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MEMORANDUM VIA ELECTRONIC MAIL

TO: Ms. Dawn Collins, Town Administrator
Town Board of Directors
Town of Palmer Lake

DATE: August 16, 2022

FROM: David R. Frisch, P.L.S.
GMS, Inc., Consulting Engineers

RE: Town of Palmer Lake
Preliminary Engineering Report (PER)

GMS, Inc. would like to offer some thoughts to consider as you review the Preliminary Engineering Report (PER) for the Town's Water System. There are some key things that should be considered in the process. Here are some thoughts:

The Town Board ultimately has the responsibility to create the final Priority List for the PER. If you decided to pursue a project, there is benefit in creating a project that addresses your needs for the 20-year planning period. There are savings in a larger project versus a couple of smaller projects. This breaks down into a few different categories.

A. WATER SUPPLY

1. A good water supply is critical no matter what direction the Town takes, either growth or no growth. Consideration should be given to short term and long-term needs.
2. The Town has considerable ground water rights, but those rights have not been fully developed.
3. A new Arapahoe Well is a key part of establishing a firm capacity of water supply.
4. Upgrades to the existing groundwater Water Treatment Plant (WTP) are needed in meeting equipment redundancy regulations.

B. DISTRIBUTION NEEDS

1. The condition of your existing infrastructure needs to be considered. If existing lines are old, they should be replaced.
2. If there are dead-end lines, they should be looped to allow good water circulation in the water system and provide redundant feed should a water line break occur.

C. STORAGE CAPACITY

1. The Town presently has adequate storage capacity

D. FUTURE LINE EXTENSIONS

1. The PER addresses future lines that will provide looping to the existing distribution system and at the same time provide for some future development.
2. These lines can be installed as a part of a Town water project to loop your own system. If development does occur, the Town could assess a connection fee to cover the cost of the looping.
3. The Town may choose to leave this up to future development to build and pay for. That can be done but, the looping component is then delayed until development does occur.

We trust you will find this beneficial as you review the priorities recommended in the PER. If at any time you have questions, please feel free to give us a call.

PRELIMINARY ENGINEERING REPORT

for

WATER SYSTEM IMPROVEMENTS - 2022

Prepared for the:

TOWN OF PALMER LAKE

GMS, Inc.
Consulting Engineers

PRELIMINARY ENGINEERING REPORT

FOR

WATER SYSTEM IMPROVEMENTS - 2022

PROJECT NO. 2021-062.100

DRAFT: July 2022
FINAL: November 2022

OWNER:

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

PREPARED BY:

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SECTION I
EXECUTIVE SUMMARY

The Town of Palmer Lake is a statutory Town with a 2020 estimated population of 2,636 people. The Town is located in central Colorado, in the northwest portion of El Paso County. The Town is located on Colorado Highway 105 on the south side of the Palmer Divide. The Town owns and operates a public drinking water system currently providing potable water to 1,015 active customers.

The Town's water system consists of reservoir storage, supply, groundwater well production, surface water and groundwater treatment, treated water storage, distribution and customer metering components. The Town delivers surface water supply from the Glen Park Reservoir on North Monument Creek, and groundwater supplies from the Denver and Arapahoe aquifers in the Denver Basin utilizing two wells.

The Town was incorporated in 1889. The original water system appears to have been constructed around 1867 with the adjudication of its original water rights. Several Water System Improvement projects have been conducted over the last century including distribution system extensions to new developments within the Town. The Town's surface water treatment plant (SW-WTP), treating water from Glen Park Reservoir, was constructed in the 1960's. New treatment process equipment was installed in 2012. In the late 1980's, the Town completed several water court filings to claim Denver Basin water underlying the corporate limits of the Town. The Denver Aquifer well, D-2, was constructed in 1987 and was replaced in 2021. In 2002, the Town constructed, the Arapahoe Aquifer well, the groundwater treatment plant (GW-WTP) for iron and manganese removal, and the low zone water storage tank. Over the last 20 years, the Town Water Department has been replacing old lead joint cast iron pipe within the older areas of the distribution system. A second high zone distribution system storage tank was completed in 2019 to supplement the storage capacity of the 1960's high zone storage tank.

The Town surface water and groundwater rights are adequate to meet current and projected water demands. The Town's surface water supply has declined over the last 20 years due to long term drought conditions and increased water rights calls on the Glen Park Reservoir. Under worst case conditions of low surface water availability and the larger capacity groundwater well out of

service, overall water supply capacity falls short of meeting existing and future maximum day demand conditions. Additional groundwater supply capacity is recommended with a new Arapahoe well to firm up the supply capacity in meeting existing and future projected demands

The distribution system is generally in good condition. Continued replacement of older cast iron pipe within the system piping is recommended. Distribution system improvements are also recommended to connect the east and west sides of the distribution system divided by Highway 105, and to reinforce overall water conveyance.

Water quality is generally compliant with water quality regulations. Elevated radium concentrations are present in the Denver and Arapahoe formations combined with elevated levels of iron and manganese. The GW-WTP was designed to provide iron and manganese removal, and subsequently radium is removed. The GW-WTP capacity is currently rated based on the use of both filters, however, levels of radium in the Denver Basin Aquifer are rising regionally. If raw water radium levels rise above the regulated limit, and radium compliance becomes dependent on the GW-WTP for removal, the facility will require the addition of a third filter to provide redundancy.

The Town has approximately 141 private wells on individual properties for potable water supply. These were accepted by the Town for installation as the Town was unable to provide public water supply to these properties. The majority of these properties are located in the southeast quadrant of the Town on the northeast side of Highway 105. The necessary potable water supply improvements were determined in this report to serve these properties on private wells. Due to the high capital costs associated with providing public waters to these in-Town properties, these necessary improvements are not recommended at this time.

This Preliminary Engineering Report presents a summary of the Town's water system components and an evaluation of the condition and needs of the system. Overall, the water system is well operated and in relatively good condition. The recommended improvements identified in this report include:

- Install new Arapahoe Aquifer groundwater well and pipeline to the GW-WTP
- Install third filter in the GW-WTP
- Replace lead joint cast iron and problematic pipe segments within the distribution system

- Install new distribution system piping to loop together the east and west sides of Highway 105 and to provide distribution system reinforcement

The recommended improvements have been grouped into two priorities. The first priority includes the new well, GW-WTP improvements, and replacement of older segments of distribution system piping. The estimated project costs for these improvements is $4,750,000. The second priority of recommended improvements includes distribution system upgrades to loop and reinforce the distribution system. The estimated project cost for these improvements is $1,259,000. If the Priority One and Priority Two projects are combined into a single project, the combined project cost estimate is $5,833,600. The third priority of improvements is to provide public water supply to those in-Town properties on private wells. The estimated project cost for these improvements is $4,067,000. This third priority is not recommended at this time.

A financial review of the Town of Palmer Lake's water fund indicates that the utility is well managed and in good financial condition. Funding of the needed improvements is recommended to be pursued using Drinking Water Revolving Fund (DWRF) loan funds available through the Colorado Water Resources and Power Development Authority (CWR&PDA) as administered by the Colorado Department of Public Health and Environment (CDPHE).

SECTION II
INTRODUCTION

A. PURPOSE AND SCOPE

This Preliminary Engineering Report has been prepared for the Town of Palmer Lake's potable water system. The Town has provided central water service to its constituents since around 1867 with the adjudication of its original water right. The purpose of this report is to present the findings of a comprehensive evaluation of the water system including water supply, water quality, treatment, storage and distribution elements. A financial review of the Town's water fund was also conducted. Details of recommended improvements are presented in this report in order to upgrade and improve the water system to meet current waterworks standards and regulatory requirements to ensure a long-term, reliable and safe water system.

This report has been prepared to address the requirements of the Colorado Department of Public Health and Environment (CDPHE), Drinking Water Project Needs Assessment (PNA) and is presented in a logical, readable format.

B. BACKGROUND

The Town of Palmer Lake's government is that of a Statutory Town. The Town was established around 1882 at the top of the Palmer Divide following the construction of the Denver & Rio Grande Western Railroad which used water from Palmer Lake for steam engines. Early industries included ice harvesting, saw mills and railroad support. The Town was incorporated in 1889. The D&RGW Railroad was constructed through the Town in 1871. The Atchison, Topeka and Santa Fe Railroad (ATSF) built tracks through the Town in 1887. The Town has maintained its own central water system since approximately its incorporation.

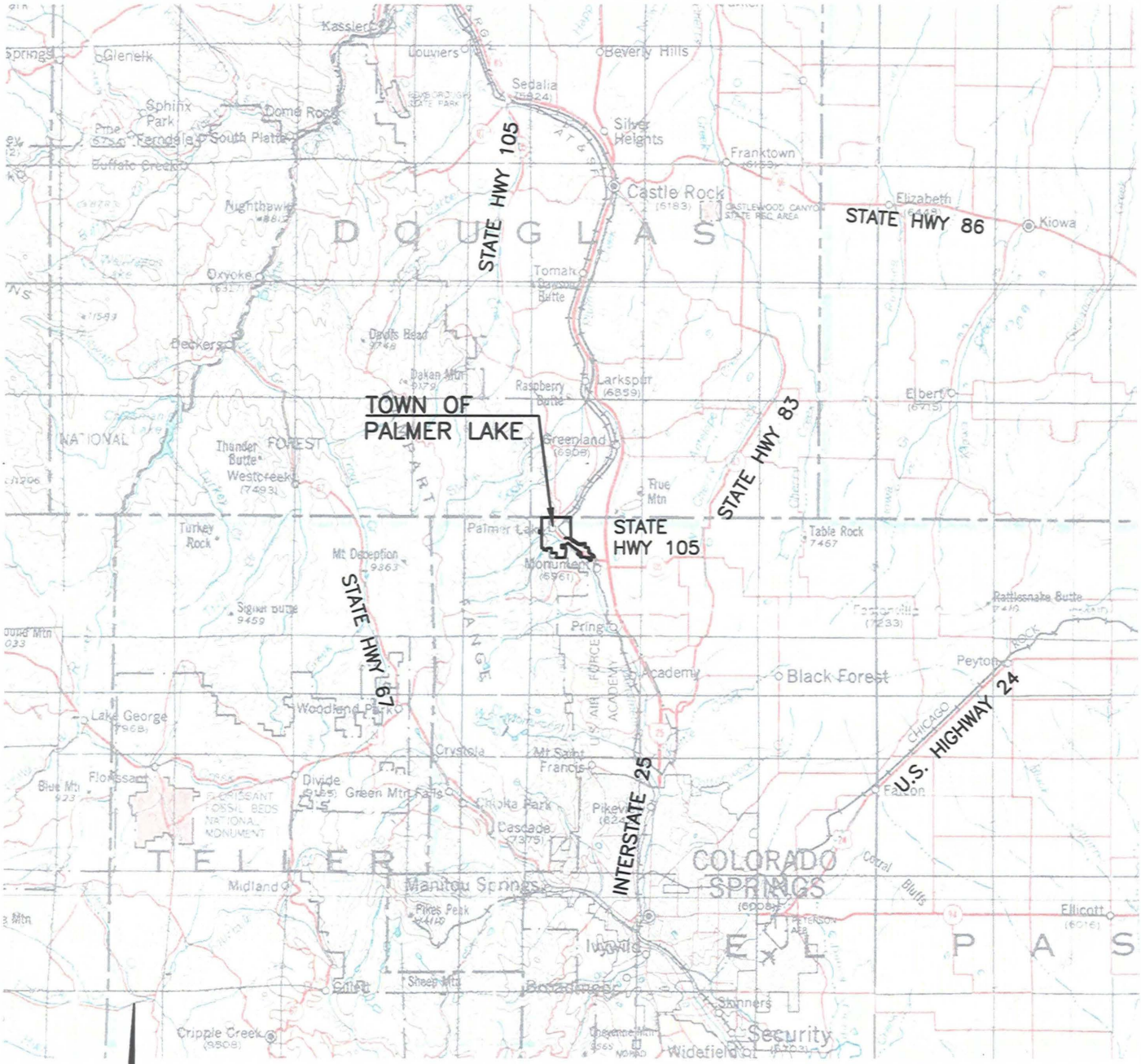
The Town's water supply consists of two active groundwater wells located within the Town limits, and the Glen Park and lower reservoirs. The wells draw from the Arapahoe and Denver formations within the Denver Basin. The reservoirs located on Monument Creek provide surface water supply for the Town. This surface water is treated at the Town's service water

treatment plant (SW-WTP). Groundwater is treated at the groundwater water treatment plant (GW-WTP). The water system is operated as a single pressure zone with storage provided by two 250,000 gallon gravity storage tanks. Water from the 500,000 gallon treated groundwater storage tank is boosted into the distribution system.

The distribution system consists primarily of polyvinyl chloride (PVC) piping with some remaining cast-iron pipe 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. This opened up development of the southeast quadrant of Town for commercial and residential housing with private water supply.

C. SERVICE AREA

The Town of Palmer Lake is located in central Colorado within northeastern El Paso County. The following Figure 1 depicts Palmer Lake and its relationship to surrounding communities and counties. The source of this map is the U.S. Geological Survey Base Map for the State of Colorado, compiled at a scale of 1-inch equals 8 miles. The community is located within Sections 4, 5, 8, 9 and 10, Township 11, Range 67 West of the 6th Principal Meridian. Palmer Lake is generally located 3 miles north of the Town of Monument. The Town is bisected by Colorado Highway 105, which provides access to Interstate 25 and the Town of Monument to the south. The relationship of the Interstate 25 transportation corridor to the community can be seen on the following Figure 2. This figure is an excerpt taken from the U.S. Geological Survey Larkspur and Palmer Lake Quadrangle maps. The figure highlights the incorporated limits of the Town, street configurations of the community, general topography, drainage locations, Interstate 25, local and county roads and their relationship to the Town. The figure has been annotated to depict the current Town limit boundary.



SCALE: 1" = 8miles
(approximate)

SOURCE: USGS MAP OF COLORADO

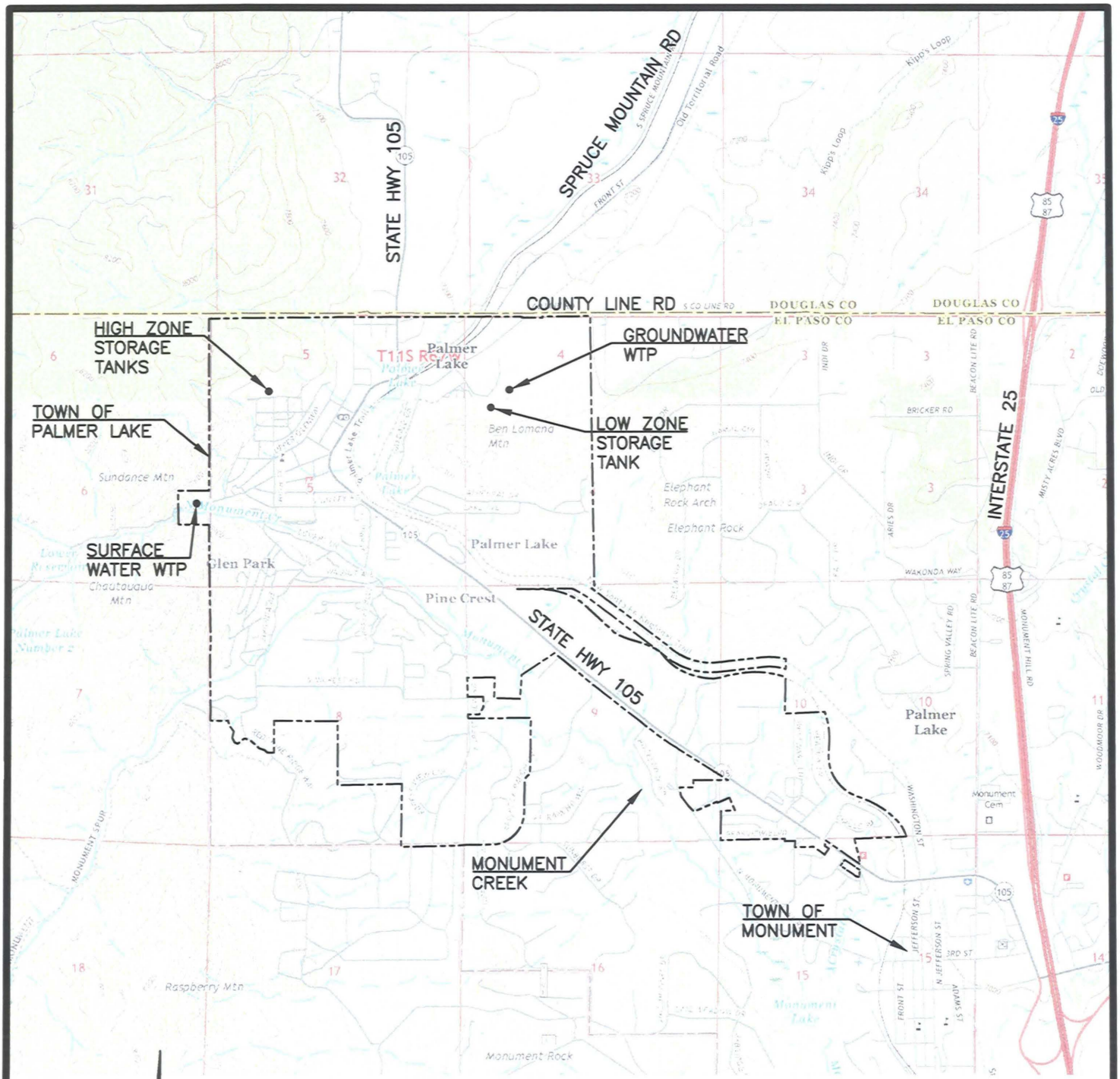
FIGURE 1.DWG

FIGURE 1
VICINITY MAP
TOWN OF PALMER LAKE

GMS, INC.

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

OCTOBER 2021



N

SCALE: 1" = 3,000'

SOURCE: PALMER LAKE AND LARKSPUR USGS QUAD MAPS

FIGURE 2.DWG

FIGURE 2
LOCATION MAP
TOWN OF PALMER LAKE

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MAY 2022

SECTION III
PLANNING AREA

A. LOCATION

The Town of Palmer Lake and its service area are located in northern El Paso County. The Town lies along Monument Creek, approximately three miles northwest of Monument, Colorado. Colorado Highway 105 extends generally in a northwest/southeast direction, bisecting the community. Interstate 25 is the major transportation corridor which lies to the east of the Town.

B. PLANNING ANALYSIS

The Town is currently having a comprehensive community master plan prepared to provide the Town a roadmap into the future for growth and development. The new master plan is scheduled to be completed in October 2022.

The planning analysis presented in this report is offered to address the requirements of the CDPHE PNA. Specific details on environmental features are discussed in this section of the report. The following Figure 3 has been prepared to depict a three-mile radius around the Town and to compile environmental conditions and potential project impacts. The existing planning area generally consists of the limits of the Town of Palmer Lake. As shown on Figure 2, the Town limits extend southeast along a stem north of Highway 105. This portion of the Town is not served by the Town's potable water system. Constituents of the Town in this area are served with private groundwater wells.

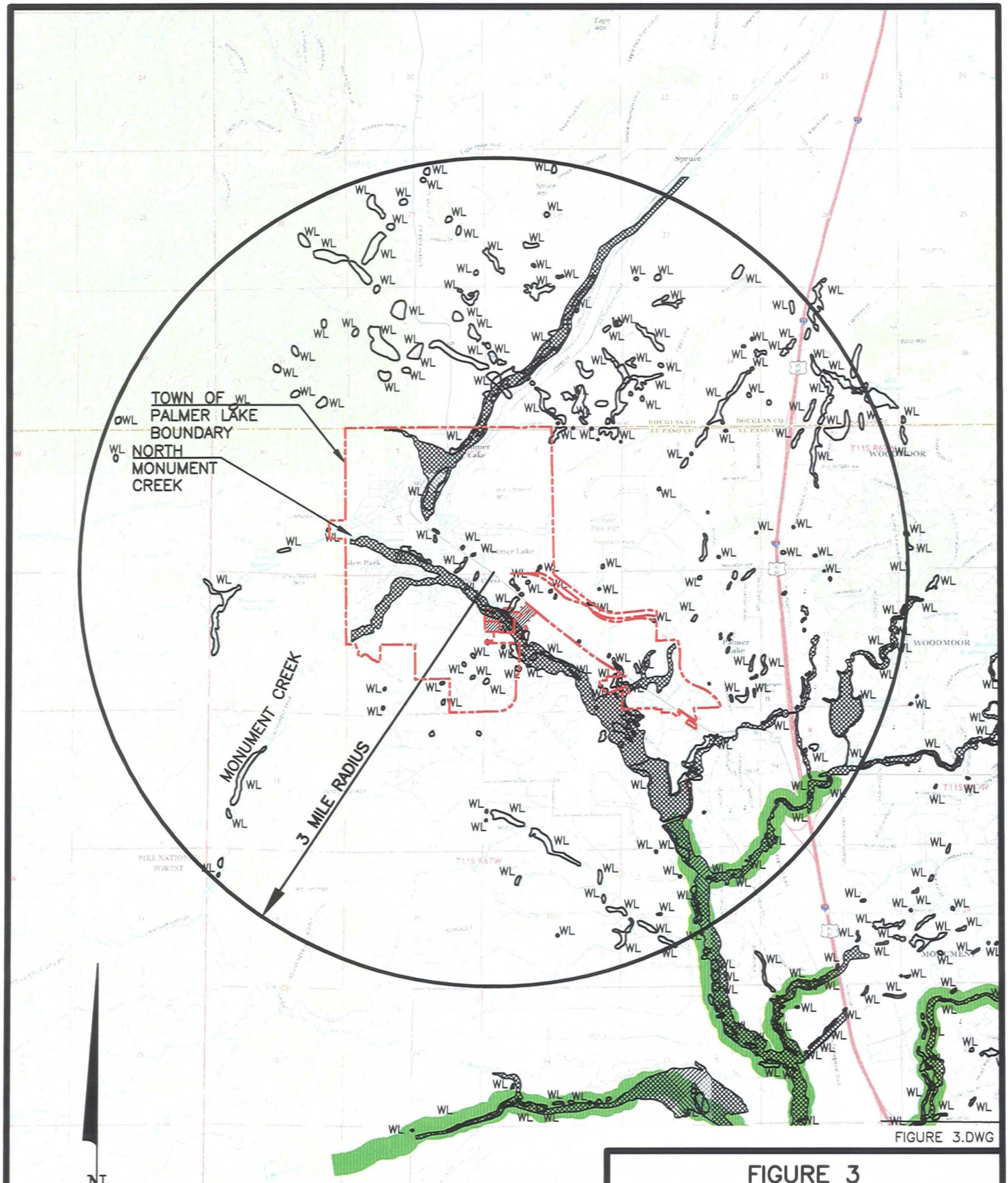

FIGURE 3.DWG

FIGURE 3
3 MILE RADIUS MAP
TOWN OF PALMER LAKE

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MAY 2022

The constituents located within the Town of Palmer Lake's planning area enjoy the use of potable water made available through the Town's central water distribution system. The Town also provides street maintenance, park maintenance, and other general municipal services. Central wastewater collection and treatment within the Town is provided by the Palmer Lake Sanitation District (PLSD).

Palmer Lake is a small, rural community located along Colorado's Front Range. The Town has a small retail business community which provides goods and services to its residents and surrounding areas. The majority of businesses and commercial activity within the Town are service oriented. The Town of Palmer Lake has also experienced the explosive growth occurring along the Front Range. Significant development pressure remains.

Population projections for the Town's service area are presented in this section of the report. An analysis of existing and future water demands is then presented in this report. An evaluation of the adequacy of the source water supply, water rights and capacity are also presented.

C. WATER RESOURCES

A water resources evaluation of the Town's water rights and facilities was prepared by the consultant dated April 2021. A summary of the finding and recommendations in that report are presented herein. The Town's potable water supply is derived from two groundwater wells drawing from the Arapahoe and Denver Aquifers within the Denver Basin; and surface water supply from the Glen Park reservoir on Monument Creek. The Town operates two water treatment plants (WTP), serving each of these supplies.

The community lies within the Monument Creek drainage basin, which is tributary to Fountain Creek and the Arkansas River. As shown on Figure 2, runoff from the service area is to Monument Creek.

Surface water quality of Monument Creek is regulated by the Water Quality Control Commission's Regulation 32 "Classifications and Numeric Standards for the Arkansas River Basin". The segments of North Monument Creek and Monument Creek are designated as Segments 3A and 6B, respectively, of the Arkansas River Basin. North Monument Creek

(Segment 3A) is classified for water supply, aquatic life (Class 1, cold water), recreation (Class E), agriculture, and has a renewable designation. Monument Creek (Segment 6B) is classified for agricultural, aquatic life (Class 2, warm water), and also has a renewable designation.

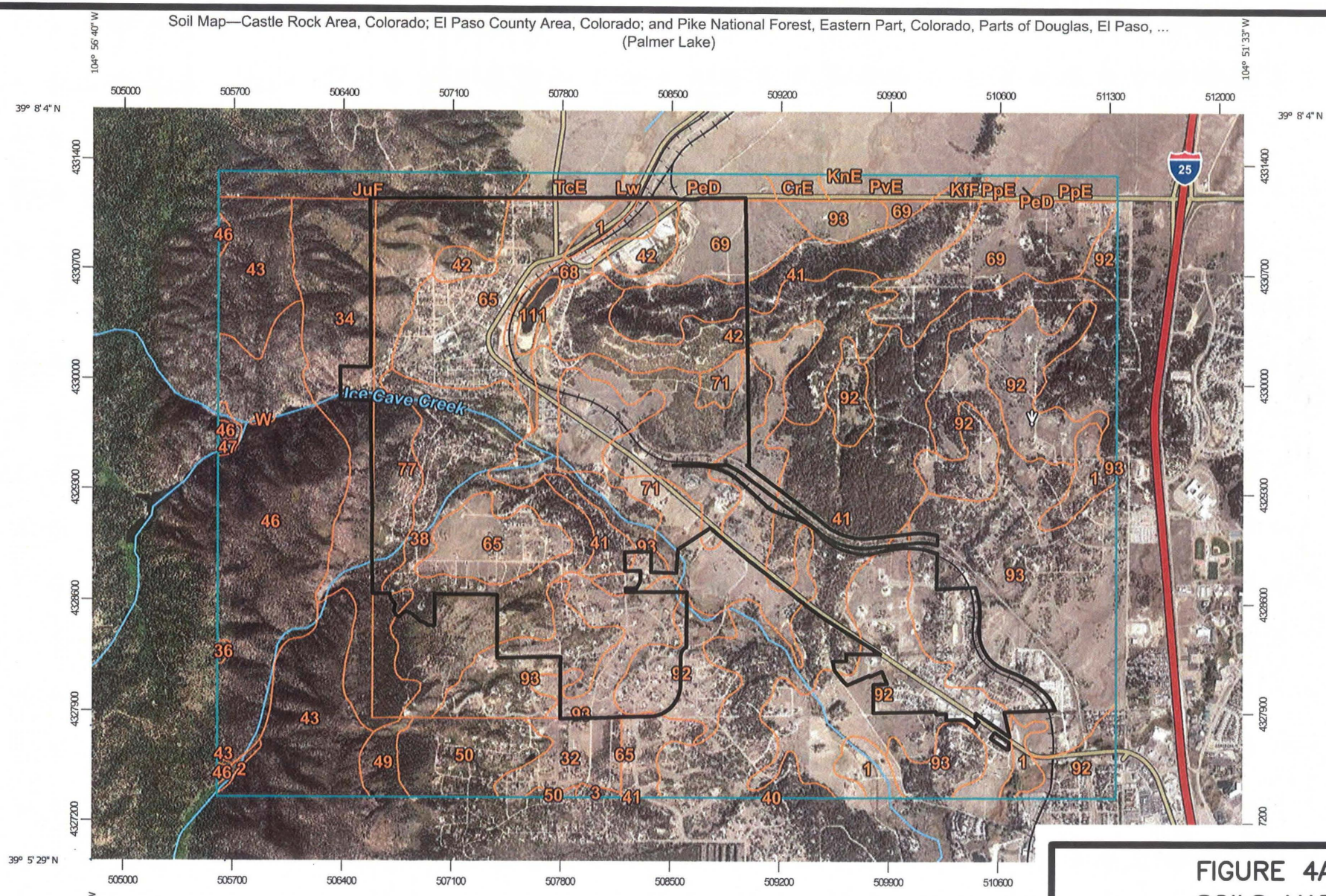
D. PHYSIOGRAPHY, TOPOGRAPHY AND SOILS

Northern El Paso County lies within the physiographic province of the Southern Rocky Mountains within the foothills of the Front Range. Palmer Lake lies at the top of the Palmer Divide at the base of the Rampart Range. Slopes rise modestly to steeply to the northeast and southwest to Monument Creek. Figure 2 shows that the general topography and slope of the land as it drains in the southeasterly direction. Elevations across the Town's service area range from approximately 7,480 feet at Brook Street and Highland Road, to 7,070 feet on Forest View Way to the south. Monument Creek generally flows southeast in this area. The majority of the community is located outside of the confines of major drainageways.

Local soils in the area have been classified by the Natural Resources Conservation Service (NRCS). The NRCS Web Soil Survey Mapping Tool was used to determine the soil types in and around the Town of Palmer Lake. The NRCS Soils Map and associated soil types are shown on the following Figures 4A through 4D. The following is a summary of the predominant soils within the Town of Palmer Lake.

- Tomah-Crowfoot Loamy Sands, 3-8% slopes: located primarily in the southwest quadrant of the Town.
- Perry Park Gravely Sandy Loam, 3-9% slopes: located primarily within the historical Town center.
- Jarre-Tecolote Complex, 8-65% slopes: located primarily on the southside of North Monument Creek.
- Pring Coarse Sandy Loam, 3-8% slopes: located throughout the eastside of Town in multiple locations.
- Rock Out Crop-Cold Creek – Tolman Complex, 9-90% slopes: located along the west limits of Town in the steep foothills of the Rampart Range.

Soil Map—Castle Rock Area, Colorado; El Paso County Area, Colorado; and Pike National Forest, Eastern Part, Colorado, Parts of Douglas, El Paso, ...
(Palmer Lake)



Map Scale: 1:33,700 if printed on A landscape (11" x 8.5") sheet.

N

Meters
0 450 900 1800 2700

Feet
0 1500 3000 6000 9000

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 13N WGS84

USDA **Natural Resources Conservation Service**

Web Soil Survey
National Cooperative Soil Survey

FIGURE 4A.DWG

FIGURE 4A
SOILS MAP
TOWN OF PALMER LAKE

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COLORADO SPRINGS, COLORADO 80903

OCTOBER 2021

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at scales ranging from 1:20,000 to 1:24,000.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Castle Rock Area, Colorado
Survey Area Data: Version 13, Jun 5, 2020

Soil Survey Area: El Paso County Area, Colorado
Survey Area Data: Version 18, Jun 5, 2020

Soil Survey Area: Pike National Forest, Eastern Part, Colorado, Parts of Douglas, El Paso, Jefferson, and Teller Counties
Survey Area Data: Version 7, Jun 5, 2020

Your area of interest (AOI) includes more than one soil survey area. These survey areas may have been mapped at different scales, with a different land use in mind, at different times, or at different levels of detail. This may result in map unit symbols, soil properties, and interpretations that do not completely agree across soil survey area boundaries.

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Aug 19, 2018—Sep 23, 2018

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

FIGURE 4B.DWG

USDA **Natural Resources Conservation Service**

Web Soil Survey
National Cooperative Soil Survey

Soil Map—Castle Rock Area, Colorado; El Paso County Area, Colorado; and Pike National Forest, Eastern Part, Colorado, Parts of Douglas, El Paso, Jefferson, and Teller Counties (Palmer Lake)

FIGURE 4B
SOILS MAP LEGEND
TOWN OF PALMER LAKE

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

OCTOBER 2021

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
1	Alamosa loam, 1 to 3 percent slopes	90.2	1.6%
38	Jarre-Tecolote complex, 8 to 65 percent slopes	325.4	5.7%
40	Kettle gravelly loamy sand, 3 to 8 percent slopes	0.1	0.0%
41	Kettle gravelly loamy sand, 8 to 40 percent slopes	776.6	13.7%
42	Kettle-Rock outcrop complex	254.3	4.5%
65	Perrypark gravelly sandy loam, 3 to 9 percent slopes	397.5	7.0%
68	Peyton-Pring complex, 3 to 8 percent slopes	50.3	0.9%
69	Peyton-Pring complex, 8 to 15 percent slopes	270.1	4.8%
71	Pring coarse sandy loam, 3 to 8 percent slopes	290.8	5.1%
77	Rock outcrop-Coldcreek-Tolman complex, 9 to 90 percent slopes	226.6	4.0%

FIGURE 4C.DWG

FIGURE 4C
SOILS MAP UNIT LEGEND
TOWN OF PALMER LAKE

GMS, INC.

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

MAY 2022

I:\PALMERLK\2021-06 Water Study\Figure 4C.dwg, 8.5x11, 5/18/2022 8:02:45 AM, sc, DWG To PDF.pc3, 1:1

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
92	Tomah-Crowfoot loamy sands, 3 to 8 percent slopes	618.4	10.9%
93	Tomah-Crowfoot complex, 8 to 15 percent slopes	973.6	17.2%
111	Water	15.0	0.3%
Subtotals for Soil Survey Area		**4,289.0**	**75.7%**
Totals for Area of Interest		**5,668.1**	**100.0%**

FIGURE 4D.DWG

FIGURE 4D
SOILS MAP UNIT LEGEND
TOWN OF PALMER LAKE

GMS, INC.

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

MAY 2022

Local soils are viable for range land grazing in unforested areas. All soils consist of gravely, sandy loam, loam, silty loam and clay loam. These soils are deep, well to moderately-well drained with soil transmissivity ranging from low to moderately high. The NRCS ratings for septic system suitability throughout the incorporated limits of Town indicate very limited viability with the exception of areas along the creeks.

E. CLIMATE

The semi-arid climate of northern El Paso County is typical of the Southern Rocky Mountains, modified by the effect of the mountains to the west. The region's climate is influenced by a combination of geographic conditions. The relatively high elevation of the Town moderates the high summer temperatures compared to the areas to the east. Its distance from large bodies of water and semi-arid climate keeps humidity low. The Palmer Divide to the north creates a barrier to storm systems from the north and also creates an area of microclimate.

A review of the National Weather Service weather station database available through the Division of Water Resources, Colorado Decision Support System indicates multiple weather stations within the area. The Palmer Lake Station on Virginia Drive has precipitation data from the period of 1899 through 2022, with several gaps in the data. The annual average precipitation at this weather station is 20.5 inches per year for the period of 2008 to 2021.

General temperature information was obtained from the Climatic Atlas of the United States. The lowest monthly average temperature occurs in January and is approximately 25.0°F. The highest monthly average temperature occurs in July and is 70.0°F. Winters in this area are typically dry; however, cold temperatures are typical with winter storms. The last day of anticipated 32°F temperature in the spring occurs in late May. The first day of 32°F temperature in the fall occurs around the end of August. On an annual basis, the area experiences an average of less than 20 days with maximum day temperatures exceeding 90°F and 240 days with minimum temperatures reaching below 32°F.

Most precipitation occurs in the late summer months of August and September. Lake evaporation in this area averages 40 inches per year, which far exceeds the annual precipitation for the area. The average annual snowfall in Palmer Lake is 95.4 inches per

year. Winds prevail the majority of the time from the north during winter months and from the west during the summer months.

F. FLOODPLAIN AND WETLANDS

Floodplain mapping for El Paso County has been prepared by the Federal Emergency Management Agency (FEMA). FEMA floodplain mapping for the Town of Palmer Lake is shown on Figure 5A through 5D.

The floodplain of North Monument Creek and Monument Creek is designated as Zone AE, indicating a 100-year floodplain having base flood elevations determined. The 100-year floodplain expands out from the delineated floodway throughout the length of the Town. No structures are within the 100-year floodplain of North Monument Creek or Monument Creek.

The US Fish and Wildlife Service, National Wetlands Inventory Mapping was reviewed to determine the types and locations of wetlands within the planning area. Figure 3 identifies wetlands within the three-mile radius of Palmer Lake. The following Figure 6 shows a closer view of wetlands along Monument Creek. These consist of freshwater forested/shrub wetlands, riverine wetlands, and freshwater emergent wetlands.

G. VEGETATION

Undeveloped areas within and around the corporate limits of the Town of Palmer Lake is forested with open grass lands. Open grass meadows and forested gullies typically line the waterways. Vegetation is comprised primarily of Ponderosa, Cottonwood, Blue Spruce, Willow, Gambel Oak, Skunk Brush, Cotton Easter and native grasses, as well as invasive weeds.

FLOOD HAZARD INFORMATION

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR DRAFT FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS
- Without Base Flood Elevation (BFE) *Zone A, V, A99*
- With BFE or Depth *Zone AE, AO, AH, VE, AR*
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD
- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee See Notes *Zone X*
- Area with Flood Risk due to Levee *Zone D*

OTHER AREAS
- NO SCREEN Area of Minimal Flood Hazard *Zone X*
- Effective LOMRs
- Area of Undetermined Flood Hazard *Zone D*

GENERAL STRUCTURES
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES
- 20.2 — Cross Sections with 1% Annual Chance
- 17.5 — Water Surface Elevation
- 8 — Coastal Transect
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature
- 513 — Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary

FEMA

National Flood Insurance Program

NATIONAL FLOOD INSURANCE PROGRAM

FLOOD INSURANCE RATE MAP

PANEL 256 OF 1275

Panel Contains:

COMMUNITY	NUMBER	PANEL
PIKE NATIONAL FOREST	08FED	0256
EL PASO COUNTY	080059	0256
TOWN OF PALMER LAKE	080065	0256

MAP NUMBER
08041C0256G
EFFECTIVE DATE
December 07, 2018

FIGURE 5A.DWG

FIGURE 5A
FEMA FLOODPLAIN MAP
TOWN OF PALMER LAKE

GMS, INC.

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

MAY 2022

FIGURE 5B.DWG

FIGURE 5B
FEMA FLOODPLAIN MAP
TOWN OF PALMER LAKE

GMS, INC.

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

MAY 2022

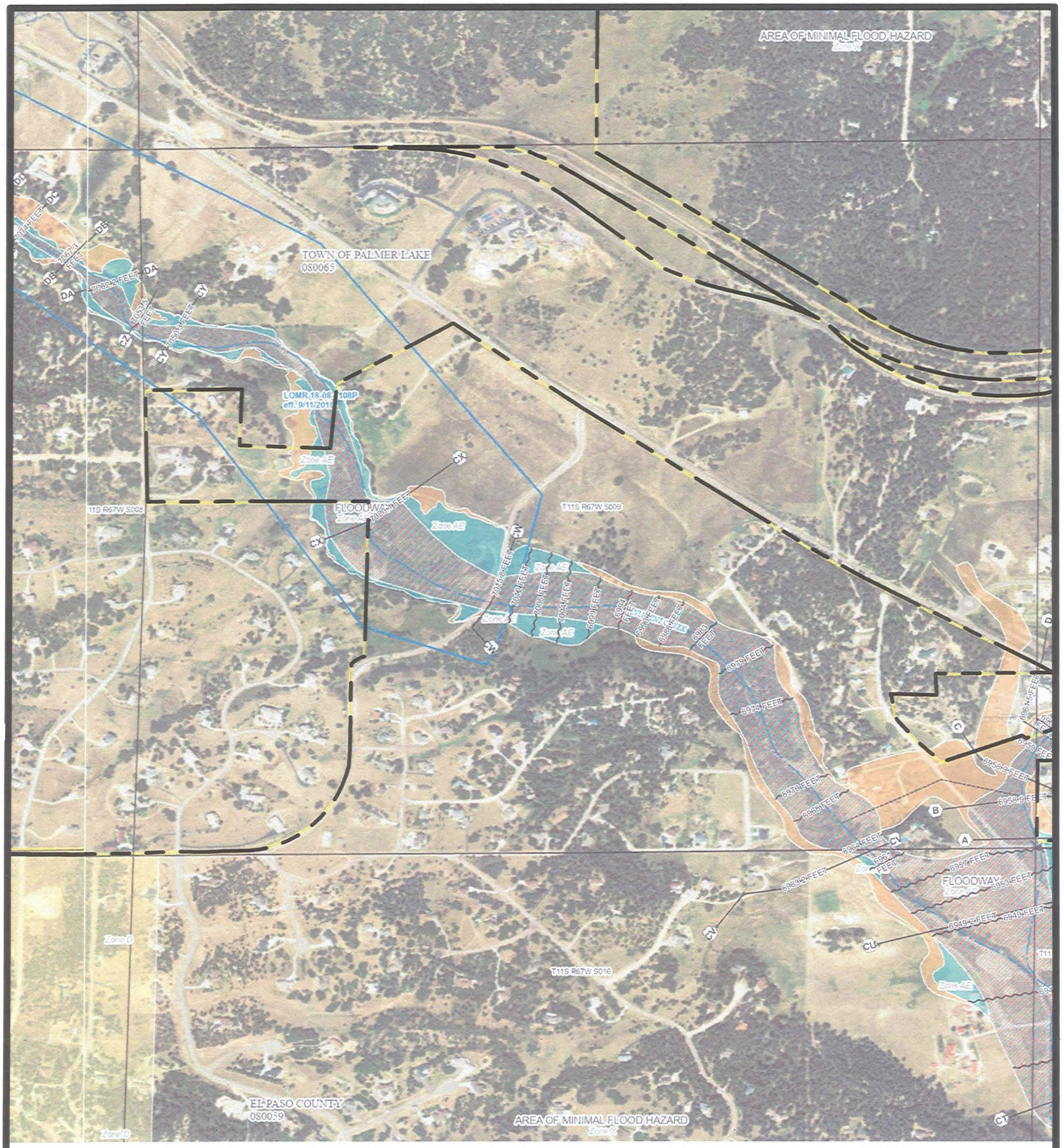

FIGURE 5C.DWG

FIGURE 5C
FEMA FLOODPLAIN MAP
TOWN OF PALMER LAKE

GMS, INC.

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

MAY 2022

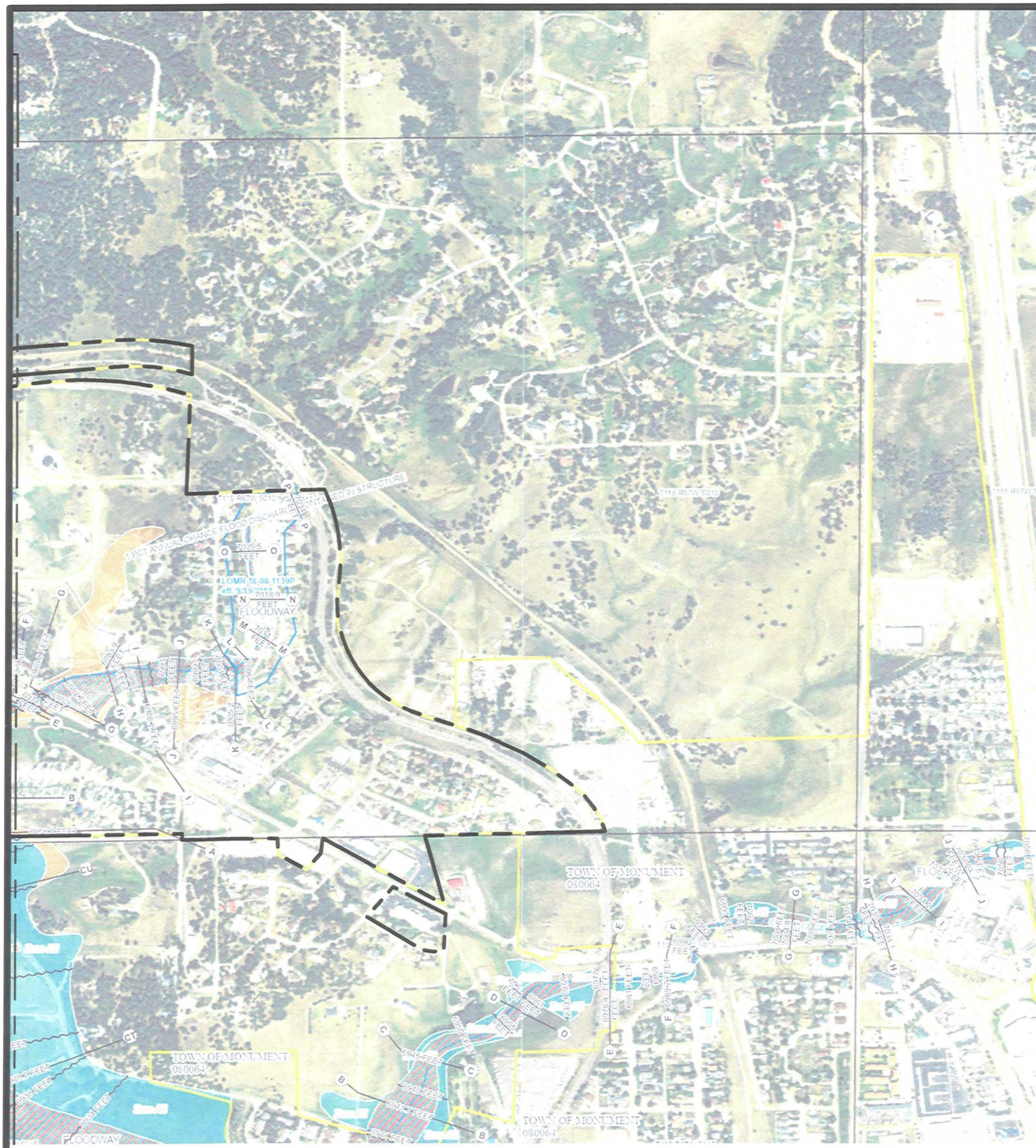

FIGURE 5D.DWG

FIGURE 5D
FEMA FLOODPLAIN MAP
TOWN OF PALMER LAKE

GMS, INC.

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MAY 2022

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U.S. Fish and Wildlife Service

National Wetlands Inventory

Town of Palmer Lake

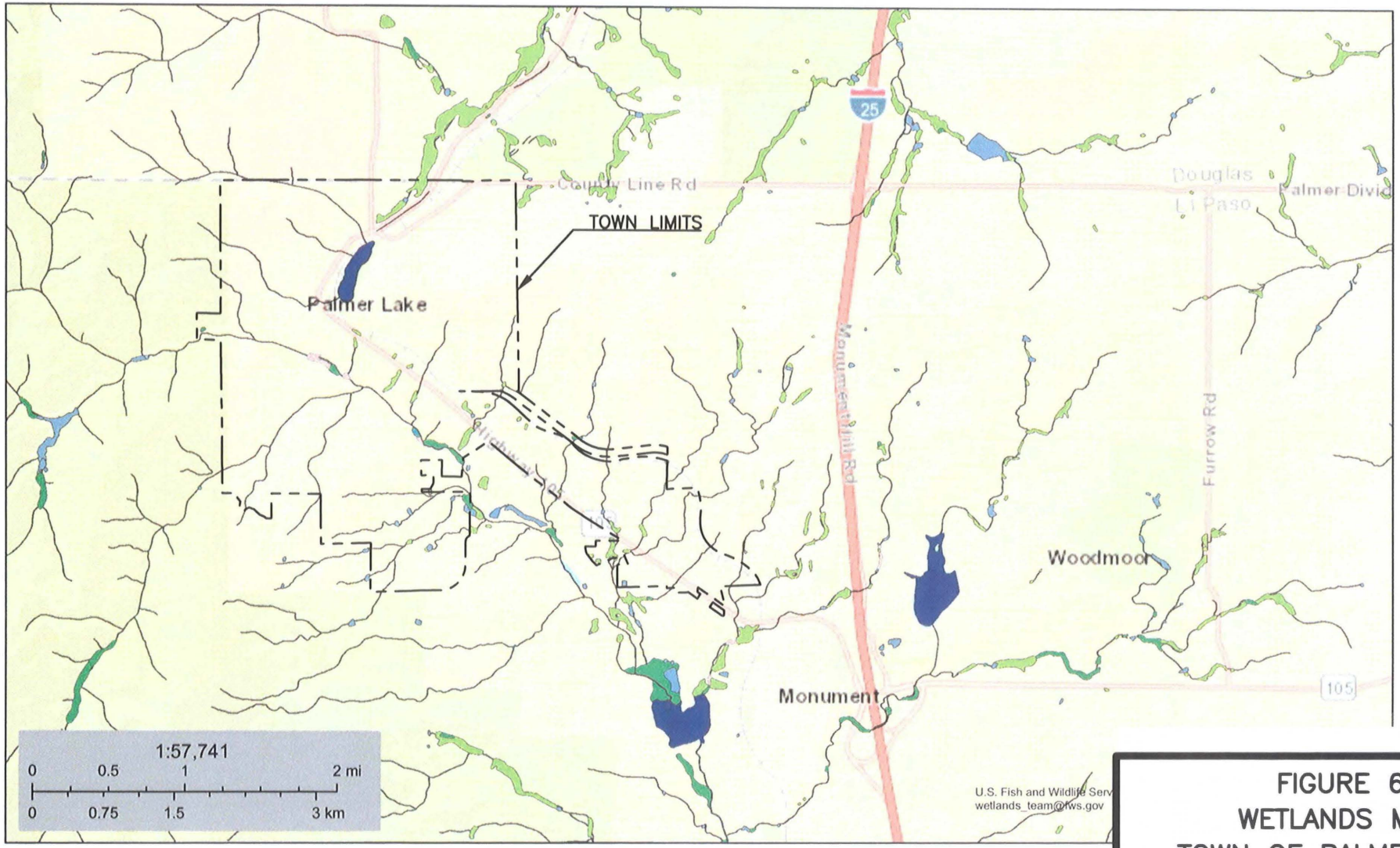


FIGURE 6.DWG

September 27, 2021

Wetlands

- Estuarine and Marine Deepwater
- Estuarine and Marine Wetland
- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland
- Freshwater Pond
- Lake
- Other
- Riverine

FIGURE 6
WETLANDS MAP
TOWN OF PALMER LAKE

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

OCTOBER 2021

H. WILDLIFE

Wildlife within southern Douglas County includes most species common to the foothills including habitat for cottontail rabbits, red fox, coyote, turkey, redtail hawk, mourning doves and a host of small varieties of song birds common to the mountains of Colorado.

Creek bottoms provide habitat for raccoons, skunks, mule and white tail deer, and song birds. These are the more common varieties of wildlife encountered. The U.S. Fish and Wildlife mapping was reviewed for potential habitat of threatened and endangered species. Critical delineated habitat for the Preble's Meadow Jumping Mouse (PMJM) is shown on Figure 3 and lies outside of the corporate limits of the Town of Palmer Lake. Critical habitat for the Mexican Spotted Owl lies to the north and west of Palmer Lake, outside of the three-mile radius.

I. AIR QUALITY AND NOISE

Palmer Lake is a relatively small community located in central Colorado in the foothills of the Front Range. A review of the available data on air quality shows that the nearest air quality monitoring station is the U.S. Air Force Academy Station located 10 miles to the south. This station monitors ozone only. Approximately 18 miles south is the Colorado College air quality monitoring station which monitors ozone, 2.5 micron particulate matter (PM2.5) and 10 micron particulate matter (PM10). Palmer Lake lies within the Pikes Peak air quality region, away from the large population centers of Colorado Springs. The 2020 Annual Air Monitoring Report by the Colorado Air Pollution Control Division indicates that the region has been in compliance with all Federal quality air standards. The air quality in and around Palmer Lake is expected to be somewhat better than the Colorado Springs metropolitan area, having lower levels of ozone and particulate material due to its remote location from the metropolitan center.

The noise generated within the community is limited to those normal domestic activities that occur within a small residential community with typical associated commercial activities. No significant noise generation occurs within the area, with the exception of the Burlington Northern and Santa Fe Railroad which bisects the Town on a steep grade to the Palmer Divide. Interstate 25 is located east of the Town and produces significant noise from continual highway traffic. Overall, the Town of Palmer Lake does not experience any significant noise or air quality problems.

J. PUBLIC FACILITIES AND SERVICES

Palmer Lake is a statutory Town created under the Colorado Revised Statutes. The Town staffing consists of administrative staff as well as police, fire, public works and water department personnel. The Mayor and Town Board of Trustees meet on a regular basis to discuss and address interim and future facility operations and development within the Town. Wastewater collection and treatment are provided by the PLSD.

The Town residents enjoy the availability of potable water made available through the Town's central water distribution system. Electric service is provided by CORE Electric Corporative (formerly Intermountain Rural Electric Association). The Town is served natural gas by Black Hills Energy. Telephone service is provided by Century Link Communications. The Town also provides street maintenance, park maintenance, and other general municipal services.

K. POPULATION

1. 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 and Teller. From 1980 to 2019, this region grew from a population of 317,458 people to 756,420 people, an increase of 138%, 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 and the desirable Colorado lifestyle. In general, El Paso County experienced explosive growth from 1980 through 2020, growing in population by 136% from 309,424 to 730,395 people. 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).

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 1

TOWN OF PALMER LAKE

HISTORICAL POPULATION [1)]

Year	El Paso County	Town of Palmer Lake
1970	235,972	947
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

1) Census population

The above table shows that between 1980 and 2020, the total County and Town population increased dramatically. The population of Palmer Lake grew the most dramatically in the 1990's with growth slowing due to the limits on available water supply.

2. 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 most recent population projection data from the SDO, dated October 2021, reflects an increasing trend occurring within El Paso County over the next 25 years with a steady population increase through 2045 ranging from 1.2% (2020 to 2025) per year to 0.8% (2040 to 2045) per year. 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 is available.

The pressure for growth within Palmer Lake and subsequently to the Town's water system are strong. The construction of the Interstate 25 Gap project between Monument and Castle Rock has relieved 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 taps at 1,060. A moratorium by the Town was implemented in September 2020. The 2020 Water Resources Study conducted a more detailed evaluation of the available water supply and reset the number of available taps at 1,145. As noted previously, not all of the Town is served by the Town's water system. Currently, 141 residential and commercial water wells have been constructed within the Town limits. These existing wells could potentially be replaced with potable water from the Town's system. A new comprehensive plan is being prepared for the Town by Community Matters Institute. Preliminary estimates put the buildout scenario at 1,659 residential taps. For the purpose of this report, a Town growth rate equal to the SDO's county-wide growth rate is used.

The following Table 2 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 2045 are seen as being relatively conservative. Also presented is the preliminary population buildout estimate from the Community Matters Institute comprehensive plan. The following population projections for the Town's water system reflect the service areas population including those currently on private wells.

TABLE 2

TOWN OF PALMER LAKE

POPULATION PROJECTED ESTIMATES

Year	El Paso County [1]	Town of Palmer Lake [2]
2020	731,641	2,637
2025	778,050	2,804
2030	832,460	3,000
2035	885,399	3,191
2040	930,818	3,355
2045	966,946	3,485
Buildout [3]	-	3,670

1) Population forecasts from State Demographers Office, October 2021
2) Town growth rate based on countywide projections includes private properties served by private wells.
3) Preliminary Buildout population estimate by Community Matters Institute

Based on these population projections, the Town's population is projected to increase from a 2020 census population of 2,637 people to 3,485 people in 2045, an increase of 32%. The average household size within the Town of Palmer Lake is 2.35 people per household

based on the current number of residential taps plus the current number of residential private wells.

L. LAND USE AND DEVELOPMENT

The Town of Palmer Lake, located along the populous Front Range, reflects land use patterns within rural Colorado communities that are experiencing growth pressures from nearby metropolitan areas. Commercial activity occurs within the community and is centralized primarily along Colorado Highway 105, which also serves as the Town's main street. No significant industrial activity currently exists within the immediate area.

The growth projected for the community is anticipated to be accommodated by infilling within the Town's present incorporated limits. Departures from the current land use patterns established within the community may be recommended based on the findings of the comprehensive plan currently being developed. Also, there is a potential to serve existing residential customers having private wells.

M. HISTORIC AND ARCHAEOLOGICAL RESOURCES

A review of the National Register of Historic Places for Palmer Lake and El Paso County was conducted. Multiple structures, including several historic schools, are listed on the National Register, but are not located in the immediate vicinity of Palmer Lake. The historic Estemere Estate Mansion on Glenway Street was constructed in 1887; however, this property is not listed on the National Historic Register. There are no listed or identified archeological or pre-historic sites identified within the Town of Palmer Lake.

N. EQUIVALENT RESIDENTIAL USERS

The Town of Palmer Lake's water system service area is limited to the incorporated limits of the Town and excludes the areas of Town along Highway 105 served by private wells. The Town's service area consists primarily of residential housing with some commercial activities along Highway 105. All customers are metered and billed. Currently, the Town has 1,015 customer accounts. Of this total, 5 accounts are inactive, 12 are commercial, 11 are irrigation, and 992 are residential.

An equivalent residential user (EQR) evaluation is used to establish an equitable method for analysis and comparison of water system usage. One (1) EQR represents the typical amount of water use by a typical residential home. One EQR determination method uses the cross-sectional area of the service line size for establishing a service EQR. Thus, a typical ¾-inch service has an EQR of 1.0, a 1-inch service has an EQR of 1.78 (0.78% more service line size over a ¾-inch service), and so on. The following table is an EQR summary for the Town's water system service area.

TABLE 3
TOWN OF PALMER LAKE
EQR TABULATION

Service Size	EQR	Services	EQR Total
¾-inch	1.00	1,000	1,000
1-inch	1.78	12	21.3
1½-inch	4.00	2	8.0
2-inch	7.11	1	7.1
Total		1,015	1,036

The Town of Palmer Lake has a total of 1,015 customer accounts which equates to 1,036 EQRs.

SECTION IV
EXISTING WATER SYSTEM

A. BACKGROUND

A field review of the Town's existing water system was undertaken within the course of this study effort. A list of information requested on the Town's water system was provided to Town representatives prior to an on-site field review.

As previously discussed, the Town has maintained its own water system since around the time of its first water right in 1881. The original distribution system has been extended and replaced over the last century. 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 newly 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 a new 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 water resources evaluation for the Town of Palmer Lake was prepared by the consultant in 2021. The evaluation summarized the Town's current water rights status and water system capacity. The report established a maximum available water tap count at 1,145 serviceable taps under worst case conditions. Also recommended was the quantification and reporting of Town water pumped by private wells within the limits of the Town. Findings and recommendations of the water resources evaluation are incorporated into this report.

Figure 7 in the back of this report depicts the Town's existing potable water system. A detailed geographic information system (GIS) map has been compiled of the Town's water systems by GMS, Inc., Consulting Engineers. This provides the Town with a comprehensive mapping and management system for the water system.

B. WATER SUPPLY

The Town of Palmer Lake derives its water supply from both surface water and groundwater sources. The original surface water system was developed in the late 1880's with the construction of the Glen Park Reservoir. Ground water supplies have more recently been developed to meet the growing demands of the Town and declining surface water supply availability.

The 1987 Water Use Study recommendation to adjudicate Denver Basin water rights below the footprint of the Town has been completed. Town Ordinance 8-85 (1985) claimed all nontributary and not-nontributary groundwaters underlying the corporate limits of Town, in the Dawson, Denver, Arapahoe, and Laramie-Fox Hills Aquifers. The ordinance also allowed for property owners to drill private wells if Town facilities are not available to provide water supply. Currently, 141 private wells have been installed within the Town drawing groundwater from the Town's water rights. The majority of the wells are located in the southeast quadrant of Town. An exception to these private wells allowed by Town Ordinance 8-85, the Pioneer Preserve development was built using a stand-alone water court decree and augmentation plan. However, this development still uses Town owned groundwater below the development.

The following is a summary of the Town's surface water and groundwater rights. This discussion is an excerpt from the 2021 Water Resources Evaluation.

1. Surface Water Rights

The Town's surface water rights consist of the following:

- Anchor Ditch No. 1 - 0.89 cubic feet per second (cfs), being decreed for domestic use. This ditch right is augmented under Water Court Case 87CW069 using non-tributary groundwater sources.

- Anchor Ditch No. 1 for 0.89 cfs is decreed for railroad and industrial use. This water right is leased by the Town presumably for filling Palmer Lake and is not available for use in the Town's domestic water system.
- Monument Ditch having a 2.74 cfs right for irrigation use. This right is also not available for the Town's domestic water system.
- Palmer Lake Water System right for 2.19 cfs. This pipeline structure right is decreed for municipal use and is augmented by Water Court Case 87CW069 using non-tributary groundwater.
- Glen Park Reservoir has a storage right of 147.5 acre feet (AF). This storage right is decreed for municipal use. Any out-of-priority usage is augmented under Water Court Case 87CW069 using non-tributary groundwater.
- Palmer Lake Exchange Right. This right is decreed for all beneficial usage. All out-of-priority diversions are augmented under Water Court Decree 87CW069. Augmentation is limited to using non-tributary Denver aquifer wells up to 3.08 cfs and 426 AF per year, and using non-tributary Arapahoe aquifer and Laramie-Fox Hills aquifer wells up to 3.08 cfs and 426 AF per year.

The Anchor Ditch water right owned by the Town (0.89 cfs), the Town of Palmer Lake Water System water right (2.19 cfs), and the Glen Park Reservoir storage right (147.5 AF) can be used for municipal purposes by the Town. The Monument Ditch water right (2.74 cfs) and the Anchor Ditch railroad water right (0.89 cfs) are decreed for irrigation, railroad and industrial use. These rights have not been converted in Water Court. A filing for conversion to municipal use in Water Court would need to demonstrate ten years of historical irrigation use. The 0.89 cfs of Anchor Ditch right owned by the Town equates to 575,000 gallons per day, if available. The Palmer Lake Water System water right was 45% out-of-priority over the period from April 2020 through March 2021; thus, indicating a limited physical availability for water from North Monument Creek. This represents, in general, to be insufficient for water requirements beyond the diversion capabilities of the senior Anchor Ditch and Monument Ditch rights. The Glen Park Reservoir storage right was 67% out-of-priority over the period from April 2020 through March 2021. Thus, it is subject to being called out frequently by downstream senior water rights holders. However, it has considerable value to the Town since it can fill during periods of higher run-off and provide carry over storage to help meet winter demands.

2. Groundwater Rights

Groundwater rights decreed to the Town are summarized in the following table.

TABLE 4
TOWN OF PALMER LAKE
GROUNDWATER RIGHTS

Aquifer	Classification	Well No.	Status/ Permit	Annual Limit, AF/yr[1)]	Annual Limit, gpd [2)]	Pumping Limit, gpm [3)]	Actual Pumping Rate, gpm	Notes
Laramie-Fox Hills	Nontributary	LFH-1	Not Constructed	183	163,000	150	-	Limited to non-tributary Laramie-Fox Hills underlying 1,837 acres of 1,990 acres in deemed consent area. Remaining non-tributary Laramie-Fox Hills is reserved for post pumping replacement for Pioneer Reserve.
		LFH-2	Not Constructed	183	163,000	150	-	
Arapahoe	Nontributary	A-1	Not Constructed	462 [4)]	412,000	350	-	Limited to non-tributary Arapahoe under 1,735 acres of 1,990 acres in deemed consent area.
		A-2	Constructed 56816-F	462 [4)]	412,000	350	240-350	
		A-3	Not Constructed	462 [4)]	412,000	350	-	
Denver	Nontributary and Not-Nontributary	D-1	Not Constructed	82.8	74,000	200	-	Limited to non-tributary Denver under 1,617 acres of 1,990 acres in deemed consent area. Limited to Not non-tributary Denver under 220 acres of 1,990 acres in deemed consent area.
		D-2R	Constructed 31264-F-R	281	251,000	200	100-200 [5)]	
		D-3	Constructed 55261-F	72.5	65,000	200	0 [6)]	
Dawson	Not-Nontributary	DA-2	Not Constructed	595	531,000	400	-	Limited to not non-tributary Dawson under 1,836.5 acres of 1,990 acres in deemed consent area.
		DA-4	Not Constructed	595	531,000	400	-	
Aquifer	Classification	Well No.	Status/ Permit	Annual Limit, AF/yr[1)]	Annual Limit, gpd [2)]	Pumping Limit, gpm [3)]	Actual Pumping Rate, gpm	Notes
Monument Creek Alluvium	Tributary	QAL-4	Not Constructed	161	144,000	100		Augmentation and exchange by non-tributary Denver and Triview WWTP.

Available Total	3,539.3	3,158,000	2,850		
Current Available	743	663,000	550	340-550	

1) AF/yr - acre-foot per year (325,850 gallons per year)
2) gpd - gallons per day
3) gpm - gallons per minute
4) Maximum withdrawal from three combined Arapahoe wells limited to 1,386 AF/yr
5) Existing Well D-2 has limited production capacity due to a corroded screen. A replacement well is currently being constructed. The replacement well is scheduled to be completed and on line in the summer 2022.
6) Well D-3 does not have a pump. Upon completion, the well produced only 60 gpm.

From the previous table, the Town has a total groundwater right of 3,529.3 AF per year. Out-of-priority diversions from the Anchor Ditch right, Town of Palmer Lake Water System right, and Glen Park Reservoir storage right are replaced with water from the non-tributary Laramie-Fox Hills, Arapahoe and Denver aquifers. The replacement is limited to 3.09 cfs.

Town Ordinance 8-85 allows for installation of private wells when Town water facilities are not available to provide potable water service. Thus, the Town has consented to withdrawals from the Town's groundwater rights for these private wells. A tabulation of private wells within the corporate limits of the Town is presented in the 2021 Water Resources Evaluation by GMS, Inc. This tabulation of private wells may not include older wells that have not been permitted, if any. Of the 151 private well records compiled, 141 are listed as constructed and 10 are listed as having the permit issued, received or extended. Of the 151 wells, 143 are in the Dawson aquifer, 5 in the Denver aquifer and 3 in the Arapahoe aquifer. Most of the wells are exempt domestic or household use only wells used for a single-family residential home. Annual withdrawal limits range from 0.16 AF to 200 AF. Pumping rate limits range from 6 gpm to 250 gpm. The following table presents the reduction in Town groundwater rights consented to private wells and the net remaining Town groundwater rights.

TABLE 5

TOWN OF PALMER LAKE

NET GROUNDWATER RIGHTS

Aquifer	Town Water Rights, AF/yr [1)]	Consented To Private Wells, AF/yr	Net Town Water Rights, AF/yr
Laramie-Fox Hills	366.0	0.0	366.0
Arapahoe	1386.0	73.0	1313.0
Denver	436.3	213.5	222.8
Dawson	1190.0	117.5	1072.5

1) Acre feet per year

Most individual private wells require metering and reporting. Of the 151 private well records, 27 are required to be metered and readings provided to the DWR (21 of these to be reported only when requested); 69 are required to be metered and readings provided to the Town (one of these only is to provide the information upon request by the Town); and 55 have no metering requirements.

Water in the Denver Basin aquifers is finite and being mined throughout the basin by municipal, commercial, industrial and residential wells. Water levels throughout each aquifer are dropping. The DWR manages basin aquifer wells through the permitting process under the 100-year life policy. This limits annual withdrawals to 1% of the aquifer water underlying a defined area. The DWR publishes an annual report titled "Groundwater Levels in the Denver Bedrock Aquifers". The 2020 report indicates that the Dawson and Denver aquifers, from 2019 to 2020, in the vicinity of Palmer Lake, have dropped by greater than 16 feet, and the Arapahoe has gained greater than 12 feet of water level. No water level monitoring of the Laramie-Fox Hills aquifer is located within the vicinity of Palmer Lake.

3. 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 cfs (575,000 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 can be replaced for out-of-priority diversions with non-tributary water via the adjudicated exchange plan.

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). Thus, the Town has 4,650,000 gpd in domestic water supply rights. This, of course, does not represent the amount of water that can be physically provided.

4. Summary of Available Supply

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

The 2021 Water Resources of Evaluation presented an update of available surface water supplies. Data from the Monument stream gauge station MONPALCO 017103747 was used for historical minimum stream flows available at the Lower Glen Park Reservoir. Monthly stream flows in cfs were converted AF. The SW-WTP diversions were added to the stream flows to represent total flow conditions. The Lower Glen Park Reservoir flows were estimated by the ratio of total watershed area at the lower reservoir to the watershed area of the gauging station. A recurrence frequency analysis of minimum monthly flows was conducted for the 16 years of full record using A log-Pearson type III distribution. The minimum monthly flows range from 0.21 cfs (2011) to 2.45 cfs (1984). The 95% probability low flow was calculated at 0.2004 cfs (0.397 AF/d). This equates to 11.9 AF per month. Subtracting out the Glen Park Reservoir minimum month evaporation, (3.59 AF, July, Table C, Case 13CW3061), and the Colorado Water Conservation Board (CWCB) minimum stream flow discharged, (July, 2.56 AF per month, paragraph 19g, Case 13CW3061), leaves 5.75 AF per month available for Town use of the Anchor Ditch right (assumes Town of Palmer Lake Water System Right is called out). This minimum calculated available surface water supply of 5.75 AF per month equates to 60,400 gallons per day (gpd); worst-case. The lower surface water yield calculated was driven primarily by dry years occurring in 2008 and 2011 which were not previously considered. Note that the stream flow data for the historic 2002 drought was not available from this stream gauge station.

Under a worst-case condition with only 60,400 gpd in a 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 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 2020 average day demand for Palmer Lake was 0.55 AF per day. Thus, the reservoir storage could provide surface water supply for up to 294 days [45 AF storage/(0.397 AF/d inflow – 0.55 AF/d demand -0.127)], assuming the reservoir starts the year full.

The Town's groundwater rights far surpass its ground water well capacity. The Town's A-2 well is 2,233 feet deep into the Arapahoe aquifer. The well pumps at a maximum rate of 300 gpm. The newly constructed D-2R replacement well is 1,630 feet deep into the Denver aquifer. 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 ground water treatment plant (GW-WTP). With a combined capacity of 500 gpm, the two wells could produce 720,000 gpd. With the larger capacity well out of service the available ground water capacity is 288,000 gpd. The GW-WTP has a total capacity of 500 gpm, or 720,000 gpd.

Under worst-case surplus water right conditions of 5.75 AF per month (60,400 gpd), and worst-case ground water 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 original D-2 well was constructed in 1987 into the Denver Formation under permit number 31264-F. The well is 1,793 feet deep with 10-inch diameter steel casing and seven screened intervals between 1,050 feet and 1,640 feet in depth. The well was equipped with a 100-hp, 200 gpm Hitachi pump. The well pump has a variable frequency drive for flow control. Discharge from the well is to the D-2 well house. Originally the ground water was disinfected at the well house; however, in 2007 the D-

2 well was piped to the GW-WTP for filtration and disinfection. Within the last decade, flows from the D-2 well had declined. Inspections of the well determine that the well casing had failed. The replacement D-2R well was constructed in 2021 and equipped in 2022. The D-2R well is located approximately 50 feet northeast of the original D-2 well. It was drilled to a depth of 1,630 feet with 10-inch steel casing to 869 feet and 14 screened intervals between 825 feet and 1,590 feet in depth. It is equipped with a 150-hp, 200 gpm pump and variable frequency drive. The D-2R well currently awaits CDPHE approval for use.

The A-2 well was constructed in 2002 into the Arapahoe Formation concurrently with the GW-WTP. The well has a permanent number 56816-F. The well is 2,270 feet deep with 10-inch steel casing and 11 screened intervals between 1,710 and 2,212 feet in depth. The well pump was replaced in 2018 with a 300-hp, 300 gpm Summit submersible pump. The pump has a variable frequency drive for flow control. Discharge from the A-2 well is to the A-2 well house, thence to the GW-WTP for filtration and disinfection.

The Woodmoor Water and Sanitation District (WWSD) is heading up a regional project called "The Loop". This project, which would create a regional treated water supply system, is still in the conceptual stage. The Loop would use the WWSD Chilcott water rights and divert water from Fountain Creek. This renewable source of water would be treated and pumped to Loop participants in northern and eastern El Paso County. Current Loop participants include the Cherokee Metropolitan District, WWSD and the Town of Monument. The Loop concept is to commit water rights from each participant within an adjudicated exchange plan for augmentation of surface water depletions. This project is open to the Town of Palmer Lake to participate. The Loop, while conceptual at this point, would provide a renewable source of water supply to water providers in the northern parts of the County that are dependent on finite ground water supplies.

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 7. The facility treats surface water piped in from Glen Park Reservoir. The original facility was constructed in the 1960's. In 2007, chlorine dioxide addition to the raw water was started in order to reduce the disinfection by-product formation potential and reduce taste & odor (T&O) from the raw water. The filtration equipment was replaced in 2012 with two (2) Pall Aria AP-4 microfiltration units with 22 modules each. The two skid mounted treatment units are each rated at 350 gpm. In the winter the WTP is run at 50 gpm. The firm capacity of the WTP is 350 gpm with one skid required for redundancy.

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.

The pre-strainer is equipped with an automatic cleaning system that automatically back flushes the strainer every 2.5 hours or on a high differential pressure condition. The microfiltration units also have a 400-micron automatic cleaning strainer ahead of the membrane modules. The microfiltration units are typically alternated every few days. A flux maintenance cycle consisting of an air and water backwash is conducted weekly during the summer. A full clean-in-place chemical cleaning is conducted on the microfiltration modules typically monthly. Pre-chlorine dioxide addition is typically dosed at 0.4 mg/l in the winter and 1.0 mg/l in the summer to reduce T&O conditions. Chlorine solution for disinfection is typically dosed at 1.4 mg/l.

The SW-WTP is in good operating condition and well maintained.

2. Groundwater Treatment Plant, GW-WTP

The Town's GW-WTP is located on the north side Lomand Mountain at the end of Spruce Avenue as shown of Figure 7. This facility treats water from the Town's A-2 Well and D-2R Well. The facility was constructed in 2002 to treat water from the A-2 Well. The D-2 Well was subsequently piped to the facility in 2007. The D-2R replacement well is scheduled to be put into service in summer 2022. This filtration plant provides iron oxidation and filtration of the groundwater supply. High levels of radium in the raw water are also removed with the oxidation of the iron.

As water enters the facility it is chlorinated using 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 original facility utilized a breakpoint chlorination method for nitrate removal; however, this process has not been used since the facility was started. Backwash water flows to a 20,000-gallon tank inside the WTP building. The decant from the backwash waste storage tank is recycled back through the filters. Accumulated sludge in the backwash waste tank is discharged to an outside buried concrete tank. This waste material is removed periodically for disposal. The filtration equipment is rated at 250 gpm per filter. Disinfection contact piping outside of the WTP consists of approximately 400 feet of 24-inch piping.

Overall, the facility is in good operating condition and well maintained.

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 on Figure 7. 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 was constructed in 2019 on the east side of High Zone Tank No. 1. This 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-foot 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-foot in diameter, 24-foot high, and has a capacity of 500,000 gallons. The tank was constructed in 2002 with the GW-WTP. The Low Zone Storage Tank is 166 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 tank vent is currently being replaced with a frost proof vent.

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. The Low Zone Tank booster pump station can be operated remotely from the Town's SCADA system.

E. WATER DISTRIBUTION SYSTEM

The Town's water distribution system is depicted on Figure 7 in the back of this report. Figure 7 (3 sheets) was prepared using system as-built and construction drawings provided by the Town. The Town has been aggressively replacing older segments of piping within the system over the last 10 years. The majority of the system consists of PVC piping; however, some segments of old lead joint pipe remain in service.

Distribution piping ranges in size from 2-inch to 12-inch diameter. Disinfection contact piping at both the SW-WTP and GW-WTP is 24-inch diameter piping. 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 typical depth of cover on the distribution system piping is 5.5-feet. This depth is below the maximum frost depth.

Replacement of the remaining lead joint piping within the system has been the Town's priority for water system improvements. These segments as well as other problematic segments of the existing distribution system are included in the recommended improvements of this report.

The distribution system operates as a single pressure zone with gravity storage provided by the two high zone storage tanks. There are no pressure reducing valves within this system. 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. In the center of Town near the Town Hall the system pressure is approximately 125 psi.

The East and West sides of Town, as divided by Highway 105, are connected at two locations with 10-inch PVC pipes; on the north at County Line Road, and on the south at Vale Street.

The Town has 166 fire hydrants throughout its service area. Fire hydrants located within the community are shown on Figure 7. All hydrants are reported to be in good operating condition and are typically exercised annually. The typical fire hydrant spacing is 400 feet.

Distribution system valving is shown on Figure 7. Valving provides the system operator the ability to isolate and shut down a segment of the distribution system for maintenance and repairs. The system operator noted that all valves within the water system are in generally good operating condition. Valves are typically exercised annually.

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 to issue monthly water bills. Meters are located within in-ground meter pits. Meters and service lines are typically ¾-inch in size. The Town has twelve 1-inch, two 1½-inch, and one 2-inch meters, as previously presented in Table 3. Service lines are typically copper pipe extending from the meter to the water main in the street. There are no lead service lines within the Town's system.

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 Water System Supervisor and are provided to the 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. Flux maintenance waste is also metered.

G. OPERATIONS AND MAINTENANCE

The Town of Palmer Lake operates its water system in conformance with the CDPHE, Water Quality Control Commission's (WQCC) Regulation 11, Colorado Primary Drinking Water Regulations. The Town has been assigned Public Water System Identification Number CO-0121575.

1. Organizational Description

Water system operations are conducted by the Town's Operator-of-Responsible Charge and a staff of two employees. Based on WQCC Regulation 100, the Town's water system requires a minimum Colorado certified Class "A" treatment operator and a Class "1" distribution system operator to oversee its operations. The Town's water operator holds a Class "A" treatment certification and a Class "4" distribution certification which are at levels equal to and above the required levels. The Town of Palmer Lake's water system organizational structure is fairly simple. The water system is managed under the authority of the Town Board of Trustees. The Town Administrator reports to The Town Board. The Water System Supervisor reports directly to the Town Administrator on day-to-day operations, maintenance issues, and other system concerns. The Town Administrator provides support for the Town Board of Trustees and Water System Supervisor. The Town Deputy Clerk collects and posts all water system revenues and expenditures.

2. Record Keeping

Water system record keeping is conducted in accordance with the requirements of the CDPHE Water Quality Control Division (WQCD) including water quality monitoring reports,

operating reports and maintenance and financial records. Operational, reporting and compliance records are maintained by the operator.

3. Operator-of-Responsible Charge

The operation of public water systems is regulated by the WQCD under Regulation 100. The Town's Water System Supervisor holds a Class "A" treatment and Class "4" distribution certification and serves as the Operator-of-Responsible Charge.

4. Cross-Connection Control Plan

The Town has implemented a Cross-Connection Control Plan in accordance with Regulation 11, Section 11.39(2)(a) of the Colorado Primary Drinking Water Regulations (5CCR 1002-11). There are 64 individual backflow preventors on service lines within the Town's service area. The Water System Supervisor administers this program.

5. Routine Operations and Maintenance

System operations and maintenance is conducted by the Town's Water System Supervisor. Water system breaks, repairs and meter related issues are handled by the Water System Supervisor with support provided by a local contractor, as needed. The Town maintains standard operating procedures for routine and emergency operations. The overall system is monitored, controlled and alarmed with a supervisory control and data acquisition (SCADA) system. The SCADA system monitors the high-zone storage tank levels. The low-zone booster pump station and GW-WTP are started on a demand call for water. The SW-WTP is typically run manually to meet base line usage demands. The following is a list of routine operation and maintenance activities conducted by the Water Superintendent and staff:

- Check and adjust WTP Operational Systems ..... Daily
- Check operations of well pumps ..... Daily
- Check and record master meters ..... Monthly
- Read and record customer meters ..... Monthly

- Chlorine residual testing ..... Monthly
- Replace meters ..... As needed
- Respond to and repair line breaks ..... As needed
- Water quality compliance monitoring ..... Per monitoring schedule

SECTION V
HISTORICAL AND PROJECTED WATER CONSUMPTION

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. These parameters were then used to project future demands on the water system based on service area population projections.

Total monthly water sales data was provided by the Town for the period from January 2018 through December 2021. Total monthly production data for the GW-WTP and SW-WTP was provided for the period from January 2017 through December 2021.

The following table is a summary of water production from the Town's two WTPs for the last three years.

TABLE 6
TOWN OF PALMER LAKE
WATER PRODUCTION

Month	Surface Water, gal.	Well D-2, gal.	Well A-2, gal.	Total Production, gal.
Jan 2019	4,460,000	0	0	4,460,000
Feb 2019	3,652,000	0	0	3,652,000
Mar 2019	4,353,000	0	0	4,353,000
Apr 2019	4,387,000	0	0	4,387,000
May 2019	3,784,000	0	1,459,000	5,243,000
Jun 2019	2,593,000	771,000	3,032,000	6,396,000
Jul 2019	2,815,000	4,704,000	0	7,519,000
Aug 2019	2,878,000	4,959,000	0	7,837,000
Sep 2019	2,930,000	2,822,000	0	5,752,000
Oct 2019	2,802,000	1,860,000	0	4,662,000
Nov 2019	2,444,000	2,235,000	0	4,679,000
Dec 2019	2,592,000	1,552,000	0	4,144,000
Total 2019	39,690,000	18,903,000	4,491,000	63,084,000
% of Total	62.9%	30%	7%	
Jan 2020	2,763,000	1,313,000	0	4,076,000
Feb 2020	2,775,000	1,428,000	0	4,203,000
Mar 2020	3,323,000	952,000	0	4,275,000

Month	Surface Water, gal.	Well D-2, gal.	Well A-2, gal.	Total Production, gal.
Apr 2020	3,769,000	518,000	0	4,287,000
May 2020	4,302,000	1,265,000	0	5,567,000
Jun 2020	4,503,000	2,267,000	0	6,770,000
Jul 2020	3,101,000	4,545,000	0	7,646,000
Aug 2020	2,853,000	4,517,000	0	7,370,000
Sep 2020	2,822,000	3,250,000	0	6,072,000
Oct 2020	2,977,000	1,634,000	1,011,000	5,622,000
Nov 2020	3,041,000	0	1,850,000	4,891,000
Dec 2020	2,910,000	0	2,045,000	4,955,000
Total 2020	39,139,000	21,689,000	4,906,000	65,734,000
% of Total	59.5%	33%	7%	
Jan 2021	2,673,000	0	3,146,000	5,819,000
Feb 2021	2,345,000	0	2,769,000	5,114,000
Mar 2021	3,677,000	0	1,824,000	5,501,000
Apr 2021	4,138,000	0	85,000	4,223,000
May 2021	4,872,000	0	0	4,872,000
Jun 2021	4,901,000	0	1,991,000	6,892,000
Jul 2021	4,476,000	0	1,901,000	6,377,000
Aug 2021	4,297,000	0	3,914,000	8,211,000
Sep 2021	1,926,000	0	4,576,000	6,502,000
Oct 2021	1,972,000	0	2,877,000	4,849,000
Nov 2021	1,919,000	0	2,363,000	4,282,000
Dec 2021	1,981,000	0	2,483,000	4,464,000
Total 2020	39,177,000	0	27,929,000	67,106,000
% of Total	59.6%	0%	42%	

Total well production in 2021 was 27.9 million gallons (MG), or 85.7 ac-ft,(100% from A-2 well). The 2021 SW-WTP production was 39.2 MG, or 120 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.

Total water production has increased over the last 3 years due primarily to an increase in the number of customers. Filter backwash water at both WTPs uses treated water from the distribution system. Spent backwash water at the GW-WTP is recycled. At the SW-WTP, backwash water amounts to approximately 4.5% of the total throughput. Backwash water is discharged to the Palmer Lake Sanitation District sewer system.

Historically, the D-2 well and the A-2 well were alternated and not run together, however, they could be run simultaneously at a combined rate of 500 gpm. The D-2 well was taken offline in November 2020. The D-2R replacement well is expected to be put into service in the summer of 2022.

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 2019 through 2021.

TABLE 7
TOWN OF PALMER LAKE
METERED WATER SALES

Month	2019		2020		2021	
	Production [1], gal.	Sales [2], gal.	Production [1], gal.	Sales [2], gal.	Production [1], gal.	Sales [2], gal.
January	4,460,000	6,411,800	4,076,000	3,208,000	5,819,000	3,606,500
February	3,652,000	3,242,500	4,203,000	3,409,500	5,114,000	3,566,700
March	4,353,000	3,467,900	4,275,000	3,760,000	5,501,000	3,114,700
April	4,387,000	3,243,200	4,287,000	3,176,900	4,223,000	3,202,600
May	5,243,000	4,694,500	5,567,000	3,876,400	4,872,000	3,170,300
June	6,396,000	4,063,000	6,770,000	5,315,300	6,892,000	4,390,700
July	7,519,000	5,090,000	7,646,000	6,065,700	6,377,000	5,536,600
August	7,837,000	4,996,800	7,370,000	5,641,200	8,211,000	6,207,100
September	5,752,000	5,358,500	6,072,000	5,784,000	6,502,000	5,626,700
October	4,662,000	4,098,200	5,622,000	4,692,000	4,849,000	4,354,200
November	4,679,000	3,293,900	4,891,000	3,888,600	4,282,000	3,472,400
December	4,144,000	3,314,600	4,955,000	3,313,900	4,464,000	3,102,500
Total, gal.	63,084,000	51,274,900	65,734,000	52,131,500	67,106,000	49,351,000
WTP backwash waste, gal. [3]	2,920,000	-	2,928,000	-	2,920,000	-
WTP Production, gpd [4]	164,833		171,601		175,852	
Water Sales, gpd [4]		140,479		142,826		135,208
Unaccounted-for-water, % [5]	14.8%		17.0%		23.1%	
Water Customer Taps	981		1,003		1,015	
Gallons per Tap per Day	168.0	143.2	171.1	142.4	173.3	133.2

1) Total raw water from Glen Park Reservoir, Well A2, and Well D2.
2) Total Metered water sales. Note that the data straddles months so monthly loss not accurate, annual loss more accurate.
3) Based on daily use of 8,000 gpd at the Surface Water WTP. A high percentage of the back wash waste at the Groundwater WTP is recycled.
4) gpd = gallons per day, average
5) Unaccounted-for-water is WTP production minus water sales divided by WTP production. 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.

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 2021, net production averaged 175,852 gallons per day (gpd). This total production was similar in 2020 and slightly lower in 2019.

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 pipe line leaks and breaks within the distribution system. These loss factors are not quantifiable. An unaccounted-for water value of 15% to 20% is not unreasonable. Values of 30% to 40% are not uncommon. 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 2019 through December 2021. The comparison indicates unaccounted-for water raged from 14.8% in 2019 to 23.1% in 2021. This amounts to an average water loss of 30,000 gpd. This is not unusually high for a system having older segments of piping, noted system breaks, and reported high fire department training use. With consideration of continued unaccounted-for-water fire training usage, in all likely hood, the actual unaccounted-for-water percentage for the Town is in the 15-20% range. Therefore, water demand projections presented in this section are based on 2021 metered water sales, and an assumed 20% unaccounted-for-water percentage.

The maximum month of water production occurred in August 2021 and totaled 8.2 MG. This represents a maximum month factor of 147% of average day demand. Maximum daily demand conditions occur during the summer months when conditions are dry and outdoor water usage is elevated. Daily water production was not available. However, the Town's operator has indicated that up to 500,000 gpd has been produced by both WTPs. Thus, the maximum day demand peaking factor is estimated at 284% 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 for 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 350% of average day has been selected as being representative of peak hour conditions.

The following table is a summary of the baseline water use parameters used in this report for the Town of Palmer Lake's water system in projecting future water demand conditions.

TABLE 8

TOWN OF PALMER LAKE

BASELINE WATER USE PARAMETERS

Parameter	Value
Average daily WTP production, gpd	169,000
Average daily water sales, gpd	135,208
Unaccounted-for-water	20.0%
Maximum monthly water usage [1)]	147%
Maximum daily water usage [2)]	284%
Peak hour water usage [2)]	350%
Service area taps	1,015
Service area population [3)]	2,331
Per capita water production, gpcd [4)]	72.5

1) August 2021
2) Estimated
3) Based on 992 residential taps and 2.35 people per household
4) Gallons per capita per day. Includes commercial and industrial uses.

Using the baseline water use parameters presented in the previous table and the population projections from Table 2, the existing and estimated future water demand requirements for the Town's water system are presented in the following table. Water projection estimates are presented for existing, future, and Town build-out conditions. Additional demand estimates are also presented for the condition where the existing private wells, within the Town boundaries are provided Town water with the extension of the distribution system to serve these areas.

TABLE 9

TOWN OF PALMER LAKE

EXISTING AND PROJECTED WTP DEMANDS [1]

Condition [2]	Service Area Population	Average Day Demand [3], gpd	Maximum Day Demand [4], gpd	Peak Hour Demand [5], gpm
Existing - 2021	2,331	169,000	480,000	411
Future - 2025	2,499	181,200	514,600	440
Future - 2030	2,696	195,400	554,900	475
Future - 2035	2,886	209,200	594,100	508
Future - 2040	3,050	221,100	627,900	537
Future - 2045	3,180	230,600	654,900	560
Future - 2045 plus service to residents with existing private wells	3,485	252,700	717,700	614
Buildout	3,365	244,000	693,000	593
Buildout plus service to residents with existing private wells	3,670	266,100	755,700	647

1) Water treatment plant production. Well production estimated at 4.5% higher to account for SW-WTP Backwash
2) Assumes estimated population of 306 people served by 141 private wells will remain unchanged, except for conditions noted to provide water services
3) Average day demand from WTP = population x gpcd
4) Estimated maximum day demand = 284% of average day demand
5) Estimated peak hour demand, gpm = 350% of average day demand/1440

SECTION VI
FUTURE WATER SUPPLY REQUIREMENTS

A summary of the Town's adjudicated water rights is presented in section IV. B. of this report. Details of Town water rights are presented in the 2021 Palmer Lake Water Rights Evaluation report.

The Town's ground water supply is from non-tributary Denver basin aquifers. These aquifers are not naturally recharged. Ground water 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. Existing and future water demands are presented in Table 9 for both the existing service area and the expanded service area to include residence on private wells. The existing water system capacity is defined by available minimum stream flow, well flow rates, and treatment facility capacities.

A water treatment plant (WTP) is required to provide redundant treatment equipment when the facility is treating water to meet water quality standards of the Colorado Primary Drinking Water Regulations. This is the case for the SW-WTP providing filtration of surface water. Thus, the rated capacity of the SW-WTP is 350 gpm (one of two treatment trains). This SW-WTP rated capacity is well above the available minimum low flow of North Monument Creek. The GW-WTP with two 250 gpm filters provides iron and manganese removal from the deep wells. Iron and manganese are not regulated contaminants (although they have secondary maximum contaminant levels for aesthetic acceptability, and manganese has a health advisory at 0.3 mg/l). Thus, the rated capacity of the GW-WTP is 500 gpm. However, elevated raw water radium levels in the wells may require this facility to be a compliance required facility 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 to meet maximum day demand conditions. Under worst case conditions of low stream flow for the SW-WTP and both wells serving the GW-WTP, the firm water production capacity is established at 780,400 gpd. This is sufficient to meet future 2045 and buildout demand conditions presented in Table 9. However, with the larger capacity well out of service the combined WTP water production capacity reduced to 348,400 gpd. This capacity is below the existing maximum day demand conditions as present in Table 9. Also considered is the potential of the GW-WTP being classified as a required compliance facility. Under this

condition the total water production capacity is 420,400 gpd. This is also below the existing maximum day demand conditions as present in Table 9. Therefore, water supply and treatment capacity improvements are needed to meet future maximum day demand conditions. These needed improvements include:

- GW-WTP: Add third filtration train for redundancy increasing the rated capacity to 500 gpm for potential GW-WTP reclassification as a compliance facility.
- Supply: Construct new Denver Basin ground water well with minimum capacity of 212 gpm to provide ground water supply redundancy in order to meet future 2045 maximum day demands (not including service to in-Town private wells).

In order to meet future average day demand conditions, the Town needs to hold adequate water rights. Surface water rights have historically been sufficient in meeting annual demands. However, with declining runoff to the Glen Park Reservoir and more frequent senior water right calls, less of this lower cost supply has been available for water supply. As presented in the previous section of this report, the worst-case condition provides 60,400 gpd available to the SW-WTP. The Town's net available ground water rights are presented in Table 5. The Denver Aquifer has a net estimated ground water right of 222.8 ac-ft/yr after the Town consented private well rights are subtracted. The D-2R well in the Denver Aquifer has an annual limit of 281 ac-ft/yr. Thus, that the Denver Aquifer rights underlying the incorporated limits of the Town have been fully allocated to the consented private wells plus some of the annual limits on the D-2R well. The Arapahoe aquifer has an estimated net available ground water right of 1,313 ac-ft/yr after the Town consented private well rights are subtracted. This equates to 1.2 million gallons per day, which is more than sufficient in meeting future average day demand conditions. Therefore, from a water rights position, a new Denver Basin well would be best constructed into the Arapahoe Aquifer.

SECTION VII
EXISTING FINANCIAL STATUS OF THE WATER SYSTEM

The Town of Palmer Lake adopts a formal budget each fiscal year for its individual Town funds, including the water fund. A formal audit of the financial statements of the Town is conducted by an independent auditor. Audits for the years 2016 through 2020 were provided by the Town. The water fund is a stand-alone enterprise fund and is accounted for separately in the audit. The Town's adopted budgets for 2021 and 2022 were also provided by the Town.

The Government Funds receive income primarily from sales tax and property tax revenues. The water fund is a self-funded Enterprise Fund, which receives user charge revenues as its primary source of income. The Town has a 2020 assessed valuation of $38,305,380, which is established annually by the County Assessor. A property tax levy of 21.238 mills is applied to the assessed valuation with a 2021 property tax revenue estimated at $813,529. All property tax revenue is directed to the general fund. No property tax revenues or sales tax revenues are provided to the water fund.

From the data available from the Town's audits and budgets, an assessment of the water fund revenues and expenditures is made. The Town operates its water system within the financial framework of the Water Enterprise Fund which is run independently from the general fund as an enterprise fund as described under Article X, Section 20 of The State Constitution (TABOR).

The Town assesses monthly water charges to all connections to its system. The current water rate schedule was established by Town Resolution 2019-4. Rates are subject to an annual increase of 3% per year. The following table recaps the Town's current 2022 water use rates.

TABLE 10

TOWN OF PALMER LAKE

WATER RATES

Rate Category	Water Rate
Base Rate [1)]	3/4-inch water tap - $66.75 per month
	1-inch water tap - $87.68 per month
	1 1/2-inch water tap - $112.88 per month
	2-inch water tap - $165.14 per month
Use Surcharge	$7.85 per 1,000 gallons - 1 to 4,999 gallons per month
	$9.42 per 1,000 gallons - 5,000 to 9,999 gallons per month
	$11.31 per 1,000 gallons - over 10,000 gallons per month

1) Includes monthly base rate, capital improvements fee, and water loan payment fee

Water tap fees were established by Town Resolution 2019-11 and are subject to an annual increase of 3% per year. The following is a summary of the Town's 2019 tap fees schedule from the 2019 Resolution as adjusted to 2022 at 3% per year.

TABLE 11

TOWN OF PALMER LAKE

WATER TAP FEES 2022

Tap Size	Meter Type	Tap Fee
5/8-inch	Displacement	$21,855
3/4-inch	Displacement	$21,855
1-inch	Displacement	$40,033
1 1/2-inch	Displacement	$70,330
2-inch	Displacement	$106,685
2 1/2-inch	Displacement	$161,217
3-inch	Singlet	$203,632
	Compound, Class 1	$203,632
	Turbine, Class 1	$221,810
4-inch	Singlet	$312,699
	Compound, Class 1	$312,699
	Turbine, Class 1	$385,409

1) As increased from 2019 to 2022 at 3% per year

The following table provides a summary of the major categories of water fund revenues as extracted from the 2018 through 2020 audits and the 2021 through 2022 budgets.

TABLE 12
TOWN OF PALMER LAKE
WATER FUND REVENUES

Year	User Charges Revenues	Interest Revenue	Tap Fees	Misc. [3]	Total	Grants	Total with Grants
2018 [1]	$894,295	$7,530	$2,000	$15,930	$919,755	$0	$919,755
2019 [1]	$1,050,451	$8,580	$127,400	$18,522	$1,204,953	$50,000	$1,254,953
2020 [1]	$1,186,172	$2,716	$140,000	$17,962	$1,346,850	$0	$1,346,850
2021 [2]	$1,050,750	$8,800	$200,000	$6,500	$1,266,050	$0	$1,266,050
2022 [2]	$1,056,957	$3,000	$200,000	$6,500	$1,266,457	$0	$1,266,457

1) From 2018 through 2020 audits
2) Budget figures taken from the 2022 budget.
3) Includes late fees and other miscellaneous

The revenue table for the water fund shows user charge collections increasing from 2018 through 2022. This is reflective of the annual water rate increase and increasing number of water-taps on the system.

The following summary of expenditures covers the same period as that of the above revenue summary. It highlights the major categories of expenditures for the water system. As with the revenue summary, the expenditures detail the audited expenditures as provided in the 2018 through 2020, as well as the 2021 and 2022 budgets. This expenditure table also includes expenditures for capital improvement projects.

TABLE 13

TOWN OF PALMER LAKE

WATER FUND EXPENDITURES

Year	Wages and Benefits	Admini-strative [3]	Contract Services [4]	Utilities	Operations and Maintenance [5]	Debt (P&I)	Misc.	Total	Capital Outlay	Total with Capital Outlay
2018 [1]	$230,741	$47,548	$46,183	$90,979	$287,139	$105,308	$1,549	$809,447	$1,435,481	$2,244,928
2019 [1]	$299,603	$31,024	$91,437	$105,527	$154,258	$162,415	$2,451	$846,715	$346,676	$1,193,391
2020 [1]	$298,468	$34,767	$93,522	$122,703	$286,269	$186,618	$1,422	$1,023,769	$226,398	$1,250,167
2021 [2]	$387,165	$57,297	$99,500	$115,000	$185,110	$157,325	-	$1,001,397	$800,000	$1,801,397
2022 [2]	$454,797	$62,700	$127,500	$120,750	$382,370	$183,229	-	$1,331,346	$491,684	$1,823,030

1) From 2018 through 2020 audits
2) Budget figures taken from the 2022 budget.
3) Includes memberships, registrations, payment processing, office expenses, and insurance
4) Includes contract services and professional services
5) Includes Repairs and maintenance, operating supplies, reservoir and dam maintenance, and water quality tests

As indicated in the above table, the long-term obligation for debt payments reflects loan obligations. A 2009 loan obligation with the Colorado Water Resources and Power Development Authority (CWR&PDA) was for a $1,862,552 loan for water resources projects. This was for the SW-WTP treatment upgrades. This 20-year loan requires an annual payment of $104,941 with an annual interest rate of 2%. This loan will be retired in 2030.

The Town also holds a second loan with CWR&PDA in the amount of $1,100,000. This loan was executed in March 2018. This funding was for the purpose of the redrill of Town well D-2R and the new high zone storage tank. This 2% loan, with a 20-year term, has an annual payment of $68,168.

In May 2019, the Town made a direct loan to the water enterprise from the general fund in the amount of $500,000 to complete the new water storage tank project. This 20-year loan at 2% has initial interest payments only of $10,000 through 2023, a 2024 payment of $24,374, then $38,748 through 2035, and $27,124 through 2039.

The total annual debt burden on the Water Enterprise Fund is $183,229. This equates to an individual user debt burden of $14.74 per EQR per month. This debt burden increases to $17.04 per EQR per month in 2025.

The 2020 audit indicates that the Water Enterprise Fund has $887,278 of unrestricted cash and investments on hand. Based on the 2021 and 2022 budgeted surpluses (excluding the capital improvement budgets), the water fund should have $1,087,000 in unrestricted in cash and investments by 2022 year end.

SECTION VIII
EVALUATION OF EXISTING FACILITIES

In evaluating the adequacy of the Town's water system, the various discrete elements of the system are considered. This section reviews the Town's water supply, water quality, treatment, storage, distribution, and metering components. Recommended water system improvements to the Town's facilities are then drawn from this review.

A. WATER SUPPLY

An assessment of the Town's water supply capacity with respect to existing demands was presented in IV of this report. In summary, the Town has become more dependent on ground water supply over the last 2 decades. The surface water supply, while less costly to use, can no longer support the water demands of the Town. This is due to the long-term decline of surface water runoff to Glen Park Reservoir, increased priority right calls on Monument Creek and an increase in Town customers.

As presented in section VI, a new Arapahoe Aquifer well is needed to provide water well capacity redundancy and to meet future demands of the Town as it continues to grow. The recommended A-1 well is located in water court decree 86CW108 approximately 1,900 feet southeast of the existing A-2 well, on the top of Lomand Mountain. The well is recommended to be relocated north as far as possible from the A-1 well to County Line Road. This would be on private property for which property or an easement would need to be acquired. According to the Town's water rights consultant, this relocation would be made through a request with the Division of Water Resources. The well would be permitted at 350 gpm with an annual withdraw limit of 462 ac-ft/yr, however, the actual yield may be less. A minimum of 212 gpm is needed to meet future maximum day demand conditions. The Division of Water Resources Denver Basin Aquifer Tool shows the Arapahoe Aquifer between 1601 feet and 2154 feet deep at the proposed relocated site. Discharge from the new well would need to be piped to the GW-WTP for treatment assuming similar water quality to the existing A-1 well.

Surface water from Glen Park Reservoir is the preferred source of supply. Under low flow conditions, this supply is estimated to be limited to 60,400 gpd. The SW-WTP has relatively new treatment equipment. No changes to this source of supply are recommended.

B. WATER QUALITY AND TREATMENT

Treated water quality data of regulated containments for the Town of Palmer Lake was obtained from the CDPHE water quality data base. A summary of the data for the period from 2002 through 2022 is presented in the following Table. This table presents average water quality for water provided from both the SW-WTP and the GW-WTP sources including the period prior to the SW-WTP treatment upgrades and the 2007 well D-2 connection to the GW-WTP.

TABLE 14

TOWN OF PALMER LAKE

WATER QUALITY SUMMARY 2002-2022

Parameter	Samples	Average Concentration	MCL [1]	Units [2]
Antimony	45	BDL [3]	0.006	mg/l
Arsenic	45	0.0002	0.01	mg/l
Barium	45	0.0603	2	mg/l
Beryllium	45	BDL [3]	0.004	mg/l
Cadmium	45	BDL [3]	0.005	mg/l
Chlorite	213	0.14	[5]	mg/l
Chromium	45	0.0002	0.1	mg/l
Copper, Free	5	0.0060	1.0 [7]	mg/l
Cyanide	2	BDL [3]	0.2	mg/l
Fluoride	46	1.52	2.0/4.0 [4]	mg/l
Lead	5	BDL [3]	0.015	mg/l
Mercury	45	BDL [3]	0.002	mg/l
Nickel	45	BDL [3]	[5]	mg/l
Nitrate	67	0.08	10	mg/l
Nitrite	16	BDL [3]	1	mg/l
Selenium	45	0.0001	0.05	mg/l
Sodium	45	10.4556	[5]	mg/l
Sulfate	5	5.9000	250 [7]	mg/l
Thallium	45	BDL [3]	0.002	mg/l
Total Dissolved Solids	8	158	500 [7]	mg/l
Combined Radium $_{266, 228}$	17	2.6	5	pCi/L
Combined Uranium	13	0.50	30	ug/L
Gross Alpha Excl. Radon & Uranium	13	2.3	15	pCi/L
Gross Beta Particle Activity	4	5.1 pCi/l	4 mrem/yr	
Radon	2	400 pCi/l	[5]	
Total Coliform	726	0% of samples	5% of samples	Positive
E. Coli	294	0.7% of samples	5% of samples	Positive
Free Chlorine	726	1.07	0.2 - 4.0 [6]	mg/L
Total Haloacetic Acid	186	20.0	60	ug/L
Total Trihalomethanes	205	17.7	80	ug/L

1) Regulated Maximum Contaminant Level
2) mg/L – milligrams per liter, ug/L – micrograms per liter, pCi/L – picocuries per liter
3) BDL – Below Detection Limit
4) Secondary MCL at 2mg/L, not enforceable
5) No MCL
6) Minimum and Maximum Residual Disinfectant Level
7) Secondary MCL

Overall water quality from both sources of supply are considered to be good. All regulated contaminants are below their regulated maximum contaminant level (MCL). The GW-WTP constructed in 2002 was installed for the purpose of iron and manganese removal from the 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 secondary maximum contaminant level (SMCL), which is not enforceable, for iron and manganese are 0.3 mg/l and 0.5 mg/l, respectively. Oxidation of iron and manganese prior to filtration also removes radium which is common in both the Arapahoe and Denver Aquifers. The entry point concentration of combined $radium_{226/228}$ has an average concentration of 2.6 picocuries per liter (pCi/l) over the 20 years of record. No individual samples have exceeded the combined radium MCL of 5 pCi/l. With radium anticipated being removed with the iron and manganese removal process, the raw water radium concentrations, while not specifically known, are likely to be higher than the reported entry point concentration. Raw water combined radium concentrations measured from the new D-2R well were found to be at 3.9 pCi/l, below the MCL. Raw water radium concentrations in the region have been noted to be increasing over the last few decades. Thus, it is anticipated that the raw water radium concentrations will ultimately exceed the MCL. As such, this treatment facility will be reclassified as a treatment compliance facility and require redundant treatment equipment. Therefore, the recommendation is made to add a third filter train at the GW-WTP. Fluoride concentrations have exceeded the SMCL in 2003, 2006, and 2009. Since those SMCL exceedances, the treated water fluoride concentrations have remained below 2.0 mg/L.

Overall water quality from the SW-WTP is considered to be good. All regulated contaminants have remained below their MCLs. Similar to the GW-WTP, fluoride concentrations have exceeded the 2.0 mg/l SMCL in the past. However, no recent MCL exceedances have been reported. No improvements in the SW-WTP are recommended.

C. WATER STORAGE

Treated water storage for the Town of Palmer Lake is provided by the two high zone gravity storage tanks located on the north side of Town, and a low zone storage tank adjacent to the GW-WTP. These storage tanks are shown on Figure 7 in the back of this report. The high zone tanks have a capacity of 250,000 gallons each. The low zone tank has a capacity of

500,000 gallons. The low zone tank has a maximum booster pumping capacity of 1,400 gpm, from the higher capacity pump.

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 placed 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 2045 maximum day demand on the system is estimated at 654,900 gpd without consideration of service to those within the Town having private wells. Thus, the equalization storage requirement for the Town is between 98,200 and 196,500 gallons.

The second component of storage is fire flow. Fire protection within the Town is provided by the Palmer Lake Fire Department. The Insurance Service Office (ISO) Public Classification Report for Palmer Lake, dated September 27, 2021 indicates that the Town has received a public protection classification of 04/4X. Public protection classification ratings range from one to ten. A classification of four is relatively good for a small Town. The X in 4X indicates some structures within the jurisdiction are greater than 1,000 feet from a credible firefighting water supply. ISO ratings are used by insurance companies to establish risk and rates. The details of the ISO evaluation were not available. These detailed calculations would indicate the maximum calculated commercial needed fire flow. The fire suppression rating schedule contained within the ISO guidelines suggests 500 to 1,000 gpm for typical residential housing spacings that is typical within the Town of Palmer Lake. Higher flows are needed in commercial areas. The International Fire Code requires a minimum 1,500 gpm for "other than residential dwellings". This applies to moderately sized commercial and smaller multi-family

buildings. For the purpose of this evaluation, a commercial need fire flow of 2,500 gpm is used.

The Town's distribution system is largely comprised of 6-inch diameter pipelines. 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, the needed fire flow of 2,500 gpm is increased by the maximum future day demand which has been established at 654,900 gpd (455 gpm), and is decreased by the worst-case water system supply rate (200 gpm from the GW-WTP). Thus, the minimum needed fire flow rate from storage is 2,755 gpm for the 2,500 gpm commercial fire flow. 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 330,600 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 any 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 conditions equates to 57,700 gallons.

Based on the estimated quantities from these three factors described above, the calculated minimum future distribution storage requirement for the Town of Palmer Lake is 584,800 gallons. The combined capacity of the Town's three storage tanks is 1,000,000 gallons. Thus, additional storage is not required.

In accordance with the Storage Tank Rule of Regulation 11, the Town has implemented a written plan for finish water storage tank inspections, including both periodic (quarterly) and comprehensive (5-year) inspections.

D. DISTRIBUTION SYSTEM

The existing distribution system is shown on Figure 7 in the back of this report. Recommended distribution system improvements are shown on Figure 8 (3 sheets) in the back of this report. Available water pressures throughout the single pressure zone service area is above the CDPHE required minimum 35 psi. As previously discussed, static pressures within the distribution system range from 35 psi to 210 psi.

Distribution system piping is well looped on the west side of Highway 105 providing good flow and pressures throughout. Several older segments of cast iron pipe with lead joints have been replaced by the Town. The remaining older segments of cast iron as well as segments with frequent leaks and breaks have been identified by the Town's staff. These older pipelines are included in the recommended improvements of this report for replacement. Other segments of older piping are located in Verano Ave., Largo, Ave., Corona St., and Buena Vista Ave. These segments are not included in the recommended improvements as additional investigation of this area is required before recommending replacement.

Treated water from the GW-WTP flows through a 24-inch disinfection contact pipe, then continues in a 12-inch pipeline to the low zone water storage tank or directly to the distribution system. The GW-WTP has a treatment capacity of 500 gpm. The low zone booster tank pump station has a large capacity pump of 1400 gpm. Based on existing mapping, a single 6-inch pipe on County Line Road presents a restriction in the ability to move water from the GW-WTP, or the low zone tank booster pump station into the distribution system. The capacity of this pipeline needs to be reinforced with a parallel 10-inch pipeline, or replaced with a 12-inch pipe line.

The distribution system on the east side of Highway 105 includes a 10-inch main line. This line crosses the Santa Fe Regional Trail, BNSF Railroad, and the Highway 105 corridors and connects to the west side of the distribution system at Vale Street. Further to the southeast, the 10-inch crosses Highway 105 to serve Town property (formerly Living Word Chapel). This 6-inch service line needs to be looped across Monument Creek to Shady Lane.

An 8-inch pipeline in Highway 105 was extended south from the Living Word Chapel service crossing of Highway 105 approximately 1,300 feet to serve the fire sprinkler system of the

Mission Training International Facility. Note that this property has a groundwater well for potable water use. This long fire sprinkler service pipeline is part of the Town's distribution system and requires frequent flushing to prevent stagnant water conditions and maintain a chlorine residual. This long dead-end line should be looped to the west side of the distribution system. Looping this pipeline will eliminate stagnant water conditions and reinforce water distribution system in the southern service area of the system. Looping would require extension of the 8-inch line in Highway 105 to the southeast, then west in Red Rock Ranch Drive to Forest View Lane.

As part of this report, the infrastructure needed to serve properties within Town limits on private wells was compiled. These properties are primarily in the southeast quadrant of the Town. Necessary distribution system improvements are shown on Figure 8 (3 sheets). A cost estimate for these necessary improvements is also presented in this report.

Fire hydrants within the Town's service area provide fire protection to the Town buildings and structures. Fire flow rates from individual hydrants were not measured within the course of this study, however, with relatively high pressures provided throughout the distribution system, needed residential and commercial fire flows are readily available. Existing fire hydrants within the Town were reviewed for coverage area. The review was based on the National Fire Protection Association (NFPA) fire code which requires a maximum fire hydrant spacing of 800 feet in residential areas and 500 feet in commercial areas. The maximum distance to a fire hydrant from the closest point on a building shall not exceed 600 feet for residential dwellings and 400 feet for commercial buildings. Based on this assessment, it appears that adequate fire protection is provided throughout the Town's service area. The Town operator has indicated that all fire hydrants are in good operating condition and are typically exercised annually.

The locations of existing distribution system valves were reviewed to determine the ability to isolate a segment of this system for maintenance or repair, as necessary. Valving throughout the distribution system appears to be adequate to provide isolation for maintenance and repair.

E. METERS

The Town currently meters all customers for water use. Town services are also metered. Customers are billed monthly based on total water use. The Town currently utilizes radio read meters with meter readings conducted by the Town Water Department staff and provided to the Town Clerk for billing. These readings are entered into the Town's billing software. Meters are routinely replaced when they fail or indicate inaccurate readings. No upgrades are recommended to the Town's customer water meter system. Master meters of the Town wells and two WTPs are read and recorded monthly by the Town Water Department staff. These records are provided to the office of the State Engineer as required and used to track overall operational trends.

SECTION IX
WATER SYSTEM IMPROVEMENT NEEDS AND ALTERNATIVES

The Town of Palmer Lake has several water system needs and deficiencies. Typically, improvements necessary to address system deficiencies are categorized as protection of public health; protection of public safety; system reliability; and operation and maintenance.

The public health related water system needs of the Town include replacement of the old lead joint cast iron pipe within the distribution system. The addition of a third filter to the GW-WTP is also a public health related need, if well radium concentrations rise above the regulated maximum contaminant level and the WTP becomes classified as a water quality compliance facility. The distribution system extension improvements to properties with private wells is also considered a public health need in the long term with the ultimate dry up of the Denver Basin Aquifers. Due to the relatively high cost of the necessary improvements and the long-term need, this becomes a lower priority recommendation.

The water system reliable needs include the addition of a new Arapahoe Aquifer well. The Town's well supply capacity is vulnerable with only two wells. With the existing larger capacity well out of service, well production capacity is limited to 288,000 gpd, less than the existing average day demand. Distribution system looping is also recommended to improve system reliability, improve water circulation, and delivery pressures during high demand conditions.

Of the improvements recommended within this study, there are no recommended improvements that fall within the categories of operations and maintenance and protection of public safety.

Growth and infill within the community will generally be accommodated by the upgraded water system improvements as recommended herein. With the potential for new development occurring within the existing Town boundaries, the developer would be expected to construct the needed extensions to the water distribution system per the Town's standards and at the developer's expense. The completed construction, once acknowledged as being acceptable, would then be dedicated to the Town.

Alternatives to the Town's existing water supply, treatment, storage, distribution and metering system components were considered to determine if any conceptual changes would be viable. No conceptual changes to the Town's current water supply, storage and distribution components are recommended. A new Town of Palmer Lake Comprehensive Plan is currently being compiled and will include recommendations for guiding growth of the Town into the future. There are no water supply alternatives that would be viable for the Town other than its existing use of Denver Basin aquifers. Groundwater from the Denver Basin aquifers provide sufficient quantity, with treatment, and acceptable water quality for the Town. The long-term potential of obtaining renewable water supply from the Loop project is likely several decades down the road. The consultant recommends that the Town participate in these early discussions of the Loop project to better understand the potential benefits for water supply to Palmer Lake and northern El Paso County.

Potential environmental impacts resulting from water system improvements recommended herein will primarily be associated with construction activities. Standard erosion control and dust mitigation measures typical of this type of construction will be incorporated into the project's specifications. An assessment of endangered species, floodplains, historic and archeological resources within an Environmental Report will be required to comply with the funding agency requirements utilized for the project. In reality, the recommended improvements will occur within existing road rights-of-way and areas that have been previously disturbed. Environmental and wildlife impacts will be minimal. Design and construction activities will be tailored to minimize environmental impacts. All distribution system improvements will be conducted within Town or CDOT rights-of-way or on land owned by the Town. No construction related problems are anticipated. Operation and maintenance cost savings for the water system are anticipated to be minimal with the recommended improvements contained in this study.

SECTION X
RECOMMENDED IMPROVEMENTS

A list of recommended improvements has been developed based on the deficiencies and needs identified within the Town's water system. Given the magnitude of the water system's related needs and the relatively small size of the community, the overall costs of rectifying the deficiencies are significant. Therefore, the recommended improvements are presented in this report as three priorities of work.

The recommended improvements identified in this study with the highest priority need have been grouped into the priority one improvements and include construction of a new Denver Basin Arapahoe Aquifer well, improvements to the GW-WTP, and distribution system piping replacements. The largest component of this work is the new Denver Basin Arapahoe Aquifer groundwater well followed by distribution system improvements, and GW-WTP upgrades. The following Table is a construction cost estimate summary for the recommended priority one improvements, and include soft project costs for a stand-alone project.

TABLE 15
TOWN OF PALMER LAKE
PRIORITY ONE IMPROVEMENTS

Item	Description	Quantity	Unit Cost	Total Cost
A. New Arapahoe Formation Well				
1.	Mobilization/demobilization	1 LS	$200,000	$200,000
2.	18" diameter hole	2,154 VF	$110	$236,940
3.	30" surface casing	40 VF	$600	$24,000
4.	10" diameter steel casing	1,601 VF	$120	$192,120
5.	10" stainless steel wire screen	553 VF	$250	$138,250
6.	Gravel pack	553 VF	$150	$82,950
7.	Cement grout	1,601 VF	$30	$48,030
8.	Well development	24 HRS	$2,500	$60,000
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.	Well pump, motor, level sensor and conductors	1 LS	$210,000	$210,000
13.	4" stainless steel drop pipe with centralizers	1,854 VF	$100	$185,400

Item	Description	Quantity	Unit Cost	Total Cost
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	$20,000	$20,000
19.	Well house building, piping and valves	1 LS	$100,000	$100,000
20.	8" piping to Town WTP	3,200 LF	$94	$300,800
21.	Property purchase	1 LS	$25,000	$25,000
22.	Water Rights Filing	1 LS	$30,000	$30,000
	Subtotal			$2,144,490
B. Groundwater Treatment Plant Improvements				
1.	Add third filter including installation, media, startup, and moving of existing filter	1 LS	$330,000	$330,000
2.	Piping modifications for filter move	1 LS	$24,000	$24,000
3.	Piping and valves	1 LS	$85,000	$85,000
4.	Filter control modifications	1 LS	$9,000	$9,000
5.	Add building exterior double doors for chemical deliveries	1 LS	$4,500	$4,500
	Subtotal			$452,500
C. Distribution System Replacement				
1.	Park Street - Dixie St. to Milton St.			
a.	Replace existing with 6" piping	370 LF	$79	$29,230
b.	Service connections	6 EA	$900	$5,400
c.	Connection to existing piping	2 EA	$4,500	$9,000
d.	Asphalt replacement	247 SY	$120	$29,640
	Subtotal			$73,270
2.	Upper Glenway - High St. to Pie Corner			
a.	Replace existing with 6" piping	800 LF	$79	$63,200
b.	6" gate valve	6 EA	$2,090	$12,540
c.	Service connections	14 EA	$900	$12,600
d.	Connection to existing piping	3 EA	$4,500	$13,500
e.	Asphalt replacement	533 SY	$120	$63,960
	Subtotal			$165,800
3.	Glenway Street - High St. to Hwy. 105			
a.	Replace existing with 6" piping	1,110 LF	$79	$87,690
b.	6" gate valve	4 EA	$2,090	$8,360
c.	New fire hydrant	1 EA	$9,050	$9,050
d.	Service connections	16 EA	$900	$14,400
e.	Connection to existing piping	2 EA	$4,500	$9,000

Item	Description	Quantity		Unit Cost	Total Cost
f.	Asphalt replacement	740	SY	$120	$88,800
	Subtotal				$217,300
4.	Valley Crescent Street - S Valley Rd. to Middle Glenway				
a.	Replace existing with 6" piping	625	LF	$79	$49,375
b.	6" gate valve	6	EA	$2,090	$12,540
c.	Service connections	4	EA	$900	$3,600
d.	Connection to existing piping	4	EA	$4,500	$18,000
e.	Asphalt replacement	417	SY	$120	$50,040
	Subtotal				$133,555
5.	Shady Lane - Greeley Blvd. to Laughing Water Dr.				
a.	Replace existing with 6" piping	1,600	LF	$79	$126,400
b.	6" gate valve	5	EA	$2,090	$10,450
c.	New fire hydrant	3	EA	$9,050	$27,150
d.	Service connections	32	EA	$900	$28,800
e.	Connection to existing piping	4	EA	$4,500	$18,000
f.	Asphalt replacement	1,067	SY	$120	$128,040
	Subtotal				$338,840
6.	Hilltop Road - Douglas Ave. north to existing 6"				
a.	Replace existing with 6" piping	810	LF	$79	$63,990
b.	6" gate valve	3	EA	$2,090	$6,270
c.	Service connections	4	EA	$900	$3,600
d.	Connection to existing piping	2	EA	$4,500	$9,000
e.	Asphalt replacement	540	SY	$120	$64,800
	Subtotal				$147,660
Total construction cost estimate					$3,673,415
Project contingencies @ 15%					551,012
Engineering design/contract administration					274,600
Construction observation based on 150 calendar days					150,000
Other Engineering [1)]					85,000
Administrative expenses (advertising, legal counsel, bond counsel, and project audit)					15,500
Total preliminary project cost estimate					$4,749,527

1) Other engineering costs includes: easements, environmental report, geotechnical services, reproduction, funding administration, CDPHE approvals, DWP permit and approvals, well sampling, Prequalification Application, Project Needs Assessment, and permits.

The second priority of improvements consists of distribution system looping and reinforcement improvements. The following table presents a project cost estimate for the Priority Two recommendations.

TABLE 16

TOWN OF PALMER LAKE

PRIORITY TWO IMPROVEMENTS

Item	Description	Quantity	Unit Cost	Total Cost
A. Distribution System Looping and Reinforcement				
1.	County Line Road - Oak Dale Rd. to Spruce Ave.			
a.	New 10" piping	800 LF	$113	$90,400
b.	8" gate valve	2 EA	$2,540	$5,080
c.	Connection to existing piping	2 EA	$4,500	$9,000
d.	Asphalt replacement	533 SY	$120	$64,000
	Subtotal			$169,400
2.	East-West Loop - Northeast from Shady Lane to existing 6" on town property (formerly Living Word Chapel)			
a.	New 6" piping	330 LF	$79	$26,070
b.	New 6" HDPE bore across Monument Creek	100 LF	$350	$35,000
c.	6" gate valve	2 EA	$2,090	$4,180
d.	Connection to existing piping	2 EA	$4,500	$9,000
	Subtotal			$74,2500
3. [2]	South Loop - Red Rock Ranch Dr. northeast from Forest View Way to Hwy. 105 thence northwest to existing 8"			
a.	New 8" piping	4,660 LF	$94	$438,040
b.	New 8" HDPE DR9 bore across Monument Creek	400 LF	$350	$140,000
c.	8" gate valve	4 EA	$2,540	$10,160
d.	Connection to existing piping	2 EA	$4,500	$9,000
	Subtotal			$597,200
Total construction cost estimate				$840,8100
Project contingencies @ 15%				126,122
Engineering design/contract administration				72,500
Construction observation based on 120 calendar days				120,000
Other Engineering [1]				86,500
Administrative expenses (advertising, legal counsel, bond counsel, and project audit)				13,000
Total preliminary project cost estimate				$1,258,932

1) Other engineering costs includes: easements, environmental report, geotechnical services, reproduction, funding administration, Prequalification Application, Project Needs Assessment, and permits.
2) Potentially paid by developers adjacent to Red Rock Ranch Drive on a cost reimbursement plan.

The Priority Three improvements include distribution system extensions to serve properties in the southeast quadrant of Town currently served by private wells. The following Table presents a project cost estimate for the priority three recommendations.

TABLE 17

TOWN OF PALMER LAKE

PRIORITY THREE IMPROVEMENTS

Item	Description	Quantity	Unit Cost	Total Cost
A. Distribution System Extension to Serve Properties on Private Wells				
1.	PRV vault with 8" pressure reducing valve, low flow bypass, heating, lighting, electrical service, and SCADA monitoring.	1 LS	$85,000	$85,000
2.	6" PVC piping	6,440 LF	$79	$508,760
3.	8" PVC piping	9,890 LF	$94	$929,660
4.	8" HDPE DR9 bore across Hwy 105	150 LF	$350	$52,500
5.	6" Gate Valve	8 EA	$2,090	$16,720
6.	8" Gate Valve	10 EA	$2,540	$25,400
7.	Fire Hydrant with lateral and valve	22 EA	$9,050	$199,100
8.	Pavement replacement	6,673 SY	$120	$800,760
9.	Service taps with 75' copper service line, meter pit, radio read meter, and connection to existing well piping into house	141 EA	$3,350	$472,350
Subtotal preliminary cost				$3,090,250
Project contingencies @ 15%				463,538
Engineering design/contract administration				227,400
Construction observation based on 180 calendar days				180,000
Other Engineering [1)]				90,500
Administrative expenses (advertising, legal counsel, bond counsel, and project audit)				15,500
Total preliminary project cost estimate				$4,067,188

1) Other engineering costs includes: easements, environmental report, geotechnical services, reproduction, funding administration, Prequalification Application, Project Needs Assessment, and permits.

The following Table is a summary of the three priorities of system improvements.

TABLE 18

TOWN OF PALMER LAKE

SUMMARY OF PROJECT COSTS

Description	Cost
Priority One - New Well, GW-WTP Improvements, and Distribution System Piping Replacements	$4,749,527
Priority Two - Distribution System Looping and Reinforcement	$1,258,932
Priority Three - Distribution System Extension to Properties In Town with Private Wells	$4,067,188
Grand Total Estimated Project Cost	$10,075,646

The Priority Three improvements to serve properties with private wells comes at a high cost and does not represent an urgent need. Therefore, at this time, only Priority One and Priority Two are recommended. If both priorities of work are undertaken at the same time, the Town would realize a savings in soft costs. The projected savings is estimated to be $175,400.

SECTION XI
FUNDING OF THE RECOMMENDED IMPROVEMENTS

The recommended water system improvements contained within this study address the most critical needs of the Town of Palmer Lake within the first phase of work. The major components contained within Priority One work includes: a new Denver Basin well for increased groundwater supply, GW-WTP upgrades for compliance redundancy, and replacement of existing lead join cast iron pipe segments of the distribution system. The Priority Two work includes: distribution system looping and reinforcement of piping segments. The estimated cost of the Priority One improvements is estimated at $4,750,000. The Priority Two improvements are estimated at $1,259,000. The Priority Three of work includes a distribution system extension to serve properties in Town with private wells. These improvements are costly, estimated at $4,067,000, and are not necessarily needed at this time. The funding discussions presented in this section consider a Priority One project, and a combined Priority One and Priority Two project. This section of the report outlines the potential funding sources available to the Town of Palmer Lake.

Given the number of users associated with the Town of Palmer Lake's water system, projects of this magnitude cannot be undertaken by the Town without sizeable grant and/or loan assistance through state and/or federal organizations. Funding for such projects has historically been available through: the USDA Office of Rural Development; the CDPHE, WQCD, Small Community Grants program; the Community Development Block Grant (CDBG) program; and the State of Colorado's Energy and Mineral Impact Assistance (EMIA) program. In addition, the WQCD in conjunction with the CWR&PDA, administrator of the Drinking Water Revolving Fund (DWRF), that historically has provided loan funds only, also incorporated loan forgiveness funds as a component of their package for those communities being designated as a Disadvantaged Community. A Disadvantaged Community is based on having two of the following factors being in designated ranges; median household income (MHI); median home value (MHV); the County 24-month unemployment average; total loss in the number of jobs for the County. These programs all base their funding not only on the viability of the project, but also on other factors such as median household income, the need for the project, the debt burden of the community, the percentage of population in the low to moderate income category and the community's existing water rates.

In 2021, the CDPHE secured a special allocation of funds through the State Legislature. The funds have been used for a program entitled Small Community Grants (SCG), which are limited to communities with populations less than 5,000 people. The funds are split between water and sewer, with funds available for water construction statewide. Funds are appropriated annually, as available. The program was not funded for 2022. Presently it does not appear that this program will be funded for 2023.

The USDA Rural Development Rural Utility Program has been used extensively throughout Colorado for small water system improvement projects. However, given their 40-year loan amortization schedule and corresponding interest rates, limited grant availability, coupled with extensive frontend expenditures, this funding source has fallen out of favor for municipalities. The Town would be much better served pursuing other state related programs.

Several other funding programs exist which have proven recently to be much more attractive to communities within the implementation of their infrastructure improvement projects. The following details these other programs.

The State of Colorado in their administration of the CDBG program and the EMIA program utilize different funding guidelines than those of Rural Development. The State does not utilize average water rates as a firm guideline around which additional debt burden has to be incurred as does Rural Development. The following highlights the general criteria of the state programs.

CDBG assistance, based on federal guidelines, requires that a minimum of 51% of the community falls in the low-to-moderate income categories. Based on the 2011-2015 American Community Survey data for the Town of Palmer Lake (most current available), 42% of the population base falls in the low to moderate income category. Based on this low to moderate income percentage within the community, the Town would not qualify for CDBG assistance.

Another DOLA administered program is DOLA's EMIA program. This program has loan funds available at an interest rate of 5% with a 20-year amortization schedule. Grant funds are also available. Competition for this funding is statewide. Applications run on a cyclical basis. In the past when oil and gas revenues were generating significant tax revenues for this program, the maximum grant amounts on this form of assistance were significantly increased beyond the prior $500,000 cap. DOLA had structured their program such that three tiers of funding levels exist.

Tier II consisted of a funding bracket that initially extended from $200,000 to $2,000,000 in requested assistance. Given the significant reduction in new oil well development, and the subsequent reduction in mineral and severance tax revenues to this fund, the upper limit in the Tier II work has been decreased to $750,000. This would be the tier that could potentially be sought by the Town. A local match is required at a minimum of 50%, preferably more of the project's cost unless extenuating circumstances exist. Administration requirements associated with this funding source are minimal. Given the magnitude of funds that would be requested, the application would normally be considered within DOLA's scheduled committee cycle. The funding cycles for this program are twice per year: in February and September. DOLA is now indicating to communities they should apply for capital construction funds as close to being ready to go to bid as possible. This approach will facilitate the utilization of the EMIA grant proceeds to follow into construction shortly after their award. This source of funding holds potential for the Town; however, these funds are extremely competitive. The Town does not have a significant impact from oil and gas activities, therefore, the probability of obtaining funding is small. As such, the recommendation is made to not pursue this funding program.

Another potential funding source is the use of the CWR&PDA's DWRF as the loan component of the funding package. The Town of Palmer Lake's water system related needs are included on the CDPHE's eligibility list in the 2022 Colorado Drinking Water Revolving Fund Intended Use Plan. This enables the Town to start the process with the State Revolving Fund through the CDPHE, WQCD. Within the State Revolving Fund (SRF) program, the Disadvantaged Communities Program (DCP) was formed as a 3-year pilot program. The program's success has resulted in its extension and is now one of the SRF's sought after programs. The SRF program historically provided loan funds only; however, in the recent past loan forgiveness funds (i.e., grant funds) had been available through this funding program. In 2015, the SRF program created a new definition of a Disadvantaged Community. For those communities falling in the Disadvantaged Communities Category, a portion of the funding is based upon engineering related expenses with a cap of $300,000 available in the form of loan forgiveness (grant) funds.

In order for a community to be designated as a Disadvantaged Community (DAC), the community must meet two of three scenarios. The first item pertains to the communities' median household income (MHI); the second factor reviews the communities' median home value (MHV); and the third item examines the County's unemployment numbers or job loss numbers within the community itself. As long as the community meets two of these three factors, the community will

be deemed a DAC. Once a community has been designated as a DAC, a portion of the funding will be available in the form of a Design and Engineering Grant. The total amount for this is up to $300,000. The specific amount is ultimately determined by the CDPHE once the Project Needs Assessment has been submitted.

In order for a community to be determined as a DAC, the MHI must be below 80% of the State's MHI which is currently at $72,330. The MHI for Palmer Lake is $92,333 Thus, the Town does not meet the DAC criteria for MHI. To meet the MHV requirement, the Town would have to have an MHV less than 100% of the State MHV. The State's current MHV stands at $369,900. The MHV for Palmer Lake is $329,700. Thus, the Town meets the DAC criteria for MHV. To meet the 24-month unemployment value for the third factor, El Paso County would have to have a 24-month unemployment average of greater than or equal to the State average, which currently stands at 7.1%. El Paso County has a 24-month unemployment rate of 5.25%. The other potential factor is a review of the ten-year job change within El Paso County. El Paso County currently shows 37,433 jobs created within the last ten years. Therefore, based on the current review, the Town of Palmer Lake would not qualify as a Disadvantaged Community. Thus, the Town would not be eligible for the lower DAC loan rates. A DWRF loan would be available to the Town at the direct loan rate of 2.25%.

The 2022 Infrastructure Investment and Jobs Act, also known as the Bipartisan Infrastructure Legislation (BIL) will provide grant and loan funding for water system improvement projects through the DWRF program. Loan forgiveness funds will be available for communities that qualify as DAC, or communities with public health related needs including lead service line replacement and to address emerging contaminants. The DWRF will be receiving $46,000,000 funds annually over the next five years for water related improvements. The eligibility criteria for loan forgiveness requires the community to qualify as a DAC, or to meet three of nine other criteria. In reviewing these eligibility criteria, the Town of Palmer Lake would not qualify for BIL loan forgiveness.

Funding of the needed improvements is recommended to be pursued using Drinking Water Revolving Loan Funds available through the Colorado Water Resources and Power Development Authority.

The following table has been developed to depict a potential funding scenario for the implementation of the Priority One improvements and a combined Priority One and Priority Two

improvements project. The following funding scenarios are based on a DWRF program loan administered by the Colorado Water Resources and Power Development Authority at the current loan rate of 2.25% with a 30-year amortization schedule.

As previously recapped, the Town has 1015 active water customer taps, which represent 1036 EQRs. The total 1036 EQR figure has been used in the following table as the basis to both establish average O&M costs per tap, as well as the distribution of any added loan and reserve payments required as a result of the project. The consultant in providing this information does not claim to be a financial consultant representing any financial products or the issuance of any municipal securities.

TABLE 19

TOWN OF PALMER LAKE

WATER SYSTEM IMPROVEMENTS

POTENTIAL PROJECT FUNDING SCENARIO

Component	Priority One Only	Priorities One and Two
Project Cost [1)]	$4,750,000	$5,833,600
Local Match [2)]	$700,000	$700,000
DWRF Loan [3)]	$4,050,000	$5,133,600
Current O&M Expense (EQR/mo) [4)]	$80.55	$80.55
New Debt Service (EQR/mo) [5)]	$15.05	$19.08
Added Loan Reserve (EQR/mo) [6)]	$1.51	$1.91
Capital Improvements Fund (EQR/mo) [7)]	$8.04	$8.04
Needed Average Monthly Bill (EQR/mo) [8)]	$105.15	$109.58
Current Average Revenue (EQR/mo) [9)]	$101.84	$101.84
Estimated Required Rate Increase	$3.32	$7.74

1) Total estimated project cost.
2) Local cash match from capital Improvements Fund reserves
3) Required loan amount for full project financing.
4) Base on 2021 budgeted operating expense of $1,001,397
5) Monthly user debt burden for DWRF loan at 2.25% and 30 years, the annual payment is $187,107 and $237,169, respectively for Priority One and Two, divided by 1,036 EQR and 12 months.
6) Required 10% monthly reserve requirement on debt service.
7) Recommended Water Fund cash reserve rebuild of 100,000 per year
8) Total projection of all monthly expenses
9) Based on 2021 budgeted operating revenue of $1,266,050 divided by 1,036 EQRs and 12 months.

The funding projections in the above table are based on a CWR&PDA DWRF loan.

For the Priority One improvements only, the Town's water loan payment fee of the base water rate would need to be increased to cover the added debt service of $15.05 per EQR per month, and the $1.51 per EQR per month loan payment reserve; and to rebuild the water fund capital improvements fund. For the combined Priority One and Priority Two improvements, the added debt service is slightly higher at $19.08 per EQR per month plus the $1.91 per EQR per month for loan payment reserve. The assessment to rebuild the capital improvements fund is assumed to be $100,000 per year, or $8.04 per EQR per month. The local match amount used the above funding scenario is based on the estimated 2022 year-end cash balance within the water fund estimated at $1,087,000, and the annual budgeted water tap fee revenue of $200,000.

In 2021, the average budgeted water sales revenue was $1,050,750, down slightly from the 2020 audited sales revenues. This equates to an average water bill of $84.52 per EQR per month. This average water bill would need to be increased by $3.32 per month to $87.84 per month for the Priority One improvements only; and by $7.74 per month for the combined Priority One and Priority Two improvements project. The Final required adjustments would be a function of the funding secured and the extent to which loan funds and their associated debt service and reserve requirements are imposed upon the water fund as an added expense.

The above funding figures are projections only. The actual loan amounts will depend on the outcome of the discussions held with the funding agencies, the funding level at which the agencies are willing to participate in the project, and the amount of loan the Town desires to pursue. Through the use of available funding sources, the project can be made a reality.

SECTION XII

PLAN OF ACTION

A plan of action and schedule has been developed for the water improvements recommended herein. The following table has been developed based upon the normal progression of a project of this nature. The table is based on utilizing the CWR&PDA DWRF funds.

TABLE 20

TOWN OF PALMER LAKE

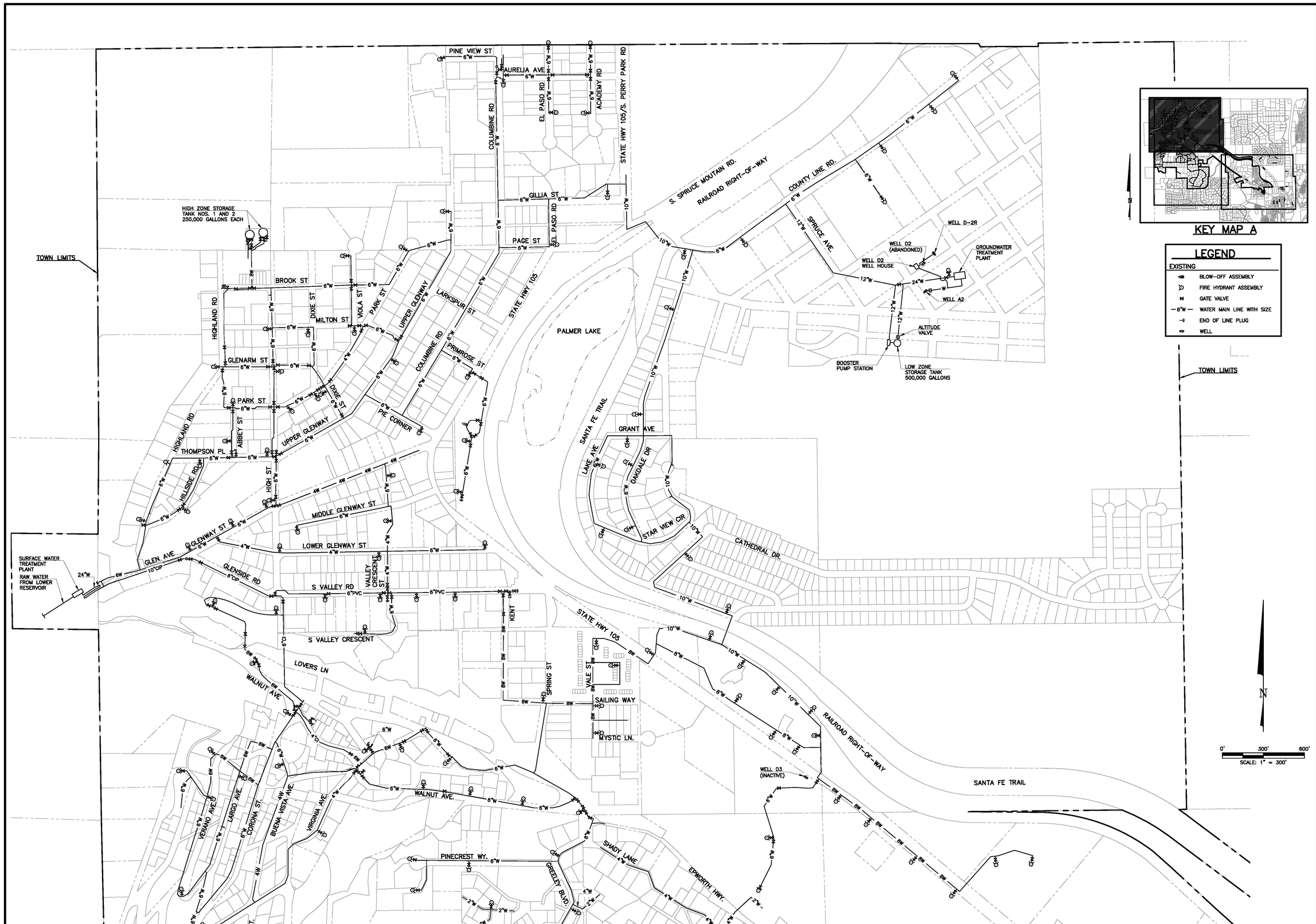
PLAN OF ACTION AND IMPLEMENTATION SCHEDULE

Scheduled Event	Date
Submit Preliminary Engineering Report to Town	July 2022
Authorize funding and design	August 2022
Submit pre-qualification application, project needs assessment and design plans and specifications to CDPHE for DWRF funding	February 2023
Submit DWRF application	April 2023
Obtain DWRF funding commitments	June 2023
Advertise project for bid	August 2023
Bid opening	September 2023
Project award	October 2023
Initiate construction	November 2023
Completion of construction	May 2024

The above schedule realistically represents the required timeline for implementation of the recommended improvements. Significant activity must occur prior to the initiation of construction. A first key activity is focused on securing the necessary funds together with completing, submitting to, and obtaining approvals from the CDPHE on various submittals including the project needs assessment, environmental report, three step application process and preparation of plans and specifications. Time has been allotted in the schedule for CDPHE's review time for the submittals.

This plan of action and schedule is a dynamic activity that will require modifications and refinements as the project evolves. A delay in one activity will result in subsequent delays in

following activities. Securing adequate funding in a timely manner will be crucial not only to maintaining the schedule, but ultimately in implementing the needed improvements.



KEY MAP A

LEGEND

EXISTING

- BLOW-OFF ASSEMBLY
- FIRE HYDRANT ASSEMBLY
- GATE VALVE
- 8"W — WATER MAIN LINE WITH SIZE
- END OF LINE PLUG
- WELL

SCALE VERIFICATION

BAR IS ONE INCH ON ORIGINAL DRAWING

IF NOT ONE INCH ON THIS SHEET ADJUST SCALES ACCORDINGLY

REVISIONS

NO.	DATE	DESCRIPTION

FIGURE 7A
EXISTING WATER DISTRIBUTION SYSTEM TOWN OF PALMER LAKE

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

DRAWN	SKC	PROJECT NO.	2021-062.100
DESIGNED	TAM	GMS FILE NO.	2999
CHECKED	TAM		
DATE	JULY 2022		

SHEET 1 OF 3

SEE SHEET 7A

SEE SHEET 7C

SEE SHEET 7C

KEY MAP B

LEGEND

EXISTING

- BLOW-OFF ASSEMBLY
- FIRE HYDRANT ASSEMBLY
- GATE VALVE
- 8"W — WATER MAIN LINE WITH SIZE
- END OF LINE PLUG
- WELL

ROSITA AVE. · WALL ST. · TRUMAN AVE. · HOOVER LN. · EISENHOWER DR. · ROOSEVELT ST. · SUN RIDGE CIR. · ROCK RIDGE RD. · SUNCREST RD. · FT. COLLINS DR. · ROMOCA LN. · DURANGO WY. · STERLING AVE. · PLATTE LN. · TRINIDAD LN. · FIRST ST. · SECOND ST. · THIRD ST. · PEATON RD. · FORD DR. · LAUGHING WATER DRIVE · BROOKRIDGE AVE. · HILLTOP RD. · FOREST VIEW RD. · DOUGLAS AVE. · STATE HWY 105 · TOWN LIMITS · ROCKBROOK RD. · FOREST VIEW WAY · FOREST VIEW CIR. · RED ROCK RANCH DR. · SIERRA VISTA RD. · PIKE VIEW WAY · EL RANCHO WAY · RANGE VIEW RD. · PIKE VIEW WAY · SUNBURST DR. · PEAKVIEW BLVD. · SUNBURST CT. · SUMMERTIME CT. · SUNSTAR CT. · SUNBURST DR. · RED ROCK RANCH DR. · REDSTONE RIDGE DR. · LIMESTONE RD. · RED ROCKS DR. · SANDSTONE RD. · ASPEN WAY · FOREST VIEW RD. · STONEVIEW RD. · FOREST VIEW WAY · DEER VALLEY CT. · ROBERTS RIDGE PL.

N

0' 300' 600'
SCALE: 1" = 300'

SCALE VERIFICATION
BAR IS ONE INCH ON ORIGINAL DRAWING
IF NOT ONE INCH ON THIS SHEET ADJUST SCALES ACCORDINGLY

REVISIONS

NO.	DATE	DESCRIPTION

FIGURE 7B
EXISTING WATER DISTRIBUTION SYSTEM
TOWN OF PALMER LAKE

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

DRAWN	SKC	PROJECT NO.	2021-062.100
DESIGNED	TAM	GMS FILE NO.	2999
CHECKED	TAM		
DATE	JULY 2022		

SHEET 2 OF 3

SEE SHEET 7B

SEE SHEET 7B

SUNBURST DR.
SUNSTAR CT.
SUMMERTIME CT.
RANGE VIEW RD.
EL RANCHO WAY
PIKE VIEW WAY
ROCKBROOK RD.
TOWN LIMITS
CLOVEN HOOF RD.
SHILOH PINES DR.
0'
300'
600'
SCALE: 1" = 300'
N
N. MONUMENT LAKE RD.
OXBRIDGE RD.
PIKEVIEW BLVD.
STATE HWY 105
TOWN LIMITS
WESTWARD LN.
MEADOW LN.
FAULKNER ST.
CHANDLER PL.
RASPBERRY LN.
BEL LARGO VW.
ROBERTS DR.
MEADOW LN.
CIRCLE RD.
McSHANE DR.
GUIRE WAY
WALKER CT.
N. MONUMENT LAKE RD.
RAILROAD RIGHT-OF-WAY
SANTA FE TRAIL
CRESTWOOD DR.
DRACO DR.
SPRING VALLEY RD.
WAKONDA WAY
3RD ST.
WASHINGTON ST.
4TH ST.
5TH ST.
JEFFERSON ST.
TRAILHEAD ST.
CENTURY PL.
CENTURY LN.
BEACON LITE RD.
8TH ST.
WOLF CT.
STATE HWY 105

LEGEND

EXISTING

- BLOW-OFF ASSEMBLY
- FIRE HYDRANT ASSEMBLY
- GATE VALVE
- 8"W — WATER MAIN LINE WITH SIZE
- END OF LINE PLUG
- WELL

KEY MAP

N

SHEET 3 OF 3	DRAWN	SKC	GMS, INC. CONSULTING ENGINEERS 611 N. WEBER, SUITE 300 COLORADO SPRINGS, COLORADO 80903
	DESIGNED	TAM	
	CHECKED	TAM	
	DATE	JULY 2022	
	PROJECT NO.	2021-062.100	
	GMS FILE NO.	2999	

FIGURE 7C
EXISTING WATER DISTRIBUTION SYSTEM
TOWN OF PALMER LAKE

REVISIONS

NO.	DATE	DESCRIPTION

SCALE VERIFICATION
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LEGEND

PROPOSED	EXISTING	
		BLOW-OFF ASSEMBLY
		FIRE HYDRANT ASSEMBLY
		GATE VALVE
8"W	8"W	WATER MAIN LINE WITH SIZE
		END OF LINE PLUG
		WELL
8"W		WATER MAIN TO SERVE EXISTING PRIVATE WELL IN TOWN LIMITS

SEE SHEET 7B

SCALE VERIFICATION
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REVISIONS

NO.	DATE	DESCRIPTION

FIGURE 8A
PROPOSED WATER SYSTEM IMPROVEMENTS
TOWN OF PALMER LAKE

GMS, INC.
CONSULTING ENGINEERS
615 N. NEVADA AVE., SUITE 200
COLORADO SPRINGS, COLORADO 80903

DRAWN	SKC
DESIGNED	TAM
CHECKED	TAM
DATE	JULY 2022
PROJECT NO.	2021-062.100
GMS FILE NO.	3000

SHEET 1 OF 3

SEE SHEET 7A

ROSITA AVE.
WALL ST.
TRUMAN AVE.
HOOVER LN.
EISENHOWER DR.
ROOSEVELT ST.
SUN RIDGE CIR.
ROCK RIDGE RD.
SUNCREST RD.
FT. COLLINS DR.
ROMOCA LN.
DURANGO WY.
STERLING AVE.
PLATTE LN.
TRINIDAD LN.
FORD DR.
LAUGHING WATER DRIVE
BROOKRIDGE AVE.
FIRST ST.
SECOND ST.
THIRD ST.
EATON RD.
HILLTOP RD.
FOREST VIEW RD.
DOUGLAS AVE.
STATE HWY. 105
PRESSURE REDUCING VALVE VAULT
FUTURE CONNECTION TO TOWN OF MONUMENT SYSTEM
TOWN LIMITS
ROCKBROOK RD.
FOREST VIEW WAY
FOREST VIEW CIR.
RED ROCK RANCH DR.
SIERRA VISTA RD.
EL RANCHO WAY
PIKE VIEW WAY
RANGE VIEW RD.
SUNBURST DR.
PEAKVIEW BLVD.
SUNBURST CT.
SUMMERTIME CT.
SUNSTAR CT.
ROBERTS RIDGE PL.
DEER VALLEY CT.
RED ROCK RANCH DR.
REDSTONE RIDGE DR.
LIMESTONE RD.
RED ROCKS DR.
SANDSTONE RD.
ASPEN WAY
FOREST VIEW RD.
STONEVIEW RD.

SEE SHEET 7C

SEE SHEET 7C

KEY MAP B

LEGEND

PROPOSED	EXISTING	
		BLOW-OFF ASSEMBLY
		FIRE HYDRANT ASSEMBLY
		GATE VALVE
8"W	8"W	WATER MAIN LINE WITH SIZE
		END OF LINE PLUG
		WELL
8"W		WATER MAIN TO SERVE EXISTING PRIVATE WELL IN TOWN LIMITS

N

0' 300' 600'
SCALE: 1" = 300'

G:\PALMER\RLK\2021-062\100\Water Study\Figure 8.dwg, Figure 8B, 7/21/2022 2:57:12 PM, sc, AutoCAD PDF (General Documentation).pc3, 1:1

SCALE VERIFICATION
BAR IS ONE INCH ON ORIGINAL DRAWING
IF NOT ONE INCH ON THIS SHEET ADJUST SCALES ACCORDINGLY

REVISIONS

NO.	DATE	DESCRIPTION

FIGURE 8B
PROPOSED WATER SYSTEM IMPROVEMENTS
TOWN OF PALMER LAKE

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

DRAWN	SKC
DESIGNED	TAM
CHECKED	TAM
DATE	JULY 2022
PROJECT NO.	2021-062.100
GMS FILE NO.	3000

SHEET 2 OF 3

SEE SHEET 7B

SEE SHEET 7B

SUNBURST DR.
SUNSTAR CT.
AMERTIME CT.
RANGE VIEW RD.
EL RANCHO WAY
PIKE VIEW WAY
ROCKBROOK RD.
PRESSURE REDUCING VALVE VAULT
TOWN LIMITS
CLOVEN HOOF RD.
SHILOH PINES DR.
0'
300'
600'
SCALE: 1" = 300'
N
N. MONUMENT LAKE RD.
OXBRIDGE RD.
PIKEVIEW BLVD.
STATE HWY 105
TOWN LIMITS
FAULKNER ST.
CHANDLER PL.
RASPBERRY LN.
WESTWARD LN.
MEADOW LN.
ROBERTS DR.
CIRCLE RD.
McSHANE DR.
GUIRE WAY
WALKER CT.
BEL LARGO VW.
RAILROAD RIGHT-OF-WAY
SANTA FE TRAIL
CRESTWOOD DR.
DRACO DR.
SPRING VALLEY RD.
WAKONDA WAY
3RD ST.
WASHINGTON ST.
4TH ST.
5TH ST.
JEFFERSON ST.
TRAILHEAD ST.
CENTURY PL.
CENTURY LN.
BEACON LITE RD.
8TH ST.
WOLF CT.
STATE HWY 105

LEGEND

PROPOSED	EXISTING	
		BLOW-OFF ASSEMBLY
		FIRE HYDRANT ASSEMBLY
		GATE VALVE
8"W	8"W	WATER MAIN LINE WITH SIZE
		END OF LINE PLUG
		WELL
8"W		WATER MAIN TO SERVE EXISTING PRIVATE WELL IN TOWN LIMITS

KEY MAP C

DRAWN	SKC
DESIGNED	TAM
CHECKED	TAM
DATE	JULY 2022
PROJECT NO.	2021-062.100
GMS FILE NO.	3000

SHEET 3 OF 3

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FIGURE 8C
PROPOSED WATER SYSTEM IMPROVEMENTS
TOWN OF PALMER LAKE

REVISIONS

NO.	DATE	DESCRIPTION
1		

SCALE VERIFICATION
BAR IS ONE INCH ON ORIGINAL DRAWING
IF NOT ONE INCH ON THIS SHEET ADJUST SCALES ACCORDINGLY