World Logistics Center Specific Plan Water System Analysis

PREPARED FOR: Highland Fairview

PREPARED BY: CH2M HILL

DATE: September 2014

Summary of Modifications

Modifications to the water system analysis have been made to reflect changes in the Project Description. These modifications are reflected throughout the memo and in Figures 4 and 5.

Introduction

The proposed World Logistics Center Specific Plan (WLC) is a master plan for the development of logistics warehouse distribution facilities on approximately 2,610 acres of land in the Rancho Belago area of eastern Moreno Valley. The Specific Plan proposes the development of 40.4 million square feet of high-cube logistics facilities on 2,382.8 acres, 200,000 square feet of light logistics facilities on 37.1 acres, an in-project fueling station, 115.8 acres of street right-of-way and 74.3 acres of permanent open space.

The Specific Plan area is situated southerly of State Route 60, generally between Redlands Boulevard and Gilman Springs Road (the easterly City limit). The Specific Plan extends to, but does not include, the San Jacinto Wildlife Area (SJWA). The General Plan Amendment and Zone Change which accompany the Specific Plan includes a portion of the SJWA property in order to designate that land for open space use.

The World Logistics Center is located within the water service area of Eastern Municipal Water District (EMWD). The purpose of this analysis is to determine the hydraulic infrastructure necessary to provide water supply to the development.

Analysis Criteria

The criterion used to evaluate system performance was adopted from EMWD Water Facilities Master Plan (WFMP) document (CH2M HILL, 2009). The criterion is summarized below.

Pressure Requirements

System pressure is an indication of system performance. Minimum and maximum pressure requirements help determine if the system is functioning optimally. Table 1 details the pressure requirements used for hydraulic analysis.

TABLE 1
Pressure Requirements
Adopted from EMWD WFMP Appendix A - Water Facilities Master Plan Design Criteria Evaluation

Condition	Pressure Required (psi)
Minimum Dynamic Pressure at downstream of RPDA[a]	40
Minimum Dynamic Pressure from tank low water level to upstream of meter	50
Minimum Static Pressure from tank low water level to upstream of meter[b]	60
Minimum Static Pressure from tank high water level to upstream of meter	75
Maximum Static Pressure from tank high water level to upstream of meter[c]	110
Minimum Pressure anywhere in the system during MDD+FF	20

psi = pounds per square inch
[a] If no Reduced-Pressure Principle Detector Assembly (RPDA), then downstream of meter.
[b] Tank low water level is based on 5 feet above tank bottom.
[c] Assumes a full tank and a pressure limit that accounts for pressure surging that may occur to prevent pressures exceeding 125 psi.

Piping Requirements

Excessive velocities and head losses are indicators of inefficient operations. The head loss requirements presented in Table 2 and the velocity requirements presented in Table 3 were used as guidelines for analysis of the World Logistics Center.

TABLE 2
Head-Loss Requirements
Adopted from EMWD WFMP Appendix A - Water Facilities Master Plan Design Criteria Evaluation

Design Criteria	Allowable Head Loss
Flows less than 20 cfs	3.0 feet/1,000 feet
Flows 20 to 50 cfs	2.0 feet/1,000 feet
Flows greater than 50 cfs	1.0 foot/1,000 feet

cfs = cubic feet per second

TABLE 3
Velocity Requirements
Adopted from EMWD WFMP Appendix A - Water Facilities Master Plan Design Criteria Evaluation

Design Criteria	Allowable Velocity (fps)
MDD	<5
PHD	<10
FF	<15

MDD = Maximum-Day Demand
PHD = Peak-Hour Demand
FF = fire flow
fps – feet per second

Source Capacity

Source capacity is considered to be any source of water supply to a pressure zone via direct connections, pump stations, regulators, or wells. Source capacity for the World Logistics Center was measured against the criteria presented in Table 4.

TABLE 4
Source Capacity Requirements
Adopted from EMWD WFMP Appendix A - Water Facilities Master Plan Design Criteria Evaluation

Design Criteria	Required Capacity
Minimum Capacity	MDD + maximum fire flow in each pressure zone

MDD = Maximum-Day Demand

Pumping Capacity

The pump stations involved in the World Logistics Center analysis were analyzed against the criteria presented in Table 5.

TABLE 5
Pumping Capacity Requirements
Adopted from EMWD WFMP Appendix A - Water Facilities Master Plan Design Criteria Evaluation

Pump Station/Zone Type	Required Capacity
All pump stations	1 Stand-by pump
No time of use	MDD
Time of use	1.33 x MDD
No equalization storage available	Peak-hour demands
No fire storage available	FF capacity

MDD = Maximum-Day Demand
FF = fire flow

Storage Capacity

Distribution and storage systems are designed to provide adequate water supply for customers as well as to help equalize fluctuations between supply and demand, provide water for firefighting and to meet demands during emergencies or unplanned outages of major supply sources. Three types of storage were considered in the World Logistics Center analysis: operational storage, fire storage, and emergency storage.

Operational storage consists of equalization storage, time-of-use, and pump-through storage. The criterion for each operational storage category is presented in Table 6.

TABLE 6
Operational Storage Requirements
Adopted from EMWD WFMP Appendix A - Water Facilities Master Plan Design Criteria Evaluation

Storage Type	Design Criteria
Equalization	0.25 x MDD
Time of Use	0.25 x MDD
Pump Through	0.10 x flow pumped to higher pressure zone

MDD = Maximum-Day Demand

Fire Storage is dependent on the instantaneous flow rate required to fight the fire, the duration of the fire flow, and the number of fire flows that occur before the volume can be replenished. The World Logistic Center analysis required a fire flow of 4,000 gpm for 4 hours. The required storage volumes are listed in Table 7.

TABLE 7
Fire Storage Requirements
Adopted from EMWD WFMP Appendix A - Water Facilities Master Plan Design Criteria Evaluation

Land Use Category	Minimum Fire Flow Required (gpm)	Duration (Hours)	Number of Fire Hydrants	Required Fire Storage Volume (MG)
Single Family (Residential)	1,500	2	1	0.18
Multifamily – five or more units per acre (Residential)	3,000	3	3	0.36
Light Commercial/Industrial (including schools)	3,000	3	3	0.54
World Logistics Center	4,000	4	3	.96
Heavy Commercial/Industrial	5,000	4	4	1.20

gpm = gallons per minute
MG = million gallons

Emergency storage is a dedicated source of water that can be used as backup supply in the event a major supply source is interrupted. The emergency storage criteria are presented in Table 8.

TABLE 8
Emergency Storage Requirements
Adopted from EMWD WFMP Appendix A - Water Facilities Master Plan Design Criteria Evaluation

Zone Type	Storage Volume Requirement
Zone with multiple pump stations	0.5 x (MDD minus flow from remaining pump stations)
Minimum volume for zone with multiple pump stations	0.25 x MDD
Zone with single pump station	0.50 x MDD

MDD = Maximum-Day Demand

For the hydraulic analysis portion of this study, an extended-period simulation of max-day-demand was used.

Water Demand Factors

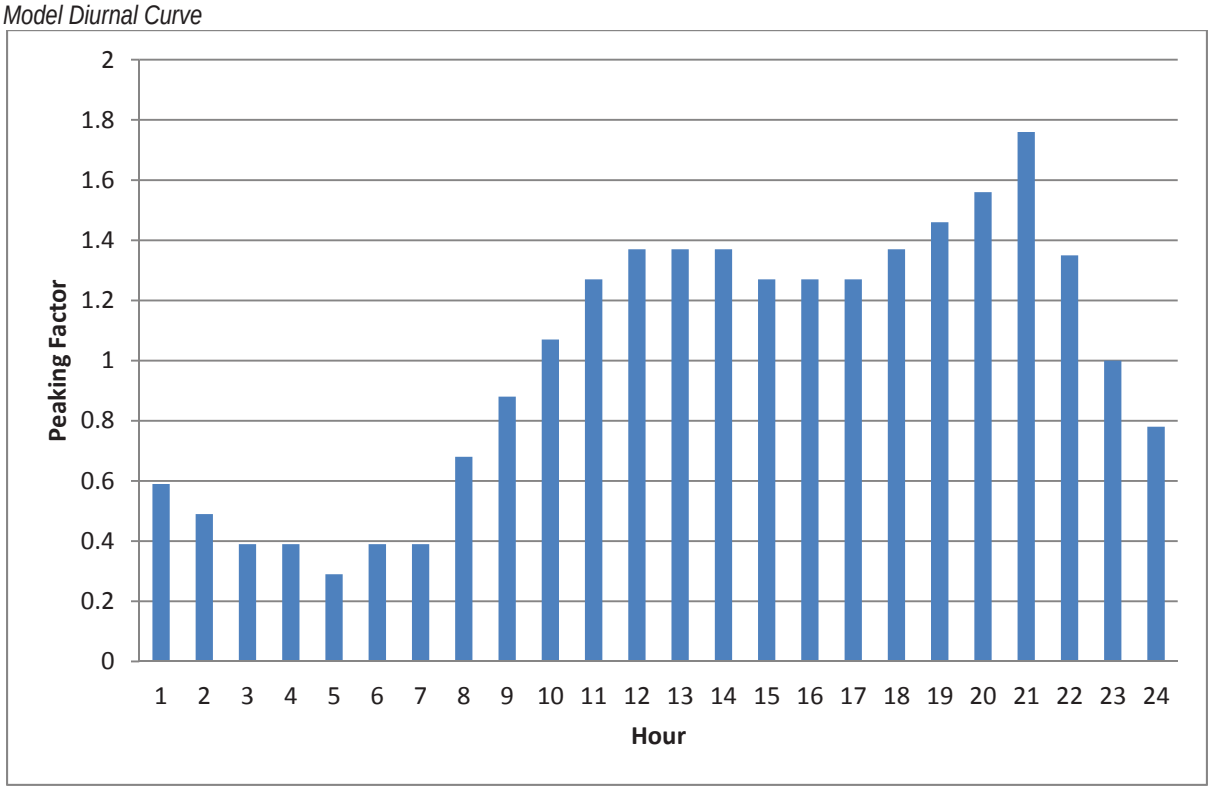
A Water Supply Assessment was prepared by EMWD that evaluated metered data from similar logistics facilities within the District. The water supply assessment includes the entire water use for these facilities including building and irrigation demand. Based on this analysis, EMWD concluded that 670 gallons per day per acre is an appropriate water demand for these types of logistics facilities.

The WLC is proposing a plant palette that relies on native landscaping and virtually zero irrigation. Because of this a building water demand analysis and benchmarking study was conducted as outlined in the Technical Memorandum entitled *World Logistics Center Water Demands and Waste Water Generation for Buildings* dated September 10, 2013. Based on this analysis, it was determined that an appropriate water demand factor for Logistics Developments is equivalent to 0.01 gpd/sf of building or 436 gpd/acre. Since this study is at a preliminary stage and is for programmatic planning purposes and because there is a potential that building and/or irrigation demands could change in the future, it was decided to use the 670 gpd/acre for this analysis. At the time a plan of service is prepared for the project the water demand factors will be refined and developed for the specific buildings being built and will be based on the 0.01 gpd/sf of building or other appropriate factors, including irrigation, if any.

Extended Period Simulation Diurnal Curve

In an extended period model simulation run, a diurnal curve is applied to the demand to simulate water usage over a 24 hour period. The peaking factor dictated in the diurnal curve is multiplied by the demand at each node in the model to generate the estimated demand for each hour during the extended period simulation model run. The diurnal curve used in the EMWD WFMP has been used for the World Logistics Center Analysis. This diurnal curve is presented below in Figure 1.

FIGURE 1
Model Diurnal Curve



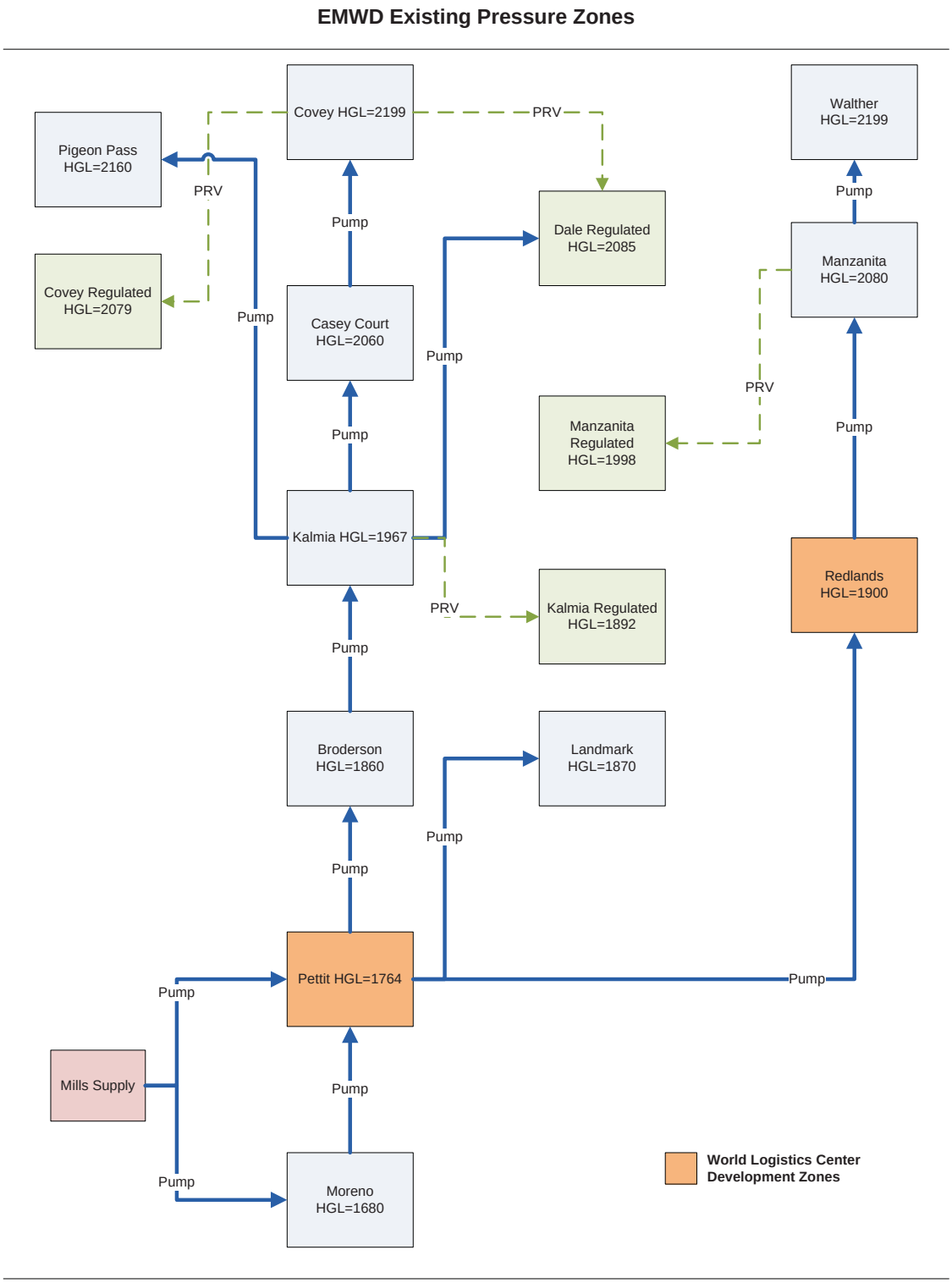
Existing Water System

The existing water system in Moreno Valley consists of an intricate network of pipe, pumps, valves, wells, and storage tanks. There are approximately 625 miles of pipeline ranging in diameter from 6 to 54 inches. Water is provided to the Moreno Valley area through the 54-inch Mills pipeline and 48-inch Cactus Transmission Main. A total of 25 pumping stations, 20 regulating stations, and 25 in-zone storage tanks work together to facilitate movement of water throughout the system.

The topography of the area varies greatly with the lowest service elevation at approximately 1,465 feet above mean sea level (msl) and the highest service elevation at approximately 2,138 feet msl. To handle varying elevations and maintain adequate pressures throughout the distribution system, the Moreno Valley area is divided into 15 hydraulic regions or pressure zones. Figure 2 is a schematic diagram of the existing system pressure zones.

The proposed location of the World Logistics Center falls within the existing Pettit (1764) and Redlands (1900) Zones. Water supply provided from the Moreno (1680) Zone and Pettit (1764) Zone travels through the existing pipeline infrastructure to supply the Redlands (1900) area.

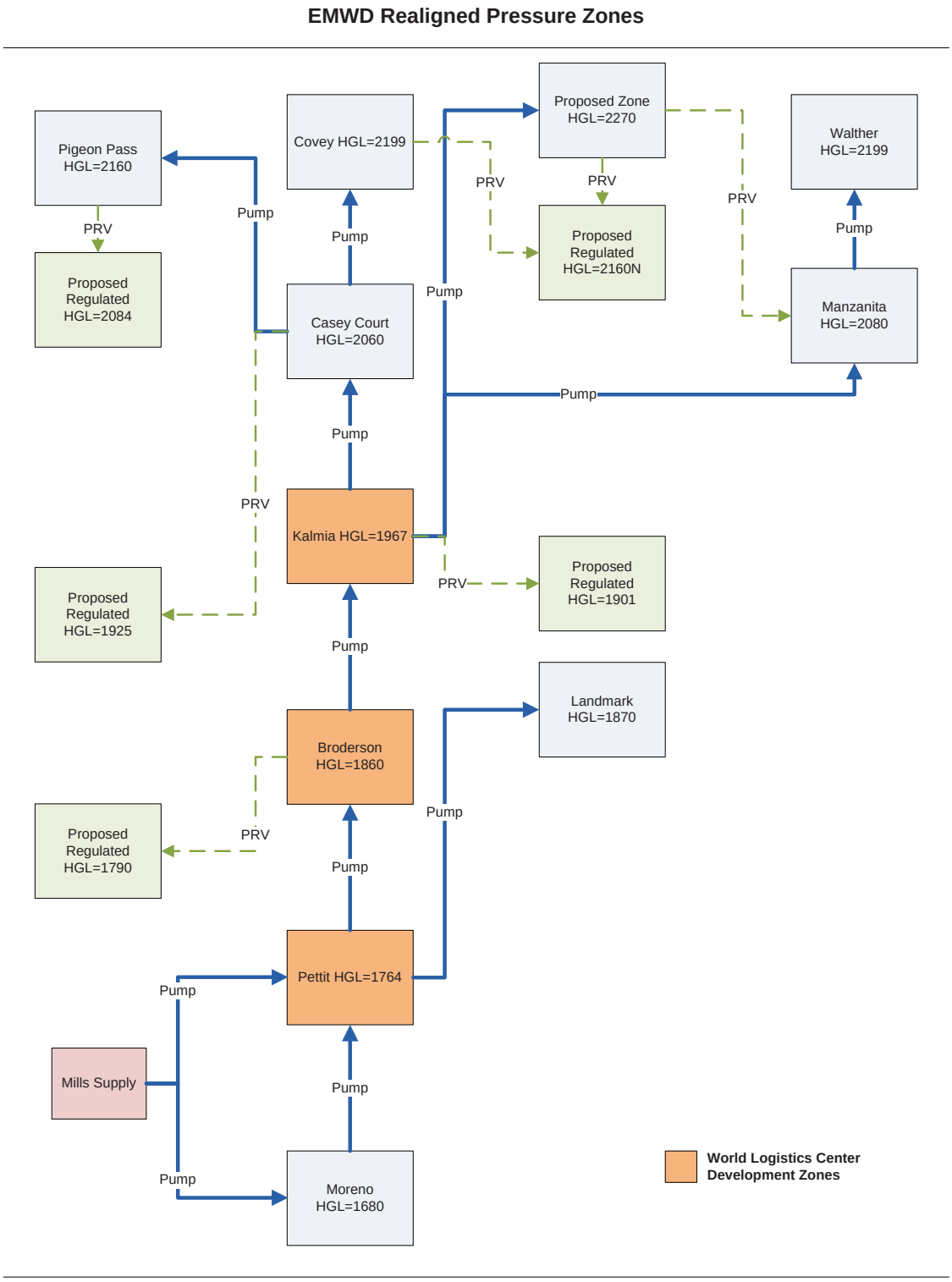
Figure 2
Existing System Diagram



The current pressure zone configuration in the Moreno Valley System creates low static pressures ranging from approximately 26 pounds per square inch (psi) to 57 psi and high static pressures ranging from approximately 68 psi to 154 psi. These pressures do not reflect EMWD pressure design criteria of 40 psi to 110 psi. This is due to high and low elevation areas at zone boundaries. EMWD is aware of this issue and has explored options to remedy the situation. One of EMWD's options is documented in The Moreno Valley Zone Realignment (MVZR) (CH2M HILL, 2009). This document explores options for improving pressures in low and high elevation areas by realigning zone boundaries.

The World Logistics Center is located within the area planned for zone boundary realignment. The realigned zone boundaries recommended in the MVZR were taken into consideration when planning the build out scenario for the World Logistics Center. The proposed location of the World Logistics Center will fall in the Pettit (1764), Broderson (1860), and Kalmia (1967) Pressure Zones. Figure 3 presents EMWD's realigned pressure zone schematic diagram along with World Logistics Center development zones.

Figure 3
Realigned System Diagram



Analysis

In order to analyze the impact of the World Logistics Center Development on the existing Moreno Valley System, the existing system hydraulic model was obtained from EMWD. The 2008 scenario within the model was considered existing and was the scenario used for hydraulic analysis. The storage analysis was completed utilizing EMWD's supply and storage spreadsheets, which were developed as part of the WFMP.

Hydraulic Analysis

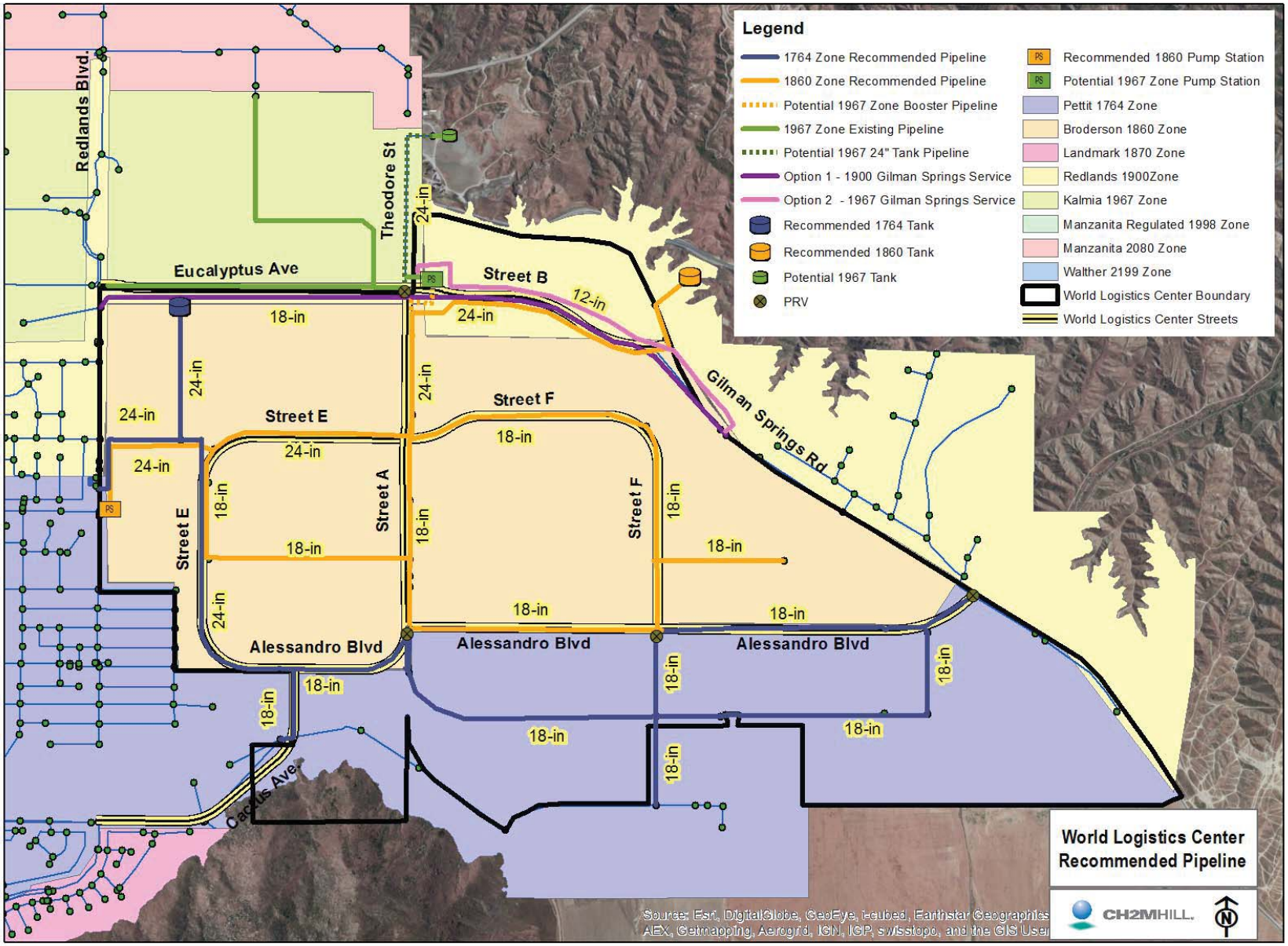
The first step in the World Logistics Center Hydraulic Analysis was to determine the pipeline network which would connect the proposed system to the existing Moreno Valley distribution system. Estimated World Logistic Center demands were distributed to junction nodes within the model using a demand factor of 670 gallons per day (gpd) per acre. Plans for the World Logistics Center span three pressure zones. The majority of the development will be serviced from the 1860 zone. Service for the south side of the development will be from the 1764 zone, and the small portion of the development north and south of Street B will be served from the existing Redlands (1900) Zone or the future Kalmia (1967) Zone. Table 9 provides the summary of demand by pressure zone.

Table 9
Demands by Pressure Zone

Pressure Zone (Realigned Zones after Grading)	ADD (gpm)	MDD (gpm)
1764 (30%)	403	806
1860 (65%)	690	1,380
1967 (5%)	57	114
Totals	**1,150**	**2,300**

Utilizing the proposed street layout and the existing pressure zone alignment, pipelines were added to connect the junction demand nodes. The pipeline was sized to meet EMWD criteria, during a fire flow situation of 4,000 gpm at max day demand, peak hour. For purposes of this analysis, the Redlands (1900) zone was assumed to remain in place, with a new alignment, to provide service to existing customers. Two options for providing service to the existing Redlands (1900) Zone are presented below. Figure 4 shows the recommended pipeline by pressure zone for the World Logistics Center development.

Figure 4
World Logistics Center Recommended Pipeline



Analysis Recommendations and Results

The majority of the World Logistics Center development will be served from the Broderson (1860) Zone. The low elevation area of the development on the south side of the system will be served by the Pettit (1764) Zone. The area directly north and south of Street B will be served by the existing Redlands (1900) Zone or the Future Kalmia (1967) Zone. The existing Redlands Booster Station is planned to remain in service, to provide flow to adjacent customers currently in the Redlands (1900) Zone. Options for providing service to Gilman Springs Road customers who are also currently served by the Redlands (1900) Zone are presented below.

Gilman Springs Road Service Options

The existing Redlands Booster Station is planned to remain in service to provide flow to adjacent customers. As suggested in the MVZR, EMWD may retire this station at some time in the future, and service to these customers will be provided from the Broderson (1860) Zone. Existing customers along Gilman Springs Road also receive service from the existing Redlands (1900) Zone. The MVZR suggests that at some point in the future EMWD may realign these customers to the Kalmia (1967) Zone. The 12-inch pipeline currently serving the customers on Gilman Springs Road runs under the planned World Logistics Center Development area. For ease of construction of the World Logistic Center Development, the existing 12-inch pipeline is planned to be removed. The following two options are presented as alternatives to maintain service to the existing customers on Gilman Springs Road. These options are shown on Figure 4, and Option 1 was utilized for the analysis results presented in this report.

Option 1 –This option keeps Gilman Springs on the existing Redlands (1900) Zone. A new 18-inch pipeline would be installed parallel to the existing pipe in Eucalyptus Ave, and a 12-inch pipeline would be constructed along Street B, connecting to the existing 8-inch pipeline on Gilman Springs. Flow would be provided by the existing Redlands booster station. With this option in place, the planned World Logistics Center Development north and south of Street B would be served from the Redlands (1900) Zone. A 12-inch pipeline is adequate to serve the existing development along Gilman Springs Road, however an 18-inch pipeline along Eucalyptus Avenue would be needed to provided fire flow to the potential World Logistics Center development north and south of Street B. Fire flow cannot be provided through a PRV from the Kalmia (1967) Zone because there is not adequate capacity in the Kalmia (1967) Zone unless a new storage tank is constructed.

Option 2 – This option provides flow to the Gilman Springs area by connecting to the existing Kalmia (1967) Zone. This option aligns with the MVZR plan; however the existing Kalmia Zone cannot support additional demand at this time. A new Kalmia (1967) Zone tank and booster station would need to be constructed in order for this option to be feasible. With this option in place, the planned World Logistics Center Development north and south of Street B would be served from the Kalmia (1967) Zone.

Results

The minimum fire flow available to the World Logistics Center, with the recommended pipe alignment, is approximately 10,800 gpm with a residual system pressure of 20 psi. Within

the Specific Plan area pressures in the Pettit (1764) Zone range from a low of 65 psi to a high of 110 psi and pressures in the Broderson (1860) Zone range from a low of 45 psi to a high of 110 psi. The recommended pipeline aligns with EMWD future zone realignment plans; therefore, no special considerations will need to be taken regarding future zone realignment.

Specific Plan Infrastructure Planning

Two types of infrastructure need to be constructed as part of the World Logistics Center build-out: the backbone infrastructure and the distribution infrastructure.

- Backbone infrastructure consists of tanks, booster stations and transmission pipeline to expand supply capability within service areas.
- Distribution infrastructure consists of pipeline needed to supply customers within service areas.

EMWD has existing backbone infrastructure, as discussed above and shown in Figure 2, *Existing System Diagram*. The backbone infrastructure recommended as part of this memorandum was designed to provide adequate water supply service to the World Logistics Center development at build-out. It is unrealistic to assume all recommended backbone infrastructure will be in place before any development takes place within the World Logistics Center. In order to provide service to building sites before all backbone infrastructure is in place, a water supply analysis will need to be conducted to determine if service is feasible with existing infrastructure. As each building in the World Logistics Center is planned for development, the water supply analysis will be conducted to identify the plan of service for that individual building. The analysis will take into consideration both the existing EMWD backbone infrastructure and newly developed backbone infrastructure, to determine the best plan of water supply service for the building site. These water supply analysis studies will be needed until all recommended backbone infrastructure is in place. Therefore, when the backbone infrastructure recommended below is complete, water supply service plans for individual buildings will no longer be needed and the distribution infrastructure can be built out as planned.

Backbone

The backbone infrastructure consists of tanks, booster stations, and transmission pipeline to provide additional capacity in the Pettit (1764) Zone, Broderson (1860) Zone, and Kalmia (1967) Zone. The majority of the World Logistics Center development will be supplied from the Broderson (1860) Zone. In order for supply to be provided by the Broderson (1860) Zone, a tank and booster pump station will need to be constructed. To supply water to the recommended Broderson pump station and tank, improvements will need to be made to EMWD facilities in lower pressure zones to support providing flow to the Broderson (1860) Zone. One recommended improvement is the addition of a Pettit (1764) Tank. The recommended Pettit Tank supports World Logistics Center Development build out by providing support for the Broderson (1860) Zone, and will also support the area of the World Logistics Center Development served from the Pettit (1764) Zone by being an in-zone supply source. The Pettit (1764) tank will be supplied from existing pipeline within the zone, so no booster station is needed. These two tanks, along with a booster station supply for the Broderson (1860) Tank and connecting pipeline are part of the recommended backbone improvements. Backbone improvements will also consist of one of the options to keep the

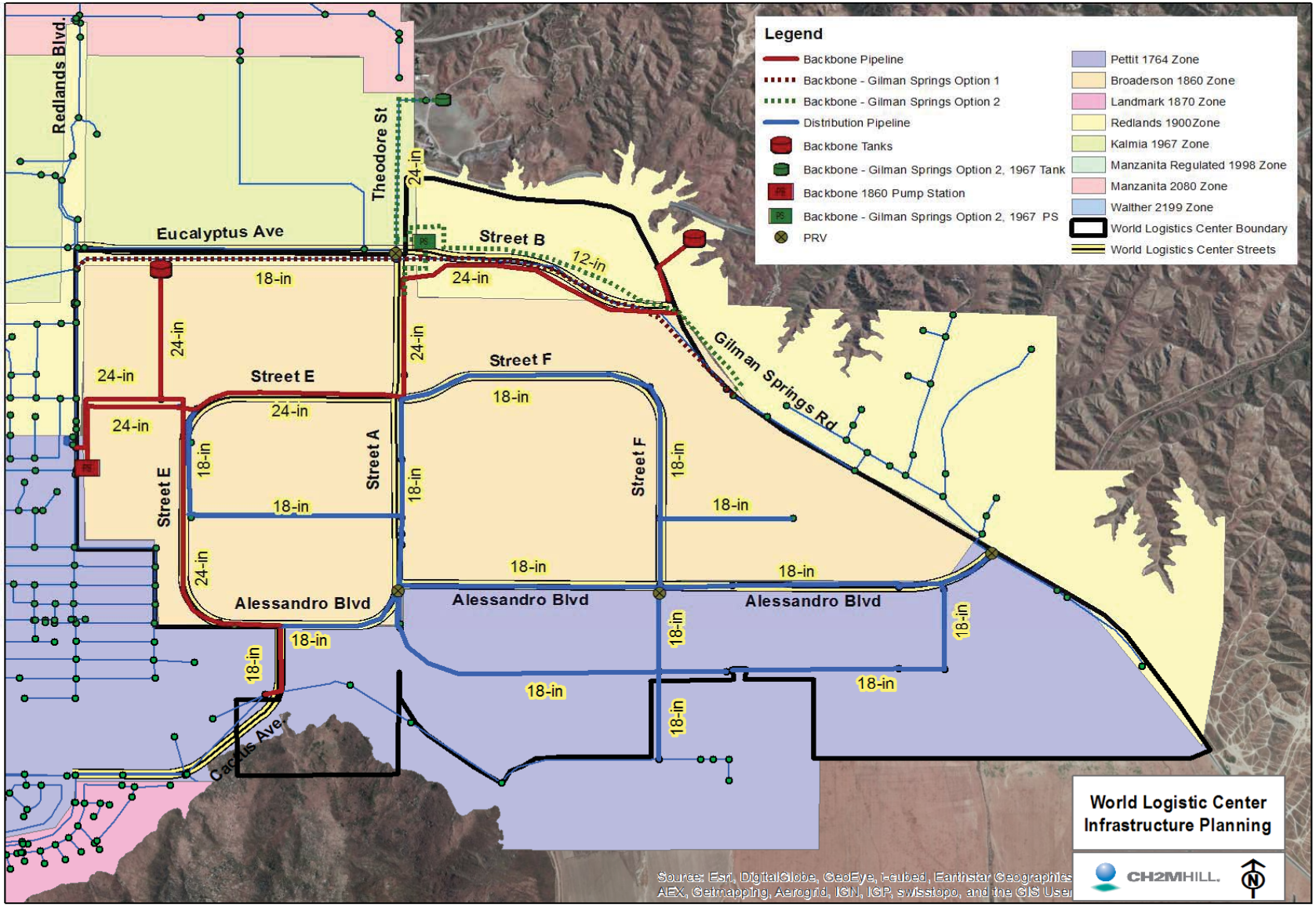
existing Gilman Springs customers online. Once these improvements are in place, World Logistics Center Development distribution pipeline can be added as needed to meet customer demands. As mentioned above, buildings within the World Logistics Center development that go online before the backbone infrastructure is complete will need a plan of service analysis to determine the optimal service and infrastructure needs for the individual site.

Distribution

Distribution improvements are all the pipeline recommendations to support projected development. Once the backbone infrastructure is in place, pipelines can be built out as needed to support customer demand. A water supply plan of service analysis will be needed for buildings that go online before the backbone infrastructure is complete.

Backbone and distribution improvements are shown in Figure 5.

Figure 5
World Logistics Center Infrastructure Planning



Storage Analysis

The storage analysis was completed using a spreadsheet model based on EMWD's storage criteria, presented above. The total storage requirements for the World Logistics Center were determined based on a demand of 670 gpd per acre as discussed previously. Because the World Logistics Center spans over three zones (1764, 1860, and 1967) storage analysis was performed for each zone. For each zone analysis, storage was calculated as follows:

- Operational storage (equalization) = 25% of MDD
- Fire flow storage = 0.96 MG (4,000 gpm for 4 hours)
- Emergency storage = Time of Use (25% of MDD)[a] + Emergency (25% of MDD)

  [a] Per EMWD, Time of Use is not included in the Pettit (1764) zone

From this analysis the storage requirements for the World Logistics Center will be 1.6 MG in the Pettit (1764) Zone, and 2.4 MG in the Broderson (1860) Zone. Kalmia (1967) Zone has a storage requirement of 1.1 MG, which is mainly for fire flow purposes. The results from the storage analysis for each zone are presented in Table 10.

TABLE 10
Storage Analysis by Zone

		Zone		
Description	**Unit**	**Pettit (1764)**	**Broderson (1860)**	**Kalmia (1967)**
ADD	gpm	403	690	57
MDD	gpm	806	1380	114
Total Storage Required	MG	1.5	2.5	1.1

gpm = gallons per minute
MG = million gallons

Storage Tank Locations

The 1.5 MG recommended Pettit (1764) Zone tank is currently being proposed for construction southeast of the intersection of Redlands Blvd and Eucalyptus Ave. Service to the tank is provided by the existing 24-inch pipeline in Cactus Ave and existing pipeline in the 1764 zone.

The 2.5 MG proposed Broderson (1860) Zone storage tank is located on the east side of the World Logistics Center development. A pump station near the existing Redlands Booster Station is needed to fill the proposed tank. A 24-inch pipeline along Street E is recommended to connect the pump station to the World Logistics Center pipe network.

Storage for the Kalmia (1967) Zone is needed for Gilman Springs Road service option 2 (if chosen). Based on the World Logistics Center demands serviced from this zone, the potential tank would be 1.1 MG. Water would be pumped from the Broderson (1860) Zone to fill this tank. A transmission main from the booster station to the tank would be built along Theodore Street. Table 11 summarizes the recommended tanks.

Table 11
Storage Tank Summary

Tank Description	Tank Size	Pump Station Required	Estimated Pipeline (ft)	Location
1764 Zone	1.6 MG	No	2,300[(1)]	Southeast of Intersection of Redlands Blvd and Eucalyptus Ave
1860 Zone	2.4 MG	Yes	7,100[(2)]	East of WLC Development, North of Gilman Springs Rd
1967 Zone	1.1 MG	Yes	3,050	East of Theodore, South of Ironwood

(1) Estimated pipeline is only the mainline from Street E to the tank location. The remaining pipeline needed to connect the tank to the system is listed below in Table 12.

(2) Estimated pipeline is only the mainline from Street F to the tank location. The remaining pipeline needed to connect the tank to the system is listed below in Table 12.

Pumping Analysis

Two pump stations are recommended for the World Logistics Center Development. One station is required to supply the recommended Broderson (1860) Zone tank, and the other pump station is needed to support the Kalmia (1967) Zone with additional storage. Both will fill the recommended/proposed tanks and supply demands. The results below are based on initial analysis and may need to be updated if the pump station location or tank size is changed.

For this analysis, the 1860 Zone Pump Station was placed near the existing Redlands Booster Station. The flow requirement is based on the criteria outlined in Table 5 for a "time of use" pump station. The recommended 2.5 MG 1860 Zone Tank will require one active pump with a flow of 1,742 gpm with a head gain of 105 feet. An additional pump with the same flow and head is recommended to be placed at the station as a backup pump.

The 1.1 MG potential 1967 Zone Tank will require one active pump with a flow of 230 gpm and a head gain of 107 feet. Due to the small size of this zone, using peak hour (2 x MDD) as the flow criteria from Table 5 was more appropriate for this station to fill the tank in a timely manner. An additional pump with the same flow and head is recommended to be placed at the station as a backup pump. For purposes of this study, the 1967 Zone Pump Station was located at the intersection of Theodore Street and Street B. This station would suction from the Broderson (1860) Zone. This pump station is only required if the 1967 tank is constructed.

The planned 1764 Tank receives flow from the existing Cactus Pump Station, therefore, no additional pump station was recommended for this tank.

Analysis Summary

Table 12 details the approximate length of the recommended pipeline along with the diameter and location within the system. Improvements are labeled as backbone infrastructure or distribution infrastructure.

Table 12
Proposed Specific Plan Pipeline

Length (ft)	Diameter (inch)	Backbone, or Distribution	Pressure Zone	Location
2,300[(1)]	24	Backbone	1764	1764 Tank Pipeline
4,850	24	Backbone	1764	South of 1764 Tank along Street E
2,250	24	Backbone	1764	Supply pipeline to 1764 Tank
1,850	18	Backbone	1764	Connection to existing system south of Alessandro Blvd on Cactus Ave
5,000	18	Backbone	1900	Option 1 – Gilman Springs, south of Eucalyptus
7,000	12	Backbone	1900	Option 1 – Gilman Springs Street B
7,000	12	Backbone	1967	Option 2 – Gilman Springs
3,050[(1)]	24	Backbone	1967	Option 2 – Gilman Springs 1967 Tank Pipeline
1,450	24	Backbone	1860/1967	Option 2 – Gilman Springs 1967 Booster Pipeline
7,100[(1)]	24	Backbone	1860	1860 Tank Pipeline
2,900	24	Backbone	1860	Booster station supply pipeline to Street E
3,550	24	Backbone	1860	Street E
3,500	18	Distribution	1860	Street A, Between the Intersections of Street E and the loop pipeline
5,700	18	Distribution	1860	Street E loop pipeline
12,000	18	Distribution	1860	Street F loop pipeline, to dead-end east of Street F
2,000	18	Distribution	1860	Dead – end east of Street F
8,600	18	Distribution	1860	Along Alessandro Blvd, connecting at Street A loop and Street F dead-end
3,500	18	Distribution	1764	Alessandro Blvd, east of Cactus Ave to Street A intersection
10,000	18	Distribution	1764	South of Alessandro Blvd
7,000	18	Distribution	1764	Alessandro Blvd, east of Street F, to Gilman Springs and south to loop intersection
3,000	18	Distribution	1764	Street F, from Alessandro Blvd south to existing pipeline connection

(1) This pipeline length was included as the tank pipeline on Table 11.

World Logistics Center Recycled Water Analysis

PREPARED FOR: Highland Fairview

PREPARED BY: CH2M HILL

DATE: September 2014

Summary of Modifications

Modifications to the Recycled Water Analysis have been made to reflect changes in the Project Description. These modifications are reflected in the memo and shown in Exhibits 6 through 9.

Introduction

The proposed World Logistics Center Specific Plan (WLC) is a master plan for the development of logistics warehouse distribution facilities on approximately 2,610 acres of land in the Rancho Belago area of eastern Moreno Valley. The Specific Plan proposes the development of 40.4 million square feet of high-cube logistics facilities on 2,382.8 acres, 200,000 square feet of light logistics facilities on 37.1 acres, an in-project fueling station, 115.8 acres of street right-of-way and 74.3 acres of permanent open space.

The Specific Plan area is situated southerly of State Route 60, generally between Redlands Boulevard and Gilman Springs Road (the easterly City limit). The Specific Plan extends to, but does not include, the San Jacinto Wildlife Area (SJWA). The General Plan Amendment and Zone Change which accompany the Specific Plan includes a portion of the SJWA property in order to designate that land for open space use.

The World Logistics Center is located within the recycled water service area of Eastern Municipal Water District (EMWD). The purpose of this technical memorandum is to identify recycled water system requirements for the WLC. EMWD currently plans to provide recycled water for site irrigation.

Analysis Criteria

Assumptions

The recycled water distribution system analysis for the WLC was performed using the InfoWater model provided by Eastern Municipal Water District (EMWD). Recycled water distribution piping, a booster pump station, and a recycled water storage tank were added to the 2012 distribution system for this analysis.

The standard EMWD demand used for industrial land uses is 2,000 gpd/gross acre (2.2 acre-ft/year (afy) per gross acre). The developable project area (excluding open space) is 2,536 acres which equates to a water demand of 5,580 afy. The WLC has a land use generally consisting of high cube logistics which has a lower water use than typical industrial development. In addition, the project is programmed to utilize native and drought tolerant plants along with sustainable methods to direct rainfall runoff to landscaped areas, potentially reducing the total irrigation demand. Recognizing the potential reduction in water demand, EMWD issued a Water Supply Assessment (WSA) with an estimated total water demand of 1,991 afy. The estimated potable water demand for building use is 460 afy. The balance remaining for potential irrigation use is

1,521 afy. For purposes of sizing facilities, this analysis assumes the full potential irrigation demand of 1,521 afy or 1,358,000 gallons per day (gpd) for the average day demand (ADD). Irrigation demands are distributed evenly throughout the WLC site based on the piping layout.

Peaking factors were applied to ADD to obtain maximum day demands (MDD) and peak hour demands (PHD). For irrigation demands, the peaking factor from ADD to MDD is 2.5 and from MDD to PHD is 3[1].

Highland Fairview Corporate Park (HFCP), which includes the existing Skechers building and adjacent parcels, has an associated irrigation demand as shown in Exhibit 1. The existing irrigation demands are being served by a recycled water pipeline that is connected to the domestic water system. It is assumed this pipeline will be converted to recycled water service in the future.

EXHIBIT 1
Highland Fairview Corporate Park Irrigation Demands
WLC Recycled Water Analysis

Site	ADD (gpd)[a]	MDD (gpd)[a]	PHD (gpd)[a]
Skechers	41,811	104,527	313,581
Parcel 2	11,288	28,220	84,660
Parcel 3	6,682	16,704	50,112
Parcel 4	3,645	9,111	27,333
Total	**63,000**	**159,000**	**476,000**

[a] Reference: Final Environmental Impact Report for Highland Fairview Corporate Park, Appendix K, Attachment D (Michael Brandman Assoc., 2008).

The total demands for the WLC and HFCP are tabulated in Exhibit 2. The storage tank for the WLC site is sized for 75 percent of MDD storage. The placement of the recycled water storage tank is adjacent to the proposed location of the new domestic water tank east of the intersection of Gilman Springs Road and Street B. At elevation 1850, the recycled water storage tank provides sufficient pressure within the WLC and HFCP sites to require no additional operational storage.

EXHIBIT 2
Total Demands for WLC and Highland Fairview Corporate Park
WLC Recycled Water Analysis

Site	ADD (gpd)	MDD (gpd)	PHD (gpd)
WLC irrigation	1,358,000	3,395,000	10,185,000
HFCP irrigation	63,000	159,000	476,000
Total	**1,421,000**	**3,554,000**	**10,661,000**

[1] Peaking factors are based on the Final Environmental Report for the Highland Fairview Corporate Park (Michael Brandman Assoc., 2008) for irrigation.

EXHIBIT 2
Total Demands for WLC and Highland Fairview Corporate Park
WLC Recycled Water Analysis

Site	ADD (gpd)	MDD (gpd)	PHD (gpd)

Design Criteria

The criteria used to evaluate system performance were adopted from the 2010 EMWD Recycled Water Facilities Master Plan. The criteria are summarized below.

- Operating pressure range at MDD = 40 to 110 psi
- Maximum MDD flow velocity of 5 feet per second (fps)
- Maximum PHD flow velocity of 10 fps
- Maximum headloss:

Flow Condition [a]		Headloss
< 20 cfs	< 9000 gpm	3.0 feet/1000 feet
20 – 50 cfs	9000 – 22,500 gpm	2.0 feet/1000 feet
> 50 cfs	> 22,500 gpm	1.0 feet/1000 feet

[a] cubic feet per second (cfs), gallons per minute (gpm)

- The generation of recycled water is assumed to be able to match MDD for the system with the largest Regional Water Reclamation Facility out of service.
- Service level storage capacity is 75 percent of MDD based on the criterion from the 2010 Master Plan for 100 percent landscape demand:

Percent of Non-Landscape Demand	Percent of Landscape Demand	Recommended Service-Level Percent of Storage (Percent of MDD)
100	0	20
75	25	30
50	50	50
25	75	60
0	**100**	**75**

[a] cubic feet per second (cfs), gallons per minute (gpm)

Existing System

The existing distribution system consists of:

- Four Regional Water Reclamation Facilities (RWRFs) and associated Effluent Pump Stations

- Seventeen RWRF Onsite Distribution Storage Ponds
- Four RWRF Onsite Storage Pond Recycled Water Pump Stations (RWPSs)
- Six Offsite Distribution Storage Ponds
- Five Offsite Storage Pond RWPSs
- Six Recycled Water Booster Stations (RWBSs)
- Two Service Level Storage Tanks and One Service Level Reservoir
- Reach 4 Energy Dissipator
- Eight Pressure Zones
- Transmission and Distribution Piping

The Landmark Reservoir currently serves the 1710 Pressure Zone of the existing distribution system and is located nearest to the WLC site. A pump station will be required to provide recycled water from the Landmark Reservoir and 1710 Pressure Zone to the WLC site and the new recycled water storage tank.

The 2010 EMWD Recycled Water Facilities Master Plan determined the existing recycled water demands and projected future system requirements. The 2010 recycled water supply exceeded the 2010 ADD, and additional supply will be required to meet projected future demands as shown in Exhibit 3. For the 2012 scenario, the supply slightly exceeds the demand based on the extrapolated demand information in the InfoWater model supplied by EMWD and the additional recycled water demands for the WLC and HFCP sites.

EXHIBIT 3
Existing and Projected Recycled Water Supply and Demand per 2010 EMWD Recycled Water Facilities Mater Plan
WLC Recycled Water Analysis

Year	Supply		Demand	
	(afy)	(MGD)[a]	(afy)	(MGD)[a]
Existing (2010)	47,700	42.6	39,600	35.3
2015	57,100	50.9	57,100	50.9
2020	65,000	58.0	65,000	58.0
2025	73,900	65.9	73,900	65.9
2030	82,900	74.0	82,900	74.0

[a] MGD = million gallons per day

The existing recycled water distribution model obtained from EMWD includes information for the existing facilities described in the 2010 EMWD Recycled Water Facilities Master Plan. In addition, the InfoWater model is assumed to accurately represent the existing system. The Landmark Reservoir and associated piping for the 1710 Pressure Zone will supply recycled water to the WLC site via the WLC booster pump station. They are included in the WLC site recycled water analysis in order to determine the impacts of the WLC and HFCP demands on the existing

system. Potential impacts to the existing system are discussed on page 7. This analysis assumes that the existing recycled water system has sufficient pump capacity at the various pump stations to provide the additional volume required to the Landmark Reservoir under MDD conditions.

A 12-inch recycled water pipe was installed in 2010 along Eucalyptus Ave. between Redlands Blvd. and Theodore St. It is currently connected to the drinking water system. It is assumed that the 12-inch pipe will be connected to the recycled water system from the WLC site and disconnected from the drinking water distribution system in the future to provide irrigation water to the HFCP.

Analysis

Two scenarios were developed from the EMWD existing model for the WLC project area:

- Full WLC project area and demands from the EMWD existing system
- Full WLC and HFCP project areas and demands from the EMWD existing system

For each scenario, the average day, maximum day and peak hour demands developed in Exhibit 2 were distributed to nodes in the recycled water model. WLC irrigation demands are distributed to all nodes within the WLC site, except for the nodes on the piping connection between Pressure Zone 1710 and the WLC booster pump station. The scenarios and results are described below.

1. **Full WLC project area and demands from the EMWD existing system**. Pipe sizing for this scenario assumes that the entire site will be constructed without adjustments to demands from phased development. Pipe size was determined based on the pipe velocity and headloss criteria under PHD flows. On-site pipe sizes range from 8 to 18 inches as shown in Exhibit 6. There is potential for some stagnation issues with the piping in the 1730 Pressure Zone due to non-looped piping along Alessandro Blvd.. This will be evaluated further during final design. Potential solutions include routine pipe maintenance to clean out debris in the pipe. The WLC pump station will be located at the boundary of the 1710 Pressure Zone, approximately at the intersection of Merwin Street and Bay Avenue, to pump to the WLC site. The WLC booster pump station is rated at approximately 2,500 gpm and 230 feet of total dynamic head (TDH).

   An 18-inch pipeline from the WLC booster pump station conveys water approximately 20,000 lineal feet (LF) through the 1860 Pressure Zone to the 2.7 million gallon recycled water storage tank, which will be located east of Gilman Springs Road. Recycled water is supplied from the 1710 Pressure Zone; flow return to the 1710 Pressure Zone from the 1730 Pressure Zone will be limited by an emergency pressure reducing valve to eliminate unnecessary pumping of recycled water to HFCP. There will also be a backup supply from the drinking water system into the recycled water storage tank to provide an added level of redundancy to the system. The backup supply will include an air gap to prevent contamination of the drinking water system.

   Preliminary results show pressures in the 18-inch suction piping to the WLC booster pump station that are just below the design criterion of 40 psi. Since none of the controls of the existing system are modified for the WLC and HPCP analysis, further distribution system analysis will be required to determine if improvements are required to eliminate insufficient pressures.

Due to the head required to fill the storage tank in Zone 1850, pressures in the 18-inch transmission pipeline exceed the maximum operating pressure criterion of 110 psi in Zone 1790 near the pump station. These, in turn, will require pressure reducing valves to service connections. The transmission pipeline MDD pressure through the 1790 Pressure Zone ranges between 90 and 117 psi. In the 1860 Pressure Zone, pressures between 65 and 90 psi during MDD fall within the acceptable pressure criteria. Operating pressures are influenced by piping headlosses and static pressure between the tank and pump. To decrease operating pressures in the 1790 Pressure Zone, the transmission pipe size would need to be increased. However, this is not possible since the minimum static pressure due to the elevation difference between the pump and the recycled water storage tank is 110 psi.

Grade and building elevation across the WLC and HFCP sites range from 1540 to 1770. To accommodate the operating pressures associated with the WLC and HFCP sites, three pressure zones are identified to minimize excursions from the design criterion: 1860, 1790, and 1730. Pressure reducing valves are located to reduce pressure from the 1860 Pressure Zone to the 1790 Pressure Zone and from the 1790 Pressure Zone to the 1730 Pressure Zone. The pressure reducing valve to the 1790 Pressure Zone is set to 75 psi. Pressure reducing valves to the 1730 Pressure Zone are set at 65 and 55 psi to allow flow through the looped sections of piping. Exhibit 4 shows the pressure range for each pressure zone of the WLC site; Exhibit 7 shows the map of the WLC site with the pressures displayed for MDD.

EXHIBIT 4
Pressure Range Results of WLC Scenarios
WLC Recycled Water Analysis

Pressure Zone	Pressure Range		
	ADD	**MDD**	**PHD**
1730	72 – 94	62 – 89	40 – 68
1790 (not including transmission pipe)	75 – 96	75 – 92	32 – 75
1790 (transmission pipe)	98 – 119	95 – 116	86 – 107
1860	65 – 95	63 – 92	67 – 78

The WLC booster pump station is sized for 2,500 gpm at 230 feet of total dynamic discharge head (TDH). The recycled water storage tank is sized at 2.7 million gallons, with an operational depth of 40 feet. The WLC booster pump station is slightly oversized for the WLC MDD condition of 2,360 gpm.

The estimated pipe lengths required to supply the WLC site from the 1710 Pressure Zone are:

- 8-inch PVC: 14,000 LF
- 12-inch PVC: 16,000 LF

- 18-inch PVC: 20,000 LF

The WLC site will be developed in two phases. Phase 1 development is approximately 50 percent of the entire WLC site and consists of development on the west side of the site. The 18-inch transmission pipe and the 2.7MG Tank will need to be built as part of Phase 1 and the Phase 1 demands will also require the booster pumps for 1,400 gpm at 230 feet TDH to be constructed.

2. **Full WLC and HFCP project area and demands from the EMWD existing system.** The impacts of the adding the HFCP demands to the WLC distribution system do not significantly impact pressures and pipe velocities in the WLC system since the allocation for HFCP is approximately 3, 4, and 4 percent of the total WLC system demand for ADD, MDD, and PHD, respectively. The 12-inch pipe connecting to the existing 12-inch recycled water pipe at the HFCP site is located off the 18-inch transmission pipe to the recycled water storage tank as shown in Exhibit 8. Resultant pressures in the system for the WLC and HFCP sites during MDD are displayed in Exhibit 9.

EXHIBIT 5
Pressure Range Results of WLC and HFCP Scenarios
WLC Recycled Water Analysis

Pressure Zone	Pressure Range		
	ADD	MDD	PHD
1730	68 – 87	62 – 89	40 – 68
1790 (not including transmission pipe)	75 – 96	75 – 924	32 – 75
1790 (transmission pipe)	98 – 119	95 – 116	83 – 105
1860	66 – 95	65 – 92	52 – 80
HFCP site	63 – 65	62 – 63	50 – 51

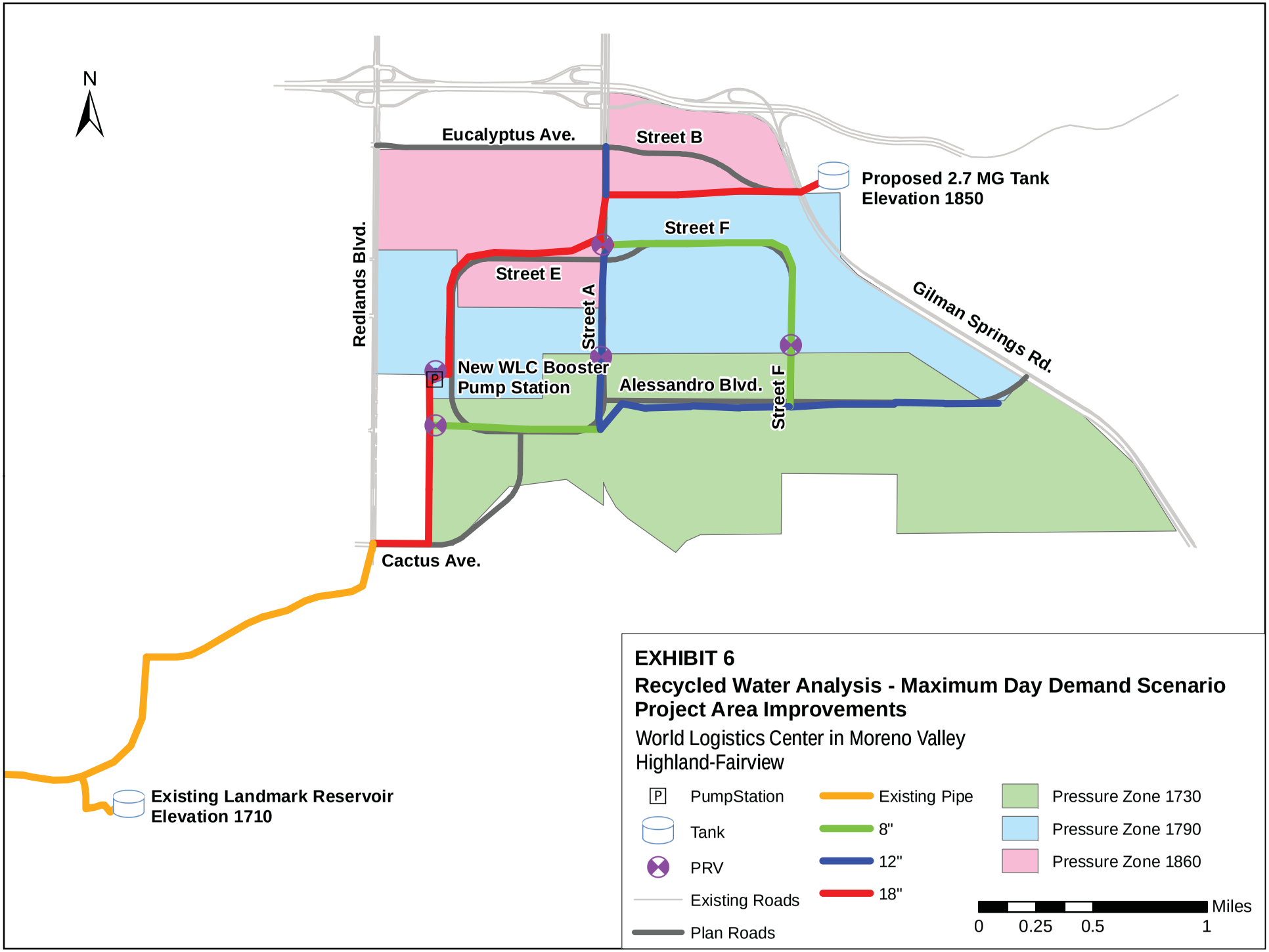
The WLC booster pump station and recycled water storage tank are sized to provide sufficient capacity at the full WLC and HFCP demands due to the minimal increase in pump station capacity and tank size. The HFCP demands increase the required pump station capacity by only 110 gpm and the required tank storage capacity by 200,000 gallons.

Changes to the street layout were made after the modeling and analysis was completed. The figures were updated to show the pipe in Alessandro Blvd in its current location. At the time of final design the analysis will need to be updated to reflect the current street location.

Potential Existing System Impacts

Based on the projected demands and the existing supply capacity of the RWRFs, the existing system is capable of producing sufficient recycled water to the existing distribution system and meeting the demands of the WLC and HFCP sites for the near-term. The supply capacity may require augmentation depending on increased demands throughout the existing system as well as phasing of the WLC and HFCP development.

The existing system will need to provide an additional 3,100 gpm through the system and up to the Landmark Reservoir. The existing system will need to be analyzed at a later date to determine adequacy of the existing pump stations to maintain existing operating levels in the Landmark Reservoir and to prevent lowering of the operating pressures below the 40 psi criteria. This analysis should include the determination of the pump stations' existing capacity to provide sufficient flow to the distribution system demands and to the Landmark Reservoir; identification of modifications to the pump stations' operations to accomplish filling and draining of the Landmark Reservoir; and identification of improvements to the existing pump stations to fix existing capacity deficiencies.


N
Eucalyptus Ave.
Street B
Proposed 2.7 MG Tank
Elevation 1850
Street F
Street E
Street A
Redlands Blvd.
Gilman Springs Rd.
New WLC Booster
Pump Station
Alessandro Blvd.
Street F
Cactus Ave.
Existing Landmark Reservoir
Elevation 1710
EXHIBIT 6
Recycled Water Analysis - Maximum Day Demand Scenario
Project Area Improvements
World Logistics Center in Moreno Valley
Highland-Fairview
PumpStation
Tank
PRV
Existing Roads
Plan Roads
Existing Pipe
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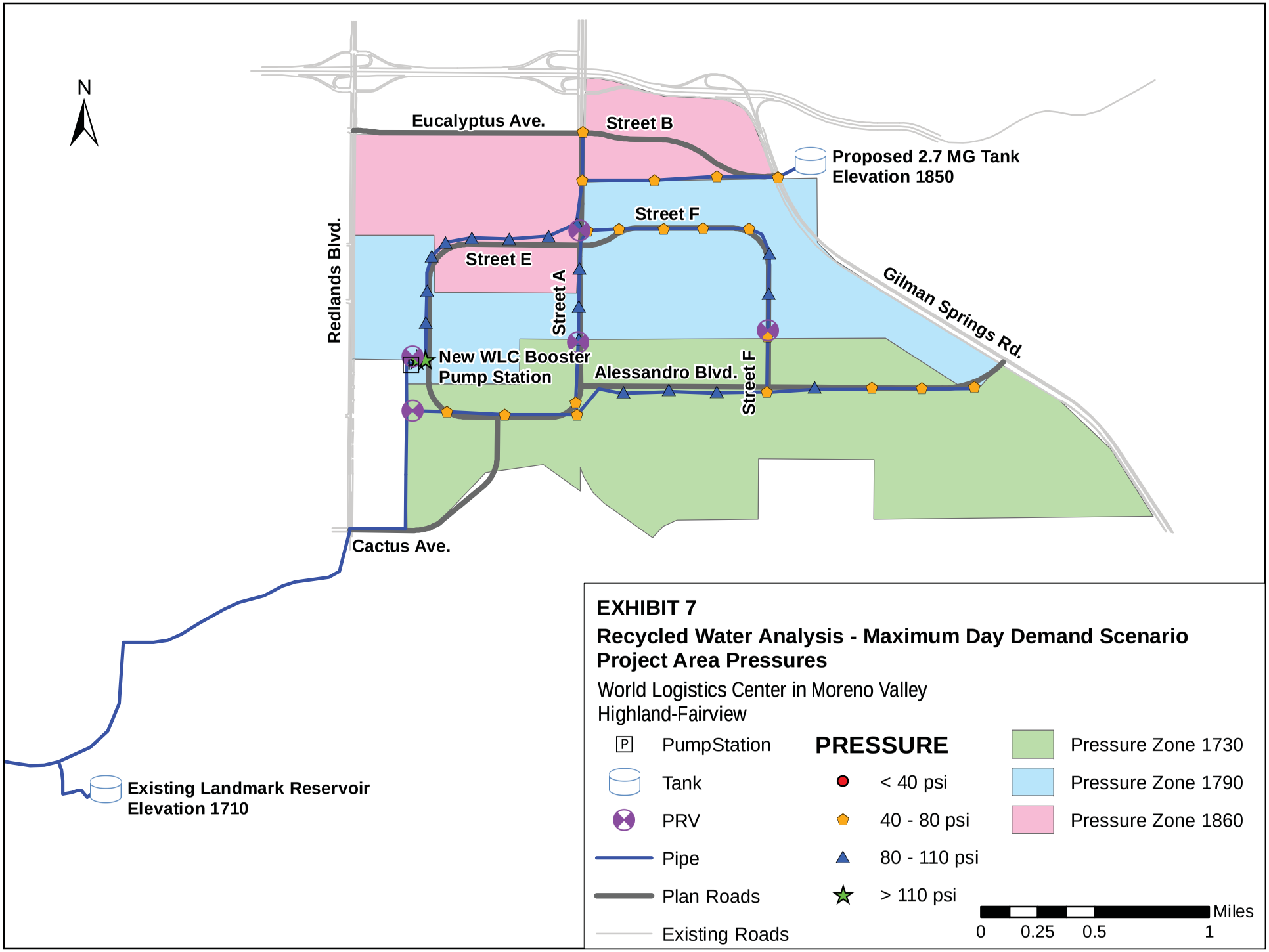
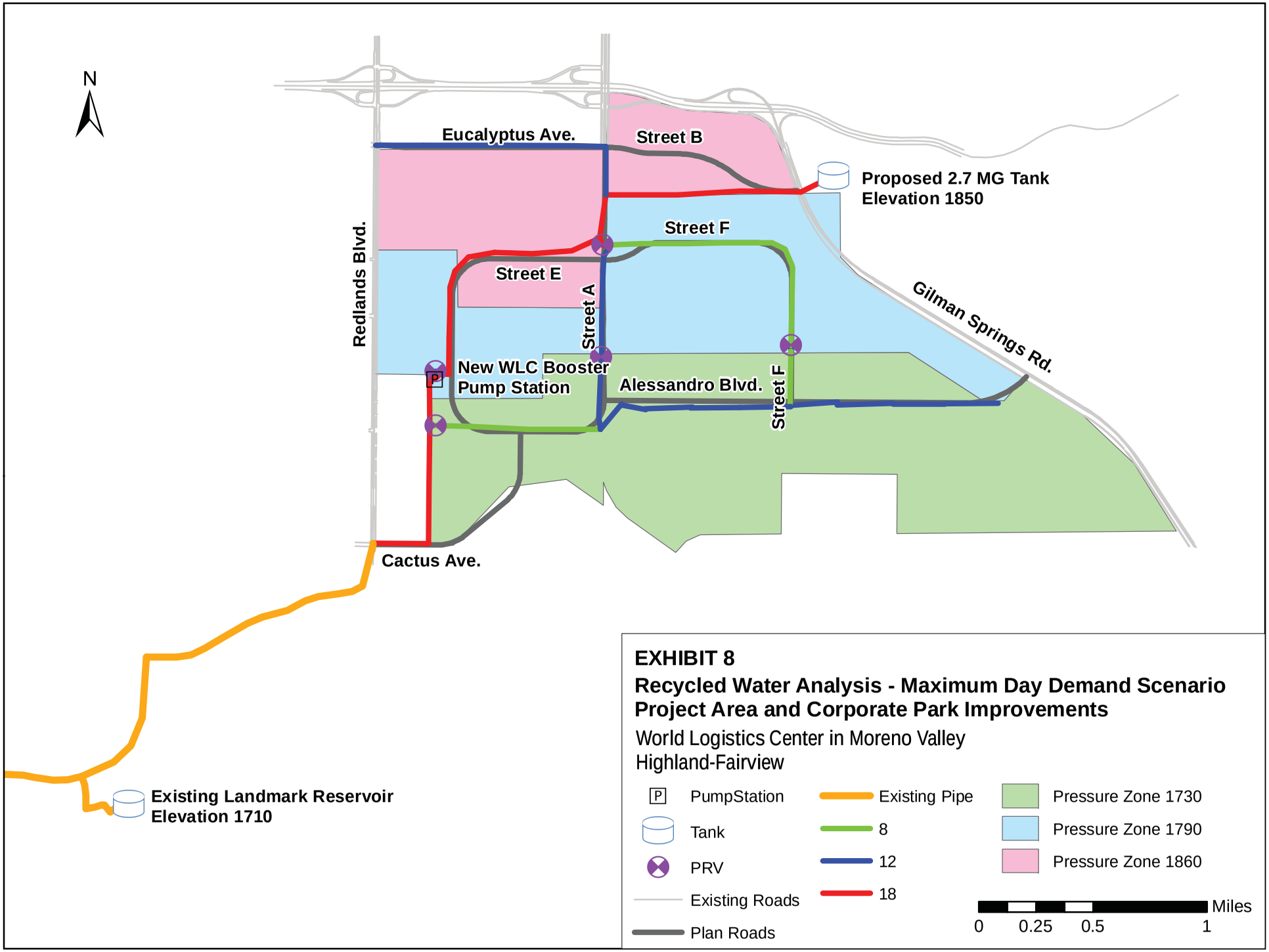
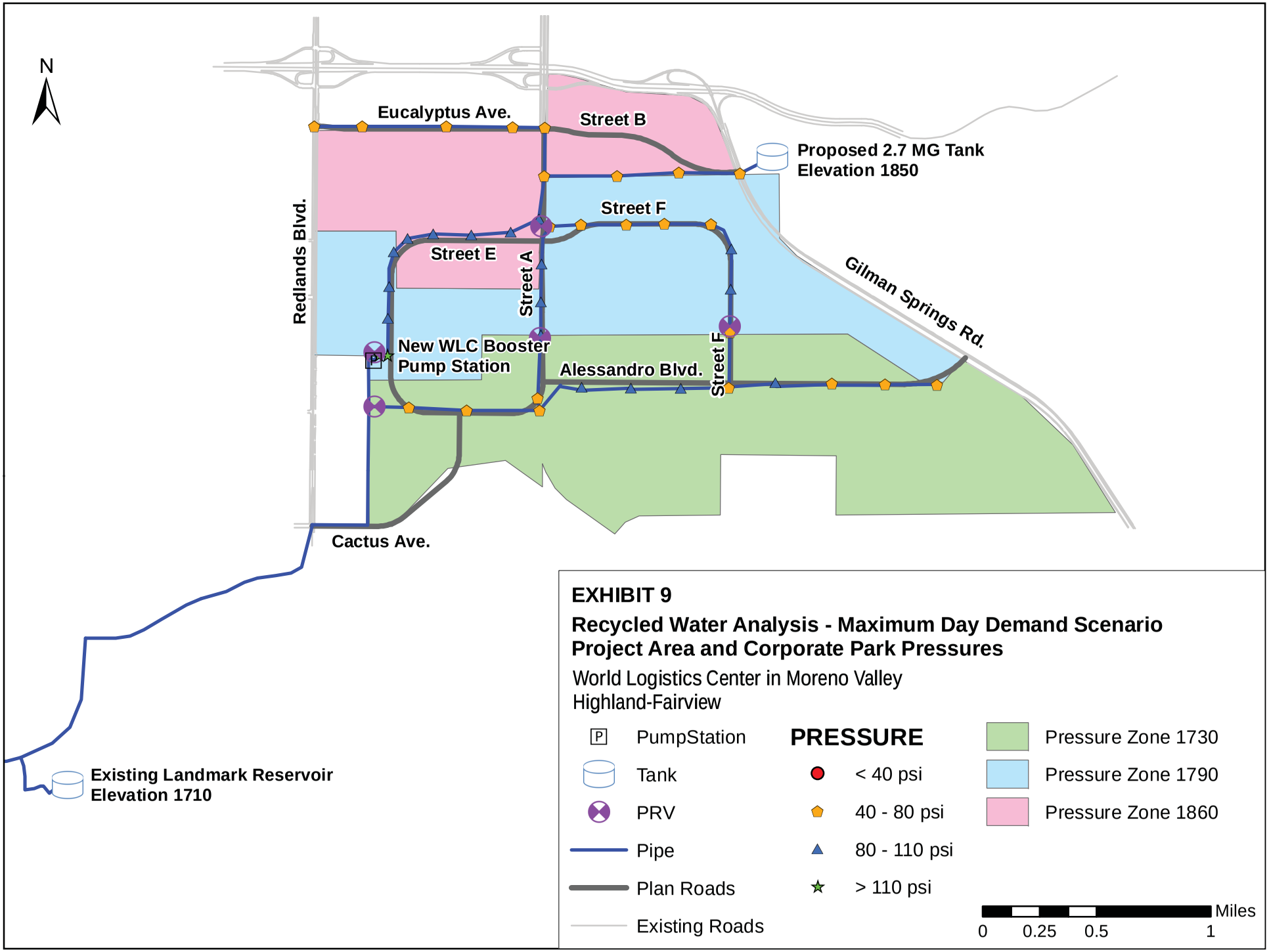
12"
18"
Pressure Zone 1730
Pressure Zone 1790
Pressure Zone 1860
Miles
0
0.25
0.5
1


N
Eucalyptus Ave.
Street B
Proposed 2.7 MG Tank
Elevation 1850
Street F
Street E
Redlands Blvd.
Street A
Gilman Springs Rd.
New WLC Booster
Pump Station
Alessandro Blvd.
Street F
Cactus Ave.
Existing Landmark Reservoir
Elevation 1710
EXHIBIT 7
Recycled Water Analysis - Maximum Day Demand Scenario
Project Area Pressures
World Logistics Center in Moreno Valley
Highland-Fairview
PumpStation
Tank
PRV
Pipe
Plan Roads
Existing Roads
PRESSURE
< 40 psi
40 - 80 psi
80 - 110 psi
> 110 psi
Pressure Zone 1730
Pressure Zone 1790
Pressure Zone 1860
Miles
0
0.25
0.5
1


N
Eucalyptus Ave.
Street B
Proposed 2.7 MG Tank
Elevation 1850
Street F
Street E
Street A
Redlands Blvd.
Gilman Springs Rd.
New WLC Booster
Pump Station
Alessandro Blvd.
Street F
Cactus Ave.
Existing Landmark Reservoir
Elevation 1710
EXHIBIT 8
Recycled Water Analysis - Maximum Day Demand Scenario
Project Area and Corporate Park Improvements
World Logistics Center in Moreno Valley
Highland-Fairview
PumpStation
Tank
PRV
Existing Roads
Plan Roads
Existing Pipe
8
12
18
Pressure Zone 1730
Pressure Zone 1790
Pressure Zone 1860
Miles
0
0.25
0.5
1


N
Eucalyptus Ave.
Street B
Proposed 2.7 MG Tank
Elevation 1850
Street F
Redlands Blvd.
Street E
Street A
Gilman Springs Rd.
New WLC Booster
Pump Station
Alessandro Blvd.
Street F
Cactus Ave.
Existing Landmark Reservoir
Elevation 1710
EXHIBIT 9
Recycled Water Analysis - Maximum Day Demand Scenario
Project Area and Corporate Park Pressures
World Logistics Center in Moreno Valley
Highland-Fairview
PumpStation
Tank
PRV
Pipe
Plan Roads
Existing Roads
PRESSURE
< 40 psi
40 - 80 psi
80 - 110 psi
> 110 psi
Pressure Zone 1730
Pressure Zone 1790
Pressure Zone 1860
Miles
0
0.25
0.5
1