

## Appendix H

### Sewer Area Study

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# PILOT TRAVEL CENTER CITY-DIRECTED SEWER AREA STUDY

City of Palmdale, CA

January 11, 2021

Prepared By:

**Kimley»Horn**



January 11, 2021

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**To:** City of Palmdale & LA County

**From:** Shae Anti, P.E.; Kimley-Horn and Associates, Inc.  
Troy Hotchkiss, P.E.; Kimley-Horn and Associates, Inc.

**Date:** January 11, 2021

**Subject:** *Pilot Travel Center Sewer Study for City of Palmdale and LA County*

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**Attachments:**

Appendix A Exhibit 1 Sewer Area Map  
Appendix B Proposed Development  
Appendix C Table of Sewer Capacity Analysis  
Appendix D Supporting Plans/Maps  
Appendix E Tentative Map / Site Specific Docs

## **I. Introduction**

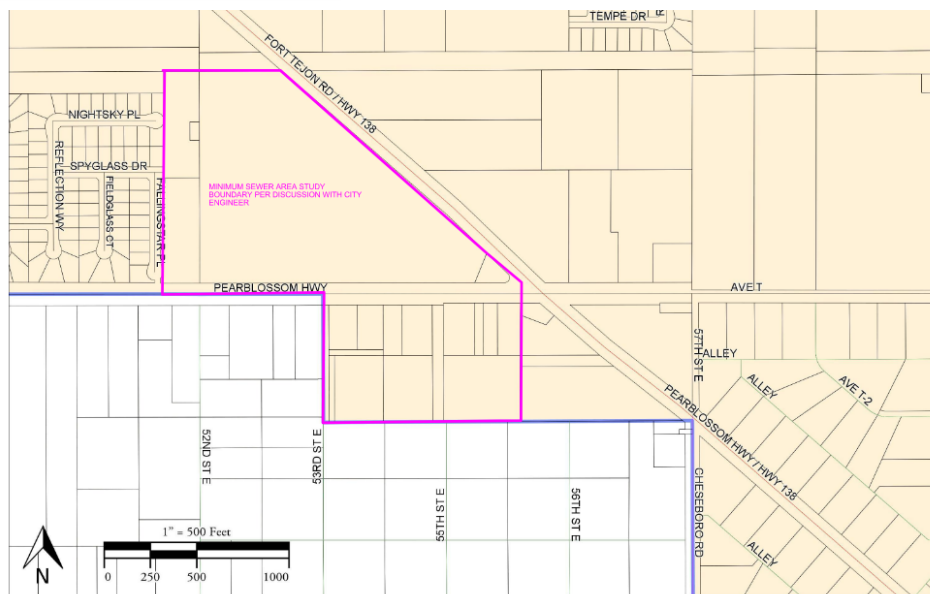
This Sewer Area Study (Study) has been prepared at the request and direction of the City of Palmdale, CA in connection with a proposed development by Pilot Travel Centers. The City directed the developer to assess two pre-defined service strategies:

- **Alternative 1** – Extension of an existing 15-inch interceptor in 47<sup>th</sup> St and Pearblossom Highway to the proposed project.
- **Alternative 2** – Extension of an existing 15-inch interceptor in 47<sup>th</sup> St and Stargazer Pl. to the proposed project. The alignment would run within an existing stormwater basin access road.

The study was prepared in accordance with the current Los Angeles County Sewer Area Study guidance documents.

## **II. Site Description**

The Pilot Travel Center is to be constructed on the plot of land bounded by Pearblossom Highway to the south and State Route 138/Fort Tejon Road to the east. The sewer study area also includes properties to the south of the Travel Center as shown in **Appendix A** and **Figure 1**. The entire area considered in the sewer study is approximately 53 acres zoned for commercial use.



**Figure 1: Sewer Study Area**

### III. Project Description

The project is a proposed Pilot Travel Center with a gas station and convenience store. The 8-acre site will host a 12,796 square foot (SF) truck travel building with a fast food restaurant, and a fueling station for cars and trucks. **Appendix B** includes the preliminary site plan for the development.

### IV. Description of Existing Sewer System

The neighborhood to the west of the development has existing 8-inch sewer lines. The lines that serve this neighborhood drain west to an existing manhole (MH) 545 at the intersection of 47<sup>th</sup> street and Stargazer Place as shown in the Palmdale Master Plan in **Appendix D**. Kimley-Horn initially evaluated the possibility of connecting to MH 664 at the intersection of Stargazer Place and Fallingstar to serve the project and the flows anticipated to be generated from the Pilot Travel Center. The existing system has capacity available to serve the project. This is verified in the existing housing tract Sewer Area Study PC05-65.

However, as noted above, the City directed the developer to assess two alternative service strategies. The City requested that a new 15-inch gravity main be evaluated for placement near 47<sup>th</sup> and Pearblossom (Alternative 1) or placement near 47<sup>th</sup> and Stargazer Place (Alternative 2) as described in the following sections.

### V. Description of City-directed Sewer System

#### Alternative 1

As directed by the City in an email dated July 13th, 2020, the proposed sewer alignment will connect to an existing 15-inch interceptor that currently ends at MH 545 at the intersection of 47<sup>th</sup> street and Stargazer Place. The proposed gravity main would be constructed along Pearblossom Highway south of the site, flow west to 47<sup>th</sup> Street and turn north to connect to MH 545 at the intersection of 47<sup>th</sup> and Stargazer. The City-directed 15-inch gravity main alignment is approximately 5,000 linear feet (LF) of interceptor.

The vertical alignment for the proposed gravity main is controlled by the existing invert at MH 545 and the low point along Pearblossom Highway located approximately 450 LF west of Fort Tejon Rd (State 138). **Table 1** summarizes the control parameters for the proposed 15-inch sewer line based on available site information. The available grade based on existing infrastructure and apparent topography is 0.60% (0.0060-ft/ft).



**Table 1: Proposed Sewer System**

Parameter	Value
MH 545 (elevation, feet)	2,720
Pearblossom low point (elevation, feet)	2,753
Min cover (ft)	5.0
Pipe Diameter (in)	15
Pipe Length (ft)	4,645
Apparent Available Slope	0.60%

**Alternative 2**

Likewise, the proposed sewer alignment for Alternative 2 will connect to an existing 15-inch interceptor that currently ends at MH 545 at the intersection of 47<sup>th</sup> street and Stargazer Place. The proposed gravity main would be constructed just north of Stargazer Place in an existing stormwater basin access road, flow west to 47<sup>th</sup> Street and turn south to connect to MH 545. The City- directed 15-inch gravity main alignment is approximately 4,610 LF of interceptor.

The vertical alignment for the proposed gravity main is controlled by the existing invert at MH 545 and the low point along the alignment located along the proposed alignment. **Table 2** summarizes the control parameters for the proposed 15-inch sewer line based on available site information. The available grade based on existing infrastructure and apparent topography is 0.22% (0.0022-ft/ft).

**Table 2: Proposed Sewer System**

Parameter	Value
MH 545 (elevation, feet)	2,720
Stargazer low point (elevation, feet)	2,735
Min cover (ft)	5.0
Pipe Diameter (in)	15
Pipe Length (ft)	4,610
Apparent Available Slope	0.22%

**VI. Methodology**

For the basis of this Study, Kimley-Horn used Palmdale design standards and Sewer Area Study Guidance presented by Los Angeles County to assess the planning-basis capacity of the proposed line. These guidelines require the design capacity to be carried by half to three-quarters full pipes and not full or pressurized flow conditions. Kutters Formula is the required method of flow calculation for LA County. Kutters Formula is as follows:

$$Q = A * c * [R * S]^{1/2}$$

Where

- Q = flow
- A = cross- sectional area
- c = coefficient (calculated based on manning's n)
- R = Hydraulic Radius
- S = Slope

Kutters Formula was used to calculate the design capacity of the proposed 15-inch gravity main. **Appendix C** shows the results of the capacity analysis.

The sewer study area to be served by the proposed main is approximately 53 acres of land zoned for commercial use. Per LA County Sewer Area Study Guidance, as shown in **Table 2**, the sewer generation zone coefficient for commercial land is 0.015 cubic feet per second (cfs)/acre. Therefore, the area under consideration would generate approximately 0.795 cfs. This flow would utilize only 14% of the available

capacity for Alternative 1 (at 0.6% slope) and 23% of the available capacity for Alternative 2 (at 0.22%) based on apparent available slope.

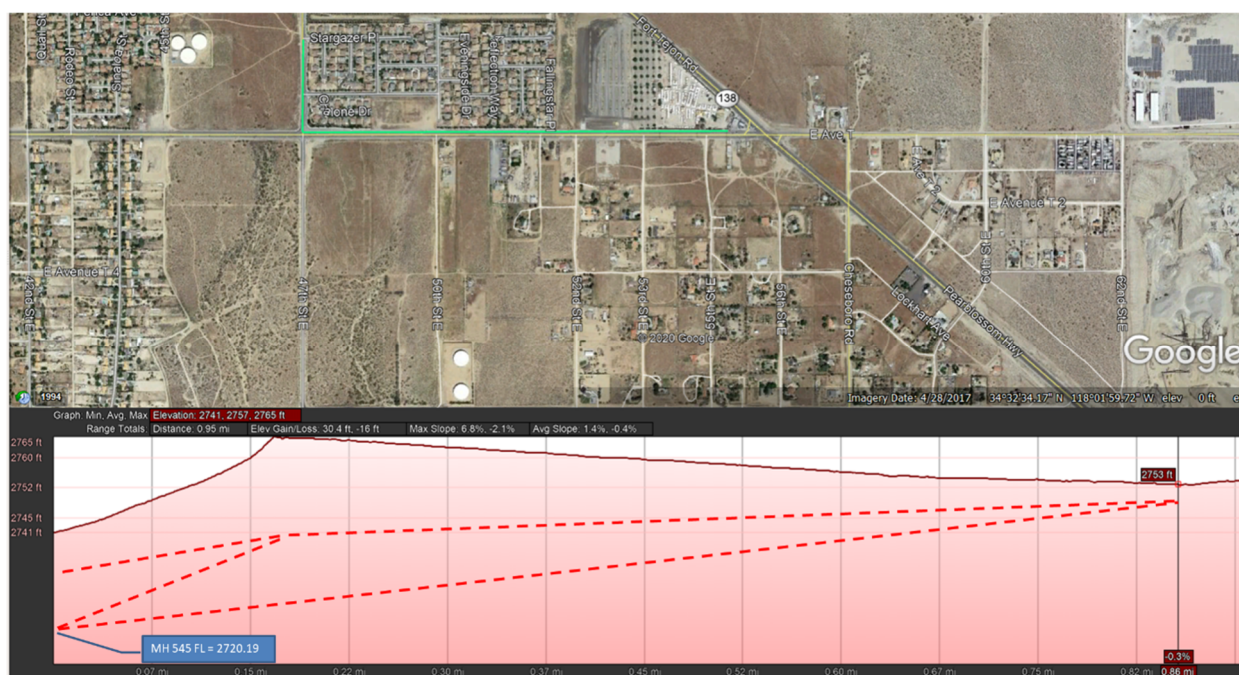
**Table 3: Estimated Average Daily Sewage Flows for Various Occupancies Zoning Coefficients (LA County Sewer Area Study Guidance)**

Zone	Coefficient (cfs/acre)
<b>Agricultural</b>	0.001
<b>Residential*:</b>	
R-1	0.004
R-2	0.008
R-3	0.012
R-4	0.016*
<b>Commercial:</b>	
C-1 – C-4	0.015*
<b>Heavy Industrial:</b>	
M-1 – M-4	0.021*

\*Individual building, commercial or industrial plant capacities shall be the determining factor when they exceed the coefficients shown

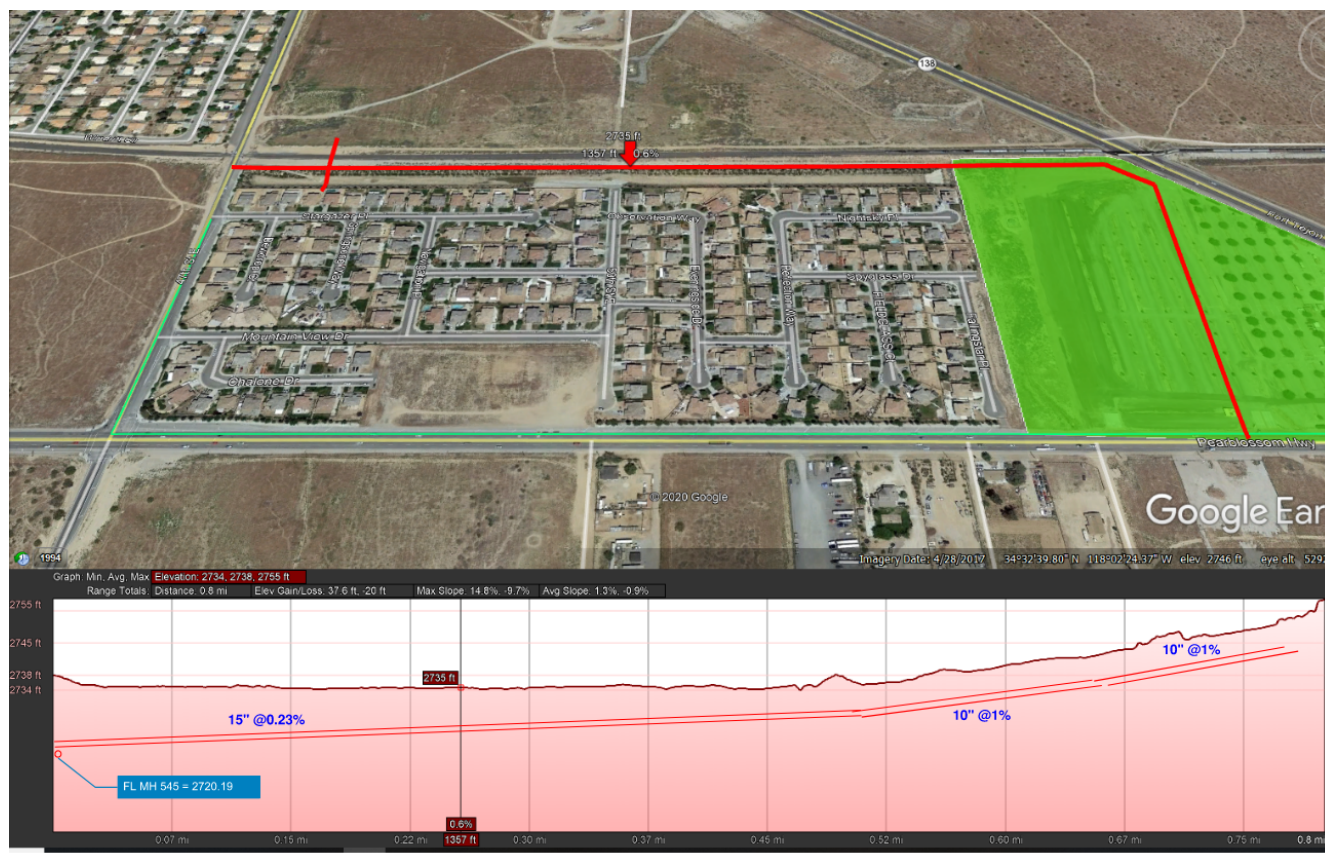
\*Use 0.001 (cfs/unit) for condominiums only

However, using the overly simplistic “apparent slope” results in a profile that is excessively deep, especially at the topographic high point for Alternative 1. The 15-inch interceptor would be approximately 33-ft deep at the intersection of Pearblossom and 47<sup>th</sup> as shown in **Figure 2**. This depth would result in extremely high construction costs and challenges for maintenance of the line. Alternative vertical alignment considerations are described in Section VII below.



**Figure 2: Alternative 1 Approximate Profile**

The resulting profile for Alternative 2 yields an approximate 14.5 ft deep installation at the existing manhole connection as shown in **Figure 3**. The alignment would require new easements through two private parcels before connecting to the proposed future private roadway to be constructed as part of the proposed Pilot project.



**Figure 3: Alternative 2 Approximate Alignment**

## VII. Sewer Capacity Analysis

The City directed Kimley-Horn to assess the capacity of alternative 15-inch sewer line alignments along Pearblossom Highway or Stargazer Place and 47<sup>th</sup> street. As shown in Section VI of this memo, the studied sewer area would only account for approximately 14% of the available capacity in the proposed 15-inch gravity line (at 0.6% grade; Alternative 1) and 23% of the available capacity for Alternative 2 (at 0.22% grade). The following sections discuss the vertical alignment and flow scenarios of this line.

### Minimum Velocity Requirements

The minimum acceptable velocity in a sewer line is 2.0 feet per second (ft/sec) according to the LA County public works guidelines. Kimley-Horn evaluated the pipe at half full and at three quarters full to determine the minimum slope requirements at the minimum velocity. The minimum slope of a half full 15-inch line capable of producing this velocity is approximately 0.23% (0.0023-ft/ft). The flow capacity of this half full line was calculated using Manning's formula to be approximately 1.24-cfs. The minimum slope of a three quarters full 15-inch line capable of producing a velocity of 2.0-ft/sec is approximately 0.15% (0.0015-ft/ft). The flow capacity of this three quarters full line was calculated using Manning's formula to be approximately 2.03-cfs.

### Maximum Available Slope

#### Alternative 1

The vertical alignment for the proposed system is controlled by the existing invert at MH 545 and the low point of

the alignment. As summarized in Table 1, the available grade based on existing infrastructure and apparent topography is approximately 0.60% (0.0060-ft/ft). The available slope is greater than the minimum required slopes to achieve a minimum velocity of 2.0 ft/s. Therefore, other sewer line sizes are also capable of serving the sewer area as summarized in **Table 3**.

**Table 4: Alternative 1 Slope Interceptor Sizing Options**

Pipe ID (in)	Slope (ft/ft)	Design Condition	Velocity (ft/sec)	Capacity (cfs)
15	0.006	$\frac{3}{4}$ full	4.12	4.07
15	0.006	half full	3.27	2.01
12	0.006	half full	2.82	1.11
10	0.006	half full	2.50	0.68 <sup>1</sup>
10	0.006	$\frac{3}{4}$ full	3.41	1.49

<sup>1</sup>10-inch is inadequate at half full, but capable of serving sewer study area at  $\frac{3}{4}$  full

### Alternative 2

The vertical alignment for Alternative 2 is also controlled by the existing invert at MH 545 and the low point of the alignment at Pearblossom. As summarized in Table 2, the available grade based on existing infrastructure and apparent topography is approximately 0.22% (0.0022-ft/ft). The available slope is greater than the minimum required slopes to achieve a minimum velocity of 2.0 ft/s. Therefore, other sewer line sizes are also capable of serving the sewer area as summarized in **Table 4**.

**Table 4: Alternative 2 Slope Interceptor Sizing Options**

Pipe ID (in)	Slope (ft/ft)	Design Condition	Velocity (ft/sec)	Capacity (cfs)
15	0.0022 (min avail slope)	$\frac{3}{4}$ full	2.50	2.48
15	0.0023	$\frac{3}{4}$ full	2.56	2.53
15	0.0023	half full	2.03	1.24
10	0.01	half full	3.22	0.88

## Economic Vertical Alignment Considerations

### Alternative 1

Kimley-Horn evaluated the topography for the proposed alignment of the new 15-inch interceptor. The vertical alignment is restricted due to the tie-in point at MH 545. The topographic highpoint of the alignment is 12 feet higher than the upstream topographic low point. Potential economic solutions to this problem include considering a broken profile with a drop manhole or having a smaller downstream pipe diameter at a steeper grade.

A 15-inch line at minimum slope from the topographic low point on Pearblossom Highway to the topographic high point on the intersection at 47<sup>th</sup> Street with half-full capacity of 1.24-cfs produces a maximum pipeline depth



of about 20-ft at the intersection.

The vertical alignment from the intersection of Pearblossom Highway and 47<sup>th</sup> Street to the existing MH 545 can be served by a range of economized profiles based on balancing diameter, slope, and depth as shown in **Table 5**.

**Table 5: Alternative 1 Pipe Configurations**

Pipe Diameter	Slope	Capacity	Depth of Drop Connection
8-inch	2.2%	1.08 cfs	-
10-inch	0.80%	0.79 cfs	13 feet

### **Alternative 2**

The vertical alignment is restricted due to the tie-in point at MH 545. The topographic low point of the alignment limits the apparent available slope. This slope is less than the minimum required slope for a 15-inch line. Potential economic solutions to this problem include considering a broken profile having a smaller upstream pipe diameter at a steeper grade.

A 15-inch line at minimum slope from the topographic low point of the alignment (west of the Study Area along Stargazer Place) to MH545 at half-full capacity of 1.24-cfs produces a maximum pipeline depth of about 14.5-ft at the manhole.

The vertical alignment upstream of the proposed 15-inch running south through the Pilot development can be served by a range of economized profiles based on balancing diameter, slope, and depth as shown in **Table 6**.

**Table 6: Alternative 2 Pipe Configurations**

Pipe Diameter	Slope	Capacity
10-inch	1.0%	0.88 cfs
15-inch	0.23%	1.24 cfs

### **Practical Sewer Operations Issues**

Operating the City-directed 15-inch sewer alternatives would come with some considerable maintenance and potential aesthetic challenges for the foreseeable future. By designing the profile to minimize construction cost and maintain minimum velocities (with planning flow assumptions), the line would need to be at 0.23% slope. The Pilot Travel Center would be the only contributing to the nearly mile-long line for the foreseeable future.

With only the Pilot travel Center connected to the 15-inch line, there would be insufficient flow to operate the line under conditions recommended by the Americans Society of Civil (ASCE) as well as the Water Environment Federation (WEF) as outlined in ASCE/WEF Manual of Practice No 60 (ASCE MOP 60; WEF FD-5) **Gravity Sanitary Sewer Design and Construction** (ASCE-WEF 2007).

At 15,000-gal/day flow, the line would only see about 1.06% of its carrying capacity. This flow translates to a

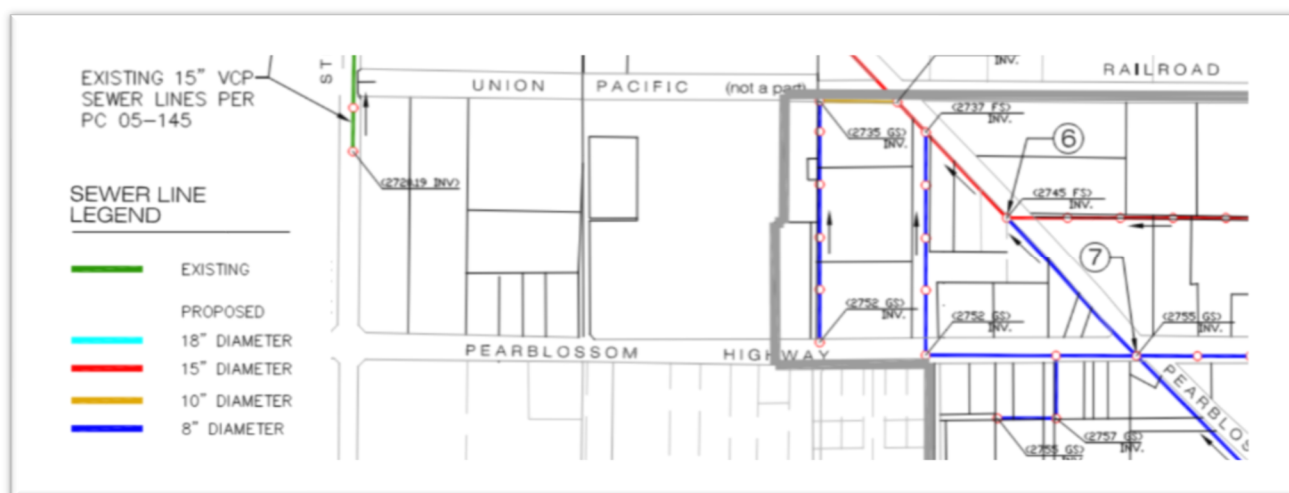
very low velocity of approximately 0.3-ft/sec. This velocity is inadequate to provide pipe scouring and will lead to deposition of solids in the line. Typically, these deposits are highly organic and putrescible, leading to odors and corrosion of concrete and most metallic structures.

Kimley-Horn does not recommend this design. Special maintenance and design considerations would be required to mitigate the probable buildup of solids and accompanying odor and flow blockage conditions that would be likely to result.

### VIII. Alternative Phased Sewer Service

Although the 15-inch sewer line alternatives to serve the sewer study area is feasible, Kimley-Horn evaluated additional opportunities to capitalize on existing and proposed City infrastructure. The intent of this analysis was to evaluate a phased approach to providing sewer service to the proposed development – just for the Pilot Travel Center – and deferring major capital infrastructure to serve the greater Four Points area as defined in the City's Sewer Master Plan.

The Palmdale Sewer Master Plan (2009), excerpts included in **Appendix D** and a “Four Points Sewer Study” provided by the City in **Figure 4** below, shows a proposed 15-inch interceptor that will be constructed along State Route 138 / Fort Tejon Road. This system is intended to serve the Four Points area, including the subject tracts in this Study. The Four Points Sewer Study clearly indicates that this system is intended to serve the proposed Pilot Travel Center. The construction timeline of the master planned infrastructure is currently unknown.



**Figure 4: Existing & Proposed Sewer Infrastructure (Four Points Sewer Study)**

The master planned infrastructure can ultimately serve the entire Four Points area once its construction is complete. Until then, the flows generated by the Pilot Travel Center, conservatively estimated to be 15,000-gal/day, can be readily served by a neighborhood sewer adjacent to the proposed site. As seen by simply updating the PC 05-65 Sewer Area Study for the neighborhood immediately to the west of the development, there is ample existing capacity to serve flows from the Pilot Travel Center in the interim see **Figures 5 and 6** below. The balance of the area requested to be served by the City – the entire 53-acres – would be served by the Master Planned facilities.

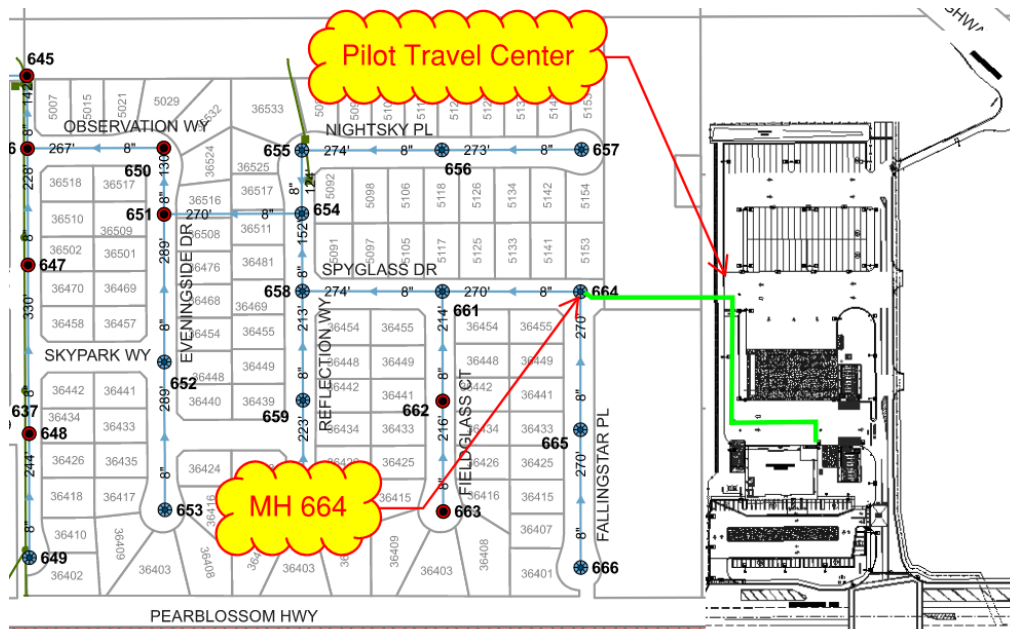


Figure 5: Pilot Travel Center Connection to Ex. Sewer

**POINT 2 + PILOT TRAVEL CENTER**

$Q_{\text{PILOT}} = 15,000\text{-gal/day} = 0.015\text{-mgd} = 0.028\text{-cfs}$

$Q_{\text{Point2+Pilot}} = 0.828 + 0.028 = 0.856\text{-cfs} < 1.290\text{-cfs} \dots \text{OK}$

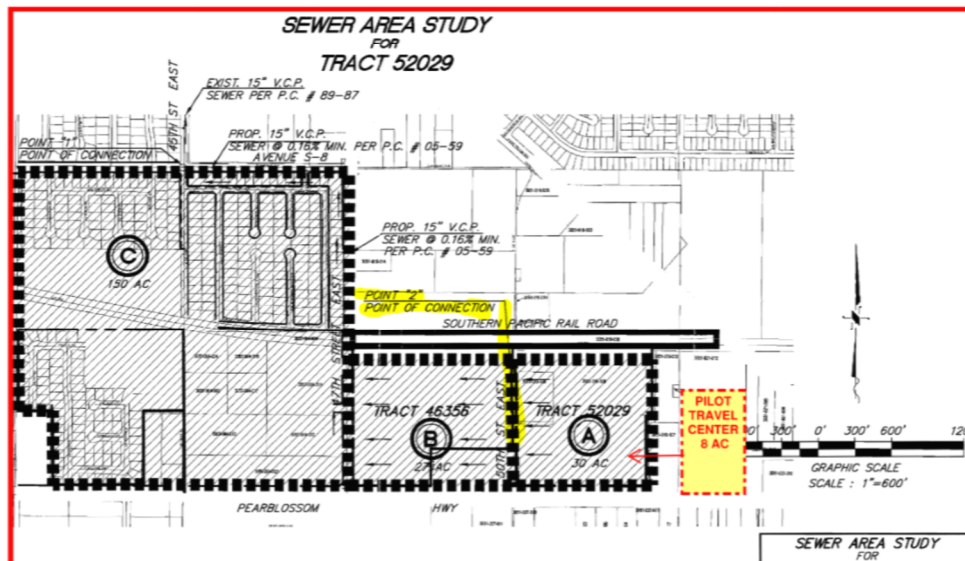


Figure 6 - Pilot Travel Center added to PC 05-65 Sewer Study

This phased approach to provide sewer service to the subject parcel only while deferring major infrastructure intended to serve the entire Four Points area meets the intent of the Master Plan and mitigates the cost and complication of excessively deep sewer infrastructure associated with the 15-inch Alternatives.

## IX. Economics

A planning-level Opinion of Probable Construction Cost (OPCC) has been prepared for the City-directed 15-inch interceptor alignment using the planning level cost estimating methods included in the City Sewer Master Plan. The unit rates from the study reflect 2008-unit pricing. Those units were escalated to current 2020 units using the ENR City Cost Index for Los Angeles as shown in **Table 7** and **Table 8** below for both alternatives.

Pearblossom is currently being paved and will require full repaving if the City-proposed sewer alignment were constructed. The City cost methodology anticipated only pavement cutting and patching. Hence the OPCC includes alternative costs for both partial and full pavement replacement options.

**Table 7 – Alternative 1 Engineer's Opinion of Probable Construction Cost**

**Planning Level (AACEI Class IV Estimate)**

Item	Units	2009	2020	Engr OPCC	Trench and Patch	Complete Repaving
		Master Plan Value	Escalation			
Pipe	5000	\$280.00	\$399.40		\$1,997,000	\$1,997,000
MH	6	\$10,000.00	\$14,261.00		\$85,566	\$85,566
Traffic Control	1			\$20,000	\$20,000	\$100,000
Drop Connect	1			\$20,000	\$20,000	\$20,000
					<b>\$2,122,566</b>	
Repaving	4000	\$120.00				\$480,000
					NIC	<b>\$2,682,566</b>
Mob	20%				\$424,513	\$536,513
					<b>\$2,547,079</b>	<b>\$3,219,079</b>
Contingency	30%				\$764,124	\$965,724
					<b>\$3,311,203</b>	<b>\$4,184,803</b>
Eng/Survey/etc	25%				\$827,801	\$1,046,201
					<b>\$4,139,004</b>	<b>\$5,231,004</b>

**California Construction Cost Index**

Jun-08	5004
Jun-20	7041
Escalation	141%

**ENR Historical City Index LA**

2008	184.7
2020	263.4
Escalation	143%



**Table 8 – Alternative 2 Engineer's Opinion of Probable Construction Cost**
**Planning Level (AACEI Class IV Estimate)**

Item	Units	2009	2020	Engr	Cross Country
		Master Plan Value	Escalation	OPCC	
Pipe	5000	\$230.00 <sup>A</sup>	\$328.10		\$1,640,500
MH	6	\$10,000.00	\$14,261.00		\$85,566
Traffic Control	1			\$20,000	\$20,000
Easements	1			\$100,000	\$100,000
					<b>\$1,846,066</b>
Mob	20%				\$369,213
					<b>\$2,215,279</b>
Contingency	30%				\$664,584
					<b>\$2,879,863</b>
Eng/Survey/etc	25%				\$719,966
					<b>\$3,599,829</b>

**California Construction Cost Index**

Jun-08	5004
Jun-20	7041
Escalation	141%

**ENR Historical City Index LA**

2008	184.7
2020	263.4
Escalation	143%

<sup>A</sup> The pipeline construction unit rate was de-rated for cross-country pipeline construction with no paving

## X. Conclusion

Per City direction, Kimley-Horn evaluated sewer service to approximately 53 acres of land zoned for commercial use. The City directed that two alignments be studied. Both originate near MH 545 in 47<sup>th</sup> south of the railroad. Alternative 1 provides an extension of the 15-inch sewer down 47<sup>th</sup> and Pearblossom and Alternative 2 runs east parallel to the railroad and turns south to Pearblossom.

The 53 acres is projected to generate approximately 0.795 cfs. While the both 15-inch alignments studied to serve this studied area are feasible, the alignments have the following challenges:

- topographic constraints resulting in the line being over 30 ft deep (Alternative 1)
- prohibitively expensive construction costs estimated at \$4.1M to \$5.2M (Alternative 1) and \$3.6M (Alternative 2)
- Alternative 2 alignment would require new easements through two private parcels
- Neither alignment is in the City's Sewer Master Plan
- probable lack of meaningful sewer flows for the foreseeable future
- probable maintenance issues
- probable odor issues

KH does not recommend the deep 15-inch alignment for either Alternative 1 nor Alternative 2 based on the challenges noted above.

The shallower alignment option has the following challenges:

- requires smaller line sizes or drop connections to meet velocity and slope requirements
- this alignment is not in the City's Sewer Master Plan
- prohibitively expensive construction costs
- probable maintenance issues

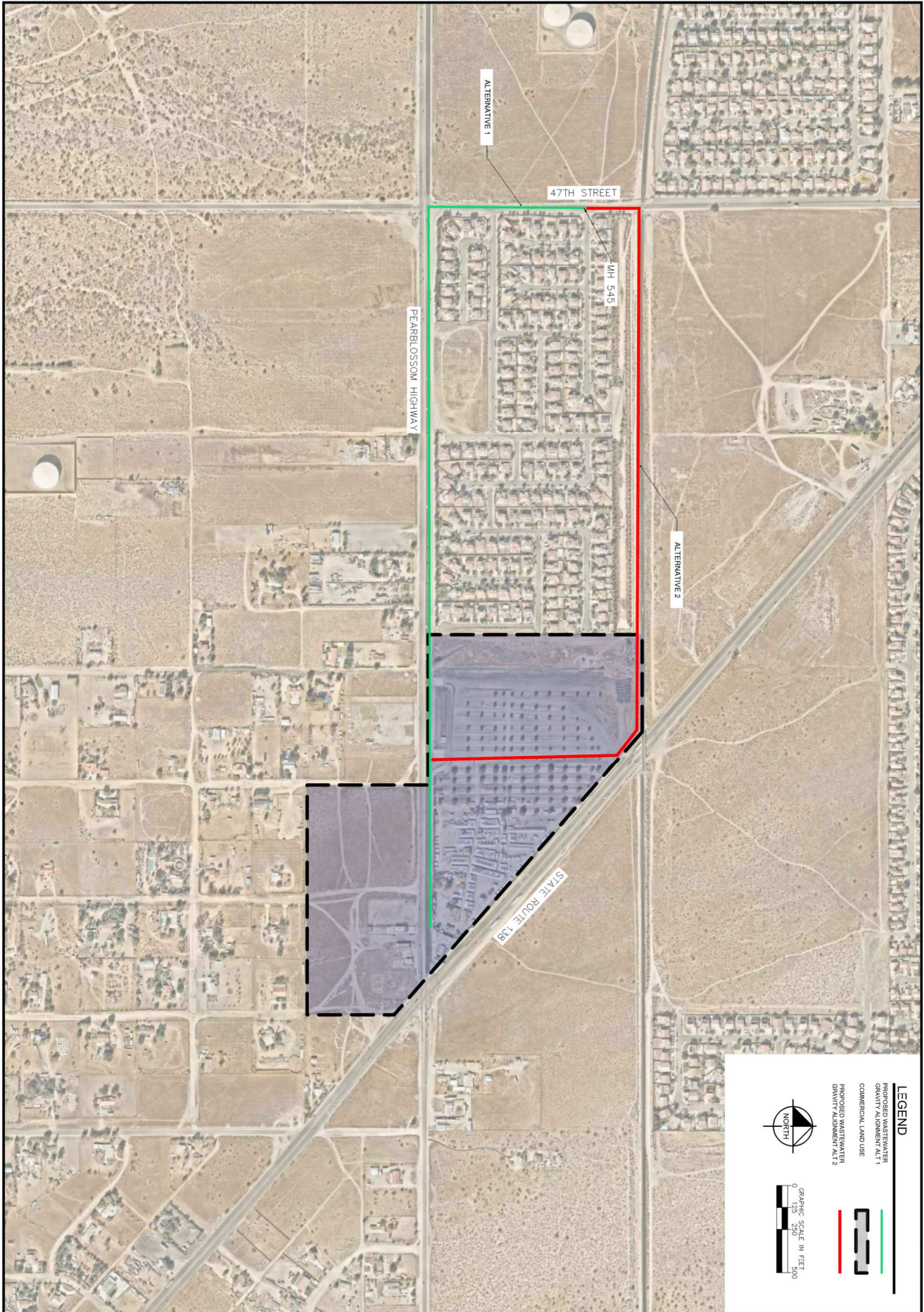
**Recommended option:**

- Serve the Pilot Travel Center with the existing 8-inch sewer located directly west of the proposed Pilot Travel Center site
- Serve the remainder of the Study Area with the master planned interceptor in Ft. Tejon Road

For these reasons, both fiscal and operational, the 15-inch interceptor alignments studied are not the preferred alternative to providing sewer service to the subject site and study area. A more reasonable, hydraulically feasible, and sound solution to providing sewer to the Study Area would be to follow the City's Sewer Master Plan and allow the Pilot Travel Center to connect to the existing 8-inch sewer west of the site.

# Appendix A

## Exhibit 1: Sewer Area Map



**LEGEND**

PROPOSED WASTEWATER  
GRANTY ALIGNMENT ALT. 1  
COMMERCIAL LAND USE  
PROPOSED WASTEWATER  
GRANTY ALIGNMENT ALT. 2



GRAPHIC SCALE IN FEET  
0 125 250 500



**1**

DATE: JULY 2020  
DESIGN: TRH  
DRAWN: RKR  
CHECKED: SMA  
RHA NO.: 095426006

**SEWER AREA MAP**

**CITY OF PALMDALE  
PILOT TRAVEL CENTER  
SEWER STUDY**

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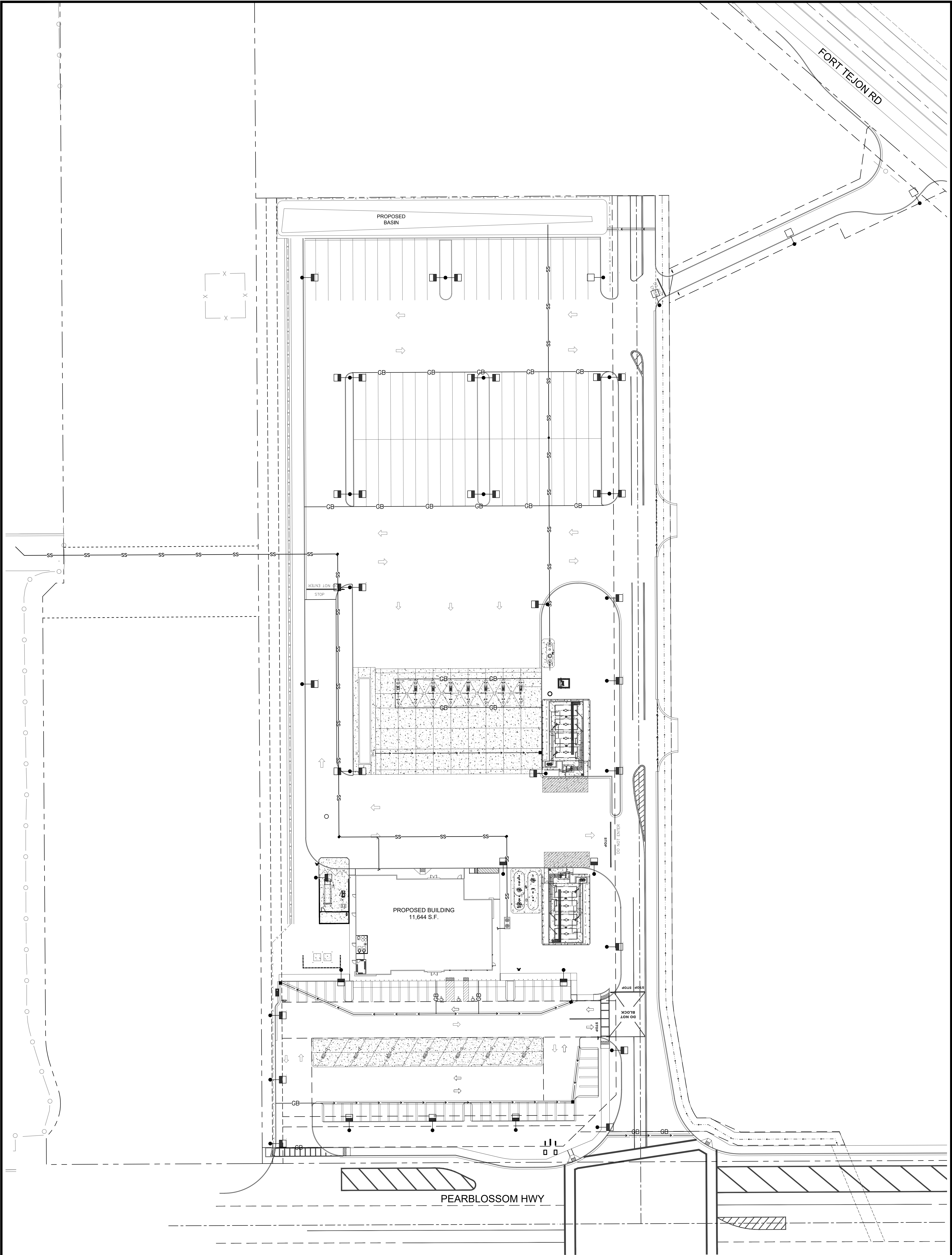
**Kimley»Horn**

No.	Revision	By	Date

# Appendix B

## Proposed Development





# Appendix C

## Table of Sewer Capacity Analysis

## Sewer Area Study Table

**\*\* Design capacity keeps three decimal places at least**

\*\*\*\* For pipes < 15", design capacity of the sewer mainline is defined as 1/2 full = 100% capacity (d/D)

\*\*\*\*\* For pipes  $\geq 15"$ , design capacity of the sewer mainline is defined as 3/4 full = 100% capacity (d/D)

$$C = \frac{41.65 + \frac{0.00281}{s} + \frac{1.811}{n}}{1 + \frac{n}{\sqrt{R}} \left( 41.65 + \frac{0.00281}{s} \right)}$$

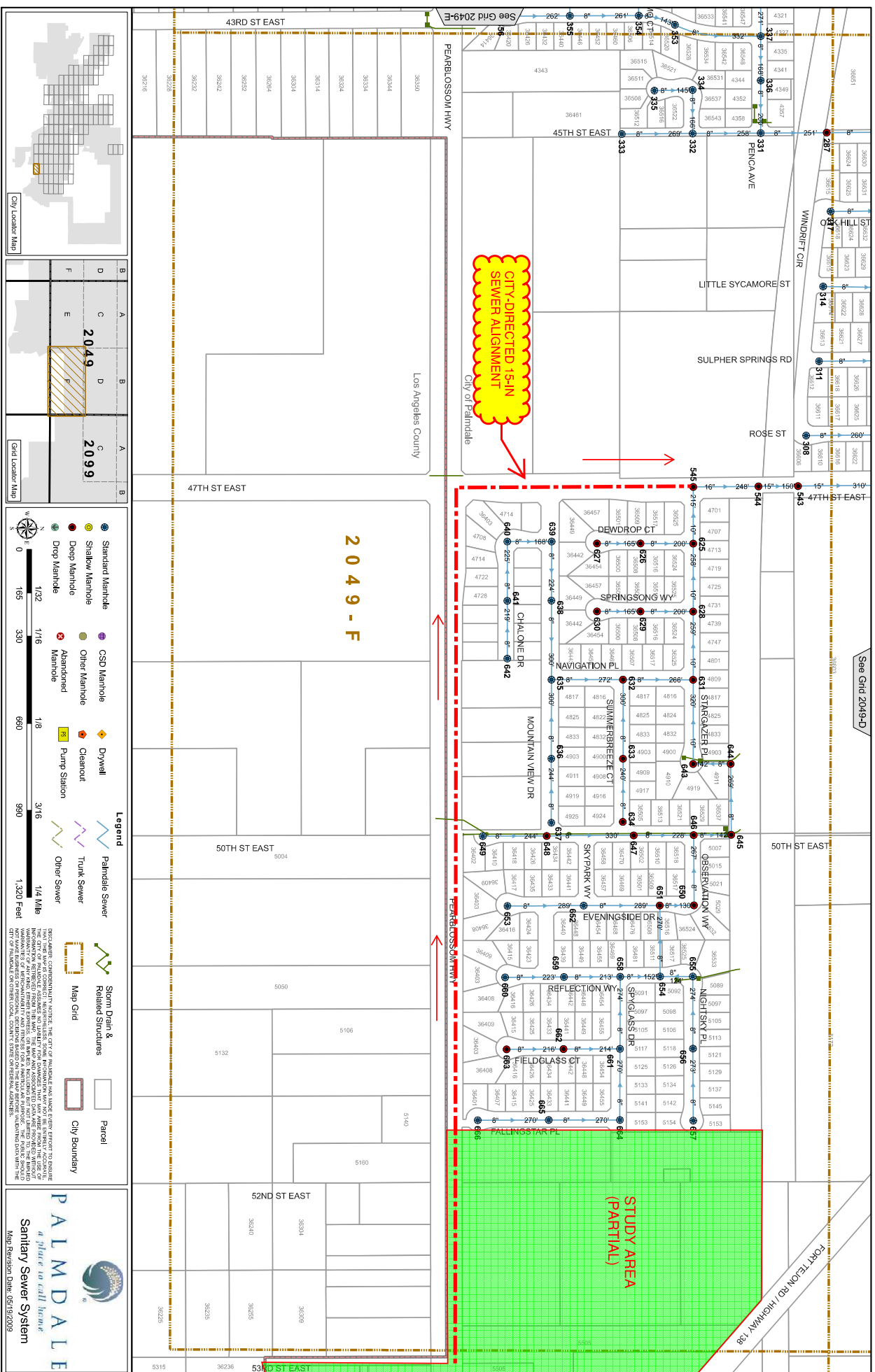
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# Appendix D

## Supporting Plans/Maps





DRAWING NUMBER  
**PC 05-145**

SARGENT & Lundy  
ENGINEERS  
10000 E. 1st Avenue, Suite 100  
Denver, CO 80231

DRAWING NUMBER

SARGENT & Lundy  
ENGINEERS  
10000 E. 1st Avenue, Suite 100  
Denver, CO 80231

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Denver, CO 80231

DRAWING NUMBER  
**384 of 5**

SARGENT & Lundy  
ENGINEERS  
10000 E. 1st Avenue, Suite 100  
Denver, CO 80231

BASED UPON INFORMATION SUPPLIED BY THE OWNER  
CONTRACTOR (NOT) FIELD CHECKED

ENGINEER *W.H.* DATE *7/11/04*  
CITY ENGINEER *W.H.* DATE *7/11/04*

APPROVED BY:

CITY ENGINEER *W.H.* DATE *7/11/04*



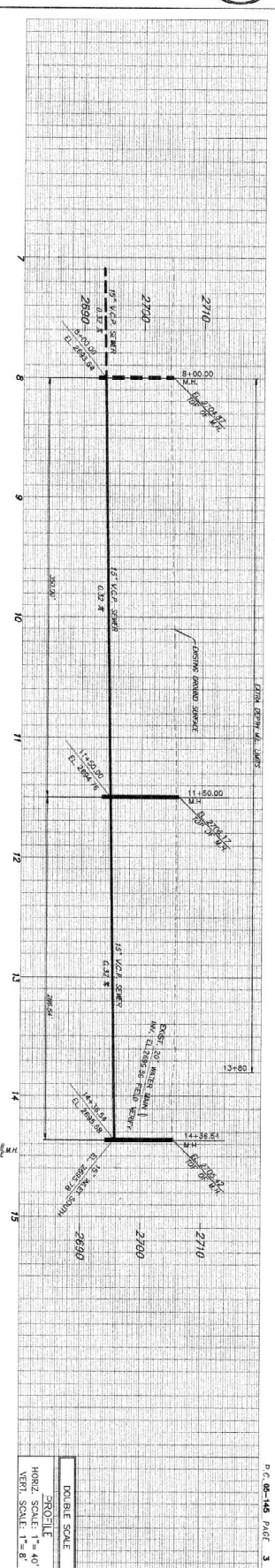
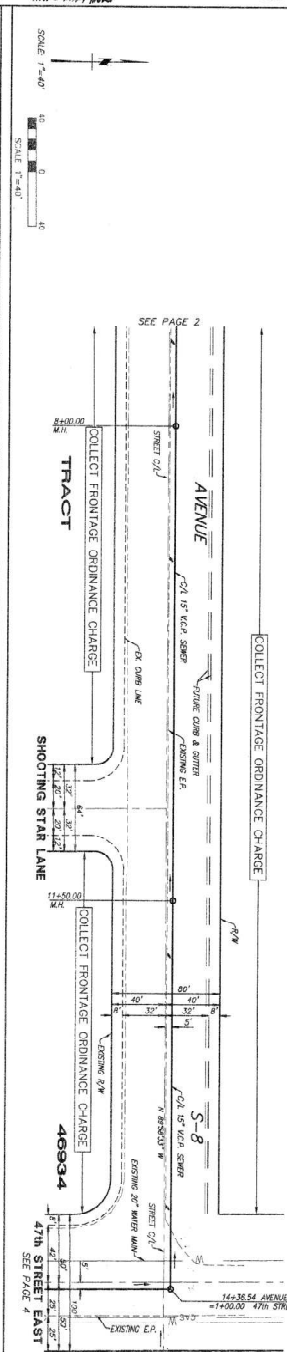
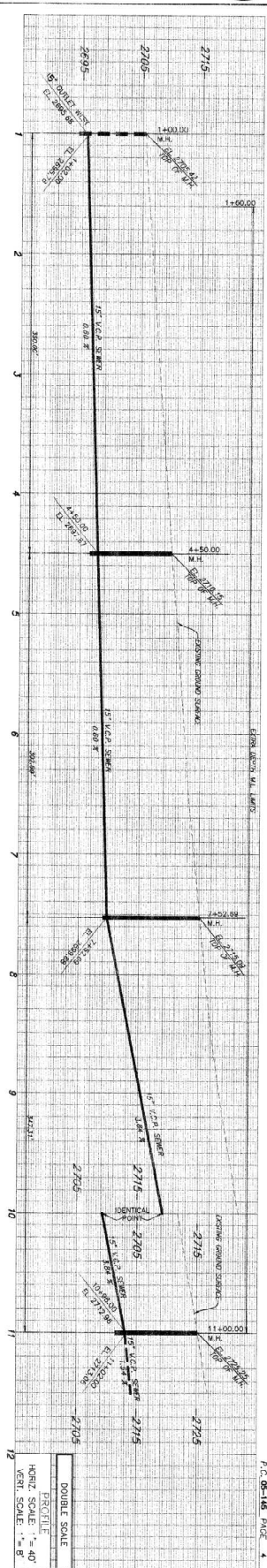
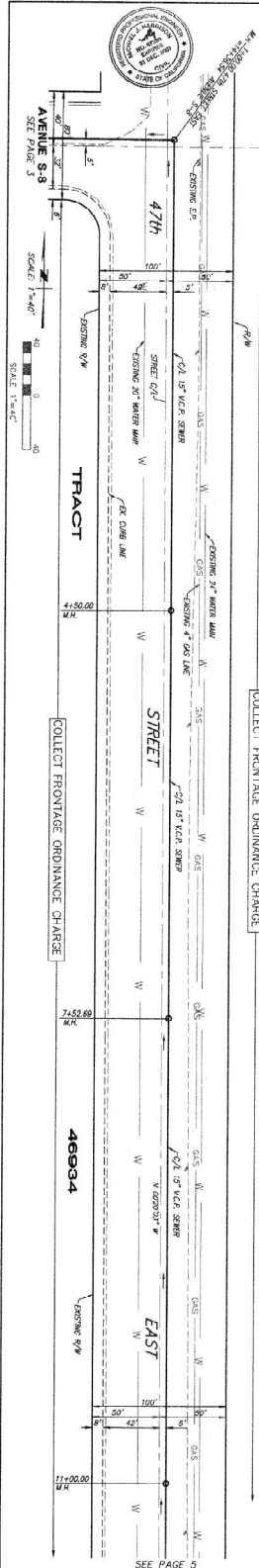
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CITY ENGINEER *W.H.* DATE *7/11/04*



APPROVED BY:

CITY ENGINEER *W.H.* DATE *7/11/04*





DRAWING NUMBER  
**PL 05-145**

SAVED PRODUCTS • NEW YORK, MINNESOTA  
RECEIVED BY PART PLANNER (S&S)

DRAWING NUMBER

SAVED PRODUCTS • NEW YORK, MINNESOTA  
RECEIVED BY PART PLANNER (S&S)

DRAWING NUMBER

SAVED PRODUCTS • NEW YORK, MINNESOTA  
RECEIVED BY PART PLANNER (S&S)

DRAWING NUMBER

**5 of 5**

SAVED PRODUCTS • NEW YORK, MINNESOTA  
RECEIVED BY PART PLANNER (S&S)

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ENGINEER *Mike Hoffman* R.C.E. NO. **CS7730** DATE **7/9/16**



APPROVED BY:

CITY ENGINEER

DATE



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CONTRACTOR (NOT FIELD VERIFIED)

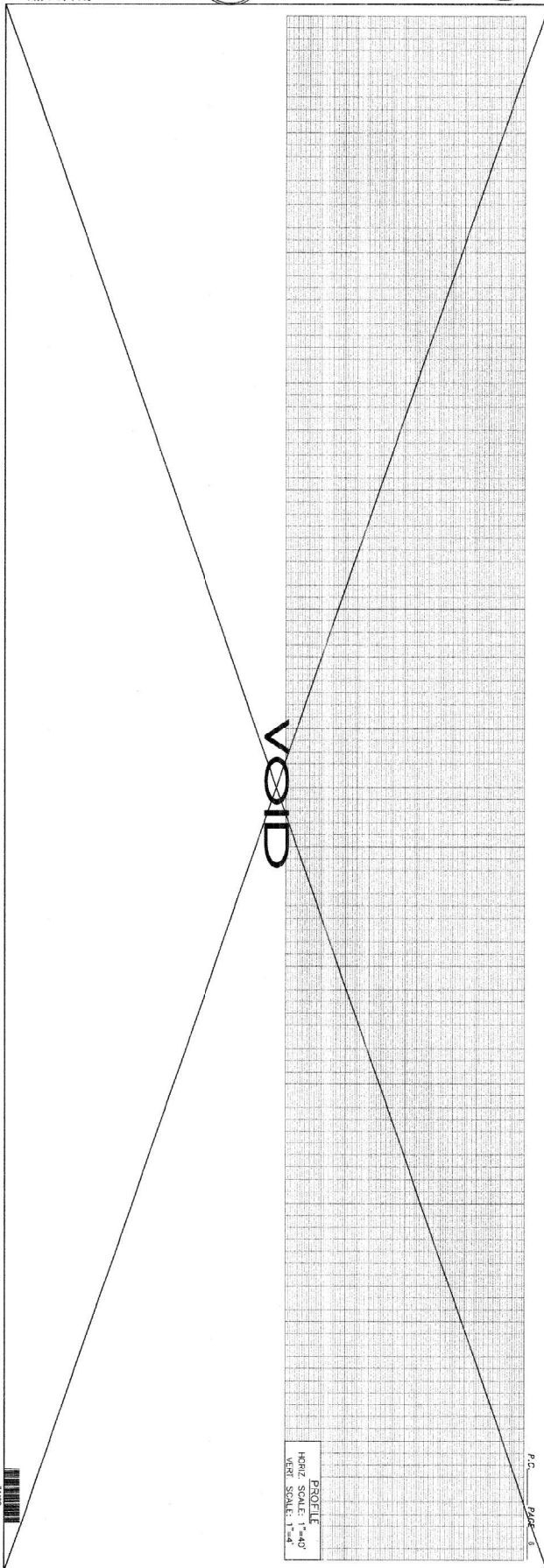
ENGINEER *Mike Hoffman* R.C.E. NO. **CS7730** DATE **7/9/16**



APPROVED BY:

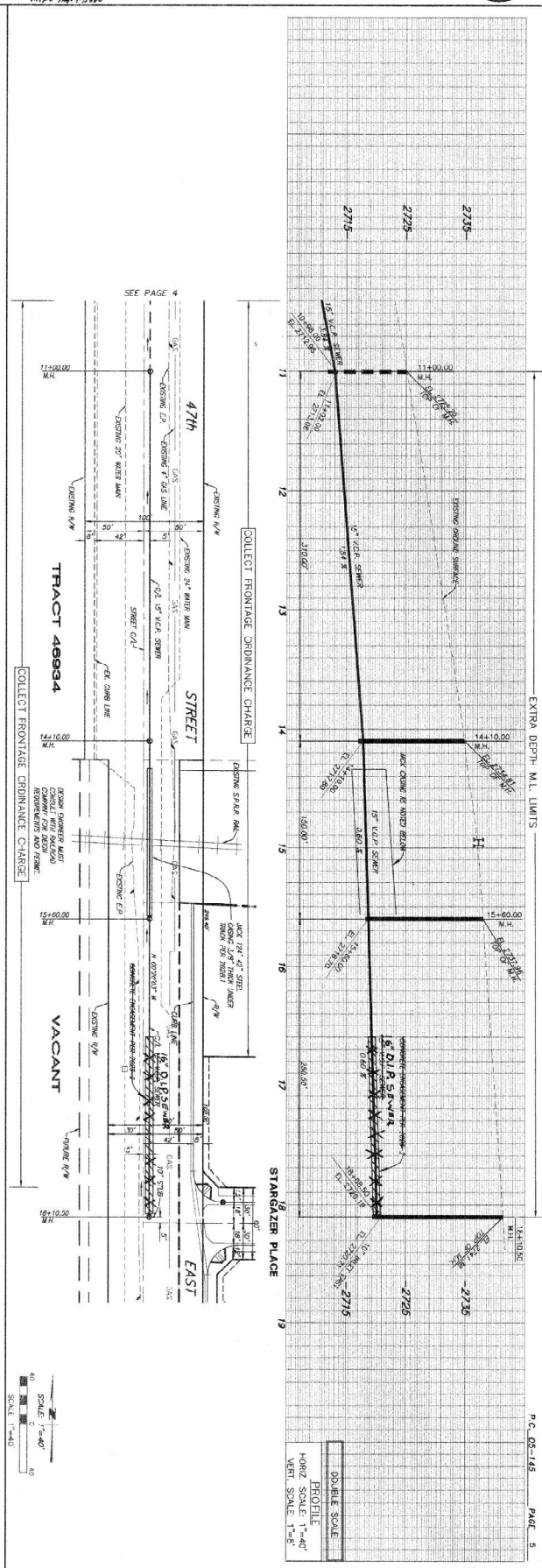
CITY ENGINEER

DATE



**VOID**

PROFILE  
HORIZ. SCALE: 1"=40'  
VERT. SCALE: 1"=4'



SCALE: 1"=40'  
SCALE: 1"=40'

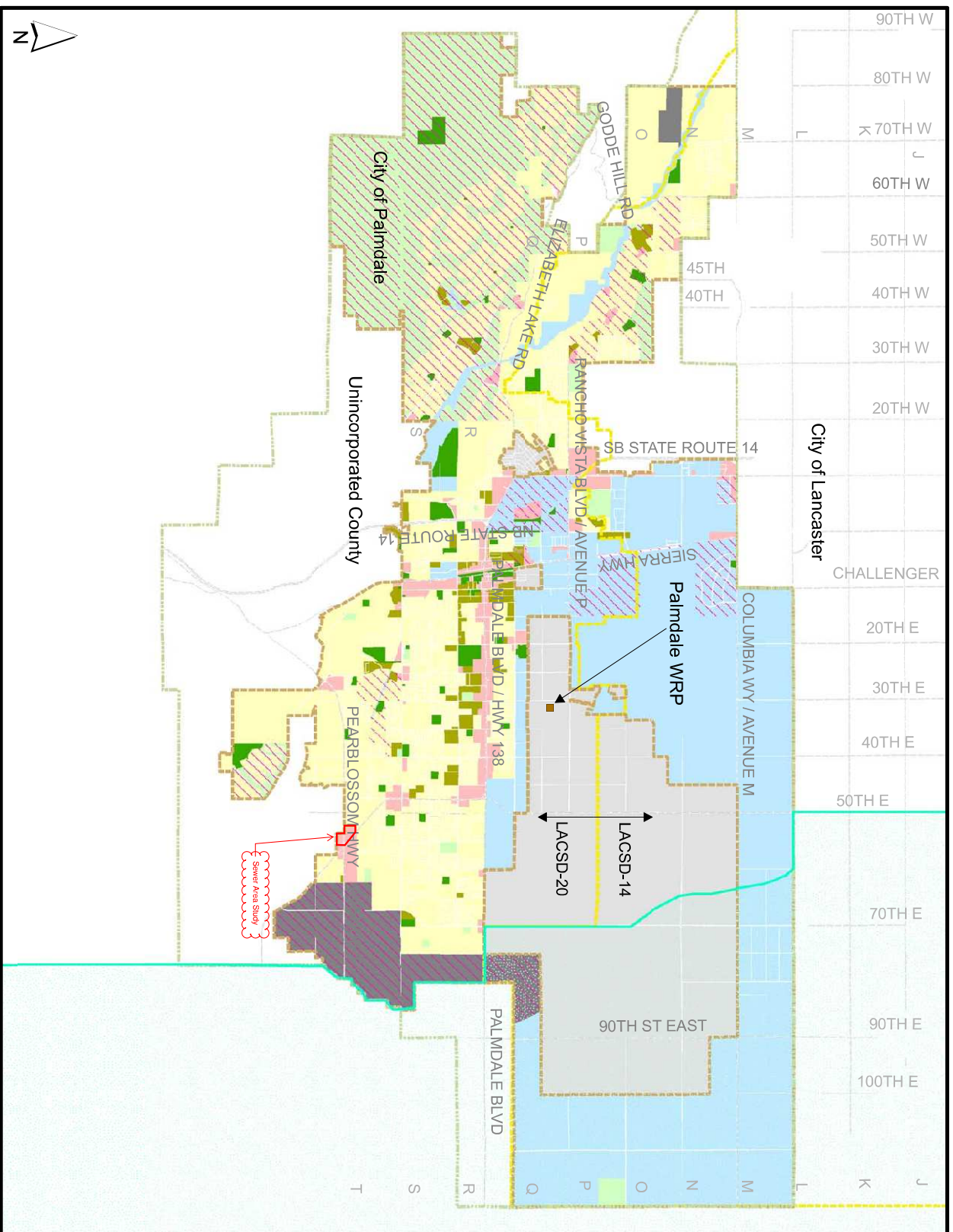
DOUBLE SCALE  
HORIZ. SCALE: 1"=40'  
VERT. SCALE: 1"=4'

EXTRA DEPTH M.L. LUMIS

P.C. 05-145 PAGE 5

PL 05-145 02-142

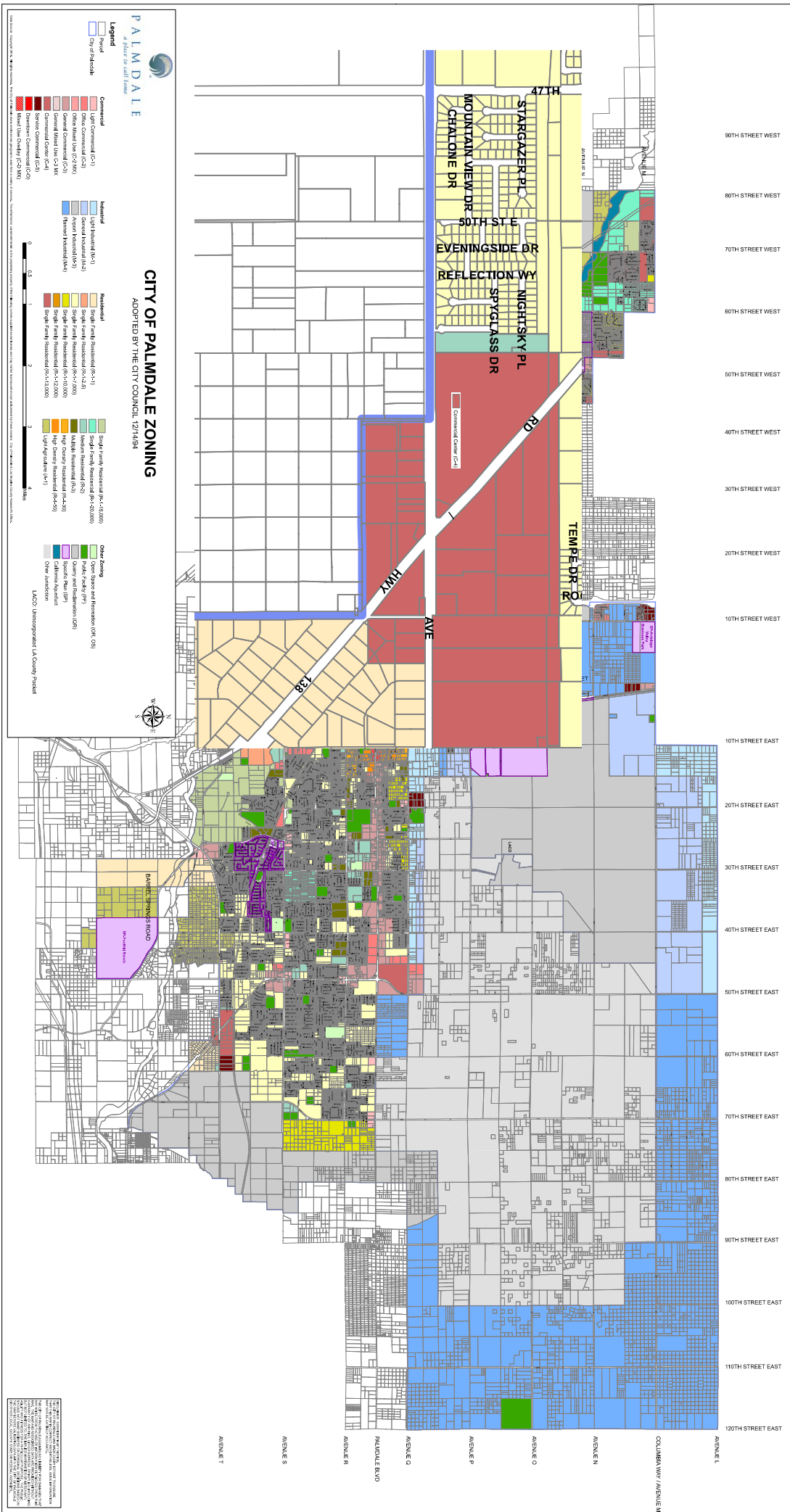
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City of Palmdale  
Sewer Master Plan  
**Figure 2-4**  
**General Plan**  
**Landuse**

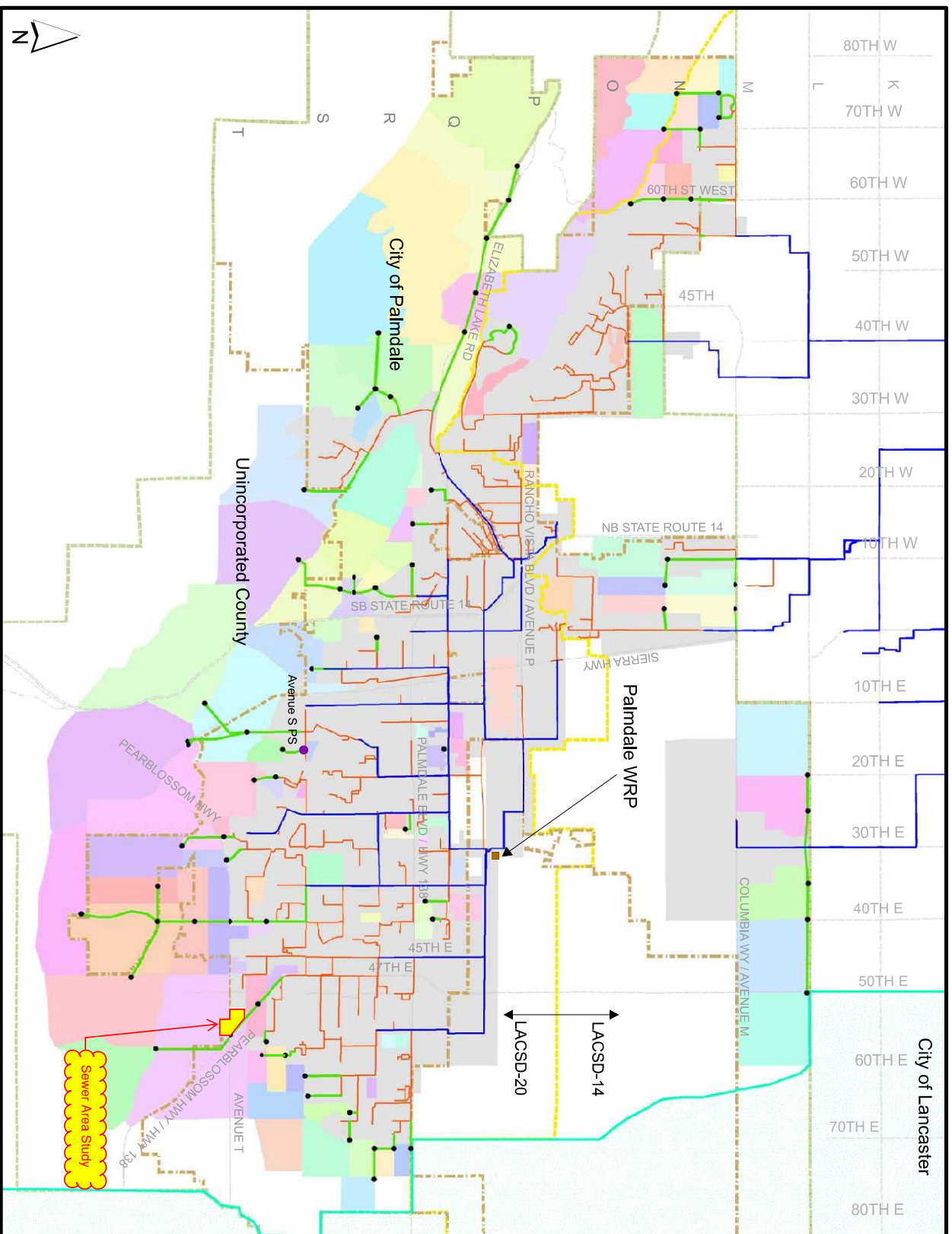
**Legend**

- General Plan Landuse**
- Industrial
  - Commercial
  - Single Family Residential
  - Multi Family Residential
  - Open Space; Park
  - Public Facility; School
  - Mineral Resource Extraction
  - Other Jurisdiction
  - Specific Plan
  - Cannot flow by gravity to Palmdale or Lancaster WRP
  - Major Street
  - Water Reclamation Plant
  - Palmdale City Boundary
  - Palmdale Sphere of Influence Boundary
  - LACSD-14/20 Sphere of Influence Boundary
- Scale:** 0 1 2 4 Miles
- CITY OF PALMDALE** **RMC**  
Water and Environment
























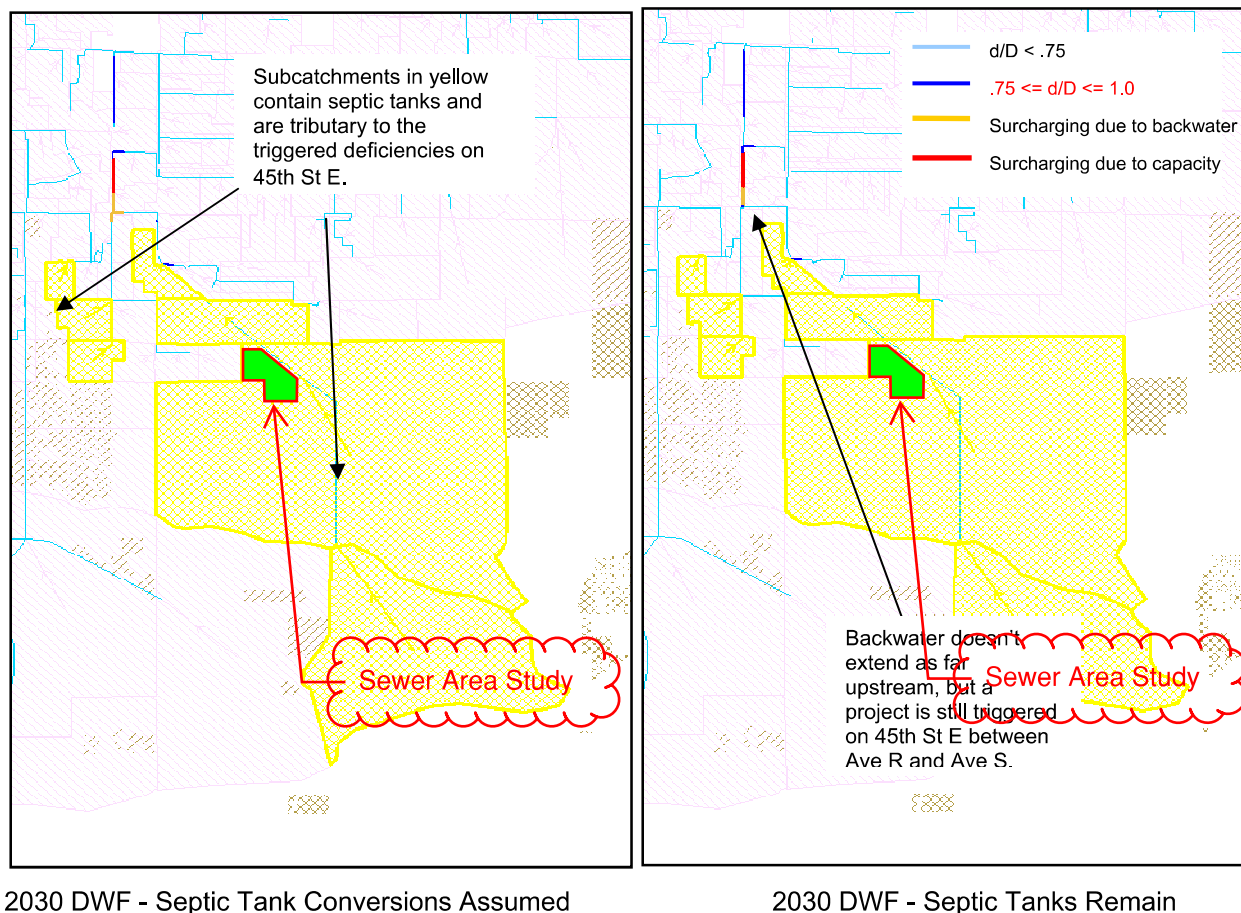
City of Palmdale  
Sewer Master Plan  
**Figure 3-10**  
**Future Model**  
**Network,**  
**Subcatchments,**  
**and Load Points**

**Legend**

-  Future Subcatchment
  -  Future Model Sewer
  -  Future Subcatchment Load Point
  -  2006 Subcatchments
  -  LACSD Trunk Sewer
  -  2006 Model Sewer
  -  Major Street
  -  Water Reclamation Plant
  -  Pump Station
  -  Palmdale Sphere of Influence Boundary
  -  Palmdale City Boundary
  -  LACSD-14/20 Sphere of Influence Boundary
  -  Cannot flow by gravity to Palmdale or Lancaster WRP
-  
- 0 0.5 1 2 Miles

flow divided by pipe diameter) for 2006 and 2030 Peak DWF and WWF, both with (Figures 5-1 through 5-4) and without (Figures 5-5 through 5-8) the LACSD trunks. The following are the key findings:

- Under 2006 DWF conditions (Figure 5-1), the only sewers that exceed the 75 percent full criteria are trunk sewers (e.g., 45<sup>th</sup> St. E), as can be seen by comparison to Figure 5-5, where the trunk sewers have been removed from the analysis. At a few locations on the trunk sewers and at one location on a City sewer, a relatively high flow depth or minor surcharging occurs at a junction where a smaller pipe joins a larger pipe with matching inverts, resulting in a back up of flow from the larger pipe into the smaller pipe for a short distance. These situations are not considered to be capacity deficiencies.
- Under 2006 WWF conditions (Figure 5-2), some surcharging is apparent (red and orange lines), primarily on the trunks. On Figure 5-6, with the trunks removed, there are two short reaches of City sewers that are shown as surcharging, although the amount of surcharging is less than two feet and therefore not sufficient to trigger a capital improvement project. One of the major surcharging trunk sewers indicated in Figure 5-2 is the existing 18-inch sewer on Technology Drive/Ave. P-8 between Division St. and 15<sup>th</sup> St. E. That deficiency will be relieved by the construction of the new 42-inch Trunk A Relief Sewer which is currently underway. The new trunk sewer was added to the model in the 2030 DWF and WWF scenarios, and was determined to eliminate the projected surcharging in both cases (see Figures 5-3 and 5-4).
- Under 2030 DWF conditions (Figure 5-3), several additional trunk sewers are projected to surcharge, in particular the trunk sewers along 45<sup>th</sup> St. E (including a possible overflow) and 55<sup>th</sup> St. E., and the westbound trunk sewer on Ave. P-8 leading to the PWRP. With the trunk sewers removed (Figure 5-7), the only projected capacity deficiency in the City is the sewer along 45<sup>th</sup> St. E. between Ave. R and Ave. S.
- Under 2030 WWF conditions (Figure 5-4), the problems in trunk sewers along 45<sup>th</sup> St. E., 55<sup>th</sup> St. E., and Ave. P-8 become more severe, including additional projected overflows. Extensive surcharging in the Ave. Q trunk is also predicted. With the trunks removed (Figure 5-8), the previously identified deficiency along 45<sup>th</sup> St. E. between Ave. R and Ave. S is exacerbated, with a potential overflow. In addition, a second deficiency is projected due to development in Joshua Ranch, in the vicinity of 30<sup>th</sup> St. W. The problem sewer is a reach of 8-inch sewer with a relatively flat slope downstream of the canal crossing that would surcharge more than two feet above the crown of the pipe for about 1000 feet. Note that this deficiency is not projected to occur under DWF conditions, and is thus triggered by the I/I allowance of 666 gallons per day per acre. Since that I/I may or may not ever occur in reality, this should be considered a low priority unless monitoring indicates a real problem under wet weather flow conditions.
- Since flow in the 45th St. E. city sewer would be affected by 110 upstream septic tank conversions, an analysis was performed to determine if this future capacity deficiency is contingent on the assumption that all parcels on septic tanks would be sewer by 2030. Figure 5-9 shows in yellow those subcatchments that contain septic tanks and are tributary to triggered capacity deficiencies under 2030 DWF conditions. The scenario with full conversion of all septic tanks tributary to the deficient sewers is on the left and the scenario without conversion is on the right. It shows that although there are some minor differences in the extent of backwater, capacity-driven surcharging is still projected to occur in the 10" sewer on 45th St E between Ave R and Ave S even if no septic tanks are converted. Therefore, this capital improvement project is not dependent on the assumption of septic tank conversions.
- One additional potential capacity deficiency was initially identified in the vicinity of Essex Dr. and 47<sup>th</sup> St. E. This future deficiency, shown in Figure 5-10, can be averted by ensuring that one specific subcatchment (2099-0115) is sewer to the north rather than the west, as indicated in the figure. No new problems are caused as a result of re-directing flow to the north.



**Figure 5-9: Effect of Septic Tank Conversions on Capacity Deficiencies**

- The capacity of Pump Station S and its forcemain were found to be adequate for all future scenarios. The rated single pump capacity of Avenue S PS is .22 mgd. Even under the worst case scenario, Buildout WWF, the relief pump kicks on for just about half the time over the two day scenario. Incoming sewers to the PS do not back up and the pump station has adequate capacity during the Buildout WWF scenario.

### 5.3 Development of Solutions to Capacity Deficiencies

As described above, only two potential deficiencies on City sewers were identified in the hydraulic capacity analysis. In both cases, the deficiencies do not exist under existing (2006) DWF or WWF conditions, but are projected to occur due to future development. This section describes the development of solutions to these two deficiencies. Details of these projects, including plans, profiles, and cost estimates are presented.

#### 5.3.1 Project 1: 45<sup>th</sup> St. E between Ave. R and Ave. S

The only reach of City sewer that exceeded the DWF trigger criteria was along 45th St E between Ave R and Ave S. Figure 5-11 shows the 2030 DWF deficiency along 45th St E. It is noteworthy that the current configuration of sewers in this area sends all flow from the 12-inch northbound sewer on 47<sup>th</sup> St. E to the west along Ave. S, and then north on 45<sup>th</sup> St. E. The diversion of flow at Manhole 2049-0910 was made

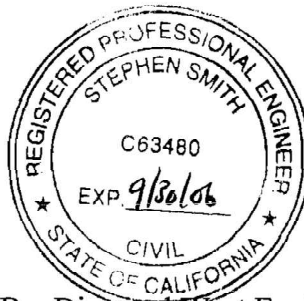




# Sewer Area Study

## Tract No. 52029

City of Palmdale



Prepared By: Diamond West Engineering, Inc

Signature:  Date: August 11, 2005



71406-PC

## TABLE OF CONTENT

• Introduction .....	1
• Calculation Discussion.....	1
• Conclusion .....	1
• Calculation .....	2
• Maps .....	4

- **INTRODUCTION:**

Diamond West Engineering, Inc. has been retained to prepare a Sewer Area Study for Tract 52029 Located North of Pearblossom Highway and east of 50<sup>th</sup> Street East. The project consists of 30 acres yielding 106 units. The slope of the ground south to north is an average of 1%.

The 1<sup>st</sup> connection point is on 50<sup>th</sup> Street east where Tract 46356 P.C. No. 05-59 is proposing a sewer line to connect to an existing 15" V.C.P. sewer line in Avenue S-8 per P.C. No. 89-87 and 45<sup>th</sup> Street East as shown on the attached map.

The purpose of this study is to determine the capacity of the proposed 15 inch line at 0.16% slope serving this project and Tract 46356. This study also addresses the capacity of the connection point in Avenue S-8 and 45<sup>th</sup> Street East by checking all the existing and new development that contributes to this line at this location.

- **CALCULATIONS DISCUSSION:**

The flow capacity of a half full 15 inch line at a minimum slope of 0.16% was calculated using Manning's formulas and the standard charts for normal flow. The capacity was calculated to be approximately 1.290 cfs.

- **CONCLUSION:**

It was found that an 8" system will be more than sufficient to serve the interior of the proposed project along with the tributary Area A as shown in the attached map. The analysis also found that the proposed 15" system in 47<sup>th</sup> Street East and Avenue S-8 will be enough to serve this tract and the future development shown on the attached map.

The Connection point was also found to be adequate to serve this project and the future project connecting to this line including tract 46356 to the west.



## SEWER AREA STUDY

### CALCULATIONS:

#### Area (A):

R1-7000 SINGLE RES.

Total Area = 30 acres

Q Per Acre = 0.004 cfs

$Q_A = (0.004)(30) = 0.120$  cfs

Capacity: 8" half full @ 0.40% = 0.387 cfs  
0.387 cfs > 0.120 cfs ...OK

**→ 8" V.C.P. @ 0.40% OK**  
**Use 8" Through Tract 52029**

#### Area (B):

R1-7000 SINGLE RES.

Total Area = 27 acre

Q Per Acre = 0.004 cfs

$Q_B = (0.004)(27) = 0.108$  cfs

Capacity: 8" half full @ 0.40% = 0.387 cfs  
0.387 cfs > 0.108 cfs ...OK

**Area (C):**

R1-7000 SINGLE RES.

Total Area = 150 acre

Q Per Acre = 0.004 cfs

 $Q_C = (0.004)(150) = 0.600 \text{ cfs}$ 

Capacity: 15" half full @ 0.16% = 1.290 cfs

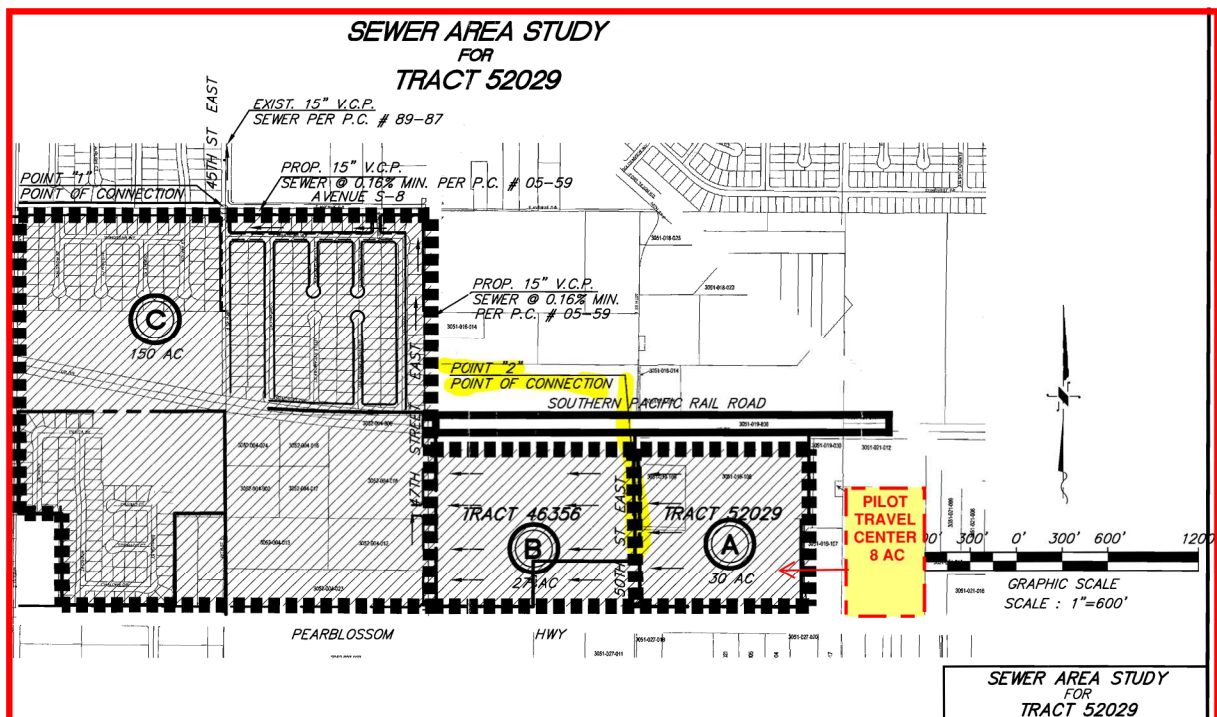
1.290 cfs &gt; 0.600 cfs ...OK

**Point "2":**

15" Half Full Capacity(avg.)= 1.290 cfs

 $Q_{\text{@Point 2}} = Q_A + Q_B + Q_C$  $Q_2 = (0.120) + (0.108) + (0.600) = 0.828 \text{ cfs} < 1.290 \text{ cfs} \text{ ..OK}$ 

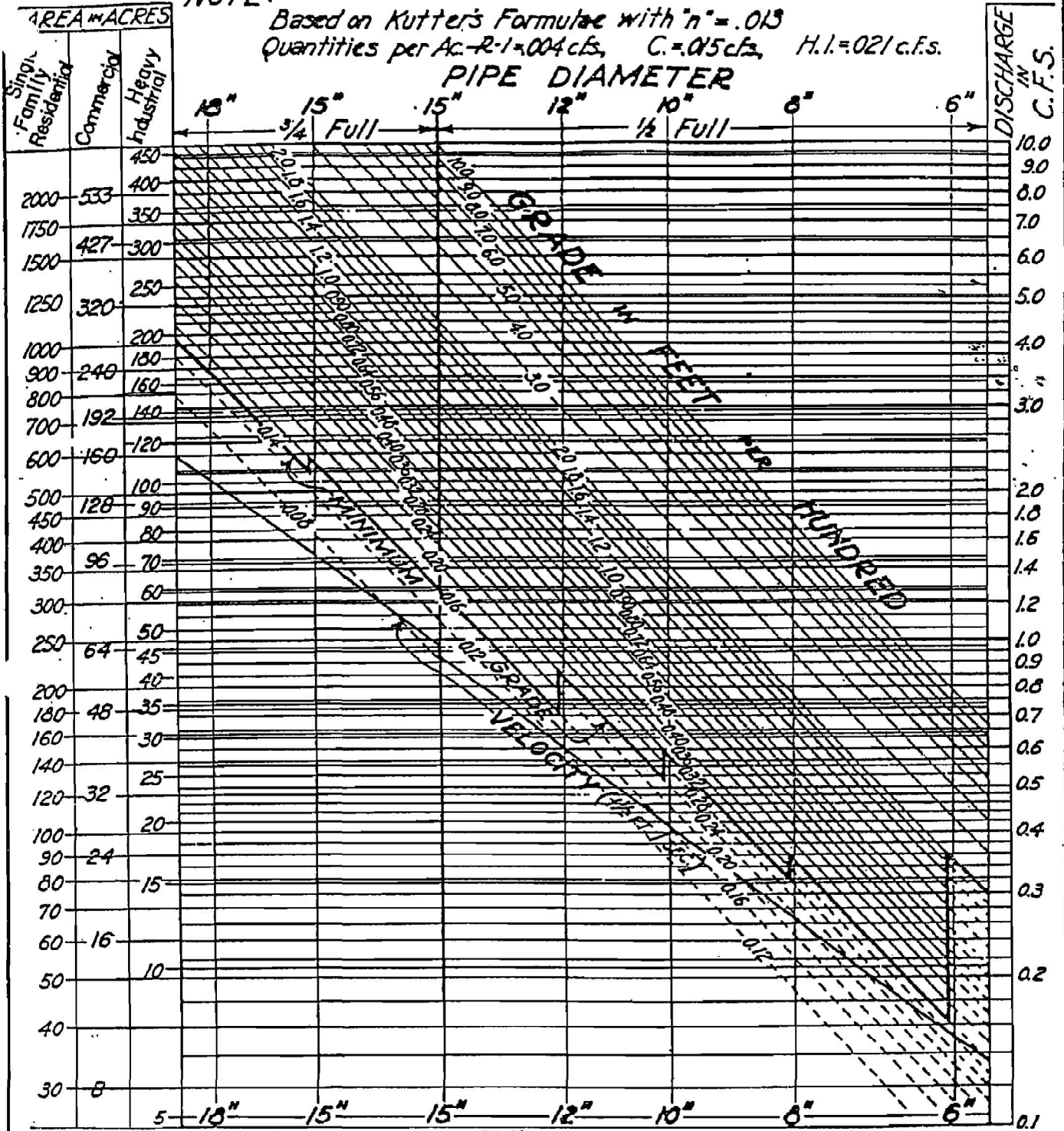
➔ 15" V.C.P. @ 0.16% OK

**POINT 2 + PILOT TRAVEL CENTER** $Q_{\text{PILOT}} = 15,000\text{-gal/day} = 0.015\text{-mgd} = 0.028\text{-cfs}$  $Q_{\text{Point2+Pilot}} = 0.828 + 0.028 = 0.856\text{-cfs} < 1.290\text{-cfs} \text{ ..... OK}$ 

NOTE:

Based on Kutter's Formulae with  $n = .013$   
 Quantities per Ac. - R-1 = .004 cfs, C-1 = .015 cfs, H.I. = .021 cfs.

## PIPE DIAMETER



### FLOW DIAGRAM FOR THE DESIGN OF CIRCULAR SANITARY SEWERS

COUNTY OF LOS ANGELES  
 DEPARTMENT OF COUNTY ENGINEER - FACILITIES

COUNTY ENGINEER  
 STANDARD

DATE: 3/80

S-C4

DESIGN

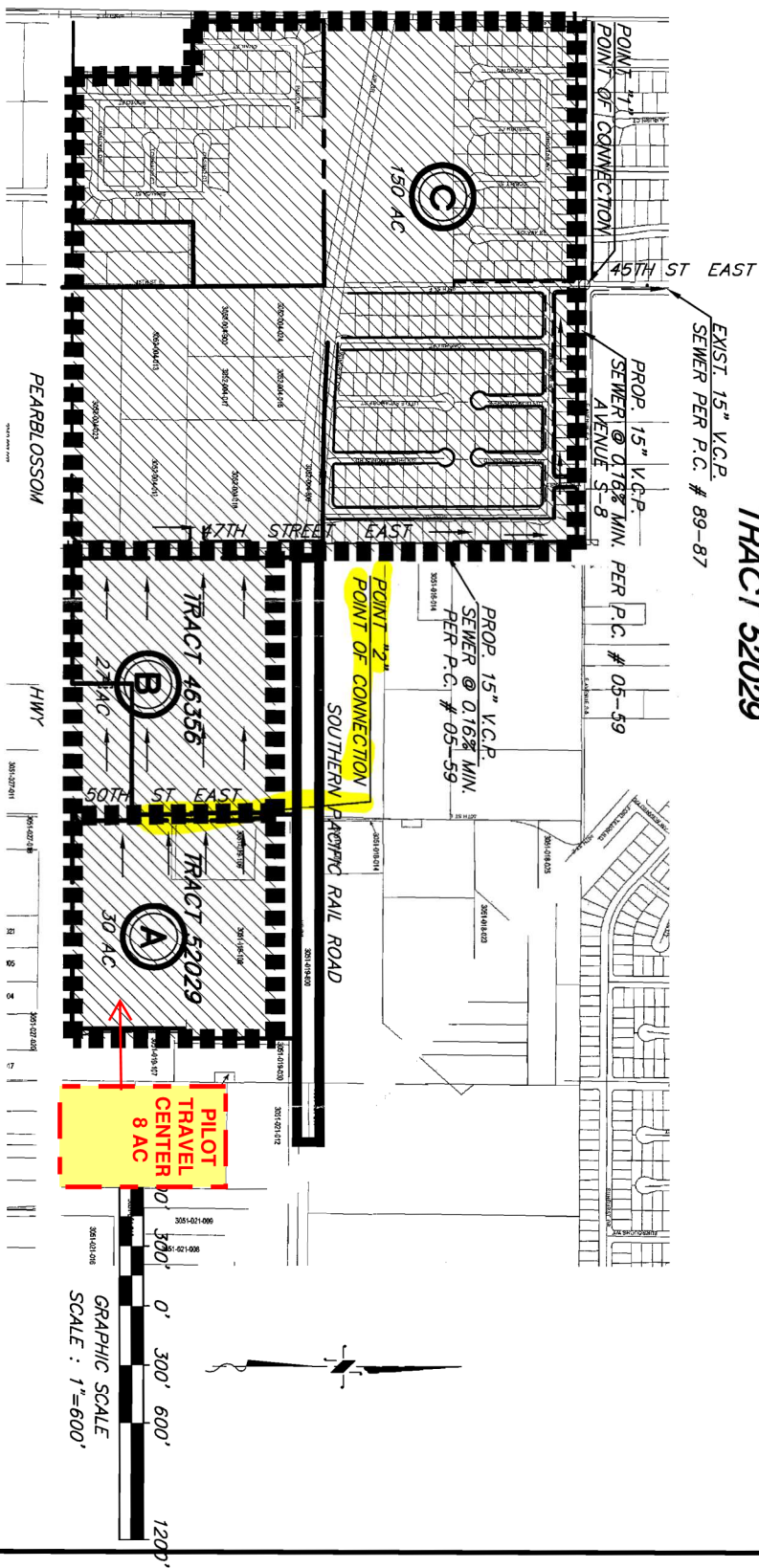
PC 05-65  
 10493

*Assistant Deputy*  
 ASSISTANT DEPUTY

*County Engineer*  
 COUNTY ENGINEER



SEWER AREA STUDY  
FOR  
TRACT 52029



SEWER AREA STUDY  
FOR  
TRACT 52029

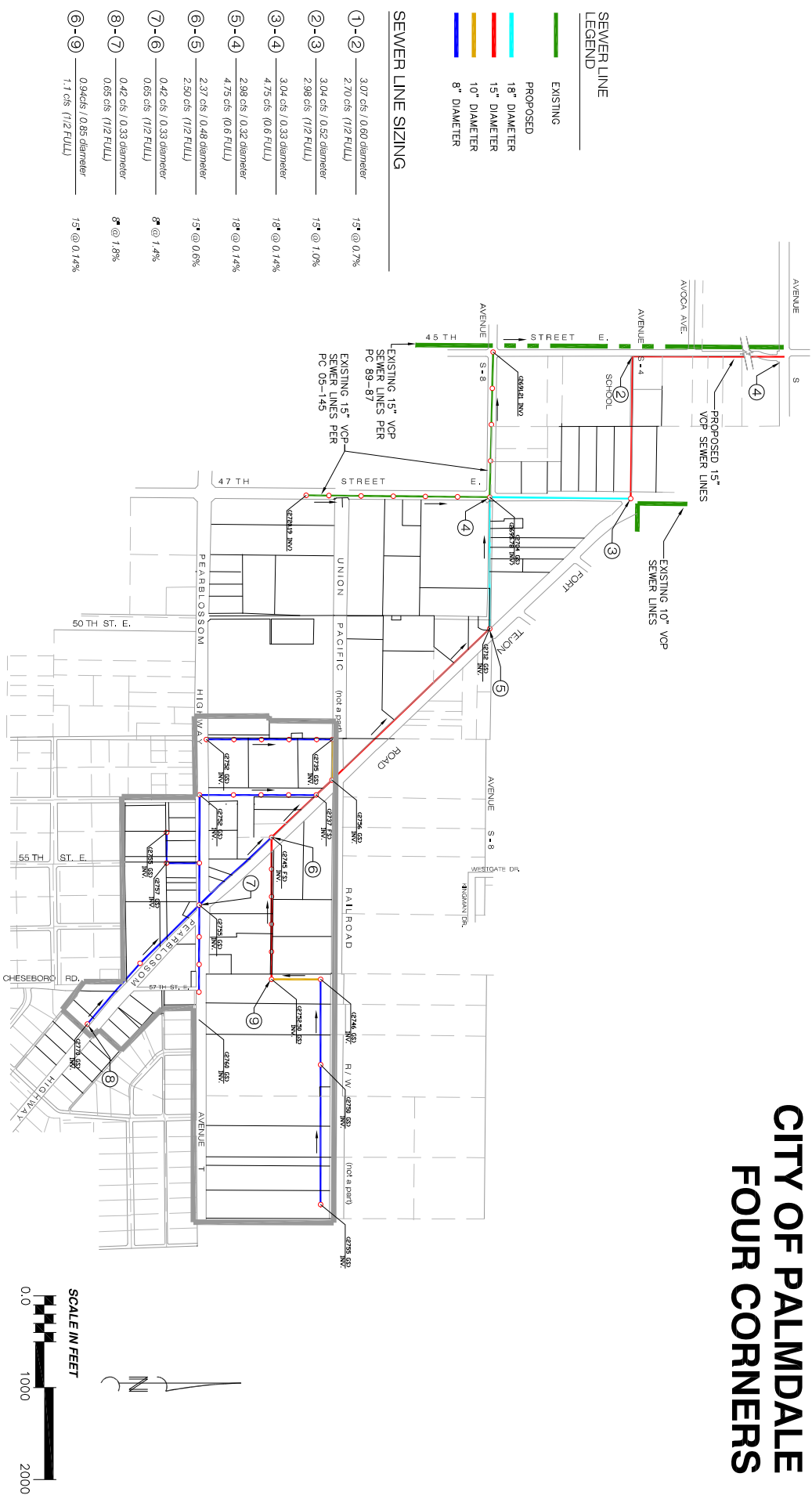
DIAMOND WEST  
engineering a better tomorrow  
Diamond West Engineering Inc.  
28800 Agoura Road, Suite 100  
Calabasas, California 91301  
Tel(818)222-3453 Fax(818)223-9215  
E-mail: dwei@diamondwest.net

SCALE: 1" = 600' SHEET 1 OF 1

# Appendix E

## Tentative Map/Parcel Map/Site Plans

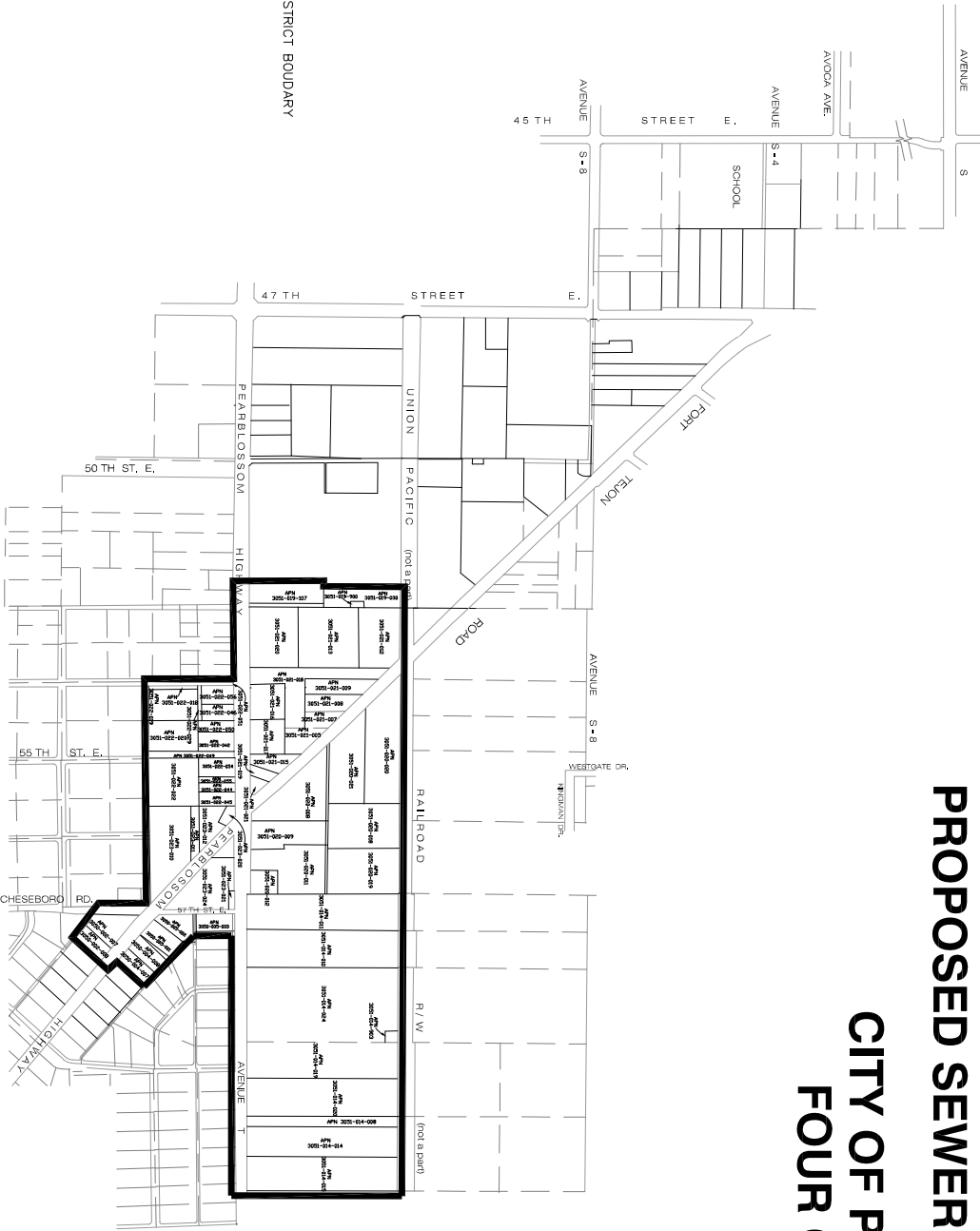
PRELIMINARY FLOW GENERATION EXHIBIT  
FOR THE  
CITY OF PALMDALE  
FOUR CORNERS





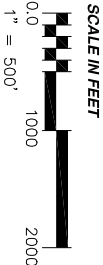
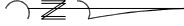
**PROPOSED SEWER DISTRICT**  
FOR THE  
**CITY OF PALMDALE**  
**FOUR CORNERS**

REVISED: 9/22/2006



**LEGEND**

PROPOSED DISTRICT BOUNDARY



**WILLDAN**

Project:

**Four Points  
Sewer  
Project**

Owner:

**City of  
Palmdale**

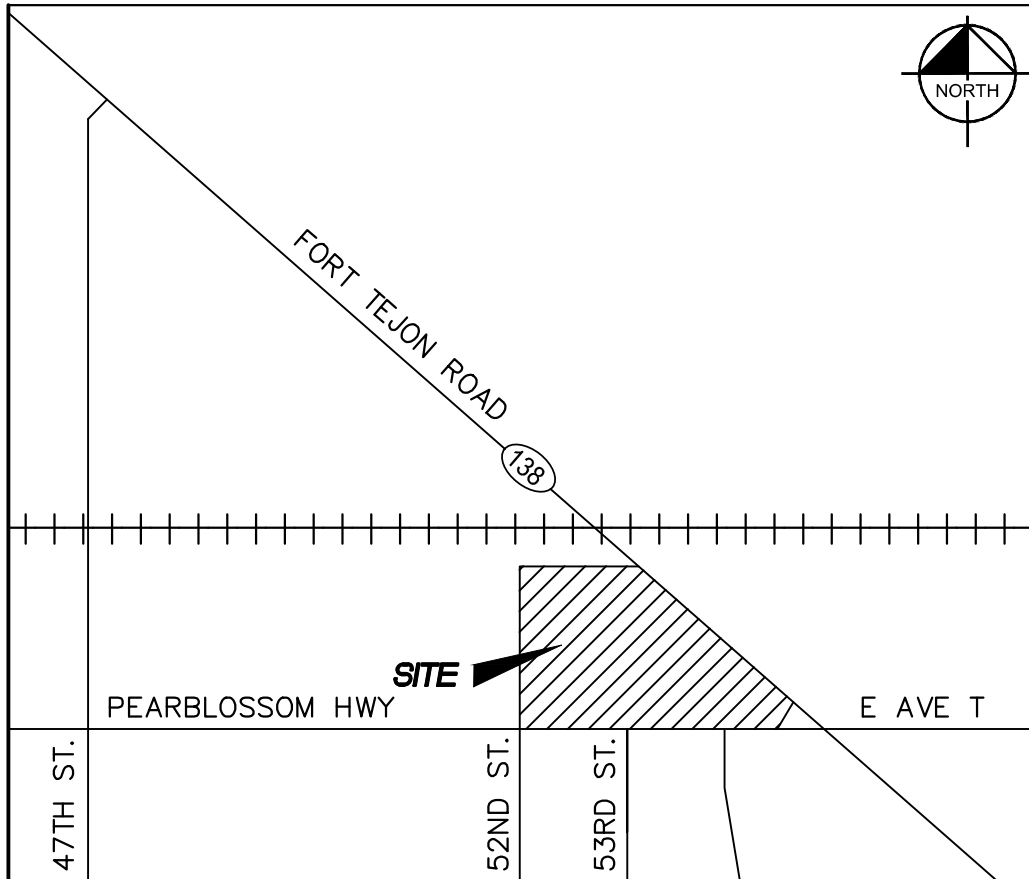
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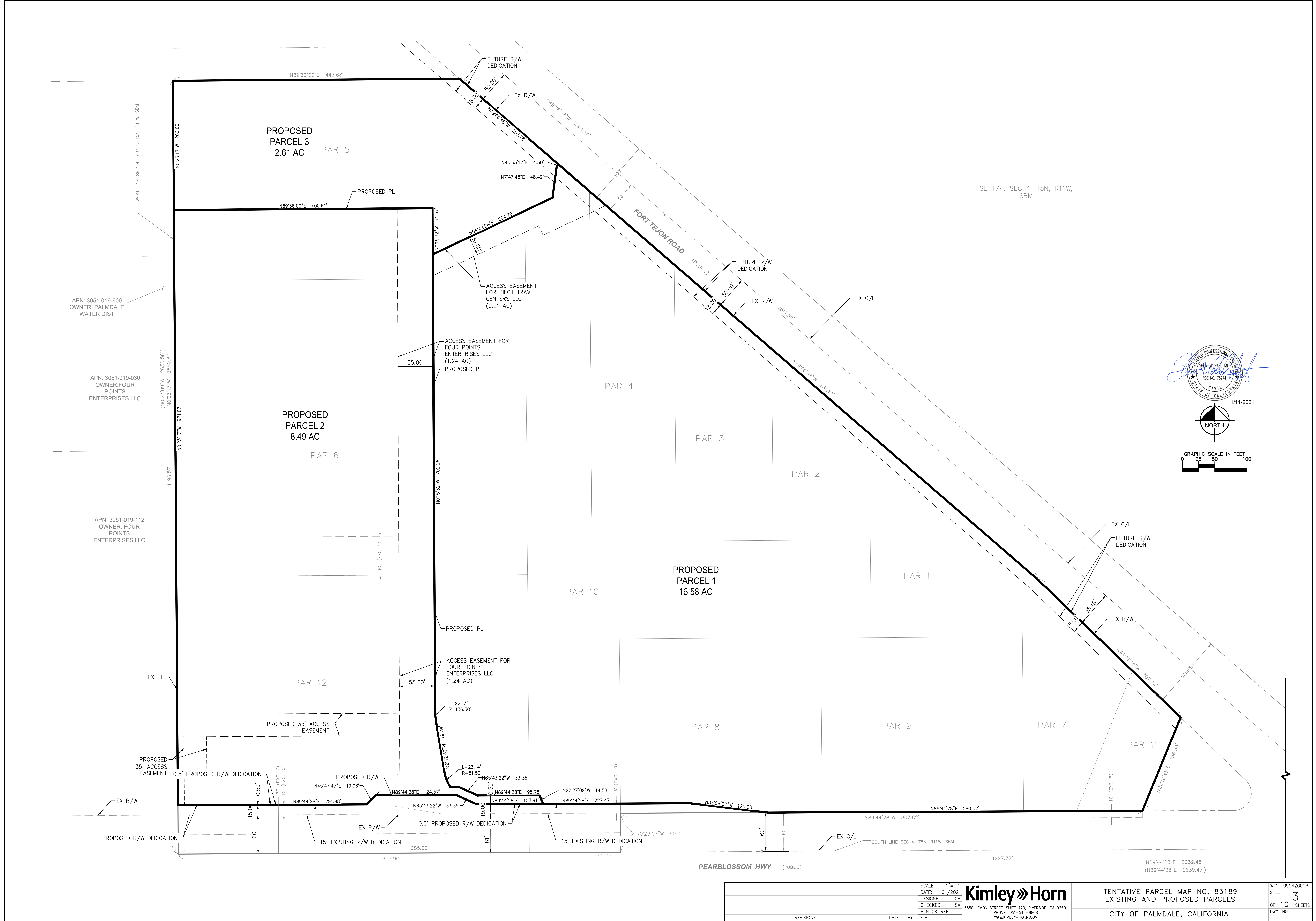
Date:

Scale:

Drawing Title:



VICINITY MAP  
NTS



REGISTERED PROFESSIONAL ENGINEER  
SEA - MECHANICAL  
RCE NO. 78274  
CIVIL  
STATE OF CALIFORNIA

1/11/2021

NORTH

0 25 50 100  
GRAPHIC SCALE IN FEET

				SCALE: 1"=50'		<b>Kimley»Horn</b> 3880 LEMON STREET, SUITE 420, RIVERSIDE, CA 92501 PHONE: 951-543-9868 WWW.KIMLEY-HORN.COM		TENTATIVE PARCEL MAP NO. 83189 EXISTING AND PROPOSED PARCELS  CITY OF PALMDALE, CALIFORNIA		W.D. 095426006	
				DATE: 01/2021						SHEET 3	
				DESIGNED: GH						OF 10 SHEETS	
				CHECKED: SA						DWG. NO.	
				PLN CK REF:							
				F.B.							
REVISIONS				DATE	BY						