and weekend traveling gear. Buc-ee's is open 24 hours per day, seven days per week and known for its abundant gas pumps and clean and spacious restrooms. The travel center does not allow larger semi-trucks on the property.

The proposed development's parcels are located approximately two (2) miles east of the Town's water distribution system. A waterline extension is needed to serve the proposed

development. The waterline extension route passes numerous (developed and undeveloped) properties that may desire connecting to the Town's water system in the future. Therefore, this report also addresses potential annexation and water service connections along the waterline extension route.

This PER includes a comprehensive evaluation of the Town's existing water system and presents an evaluation of alternatives to provide new water supply infrastructure to the proposed development and potential future customers along its annexation corridor.

C. SERVICE AREA

The Town of Palmer Lake is located in central Colorado within northeastern El Paso County. The community is located within Sections 4, 5, 8, 9, 10, and 15, Township 11, Range 67 West of the Principal Meridian. The Town's water service area consists of the incorporated limits of the Town, with the majority of the Town's population being served by the water distribution system. The southeast quadrant of the Town is served by individual private wells.

The proposed development site is located on the southwest corner of the Interstate 25 and County Line Road interchange, approximately two (2) miles east of the incorporated limits of the Town. This proposed site is located within Section 2, Township 11, Range 67 West of the Principal Meridian. The general location of the Town and the proposed site are depicted on Figure 1 – Vicinity Map. The Town of Palmer Lake corporate boundary and the proposed annexation area to the Town are shown on Figure 2 – Location Map. This figure also shows the general locations of the major components of the Town's water system.

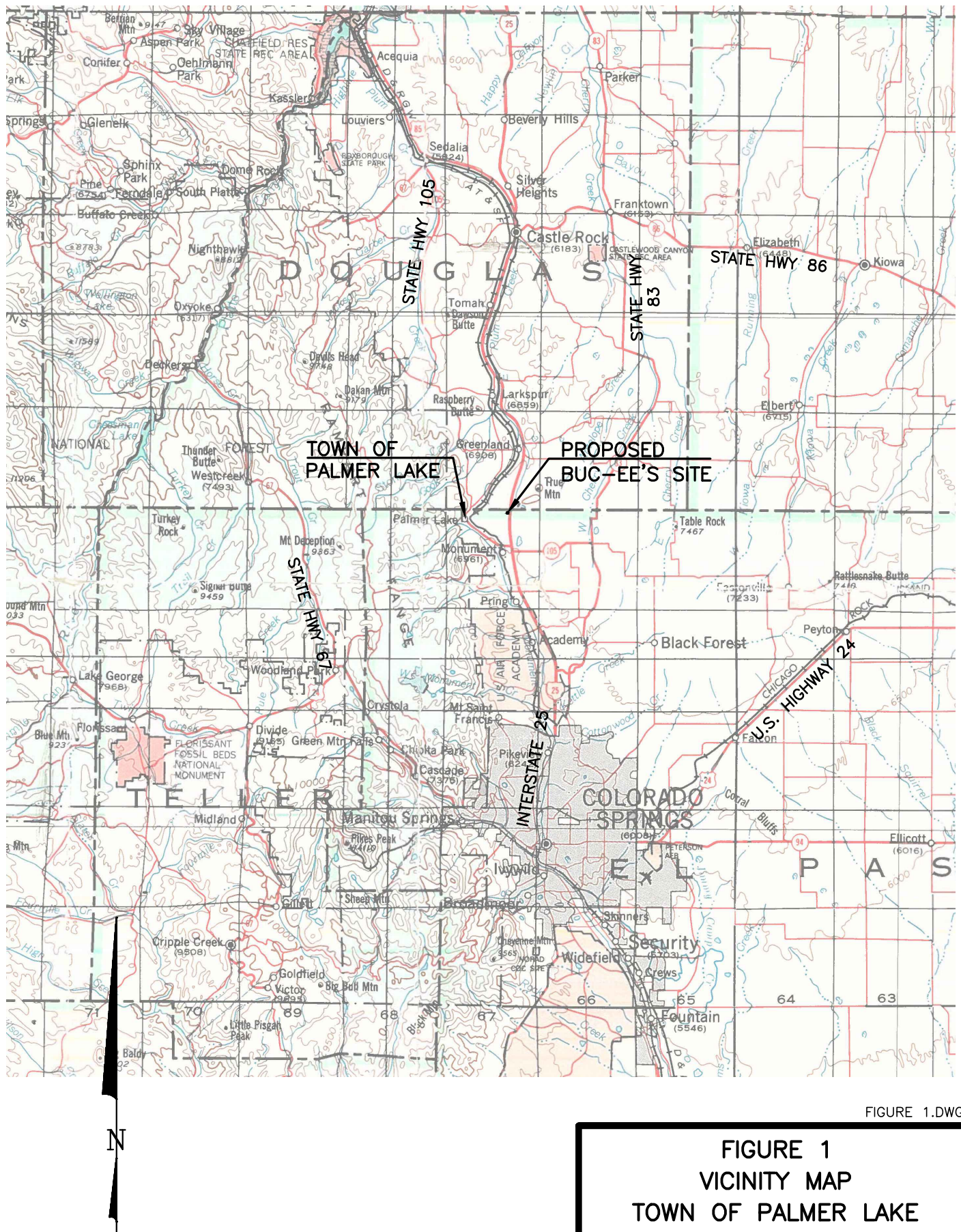


FIGURE 1.DWG

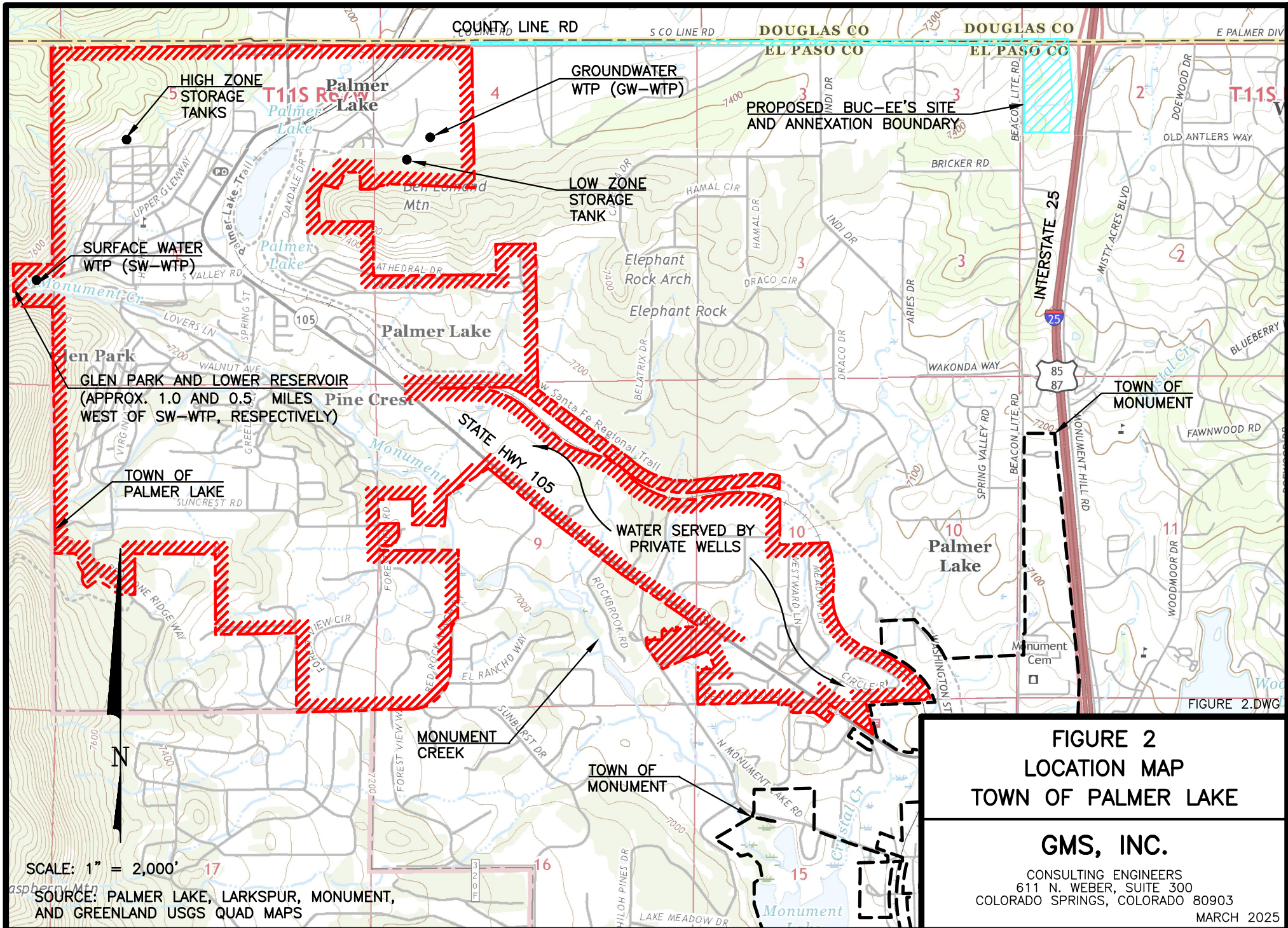
SCALE: 1" = 8miles
(approximate)

SOURCE: USGS MAP OF COLORADO

FIGURE 1 VICINITY MAP TOWN OF PALMER LAKE

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611 N. WEBER, SUITE 300
COLORADO SPRINGS, COLORADO 80903
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SECTION III POPULATION

The planning area of this evaluation is limited to the incorporated limits of the Town of Palmer Lake, the proposed annexation area associated with the new commercial development, and potential additional annexation areas along the proposed annexation location. The primary focus will be on the Town of Palmer Lake and the potential additional annexations areas to project future populations.

A. HISTORICAL POPULATION

The general population of the Colorado Front Range has seen a long-term steady increase in numbers over the last century. The Pikes Peak Region includes the counties of El Paso, Park, and Teller. From 1980 to 2023 this region grew from a population of 325,611 people to 786,885 people, an increase of 142%, or an average of 2.1% per year. The historical long-term increase in population in the Front Range of Colorado has been influenced by strong economic growth of the large metropolitan cities (Denver and Colorado Springs) and the desirable Colorado lifestyle. In general, El Paso County and Palmer Lake experienced similar growth from 1980 through 2023, growing in population by 141% and 135% respectively. Strong growth within the Colorado Springs area is projected to continue based on projections by the Colorado Department of Local Affairs, State Demographer's Office (SDO), dated October 2024.

The following table provides a tabulation of data from the previous five census periods for El Paso County and the incorporated Town of Palmer Lake.

TABLE 4
TOWN OF PALMER LAKE
HISTORICAL POPULATION ¹⁾

Year	El Paso County	Town of Palmer Lake
1980	309,424	1,130
1990	397,014	1,480
2000	516,929	2,179
2010	622,263	2,420
2020	730,395	2,636
2021 ²⁾	737,239	2,643
2022 ²⁾	740,539	2,647
2023 ²⁾	744,153	2,650 ³⁾

1) Census Population

2) State Demography population estimates, October 2024.

3) Includes 240 people served by 147 private wells.

The above table shows the total County and Town population increase from 1980 and 2023. The Town experienced its most dramatic population growth during the 1990s, but growth slowed in the following years due to limitations in the capabilities of the water supply facilities.

B. POPULATION PROJECTIONS

For this report, population estimates will focus on future growth within the current incorporated limits of the Town, known as in-fill, as well as expansion of the Town. The proposed development and adjacent properties to the proposed annexation route are accounted for separately from the Town's population projections.

The SDO compiles population projections for both regions and counties. They do not compile any statistical projections for individual communities or unincorporated portions of counties. The SDO population projections are based on regional statistical data for births, deaths and migration into and out of an area.

The recent population projection data from the SDO, dated October 2024, reflects an increasing population trend for El Paso County over the next 25 years with a steady population increase through 2050 at an average rate of 1.1% per year. The SDO average annual growth rate is comparable to the average annual population increase seen in the census data from 2000 to 2020. The magnitude of this projected growth is attributable to the continuation of

new housing construction in the urbanizing fringe of the Colorado Springs Metro area, which is occurring within both the incorporated and unincorporated areas of El Paso County. These countywide growth figures are possible for the Town of Palmer Lake, if the availability of water supply continues.

The pressures for growth within Palmer Lake and subsequently to the Town's water system are strong. This is facilitated in part by the construction of the Interstate 25 Gap project between Monument and Castle Rock has improved the traffic congestion along this major Colorado Springs to Denver transportation corridor. A 2017 estimate by Tetra Tech Engineering Services put the available number of water taps at 1,060. A moratorium by the Town was implemented in September 2020 through Resolution No. 18-2020 to effectively evaluate the Town's water supply and demand. The 2020 Water Resources Study conducted a more detailed evaluation of the available water supply and estimated the number of available taps at 1,145. In February 2021, the Town partially lifted the moratorium in Resolution No. 12-2021 by allowing up to 10 new water taps. Not all residents in the Town are served by the Town's water system. Currently, 147 private residential and commercial water wells have been constructed within the Town limits (six more residential wells have been constructed since the 2022 PER). These existing wells could potentially be replaced with potable water from the Town's system in the future. For the purposes of this report, a Town growth rate equal to the SDO's county-wide growth rate of 1.1% / year is used.

The following table presents population projections for the Town of Palmer Lake based on the SDO's county-wide growth rate for El Paso County. These population projections for Palmer Lake through the year 2050 are seen as being relatively conservative and for planning purposes generally include localized contiguous growth of the Town and general infill within the Town. The following population projections for the Town's water system reflect the service area's population including those currently on private wells.

TABLE 5
TOWN OF PALMER LAKE
PROJECTED POPULATION

Year	El Paso County ¹⁾	Town of Palmer Lake ²⁾
2023	744,153	2,650
2025	758,150	2,709
2030	810,949	2,862
2035	867,406	3,024
2040	920,112	3,195
2045	965,080	3,376
2050	1,001,087	3,567

- 1) Population forecasts from State Demographer's Office, October 2024.
- 2) Town growth rate based on countywide projections includes properties served by private wells.

Based on these population projections, the Town's population is projected to increase from a 2023 population of 2,650 people to 3,567 people in 2050, an increase of 35%. The average household size within the Town of Palmer Lake is 2.42 people per household based on the State Demographer's Office data, dated 2024.

C. POTENTIAL ANNEXATION CUSTOMER PROJECTIONS

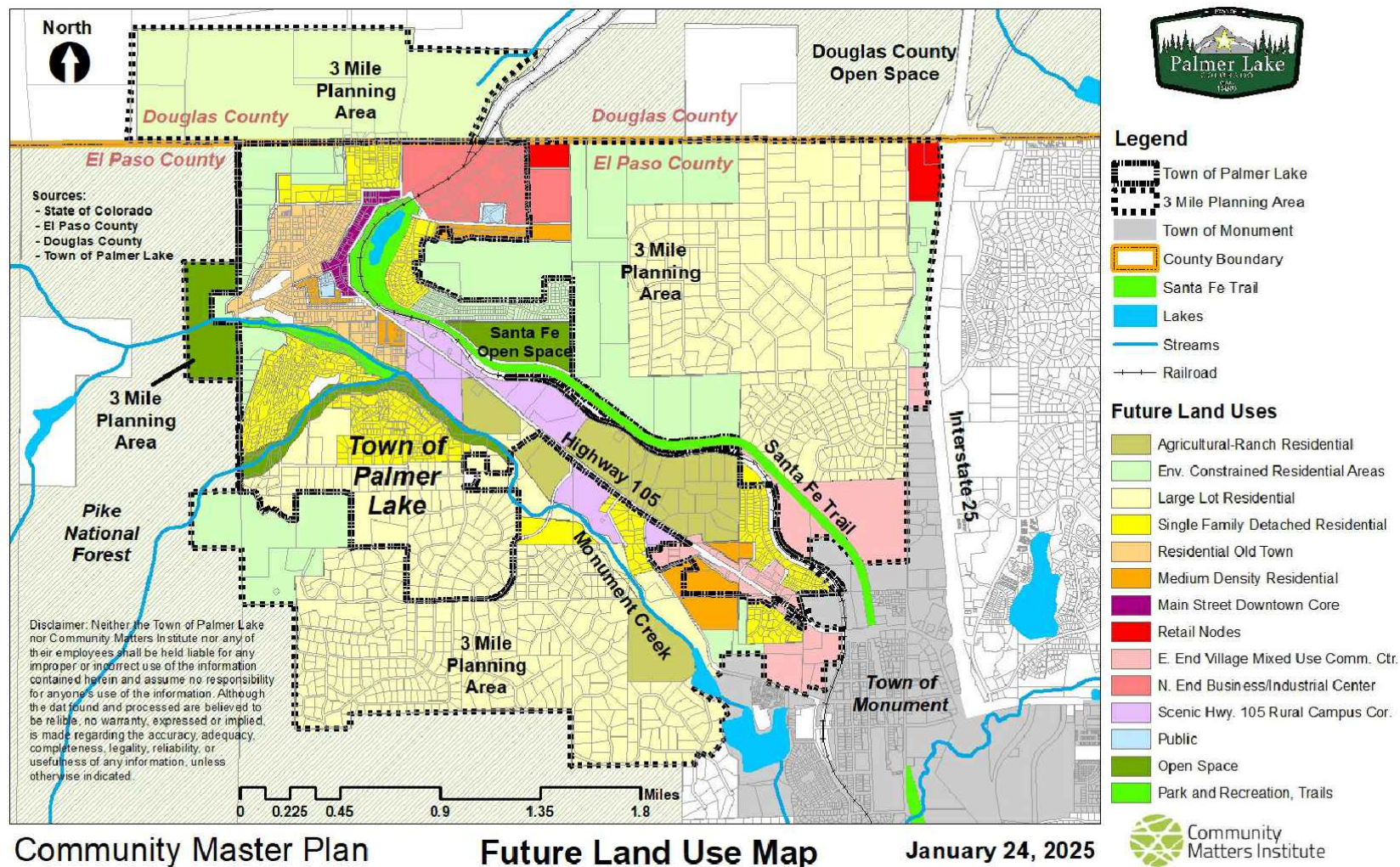
The proposed development is located approximately two (2) miles from the Town's existing water distribution system. A waterline extension to connect the proposed development would pass numerous properties (developed and undeveloped), those of which are developed are currently on their own water supplies. The waterline extension is discussed in Section VII. With the proposed annexation area and the waterline extension being in County Line Road and Beacon Lite Road, properties along this annexation route may desire to be annexed in the future as well. These properties along County Line Road and Beacon Lite Road which could be, or are, on their own water supplies could benefit from connecting to the Town's municipal water supply because it may improve their water reliability, ensure safe drinking water and reduce maintenance costs compared to private wells. In addition, connection to the Town's water system could offer other benefits such as enhanced property values, fire protection, and potentially lower insurance premiums.

When evaluating and sizing the improvements to the Town's water system, the potential additional annexation areas which could be served by the waterline extension to the proposed site must be considered. These potential connections were evaluated using the Future Land Use Map from the Town's 2022 Community Master Plan, as shown in Figure 3. The parcels included in the proposed development are designated as a retail node in Figure 3. Adjacent parcels to the south of County Line Road and west of the proposed development are primarily classified as large-lot residential, while land further west is categorized as environmentally constrained residential areas. To the north of County Line Road, land is primarily designated as Douglas County open space. Environmentally constrained residential areas and another retail node were previously identified in the Master Plan, but have recently been removed from consideration based on property owner requests. An updated Future Land Use Map received from the Town was used as a basis for Figure 3, and also serves as the reference for assessing potential waterline connections and annexations which may come to fruition if the waterline extension is in place.

For the purposes of this report, the potential connections were narrowed to properties adjacent to County Line Road and Beacon Lite Road which is the most likely proposed waterline extension route. The potential customers selected were for any homes whose primary driveway access is from these roads. In addition, an offset distance of 1,500 feet from County Line Road was selected as the nominal distance for an immediate potential customer. This distance reflects the approximate location of the furthest property boundary whose direct access is from County Line Road.

Regions outside of this offset were excluded from this analysis, as the focus is on potential connections in the foreseeable future due to the water extension to the proposed commercial development. As the Town expands and considers annexing lands to the east of its current limits, further studies will be necessary to evaluate the system capacity, components and necessary looping.

A majority of the properties south of County Line Road and to the west of the commercial development (labeled as large lot residential by the Town) are developed and designated by the El Paso County Development Service Department as RR-5 (Residential Rural – 5 acres). There are fifteen (15) immediate potential customer connections along the south side of County Line Road within the 1,500-foot offset.



NOTE: THIS MAP IS THE CURRENT VERSION OF THE MAP THAT ORIGINALLY APPEARED IN THE TOWN'S 2022 COMMUNITY MASTER PLAN. THE ONLY CHANGE FROM THE ORIGINAL MAP IS THE REMOVAL FROM THE FUTURE LAND USE BOUNDARY OF THE PRIVATE LAND NORTH OF COUNTY LINE ROAD THAT IS SURROUNDED BY DOUGLAS COUNTY OPEN SPACE.

FIGURE 3 FUTURE LAND USE MAP TOWN OF PALMER LAKE

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The water main extension is proposed to run along County Line Road before heading south on Beacon Lite Road. The extension is proposed to the main entrance of the proposed commercial development, approximately 850 feet south of County Line Road. Opposite the proposed commercial development along Beacon Lite Road are four more properties with driveway access, including one for a church. The current land owner of the proposed development site also owns land southeast of the County Line Road and Interstate 25 interchange, which was rezoned in December 2024 to RM-12 (Residential Multi-Dwelling) and RS-6000 (Residential Suburban). The new commercial development is expected to encourage further growth in the area. South of the proposed site is a 35-acre parcel zoned as C-1 (Commercial Obsolete) with allowances for special uses. This land surrounds property owned by the Town of Monument, for the Town of Monument's water storage tank, and land owned by a telephone company, which is occupied by a communications tower. South of these facilities, and on part of the 35-acre parcel, are two single-family residential homes. North of the storage tank lies the undeveloped portion of the 35-acre parcel. Development is anticipated to occur on this 10-acre portion of land given that residential and multi-dwelling zoning has already been approved at the southeast corner of the County Line Road and Interstate 25 interchange. The El Paso County Land Development Code limits RM-12 to a minimum lot area of 3,500 square feet to a single family attached dwelling (7,000 square feet for two-family dwellings). The original Monument Ridge West LLC multifamily development (once contemplated on the proposed development site) had an approximate dwelling density of 4,800 square feet per dwelling unit. Applying this density to the 10-acre parcel, there would be an estimated 45 duplexes (90 single-family attached units). Additionally, three adjacent homes opposite Beacon Lite Road extend the same distance as this 10-acre portion of land and are included as potential customers. In total, this stretch represents 97 potential customers along Beacon Lite Road.

The property owned by the United Congregational Church (UCC) was recently disconnected from the Town of Palmer Lake, removing it from the Town's corporate boundary. The property is listed as parcel number 7104200012 in the El Paso County Assessor's records. Because this property was previously contained within the Town of Palmer Lake and has since intentionally removed itself from the Town, it is believed that the property will not be seeking water service from the Town in the future. Although this property is currently outside of the Town and could potentially receive water service from the water line extension to the proposed Buc-ee's development, the recent separation from the Town justifies this property not being

included in any future annexation lands or additional water demands which may arise from the water line extension serving the proposed Buc-ee's development.

An area located just east of the UCC property described above, known as the Ben Lomand Mountain Village development, remains undeveloped (labeled as environmentally constrained residential by the Town's Future Land Use Map). This area consists of approximately 181.5 acres and is outside Town boundaries. An application was previously submitted to the Town to annex the 181.5 acres. If annexed, the owner planned to rezone the parcels from RR-5 to RE (Residential Estate) zoning. According to the Town of Palmer Lakes Code of Ordinances, RE Estate Zone allows for single-family dwellings on minimum lot sizes of 2.5 acres. Upon review of the Town's *Annexation Impact Report for the Ben Lomand Mountain Village Annexation into the Town of Palmer Lake*, within the proposed 181.5-acre annexation, approximately 130-acres is reported to be available for development, with a usable building area of around 104 acres (assuming 20% land use for rights-of-way and Town infrastructure). Assuming the RE Estate Zones, approximately 41 lots could be built in the development. These numbers present an estimated number of connections based on previously submitted documents and could change in the future.

The north side of County Line Road is zoned by Douglas County. A majority of the land adjacent to County Line Road is zoned as OS (Open Space) and not available for development. There are two parcels of land located with driveway access to County Line Road and are zoned by Douglas County as A1 (Agricultural One). These lots were previously designated as a retail node and environmentally constrained residential lots in the Town's Future Land Use Map. The A1 zone district discourages urban development and is characterized by large-acreage (35-acres or greater) farms, ranches, open area, etc. Development is limited to churches, fire stations, library, open space/trails, schools, etc. The smaller 38-acre property (noted as a retail node) has already been developed with a single residential building. The larger 120-acre property remains undeveloped; however, it is possible that this larger acreage property could be divided into three (3) 35-acre potential lots. Although this area has development potential as described above, the recent requests from the property owners have removed this area from the future land use considerations. Therefore, based on this recent change, this area is not considered to contribute to future annexation connections.

Based on a land use review and estimates of potential connections for future developments, it was assumed that approximately 153 potential connections will be made (152 residential and one church), excluding the Buc-ee's Travel Center. Assuming the Town of Palmer Lake's household density of 2.42 people per household (per the SDO dated October 2024), the projected population increase for the water extension is 368 people.

The table below summarizes the estimated potential water customers for future annexation areas along the proposed annexation route to the Buc-ee's Development. Figure 4 illustrates the location and extents of the various areas considered as potential future annexation customers.

TABLE 6
TOWN OF PALMER LAKE
ESTIMATED WATER CONNECTIONS AND POPULATION

Area	Land Use	Customer Connection	Population ¹⁾
A	Environmentally Constrained Residential	41	100
B	Large Lot Residential	15	36
C	Environmentally Constrained Residential	0 (4) ²⁾	0 (10) ²⁾
D	Large Lot Residential and Church	4	7
E	Multi-Family Residential	90	218
F	Large Lot Residential	3	7
Total		153	368

1) Based on 2.42 people/residential connection

2) Land area C is not considered

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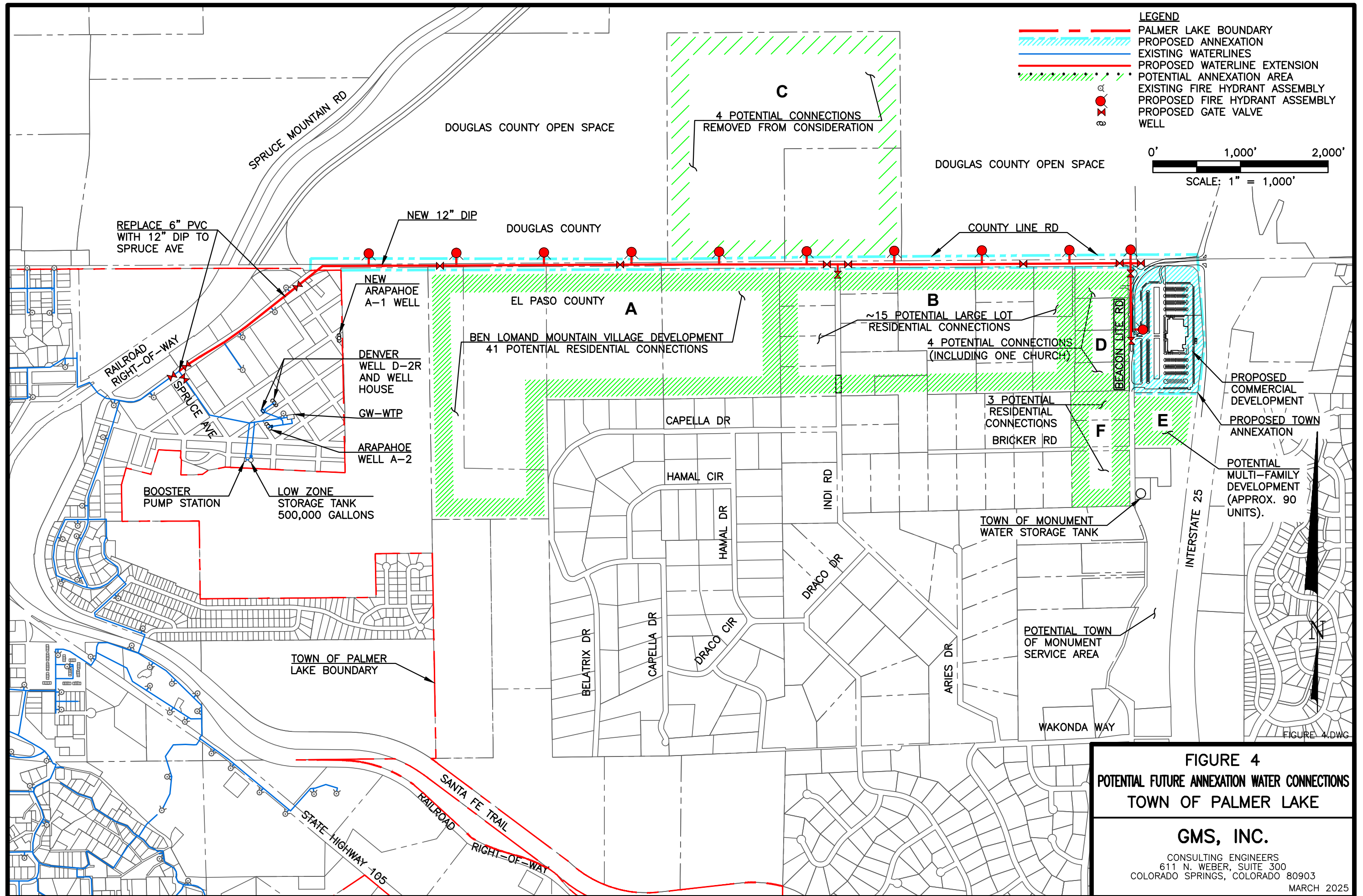


FIGURE 4
POTENTIAL FUTURE ANNEXATION WATER CONNECTIONS
TOWN OF PALMER LAKE

GMS, INC.

CONSULTING ENGINEERS
611 N. WEBER, SUITE 300
COLORADO SPRINGS, COLORADO 80903
MARCH 2025

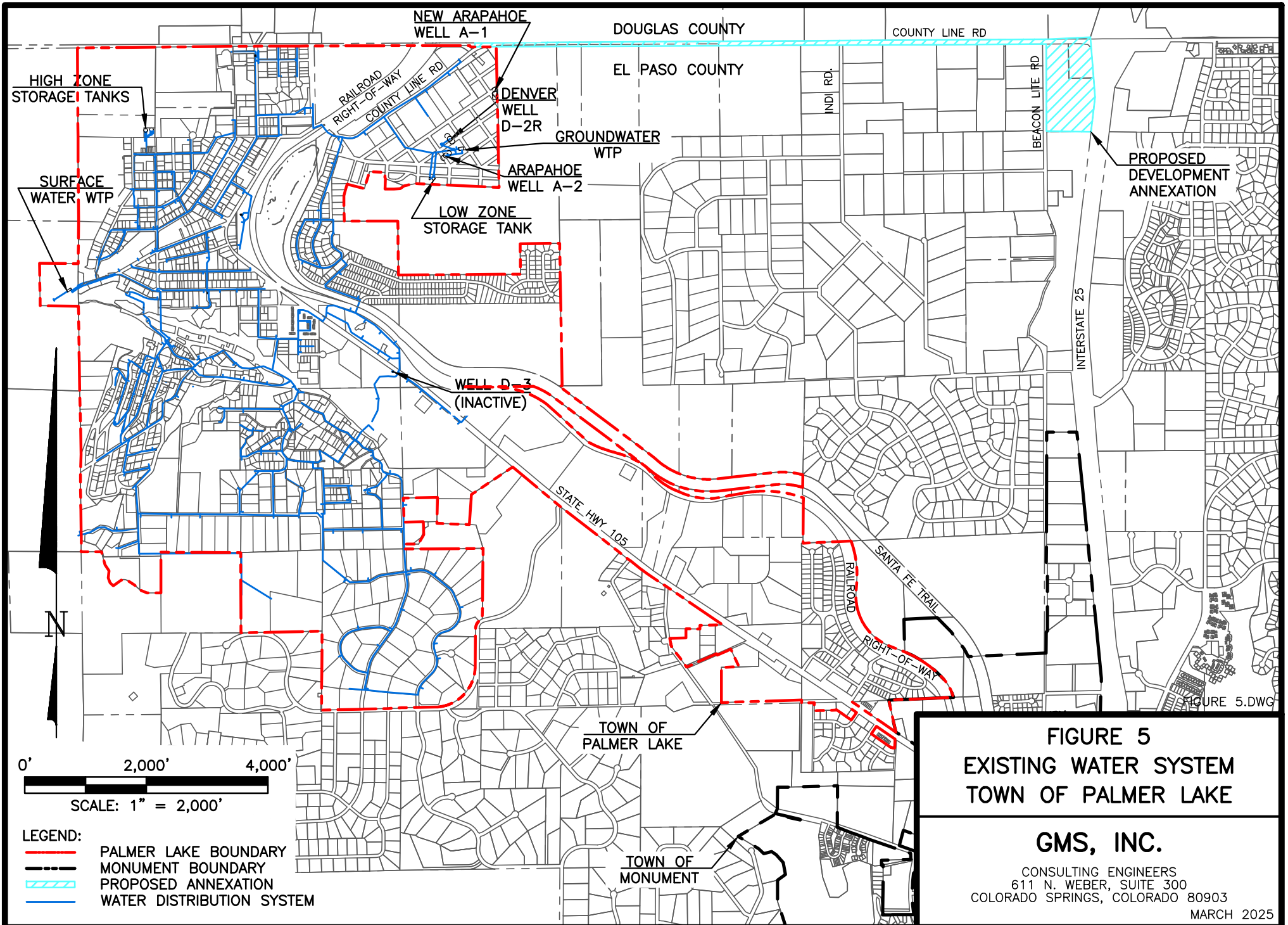
SECTION IV EXISTING WATER SYSTEM

The existing water system is discussed in detail in the Town of Palmer Lake's *Preliminary Engineering Report (PER) for Water System Improvements – 2022*. The purpose of this section is to summarize the information from the 2022 PER, relevant to proposed water service to the Buc-ee's development. Figure 5 shows the Town boundaries, existing water distribution system, surface water treatment plant (SW-WTP), groundwater treatment plant (GW-WTP), the storage tanks and wells. The Town of Palmer Lake service area consists of approximately 3.1 square miles (sq. mi.) or 1,934 acres. The Town limits extend southeast in an area north of Highway 105. This portion of the Town is not served by the Town's water system. Water in this area of Town is provided by private groundwater wells. Figure 3 also shows the proposed annexation with respect to the current Town boundaries. The proposed annexation has a total combined property area of 0.04 sq. mi. or 24.96 acres.

A. BACKGROUND

As previously discussed, the Town has maintained its own water system since around the time of its first water right in 1867. The original distribution system has been extended and replaced extensively since then. In the last ten years, the Town has aggressively been replacing segments of old cast-iron pipe having lead joints. The SW-WTP was constructed in the 1960's and was upgraded in 2012 with new microfiltration process equipment. The GW-WTP was constructed in 2002 for the then-constructed Arapahoe Aquifer Well. The Denver Aquifer Well was later connected to flow through this WTP.

A water use study prepared by W.W. Wheeler & Associates in 1987 evaluated surface water rights for the Town. The study recommended obtaining court approval for an augmentation plan for out-of-priority surface water diversions and claiming groundwater rights below the footprint of the Town. These groundwater rights and augmentation plan were adjudicated in 1987. The 1987 study was updated in 2000. The update included a distribution system model and pipeline recommendations to the distribution system. Also recommended was



the construction of an Arapahoe Aquifer Well for augmentation of out-of-priority diversions. An additional update to the study was conducted in 2017 in order to establish the number of available taps based on surface water supplies only. A separate water resources evaluation for the Town of Palmer Lake was prepared by the consultant in 2020. The evaluation summarized the Town's current water rights status and water system capacity.

A PER was conducted for the Town of Palmer Lake in 2022 with an accompanying addendum. The PER analyzed the Town's reservoir storage, supply, groundwater well production, surface water and groundwater treatment, treated water storage, distribution and customer metering components. The report determined that the Town's surface water and groundwater rights were sufficient, but recommended additional redundant well capacity to address the worst-case scenario of a 20-year low surface water availability and with one groundwater well being out of service. The report recommended installing a new Arapahoe Aquifer well (A-1) and replacing aging cast iron and problematic areas in the distribution system. System looping across Highway 105 was also advised. Extending the water system to properties on private wells to the southeast of the Town was deemed cost-prohibitive and not recommended at the time. At the preparation of this report, the Town is actively pursuing the construction of the new A-1 well.

B. WATER SUPPLY

The Town of Palmer Lake derives its water supply from both surface water and groundwater sources. The following is a summary of the Town's surface water and groundwater rights. Details of the Town's water rights are presented in the *2020 Palmer Lake Water Resources Evaluation* report.

1. Summary of Water Rights

The Town has two direct flow surface water rights available for its potable water system. The Anchor Ditch right at 0.89 cubic feet per second (cfs) (575,000 gallons per day [gpd]) has a #1 priority. The Town of Palmer Lake Water System right at 2.19 cfs (1,420,000 gpd) has a #65 right and is subject to senior priority calls. The combined 3.08 cfs (1,995,000 gpd) can be replaced for out-of-priority diversions with non-tributary water via the adjudicated exchange plan.

The Town has a total nontribuatry and not-nontributary water rights of 3,378 AF per year (3,106,000 gpd). The Town has consented 404 AF per year (361,000 gpd) to private wells within the Town limits. The net amount of nontributary and not-nontributary groundwater rights available for the Town's potable water system, and for augmentation, totals 2,974.4 AF per year (2,650,000 gpd).

Since the 2022 PER, the Town had six new residential wells come online. A tabulation of private wells within the corporate limits of the Town is presented in the 2020 Water Resources Evaluation by GMS, Inc. Of the 151 private well records compiled, 141 are listed as constructed and 10 are listed as having the permit issued. For this evaluation, it is assumed the six wells are part of the 10 that were permitted but not constructed. Thus, keeping the water rights consented assumption the same as the 2022 PER.

The Town has a net total of 4,650,000 gpd (5,209 ac-ft/yr) in domestic water supply rights. This, of course, does not represent the amount of treated water that can be physically delivered to the water system.

2. Summary of Available Supply

The Town's water supply capacity is limited to the actual availability of water supply and associated facilities' capacities. In general, surface water supply is preferred to groundwater supply because it comes at a lower operating cost.

The Town's surface water supply is currently limited to 72,000 gpd (50 gpm). The Town has indicated that pumping at rates exceeding 50 gpm would drain the water reservoir to a level that has negative water quality impacts during warm months and can lead to freezing of the intake during cold weather. The 2020 Water Resources Evaluation presented an update of available surface water supplies. The minimum calculated available surface water supply of 5.75 AF per month equates to 60,400 gpd (41.9 gpm); worst-case. Under this worst-case condition with only 60,400 gpd in direct stream flows available, the remaining water system demand would need to be made up using reservoir storage and non-tributary groundwater. The Glen Park Reservoir has a 147.5 AF storage right. Of this, 51.6 AF per year is required for Colorado Water Conservation Board (CWCB) minimum stream flows and evaporation losses. Approximately 50 AF of storage

should be considered unusable in the bottom of the impoundment. This leaves approximately 45 AF of storage available for use.

The Town's groundwater rights far surpass its groundwater well capacity. The Town's A-2 Arapahoe Well is 2,233 feet deep into the Arapahoe aquifer. The well normally pumps at 240 gpm, but has a maximum capacity of 300 gpm. The newly constructed Denver D-2R replacement well is 1,630 feet deep into the Denver aquifer. The D-2R well normally pumps at 130 gpm, with a maximum capacity of 200 gpm. The D-3 well was constructed in 2001 but had a low production rate of only 60 gpm. This well is currently not equipped with a pump. Both the A-2 and D-2R wells pump to the Town's GW-WTP. Although the wells are capable of pumping at their respective maximum capacities, the drawdown is significant enough that time is needed for the recovery of both wells. Thus, pumping the wells at their maximum capacities is not sustainable. With a combined capacity of up to 500 gpm, the two wells could produce 720,000 gpd. However, this maximum combined rate of 500 gpm is not sustainable due to the groundwater drawdown; therefore, the current pumping rates listed above are used for available capacity values rather than using the unsustainable maximum rates. With the larger capacity well out of service, the maximum available groundwater capacity is 288,000 gpd. However, the actual pumping rate of 130 gpm results in a capacity of 187,200 gpd. The GW-WTP has a total capacity of 1,000 gpm, or 1,440,000 gpd.

Under worst-case surface water right conditions of 5.75 AF per month (60,400 gpd), and worst-case groundwater production capacity of 288,000 gpd, the Town's maximum potable water production capacity is 348,400 gpd, assuming no supplemental storage reserve is available in the Glen Park Reservoir. This maximum water production rate, under worst-case conditions, needs to be able to supply the maximum day demand condition on the water system. The Town is working on the new Arapahoe Aquifer A-1 well, as recommended in the Town's 2022 PER. With the new Arapahoe A-1 well in service pumping at a maximum rate of 300 gpm (similar to the A-2 well), the Town's worst-case maximum water production capacity would then be 780,400 gpd. These numbers are noted as the maximum values. Under typical and sustainable pumping rates, the actual water production capacities are reduced. Refer to the following table for maximum and actual capacities. This report assumes the new Arapahoe A-1 well will be completed by the time the proposed water system improvements have been constructed and placed into service, and the Buc-ee's development is operational.

TABLE 7
TOWN OF PALMER LAKE
SURFACE AND GROUNDWATER SUPPLY CAPACITIES

	Maximum		Actual	
	gpm	gpd	gpm	gpd
Surface Water Supply	41.9 ¹⁾	60,400 ¹⁾	41.9	60,400
Groundwater Supply				
Arapahoe A-2 Well (existing)	300	432,000	240	345,600
Denver D-2R Well (existing)	200	288,000	130	187,200
Arapahoe A-1 Well (future)	300	432,000	240	345,600
Total Supply Worst-Case ²⁾ (with largest well out of service)				
Existing Well Conditions	241.9	348,400	171.9	247,600
Future Well Conditions	541.9	780,400	411.9	593,200

1) Assuming no storage in Glen Park Reservoir

2) Worst case surface water conditions plus largest groundwater well out of service

C. WATER TREATMENT

1. Surface Water Treatment Plant, (SW-WTP)

The Town's SW-WTP is located on the north side of North Monument Creek on Glen Avenue as shown on Figure 5. The facility treats surface water piped in from Glen Park Reservoir. The WTP has two treatment skids, each with a capacity of 350 gpm. With one skid being redundant, the firm capacity of the WTP is 350 gpm. Although actual production rates are limited by the supply capacities in the previous table.

Raw water from the reservoir enters the building at 110 psi and flows through an Amiad self-cleaning, 130-micron pre-strainer rated at 750 gpm. The water pressure is then reduced to 5-10 psi into the two microfiltration units. Filtered water flows to a small break tank. The filtered water is then boosted to 100 psi into the distribution system with three (3) 40-HP pumps. Gas chlorine solution is added for disinfection before the piping leaves the building. Buried 24-inch diameter piping outside the WTP provides disinfection contact before the first customer.

2. Groundwater Treatment Plant, (GW-WTP)

The Town's GW-WTP is located on the north side of Lomand Mountain at the end of Spruce Avenue as shown in Figure 5. This facility treats water from the Town's A-2 Well and D-2R Well. This filtration plant provides iron and manganese removal with iron oxidation and filtration of the groundwater supply. Certain levels of radium in the raw water are also removed with the oxidation of the iron.

Water is chlorinated as it enters the GW-WTP with sodium hypochlorite solution and flows into two (2) large contactor vessels for contact time. From the contactors, water flows to two (2) horizontal pressure filters manufactured by Filtronics, Inc. These filters use a proprietary media, presumably some form of manganese greensand. Filtered water continues out of the WTP to the low-pressure zone 500,000-gallon storage tank, or directly to the distribution system. The filtration equipment is rated at 500 gpm per filter, with two filters in the GW-WTP, and production is limited to the supply capacities described previously. Disinfection contact piping outside of the WTP consists of approximately 400 feet of 24-inch piping.

D. WATER STORAGE

Treated water storage for the distribution system is provided by three storage tanks having a combined capacity of 1.0 million gallons (MG). The original storage tank, High Zone Tank No. 1, is located in the northwest quadrant of the Town, north of Brook Street as shown in Figure 5. High Zone Tank No. 1 is a buried concrete storage tank with a capacity of 250,000 gallons. The tank was built in the 1960's. High Zone Tank No. 2 is also a buried concrete tank with a capacity of 250,000 gallons. These two High Zone tanks are approximately 50-feet in diameter and are connected to the distribution system in Brook Street by a single inlet/outlet 8-inch pipeline. The maximum water level in the tanks is estimated at an elevation of 7,556. Level controls in the tanks signal SW-WTP or GW-WTP to turn on and off. The high zone tanks typically operate in the range of 12 feet to 16.4 feet of depth.

The Low Zone Storage Tank is located south of the GW-WTP. This welded steel ground-level storage tank is 60 feet in diameter, 24 feet high, and has a capacity of 500,000 gallons. The Low Zone Storage Tank is 167 feet lower than the high zone tanks with an overflow elevation of approximately 7,389. Treated water enters the low zone tank from the GW-WTP through a 12-inch inlet pipeline and altitude valve.

The booster pump station adjacent to the Low Zone Storage Tank boosts the stored water to the distribution system pressure. The Low Zone Tank booster pump station is equipped with two pumps. The duty pump is a Cornell model 1.5Y-20-2, 20 horsepower (hp), 3600 rpm, 7.3 inch impeller, close-coupled, end suction centrifugal pump with a capacity of approximately 120 gpm. The second pump is considered to be, although not designated as, a fire pump. This booster pump is a Cornell model 4YB-100-2, 100-hp, 3600 rpm, 9.5 eight-inch impeller, close-coupled, end suction centrifugal pump with a capacity of 1,400 gpm.

E. WATER DISTRIBUTION SYSTEM

The Town's water distribution system is shown in Figure 5. Distribution piping ranges in size from 2-inch to 12-inch diameter. The system consists of 20.6 miles of distribution piping, primarily 6-inch in size. A breakdown of pipe sizes consists of 79% 6-inch, 5% 8-inch, 8% 10-inch and 1% 12-inch. The distribution system operates as a single pressure zone with gravity storage provided by the two High Zone storage tanks. Static pressure ranges from a low of 35 pounds per square inch (psi) at Highland Road and Brook Street, near the tanks; to a high of 210 psi on Forest View Way at the south end of the distribution system. In the center of Town near the Town Hall, the system pressure is approximately 125 psi.

F. WATER METERS

The Town of Palmer Lake requires the installation of water meters for all customers. The meter reading system consists of a radio read system. Meters are read by the Town monthly. Meter reads are provided to the Deputy Town Clerk so that monthly water bills can be issued. Meters are located within in-ground meter pits. Service lines are typically copper pipe extending from the meter to the water main in the street. The Town has indicated that there are no lead service lines, however, there are several galvanized service lines that will need to be replaced under the requirements of the Lead and Copper Rule Revisions.

The Town's A-2 and D-2R wells are metered at the GW-WTP by the filter effluent meters. Meter readings are read and recorded monthly. Monthly well pumpage readings are maintained by the Town's water system supervisor and are provided to the Colorado Division of Water Resources annually. The filter meters measure water pumped through the filters to the distribution system and filter backwash water from the distribution system to the backwash waste tank. Reservoir inflow to the SW-WTP is metered at the inlet to each microfiltration skid. Backwash maintenance waste is also metered.

SECTION V

HISTORICAL AND PROJECTED WATER DEMANDS

An assessment of the historical and projected water demands for the Town of Palmer Lake is presented in this section. Historical well pumping records and total water sales were used to establish the baseline water use parameters for the Town. In addition, the estimated number of potential connections to the water system extension is calculated along with the projected water consumption of the proposed commercial development. These parameters were then used to project future demands on the water system based on service area population projections.

A. TOWN OF PALMER LAKE CURRENT WATER USE

Total production data for the GW-WTP and SW-WTP and total monthly water sales data were provided by the Town for the period from January 2022 through December 2024.

The following table is an annual summary of water production from the Town's two WTPs for the period of analysis. The specific break down in production between the two wells was not provided at the writing of this report.

TABLE 8
TOWN OF PALMER LAKE
WATER PRODUCTION

Year	Surface Water, MG.	Groundwater Wells (D-2R + A-2), MG ¹⁾	Total Production, MG.
2022	35.1	25.6	60.7
2023	33.3	22.8	56.1
2024	24.9	31.0	55.8

1) Well D-2 taken offline in November 2020. Well D-2R came online in Summer 2022.

Total well production in 2024 was 31.0 million gallons (MG), or 95.0 ac-ft. The 2024 SW-WTP production was 24.9 MG, or 76.3 ac-ft. The water source preference by the Town is to maximize the use of the surface water supply because it comes at a lower cost for treatment and pumping. However, in 2024, the Town utilized more water from the groundwater wells than from surface water.

Total water production has decreased from 2022 to 2024 due to the Town's effort to reduce leaks and replace aging pipes. It may also be due to the recent water rate increase which is a strong encouragement to decrease water usage. These actions have reduced water loss within the system, thereby lowering the volume of water required to compensate for unaccounted for losses. Filter backwash at both WTPs use treated water from the distribution system. Spent backwash water at the GW-WTP is recycled. At the SW-WTP, backwash water amounts to approximately 5.1% of the total throughput, which is discharged to Palmer Lake Sanitation District sewer system.

The following table presents monthly water production from the SW-WTP and the GW-WTP, and the monthly water sales totals for the period from 2022 through 2024.

TABLE 9
TOWN OF PALMER LAKE
WATER SYSTEM PRODUCTION AND SALES

Month	2022		2023		2024	
	Production ¹⁾ , gal.	Sales ²⁾ , gal.	Production ¹⁾ , gal.	Sales ²⁾ , gal.	Production ¹⁾ , gal.	Sales ²⁾ , gal.
January	60,700,000	3,414,500	56,100,000	3,181,700	4,094,000	3,498,000
February		3,096,000		3,221,100	3,507,000	3,031,550
March		3,096,000		2,909,900	3,405,000	2,889,000
April		3,218,300		3,211,200	4,067,000	3,401,100
May		3,828,850		3,499,400	4,648,000	3,410,300
June		4,766,450		3,657,400	6,024,000	4,560,620
July		5,505,400		4,428,800	6,687,000	5,888,918
August		5,031,500		5,105,400	5,854,000	4,918,121
September		5,118,800		4,896,950	5,588,000	5,145,525
October		4,330,100		4,087,400	4,692,000	4,117,600
November		3,451,600		3,457,400	3,660,000	3,258,300
December		3,036,900		3,198,500	3,608,000	2,892,300
Total, gal.	60,700,000	47,894,400	56,100,000	44,855,150	55,834,000	47,011,334
WTP backwash waste, gal. ³⁾	2,920,000		2,920,000		2,928,000	
WTP Net Production ⁶⁾ , gpd ⁴⁾	158,301		145,699		144,552	
Water Sales, gpd ⁴⁾	131,218		122,891		128,446	
Unaccounted-for-water, % ⁵⁾	17.1%		15.7%		11.1%	
Water Customer Taps	1,015		1,018		1,022	
Gallons per Tap per Day	156.0	129.3	143.1	120.7	141.4	125.7

- 1) Total raw water from Glen Park Reservoir, Well A-2, and Well D-2R. Well D-2R came online in Summer 2022.
- 2) Total metered water sales. Monthly water sales not available for 2022 and 2023.
- 3) Based on daily use of 8,000 gpd at the Surface Water WTP. A high percentage of the backwash waste at the Groundwater WTP is recycled.
- 4) gpd = gallons per day, average.
- 5) Unaccounted-for-water is WTP production minus backwash waste minus water sales divided by WTP production minus backwash waste. This represents water which is not accounted for. Note that the water sales data straddles months so monthly loss is not accurate. Annual loss is more accurate.
- 6) Net Average Production = Total Production – WTP Backwash Waste

As presented in the above table, net WTP production is calculated on an average day basis by subtracting the estimated backwash use at the SW-WTP. In 2024, net production averaged 144,552 gpd. This total production was similar in 2023 and higher in 2022.

Unaccounted-for-water represents water pumped into the Town's distribution system that is not measured by the Town's customer meters. Unaccounted-for-water is primarily attributed to unmetered uses such as fire hydrant usage for fire department training, customer meter inaccuracies, storage tank overflows, as well as pipeline leaks and breaks within the distribution system. These loss factors are not quantifiable. An unaccounted-for-water value of 15% to 20% is typical for a small system. Values of 30% to 40% can be observed. The American Water Works Association recommends an unaccounted-for water goal of 10% with proactive efforts taken to reach this goal. A comparison of water put into the system to the total metered water sales was made for the period from January 2022 through December 2024. The comparison indicates unaccounted-for-water ranged from 17.1% in 2022 to 11.1% in 2024. This amounts to an average water loss of 22,000 gpd. As mentioned previously, the Town has made significant efforts to repair leaks in the system. This is reflected in the unaccounted-for-water being reduced since the 2022 PER. Therefore, water demand projections presented in this section are based on the average metered water sales between 2022 to 2024, and an average unaccounted-for-water percentage of 14.6%.

AWWA no longer uses the term “unaccounted-for-water” in assessing water loss. The AWWA has seen an inconsistent use and interpretation of “unaccounted-for-water” because it has varied for different systems. Currently, AWWA uses “non-revenue” water to reflect the distributed volume of water that is not seen in customer billings. This method specifically analyzes unbilled consumption (water for firefighting, flushing, etc.), apparent losses (customer meter inaccuracies and unauthorized consumption), and real losses (system leakage and storage tank overflows) to attain a more accurate estimate of water that is not billed to customers. For larger systems that have more resources, tracking the different ways that water is being utilized is feasible. However, smaller systems with less resources cannot easily assess the different ways that water is being lost. Regardless of the terminology, this report does provide consideration to the unquantifiable losses apparent in the Town of Palmer Lake including flushing losses, customer meter inaccuracies, and system leaks and breaks.

The maximum month of water production occurred in July 2024 and totaled 6.7 MG. This represents a maximum month factor of 144% of the average day demand. Maximum daily demand conditions occur during the summer months when conditions are dry and outdoor water usage is elevated. The maximum day demand peaking factor is estimated at 284% which remains consistent with the 2022 PER of average day demand. The highest demand condition that stresses a system the most is the peak hour demand that occurs typically for a

short period of time during the maximum day demand condition. Typical peak hour demand factors of a community of this size range from 3.0 to 4.0 times the average day demand. For the purpose of this evaluation, a peak hour demand of 3.5 or 350% of average day demand has been selected as being representative of peak hour conditions.

The following table is a summary of the baseline water use parameters that will be used in this report.

TABLE 10
TOWN OF PALMER LAKE
2022 to 2024 BASELINE WATER USE PARAMETERS

Parameter	Value
Average daily WTP Net production, gpd	149,600
Average daily water sales, gpd	127,500
Unaccounted-for-water	14.6%
Maximum monthly water usage ¹⁾	144%
Maximum daily water usage ²⁾	284%
Peak hour water usage ⁵⁾	350%
Service area taps	1,022
Service area population ³⁾	2,410
Average per capita water production, gpcd ⁴⁾	62.0

1) Occurred in July 2024

2) Maximum day factor as determined in 2022 PER.

3) Based on 996 residential taps and 2.42 people per household (per SDO, dated October 2024).

4) Gallons per capita per day. Includes commercial and industrial uses.

5) Assumed peak hour to average day factor

The baseline water use parameter of 62.0 gpcd will be used for the anticipated demands from the potential connections into the new water system extension

B. PROPOSED COMMERCIAL DEVELOPMENT WATER USE

Buc-ee's is a travel center made famous for its numerous gas pumps, Texas-style foods, shopping, and clean and spacious restrooms. According to Buc-ee's officials, more than 85% of customers come from well beyond the city, county, and even state boundaries.

Water usage data from various sources was collected and analyzed to determine the estimated water demands for the proposed Buc-ee's location. These sources include demand projections provided in a *Conceptual Annexation Proposal* letter by Vertex Consulting

Services, LLC, an *Annexation Impact Report for Monument Ridge West, LLC Annexation into the Town of Palmer Lake* by Vertex Consulting Services, LLC, and water usage data from Buc-ee's representatives for Buc-ee's Store #22 in New Braunfels, Texas and Store #60 in Johnstown, Colorado. This section evaluates the water demands presented by each source.

1. *Conceptual Annexation Proposal Letter* by Vertex Consulting Services, LLC

A conceptual annexation proposal letter was written to the Town of Palmer Lake Board of Trustees for a concept review of the possible site development. The letter provided an estimate for the Palmer Lake location based off of the square footage of the building and areas to irrigate. It estimated an average day demand of 0.14 gpm/1,000 square foot (sf) and a peak hour demand of 0.60 gpm/1,000 sf for the building. Therefore, separate calculations would suggest that the 74,000 square-foot building would have an average daily water demand of 10.36 gpm and a peak hour demand of 44.40 gpm. This would indicate a peak hour factor of 4.3 times or 430% of average day demand, which exceeds the maximum value of 4.0 or 400% typically considered for a peak hour factor range.

It also indicated a total daily requirement of 30,064 gpd. It is important to notice that the average day demand of 10.36 gpm does not directly correlate to the daily demand of 30,064 gpd. This difference is not outlined in the letter. However, reversing the calculation would indicate the daily demand was based off of a square footage demand of approximately 0.28 gpm/1,000 sf.

The property is also estimated to include 0.94 acres for irrigation. The letter estimated an irrigation peak hour demand of 24 gpm/acre, which equates a total peak hour demand of 22.56 gpm of irrigation use for the property. The letter did not include an average irrigation demand in gpm/acre but provided a total average daily irrigation requirement of 10,160 gpd. This results in a combined daily water usage estimate of 40,224 gpd (27.9 gpm) for in-store and irrigation purposes.

2. The *Annexation Impact Report* by Vertex Consulting Services, LLC

An *Annexation Impact Report for Monument Ridge West, LLC Annexation into the Town of Palmer Lake* was written to assess the impacts of the potential annexations by Monument Ridge West LLC (the property owners) and Buc-ee's (the developer). The letter indicated that exact data was not certain at the time and general assumptions were made to address the needs of the report. In this report, the estimated demand for the proposed development is 860,000 gallons per month (in-store and irrigation). No additional data was provided. This would equate to an average daily demand of 28,700 gpd (19.9 gpm) or 0.27 gpm/1,000 sf of building space.

3. Buc-ee's Store #22 in New Braunfels, Texas

Water demands were provided by Buc-ee's representatives for a slightly smaller sized store in New Braunfels, Texas. Store #22 in New Braunfels is approximately 68,000 square feet and includes 120 fueling positions, 1,000 parking spots, 64 ice freezers, 83 toilets, and 80 fountain dispensers. The following table presents monthly water use for this Buc-ee's location since its opening in October 2021 to September 2024. The table separates in-store and irrigation usage to highlight the climatic differences between Texas and Colorado.

TABLE 11
TOWN OF PALMER LAKE
STORE #22 NEW BRAUNFELS BUC-EE'S WATER USE

Year	In-store, gal	Irrigation, gal	In-store, gpd ¹⁾	In-Store Demand, gpm / 1,000 sf ²⁾	Irrigation, gpd ¹⁾
2021 ³⁾	2,145,860	0	27,163	0.28	0
2022	10,633,904	593,394	29,134	0.30	1,626
2023	11,640,941	359,567	31,893	0.33	985
2024 ⁴⁾	9,410,291	596,451	36,903	0.38	2,339

1) gpd = gallons per day

2) Based off store size of 68,000 square feet.

3) Partial year data only. Store opened October 13, 2021.

4) Partial year data only. Data available up to September 12, 2024.

From the above table, 2024 had the highest in-store average daily usage at 36,903 gpd (25.6 gpm). The average in-store daily use for 2023 and 2022 were fairly similar at 31,893 gpd (22.1 gpm) and 29,134 gpd (20.2 gpm), respectively. In 2021, the store saw

the least in-store usage at 27,163 gpd (18.9 gpm). The maximum month of in-store water consumption for this location occurred in July 2024 and totaled 1.28 MG. This represents a maximum monthly factor of 136% of the average day demand. Irrigation data was not deemed useable due to the difference in climates between this store and the proposed store in Palmer Lake.

Based on the above in-store average water uses, an estimate was also evaluated based off of the square footage of the building. The 68,000 square foot building had a year high in 2024 at 0.38 gpm/1,000 sf and a low in 2021 at 0.28 gpm/1,000 sf. However, both these years are partial years and not fully representative of the entire year. Thus, the square footage demand of 0.30 gpm/1,000 sf for 2022 and 0.33 gpm/1,000 sf for 2023 are more realistic.

4. Buc-ee's Store #60 in Johnstown, Colorado

Water demands were provided by Buc-ee's representatives for the store in Johnstown, Colorado. This northern Colorado location was requested as it would provide a useful benchmark to gauge water usage that the store in southern Colorado might use. This store is currently the only Buc-ee's in Colorado. Store #60 is approximately 74,000 square feet and includes 120 fueling positions, 478 parking stalls, 12 electric vehicle charging stations, and dozens of toilets. The following table presents monthly water consumption for this Buc-ee's location since its opening in March 2024 to November 2024. Although this data is not extensive, it is helpful to establish baseline usage for the proposed development in the same state.

TABLE 12
TOWN OF PALMER LAKE
STORE #60 JOHNSTOWN BUC-EE'S WATER USE

Year	In-store, gal	Irrigation, gal	In-store, gpd ¹⁾	In-Store Demand, gpm/1,000 sf ²⁾	Irrigation, gpd ¹⁾
2024 ³⁾	4,621,000	632,000	18,709	0.18	10,032

- 1) gpd = gallons per day
- 2) Based off store size of 74,000 sf.
- 3) Partial year data only (Store opened March 18, 2024 through November 2024)

In 2024, the Johnstown location had an average in-store daily usage at 18,709 gpd (13.0 gpm). The irrigation usage for 2024 estimated an average daily usage of 10,032 gpd (7.0 gpm). The higher irrigation use is likely due to the newly laid sod and the initial requirements needed to establish the grass, as well as the fact that it was a dry summer

in Northern Colorado. The maximum month of in-store water consumption for this location occurred in July 2024 and totaled 0.72 MG. This presents a maximum month factor of 125% of the average day demand.

Based on the above in-store average water use, an estimate was also evaluated based off of the square footage of the building. The 74,000 square foot building is estimated at 0.18 gpm/1,000 sf. However, this is only a partial year and is not representative of a full year.

Compared to the rest of the data received, this estimate from the Johnstown's location had the least amount of water usage. The New Braunfels location also experienced a slower first year, but was followed by a notable increase in usage as the store became fully operational and gained traction in subsequent years. As suggested by the New Braunfels location, there appears to be an initial adjustment period at new locations before an increase in water usage is observed.

5. Projected Buc-ee's Water Usage in Palmer Lake

The projected water usage for the Buc-ee's development in Palmer Lake is based on the combination of in-store operations and irrigation needs. The in-store water usage is based on demands per store size. *The Conceptual Annexation Proposal Letter* estimated an average day demand of 0.14 gpm/1,000 sf which would equate to a store use of 14,918 gpd. However, the concluded average daily demand equated to 30,064 gpd, reflecting a square footage demand of 0.28 gpm/1,000 sf. The *Annexation Impact Report* was calculated from a monthly demand to have an average square footage demand of 0.27 gpm/1,000 sf. Historical data for an entire year from the new Braunfels location shows an average demand of 0.30 gpm/1,000 sf in 2022 and 0.33 gpm/1,000 sf in 2023, the highest yearly demand. Data from 2021 and 2024 for New Braunfels, as well as the Johnstown location for 2024, are partial years and not used for this analysis as they do not capture the entire year. For this evaluation, a more conservative estimate based on the highest New Braunfels demand was applied, resulting in a projected square footage demand of 0.33 gpm/1,000 sf. Thus, the new 74,000 square foot store is expected to have an in-store average day demand of 35,200 gpd (24.4 gpm).

Irrigation needs are calculated using Colorado's annual supplemental irrigation amount of 2.5 acre-feet per acre (AF/acre) (30 inches of water depth). This is taken from the

Colorado State University research and is generally accepted by the Division of Water Resources as a typical supplemental irrigation value for Colorado. With a proposed irrigation area of 0.94 acres, the annual irrigation demand is approximately 765,800 gallons/year (2,100 gpd). The maximum daily demand for irrigation is estimated at 0.083 AF/acre (approximately 1" of precipitation), which translates to a daily maximum irrigation use of approximately 25,600 gpd (17.8 gpm). Since irrigation occurs sporadically during the week and over shorter durations, it is assumed that it will happen over a duration of four hours. Therefore, the maximum daily irrigation demand will have a total use of 4,250 gallons over the four-hour use.

The following table summarizes baseline criteria to establish the water use demands for the proposed new Buc-ee's Palmer Lake development.

TABLE 13
TOWN OF PALMER LAKE
PROJECTED BUC-EE'S WATER USE CRITERIA

Parameter	Value	
In-Store		
Average In-Store Demand, gpm/1,000 sf ¹⁾	0.33	
Average daily consumption, gpd ²⁾	35,200	
Maximum Monthly Water Usage Factor ³⁾	136%	
Maximum Daily Water Usage Factor ⁴⁾	250%	
Peak Hour Water Usage Factor ⁵⁾	400%	
Irrigation		
Average Demand, AF/acre/Year ⁶⁾	2.50	
Average Demand, gpd ⁷⁾	2,100	
Maximum daily water usage, AF/acre ⁸⁾	0.08	
Maximum Demand, gpd	25,600	
Combined		
Average Day Demand, (ADD) ⁹⁾	25.9 gpm	37,300 gpd
Maximum Day Demand,(MDD) ¹⁰⁾	78.9 gpm	113,600 gpd
Peak Hour Demand, (PHD) ¹¹⁾	115.6 gpm	166,500 gpd

1) New Braunfels Buc-ee's average square footage demand for 2023.

2) Average daily consumption = average square footage demand x 74,000 sf x 1440

3) Based on maximum month for New Braunfels Buc-ee's in August 2023

4) Engineering estimate

5) Estimate from *Conceptual Annexation Proposal Letter*

6) Based on Colorado's common annual supplemental irrigation amount (30 in)

7) Based on 0.94 acres to irrigate

8) Based on Colorado's maximum irrigation daily use (1 in)

9) ADD = average day in-store demand + average day irrigation demand

10) MDD = (average in-store demand x maximum daily usage factor) + maximum day irrigation demand

11) PHD = (average in-store demand x peak hourly usage factor) + maximum day irrigation demand

The criteria in the table above is based on the New Braunfels location as it had the most robust data with a similar store size, multiple years of water data and entire years' worth of data. Whereas the other sources provided estimated values without supporting data, or snapshots of data which did not cover an entire year of operating time. Based on the criteria shown in the above table, it is estimated that the new Buc-ee's development will have an average day demand of 25.9 gpm (37,300 gpd), a maximum day demand of 78.9 gpm (113,600 gpd), and a peak hour demand of 115.6 gpm (166,500 gpd).

C. POTENTIAL ANNEXATION CUSTOMERS WATER USAGE

In correspondence with Community Matters Institute, a planning consultant for the Town, it was noted that potential annexation along County Line Road will occur along the "flagpole" annexation to the Buc-ee's development. Therefore, these potential annexation customers are not included as part of the Town's natural growth rate as described in previous sections and are provided as a separate demand category due to the unique nature of the proposed development and its location.

The proposed flagpole annexation of the new commercial development would potentially allow for an additional 153 connections (152 residential and one church) to the water system extension. The estimated population along this route is approximately 368 people. According to the 2022 to 2024 baseline water use parameters from Table 9, the Town had an estimated demand of 62.0 gpcd. Projecting this per capita demand to the potential additional population from the water extension, the water system could experience an increased average day demand of 15.9 gpm (22,900 gpd) and maximum day demand of 45.2 gpm (65,100 gpd). This demand is included in the final assessment for sizing of the water extension main and supply capacity assessment.

D. WATER DEMAND SUMMARY

The Town's water demands are incrementally projected in five-year estimates in the 2022 *Preliminary Engineering Report for Water System Improvements*. These estimates extend through 2045 and include projections for buildout conditions and a scenario where private wells within the Town boundaries are served by the municipal water system. However, the Town has determined that extending the system to serve private wells is cost-prohibitive, so those projections are not considered in this report.

The following table summarizes the existing and projected water demands of the proposed annexation and combines them with the Town's existing and future projected demands.

TABLE 14
TOWN OF PALMER LAKE
EXISTING AND PROJECTED WTP DEMANDS ¹⁾

Condition	Service Area Population	Average Day Demand ²⁾ , gpd	Maximum Day Demand ³⁾ , gpd	Peak Hour Demand ⁴⁾ , gpm
Town of Palmer Lake Demands				
Existing - 2023 ⁵⁾	2,410	149,600	424,900	364
Future - 2050 ⁵⁾	3,327	206,300	585,900	501
Buc-ee's Demands				
Buc-ee's Travel Center ⁶⁾	-	37,300	113,600	116
Potential Annexation Customer Demands				
Potential Annexation Customers ⁷⁾	368	22,900	65,100	56
Total Demands from Proposed Annexation				
Existing - 2023 plus Buc-ee's	2,410	186,900	538,500	480
Future - 2050 plus Buc-ee's	3,327	243,600	699,500	617
Future - 2050 plus Buc-ee's plus Potential Annexation Customers	3,695	266,500	764,600	673

1) Based on Water Treatment Plant production of 62.0 gpcd.

2) Average Day Demand = population x gpcd

3) Maximum Day Demand for Town = 284% of average day demand

4) Peak Hour Demand for Town = 350% of average day demand/1440

5) Assumed estimated population of 240 people serviced by 147 private wells will remain unchanged.
(From Table 5: 2,650 – 240 = 2,410 and 3,567 – 240 = 3,327)

6) From Table 13.

7) Potential connections of 152 residential and one church for a population of 368 people.

Based on the previous table, it is clear that the proposed development would result in increased demands on the water system attributable to not only the Buc-ee's development, but also the potential future annexation customers. The following table presents the added demands of the proposed Buc-ee's development and the potential annexation customers as percentage increases to the current and projected demands of the Town of Palmer Lake.

TABLE 15
TOWN OF PALMER LAKE
PROJECTED DEMAND INCREASES FOR DEVELOPMENT

Condition	Average Day Demand	Maximum Day Demand	Peak Hour Demand
Increase to Existing 2023 Palmer Lake Demands			
Buc-ee's Development	25%	27%	32%
Potential Annexation Area	15%	15%	15%
Buc-ee's plus Potential Annexation	40%	42%	47%
Increase to Future 2050 Palmer Lake Demands			
Buc-ee's Development	18%	19%	23%
Potential Annexation Area	11%	11%	11%
Buc-ee's plus Potential Annexation	29%	30%	34%

SECTION VI

FUTURE WATER SUPPLY REQUIREMENTS

A summary of the Town's adjudicated water rights are presented in the 2020 Palmer Lake Water Resources Evaluation and include a combination of groundwater rights and surface water rights. The Town's groundwater supply is from non-tributary Denver basin aquifers. These aquifers are not naturally recharged. Groundwater rights decreed to the Town are based on a depletion rate over a 100-year period for water underlying the incorporated area of the Town. Surface water rights are generally confined to the available surface water and the priority of the right. The existing water system capacity is defined by available minimum stream flow (surface water), well flow rates (groundwater), and treatment facility capacities.

A WTP is required to provide backup or redundant treatment equipment when the facility is treating water to meet water quality standards of the Colorado Primary Drinking Water Regulations. The SW-WTP is required to provide redundant treatment as it provides filtration of surface water. The SW-WTP has a rated capacity of 350 gpm (one of two treatment trains) and is well above the available minimum low flow of North Monument Creek. The GW-WTP has two 500 gpm filters that provide iron and manganese removal from the deep wells. Iron and manganese are not regulated contaminants under the Colorado Primary Drinking Water Regulations. However, radium is a regulated contaminant. The elevated raw water radium levels in the wells may require this facility to meet compliance regulations in the future as radium levels in the Denver and Arapahoe aquifers have been documented to be increasing in the region.

Treatment facilities must be capable of meeting maximum day demand conditions. Typical maximum day requirements will occur with several days of heightened demand occurring prior to and immediately after the maximum day demand is experienced. Maximum day demand conditions typically occur during the summer months when conditions are dry and irrigation demands are at their highest. Sufficient water storage cannot be economically provided to meet these extended demand periods.

The following table compares the water supply requirements for current and future demand conditions for the Town of Palmer Lake, Buc-ee's and potential annexation customers to the existing available water supply capabilities. The pumping rates assume the

recommended Arapahoe aquifer A-1 well from the 2022 PER is built as a redundant well, not as an additional capacity well, and thus is not included in the production totals.

TABLE 16
TOWN OF PALMER LAKE
WATER SUPPLY REQUIREMENTS

Condition	Average Day Demand, gpd ²⁾	Maximum Day Demand, gpd ²⁾	Water Production ^{1) 3)} , gpd ²⁾	
			Current ⁴⁾	Maximum ⁵⁾
Existing - 2023	149,600	424,900	593,200	780,400
Future - 2050	206,300	585,900		
Existing - 2023 plus Buc-ee's	186,900	538,500		
Future - 2050 plus Buc-ee's	243,600	699,500		
Future - 2050 plus Buc-ee's plus Potential Annexation Customers	266,500	764,600		

1) Assumed Arapahoe Aquifer, A-1 well, built as redundant well from 2022 PER.

2) gpd = gallons per day

3) Water production from SW-WTP and GW-WTP

4) Production rates of actual conditions. SW-WTP based on 20-year low stream flow condition of 60,400 gpd, 130 gpm (187,200 gpd) for D-2R well, and 240 gpm (345,600 gpd) for A-2 well.

5) Production rates of maximum pumping rates. SW-WTP flow condition of 60,400 gpd, 200 gpm (288,000) for D-2R well, and 300 gpm (432,00 gpd) for A-2 well.

From the table above, it is important to note the Town's existing and future maximum day demands without the annexation development appear feasible with the Town's current infrastructure production rate of 593,200 gpd. In addition, the future average day water requirement of the Town with Buc-ee's and potential annexation customers of 266,500 gpd is well within the Town's current WTP production capabilities. However, the Town's current WTP production of 593,200 gpd is insufficient to meet the future maximum day demands when factoring in the Buc-ee's development. It is additionally insufficient when also considering the potential annexation customers along County Line Road.

The combined future maximum day demand for the Town, Buc-ee's, and potential annexation customers is approximately 98% of the existing maximum capacity of the WTP production, and 129% of current WTP production capacity. This demand is the primary focus due to the likelihood that these connections along County Line Road will happen due to the unique annexation of the commercial development. This extent of utilization leaves little room for operation flexibility or emergency response. In addition, the nonrenewable

basin that supplies the wells is experiencing significant drawdowns. The Buc-ee's Travel Center and the potential annexation customers result in an increase of approximately 29% of future average day demands (18% solely contributed by Buc-ee's). Thus, it is not unreasonable to think the Town's aquifers would continue to deplete further at a rate of at least that currently seen. If this trend continues, it is probable that the well's maximum pumping rates will decline further, potentially falling short of the required demand.

The Town's net available ground water rights for each aquifer in the Denver Basin, with the consented rights to private wells, are presented in the Town's 2022 PER. The Denver Aquifer has a net estimated groundwater right of 222.8 ac-ft/yr after the private well groundwater rights are subtracted. The D-2R well in the Denver Aquifer has an annual limit of 281 ac-ft/yr, however, this is reduced to 222.8 because of the consented water rights to private wells. The Arapahoe Aquifer has an estimated net available groundwater right of 1,313 ac-ft/yr for all decreed Arapahoe wells, after the private well groundwater rights are subtracted. Thus, the Town's total net available water rights for the existing wells is approximately 1,371,000 gpd (1,535.8 ac-ft/yr). However, it is noted that this figure is net available water rights and does not reflect actual well production capabilities.

To address the long-term water security and from a water rights position, it is recommended that an additional well in the Arapahoe aquifer be constructed to support the proposed development. The new A-3 well would increase the Town's overall well capacity and reduce strain on the existing wells. By avoiding consistent operation near or at maximum capacity, the Town can help minimize the impacts of aquifer drawdowns during maximum day demand events.

SECTION VII

EVALUATION OF EXISTING WATER SYSTEM IMPROVEMENTS

A list of recommended improvements to the Town's water system were developed in the Town's 2022 Preliminary Engineering Report for Water System Improvements (PER). The recommended improvements included a new Arapahoe Aquifer groundwater well (future Well A-1) and pipeline to the GW-WTP with the new well serving as a redundant groundwater source. The recommendations in this report pertain to those required due to the proposed Buc-ee's development. While these are separate recommendations, they build upon those outlined in the 2022 PER, with a specific focus on the proposed waterline extension.

A. WATER SUPPLY

Treatment facilities must be capable of meeting maximum day demand conditions with the largest water supply out-of-service. Under worst case conditions for low stream flow for the SW-WTP and both existing wells serving the GW-WTP, the maximum water production capacity is 780,400 gpd. However, with the larger capacity well out of service, the combined WTP water production capacity reduces to 348,400 gpd. This capacity is below the existing maximum day demand (MDD) of just the current Town limits. As recommended in the 2022 PER, from a water rights position, a new Denver Basin well (future Well A-1) would be best constructed into the Arapahoe Aquifer to meet the Town's existing MDD. With the future A-1 well, the GW-WTP production capacity in the worst-case scenario would increase to 720,000 gpd, bringing the maximum WTP production capacity to 780,400 gpd. However, this is the maximum water production capacity for the Town's facilities. As stated in previous sections, the groundwater wells are not run at maximum capacity due to issues with well drawdown. If current well production rates are presumed to be sustainable to meet future demands, the current water production capacity, assuming the future Well A-1 is operational, would be 593,200 gpd. This capacity would be sufficient for the Town's existing and future MDD of 424,900 gpd and 585,900 gpd, respectively.

The Buc-ee's development with the potential annexation is projected to increase the Town's future MDD by 30% which then exceeds the current water production capacity. Therefore, water supply improvements are needed to meet future MDD conditions with the proposed development and future annexations. A new A-3 well is recommended in the Arapahoe

aquifer to accommodate the increased demand and bolster long-term water production. An Arapahoe aquifer well is recommended over a Denver aquifer well for the new Well A-3. The Town currently holds 1,190 AF of water rights to the Arapahoe and 436.3 AF to the Denver. The Town has consented 213 AF of Denver rights to private wells, leaving only 223.3 AF of Denver rights. With water levels in the Denver aquifer reportedly dropping faster than Arapahoe, and a smaller reserve of rights remaining in the Denver, a new well into the Arapahoe aquifer is recommended as it would provide a more reliable long term supply. The new well would increase overall supply capacity, reduce strain on existing wells, and minimize impacts of aquifer drawdowns during maximum day demand events. The location of this well will be in accordance with the Town's Water Court Decree Case No. 86CW108. As stated in the decree, the A-3 well location will be in the NE $\frac{1}{4}$ of the NE $\frac{1}{4}$ of Section 8, Township 11 South, Range 67 West of the 6th Principal Meridian. Raw water piping will be piped from the well to a treatment facility. Refer to the following section for details on the treatment facility.

B. WATER QUALITY AND TREATMENT

Treated water quality data for the Town of Palmer Lake was obtained from the CDPHE water quality database from 2002 through 2024 for both the SW-WTP and the GW-WTP sources. Overall water quality from both sources of supply are considered to be good. The GW-WTP constructed in 2002 was installed for the purpose of iron and manganese removal from the then newly constructed A-2 Well. No raw water iron and manganese sample data is available to demonstrate the iron and manganese removal efficiency. Iron and manganese are not primary contaminants. The oxidation of iron and manganese prior to filtration also provides a degree of radium removal. Radium is a primary contaminant, and is commonly found in both the Arapahoe and Denver Aquifers. Raw water combined radium concentrations measured from the new D-2R well were found to be at 3.9 pCi/L, below the 5 pCi/L Maximum Contaminant Level (MCL). The finished water supply had combined radium concentrations well below the MCL; therefore, specific treatment for radium removal is not required at this time.

With a GW-WTP rated capacity of 500 gpm (720,000 gpd), the GW-WTP is currently configured for redundant treatment capabilities with each of the two filter units being rated at 500 gpm. Upon completion of the Town's future A-1 well, the groundwater production being delivered to the GW-WTP is 593,200 gpd minimum, and 792,000 gpd maximum. In order to realize the added groundwater production capacity from the recommended A-3 well which will

accommodate the proposed development and the potential annexation area, two water treatment options must be considered. The first option being the expansion of the existing GW-WTP with a 500 gpm filter unit to match the capacity of the existing units. This option requires an 8-inch raw water line approximately 8,200 feet long through difficult terrain and crossing the railroad, the state highway and the Santa Fe Trail. The second option would be to construct a separate water treatment facility, GW-WTP #2. The GW-WTP #2 would be served by only the recommended A-3 well, which poses advantages over expanding the existing GW-WTP. The GW-WTP #2 can be equipped with a single filter unit having a lower rated capacity of 300 gpm to accommodate only the A-3 well output. As the groundwater well redundancy is being provided by the future A-1 well, the filter unit of the GW-WTP #2 would not require a redundant filter unit. Finally, considering the decreed location of the recommended A-3 well, a treated water line connection from GW-WTP #2 to the distribution system would be significantly shorter than a raw water line installed from the A-3 well to the existing GW-WTP. The treated water line would be an 8-inch pipe extended to connect to the Town's main 10-inch trunk line, rather than utilizing the aging and undersized 6-inch pipe currently in place at the site.

It is noted that the option of constructing the new well and treatment facility improvements on a site adjacent to the proposed Buc-ee's site was not evaluated in detail as a preliminary review suggests it would be less desirable and more expensive than the recommended option of constructing these facilities on Town owned property. Constructing the new facilities adjacent to the Buc-ee's site would require the applicant to acquire additional property for the facilities, which would then be deeded to the Town. That property would also need to be included into the Town of Palmer Lake through the necessary annexation proceedings. This option would not significantly reduce the scope of construction for the new facilities. In addition, the remote location is not desirable for staff accessibility for operation and maintenance, nor is it desirable from a security perspective for public water system infrastructure. Therefore, the additional costs, efforts and time required to locate the new facilities on a less desirable site deterred the option from being investigated further.

With the recommend A-3 well located at its decreed location, and the GW-WTP #2 sited near the A-3 well, the maximum water treatment capacities will be capable of meeting the combined future maximum day demands on the Town, the Bucc-ee's development and the potential annexation area customers. The existing GW-WTP capacity of 720,000 gpd, plus the GW-WTP #2 capacity of 432,000 gpd, plus the SW-WTP capacity of 60,400 gpd equates to total

treatment capacity of 1,212,400 gpd. This maximum capacity will accommodate the total combined maximum day demand. It is noted that total water production will not necessarily be that of the maximum treatment capacity. It will be dependent upon the groundwater well production in terms of which wells are operated and at what rate each well is operated.

C. TREATED WATER STORAGE

Treated water storage for the Town of Palmer Lake is provided by the two high zone gravity storage tanks and a low zone storage tank. Distribution storage serves several purposes. Total storage needs must be evaluated with consideration given to each individual storage component. The three primary purposes of water storage are:

- 1) Equalization storage to meet hourly variations in demand.
- 2) Fire storage to store water for firefighting.
- 3) Emergency storage to provide a reserve supply for emergency use.

Instantaneous demands place on a water system are not uniform throughout any given day. The system must be able to supply the peak demands that occur on an hourly basis throughout the day. Water storage is a means whereby the equalization of these heightened demands can be obtained without placing the demand directly on the supply source. Equalization storage for a community the size of Palmer Lake typically ranges from 15% to 30% of maximum day demand. As developed in this study, the future maximum day demand of the Town with Buc-ee's and potential annexation customers is estimated at 764,600 gpd. Thus, the equalization storage requirement for the annexation is between 114,690 and 229,380 gallons.

The second component of storage is fire flow. Fire protection within the Town is provided by the Palmer Lake Fire Department. The Town of Palmer Lake has adopted the 2015 International Fire Code (IFC). The building is proposed to be 74,000 sf and the building type is classified as Type IV construction as referenced in the 2015 International Building Code (IBC). Per Table B105.1(2) in the 2015 IFC, the fire flow is 5,000 gpm for a duration of 4 hours. The commercial building is designed to include a sprinkler system, and per Table B105.2 in the 2015 IFC when an automatic sprinkler system is provided, the minimum fire flow is 25% of the fire flow listed in Table B105.1(2) for a duration at this reduced flow rate. The minimum fire flow is reduced to 1,250 gpm, however, per the 2015 IFC, the reduced fire-flow

shall not be less than 1,500 gpm. Therefore, the minimum fire flow for the proposed commercial development is 1,500 gpm, whose corresponding flow duration is two (2) hours. Buc-ee's engineers, however, have indicated a preferred fire flow of 1,700 gpm for the commercial building whose corresponding flow duration is also two (2) hours. This preferred fire flow includes 1,200 gpm for the sprinklers, 100 gpm for the interior hose, and 400 for the exterior hose. This preferred fire flow is greater than the minimum requirement from the 2015 IFC and used for the storage assessment.

The Town's distribution system is largely comprised of 6-inch diameter pipelines. Water system hydraulic modeling has previously been conducted in the Town. Based on the average system pressures within the Town, the maximum commercial fire flow of 2,500 gpm is easily available at all hydrants, while maintaining a minimum distribution residual pressure of 20 psi. In determining the needed fire storage capacity for the commercial development, the needed fire flow of 1,700 gpm is increased by the maximum future day demand of the Town, Buc-ee's, and potential annexation customers which have been established at 764,600 gpd (531 gpm) and is decreased by the worst-case water system supply rate (500 gpm from the GW-WTP assuming the new A-1 well is built from the 2022 PER). Thus, the minimum needed fire flow rate from storage is 1,731 gpm ($1,700 + 531 - 500$). The available storage requirement per the International Fire Code is two hours for multi-family and commercial fire protection. Therefore, the minimum needed fire storage requirement from the Town's storage tanks is 207,720 gallons.

The third factor in sizing storage is an emergency reserve. An emergency supply is that portion of the total storage that is available when the normal supply is interrupted. The quantity of supply for emergency storage depends primarily upon the source of water and method of its delivery. The Town does not have an emergency supply connection with a nearby water system. Town water wells and treatment facilities have back-up power supply generators and are, in general, not subject to power supply interruptions. Therefore, the necessary future emergency storage volume would be minimal. Conservatively using six hours of emergency storage at future average day demand with Buc-ee's and potential annexation customer conditions equates to 66,625 gallons.

Based on the estimated quantities from these three factors described above, the calculated minimum future distribution storage requirement for the Town's future demand and the proposed commercial development with annexation customers is 503,725 gallons. The Town

currently has storage for 1.0 MG. Therefore, the Town has adequate storage capacity to accommodate the proposed development.

D. DISTRIBUTION SYSTEM

The waterline extension to the Buc-ee's development consists of extending a pipeline approximately two miles east of the existing water system to the proposed development. The route of the pipeline will proceed east along County Line Road before heading south on Beacon Lite Road approximately 850 feet to the entrance of the proposed development.

Water system hydraulic modeling was conducted for the Town's water distribution system for ADD, MDD, and fire flow conditions. The modeling considered multiple operating scenarios summarized as follows:

- Existing Demand Scenarios:
 - ADD of the Town, Buc-ee's, and potential annexation customers
 - MDD of the Town, Buc-ee's, and potential annexation customers
 - MDD of the Town and the potential annexation customers with the fire flow requirements for Buc-ee's
- Future Demand Scenarios:
 - ADD of the Town, Buc-ee's, and potential annexation customers
 - MDD of the Town, Buc-ee's, and potential annexation customers
 - MDD of the Town and the potential annexation customers with the fire flow requirements for Buc-ee's

The modeling primarily analyzed the residual pressures for the points of interest along County Line Road. The waterline extension size is subject to *CDPHE Design Criteria for Potable Water Systems* Chapter 8.2.1 which states that "the system must be designed to maintain a minimum pressure of 20 psi at ground level at all points in the distribution system under all conditions of flow. The normal working pressure in the distribution system must be at least 35 psi and should be approximately 60 to 80 psi." County Line Road features significant elevation changes, with its highest point at an elevation of 7,393 feet near its intersection with Indi Road. The elevation at the proposed entrance of the commercial development is approximately 7,355 feet. As mentioned previously, the Town's Low Zone Storage Tank is located south of the GW-WTP and pressurizes the distribution system via a booster pump. A

1,400-gpm high usage pump is also located at this pump station for fire scenarios. The 500,000-gallon Low Zone Storage Tank has an overflow elevation of 7,389 feet. The Town has two other High Zone storage tanks that are 250,000 gallons each and have maximum water level elevations of 7,556 feet. Both tanks operate in the depth range of 12 to 16.4 feet. These tanks provide pressure via gravity to the community.

The hydraulic modeling indicated a minimum size for the waterline extension of 12 inches. This pipeline size was determined from the minimum needed fire flow (NFF) requirements of 1,500 gpm for Buc-ee's (as required by the 2015 IFC); in addition to the maximum day demands of the Town and the potential annexation customers along County Line Road and Beacon Lite Road. The pipe was modeled assuming an increased pipe roughness (C value=130) to properly account for the age of the pipe in the future. With the anticipated annexation, residual pressures within the Town boundaries for future average day demands ranged from 37 psi near the High Storage tanks to 210 psi near the south end of the Town along Forest View Way. Peak hour demands dropped pressures in the community less than five psi. The hydraulic modeling primarily analyzed pressures along the proposed waterline extension to determine if adequate pressures were met with the existing facilities. The following table provides the residual pressures at the Buc-ee's entrance and the highest elevation located along County Line Road. The results can be graphically seen in Appendix A.

TABLE 17
TOWN OF PALMER LAKE
HYDRAULIC ANALYSIS RESULTS

Condition	Residual Pressure (psi) at NFF=1,500 gpm		Residual Pressure (psi) at NFF=1,700 gpm	
	Highest Point on County Line Road	Buc-ee's Entrance	Highest Point on County Line Road	Buc-ee's Entrance
Initial Demand Conditions				
ADD for the Town, Buc-ee's, and potential annexation customers ¹⁾	73.1	89.5		
MDD for the Town, Buc-ee's, and potential annexation customers ¹⁾	70.1	86.5		
MDD for the Town and potential annexation customers with fire flow requirements from Buc-ee's ²⁾	48.1	54.1	36.8	40.2
Future Demand Conditions				
ADD for the Town, Buc-ee's, and potential annexation customers ¹⁾	72.8	89.3		
MDD for the Town, Buc-ee's, and potential annexation customers ¹⁾	68.8	85.1		
MDD for the Town and potential annexation customers with fire flow requirements from Buc-ee's ²⁾	46.1	52.2	34.3	37.8

1) Booster pump in operation, fire pump in off position. Minimum pressure required is 35 psi.

2) Booster pump and fire pump in operation and minimum required pressure of 20 psi.

The table indicates that the current storage tanks in the community, along with the existing booster pump in operation, are adequate to provide the proposed annexation with adequate pressures at a NFF of 1,500 gpm. The analysis was conducted with the Town's existing booster pump operating continuously to maintain pressure, and the fire pump only activated for the fire scenario at the Buc-ee's site. Therefore, a 12-inch diameter line is recommended. The above table assumes that the existing 6-inch PVC line is replaced with the recommended 12-inch pipeline extending from Spruce Avenue to the end of the current line to the northeast. Retaining the existing 6-inch waterline and simply extending it with 12-inch piping would not provide Buc-ee's with the minimum NFF. Therefore, it is recommended to replace the 6-inch PVC line up to Spruce Avenue.

This analysis was completed using the minimum NFF of 1,500 as specified by the 2015 IFC. Buc-ee's representatives had indicated that the most demanding areas of Buc-ee's, including external and internal hose usages, require a fire flow of 1,700 gpm. This preferred fire flow of 1,700 gpm can also be achieved through a 12-inch pipeline. The residual pressure for this fire demand have also been presented in the previous table and do meet the minimum residual pressure of 20 psi during fire flow scenarios according to the CDPHE.

As seen in the previous table, the 12-inch waterline provides adequate pressures along the waterline extension for the evaluated scenarios. However, the fire pump is essential for maintaining the necessary flow and pressure during fire events, as the system alone cannot meet these demands. The pressures within the Town limits were also analyzed for a fire scenario at the Buc-ee's site. Pressures remained primarily unaffected in the community with the lowest pressure at approximately 26 psi near the high storage tanks, which exceeds the minimum requirement of 20 psi set by the CDPHE. Additionally, the pressure at Buc-ee's was also minimally affected with a fire scenario occurring within Town limits. To provide initial fire protection measures along County Line Road, it is also recommended that fire hydrants be installed at approximately 1,000-foot spacings.

The water model also evaluated fire flow demands solely to Buc-ee's without including the maximum day demands associated with the full potential annexation area. This analysis was conducted to roughly distinguish the infrastructure requirements directly attributable to Buc-ee's from those that could be attributable to the future annexation areas. The analysis concluded that to serve only the Buc-ee's development a 12-inch pipeline is the minimum size required to maintain 20 psi residual pressure at the Buc-ee's location for both the 1,500 and 1,700 gpm fire flow scenarios. Therefore, the same 12-inch pipeline size is required for the Buc-ee's development alone, as well as the Buc-ee's development plus the potential annexation area.

An important consideration for the nearly two-mile waterline extension is the water quality. Excessive water age can lead to a deterioration of distribution system water quality, including increased disinfection byproduct (DBP) formation and disinfectant residual consumption. Microbial growth can become a particular problem at dead-end water mains and where accumulated air blocks water flow at high points. The design criteria require systems to be designed to maximize turnover and to minimize residence times while delivering acceptable

pressures and flows. As this waterline extension dead ends into the proposed commercial development, a fire hydrant is required to provide firefighting capabilities and a means to provide adequate flushing. The Environmental Protection Agency (EPA) recommends finished water storage facilities to have a 3-to-5-day complete water turnover as a starting point, but acknowledges each storage facility must be evaluated individually. Based on future average day demands along this pipeline, the minimum water turnover would be approximately 1.3 days. Thus, the water age is considered acceptable. In addition, the model analyzed the chlorine decay throughout the 2-mile pipeline. Chlorine decay is the gradual decrease in chlorine concentration in water over time. The chlorine residual in the existing system is approximately 1.1 mg/l. With a starting point of 1.1 mg/l in the Town's existing system, the chlorine will decay to approximately 1.0 mg/l at the end of the waterline extension. The CDPHE minimum chlorine residual is 0.2 mg/l. Therefore, no chlorination facility will be required. According to the EPA, it is recommended that the Town continuously monitor the water quality at the end of the extension by flushing the water extension to remove stagnant water, regularly measuring the disinfectant residual at the end, and exercising valves regularly.

The recommended material for the pipe extension is ductile iron pipe (DIP). In accordance with the Town's water department requirements. The two-mile stretch of pipeline extending to the annexation is a dead-end line and is vulnerable to service loss in the event a pipe break occurs. The DIP pipe provides a high degree of strength and minimizes the potential negative impacts from water hammer or other transient pressure scenarios. In addition, several 12-inch gate valves are recommended along the extension to further isolate the line for repairs and maintenance if needed.

The waterline extension is susceptible to service loss in the event of a pipe burst or maintenance event. Therefore, it is recommended that the Town include in its future planning the eventual looping of the pipeline to the south and west from Beacon Lite Road back towards Highway 105 and the Palmer Lake service area to ensure service reliability. This looping is recommended in the future as the Town expands and incorporate more land to the north and east of the existing service area.

E. METERS

The Town of Palmer Lake requires the installation of water meters for all customers. Any connections will require meters to be installed. Some locations will require a pressure reducing valve to lower pressures before entering the house. An appropriately sized meter will be required for the proposed development. The proposed site's plumbing and water distribution design will dictate the size of the service and meter, backflow prevention devices and pressure control devices.

SECTION VIII

ALTERNATIVES TO PALMER LAKE WATER SERVICE

The majority of this report is focused on the infrastructure required for the Town of Palmer Lake's water system to provide satisfactory service to the proposed development and potential future annexation customers without compromising service to existing and future Town customers. This section provides brief summaries of other available options for providing water service to the proposed commercial development. The details of the alternatives are presented below with consideration given to feasibility, costs, regulatory requirements, and long-term sustainability. Recommendations presented in a subsequent section of this report are based on the alternative evaluations and are intended to ensure the most effective and practical solution for meeting the development's water needs.

A. ALTERNATIVE 1 - ON-SITE PRIVATE WATER SUPPLY AND TREATMENT IN TOWN

This alternative assumes the proposed annexation continues to completion, but the Town's water system is not extended to the development for water service. In this case, the new commercial development has the option to drill a private individual well and pay the Town fee for an alternative water supply. According to Palmer Lake's Municipal Code Chapter 13.28 – Underground Water, the Town has appropriated all water rights underlying all lands within the boundaries of the Town which includes the lower Dawson, Denver, Arapahoe and Laramie-Fox Hills aquifers. However, if water service is not available, the property can apply for an alternative water supply. If the Town determines that it is unable to provide water services to the specified area, the Town can accept the request and consent to withdrawal of the specified groundwater rights. The property would then pay a fee as set in the master fee schedule to the Town for each permit granted for the alternate water supply. However, when the Town can provide water service to the specified region in the future, the Town may require all properties to connect to the Town's facilities and acquire all individual water facilities and rights by purchase or condemnation.

The alternate source of supply for the proposed development must comply with Town Municipal Code Chapter 13.32. This ordinance requires a well permit issued by the Town in addition to all other permits from state or federal governments or agencies. Building a new well within a newly annexed portion of the Town would likely require a water court filing to

comply with legal restrictions, requesting a formal location of the permitted well through the Colorado Division of Water Resources, adding cost, complexity, and time to the project. Additionally, the Town's water court filing denotes withdrawals from the specified aquifers which would require a deeper well to be drilled in a deeper aquifer, which is a timely and costly endeavor. Lastly, the water rights of the annexed land would need to be analyzed against the demands of the proposed development to ensure equity for the Town and its water rights portfolio.

Since Buc-ee's Travel Center serves a high volume of non-local customers, the water system facilities would be classified as a "transient non-community water system" under Regulation No. 11 – Colorado Primary Drinking Water. This regulation classifies a water supplier as a "public water supplier" when the provider has "at least fifteen service connections or regularly serves an average of at least 25 individuals daily at least 60 days per year." The commercial development meets this classification and is subject to full compliance under Colorado Regulation No. 11 to ensure safe drinking water. Historically, most areas of the Denver and Arapahoe aquifers have had high concentrations of radium in the raw water, data suggests this will continue and potentially increase in the future. To meet Colorado's primary drinking water standards, the development well would require a treatment system to reduce radium concentrations to acceptable levels, since radium concentrations in the aquifers are likely to be above the maximum contaminant levels. Such a treatment facility would be classified as a treatment compliance facility and require redundant treatment equipment. This type of facility would require certified operators to run the treatment facility; which adds not only short and long-term operation and maintenance costs to this approach, but also involves a perpetual commitment to proper operation to meet all CDPHE regulations in the future.

The new commercial development would also be required to meet building and fire code regulations. If the proposed development pursues an individual well on-site, it will require a large above-ground or ground-level storage tank on the proposed property to meet local Insurance Service Office (ISO) storage requirements. The tank would need to be designed for proper fire flow requirements and that may include fire pumps. These items would result in reduced parking to reallocate the land use of the site, additional expenses to the project and continuous commitments to operation and maintenance to meet all regulatory requirements.

These infrastructure requirements—including the well, treatment system, and fire storage facilities—would occupy significant property space, detracting from the commercial development's operations. Additionally, the ongoing maintenance and operations of the treatment facility would impose long-term costs for the development, which extend to a commitment in perpetuity to meet public water system regulations. Also, with no waterline extension for potential subsequent taps, there would be no opportunity for a reimbursement agreement to help offset or re-coop a portion of the costs of the improvements. Given these substantial challenges and continuous costs, this alternative was not considered a viable option for the proposed development.

B. ALTERNATIVE 2 – ON-SITE PRIVATE WATER SUPPLY AND TREATMENT IN COUNTY

This Alternative 2 is very similar to Alternative 1, where the proposed development would design and construct private water supply, water treatment, fire protection and distribution facilities within the site. The difference being this alternative to would not include the process of annexation into the Town of Palmer Lake. The proposed site would remain as in unincorporated El Paso County. The majority of the items described for Alternative 1 would apply to this Alternative 2. The exception being the particular Town of Palmer Lake requirements specified would be replaced with the El Paso County requirements associated with developing a source water well, designing and constructing treatment facilities for a public water system, and designing and constructing a fire protection system adequate for the proposed development. The requirements to be met through El Paso County for the water system construction are likely more lengthy and costly than that associated with the Town of Palmer Lake's processes. In addition, all other construction scope, costs, maintenance and operation responsibilities and perpetual regulatory compliance issues remain the same as presented in Alternative 1. Considering those similarities to Alternative 1 and the potential for additional time and costs associated with the El Paso County processes, this Alternative 2 was not considered a viable option for the proposed development.

C. ALTERNATIVE 3 – WATER SERVICE PROVIDED BY ANOTHER ENTITY

Alternative 3 introduces the idea of the proposed development obtaining water service from an entity other than the Town of Palmer Lake. Other public water systems which provide potable water service to its constituents are located near the general area surrounding the

proposed development site. The specific details and requirements associated with obtaining water service from another entity are not presented here. The developer would need to contact any such water provider to determine the requirements associated with obtaining service from that entity. This item does not provide specific details or scope of work estimates for this alternative. Rather, it merely poses the option should it be considered actionable by the developer as a viable option for water service to the proposed development.

SECTION IX

RECOMMENDED IMPROVEMENTS

The recommended alternative to provide the Buc-ee's Travel Center with a long-term, reliable, and safe water supply is to connect to the Town of Palmer Lake's water system. This approach provides several advantages over other water service options. It utilizes the Town's established water rights and existing wells, eliminating the need for the proposed development to file its own permits with the Town and State, a significant time-saving advantage. Incorporating water treatment needs of the development with the Town's treatment facilities minimizes new treatment requirements to meet Colorado's drinking water regulations. The Town's storage tanks provide enough storage to serve the proposed development. This includes the necessary fire flow, and an already installed high usage pump at the Town's GW-WTP to aid in the delivery of the necessary fire flows to the distribution system. The Town's full-time and appropriately certified staff oversees proper system operations and maintenance to meet CDPHE regulations for public water systems and provide a reliable water service to its customers . The Town's willingness to consider a cost reimbursement agreement would allow the development to recover portions of the initial cost investment to construct the infrastructure improvements from future customers who connect to the new construction in the future. The amounts and details associated with cost recovery from future connections shall be in accordance with the Cost Recovery Agreement to be executed between the applicant and the Town.

The specific details of each of the recommended improvements have been presented in previous sections of this report. This section has divided the recommended improvements into two major categories: waterline extension and facility upgrades. The recommended improvements are graphically shown on Figure 6. A summarized scope of work is presented in the line items of the costs prepared for each category.

The following table presents the cost estimate for the waterline extension with project soft costs included in the estimate. The costs do not include tap fees and assume the water line in County Line Road is installed outside of the road surface to avoid costs for pavement removal and replacement.

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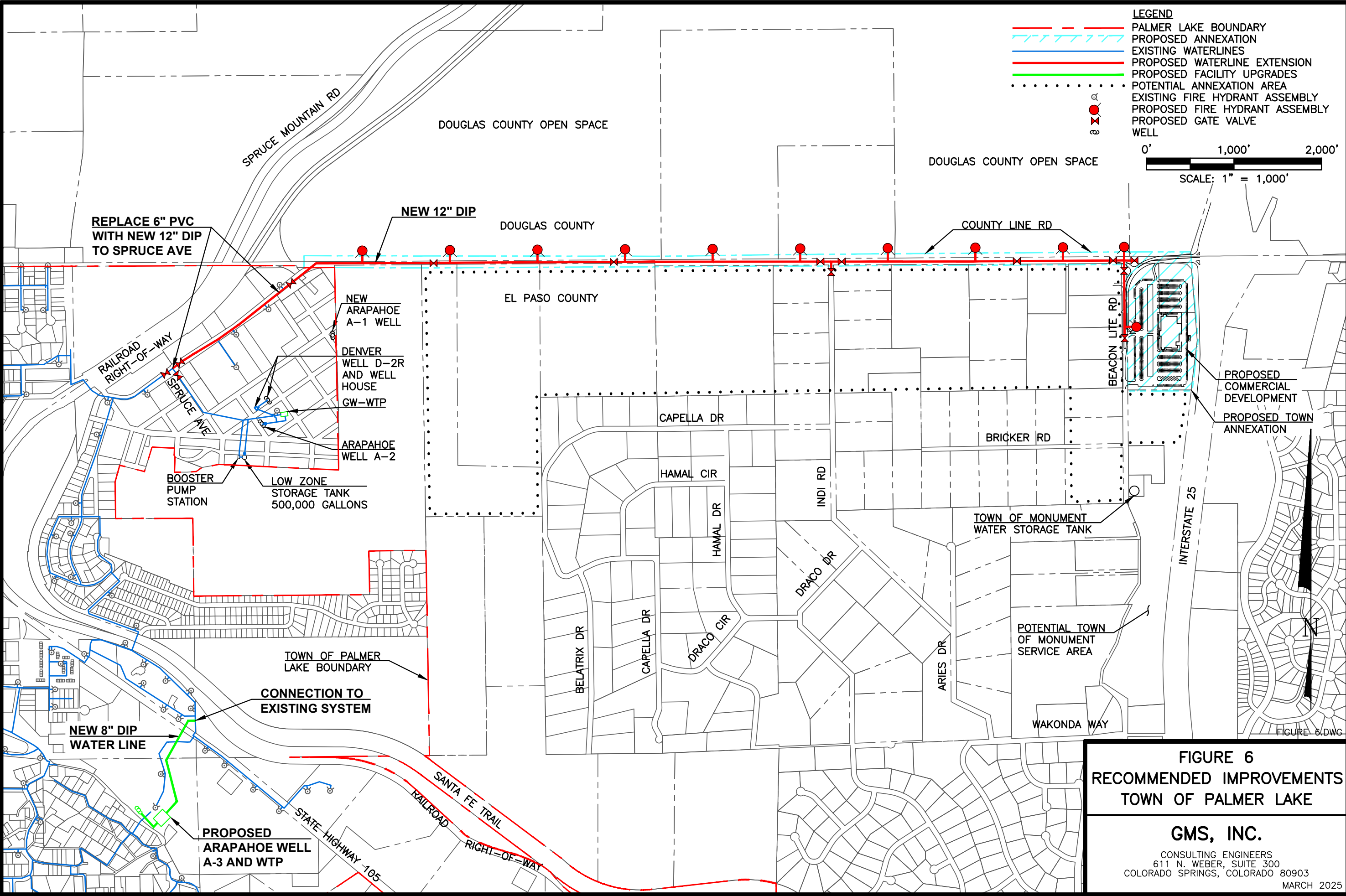


FIGURE 6
RECOMMENDED IMPROVEMENTS
TOWN OF PALMER LAKE

GMS, INC.

CONSULTING ENGINEERS
611 N. WEBER, SUITE 300
COLORADO SPRINGS, COLORADO 80903
MARCH 2025

TABLE 18
TOWN OF PALMER LAKE
WATERLINE EXTENSION COST ESTIMATE

Item	Description	Quantity	Unit Cost	Total Cost
1.	Traffic Control (along County Line Road and Beacon Lite Road)	1 LS	\$35,000	\$35,000
2.	New 12-inch DIP Water Piping	12,500 LF	\$300	\$3,750,000
3.	Connection to existing piping	1 EA	\$5,000	\$5,000
5.	12-inch gate valves w/riser boxes	14 EA	\$7,500	\$105,000
6.	Fire hydrant assembly	11 EA	\$10,000	\$110,000
7.	Air/vac assembly	6 EA	\$18,000	\$108,000
8.	New meter assemblies	1 LS	\$10,000	\$10,000
9.	Service Line and Connection, approx. 400 feet	1 LS	\$37,500	\$37,500
10.	Fire line and connection, approximately 400 feet	1 LS	\$45,000	\$45,000
11.	Sawcut, remove and replace asphalt driveways	50 SY	\$350	\$17,500
12.	Seeding	8 AC	\$3,500	\$28,000
Subtotal preliminary cost				\$4,251,000
Project contingencies @ 20%				\$850,200
Engineering design/contract administration				\$309,000
Construction observation based on 160 calendar days				\$192,000
Other engineering ¹⁾				\$46,000
Administrative expenses (Advertising, Legal Counsel, Bond Counsel, and Audit)				\$3,000
Total preliminary project cost estimate				\$5,651,200

1) Other engineering costs include: easements and rights-of-way, geotechnical services, county permits, and reproduction.

The table below presents the cost estimate for the Town water system facility upgrades. The existing infrastructure will require a new A-3 well in the Arapahoe Aquifer, a new water treatment plant for the well and treated water piping to the distribution system. The location of the A-3 well would be in accordance with the Town's water court decree. Test wells have been included to evaluate the viability of well sites. The A-3 water treatment plant would be located adjacent to the well. These facilities will be on Town owned property.

TABLE 19
TOWN OF PALMER LAKE
FACILITY UPGRADES COST ESTIMATE

Item	Description	Quantity	Unit Cost	Total Cost
A.	New Arapahoe Formation Well			
1.	Test well	3 EA	\$50,000	\$150,000
2.	18" diameter hole	2,154 VF	\$110	\$236,940
3.	30" surface casing	40 VF	\$630	\$25,200

Item	Description	Quantity		Unit Cost	Total Cost
4.	10" diameter steel casing	1,601	VF	\$130	\$208,130
5.	10" stainless steel wire screen	553	VF	\$260	\$143,780
6.	Gravel pack	553	VF	\$150	\$82,950
7.	Cement grout	1,601	VF	\$30	\$48,030
8.	Well development	24	HRS	\$3,300	\$79,200
9.	72-hr pumping test	1	LS	\$60,000	\$60,000
10.	Geophysical log	1	LS	\$40,000	\$40,000
11.	Video log	1	LS	\$3,000	\$3,000
12.	300 gpm well pump, motor, level sensor and conductors	1	LS	\$210,000	\$210,000
13.	4" stainless steel drop pipe with centralizers	1,854	VF	\$105	\$194,670
14.	Pitless Unit	1	LS	\$30,000	\$30,000
15.	Electrical including new service, power panel, step-up transformer, VFD, pressure switches and pump control panel	1	LS	\$140,000	\$140,000
16.	Disinfection	1	LS	\$3,000	\$3,000
17.	Site work, fencing and piping	1	LS	\$15,000	\$15,000
18.	SCADA and control integration	1	LS	\$50,000	\$50,000
19.	Well house building, piping and valves	1	LS	\$100,000	\$100,000
20.	8" DIP treated water piping to Town distribution system	1,100	LF	\$150	\$165,000
21.	Property purchase	1	LS	\$25,000	\$25,000
22.	Water Rights Filing	1	LS	\$30,000	\$30,000
	Subtotal				\$2,039,900
B.	New A-3 Groundwater Treatment Plant				
1.	Site work	1	LS	\$30,000	\$30,000
2.	Slab on grade foundation	1	LS	\$45,000	\$45,000
3.	Metal Building, 24 x 50' building including insulation, lighting, HVAC, and electrical	1	LS	\$360,000	\$360,000
4.	Filtration system, 250 gpm, and controls	1	LS	\$650,000	\$650,000
5.	Chemical feed systems	1	LS	\$60,000	\$60,000
6.	Backwash holding and settling facilities	1	LS	\$80,000	\$80,000
7.	Pumps, piping and valves	1	LS	\$180,000	\$180,000
	Subtotal				\$1,405,000
Subtotal preliminary cost					\$3,444,900
Project contingencies @ 20%					\$689,000
Engineering design/contract administration					\$286,000
Construction observation based on 180 calendar days					\$216,000
Other engineering ¹⁾					\$130,500
Administrative expenses (Advertising, Legal Counsel, Bond Counsel, and Audit)					\$5,000
Total preliminary project cost estimate					\$4,771,400

1) Other engineering costs include: easements and rights-of-way, geotechnical, environmental report, reproduction, basis of design report, CDPHE approvals, PPBRD permits, and water quality testing.

2) Slab on grade foundation

The total preliminary cost for the waterline extension is estimated at \$5,651,200. The total preliminary cost to add an additional well and treatment facilities is estimated at \$4,771,400. The total estimated preliminary cost of both improvements is \$10,422,600.

Additional recommendations for the Town in the future relate to the Town's water supply and property ownership around the existing and proposed GW-WTPs. The Town's groundwater sources are from the Denver Basin. As previously noted, the Denver basin aquifers have a finite amount of water if not artificially replenished with ground water recharging. Therefore, it is recommended for long-term future water supply, that the Town pursue additional surface water supply sources and/or consider ground water recharge.

With reference to Town owned property at the existing and proposed GW-WTPs, the increased system demands and declining aquifer levels may lead to higher natural radium concentration levels in the groundwater supply. The CDPHE has established specific guidelines and regulations to manage and safely dispose of Technologically Enhanced Naturally Occurring Radioactive Material (TENORM). These regulations would apply to generators of TENORM materials such as WTPs that are intended to treat and/or remove radium. In the future, the Town may need to implement measures to dewater backwash solids containing radium prior to disposal. In consideration of this future possibility, it is recommended that the Town retain ownership of the property surrounding the GW-WTPs to accommodate the potential needs relating to backwash solids management.

APPENDIX A – RESIDUAL PRESSURE EXHIBITS

