Appendix HWQ-1

Drainage Report

PREPARED FOR

WattEV

PREPARED BY

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WattEV
Electric Truck Stop
Level 3 Drainage Report

Natomas Basin Watershed
Southwest Corner of Power Line Road and Bayou Way
NAVD88

I hereby certify that this plan, specification, or report was prepared by me or under my direct supervision and that I am a duly Registered Professional Engineer under the laws of the State of California.



Zachary Tait, P.E.

Date: January 25, 2024 Registration No. 82940

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1. PROJECT OVERVIEW

The goal of this report is to demonstrate a planning level design of this project. This design requires additional coordination with RD-1000 and the Sacramento County Department of Water Resources (DWR).

1.1 Introduction and Purpose

Kimley-Horn has been contracted to prepare existing and proposed conditions XPSWMM models for the WattEV Electric Truck Stop (the Project) in the County of Sacramento, California for the purpose of supporting the design of improvements necessary to meet applicable stormwater regulatory standards. The Project consists of the conversion of existing vegetated open space to an electric truck stop on the north end and supporting solar farm on the south end of the property.

The Project is located within the Natomas Basin watershed in Sacramento County **(Figure 1**, all figures located in **Appendix A)**. The model covers approximately 156 acres of the 53,341-acre Natomas Basin watershed. The majority of the site drains south into Reclamation District (RD) -1000 West Drainage Canal, as shown in **Figure 2.** The northern portion of the site drains to the north into the existing storm system along Bayou Way and I-5. The existing storm system generally drains to the east to RD-1000 N Drain.

Short-Term Critical Event Analysis

This analysis and documentation only includes the 100-year, 10-day storm event. This is due to the availability of boundary conditions at outflow locations across the site, taken from the Natomas Regional Model. This regional model was developed to understand flow rates and high-water levels across the basin. In future submittals, the County DWR may supply a 100-year, 24-hour boundary condition. In this event, this short-term critical event will be included in analysis and documentation will be updated to include the additional results.

Urban Level of Flood Protection

Per the 200-Year Urban Level of Flood Protection (ULOP) Applicability Area figure found in the Sacramento County Floodplain Management Ordinance dated January 13, 2017, the Project is located within the 200-Year ULOP Applicability Area. Section 902.571 of the Floodplain Management Ordinance states that all of the following criteria must apply for the ULOP to be required. However, the Project does not meet all the requirements for which ULOP is applicable, as shown below:

- The project site is in a Flood Hazard Zone; and
- The project site is in an urban area with 10,000 or more residents, or is in an urbanizing area in which 10,000 or more residents are anticipated within 10 years; and
- The project site is in a watershed with a contributing area greater than 10 square miles; and
- The project site has potential flood depths greater than 3’ in the 200-year flood.

Since the release of the Floodplain Management Ordinance, a regional study was completed to determine the limits of the interior 200-year floodplain within the Natomas Basin. This regional study, *200-Year Natomas Basin Interior Drainage Study*, was completed by West Yost Associates and Mead & Hunt is included in **Appendix H** for reference. The study includes the updated 200-year floodplain limits for those locations where the tributary area of the watershed is 10 square miles or more – Figure

3 in **Appendix H**. Figure 3 also shows the extents of inundation greater than 3 feet of depth or more from the 200-year event.

The Project is not located within the 200 Year Floodplain Limits and has a drainage area of over 10 square miles or is located within the 200 Year Floodplain Limits with Depth of 3' or greater as shown in Figure 3 in **Appendix H.** The Project team acknowledges that this issue requires further discussion and will be addressed as design progresses.

Onsite Flood Mitigation

Onsite mitigation may be required due to the increased peak flow from the site. This may include stormwater detention in the form of underground vaults, pipe galleries, or similar systems. Onsite mitigation will be further discussed during the design phase. The Project will be in full compliance with the Sacramento County Ordinances, Sacramento County Improvement Standards, Section 9, and Stormwater Quality Design Manual. We anticipate additional discussions of relevant exemptions will be required.

Low Impact Development Requirements

This Project will incorporate Low Impact Development (LID) requirements as design progresses. The LID features will be designed in accordance with standards set out in the Stormwater Quality Design Manual.

Current LID features on the Project include vegetated swales, located on the north portion of the site, as shown in **Appendix B**. The swales are approximately 300 feet long, 16 feet wide, and 1 foot deep. Swale sizing as done using the modified rational method.

Hydromodification Requirements

This Project will incorporate hydromodification requirements as design progresses. The site will be designed in accordance with standards set out in the Stormwater Quality Design Manual.

FEMA Floodplain Management

Figure 3 shows the FEMA FIRM map floodplain delineations across the site taken from FIRM panel 06067C0040J with an effective date of June 16, 2015. The majority of the site is covered by Zone A "Approximate" floodplain, where base flood elevations have also not been established. The County supplied a provisional 100-year floodplain delineation along with a 100-year floodplain elevation of 14 feet. The far northern edge of the site is within Zone A99 which corresponds to areas of the 1% annual chance floodplain that will be protected by a federal flood protection system where construction has reached specified statutory milestones. No base flood elevations or flood depths are shown within this zone.

The Sacramento City/County Drainage Manual – Hydrology Standards (SCCDM) Volume 2, dated December 1996, will be used for hydrologic parameter assumptions and as the basis for developing the existing and proposed condition models. All elevations in this report are in the North American Vertical Datum of 1988 (NAVD-88), unless otherwise noted. As-built data was converted from the National Geodetic Vertical Datum of 1929 (NGVD-29) to NAVD-88 with a conversion factor of +2.497'.

2. REFERENCE DATA

2.1 Data Obtained

The following data was obtained from various sources and used to perform the analysis on the site:

- On-site Survey (Date Received: 07/05/2023)
- Aerial Imagery (Date Taken: 03/18/2022)
- Sacramento County/City Drainage Manual Volume 2 (Date Published: December 1996)
- As-Built Plans for Caltrans Project ID: 0313000316 (07/13/2016)
- As-Built Plans for Caltrans Contract No.: 03-100964 (June 1969)
- Northern Extents Boundary Conditions – from previously created study
- 200-Year Natomas Basin Interior Drainage Study – Mead & Hunt (05/12/2016)

3. ANALYSIS CRITERIA

3.1 On-Site Storm Drainage

The on-site drainage system will be designed to meet standards and parameters provided in Volume 2 of the SCCDM, which was developed by the Sacramento County Department of Water Resources (SCDWR) and the City of Sacramento Department of Utilities Engineering Services Division. The discharge and water surface elevations associated with the 100-year storm events will be calculated using the Sacramento Runoff Method in XPSWMM. The Project will generally drain the truck stop portion of the site to the existing drainage ditches to the north, labelled Bayou Way/I-5 Drainage Ditch in the appended figures. North-south surface vegetated swales will be used to capture overland flow and route to proposed culverts under Bayou Way. The vegetated swales will provide stormwater quality volume to meet the stormwater quality requirements. The proposed culverts under Bayou Way will drain into Bayou Way/I-5 Drainage Ditch. The Bayou Way/I-5 Drainage Ditch conveys runoff to the east to an existing 48-inch culvert under Powerline Road and into the RD-1000 N Drain, shown in **Figure 4B**. The southern portion of the site will drain as it does in existing conditions as sheet and shallow concentrated flow to the south, ultimately entering the existing drainage canal, RD-1000 West Drainage Canal. Runoff will generally flow to the southwest corner of the site, discharging into RD-1000 West Drainage Canal via an existing 12” culvert, as shown in **Figure 2.**

RD-1000 is planning improvements to the West Drainage Canal, to be completed in the future. In existing conditions, there is a berm along the south end of the site, directly north of the West Drainage Canal. The preliminary planned improvements will reduce that berm to be a maximum of one foot above the field elevation. This new berm elevation has been incorporated into the modelling for this Project. RD-1000 is also planning to expand the West Drainage Canal, increasing its capacity. These plans are in the preliminary stages. As a result, the widening of the canal is not included in the Project models.

3.2 RD 1000 Boundary Data

Reclamation District (RD) 1000 supplied hydraulic modeling results from the Natomas Basin SWMM model. The hydraulic modeling results were entered into the XPSWMM model to simulate the downstream conditions and provide the XPSWMM model with a hydraulic boundary condition. The comparison points are listed in Table 1 and shown in **Figure 7A and 7B**.

Table 1. Key Discharge Locations

Location	RD-1000 SWMM Node	Kimley-Horn XPSWMM Node
East Discharge – Powerline Road Culvert	11547	N-11-B
South Discharge – RD1000 West Drainage Canal	1103	S_Outfall

3.3 Previous Studies Boundary Data

A previous study, known as *Sacramento International Airport South Development Infrastructure Plan*, was done by Kimley-Horn in January 2022. This study analyzed the site directly to the north of the Project. Portions of this previous site drain south into the Bayou Way/I-5 Drainage Ditch located on the north extents of the Project. Stage-flow hydrographs were taken from the previous study's downstream extents and used as user-defined boundary conditions within the XPSWMM model for the northern portions of the Project. The comparison points are listed in **Table 2**. Models of the previous study are included in **Appendix H.**

Table 2. Stage-Flow Hydrograph Locations

Results in Previous Study from Kimley Horn	Kimley-Horn XPSWMM Node
Link P-07	OUT-05-A
Link P-03	Node82
Link19	O-03
P-08	OUT-03-A
Link20	O-02
P-09	OUT-02-A

4. HYDROLOGIC ANALYSIS

All hydrologic calculations were performed using the Sacramento Method in the XPSWMM hydrologic module. Simulations were run using the 100-year 10-day design storm to estimate runoff potential for each subbasin, peak discharge rates from the site, and water surface elevations throughout the site. The 10-day storm simulates multiple rainfall events over the watershed and produces high runoff volumes but lower peak runoff rates.

Three design methods are discussed in the SCCDM: Nolte, Sacramento, and Sato. The Nolte Method was developed in the 1960's and is designed to be used with drainage areas less than 2 square miles. This method is adequate for street drainage and storm drain design in Sacramento County. The Sacramento Method is typically used for major drainage facility and master planning designs and for areas with contributing drainage areas greater than 640 acres. The Sacramento Method can also be used for areas of special and/or unique circumstances. The Sato Method is largely used to determine optimum volume of storage for water quality detention based on given impervious area values.

The Sacramento Method was chosen due to the presence of planning-level large drainage areas and development types that lend themselves to the Sacramento methodology. According to the SCCDM,

the Sacramento Method is a hydrograph method that uses the Bureau of Reclamation urban unit hydrograph as a basis for estimating runoff hydrographs. One of two lag time calculation methods can be specified for individual subbasins. The Basin "n" method is used to compute basin lag times in order to calculate runoff hydrographs for undeveloped areas. The Travel Time method is used for areas that are developed and may include gutter and pipe flow to calculate lag times.

The Sacramento Method also calls for the following parameters to calculate runoff flow rates and estimate hydrographs for each subbasin:

- Sacramento County Rainfall Zone
- Subbasin areas
- Subbasin length of longest flow path
- Basin slope
- Centroidal longest flow path
- Subbasin mean elevation
- Land Use Impervious Percentage
- Initial Losses

The site is located wholly within the Rainfall Zone 2. For each subbasin, the longest flow path was taken to be the distance from the subbasin outlet to the most hydraulically remote point. The basin slope was calculated using onsite survey data (received 07/05/2023) to determine elevations at the start and end of the longest flow path. The length of the centroidal longest flow path was determined by trimming the longest flow paths to a point perpendicular to the centroid each subbasin per the SCCDM guidelines. The length was then taken from the point perpendicular to the centroid to the outlet point of the subbasin.

The mean elevation was taken as the elevation at the subbasin centroid based on site survey for existing conditions, and the preliminary surface grading for proposed conditions. For the proposed condition, the proposed surface grading was overlaid on the site survey DEM to create a combined finished grade DEM. Land-use/land cover was hand delineated based on aerial imagery (taken on March 18th, 2022).

4.1 Subbasin Delineation

Kimley-Horn delineated existing condition subbasins using on-site survey data. Subbasins were delineated to each section of existing drainage ditch so that accurate flows could be determined at these locations. The average subbasin size is approximately 0.5 acres for the northern truck stop area. See **Figure 4a** for the existing conditions subbasin delineations.

Existing condition subbasin boundaries were updated to reflect changes in surface grading due to the proposed truck stop development. These changes are reflected in the preliminary grading and drainage plan exhibits provided in **Appendix B and C**. Within the truck stop site, subbasins were delineated for each proposed drainage swale. See **Figure 4b** for proposed conditions subbasin delineations.

4.2 Initial Losses

Per Technical Memorandum No. 3, published by Civil Engineering Solutions in April 2018, the recommended infiltration loss rate for the Natomas basin has been determined to be 0.014 in/hr.

4.3 Lag Time

The Basin "n" method was used to compute basin lag times in XPSWMM. According to Chapter 7 of the SCCDM Volume 2, the Basin "n" method utilizes the length of longest flow path, length along longest catchment to centroid, slope, and land-use/land cover (LULC) within each subbasin to calculate lag time. XPSWMM allows for the LULC parameter values to be entered directly using absolute area in acres or as a percentage of total subbasin area. Each LULC area is broken down to developed and undeveloped condition with a corresponding Basin "n" for each subbasin. XPSWMM then uses the areas for each LULC to calculate an overall weighted Basin "n" value for the entire subbasin. The Basin "n" method was used for all subbasins in existing conditions due to the largely undeveloped nature of the site. Lag time parameters were updated for proposed conditions. The Basin "n" method was used for proposed conditions for open areas without proposed storm sewer infrastructure.

4.4 Soil Properties

The NRCS Soil Survey Geographic Database (SSURGO) for Sacramento County was used to determine the soil types present on the Project site. The SSURGO soil database includes a polygon layer for each soil type, or Map Unit Symbol (MUSYM) in the county. The Project site generally consists of Hydrologic Soil Group (HSG) C, and C/D. Dual hydrologic soil groups (e.g. C/D) are used for soils which have different properties while drained or undrained. The first and second letters refer to drained and undrained conditions respectively. HSG C and D soil ratings align with previous soil studies in the area (1987– Soil Survey of Sacramento County, Undated - Sacramento County Soil Type Maps) and previous soil borings taken on site. Areas of dual hydrologic soil groups were treated as D soils due to the historically high-water table in the region. No areas of HSG A or B were included in the analysis. See **Figure 5** for a map of the soils within the project site. Soil properties were assumed to be consistent from existing to proposed conditions due to the current poor grade of soil within the site.

4.5 Land Use

Kimley-Horn developed a land-use/land cover (LULC) GIS layer containing shapes that represent the following types: Grassland (Vegetated open space), Highway, Parking, and Intensive Industrial. See **Table 3** for a summary of land use types and the assigned Manning's n and impervious percentages based on values published in the *SCCDM*.

Similar to the Basin "n" parameter, XPSWMM allows the modeler to specify either a constant infiltration rate and impervious area, or the software can calculate an area-weighted constant infiltration rate and impervious area based on the specified LULC layer. Kimley-Horn utilized the LULC layer method to assign area-weighted infiltration rates and impervious areas for the model. See **Figure 6a** for the existing condition LULC delineation. The existing condition LULC is largely dominated by vegetated open space.

Proposed condition land use delineation was performed based upon proposed site layouts. The project site includes highly impervious parking and roadway areas, landscaping and planter areas, and vegetated open space. Landscaping and planter areas were assumed to have identical infiltration and manning's n parameters. See **Figure 6B** for the proposed conditions LULC delineation.

Table 3. Land Use Parameters

Land Use Description	Impervious Percentage	Basin n
Vegetated Open Space	2%	0.115
Highway	95%	0.030
Parking	95%	0.030
Intensive Industrial	85%	.032

5. HYDRAULIC ANALYSIS

The XPSWMM 1-Dimensional (1-D) module was used with the Sacramento Hydrology method to combine and route excess runoff hydrographs from the Runoff module. The XPSWMM Runoff and Hydraulic modules work in conjunction with one another to route runoff through the watershed while calculating peak flows and peak water surface elevations in each link and node. In the 1-D XPSWMM model, the links and nodes were connected to route runoff downstream within the Project area. The results of the hydraulic analysis were used to estimate the 100-year, 10-day peak flow rates and water surface elevations throughout the existing and proposed site.

5.1 Elevation Data

The site survey was used to create an existing ground DEM in Civil 3D which was referenced for existing subbasin delineation and routing.

The proposed surface grading was used to create a finished grade DEM. The proposed surface grading was overlaid on the site survey to create the finished grade DEM. The proposed surface grading includes parking lot creation, truck stop buildings, and drainage swales throughout the site to route flow to the outlet locations. See **Appendix C** for the preliminary grading plan.

5.2 Tailwater Conditions

The boundary conditions in the existing and proposed XPSWMM models were determined based on data from the RD-1000 regional flood model. Two outflow locations from the site are present in existing conditions. The first outlet is located on the southern border of the parcel where the solar development discharges into the RD-1000 West Drainage Canal. The second outlet point is located at the western border of the parcel where a 48” culvert passes under Powerline Rd and discharges to the RD-1000 N Drain.

The southern outlet location was modeled using the RD-1000 Node 1103. The Node 1103 stage hydrograph was applied as a tailwater condition to the 12” culvert in the southwest corner of the site, discharging into RD-100 West Drainage Canal. For the second outlet location the RD-1000 Node 11547 stage-hydrograph was applied as a tailwater condition to the 48” culvert underneath Powerline Rd. Since each of the outflow locations ultimately discharge into the RD-1000 N Drain, the RD-1000 Node 11547 stage-hydrograph was applied as a tailwater condition at the outlet of the 48” culvert under Powerline Road. The RD-1000 regional model was originally set up to simulate the 100-year, 10-day rainfall event. The tailwater stage-hydrograph was taken directly from the regional model and used for the 100-year, 10-day storm. See **Figure 7A** and **7B** for the XPSWMM links and nodes map for existing and proposed conditions, respectively. The RD-1000 regional flood model links and nodes map is also

included as **Figure 8**. The tailwater boundary condition data and hydrograph curves are shown in **Appendix D**. Tailwater conditions were held constant between the existing and proposed conditions XPSWMM models for both storm events.

5.3 On-Site Hydraulic Routing

The existing on-site hydraulic routing includes a series of ditches connected by culverts on the north end of the site just south of Bayou Way. These ditches were modeled as individual subbasins with connecting links representative of culvert geometries. The storage provided within these ditches is represented within Node D-03 in the existing conditions model. This series of ditches is generally separated from the rest of the site by a minor ridge on its south side. These subbasins are connected to the drainage ditch between Bayou Way and I-5 on the west side of the site by a 30" culvert. This culvert is sloped north to south but also allows reverse flow off of the site. The ditches on the north side of the side are also connected to the Bayou Way/I-5 ditch on the east end by an 18" culvert. This ditch outlets under Powerline Road through an existing 48" culvert into the RD-1000 N Drain which flows south and connects to an irrigation canal at the SE corner of the site. The Bayou Way/I-5 drainage ditch receives offsite flows which were modeled in a previous phase of this project, as discussed in Section 3.3. These offsite flows were included in both the existing and proposed analysis. The existing on-site hydraulic infrastructure is shown in **Figure 2** and **4A**. The model of the previous phase of this project is found in **Appendix G**. The rest of the site has minimal drainage infrastructure and is mainly defined by a series of minor low points that provide some storage before overtopping and continuing to flow south. The site is bordered on the south and west by drainage ditches and on the east by Powerline Rd. The southern portion of the site receives no offsite flows.

The existing conditions model was created using as-built drawings and supplemented with field surveys. The site survey and previous as-built drawings detailing the surrounding storm sewer infrastructure are provided in **Appendix F.**

The proposed on-site hydraulic routing modifies and improves drainage routing, but the boundary outflows are largely unchanged from existing to proposed conditions. The truck stop site is broken up into subbasins, each which drain to an individual vegetated swale which are intended to increase basin time of concentration and subsequently attenuate peak flow rates. These vegetated swales are located south of Bayou Bay, extending to the south. These swales then drain into 18" culverts which pass under Bayou Way and empty into the Bayou Way/I-5 drainage ditch. In the event the capacity of these culverts is exceeded, Bayou Way will overtop and allow flow from the site directly into the Bayou Way/i-5 drainage ditch. The proposed grading removes the minor ridge adjacent to the Bayou Way South Drainage Ditch system which directs significantly more drainage area north than in existing conditions.

Storage is provided in the center of the truck stop, in the low point of the parking lot. This storage is shown as Node C-04 in the model and **Figure 7B.** Additional onsite mitigation may be required due to the increased peak flow from the site. Onsite mitigation will be further discussed during the design phase.

The southern portion of the site's drainage patterns remain largely unchanged apart from losing some drainage area due to the previously mentioned grading. The outlet conditions will remain largely unchanged as no work is expected at the Powerline Rd culvert and there are no significant expected impacts to the southern subbasin.

5.4 Floodplain Impacts

The Electric Truck Stop site plan requires adding 7,592 cubic yards of fill material within the floodplain on the eastern edge of the site. This lost floodplain volume will be compensated by an excavation matching the fill volume on the southern portion of the site. There will be no net decrease in floodplain storage as a result of this development. The fill and borrow areas and volumes can be observed in **Figure 9.**

6. RESULTS

Existing and proposed conditions hydrologic and hydraulic models were completed for the WattEV Electric Truck Stop project using XPSWMM 2-D software. The existing conditions model sufficiently establishes the existing hydrologic and hydraulic conditions, including the peak water discharge rates and total runoff volumes. See **Table 4** for peak flow rate results at key locations for the existing and proposed conditions. See **Table 5** for cumulative runoff volumes at the same locations. **Figure 7A** and **7B** shows the key flow locations across the site. Offsite flows from north of I-5 contribute to peak flows and total runoff volume at P-10. These inflows remain constant between existing and proposed models.

Table 4. Peak Flows at Key Locations – 100-year Events

Outfall Identification Link	Location	$Q_{10\ day}$ (cfs)	
		Existing Conditions	Proposed Conditions
P-1	RD1000 West Drainage Canal	5.03	4.96
P-10	Powerline Road Culvert	19.68	21.49
Total	-	24.71	26.45

The proposed condition results show an increase in overall peak discharge rate in the 100-year, 10-day event. While peak flow does decrease at P-10, the combined peak discharge rate of the site increases from existing to proposed conditions during the storm event. Because the two outfall locations are ultimately connected at the SE corner of the site, the cumulative peak discharge rate will increase from existing conditions. Additional coordination with RD-1000 will be required to determine if this is acceptable.

Table 5. Cumulative Runoff Volumes at Key Locations

Outfall Identification Link	Location	$Q_{10\ day}$ (ac-ft)	
		Existing Conditions	Proposed Conditions
P-1	RD1000 West Drainage Canal	120.7	108.1
P-10	Powerline Road Culvert	55.8	71.6
Total	-	176.5	179.7

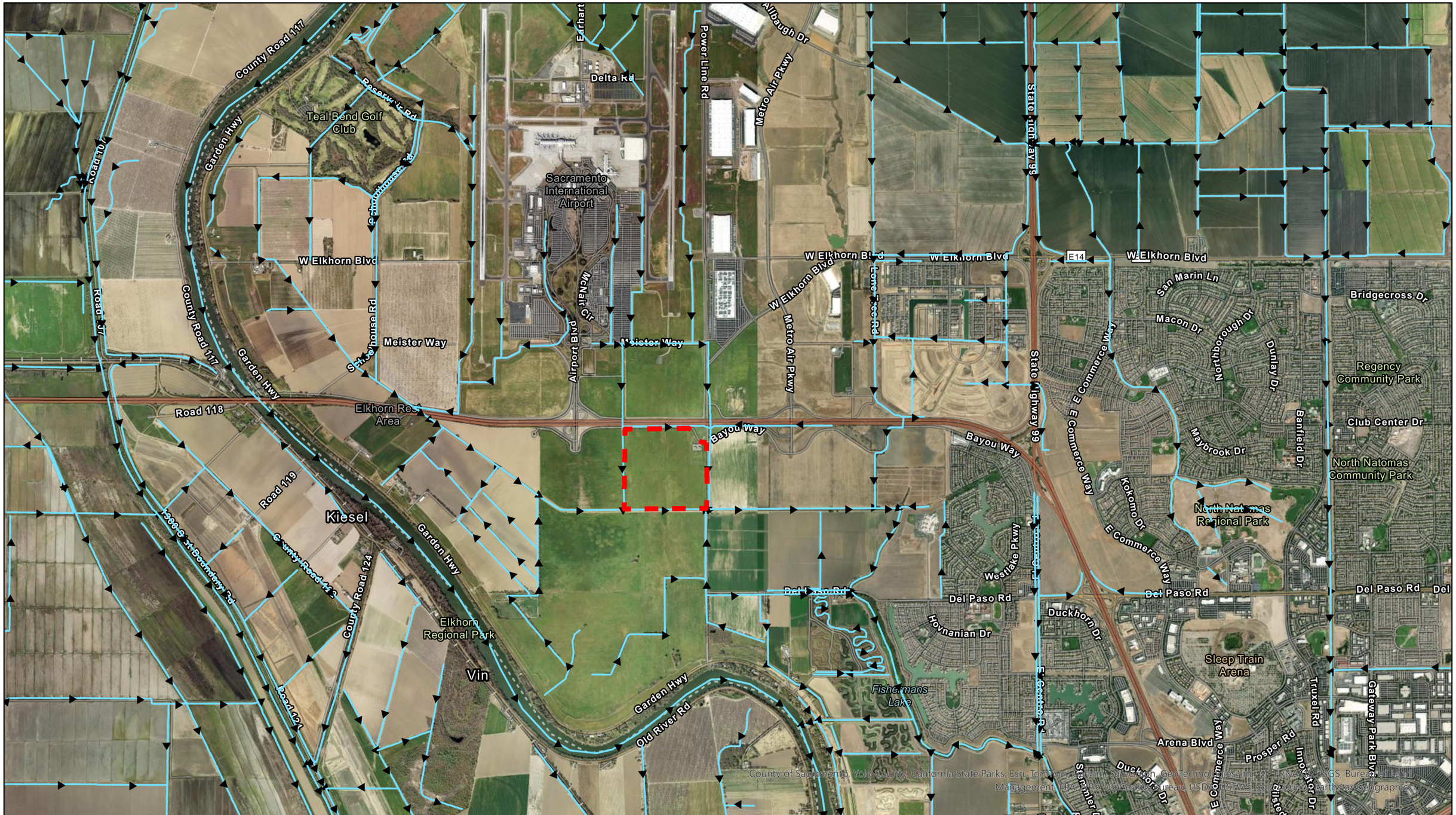
Runoff volume passing through outfall P-1 decreases from existing to proposed conditions in the 10-day event. This is due to the lack of change in land use classification and shrinking drainage area due to the truck stop development. The runoff volume flowing through outfall P-10 increases by 15.8 ac-ft in the 10-day event. Total runoff generated by the site increases by 3.2 ac-ft in the 10-day event. This increase in runoff total runoff volume is the result of the increase in impervious area at the Truck Stop from existing to proposed conditions. As part of the ongoing design process, coordination with RD-1000 will continue to determine acceptable discharge volumes from the site to the existing RD-1000 drainage canals.

7. CONCLUSIONS/RECOMMENDATIONS

This report outlines the results from the existing and proposed conditions hydrologic and hydraulic XPSWMM analysis for the WattEV Electric Truck Stop Development. The analysis shows that the proposed development and storm drainage improvements do cause a slight increase in total peak discharge rate from the site to the RD-1000 system in the 100-year 10-day rainfall event. As discussed, additional coordination with RD-1000 and the County of Sacramento Department of Water Resources will be required as design moves forward.

It is recommended to clean up Bayou Way ditch south of I-5 to increase discharge efficiency and remove debris from the ditch to the east to Powerline Road. Continued maintenance of the Bayou Way ditch will allow for efficient passage of runoff downstream. Review and maintenance of the existing irrigation control structures through the site and downstream to Powerline Road may need to be completed to assess the overall system to function as designed in this report.

Appendix A. Figures



Legend

- Site Boundary
- NHD Flowline

Kimley»Horn

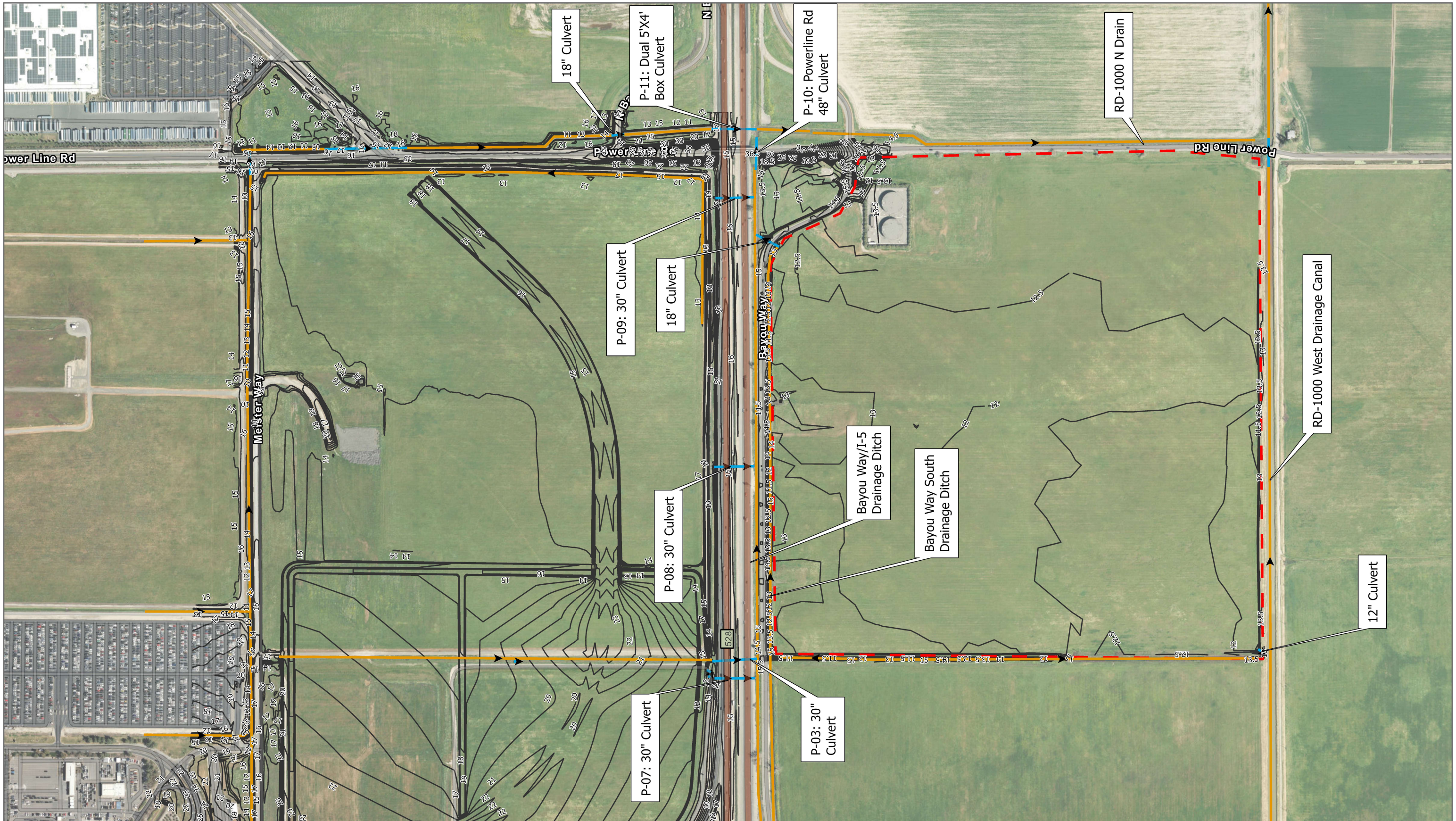
WattEV

Figure 1 - Location Map

WattEV Electric Truck Stop Development - Drainage Analysis

0 0.28 0.55 1.1 Miles

N



Legend

- Culverts
- Site Boundary
- Contours

Kimley»Horn

WattEV

Figure 2 - Topographic Map

Page 1 of 7

WattEV Electric Truck Stop Development - Drainage Analysis

0 235 470 940 Feet

N



Legend

- Culverts
- Open Channel
- Site Boundary
- Contours

Kimley»Horn

WattEV

Figure 2 - Topographic Map

WattEV Electric Truck Stop Development - Drainage Analysis

0 60 120 240 Feet

N



Legend

Culverts
Open Channel
Site Boundary
Contours

Kimley»Horn

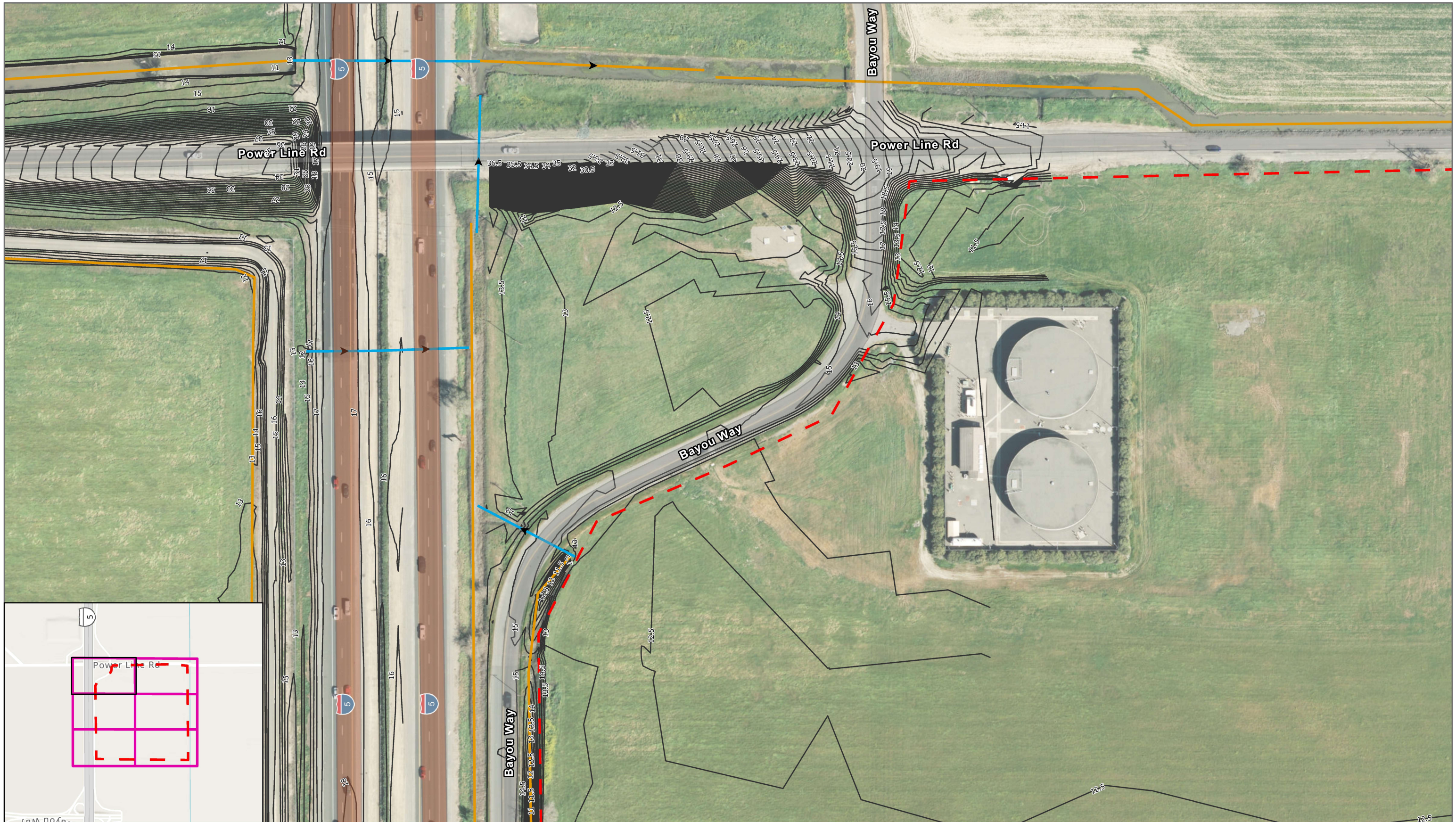
WattEV

Figure 2 - Topographic Map

WattEV Electric Truck Stop Development - Drainage Analysis

0 55 110 220 Feet

N



Legend

- Culverts
- Open Channel
- Site Boundary
- Contours

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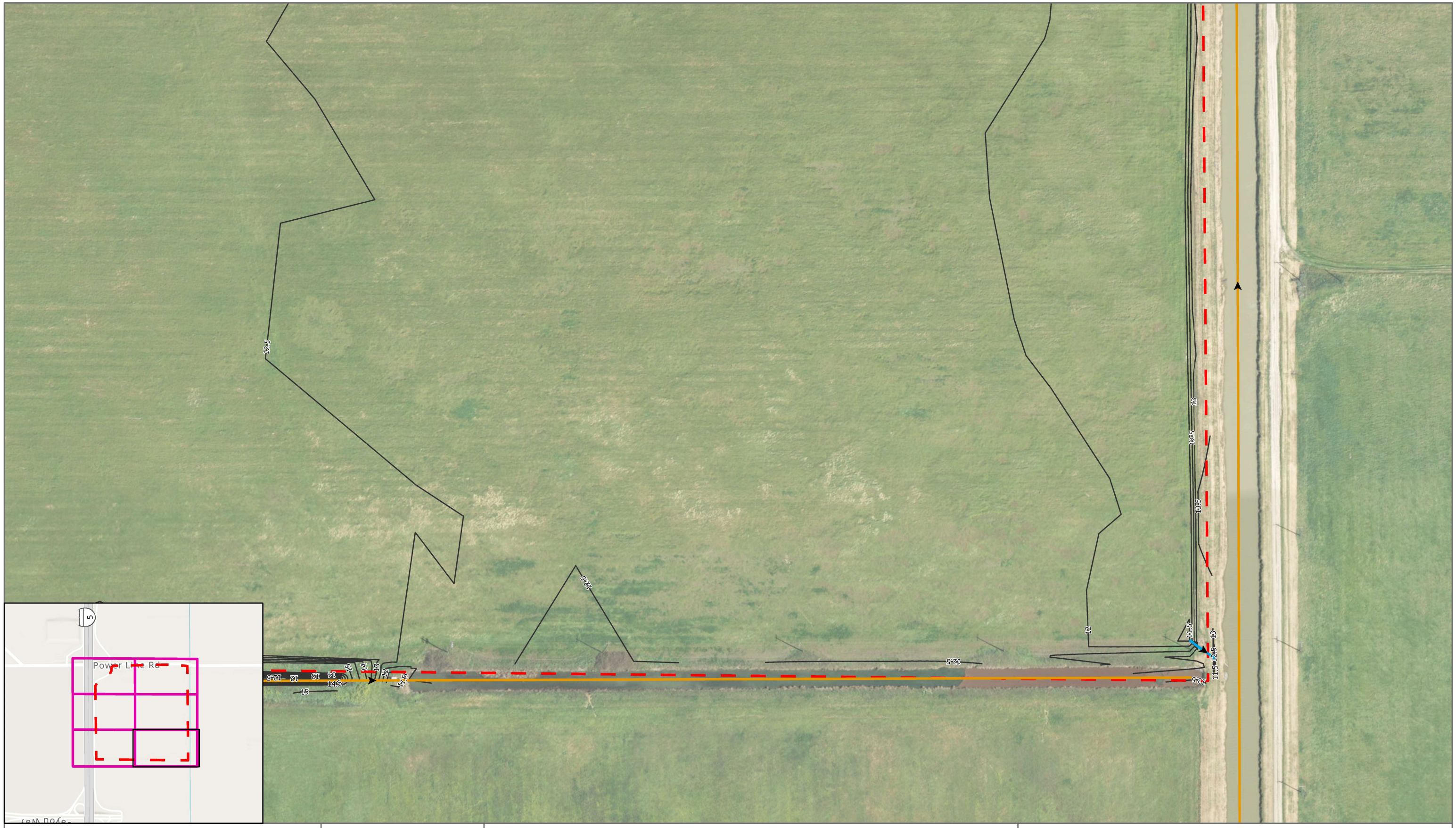
WattEV

Figure 2 - Topographic Map

WattEV Electric Truck Stop Development - Drainage Analysis

0 55 110 220 Feet

N



Legend

Culverts
Site Boundary
Open Channel
Contours

Kimley»Horn

WattEV

Figure 2 - Topographic Map

WattEV Electric Truck Stop Development - Drainage Analysis

0 60 120 240 Feet

N



Legend

Culverts
Site Boundary
Open Channel
Contours

Kimley»Horn

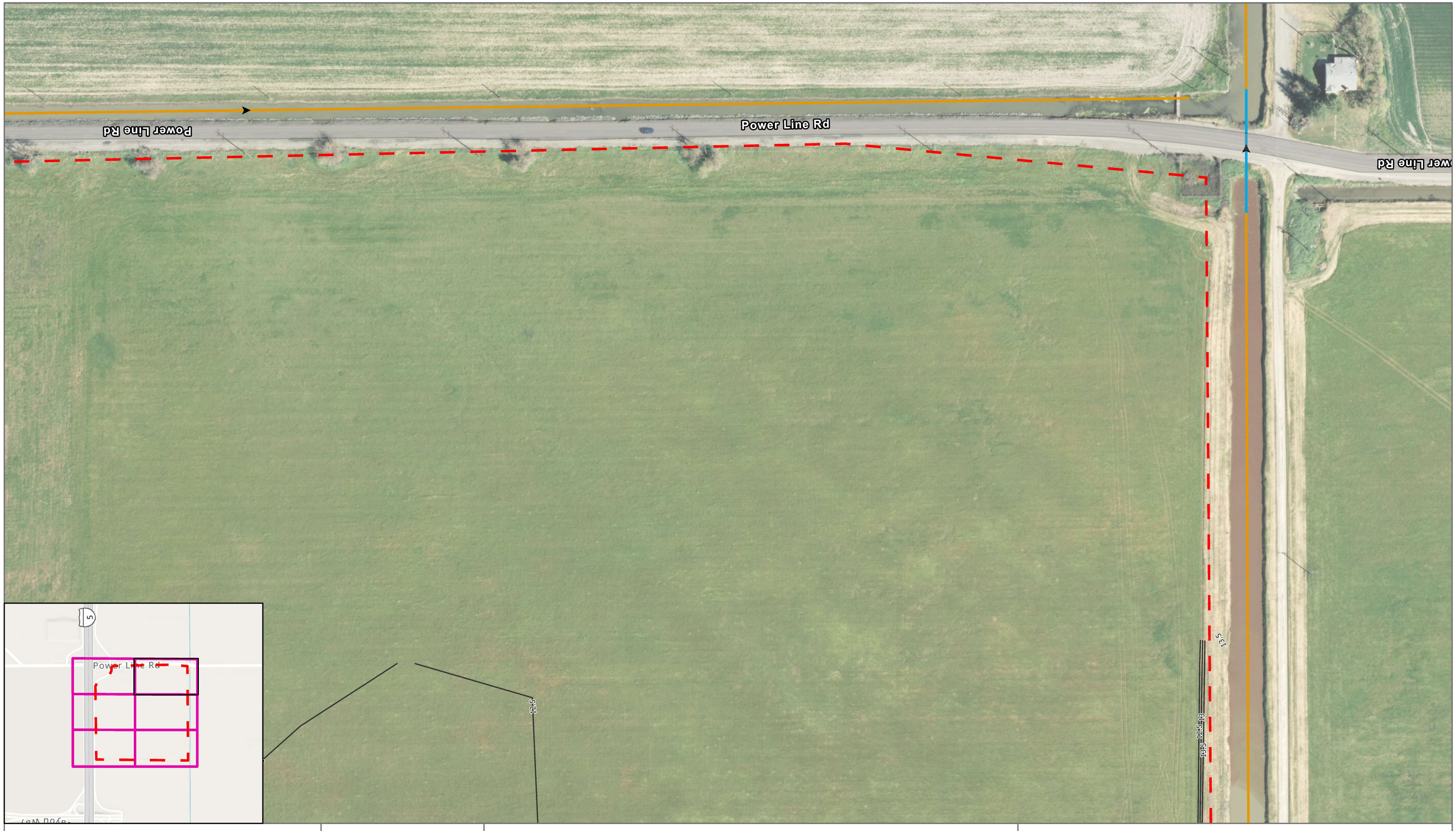
WattEV

Figure 2 - Topographic Map

WattEV Electric Truck Stop Development - Drainage Analysis

0 55 110 220 Feet

N



Legend

- Culverts
- Site Boundary
- Open Channel
- Contours

Kimley»Horn

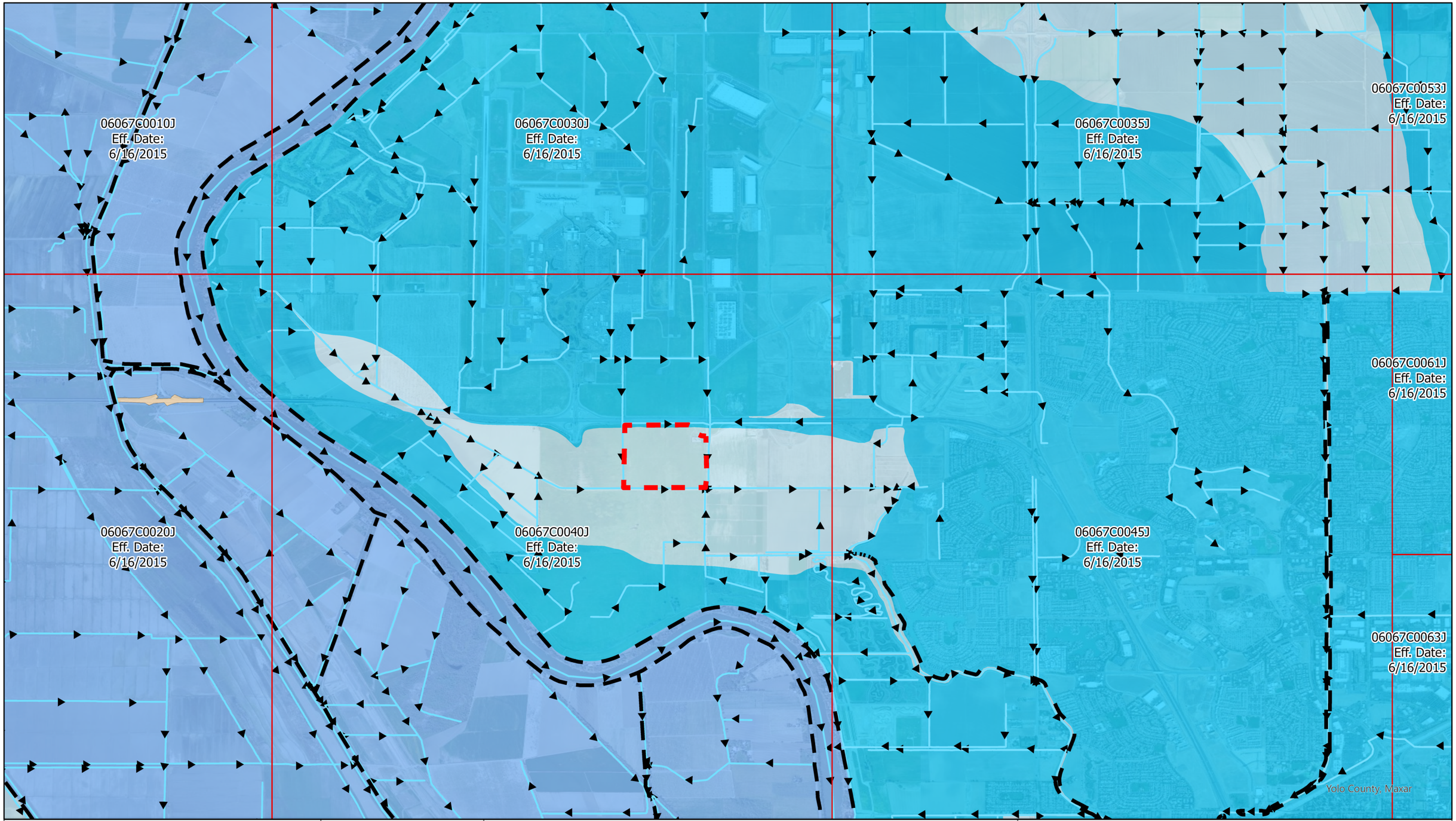
WattEV

Figure 2 - Topographic Map

WattEV Electric Truck Stop Development - Drainage Analysis

0 55 110 220 Feet

N



Legend

- FIRM Panel
- NHD Flowline
- Site Boundary
- Levee
- Zone A
- Zone A99
- Zone AE
- Zone X - 0.2% Annual Chance Flood Hazard

Kimley»Horn

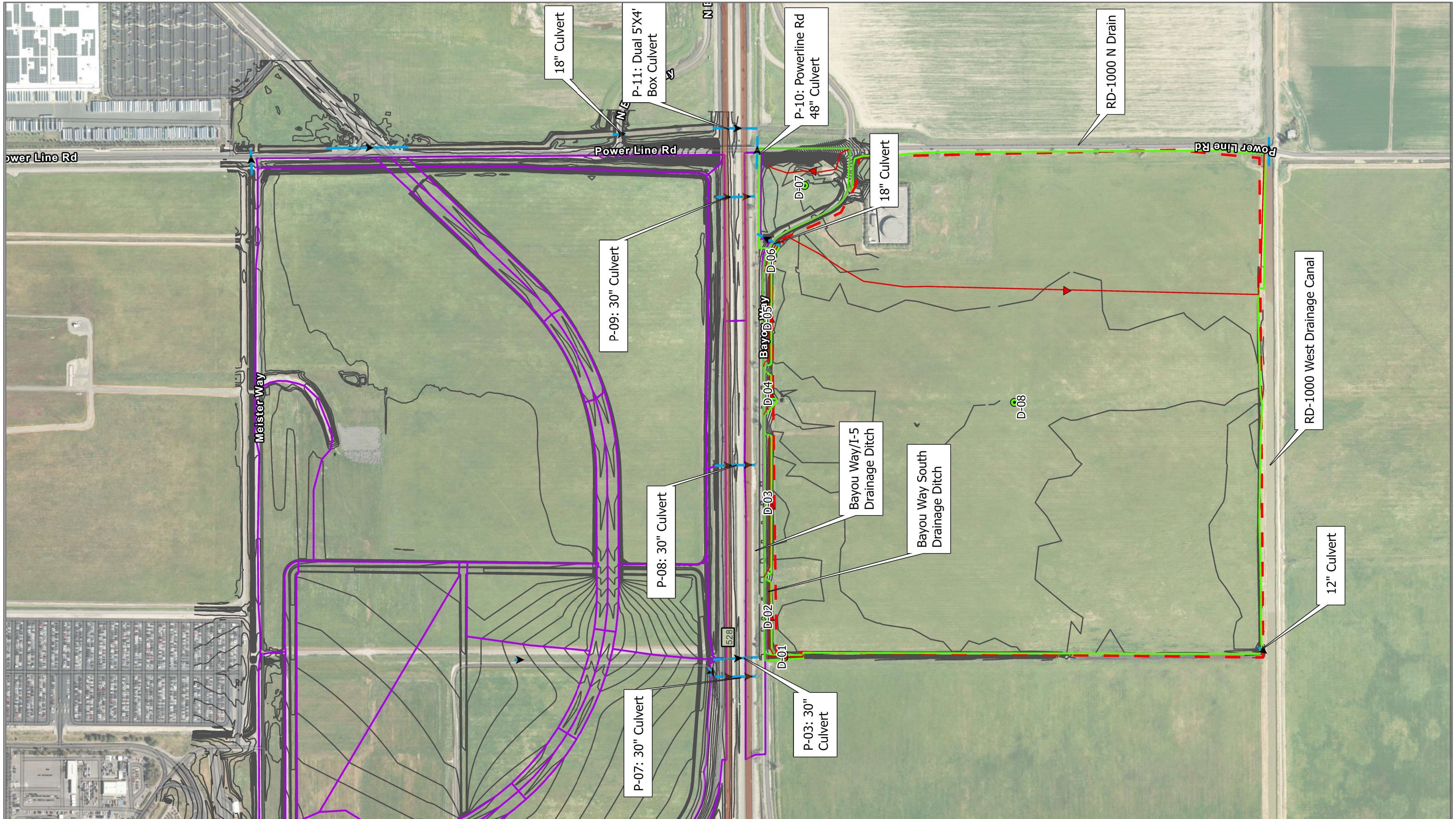
WattEV

Figure 3 - FEMA FIRM Map

WattEV Electric Truck Stop Development - Drainage Analysis

0 0.38 0.75 1.5 Miles

N



Legend

- Site Boundary
- Drainage Area - Centroid
- Existing Drainage Area
- Longest Flow Path
- Existing Culverts
- Contours
- Offsite Drainage Area

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WattEV

Figure 4A - Existing Conditions Subbasin Map

WattEV Electric Truck Stop Development - Drainage Analysis

0 237.5 475 950 Feet

N



Legend

- Site Boundary
- Drainage Area - Centroid
- Existing Drainage Area
- Longest Flow Path
- Existing Culverts
- Contours
- Offsite Drainage Area

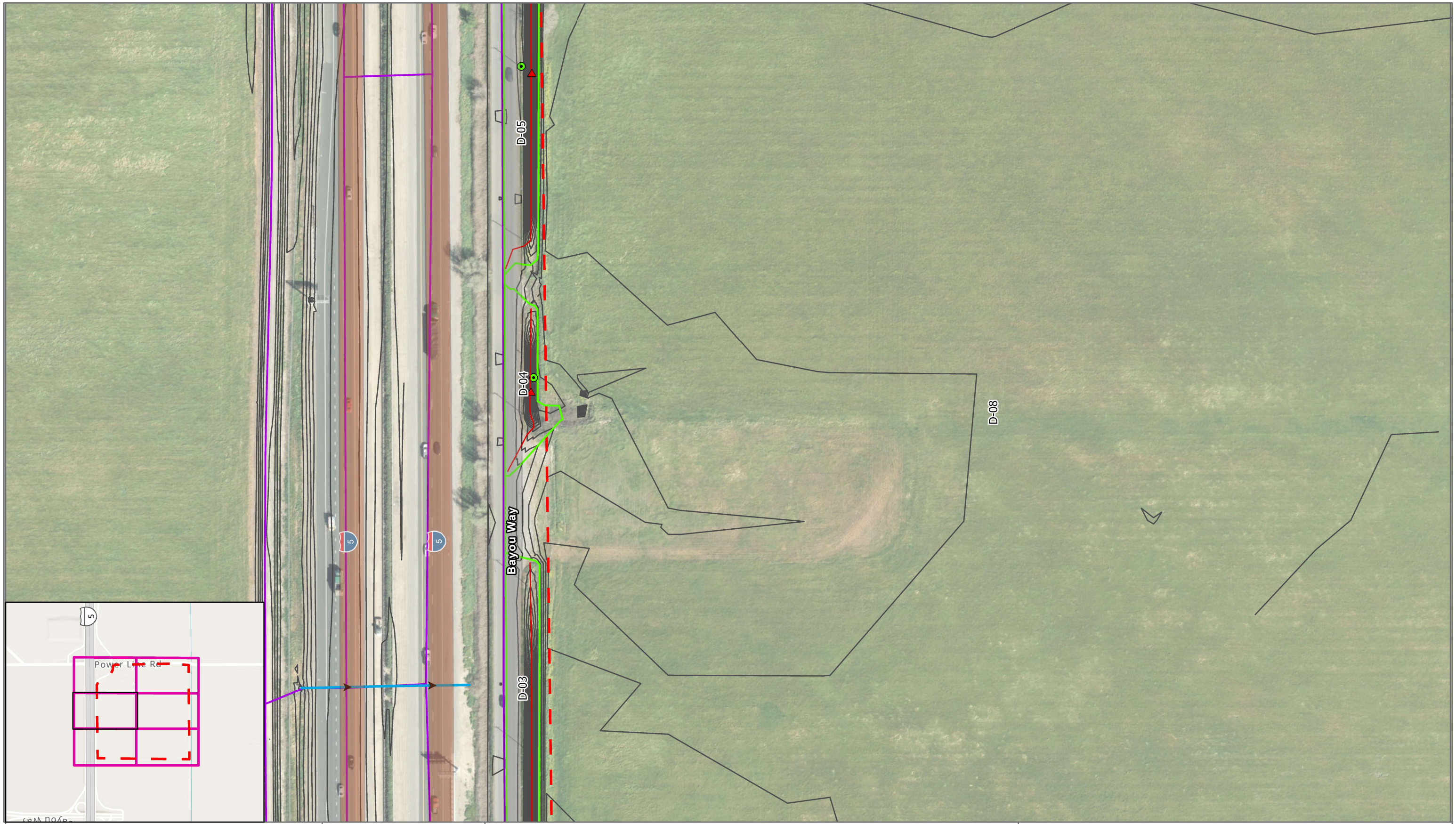
Kimley»Horn

WattEV

Figure 4A - Existing Conditions Subbasin Map

0 55 110 220 Feet

N



Legend

- Site Boundary
- Drainage Area - Centroid
- Existing Drainage Area
- Longest Flow Path
- Existing Culverts
- Contours
- Offsite Drainage Area

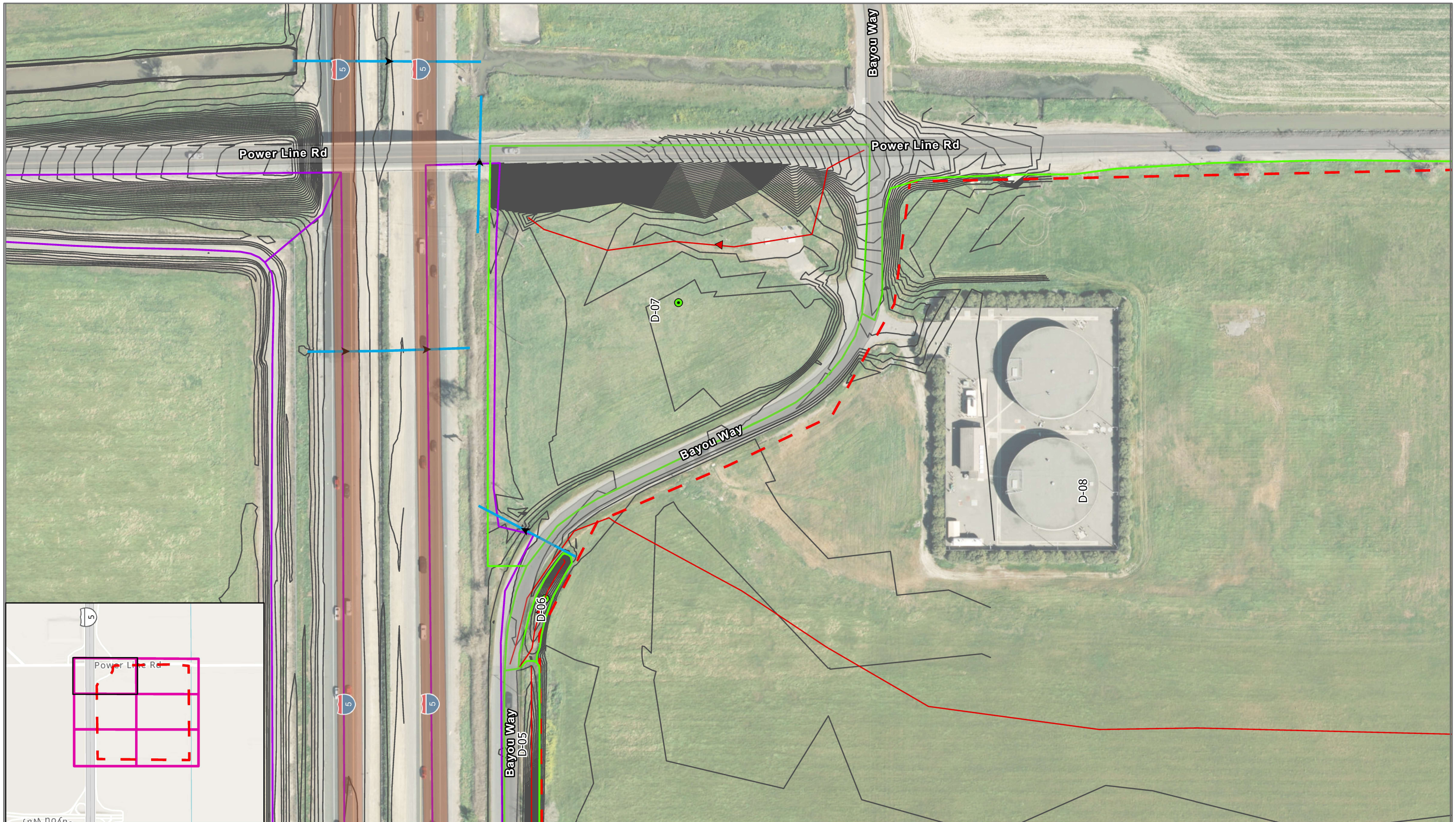
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WattEV

Figure 4A - Existing Conditions Subbasin Map

0 55 110 220 Feet

N



Legend

- Site Boundary
- Drainage Area - Centroid
- Existing Drainage Area
- Longest Flow Path
- Existing Culverts
- Contours
- Offsite Drainage Area

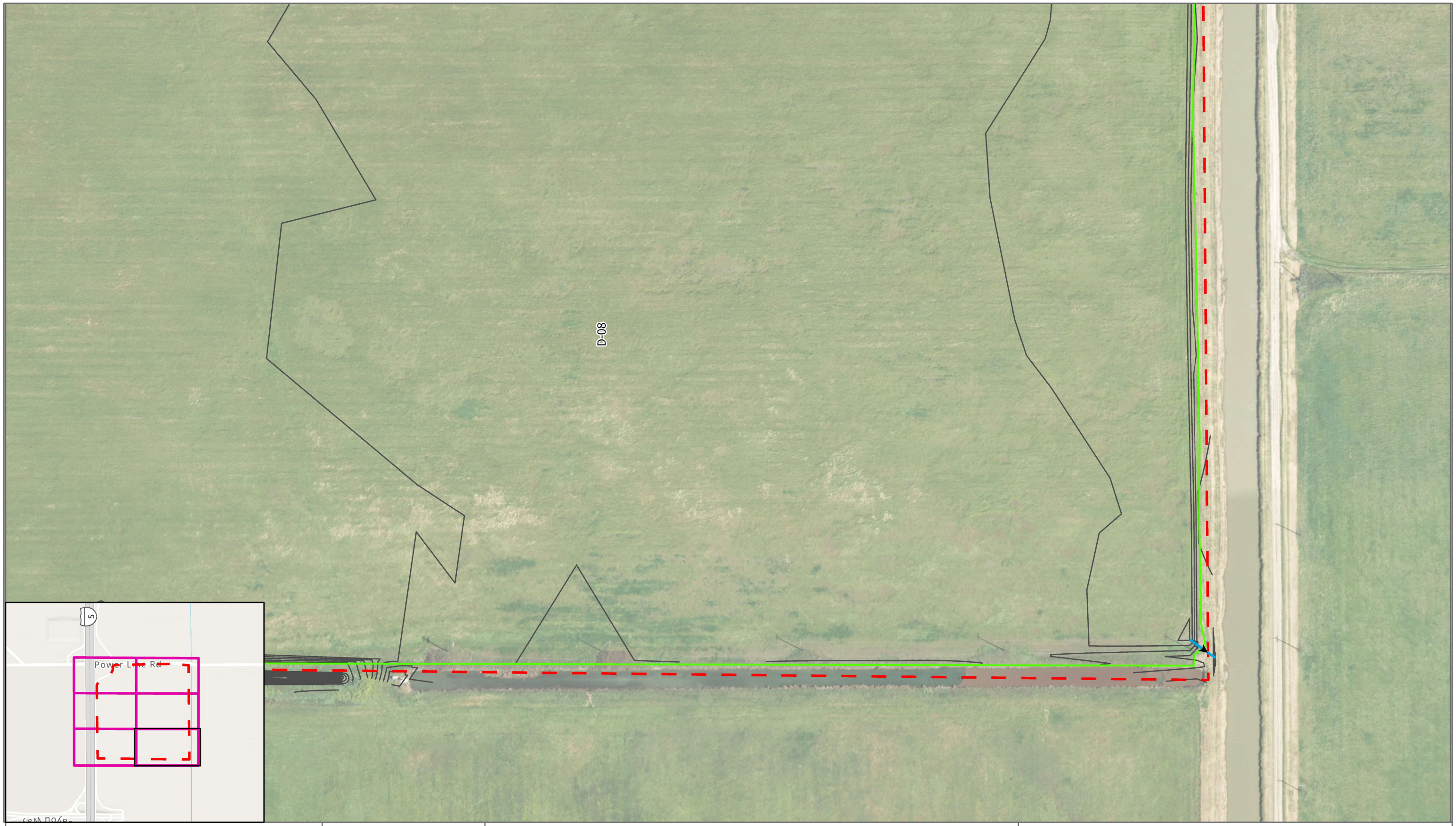
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WattEV

Figure 4A - Existing Conditions Subbasin Map

0 55 110 220 Feet

N



Legend

- Site Boundary
- Drainage Area - Centroid
- Existing Drainage Area
- Longest Flow Path
- Existing Culverts
- Contours
- Offsite Drainage Area

Kimley»Horn

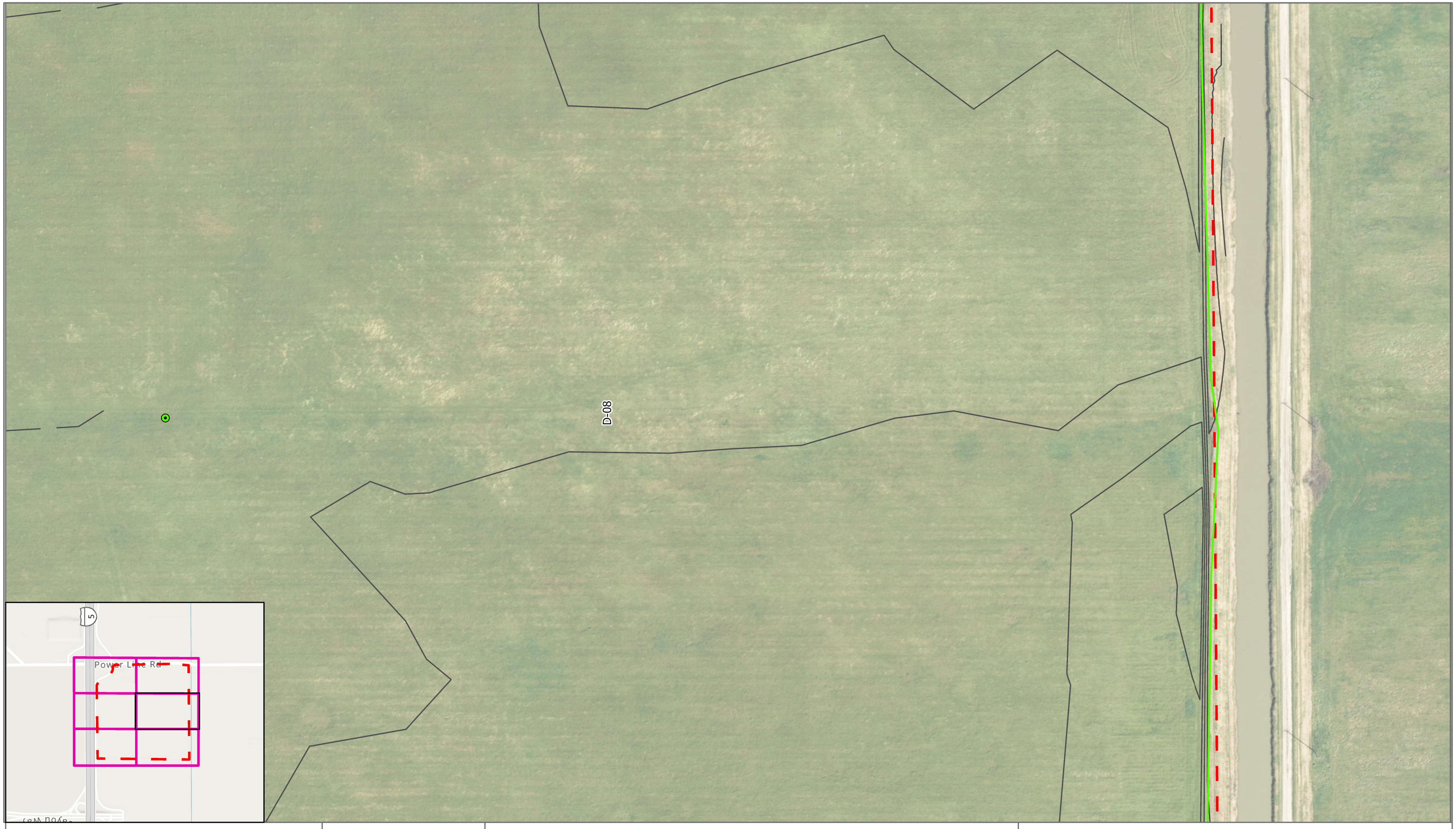
WattEV

Figure 4A - Existing Conditions Subbasin Map

Feet

0 55 110 220

N



Legend

- Site Boundary
- Drainage Area - Centroid
- Existing Drainage Area
- Longest Flow Path
- Existing Culverts
- Contours
- Offsite Drainage Area

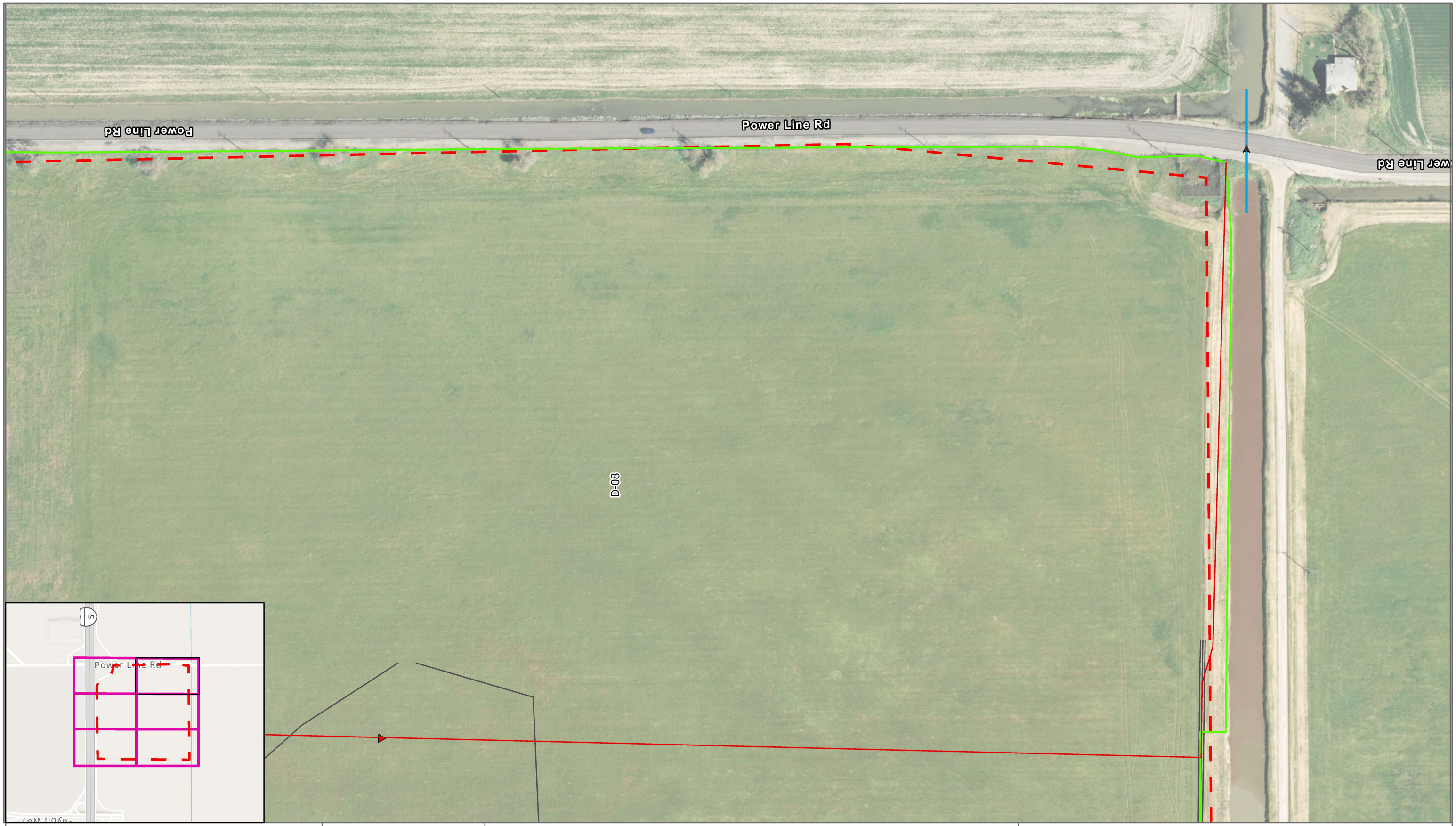
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Figure 4A - Existing Conditions Subbasin Map

0 55 110 220 Feet

N



Legend

- Site Boundary
- Drainage Area - Centroid
- Existing Drainage Area
- Longest Flow Path
- Existing Culverts
- Contours
- Offsite Drainage Area

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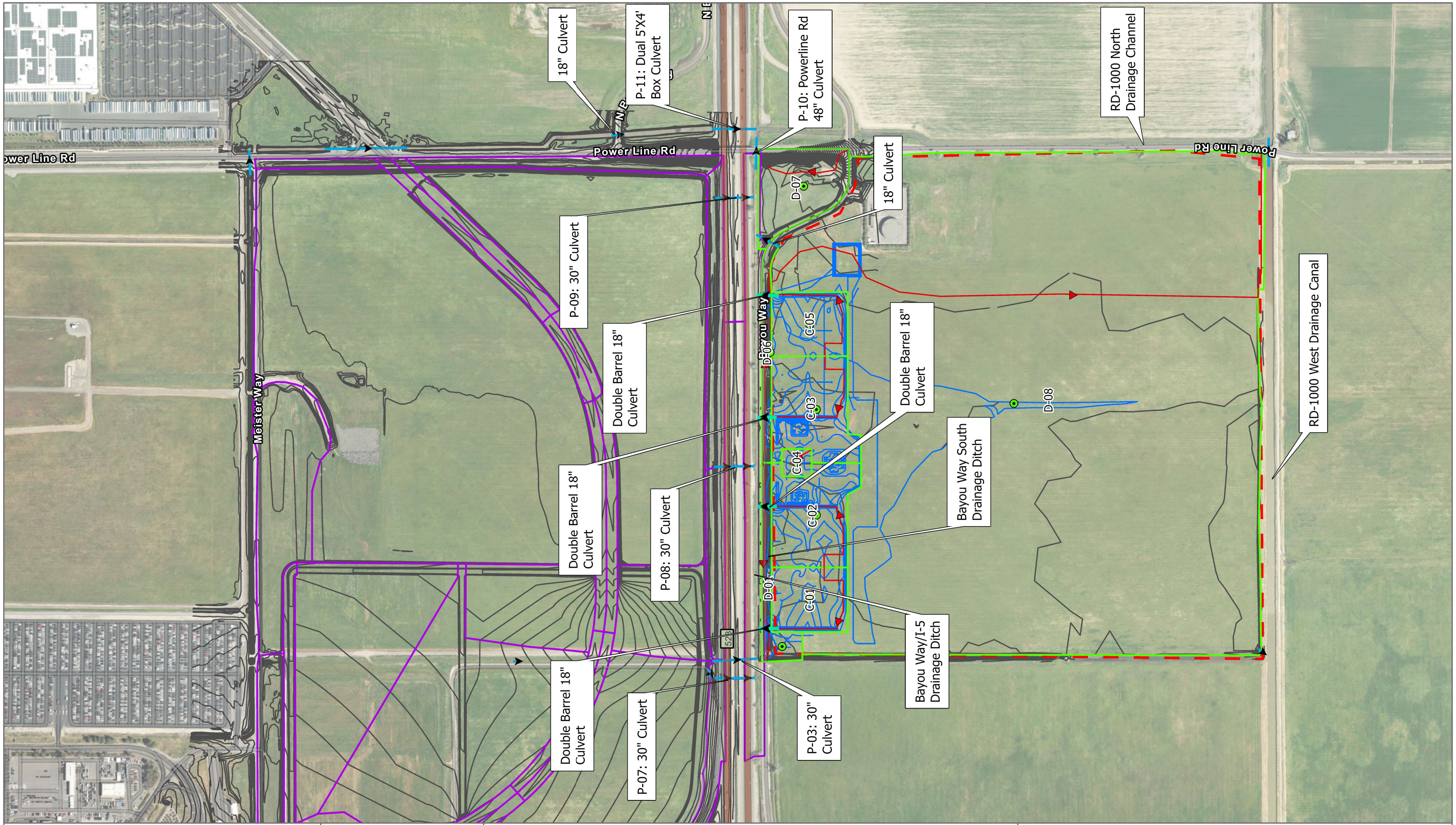
WattEV

Figure 4A - Existing Conditions Subbasin Map

WattEV Electric Truck Stop Development - Drainage Analysis

0 55 110 220 Feet

N



Legend

- Site Boundary
- Drainage Area - Centroid
- Proposed Drainage Area
- Offsite Drainage Area
- Longest Flow Path
- Existing Culverts
- Proposed Contours
- Existing Contours

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WattEV

Figure 4B - Proposed Conditions Subbasin Map

WattEV Electric Truck Stop Development - Drainage Analysis

0 237.5 475 950 Feet

N



Legend

- Site Boundary
- Drainage Area - Centroid
- Proposed Drainage Area
- Offsite Drainage Area
- Longest Flow Path
- Existing Culverts
- Proposed Contours
- Existing Contours
- Proposed Culverts

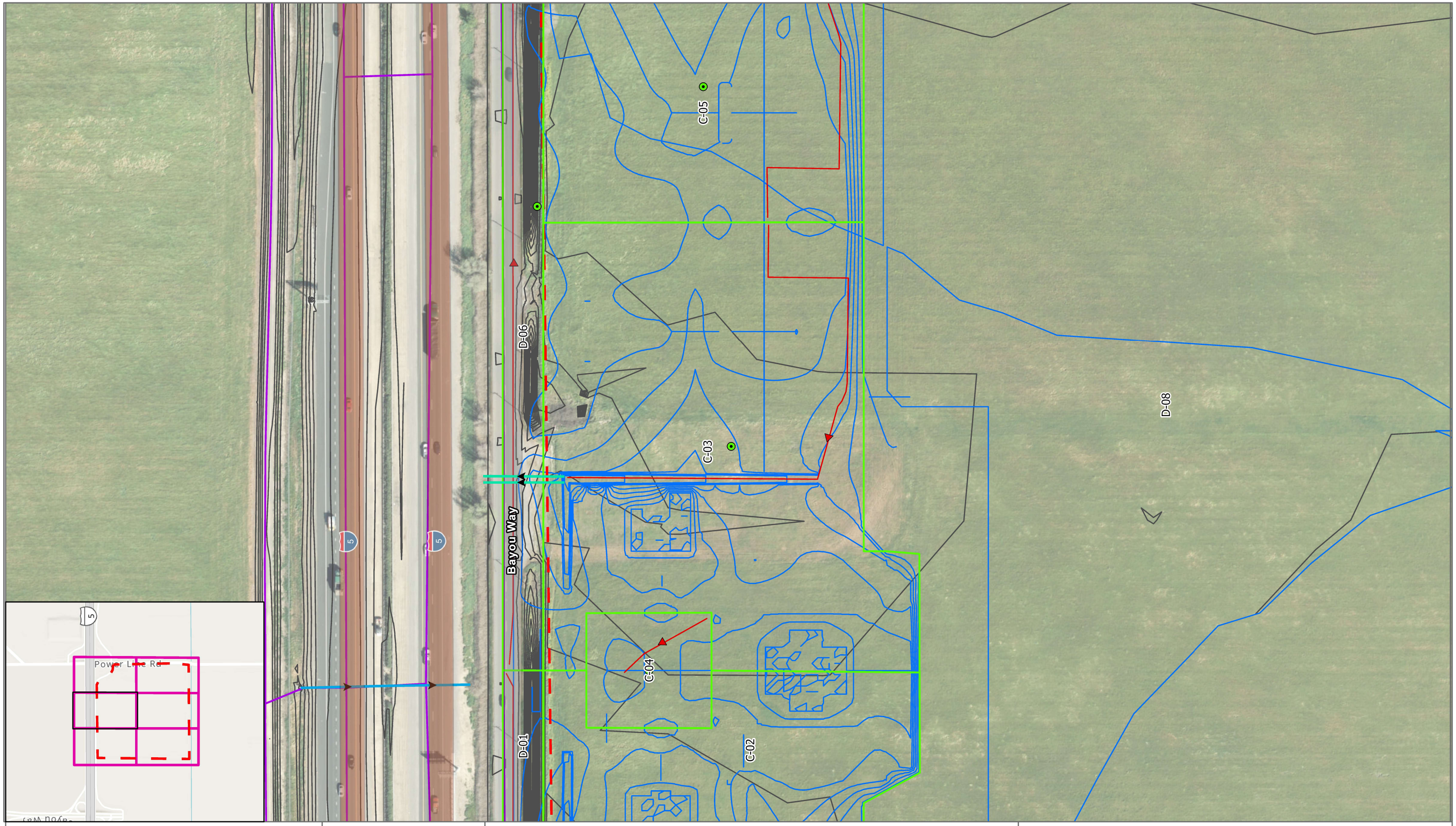
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WattEV

Figure 4B - Proposed Conditions Subbasin Map

0 55 110 220 Feet

N



Legend

- Site Boundary
- Drainage Area - Centroid
- Proposed Drainage Area
- Offsite Drainage Area
- Longest Flow Path
- Existing Culverts
- Proposed Contours
- Existing Contours
- Proposed Culverts

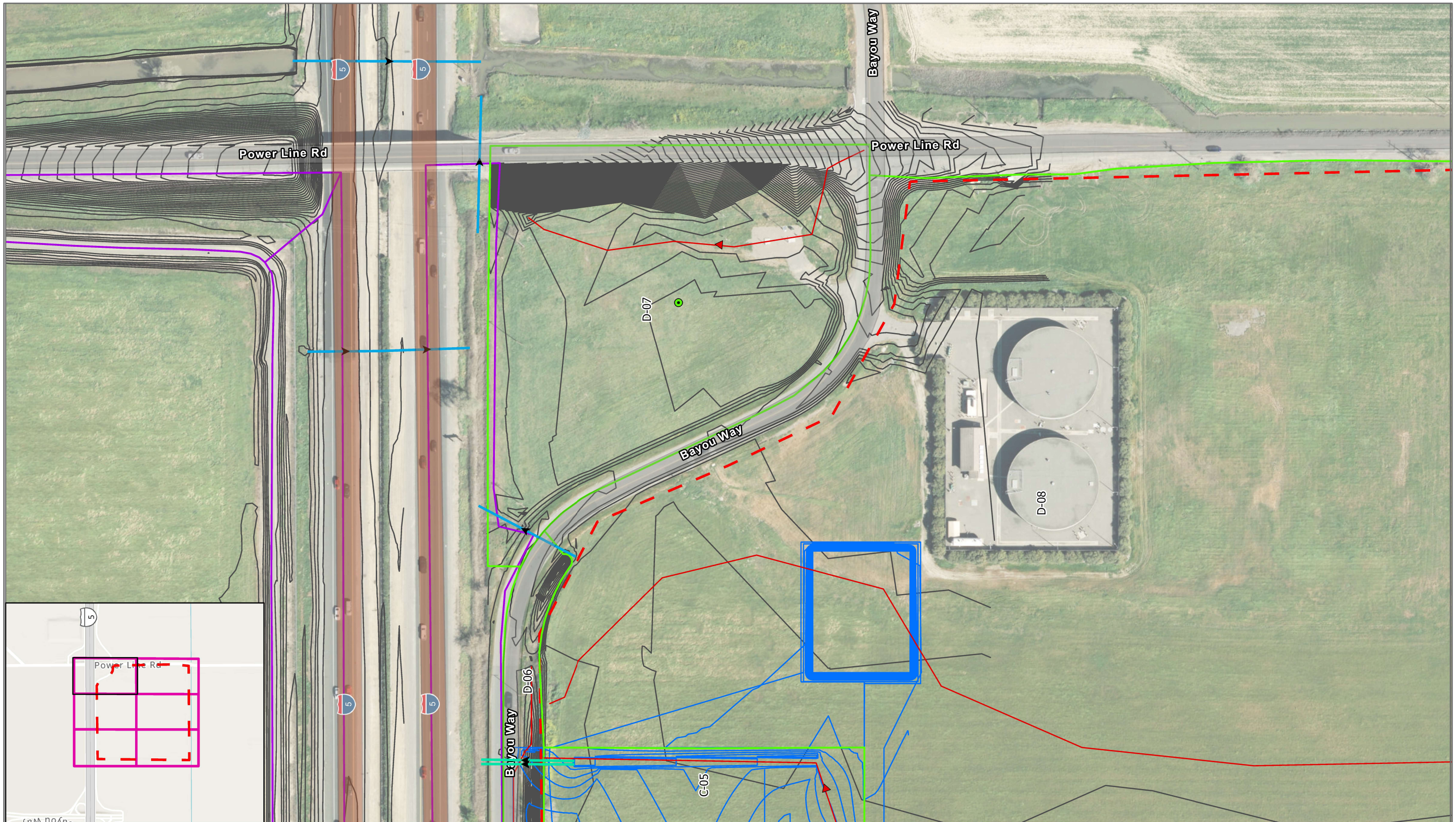
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WattEV

Figure 4B - Proposed Conditions Subbasin Map

Feet
0 55 110 220

N



Legend

- Site Boundary
- Drainage Area - Centroid
- Proposed Drainage Area
- Offsite Drainage Area
- Longest Flow Path
- Existing Culverts
- Proposed Contours
- Existing Contours
- Proposed Culverts

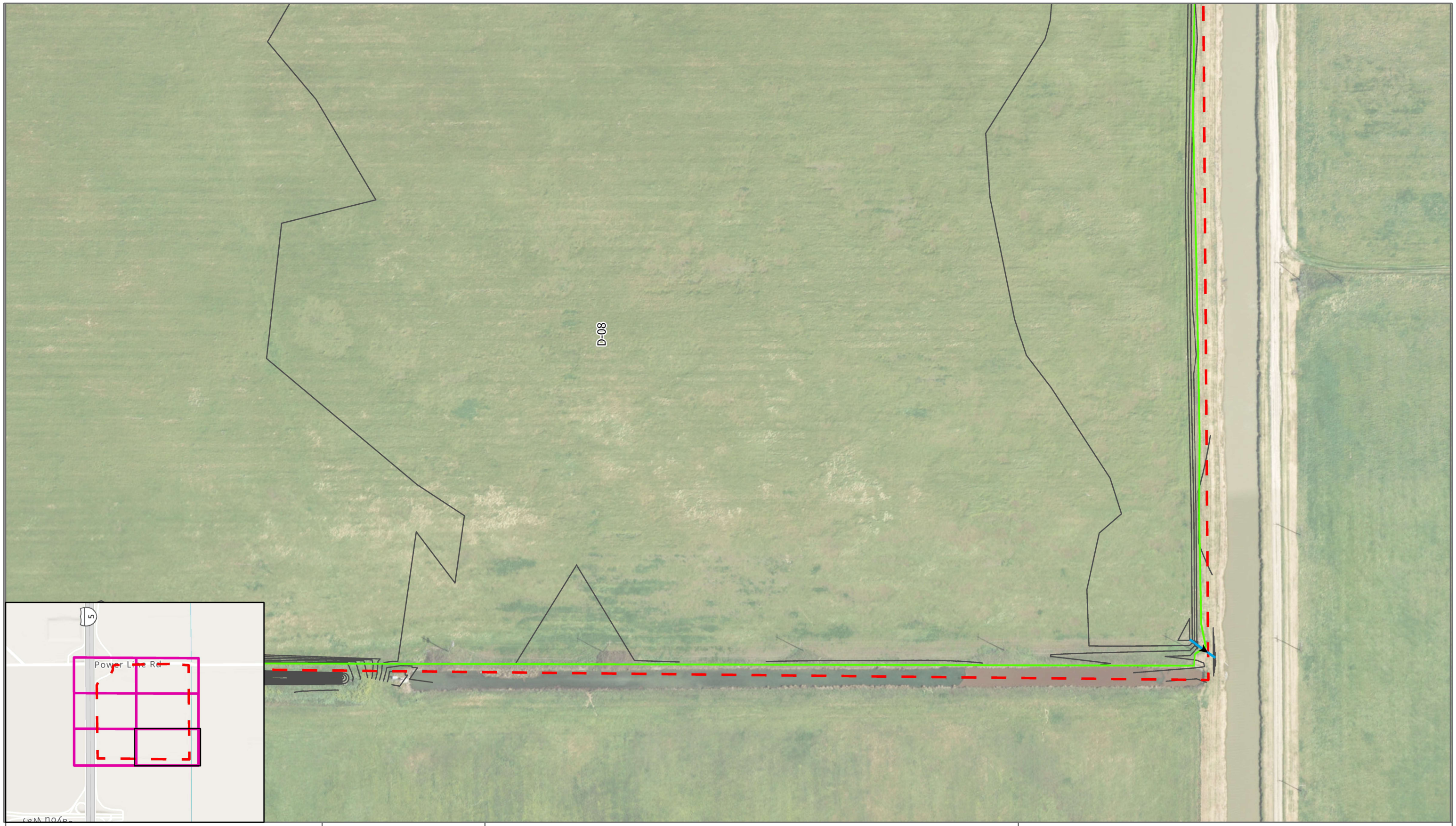
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WattEV

Figure 4B - Proposed Conditions Subbasin Map

0 55 110 220 Feet

N



Legend

- Site Boundary
- Drainage Area - Centroid
- Proposed Drainage Area
- Offsite Drainage Area
- Longest Flow Path
- Existing Culverts
- Proposed Contours
- Existing Contours
- Proposed Culverts

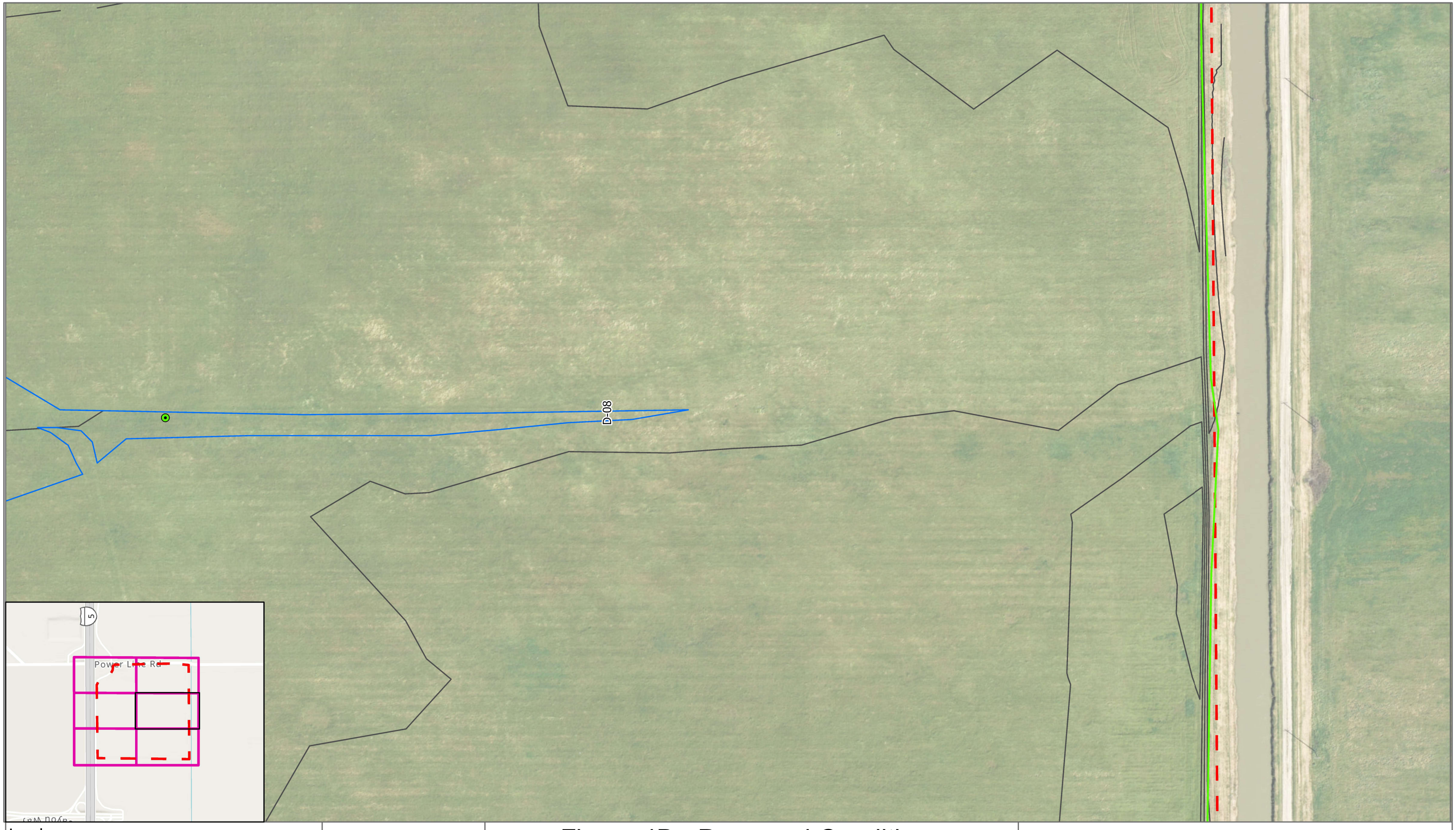
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WattEV

Figure 4B - Proposed Conditions Subbasin Map

Feet
0 55 110 220

N



Legend

- Site Boundary
- Drainage Area - Centroid
- Proposed Drainage Area
- Offsite Drainage Area
- Longest Flow Path
- Existing Culverts
- Proposed Contours
- Existing Contours
- Proposed Culverts

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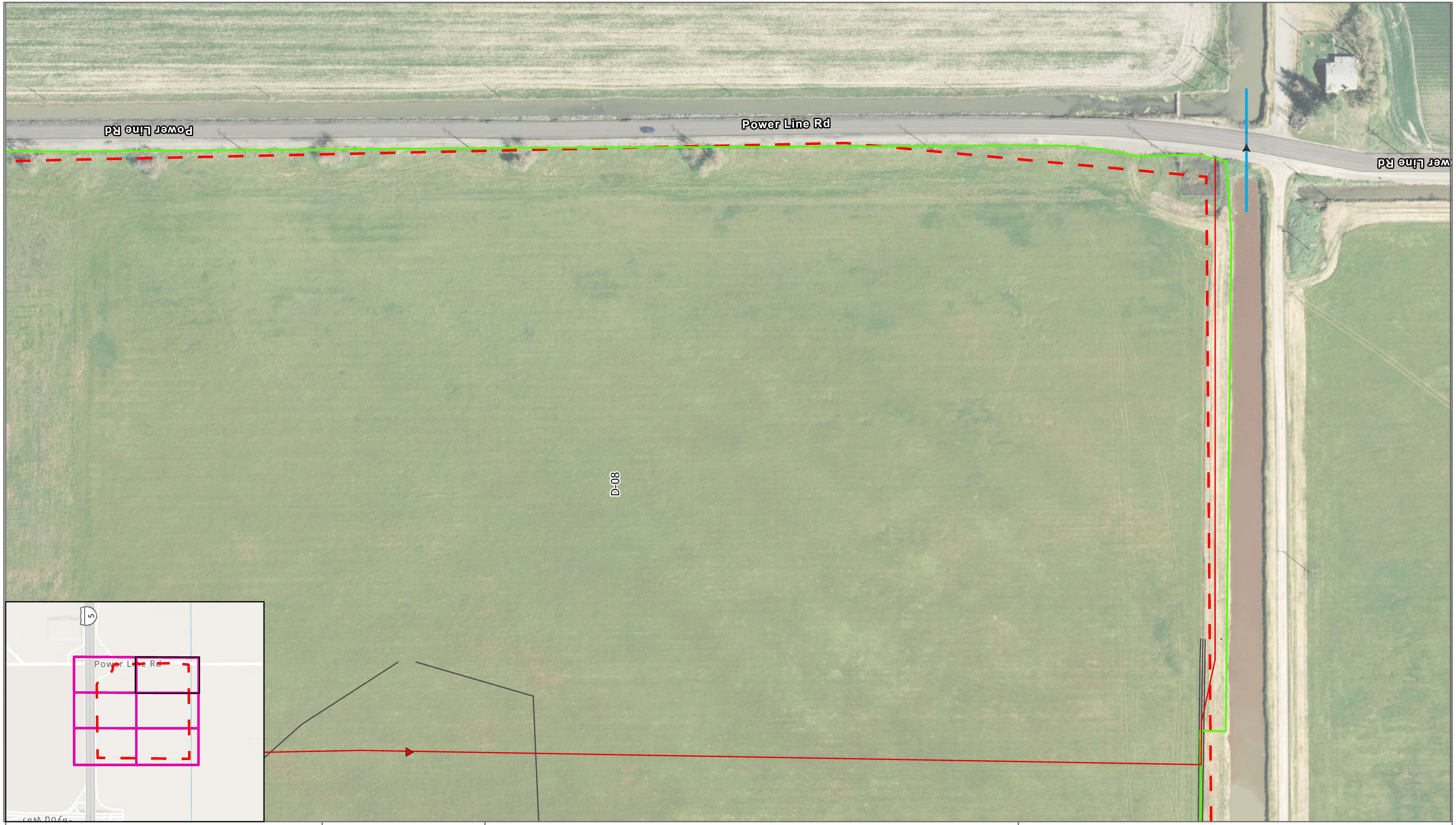
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Figure 4B - Proposed Conditions Subbasin Map

WattEV Electric Truck Stop Development - Drainage Analysis

0 55 110 220 Feet

N



Legend

- Site Boundary
- Drainage Area - Centroid
- Proposed Drainage Area
- Offsite Drainage Area
- Longest Flow Path
- Existing Culverts
- Proposed Contours
- Existing Contours
- Proposed Culverts

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Figure 4B - Proposed Conditions Subbasin Map

WattEV Electric Truck Stop Development - Drainage Analysis

0 55 110 220 Feet

N



Legend

- Existing Drainage Area

Hydrologic Soil Group

- A
- A/D
- C
- C/D
- D
- Site Boundary

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Figure 5 - NRCS Soils Map

WattEV Electric Truck Stop Development - Drainage Analysis

0 200 400 800 Feet

N



Legend

- Existing Drainage Area
- Site Boundary

Land Use Type

- Highway
- Intensive Industrial
- Natural

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Figure 6A - Existing Conditions Land Use Map

WattEV Electric Truck Stop Development - Drainage Analysis

0 200 400 800 Feet

N



Legend

- Proposed Drainage Area
- Site Boundary

Land Use Type

- Highway
- Intensive Industrial
- Natural
- Parking

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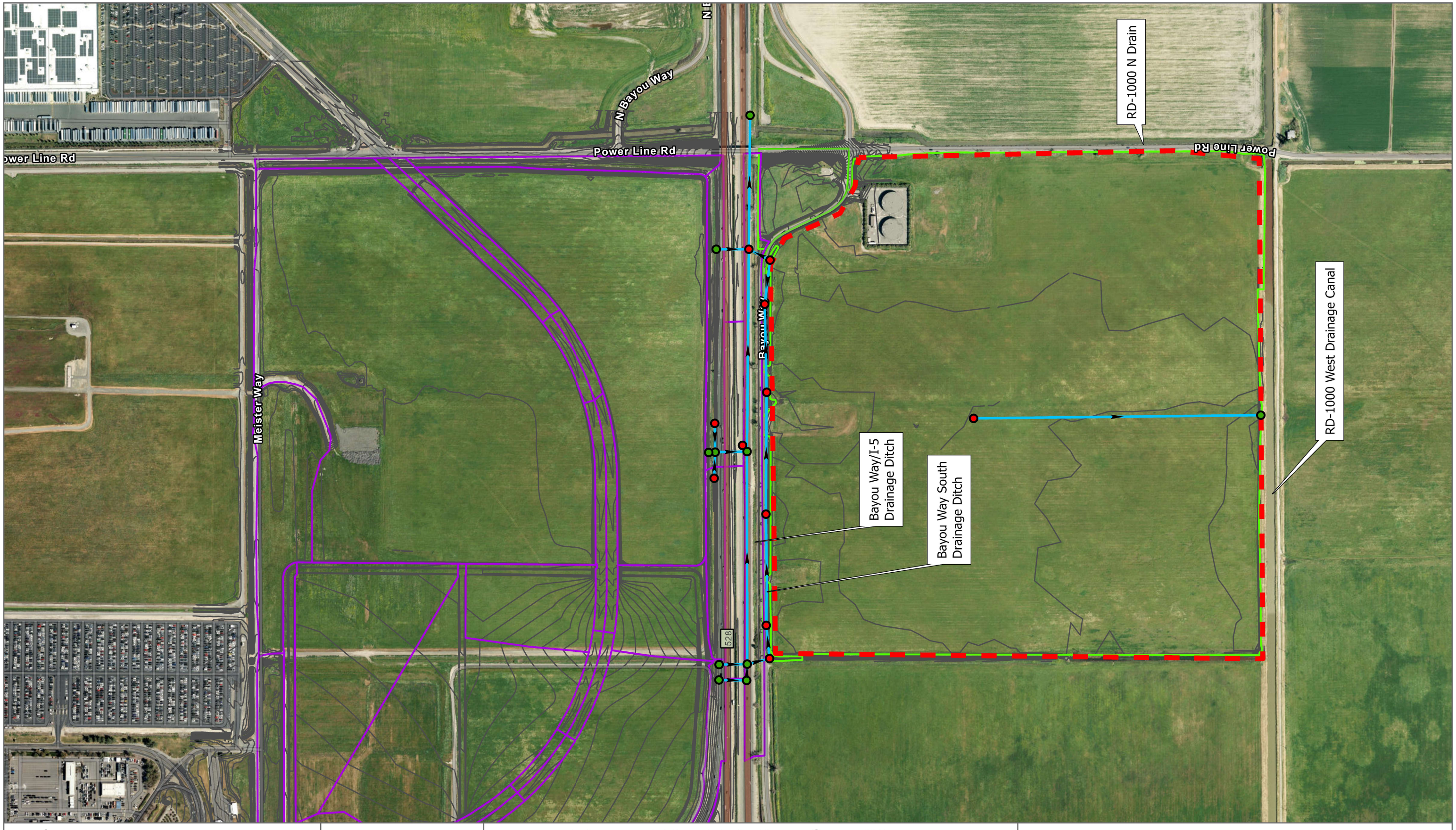
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Figure 6B - Proposed Conditions Land Use Map

WattEV Electric Truck Stop Development - Drainage Analysis

0 200 400 800 Feet

N



Legend

- XPSWMM Link
- Hydrology Node
- Site Boundary
- Offsite Drainage Area
- Existing Drainage Area

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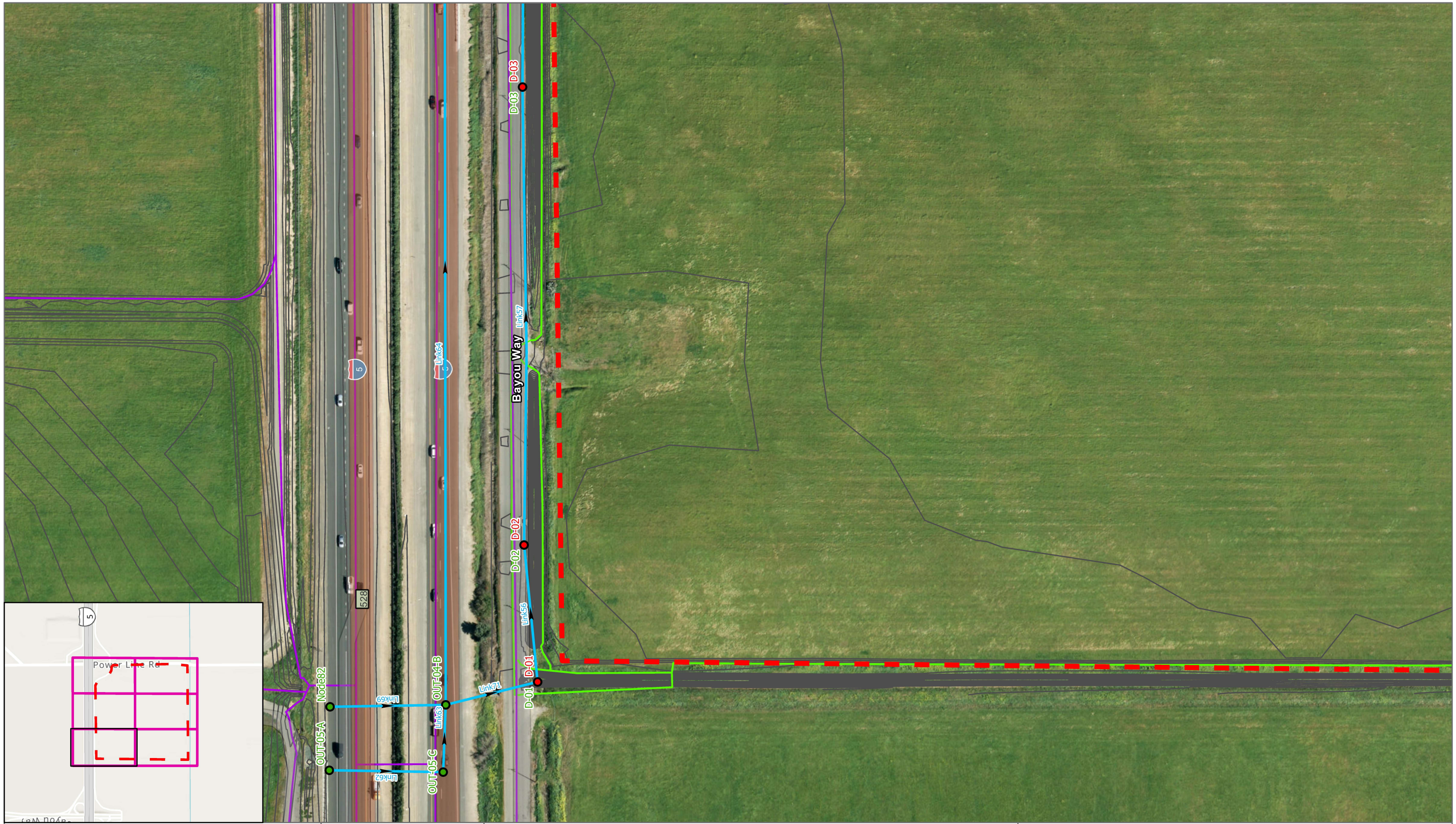
WattEV

Figure 7A - Existing Conditions XPSWMM Link & Node Map

WattEV Electric Truck Stop Development - Drainage Analysis

0 237.5 475 950 Feet

N



Legend

- XPSWMM Link
- Hydrology Node
- Hydraulics Node
- Site Boundary
- Offsite Drainage Area
- Existing Drainage Area
- Contours

Kimley»Horn

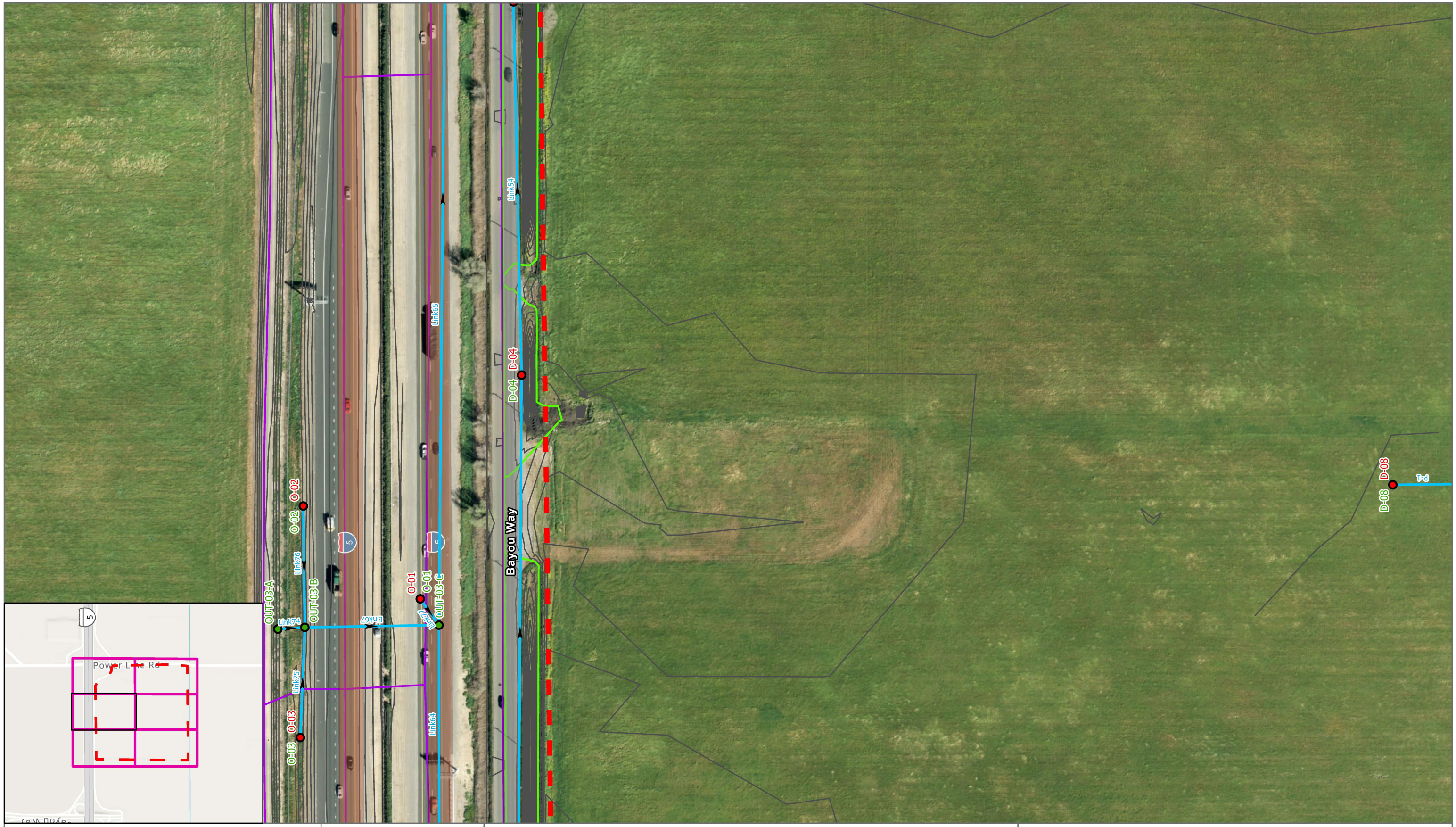
WattEV

Figure 7A - Existing Conditions XPSWMM Link & Node Map

WattEV Electric Truck Stop Development - Drainage Analysis

0 55 110 220 Feet

N



Legend

- XPSWMM Link
- Hydrology Node
- Hydraulics Node
- Site Boundary
- Offsite Drainage Area
- Existing Drainage Area
- Contours

Kimley»Horn

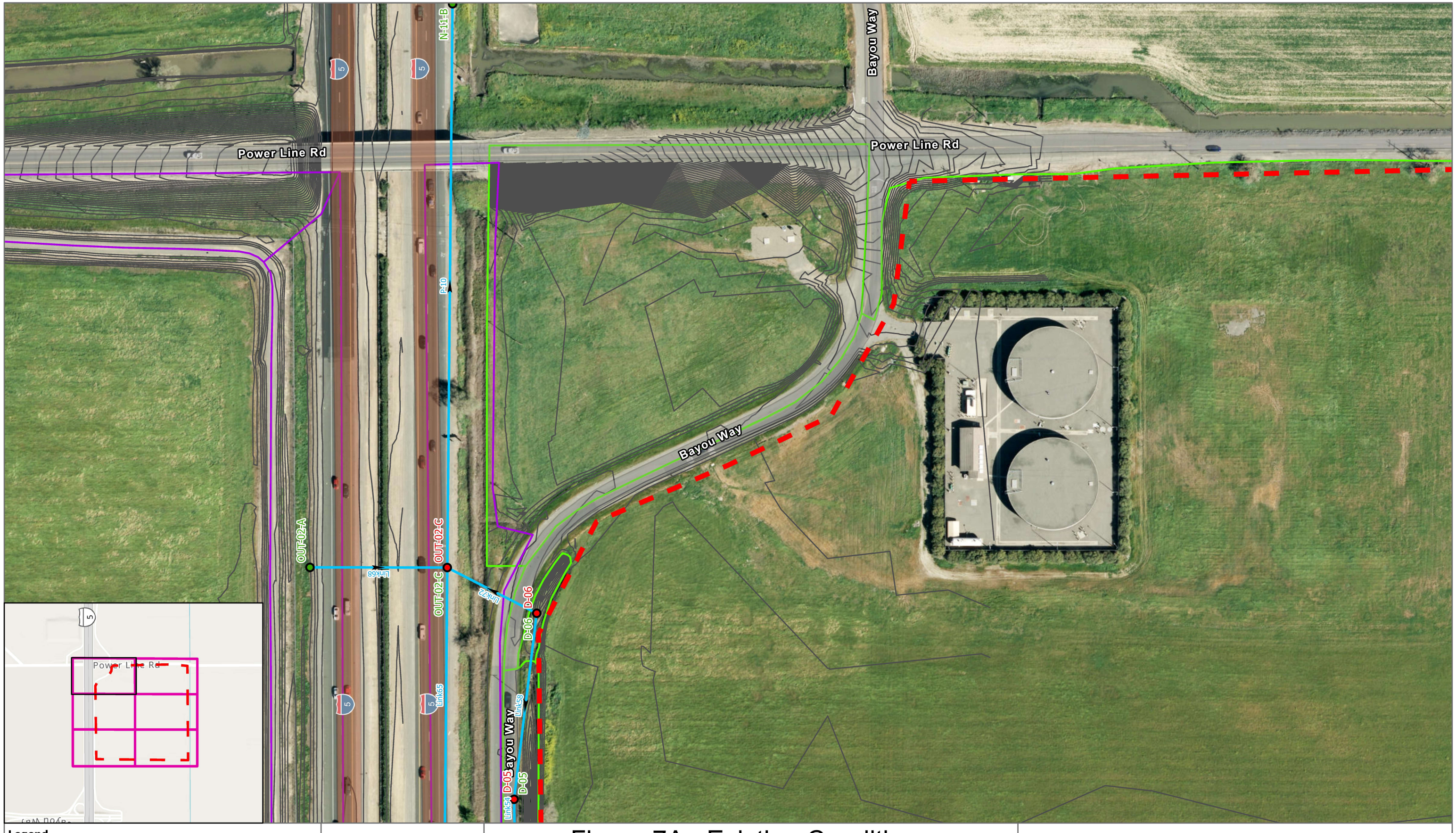
WattEV

Figure 7A - Existing Conditions XPSWMM Link & Node Map

WattEV Electric Truck Stop Development - Drainage Analysis

0 55 110 220 Feet

N



Legend

- XPSWMM Link
- Hydrology Node
- Hydraulics Node
- Site Boundary
- Offsite Drainage Area
- Existing Drainage Area
- Contours

Kimley»Horn

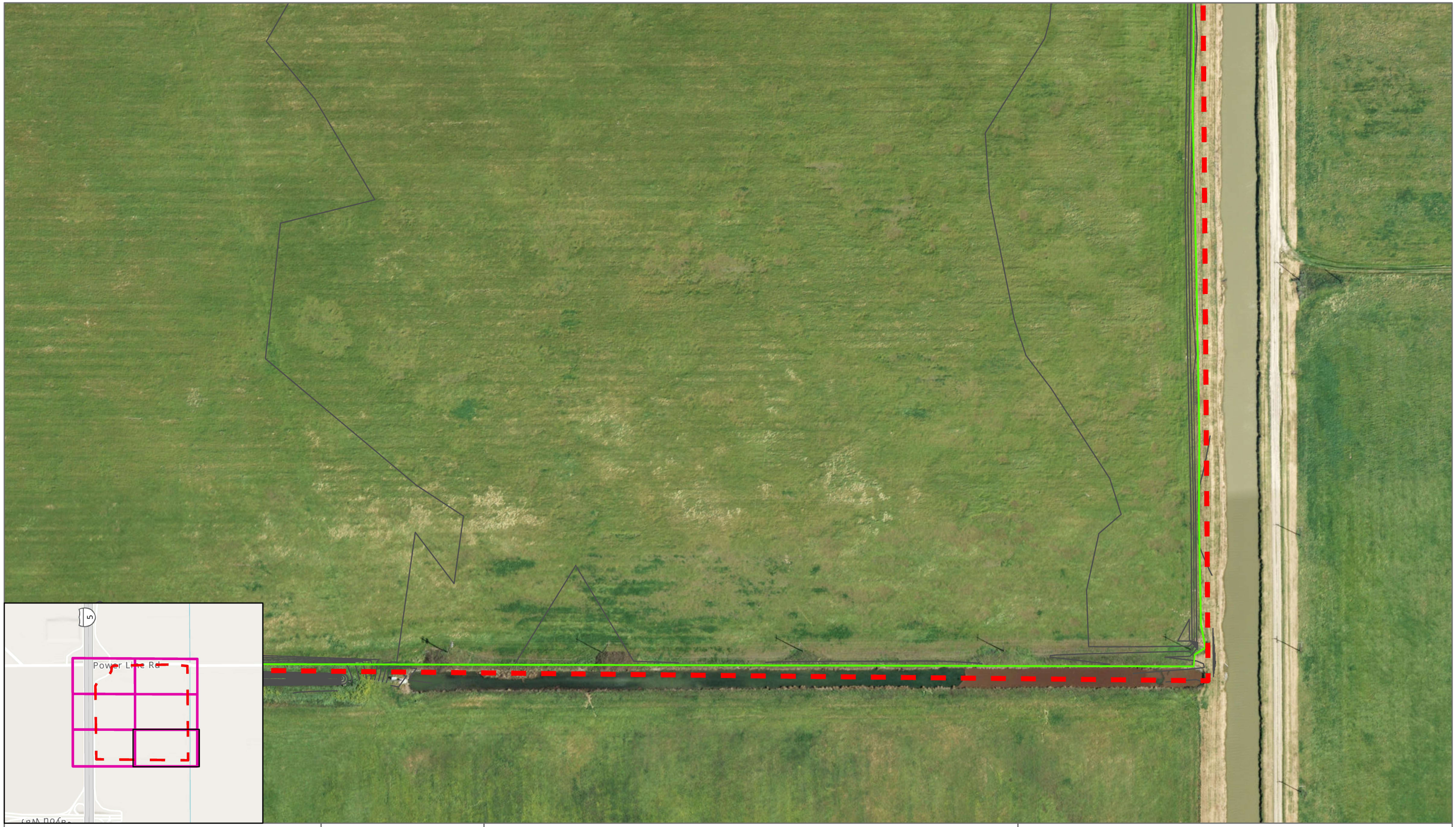
WattEV

Figure 7A - Existing Conditions XPSWMM Link & Node Map

WattEV Electric Truck Stop Development - Drainage Analysis

0 55 110 220 Feet

N



Legend

- XPSWMM Link
- Hydrology Node
- Hydraulics Node
- Site Boundary
- Offsite Drainage Area
- Existing Drainage Area
- Contours

Kimley»Horn

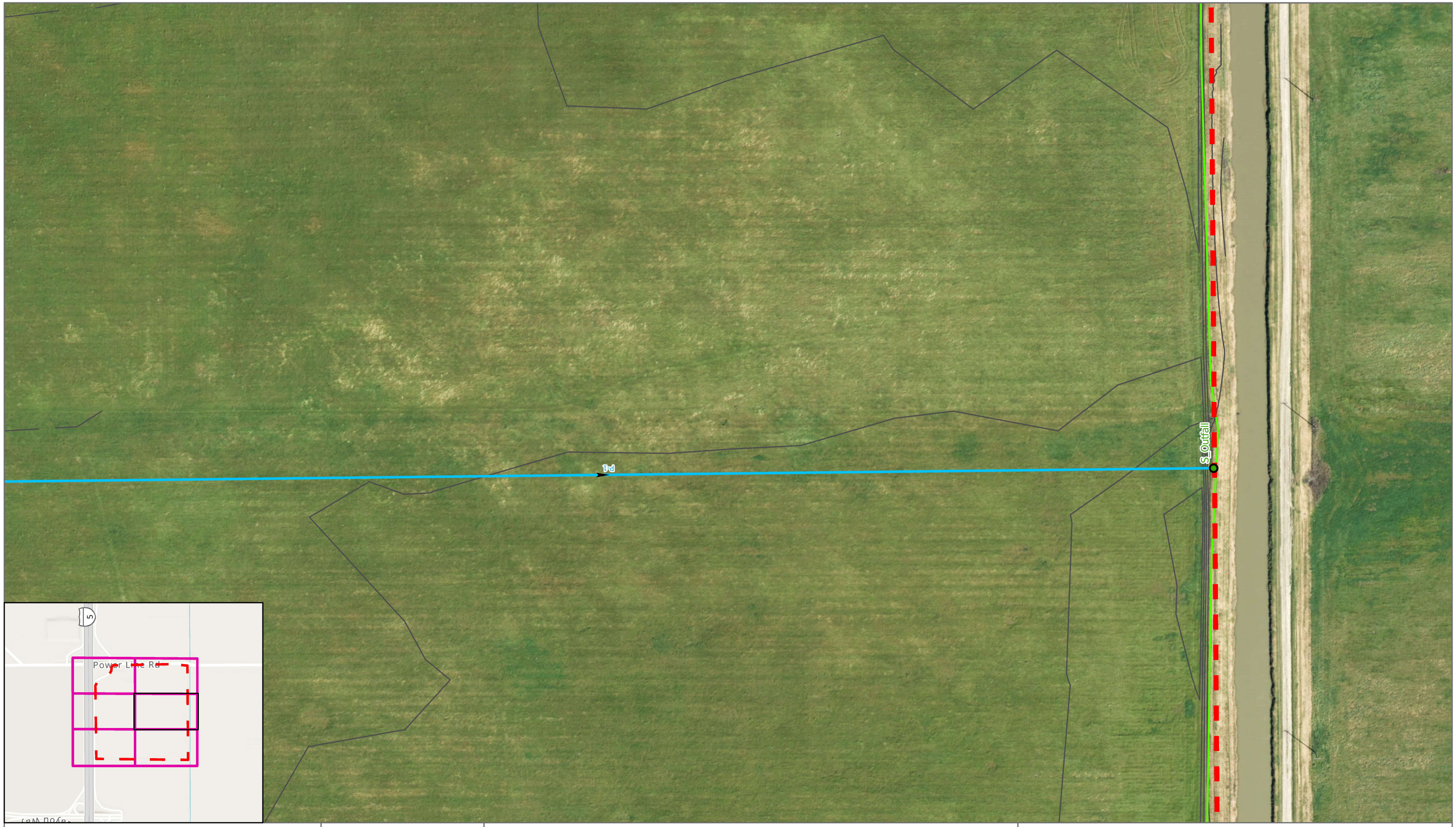
WattEV

Figure 7A - Existing Conditions XPSWMM Link & Node Map

WattEV Electric Truck Stop Development - Drainage Analysis

0 55 110 220 Feet

N



Legend

- XPSWMM Link
- Hydrology Node
- Hydraulics Node
- Site Boundary
- Offsite Drainage Area
- Existing Drainage Area
- Contours

Kimley»Horn

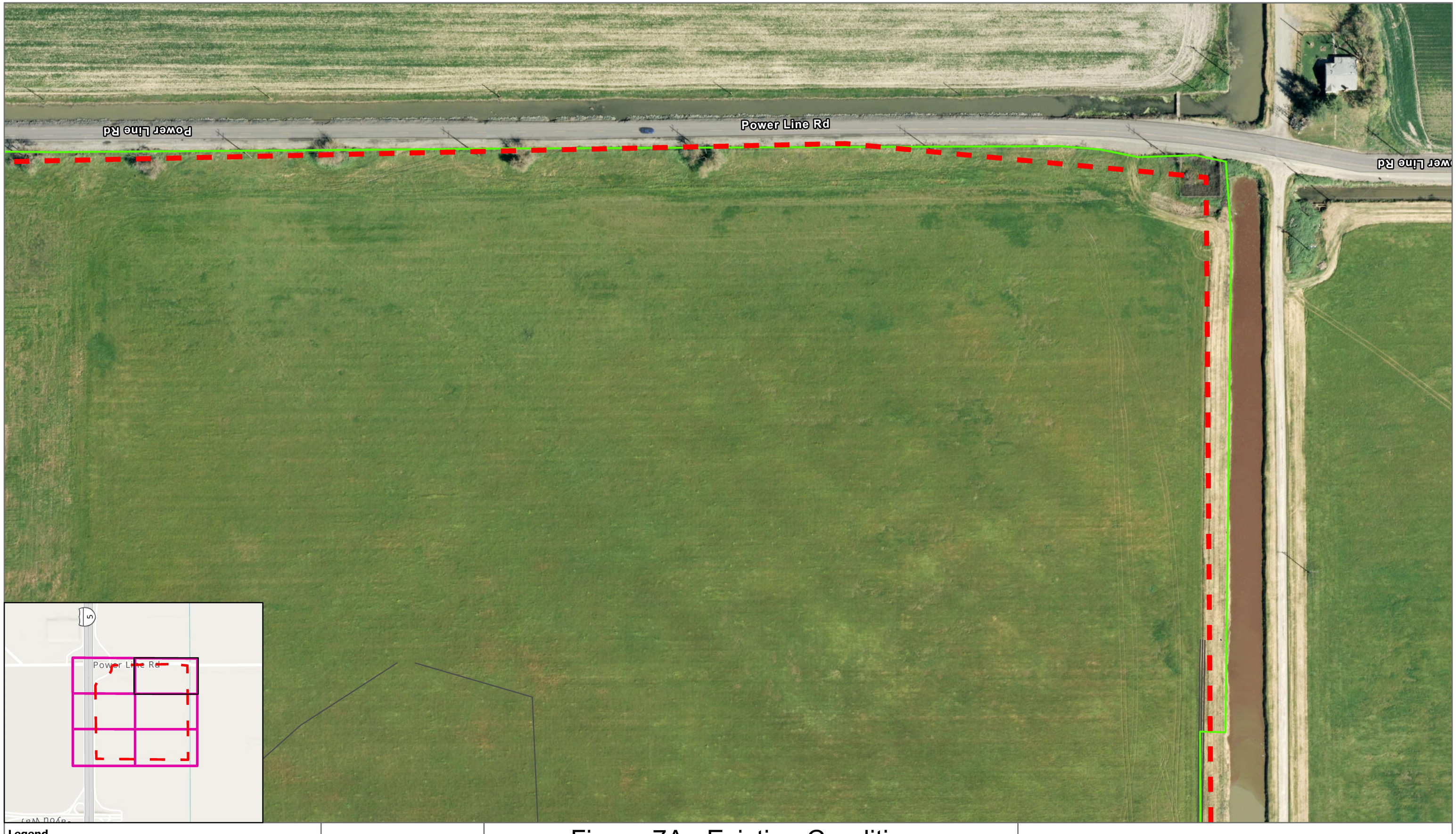
WattEV

Figure 7A - Existing Conditions XPSWMM Link & Node Map

WattEV Electric Truck Stop Development - Drainage Analysis

0 55 110 220 Feet

N



Legend

- XPSWMM Link
- Hydrology Node
- Hydraulics Node
- Site Boundary
- Offsite Drainage Area
- Existing Drainage Area
- Contours

Kimley»Horn

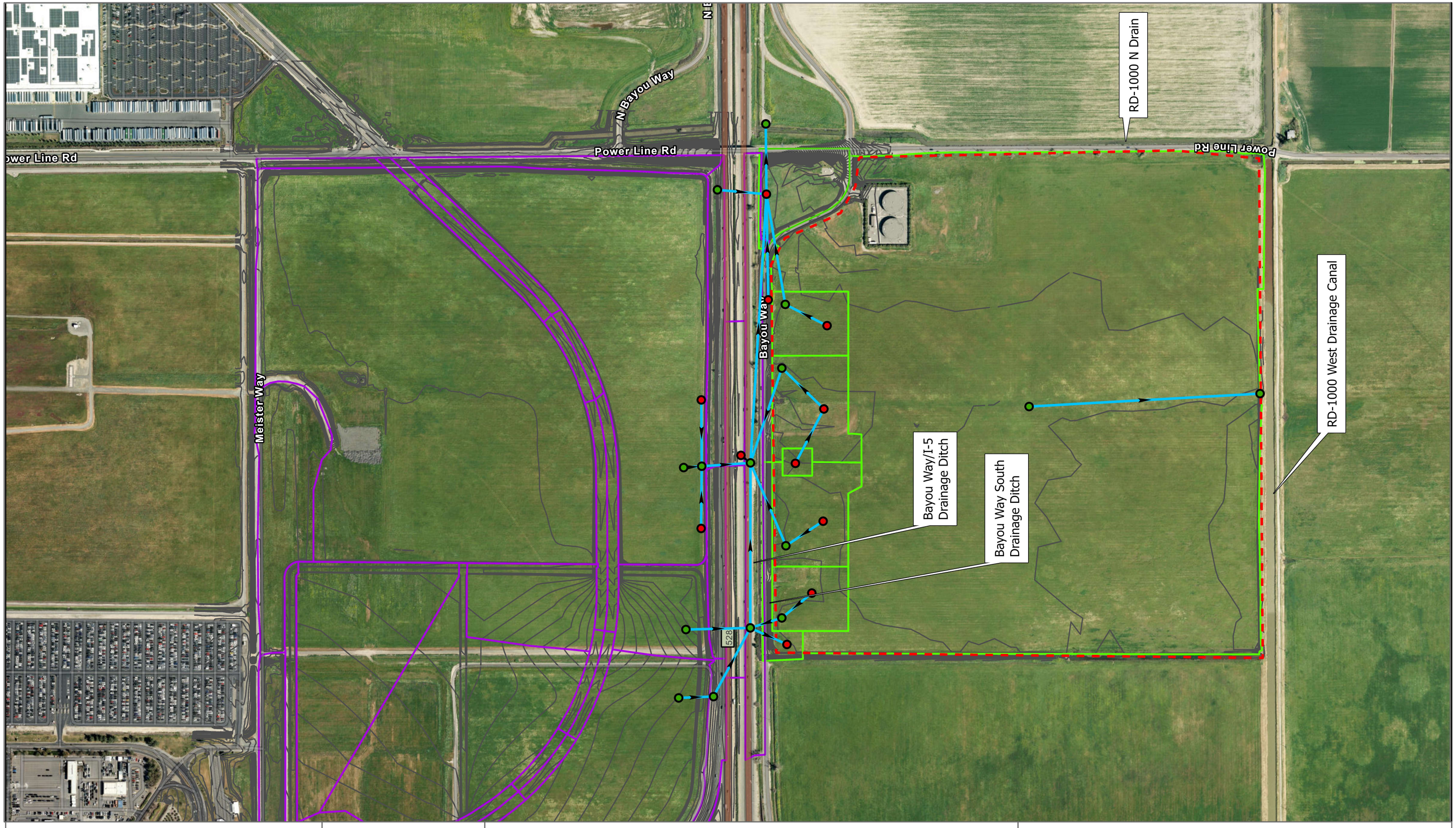
WattEV

Figure 7A - Existing Conditions XPSWMM Link & Node Map

WattEV Electric Truck Stop Development - Drainage Analysis

0 55 110 220 Feet

N



Legend

- XPSWMM Link
- Hydrology Node
- Site Boundary
- Offsite Drainage Area
- Proposed Drainage Area

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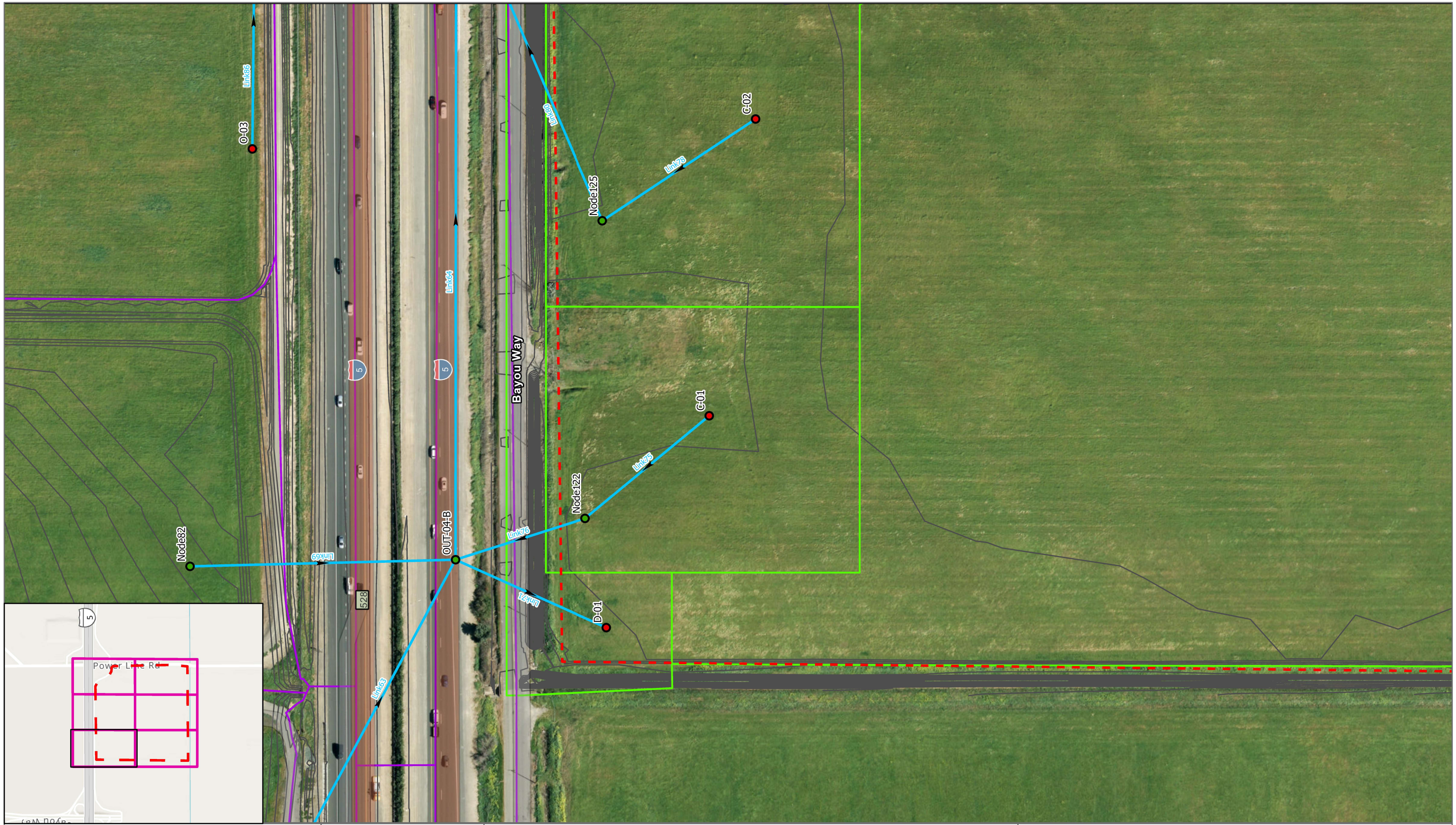
WattEV

Figure 7B - Proposed Conditions XPSWMM Link & Node Map

WattEV Electric Truck Stop Development - Drainage Analysis

0 237.5 475 950 Feet

N



Legend

- XPSWMM Link
- Hydraulics Node
- Hydrology Node
- Site Boundary
- Offsite Drainage Area
- Proposed Drainage Area
- Contours

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WattEV

Figure 7B - Proposed Conditions XPSWMM Link & Node Map

WattEV Electric Truck Stop Development - Drainage Analysis

0 55 110 220 Feet

N



Legend

- XPSWMM Link
- Hydraulics Node
- Hydrology Node
- Site Boundary
- Offsite Drainage Area
- Proposed Drainage Area
- Contours

Kimley»Horn

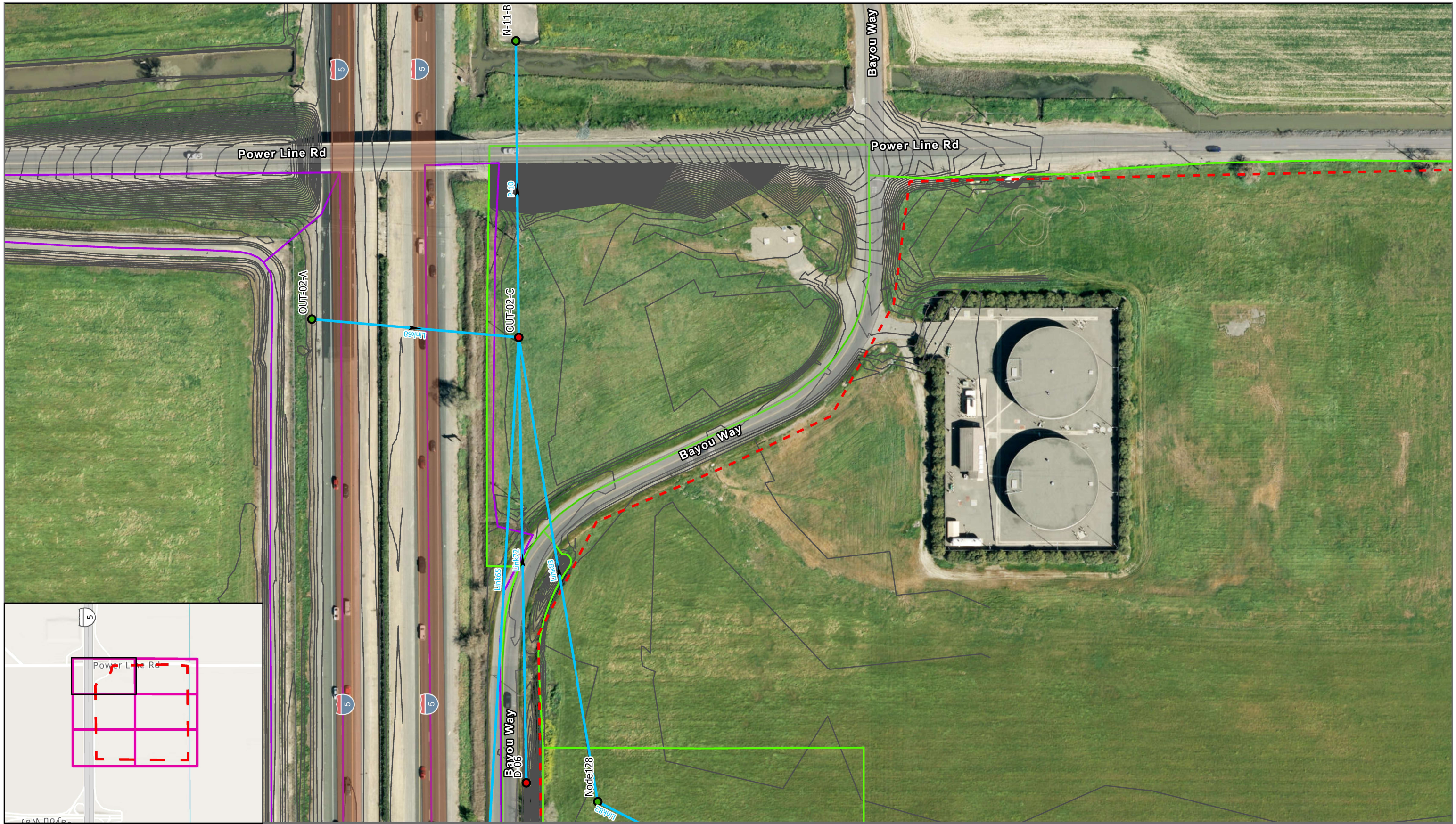
WattEV

Figure 7B - Proposed Conditions XPSWMM Link & Node Map

WattEV Electric Truck Stop Development - Drainage Analysis

0 55 110 220 Feet

N



Legend

- XPSWMM Link
- Hydraulics Node
- Hydrology Node
- Site Boundary
- Offsite Drainage Area
- Proposed Drainage Area
- Contours

Kimley»Horn

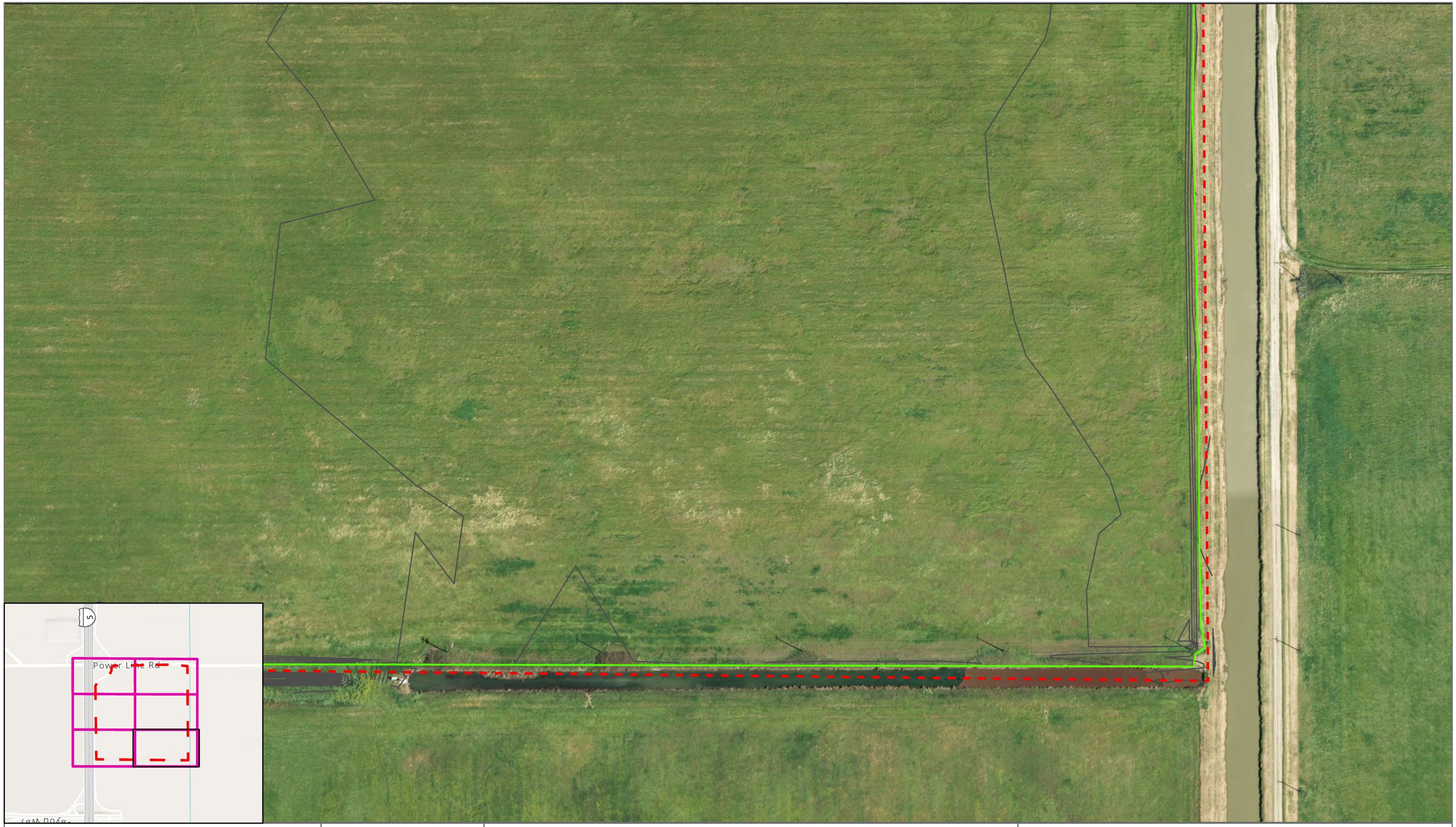
WattEV

Figure 7B - Proposed Conditions XPSWMM Link & Node Map

WattEV Electric Truck Stop Development - Drainage Analysis

0 55 110 220 Feet

N



Legend

- XPSWMM Link
- Hydraulics Node
- Hydrology Node
- Site Boundary
- Offsite Drainage Area
- Proposed Drainage Area
- Contours

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WattEV

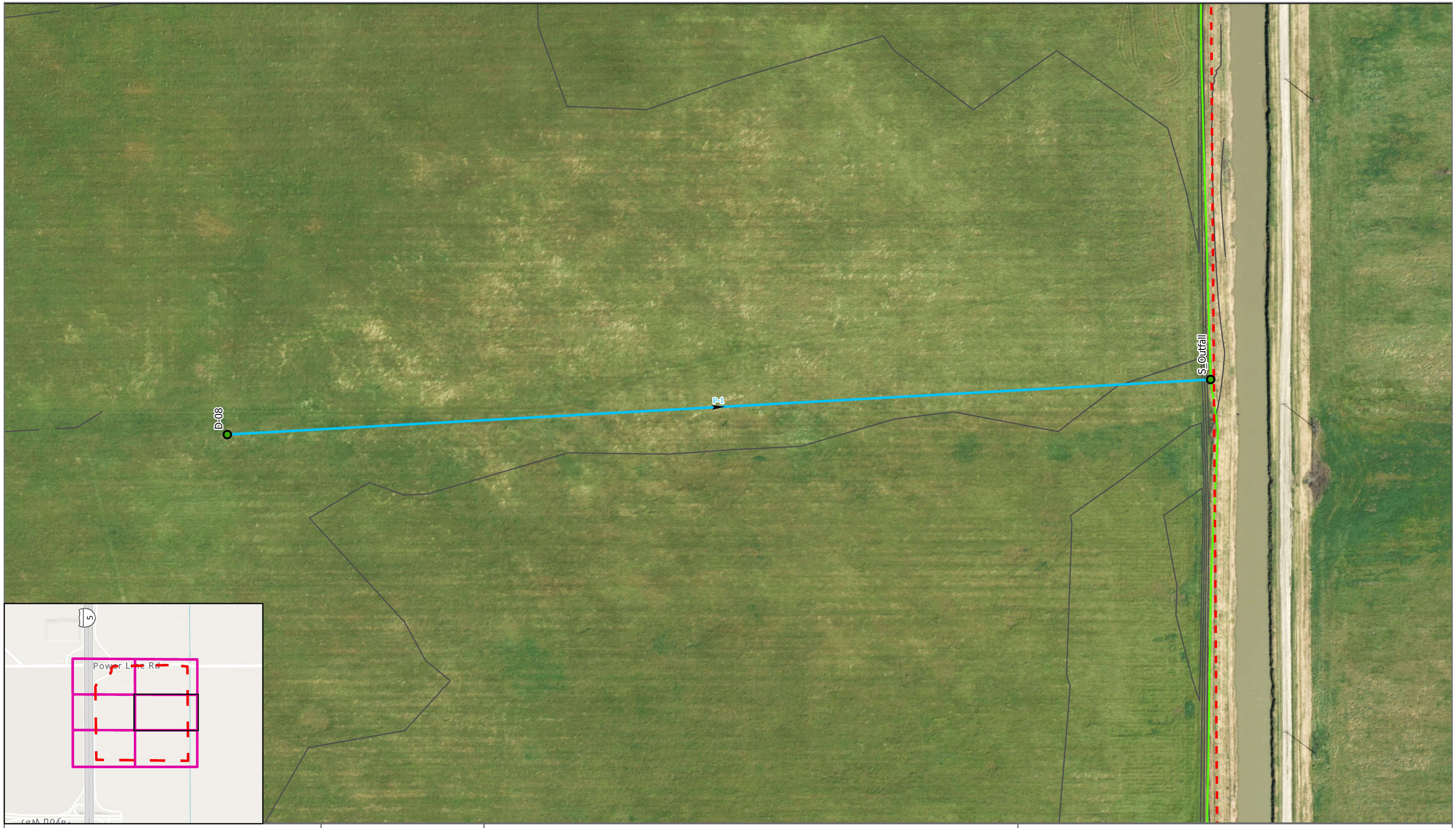
Figure 7B - Proposed Conditions XPSWMM Link & Node Map

WattEV Electric Truck Stop Development - Drainage Analysis

Feet

0 55 110 220

N



Legend

- XPSWMM Link
- Hydraulics Node
- Hydrology Node
- Site Boundary
- Offsite Drainage Area
- Proposed Drainage Area
- Contours

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Figure 7B - Proposed Conditions XPSWMM Link & Node Map

WattEV Electric Truck Stop Development - Drainage Analysis

0 55 110 220 Feet

N



Legend

- XPSWMM Link
- Hydraulics Node
- Hydrology Node
- Site Boundary
- Offsite Drainage Area
- Proposed Drainage Area
- Contours

Kimley»Horn

WattEV

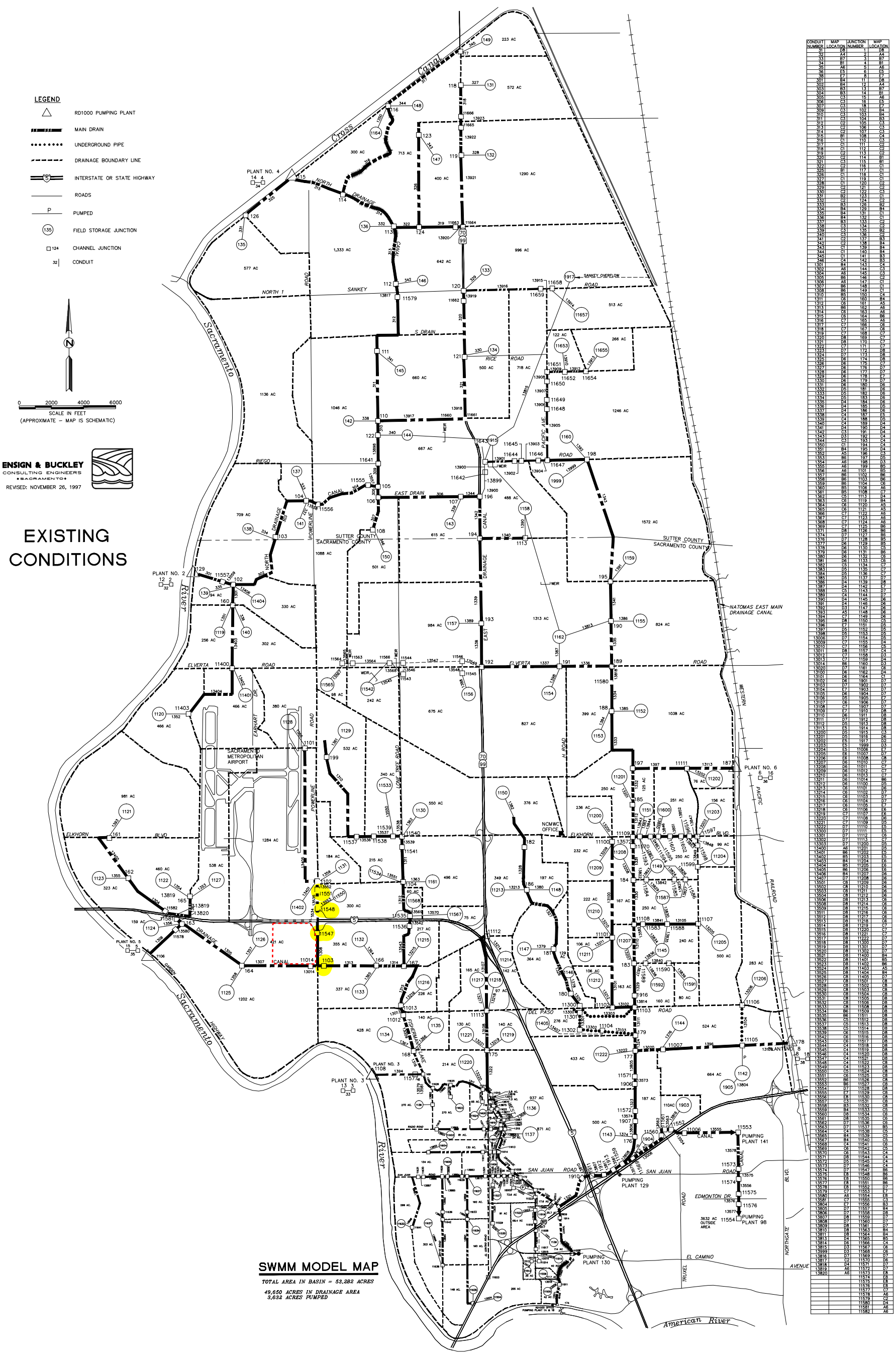
Figure 7B - Proposed Conditions XPSWMM Link & Node Map

WattEV Electric Truck Stop Development - Drainage Analysis

0 55 110 220 Feet

N

Figure 8. RD-1000 Regional Flood SWMM Model



CONDUIT NUMBER	MAP LOCATION	JUNCTION NUMBER	MAP LOCATION
31	D8	1	D8
32	A4	2	A4
33	B7	3	B7
34	B1	4	B1
35	A6	5	A6
36	E5	6	E5
38	E7	8	E7
301	B4	11	D8
302	B4	12	A4
303	B3	13	B7
304	B3	14	B1
305	C3	15	A6
306	C3	16	E5
307	C3	18	E7
309	C3	102	B4
310	C3	103	B4
311	C3	104	B3
312	C2	105	C3
313	C2	106	C3
314	C2	107	C3
315	B1	108	C4
316	C1	110	C3
317	C1	111	C2
318	C1	112	C3
319	C2	113	C2
320	C2	114	B1
321	C3	115	B1
322	C2	116	C1
325	B1	117	C1
326	C1	118	C1
327	C1	119	C1
328	C1	120	C2
329	C2	121	C2
330	C2	122	C3
331	B2	123	C1
332	C2	124	C2
333	B3	126	B2
334	B4	129	B4
335	B4	131	C1
336	B4	132	C1
337	B3	133	C2
338	C3	134	C2
339	C3	135	B2
340	C3	136	C2
341	C2	137	B3
342	C2	138	B4
343	C1	139	B4
344	C1	140	B4
345	C1	141	B3
346	C4	142	B3
1301	B4	143	C4
1302	A6	144	C3
1304	A6	145	C3
1305	B6	146	C2
1306	A5	147	C1
1307	B6	148	C1
1308	B6	149	C1
1310	B5	150	C4
1311	C6	160	B4
1312	C6	161	A5
1313	B6	162	A6
1314	C6	163	A6
1315	C6	164	B6
1316	C7	165	A6
1317	C7	166	C6
1318	C7	167	C6
1319	C7	168	C7
1320	D8	169	C7
1321	D8	170	C7
1322	C7	171	C7
1323	D7	172	D8
1324	D7	173	D8
1325	D6	174	D8
1326	D6	175	C7
1327	D6	176	D7
1328	D6	177	D7
1329	D6	178	E7
1330	D6	179	D7
1331	D6	180	D6
1332	D5	181	D6
1333	D5	182	D6
1334	D5	183	D6
1335	D4	184	D6
1336	D4	185	D5
1337	D4	186	D6
1338	C4	187	E5
1339	C4	188	D5
1340	C4	189	D4
1341	D4	190	D4
1342	C3	191	D4
1343	D3	192	C4
1344	C3	193	C4
1350	C1	194	C4
1351	B4	195	D4
1352	A5	196	D3
1353	B6	197	D5
1354	A6	198	D3
1355	A6	199	B5
1356	A6	1101	B5
1357	B6	1102	B6
1358	B6	1103	B6
1359	B6	1104	C6
1360	B5	1106	A6
1361	B5	1108	C7
1362	C5	1113	D4
1363	C6	1119	B4
1364	C6	1120	A5
1365	C6	1121	A5
1366	C7	1122	A6
1367	C7	1123	A6
1368	C7	1124	A6
1369	C7	1125	B6
1371	C8	1126	B6
1374	D7	1127	B6
1376	D7	1128	B5
1377	D6	1129	B5
1378	D6	1130	C5
1379	D6	1131	B6
1380	D6	1132	C6
1381	D6	1133	C6
1382	C5	1134	C7
1383	D5	1135	C7
1384	D5	1136	C7
1385	D5	1137	D7
1386	D4	1139	D8
1387	D4	1142	E7
1388	C5	1143	D7
1389	C4	1144	D7
1390	D4	1145	D6
1391	D4	1146	D6
1392	D3	1147	D6
1393	A5	1148	D6
1394	C7	1149	D6
1395	D8	1150	C5
1396	C7	1151	C5
1397	D5	1152	D5
1398	D5	1153	D5
13006	D7	1154	D5
13009	C7	1155	D4
13010	C7	1156	C4
13011	D8	1157	C4
13012	C7	1158	D3
13013	C7	1159	D3
13014	B6	1160	D3
13020	D7	1161	C6
13100	D6	1162	D4
13101	D6	1164	C1
13102	D6	1901	D7
13103	D7	1902	D7
13104	E7	1903	D7
13105	D6	1904	D7
13106	D5	1905	E7
13107	C6	1906	D7
13108	C7	1907	D7
13109	E7	1910	D8
13110	D6	1911	D8
13111	D7	1912	D8
13112	D5	1913	D8
13113	E5	1914	D8
13200	D5	1915	C3
13201	D5	1916	D6
13202	E5	1917	D2
13203	E5	1999	D3
13204	E5	11006	E7
13205	E6	11007	D7
13206	D6	11008	C8
13207	D6	11010	C7
13208	D6	11011	C7
13209	D6	11012	C7
13210	D6	11013	C7
13211	D6	11014	B6
13212	D6	11100	D5
13213	C6	11101	D6
13214	C6	11102	D7
13215	C6	11103	D7
13216	C6	11104	E7
13217	C6	11105	E7
13218	C6	11106	E6
13219	C7	11107	E6
13220	C7	11108	D6
13221	D7	11109	D5
13222	D7	11111	D5
13300	D7	11112	C6
13301	D7	11113	C7
13302	D7	11200	D5
13303	D7	11201	D5
13400	A6	11202	E5
13401	B5	11203	E6
13402	B4	11204	E6
13403	B4	11205	E6
13404	B5	11206	E6
13405	B6	11207	D6
13406	B4	11208	D6
13407	D7	11209	D6
13501	C8	11210	D6
13502	C8	11211	D6
13503	C8	11212	D6
13504	C8	11213	D6
13505	C8	11214	C6
13508	D8	11215	C6
13509	D8	11216	C6
13511	D8	11217	C6
13512	D8	11218	C6
13513	D8	11219	C6
13514	D8	11220	C6
13515	D8	11221	C7
13516	D8	11222	D7
13517	D8	11300	D7
13518	D8	11301	D7
13519	D8	11302	D7
13520	D8	11400	B4
13521	D8	11401	B5
13522	D8	11402	B6
13523	D8	11403	A5
13524	D8	11404	B4
13525	D8	11405	D7
13526	C8	11501	C8
13527	C8	11502	C8
13528	C8	11503	C8
13529	C8	11504	C8
13530	C8	11505	D8
13531	C8	11506	D8
13532	C8	11508	D8
13533	C8	11509	D8
13534	B6	11511	D8
13535	B6	11512	D8
13536	C5	11513	D8
13537	C5	11514	D8
13538	C6	11515	D8
13539	C6	11516	D8
13542	C6	11517	D8
13543	C6	11518	D8
13544	C4	11519	D8
13545	C4	11520	D8
13546	C4	11521	D8
13547	C4	11522	C8
13548	C4	11523	D8
13549	C4	11524	C8
13550	C5	11525	C8
13551	C6	11526	C8
13552	B6	11527	C8
13553	B6	11528	D8
13554	D7	11529	C8
13555	E7	11530	C8
13556	C8	11531	C8
13557	C3	11532	C8
13558	B3	11533	C5
13559	B4	11534	C6
13560	D8	11535	C6
13561	D8	11536	C6
13562	D7	11537	B5
13563	D7	11538	C5
13564	C4	11539	C5
13565	B4	11540	C5
13566	C4	11541	C6
13567	B4	11542	C5
13568	C6	11543	C4
13569	C6	11544	C4
13570	D6	11545	C4
13571	D8	11546	C4
13572	D5	11547	B6
13573	D7	11548	B6
13574	D7	11550	B6
13575	E8	11551	B6
13576	E8	11552	D7
13577	E8	11553	E7
13578	E8	11554	E8
13579	C7	11555	C3
13580	A6	11556	B3
13581	C7	11557	B4
13604	E7	11558	D8
13605	D7	11559	D7
13606	D7	11560	D7
13607	D8	11561	D7
13608	D8	11563	B4
13609	D8	11564	B4
13610	D8	11565	B5
13611	D4	11566	C4
13612	D6	11567	C6
13613	D3	11568	C6
13614	D6	11569	D7
13615	D7	11570	D6
13616	C2	11571	D7
13617	D4	11572	D7
13618	A6	11573	E8
13619	A6	11574	E8
13620	A6	11575	E8
		11576	E8
		11577	C7
		11578	A6
		11579	C2
		11580	D4
		11581	A6
		11582	A6

INTERSTATE 5

BAYOU WAY

FF=16.5

FF=16.5

FF=16.5

B-B

EXTENTS OF SUBSTATION

2120

2120

1000

A-A

A-A

SACRAMENTO COUNTY 100 YEAR FLOOD PLAIN

5960

5960

5960

4800

5960

5960

5364

LOT 6

LEGEND

- CENTER LINE
- PROPERTY LINE
- RIGHT-OF-WAY LINE / LEASE LINE
- EASEMENT / SETBACK LINE
- OUTLINE OF FLOODPLAIN IMPACTS
- IMPACTED FLOODPLAIN AREA
- COMPENSATORY FLOODPLAIN AREA

SUMMARY TABLE (ELEVATION @ 0.5-FT INCREMENTS)	
FLOODPLAIN IMPACTS	
Elevation Interval	VOLUME (CY)
~12.5'-13'	2859.98
13'-13.5'	3267.11
13.5'-14'	1525.87
Total	7,652.96
FLOODPLAIN REPLACMENT	
Elevation Interval	VOLUME (CY)
~12.2'-11.7'	7,653.96
DELTA	0

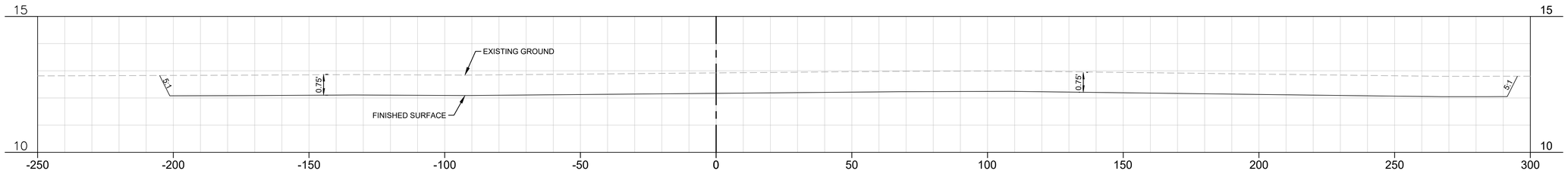
FLOODPLAIN MITIGATION EXHIBIT

NORTH

GRAPHIC SCALE IN FEET
0 50 100 200

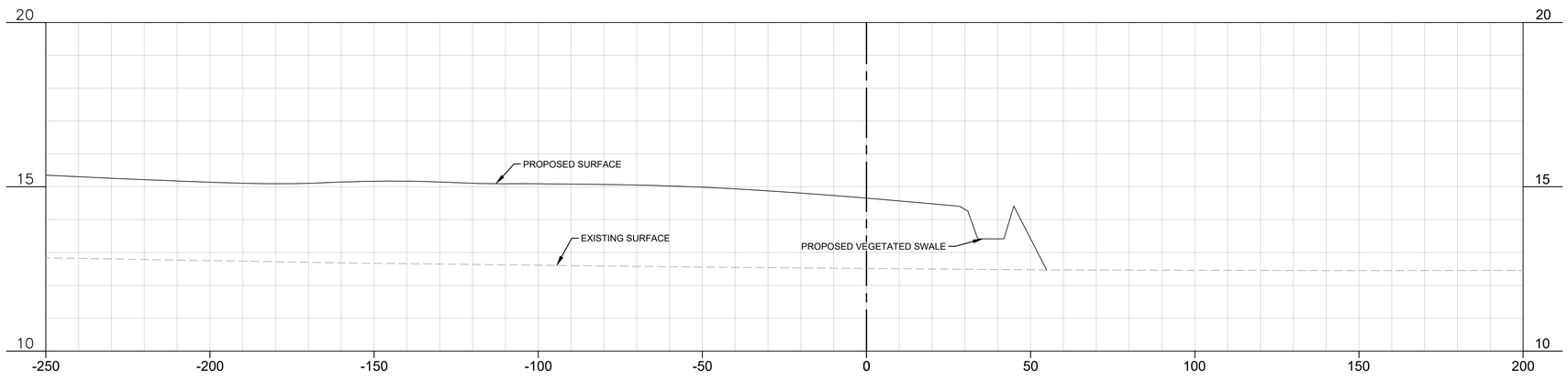
Kimley»Horn

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A-A SECTION A FLOODPLAIN REPLACMENT AREA

HORIZONTAL 1" = 20'
VERTICLE: 1" = 2'



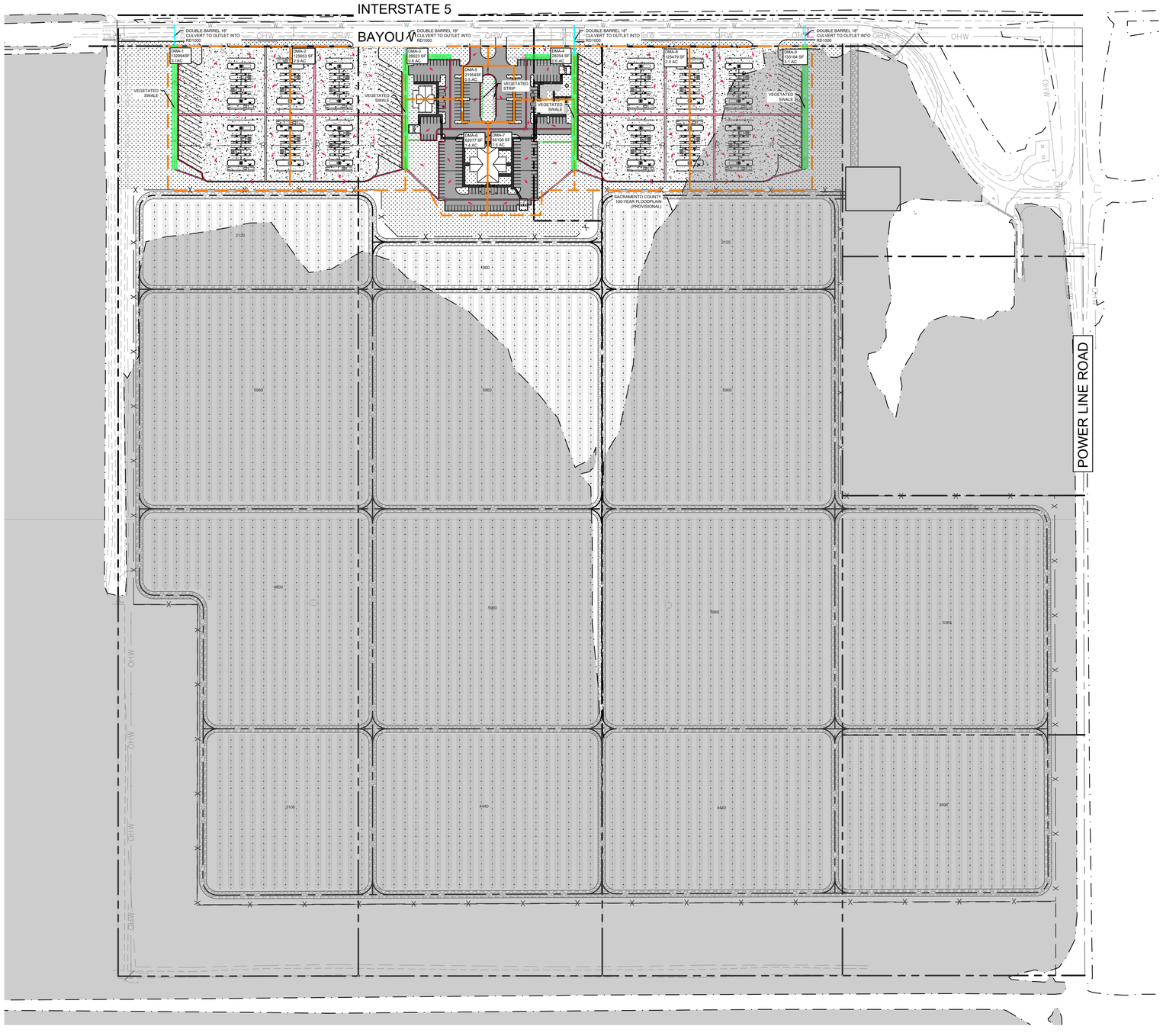
B-B SECTION B IMPACTED FLOODPLAIN AREA

HORIZONTAL: 1" = 20'
VERTICLE: 1" = 2'

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Appendix B. Preliminary Drainage and Site Plan



LEGEND

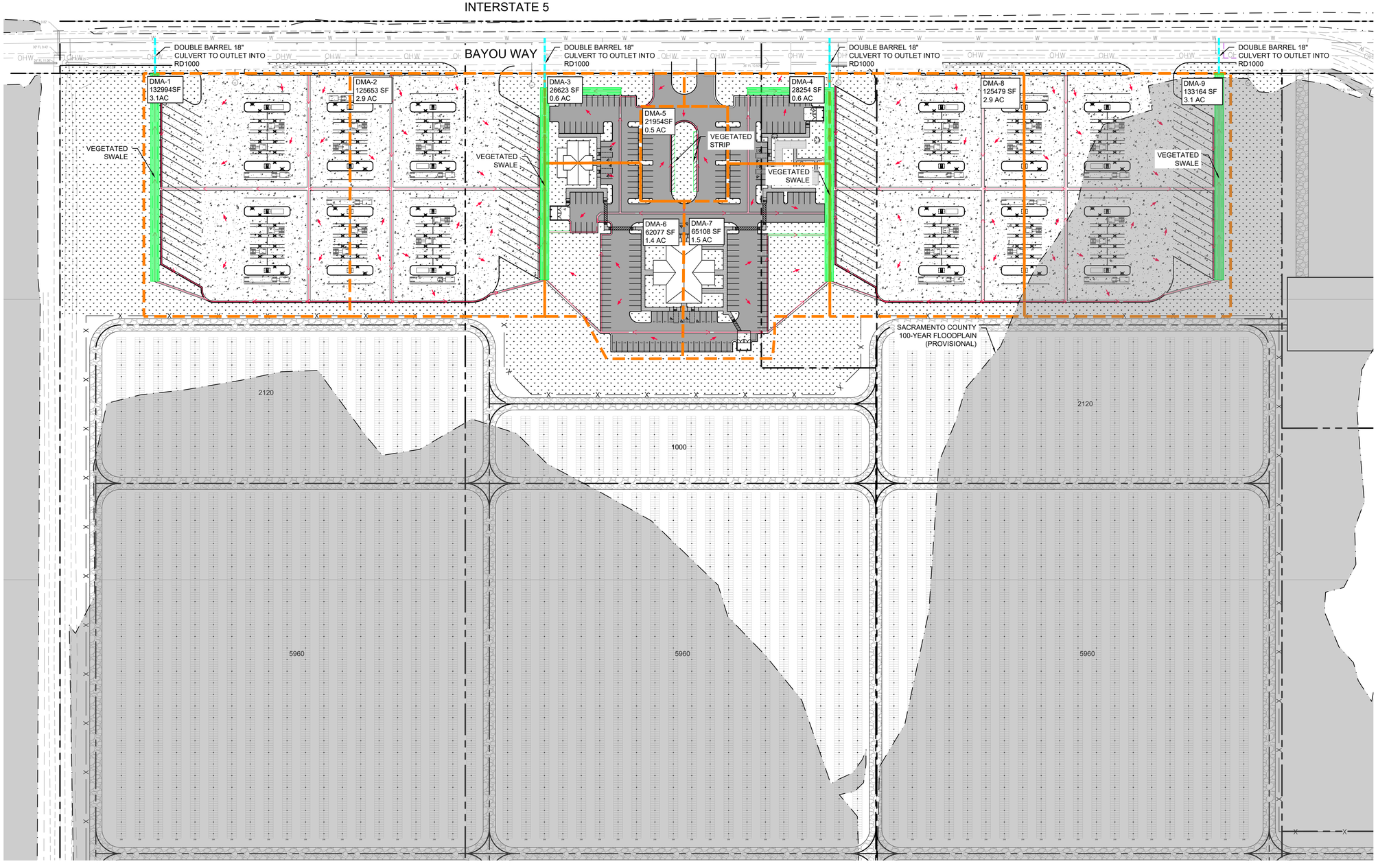
- CENTER LINE
- PROPERTY LINE
- RIGHT-OF-WAY LINE / LEASE LINE
- EASEMENT / SETBACK LINE
- DMA BOUNDARY

NORTH

GRAPHIC SCALE IN FEET
0 75 150 300

Kimley»Horn

K:\SAC_PLAN\197570002 - WattEV Sacramento Environmental\08 CADD\Exhibits\Prelim Drainage Plan_Watt EV.dwg



LEGEND

- CENTER LINE
- PROPERTY LINE
- RIGHT-OF-WAY LINE / LEASE LINE
- EASEMENT / SETBACK LINE
- DMA BOUNDARY
- VEGETATED SWALE TOP
- VEGETATED SWALE BOTTOM
- VALLEY GUTTER
- PARKING CURB LIP
- FLOW PATH
- SACRAMENTO COUNTY 100-YEAR FLOODPLAIN (PROVISIONAL)
- PROPOSED HEAVY DUTY CONCRETE PAVEMENT
- PROPOSED LANDSCAPE/PLANTER AREA.
- PROPOSED ASPHALT PAVEMENT
- SACRAMENTO COUNTY 100-YEAR FLOODPLAIN (PROVISIONAL)

NORTH

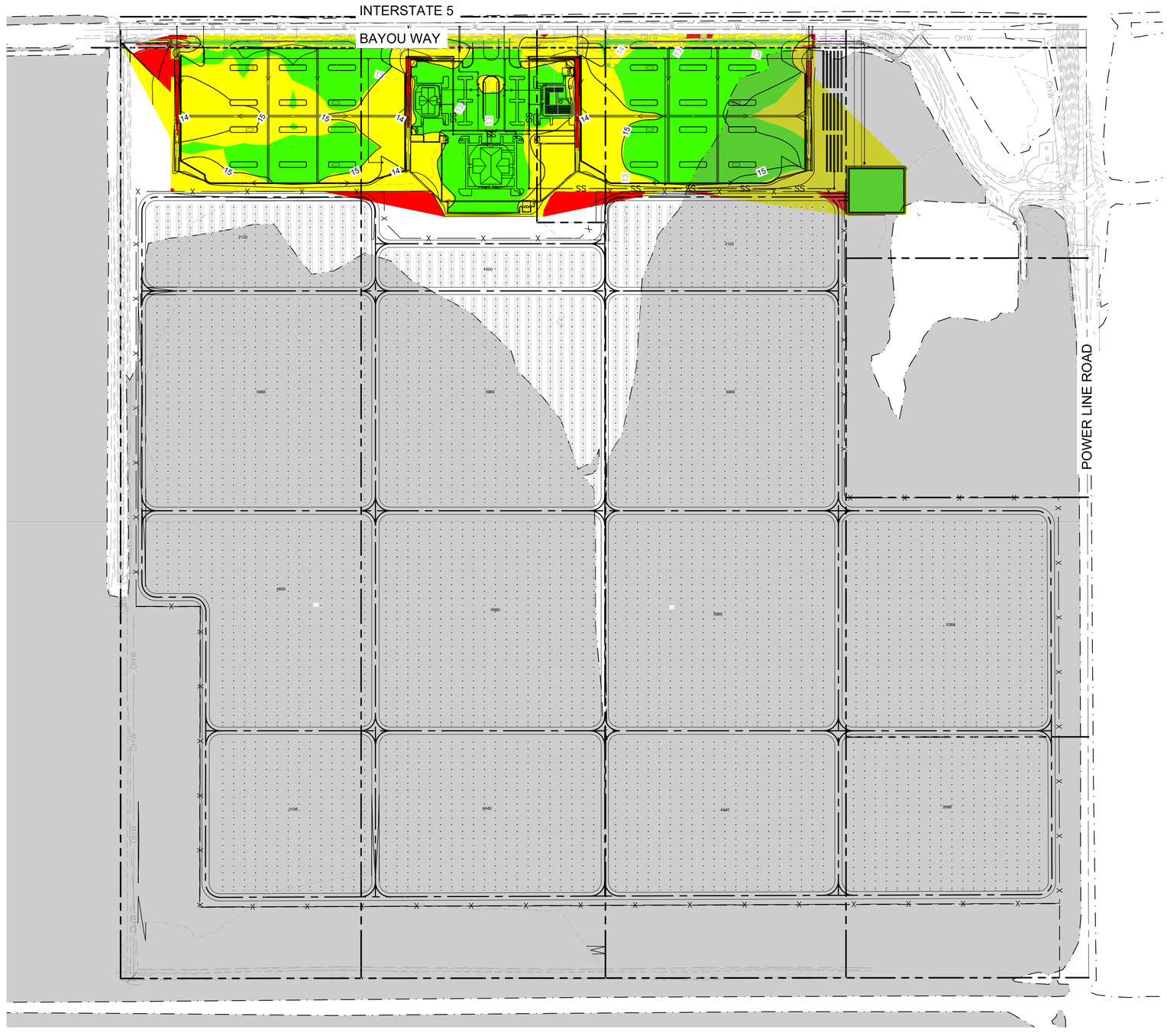
GRAPHIC SCALE IN FEET
0 40 80 160

CONCEPTUAL DRAINAGE MANAGEMENT EXHIBIT
2023-09-14

Kimley»Horn

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Appendix C. Preliminary Grading Plan



LEGEND

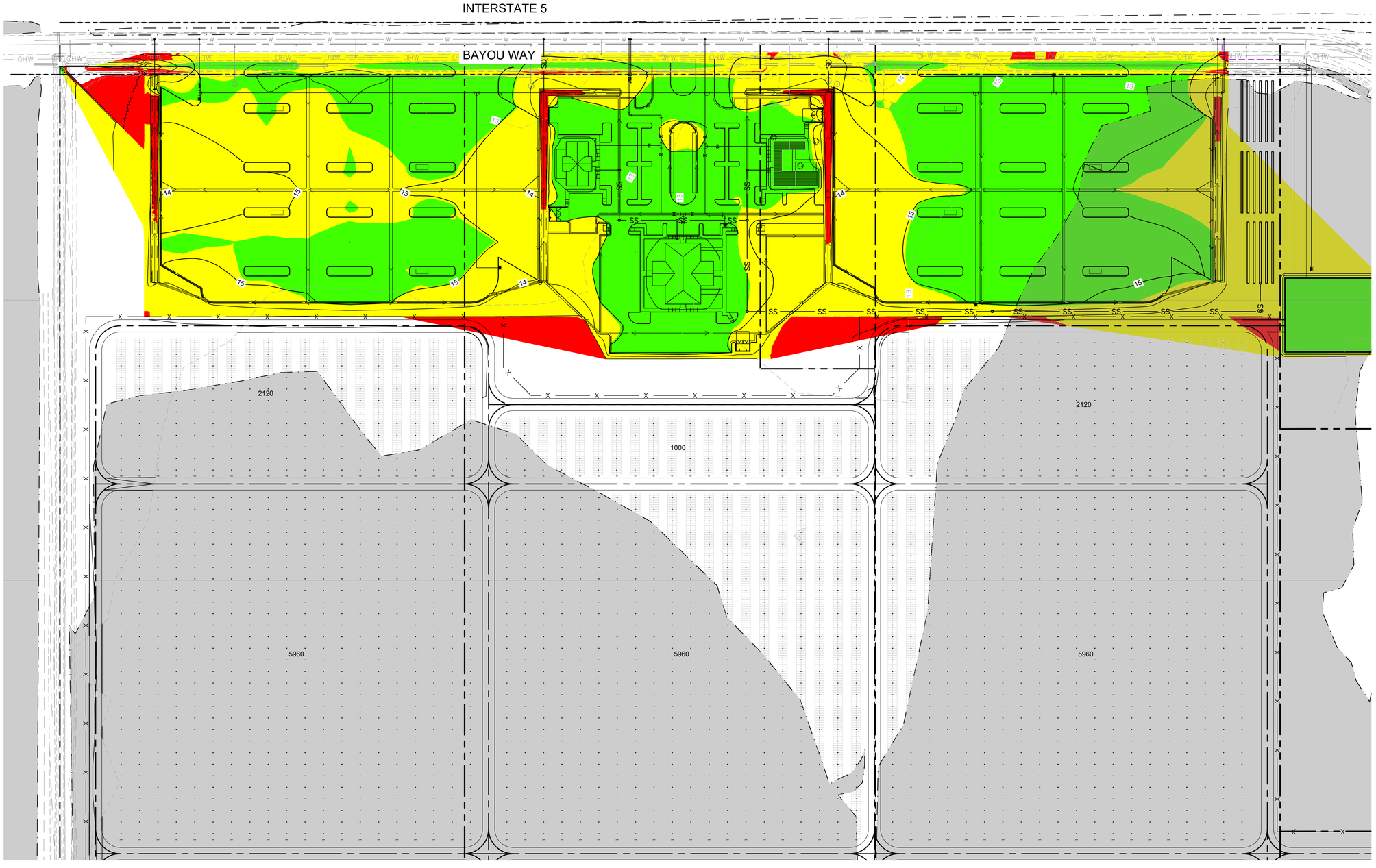
- CENTER LINE
- PROPERTY LINE
- RIGHT-OF-WAY LINE / LEASE LINE
- EASEMENT / SETBACK LINE
- DMA BOUNDARY

NORTH

GRAPHIC SCALE IN FEET
0 75 150 300

Kimley»Horn

K:\SAC_PLAN\197570002 - WattEV Sacramento Environmental\08 CADD\Exhibits\Prelim Grading Plan_Watt EV.dwg



LEGEND

- PROPERTY LINE
- SETBACK LINE
- RIGHT OF WAY / LEASE LINE
- FLOW LINE
- PROPOSED SWALE TOP
- PROPOSED SWALE BOTTOM
- SD — SD PIPE
- 1340 — EXISTING CONTOUR
- 1340 — PROPOSED CONTOUR
- 4' - 6' OF FILL
- 2' - 4' OF FILL
- 0' - 2' OF FILL
- 0' - 2' OF CUT

EARTHWORK QUANTITIES

CUT: ±204 CY

FILL: ±54,087 CY

NET: ±53,883 CY (FILL)

NOTE: THE ABOVE QUANTITIES ARE APPROXIMATE IN PLACE VOLUMES CALCULATED FROM THE EXISTING GROUND TO THE PROPOSED FINISHED GRADE. EXISTING GROUND IS DEFINED BY THE CONTOURS AND SPOT GRADES ON THE BASE SURVEY. PROPOSED FINISHED GRADE IS DEFINED AS THE FINAL GRADE AS INDICATED ON THE GRADING PLAN(S)

THE EARTHWORK QUANTITIES ABOVE ARE FOR PRELIMINARY ESTIMATING ONLY. THEY HAVE NOT BEEN FACTORED TO ACCOUNT FOR CHANGES IN VOLUME DUE TO BULKING, CLEARING AND GRUBBING, SHRINKAGE, OVER-EXCAVATION AND RE-COMPACTION, AND CONSTRUCTION METHODS. NOR DO THEY ACCOUNT FOR THE THICKNESS OF PAVEMENT SECTIONS, UTILITY PIPES, TRENCHING AND BEDDING MATERIALS, FOOTINGS SLABS REUSE OF PULVERIZED MATERIALS THAT WILL UNDERLIE NEW PAVEMENT, ETC. THE CONTRACTOR SHALL RELY ON THEIR OWN EARTHWORK ESTIMATES FOR BEDDING AND CONSTRUCTION PURPOSES.

NORTH

GRAPHIC SCALE IN FEET
0 40 80 160

CONCEPTUAL GRADING
CUT FILL MAP
2023-09-14

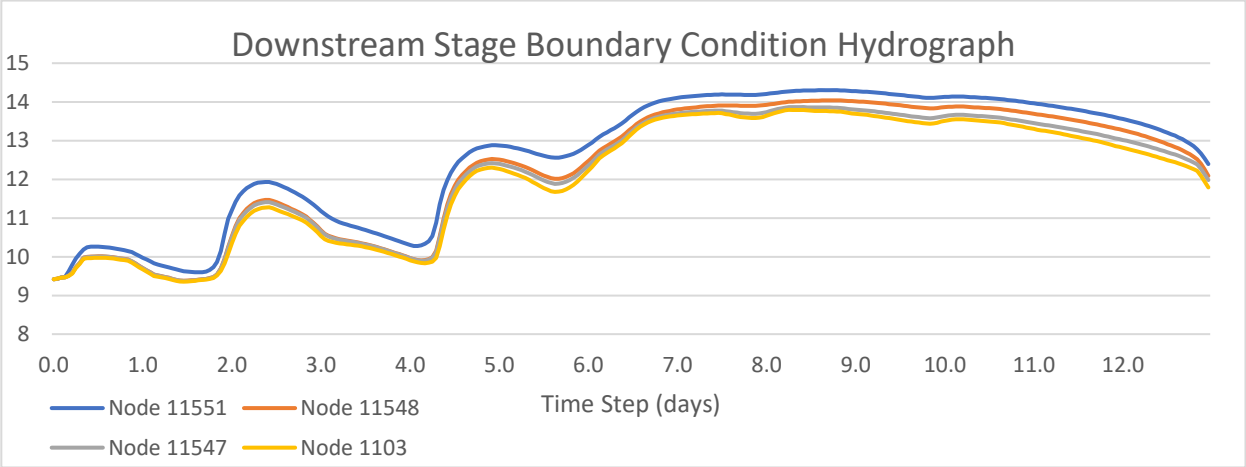
Kimley»Horn

K:\SAC_PLAN\197570002 - WatHEV Sacramento Environmental\08 CADD\Exhibits\Prelim Grading Plan_Watt EV.dwg

Appendix D. XPSWMM Boundary Condition Hydrographs

Reclamation District 1000

Results from Drainage System Hydraulic Model (XPSWMM File: Natomas_Rev_1-19_2D_100.xp)



							N-11-B	S_Outfall
			100-Year Flow (cfs)		100-Year Water Surface Elev. (feet, NAVD88)			
Ordinate	Date/Time	Time Step (day)	Conduit 1308 (Node 11547 to 1103)	Conduit 13535 (Node 11551 to 11548)	Node 11551	Node 11548	Node 11547	Node 1103
1	2/1/1992 1:00	0.042	0	0	9.42	9.42	9.42	9.42
2	2/1/1992 2:00	0.083	-1.484	-0.714	9.43	9.435	9.435	9.436
3	2/1/1992 3:00	0.125	0.988	0.24	9.465	9.46	9.46	9.46
4	2/1/1992 4:00	0.167	-0.18	0.533	9.473	9.47	9.47	9.469
5	2/1/1992 5:00	0.208	4.686	4.052	9.615	9.511	9.509	9.501
6	2/1/1992 6:00	0.250	7.586	6.993	9.8	9.588	9.585	9.567
7	2/1/1992 6:59	0.292	8.222	8.319	9.957	9.733	9.73	9.711
8	2/1/1992 8:00	0.333	9.663	9.667	10.083	9.84	9.836	9.816
9	2/1/1992 9:00	0.375	10.489	9.73	10.183	9.976	9.972	9.948
10	2/1/1992 9:59	0.417	12.86	11.052	10.242	9.997	9.992	9.96
11	2/1/1992 11:00	0.458	13.35	11.343	10.257	10.004	9.999	9.965
12	2/1/1992 12:00	0.500	13.175	11.359	10.26	10.008	10.004	9.971
13	2/1/1992 13:00	0.542	13.154	11.285	10.26	10.011	10.007	9.974
14	2/1/1992 13:59	0.583	12.977	11.183	10.254	10.009	10.004	9.972
15	2/1/1992 15:00	0.625	13.227	10.963	10.247	10.008	10.003	9.969
16	2/1/1992 16:00	0.667	12.746	10.833	10.235	9.998	9.993	9.962
17	2/1/1992 17:00	0.708	12.508	10.623	10.22	9.987	9.983	9.952
18	2/1/1992 18:00	0.750	12.219	10.416	10.203	9.972	9.968	9.939
19	2/1/1992 19:00	0.792	11.941	10.19	10.184	9.956	9.952	9.924
20	2/1/1992 20:00	0.833	11.702	9.916	10.166	9.944	9.94	9.913
21	2/1/1992 21:00	0.875	11.47	9.69	10.146	9.928	9.924	9.898
22	2/1/1992 22:00	0.917	12.103	9.766	10.118	9.884	9.88	9.848
23	2/1/1992 23:00	0.958	12.168	9.661	10.074	9.828	9.823	9.789
24	2/2/1992 0:00	1.000	11.812	9.501	10.024	9.764	9.76	9.726
25	2/2/1992 1:00	1.042	11.43	9.213	9.975	9.709	9.705	9.671
26	2/2/1992 2:00	1.083	11.157	8.963	9.928	9.653	9.649	9.615
27	2/2/1992 3:00	1.125	10.913	8.731	9.881	9.596	9.592	9.557
28	2/2/1992 4:00	1.167	10.373	8.499	9.834	9.539	9.535	9.503
29	2/2/1992 5:00	1.208	9.53	7.997	9.798	9.52	9.516	9.487
30	2/2/1992 6:00	1.250	9.133	7.715	9.771	9.498	9.495	9.468

							N-11-B	S_Outfall
			100-Year Flow (cfs)		100-Year Water Surface Elev. (feet, NAVD88)			
Ordinate	Date/Time	Time Step (day)	Conduit 1308 (Node 11547 to 1103)	Conduit 13535 (Node 11551 to 11548)	Node 11551	Node 11548	Node 11547	Node 1103
31	2/2/1992 7:00	1.292	8.918	7.483	9.747	9.477	9.474	9.447
32	2/2/1992 8:00	1.333	8.743	7.275	9.722	9.456	9.453	9.426
33	2/2/1992 9:00	1.375	8.512	7.099	9.697	9.43	9.427	9.401
34	2/2/1992 10:00	1.417	8.419	6.925	9.671	9.403	9.4	9.374
35	2/2/1992 11:00	1.458	7.772	6.673	9.646	9.384	9.382	9.359
36	2/2/1992 12:00	1.500	7.421	6.392	9.628	9.379	9.377	9.356
37	2/2/1992 13:00	1.542	6.942	6.123	9.615	9.382	9.38	9.362
38	2/2/1992 14:00	1.583	6.732	5.888	9.609	9.39	9.388	9.372
39	2/2/1992 15:00	1.625	6.464	5.707	9.603	9.397	9.395	9.379
40	2/2/1992 16:00	1.667	6.21	5.503	9.6	9.407	9.405	9.391
41	2/2/1992 17:00	1.708	6.064	5.376	9.601	9.418	9.416	9.403
42	2/2/1992 18:00	1.750	6.291	5.49	9.615	9.429	9.427	9.413
43	2/2/1992 19:00	1.792	6.773	6.003	9.654	9.447	9.445	9.429
44	2/2/1992 20:00	1.833	7.95	7.105	9.73	9.479	9.476	9.454
45	2/2/1992 21:00	1.875	9.181	9.013	9.863	9.545	9.541	9.514
46	2/2/1992 22:00	1.917	13.978	13.571	10.149	9.698	9.688	9.633
47	2/2/1992 23:00	1.958	22.009	22.113	10.602	9.951	9.931	9.828
48	2/3/1992 0:00	2.000	30.709	29.578	10.976	10.254	10.226	10.078
49	2/3/1992 1:00	2.042	35.727	33.358	11.212	10.543	10.51	10.358
50	2/3/1992 2:00	2.083	40.567	37	11.422	10.786	10.748	10.589
51	2/3/1992 3:00	2.125	44.522	39.255	11.585	10.999	10.956	10.795
52	2/3/1992 4:00	2.167	46.543	40.776	11.69	11.131	11.082	10.925
53	2/3/1992 5:00	2.208	47.77	41.838	11.772	11.236	11.182	11.03
54	2/3/1992 6:00	2.250	48.489	42.447	11.834	11.322	11.265	11.117
55	2/3/1992 7:00	2.292	48.933	42.769	11.881	11.388	11.329	11.186
56	2/3/1992 8:00	2.333	49.535	42.934	11.911	11.428	11.368	11.226
57	2/3/1992 9:00	2.375	49.34	42.809	11.926	11.455	11.396	11.258
58	2/3/1992 10:00	2.417	49.302	42.618	11.93	11.465	11.406	11.27
59	2/3/1992 11:00	2.458	48.925	42.148	11.927	11.471	11.413	11.279
60	2/3/1992 12:00	2.500	49.214	42.003	11.907	11.445	11.388	11.25
61	2/3/1992 13:00	2.542	48.985	41.615	11.879	11.411	11.355	11.215
62	2/3/1992 14:00	2.583	48.192	41.129	11.842	11.368	11.314	11.174
63	2/3/1992 15:00	2.625	47.238	40.336	11.802	11.327	11.276	11.138
64	2/3/1992 16:00	2.667	46.097	39.383	11.757	11.284	11.236	11.1
65	2/3/1992 17:00	2.708	44.834	38.295	11.708	11.238	11.193	11.06
66	2/3/1992 18:00	2.750	43.429	37.095	11.657	11.191	11.15	11.021
67	2/3/1992 19:00	2.792	41.992	35.848	11.602	11.142	11.105	10.98
68	2/3/1992 20:00	2.833	40.533	34.562	11.547	11.093	11.059	10.938
69	2/3/1992 21:00	2.875	39.553	33.393	11.488	11.036	11.006	10.885
70	2/3/1992 22:00	2.917	38.758	32.485	11.42	10.959	10.932	10.809
71	2/3/1992 23:00	2.958	37.533	31.31	11.342	10.874	10.847	10.724
72	2/4/1992 0:00	3.000	36.2	30.076	11.258	10.781	10.757	10.632
73	2/4/1992 1:00	3.042	35.1	29.264	11.18	10.684	10.66	10.533
74	2/4/1992 2:00	3.083	33.099	28.279	11.104	10.595	10.573	10.451
75	2/4/1992 3:00	3.125	31.276	26.746	11.037	10.545	10.525	10.411
76	2/4/1992 4:00	3.167	29.693	25.337	10.979	10.506	10.488	10.382
77	2/4/1992 5:00	3.208	28.178	24.162	10.932	10.477	10.46	10.363

							N-11-B	S_Outfall
			100-Year Flow (cfs)		100-Year Water Surface Elev. (feet, NAVD88)			
Ordinate	Date/Time	Time Step (day)	Conduit 1308 (Node 11547 to 1103)	Conduit 13535 (Node 11551 to 11548)	Node 11551	Node 11548	Node 11547	Node 1103
78	2/4/1992 6:00	3.250	27.168	23.25	10.893	10.451	10.436	10.343
79	2/4/1992 7:00	3.292	26.065	22.346	10.86	10.434	10.419	10.333
80	2/4/1992 8:00	3.333	25.211	21.577	10.83	10.418	10.404	10.322
81	2/4/1992 9:00	3.375	24.372	20.874	10.801	10.402	10.389	10.311
82	2/4/1992 10:00	3.417	23.693	20.231	10.774	10.385	10.373	10.298
83	2/4/1992 11:00	3.458	23.034	19.623	10.745	10.366	10.354	10.282
84	2/4/1992 12:00	3.500	22.325	19.025	10.716	10.346	10.335	10.267
85	2/4/1992 13:00	3.542	21.751	18.484	10.688	10.325	10.314	10.248
86	2/4/1992 14:00	3.583	21.177	17.934	10.657	10.301	10.291	10.226
87	2/4/1992 15:00	3.625	20.505	17.378	10.625	10.276	10.267	10.205
88	2/4/1992 16:00	3.667	20.06	16.962	10.596	10.25	10.241	10.18
89	2/4/1992 17:00	3.708	19.607	16.545	10.565	10.222	10.213	10.153
90	2/4/1992 18:00	3.750	19.061	16.108	10.533	10.192	10.183	10.125
91	2/4/1992 19:00	3.792	18.587	15.66	10.501	10.163	10.155	10.098
92	2/4/1992 20:00	3.833	18.135	15.253	10.467	10.132	10.124	10.068
93	2/4/1992 21:00	3.875	17.687	14.853	10.433	10.099	10.091	10.036
94	2/4/1992 22:00	3.917	17.121	14.434	10.399	10.067	10.059	10.006
95	2/4/1992 23:00	3.958	16.729	14.036	10.366	10.035	10.028	9.976
96	2/5/1992 0:00	4.000	16.33	13.672	10.332	10.001	9.994	9.943
97	2/5/1992 1:00	4.042	16.004	13.39	10.3	9.967	9.96	9.909
98	2/5/1992 2:00	4.083	15.842	13.34	10.279	9.936	9.929	9.878
99	2/5/1992 3:00	4.125	16.047	13.583	10.275	9.917	9.909	9.855
100	2/5/1992 4:00	4.167	16.698	14.239	10.293	9.907	9.899	9.839
101	2/5/1992 5:00	4.208	17.79	15.327	10.333	9.91	9.901	9.833
102	2/5/1992 6:00	4.250	19.367	16.932	10.404	9.937	9.925	9.847
103	2/5/1992 7:00	4.292	22.39	19.786	10.531	9.987	9.971	9.87
104	2/5/1992 8:00	4.333	29.6	27.971	10.885	10.151	10.122	9.968
105	2/5/1992 9:00	4.375	40.688	38.982	11.352	10.523	10.477	10.271
106	2/5/1992 10:00	4.417	50.324	46.431	11.724	10.971	10.912	10.697
107	2/5/1992 11:00	4.458	55.93	49.758	11.984	11.349	11.267	11.069
108	2/5/1992 12:00	4.500	58.421	51.664	12.171	11.617	11.527	11.351
109	2/5/1992 13:00	4.542	59.725	53.144	12.326	11.828	11.736	11.579
110	2/5/1992 14:00	4.583	60.902	54.046	12.45	11.991	11.898	11.752
111	2/5/1992 15:00	4.625	61.848	55.086	12.546	12.109	12.013	11.875
112	2/5/1992 16:00	4.667	61.867	55.732	12.628	12.212	12.117	11.988
113	2/5/1992 17:00	4.708	61.872	56.211	12.697	12.299	12.204	12.083
114	2/5/1992 18:00	4.750	61.798	56.469	12.754	12.371	12.277	12.162
115	2/5/1992 19:00	4.792	62.212	56.488	12.797	12.428	12.334	12.221
116	2/5/1992 20:00	4.833	63.285	56.707	12.827	12.465	12.368	12.254
117	2/5/1992 21:00	4.875	64.092	56.921	12.85	12.493	12.393	12.278
118	2/5/1992 22:00	4.917	64.643	57.077	12.867	12.512	12.411	12.296
119	2/5/1992 23:00	4.958	65.696	57.348	12.878	12.523	12.42	12.301
120	2/6/1992 0:00	5.000	67.121	57.731	12.88	12.521	12.413	12.289
121	2/6/1992 1:00	5.042	68.412	58.096	12.876	12.51	12.398	12.268
122	2/6/1992 2:00	5.083	69.536	58.531	12.867	12.493	12.378	12.241
123	2/6/1992 3:00	5.125	70.328	58.844	12.854	12.472	12.354	12.212
124	2/6/1992 4:00	5.167	70.804	59.064	12.837	12.447	12.327	12.181

							N-11-B	S_Outfall
			100-Year Flow (cfs)		100-Year Water Surface Elev. (feet, NAVD88)			
Ordinate	Date/Time	Time Step (day)	Conduit 1308 (Node 11547 to 1103)	Conduit 13535 (Node 11551 to 11548)	Node 11551	Node 11548	Node 11547	Node 1103
125	2/6/1992 5:00	5.208	71.076	59.287	12.818	12.419	12.299	12.148
126	2/6/1992 6:00	5.250	71.188	59.416	12.797	12.387	12.267	12.112
127	2/6/1992 7:00	5.292	71.292	59.549	12.773	12.353	12.233	12.074
128	2/6/1992 8:00	5.333	71.342	59.657	12.748	12.318	12.197	12.035
129	2/6/1992 9:00	5.375	71.775	59.852	12.722	12.278	12.156	11.987
130	2/6/1992 10:00	5.417	72.047	60.001	12.691	12.233	12.11	11.934
131	2/6/1992 11:00	5.458	72.309	60.133	12.661	12.188	12.064	11.881
132	2/6/1992 12:00	5.500	72.633	60.39	12.631	12.141	12.016	11.825
133	2/6/1992 13:00	5.542	72.876	60.686	12.606	12.098	11.972	11.773
134	2/6/1992 14:00	5.583	72.949	60.965	12.585	12.06	11.934	11.729
135	2/6/1992 15:00	5.625	72.988	61.25	12.57	12.03	11.903	11.694
136	2/6/1992 16:00	5.667	72.741	61.521	12.561	12.01	11.883	11.672
137	2/6/1992 17:00	5.708	72.222	61.618	12.563	12.012	11.886	11.679
138	2/6/1992 18:00	5.750	71.874	61.731	12.575	12.029	11.904	11.701
139	2/6/1992 19:00	5.792	71.456	61.821	12.597	12.061	11.936	11.741
140	2/6/1992 20:00	5.833	71.377	61.935	12.627	12.105	11.981	11.792
141	2/6/1992 21:00	5.875	70.893	61.837	12.661	12.158	12.035	11.855
142	2/6/1992 22:00	5.917	70.248	61.623	12.706	12.227	12.105	11.937
143	2/6/1992 23:00	5.958	69.684	61.566	12.76	12.304	12.184	12.028
144	2/7/1992 0:00	6.000	69.087	61.568	12.821	12.39	12.271	12.127
145	2/7/1992 1:00	6.042	68.478	61.662	12.888	12.479	12.363	12.23
146	2/7/1992 2:00	6.083	68.367	62.17	12.951	12.558	12.441	12.316
147	2/7/1992 3:00	6.125	65.748	62.306	13.027	12.655	12.548	12.439
148	2/7/1992 4:00	6.167	63.251	62.898	13.096	12.739	12.64	12.545
149	2/7/1992 5:00	6.208	63.075	63.879	13.159	12.808	12.71	12.619
150	2/7/1992 6:00	6.250	63.231	64.986	13.216	12.869	12.771	12.684
151	2/7/1992 7:00	6.292	63.353	66.084	13.27	12.926	12.827	12.743
152	2/7/1992 8:00	6.333	63.365	67.142	13.322	12.981	12.883	12.801
153	2/7/1992 9:00	6.375	63.507	68.34	13.378	13.04	12.941	12.861
154	2/7/1992 10:00	6.417	63.252	69.81	13.443	13.107	13.008	12.932
155	2/7/1992 11:00	6.458	62.255	71.678	13.519	13.184	13.087	13.018
156	2/7/1992 12:00	6.500	60.4	73.534	13.599	13.266	13.175	13.113
157	2/7/1992 13:00	6.542	58.692	75.074	13.675	13.347	13.262	13.206
158	2/7/1992 14:00	6.583	57.582	76.365	13.745	13.423	13.341	13.289
159	2/7/1992 15:00	6.625	56.986	77.501	13.808	13.491	13.41	13.362
160	2/7/1992 16:00	6.667	56.949	78.539	13.862	13.549	13.469	13.422
161	2/7/1992 17:00	6.708	57.331	79.49	13.909	13.598	13.518	13.472
162	2/7/1992 18:00	6.750	58.049	80.36	13.948	13.639	13.557	13.511
163	2/7/1992 19:00	6.792	59.14	81.138	13.981	13.674	13.589	13.542
164	2/7/1992 20:00	6.833	60.178	81.805	14.01	13.703	13.616	13.567
165	2/7/1992 21:00	6.875	61.255	82.387	14.035	13.729	13.638	13.589
166	2/7/1992 22:00	6.917	62.342	82.89	14.056	13.751	13.657	13.606
167	2/7/1992 23:00	6.958	63.297	83.295	14.074	13.77	13.674	13.622
168	2/8/1992 0:00	7.000	64.206	83.627	14.091	13.788	13.689	13.636
169	2/8/1992 1:00	7.042	65.108	83.899	14.106	13.804	13.702	13.648
170	2/8/1992 2:00	7.083	66.036	84.122	14.119	13.818	13.713	13.658
171	2/8/1992 3:00	7.125	67.036	84.307	14.129	13.829	13.722	13.665

							N-11-B	S_Outfall
			100-Year Flow (cfs)		100-Year Water Surface Elev. (feet, NAVD88)			
Ordinate	Date/Time	Time Step (day)	Conduit 1308 (Node 11547 to 1103)	Conduit 13535 (Node 11551 to 11548)	Node 11551	Node 11548	Node 11547	Node 1103
172	2/8/1992 4:00	7.167	67.93	84.442	14.139	13.84	13.729	13.671
173	2/8/1992 5:00	7.208	68.516	84.472	14.148	13.851	13.738	13.68
174	2/8/1992 6:00	7.250	69.178	84.464	14.157	13.861	13.747	13.687
175	2/8/1992 7:00	7.292	69.97	84.505	14.164	13.87	13.753	13.692
176	2/8/1992 8:00	7.333	70.633	84.394	14.17	13.878	13.758	13.697
177	2/8/1992 9:00	7.375	71.104	84.288	14.176	13.886	13.765	13.703
178	2/8/1992 10:00	7.417	71.693	84.24	14.182	13.893	13.77	13.707
179	2/8/1992 11:00	7.458	72.399	84.135	14.186	13.899	13.774	13.71
180	2/8/1992 12:00	7.500	72.9	83.926	14.19	13.905	13.778	13.713
181	2/8/1992 13:00	7.542	74.538	83.95	14.193	13.908	13.776	13.708
182	2/8/1992 14:00	7.583	77.551	83.947	14.188	13.903	13.76	13.685
183	2/8/1992 15:00	7.625	79.926	83.822	14.187	13.903	13.75	13.671
184	2/8/1992 16:00	7.667	83.929	83.666	14.187	13.903	13.735	13.647
185	2/8/1992 17:00	7.708	87.382	83.535	14.187	13.904	13.722	13.626
186	2/8/1992 18:00	7.750	89.417	83.452	14.184	13.902	13.711	13.609
187	2/8/1992 19:00	7.792	90.694	83.372	14.181	13.899	13.702	13.598
188	2/8/1992 20:00	7.833	91.472	83.294	14.179	13.897	13.697	13.59
189	2/8/1992 21:00	7.875	91.913	83.232	14.178	13.896	13.694	13.586
190	2/8/1992 22:00	7.917	92.098	83.245	14.18	13.898	13.695	13.587
191	2/8/1992 23:00	7.958	92.051	83.421	14.185	13.903	13.7	13.592
192	2/9/1992 0:00	8.000	90.814	83.563	14.195	13.913	13.715	13.611
193	2/9/1992 1:00	8.042	88.812	83.756	14.207	13.926	13.737	13.639
194	2/9/1992 2:00	8.083	85.383	83.917	14.22	13.941	13.765	13.676
195	2/9/1992 3:00	8.125	81.741	84.159	14.229	13.95	13.789	13.709
196	2/9/1992 4:00	8.167	79.293	84.275	14.241	13.963	13.812	13.737
197	2/9/1992 5:00	8.208	77.646	84.322	14.253	13.977	13.832	13.761
198	2/9/1992 6:00	8.250	76.462	84.358	14.265	13.991	13.85	13.782
199	2/9/1992 7:00	8.292	76.499	84.455	14.274	14.002	13.862	13.794
200	2/9/1992 8:00	8.333	77.661	84.569	14.279	14.006	13.862	13.792
201	2/9/1992 9:00	8.375	78.72	84.628	14.283	14.011	13.863	13.791
202	2/9/1992 10:00	8.417	79.606	84.633	14.287	14.016	13.865	13.791
203	2/9/1992 11:00	8.458	80.339	84.594	14.291	14.021	13.867	13.792
204	2/9/1992 12:00	8.500	82.784	84.587	14.293	14.023	13.859	13.779
205	2/9/1992 13:00	8.542	84.721	84.492	14.296	14.027	13.856	13.772
206	2/9/1992 14:00	8.583	86.191	84.369	14.298	14.031	13.853	13.766
207	2/9/1992 15:00	8.625	86.966	84.282	14.3	14.034	13.853	13.764
208	2/9/1992 16:00	8.667	87.181	84.134	14.301	14.036	13.855	13.766
209	2/9/1992 17:00	8.708	87.67	83.972	14.302	14.038	13.854	13.764
210	2/9/1992 18:00	8.750	88.282	83.837	14.302	14.039	13.853	13.761
211	2/9/1992 19:00	8.792	88.916	83.671	14.301	14.039	13.85	13.757
212	2/9/1992 20:00	8.833	89.561	83.512	14.3	14.038	13.847	13.752
213	2/9/1992 21:00	8.875	90.18	83.348	14.298	14.037	13.843	13.747
214	2/9/1992 22:00	8.917	91.828	83.269	14.293	14.031	13.83	13.73
215	2/9/1992 23:00	8.958	92.989	83.179	14.287	14.025	13.819	13.716
216	2/10/1992 0:00	9.000	93.851	83.069	14.282	14.02	13.81	13.704
217	2/10/1992 1:00	9.042	94.498	82.914	14.276	14.014	13.801	13.694
218	2/10/1992 2:00	9.083	95.074	82.759	14.271	14.009	13.793	13.684

							N-11-B	S_Outfall
			100-Year Flow (cfs)		100-Year Water Surface Elev. (feet, NAVD88)			
Ordinate	Date/Time	Time Step (day)	Conduit 1308 (Node 11547 to 1103)	Conduit 13535 (Node 11551 to 11548)	Node 11551	Node 11548	Node 11547	Node 1103
219	2/10/1992 3:00	9.125	95.561	82.591	14.265	14.003	13.785	13.674
220	2/10/1992 4:00	9.167	96.15	82.437	14.258	13.996	13.776	13.663
221	2/10/1992 5:00	9.208	96.747	82.278	14.251	13.989	13.765	13.65
222	2/10/1992 6:00	9.250	97.369	82.143	14.243	13.98	13.755	13.637
223	2/10/1992 7:00	9.292	97.958	81.983	14.235	13.972	13.743	13.623
224	2/10/1992 8:00	9.333	98.522	81.827	14.226	13.963	13.731	13.609
225	2/10/1992 9:00	9.375	99.057	81.667	14.217	13.953	13.719	13.595
226	2/10/1992 10:00	9.417	99.554	81.501	14.208	13.943	13.707	13.581
227	2/10/1992 11:00	9.458	100.043	81.333	14.198	13.933	13.694	13.566
228	2/10/1992 12:00	9.500	100.52	81.163	14.188	13.922	13.682	13.551
229	2/10/1992 13:00	9.542	100.982	80.991	14.178	13.911	13.668	13.536
230	2/10/1992 14:00	9.583	101.428	80.815	14.167	13.9	13.655	13.52
231	2/10/1992 15:00	9.625	101.829	80.631	14.157	13.888	13.641	13.504
232	2/10/1992 16:00	9.667	102.112	80.426	14.146	13.877	13.628	13.49
233	2/10/1992 17:00	9.708	102.262	80.199	14.136	13.866	13.617	13.477
234	2/10/1992 18:00	9.750	102.428	79.993	14.126	13.856	13.606	13.465
235	2/10/1992 19:00	9.792	102.64	79.827	14.117	13.846	13.595	13.452
236	2/10/1992 20:00	9.833	102.816	79.742	14.108	13.837	13.585	13.441
237	2/10/1992 21:00	9.875	102.641	79.683	14.104	13.832	13.58	13.436
238	2/10/1992 22:00	9.917	101.73	79.525	14.106	13.835	13.587	13.446
239	2/10/1992 23:00	9.958	100.567	79.384	14.11	13.841	13.598	13.462
240	2/11/1992 0:00	10.000	98.744	79.09	14.119	13.854	13.62	13.49
241	2/11/1992 1:00	10.042	97.354	78.87	14.127	13.865	13.637	13.513
242	2/11/1992 2:00	10.083	96.362	78.738	14.132	13.872	13.649	13.527
243	2/11/1992 3:00	10.125	95.509	78.583	14.135	13.876	13.658	13.539
244	2/11/1992 4:00	10.167	94.784	78.437	14.137	13.879	13.664	13.548
245	2/11/1992 5:00	10.208	94.237	78.296	14.137	13.881	13.669	13.554
246	2/11/1992 6:00	10.250	94.171	78.214	14.136	13.88	13.669	13.554
247	2/11/1992 7:00	10.292	94.583	78.187	14.131	13.875	13.661	13.544
248	2/11/1992 8:00	10.333	95.015	78.155	14.125	13.868	13.653	13.534
249	2/11/1992 9:00	10.375	95.333	78.076	14.119	13.861	13.644	13.525
250	2/11/1992 10:00	10.417	95.528	77.966	14.113	13.855	13.637	13.517
251	2/11/1992 11:00	10.458	95.658	77.833	14.108	13.849	13.631	13.51
252	2/11/1992 12:00	10.500	95.782	77.681	14.101	13.843	13.624	13.502
253	2/11/1992 13:00	10.542	95.887	77.522	14.095	13.837	13.617	13.494
254	2/11/1992 14:00	10.583	95.97	77.314	14.088	13.83	13.61	13.486
255	2/11/1992 15:00	10.625	96.135	77.177	14.081	13.822	13.602	13.477
256	2/11/1992 16:00	10.667	96.26	76.987	14.073	13.815	13.594	13.468
257	2/11/1992 17:00	10.708	97.047	76.909	14.063	13.803	13.579	13.45
258	2/11/1992 18:00	10.750	97.73	76.827	14.051	13.789	13.562	13.43
259	2/11/1992 19:00	10.792	98.217	76.672	14.039	13.776	13.546	13.412
260	2/11/1992 20:00	10.833	98.669	76.564	14.028	13.764	13.532	13.395
261	2/11/1992 21:00	10.875	99.18	76.419	14.015	13.75	13.516	13.376
262	2/11/1992 22:00	10.917	99.671	76.274	14.002	13.736	13.499	13.357
263	2/11/1992 23:00	10.958	100.134	76.14	13.989	13.721	13.482	13.337
264	2/12/1992 0:00	11.000	100.57	75.972	13.976	13.706	13.465	13.318
265	2/12/1992 1:00	11.042	100.898	75.783	13.962	13.691	13.448	13.299

							N-11-B	S_Outfall
			100-Year Flow (cfs)		100-Year Water Surface Elev. (feet, NAVD88)			
Ordinate	Date/Time	Time Step (day)	Conduit 1308 (Node 11547 to 1103)	Conduit 13535 (Node 11551 to 11548)	Node 11551	Node 11548	Node 11547	Node 1103
266	2/12/1992 2:00	11.083	101.087	75.542	13.949	13.677	13.433	13.281
267	2/12/1992 3:00	11.125	101.248	75.336	13.936	13.663	13.419	13.265
268	2/12/1992 4:00	11.167	101.305	75.077	13.923	13.649	13.405	13.25
269	2/12/1992 5:00	11.208	101.337	74.796	13.91	13.636	13.391	13.235
270	2/12/1992 6:00	11.250	101.347	74.521	13.897	13.622	13.377	13.22
271	2/12/1992 7:00	11.292	101.457	74.247	13.883	13.608	13.362	13.203
272	2/12/1992 8:00	11.333	101.721	73.983	13.868	13.592	13.345	13.184
273	2/12/1992 9:00	11.375	101.817	73.697	13.852	13.575	13.327	13.164
274	2/12/1992 10:00	11.417	101.97	73.46	13.836	13.558	13.31	13.144
275	2/12/1992 11:00	11.458	102.064	73.156	13.82	13.541	13.293	13.125
276	2/12/1992 12:00	11.500	102.142	72.833	13.804	13.525	13.276	13.106
277	2/12/1992 13:00	11.542	102.225	72.516	13.788	13.508	13.259	13.087
278	2/12/1992 14:00	11.583	102.299	72.184	13.772	13.49	13.241	13.067
279	2/12/1992 15:00	11.625	102.358	71.83	13.755	13.473	13.223	13.047
280	2/12/1992 16:00	11.667	102.403	71.471	13.737	13.455	13.205	13.027
281	2/12/1992 17:00	11.708	102.409	71.086	13.72	13.437	13.187	13.007
282	2/12/1992 18:00	11.750	102.402	70.695	13.702	13.419	13.169	12.987
283	2/12/1992 19:00	11.792	102.644	70.337	13.683	13.398	13.147	12.962
284	2/12/1992 20:00	11.833	102.84	69.976	13.663	13.377	13.125	12.937
285	2/12/1992 21:00	11.875	102.989	69.571	13.643	13.356	13.103	12.912
286	2/12/1992 22:00	11.917	103.151	69.156	13.622	13.334	13.081	12.886
287	2/12/1992 23:00	11.958	103.261	68.718	13.601	13.312	13.058	12.86
288	2/13/1992 0:00	12.000	103.242	68.209	13.58	13.292	13.038	12.838
289	2/13/1992 1:00	12.042	103.294	67.68	13.56	13.271	13.017	12.814
290	2/13/1992 2:00	12.083	103.291	67.188	13.537	13.248	12.994	12.789
291	2/13/1992 3:00	12.125	102.871	66.748	13.512	13.221	12.969	12.762
292	2/13/1992 4:00	12.167	102.286	66.242	13.486	13.194	12.945	12.737
293	2/13/1992 5:00	12.208	101.387	65.661	13.461	13.168	12.923	12.717
294	2/13/1992 6:00	12.250	100.57	65.065	13.434	13.141	12.9	12.694
295	2/13/1992 7:00	12.292	99.832	64.478	13.405	13.112	12.875	12.668
296	2/13/1992 8:00	12.333	99.072	63.867	13.375	13.08	12.846	12.639
297	2/13/1992 9:00	12.375	98.137	63.199	13.344	13.048	12.819	12.612
298	2/13/1992 10:00	12.417	97.305	62.485	13.312	13.016	12.791	12.584
299	2/13/1992 11:00	12.458	96.316	61.746	13.276	12.979	12.759	12.552
300	2/13/1992 12:00	12.500	95.104	60.893	13.241	12.944	12.729	12.524
301	2/13/1992 13:00	12.542	93.713	59.936	13.204	12.908	12.699	12.496
302	2/13/1992 14:00	12.583	92.211	58.88	13.166	12.872	12.67	12.47
303	2/13/1992 15:00	12.625	90.652	57.645	13.126	12.835	12.64	12.443
304	2/13/1992 16:00	12.667	89.171	56.308	13.084	12.797	12.608	12.414
305	2/13/1992 17:00	12.708	87.244	54.962	13.035	12.75	12.57	12.38
306	2/13/1992 18:00	12.750	85.088	53.503	12.981	12.7	12.529	12.343
307	2/13/1992 19:00	12.792	82.629	51.774	12.923	12.647	12.485	12.305
308	2/13/1992 20:00	12.833	79.586	49.599	12.854	12.587	12.437	12.265
309	2/13/1992 21:00	12.875	76.438	47.219	12.778	12.519	12.383	12.218
310	2/13/1992 22:00	12.917	76.286	46.122	12.67	12.4	12.266	12.088
311	2/13/1992 23:00	12.958	74.259	44.735	12.544	12.26	12.133	11.95
312	2/14/1992 0:00	13.000	70.87	42.92	12.392	12.092	11.979	11.793

Appendix E. XPSWMM Model Results

Appendix F. Survey and As-Built Data

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
03	Sac	5	32.2/32.7	3	62

REGISTERED CIVIL ENGINEER 5-22-15 DATE

PLANS APPROVAL DATE 6-1-15

REGISTERED PROFESSIONAL ENGINEER — ERIC NORMAN SOUZA No. 75706 Exp. 6-30-16 CIVIL — STATE OF CALIFORNIA

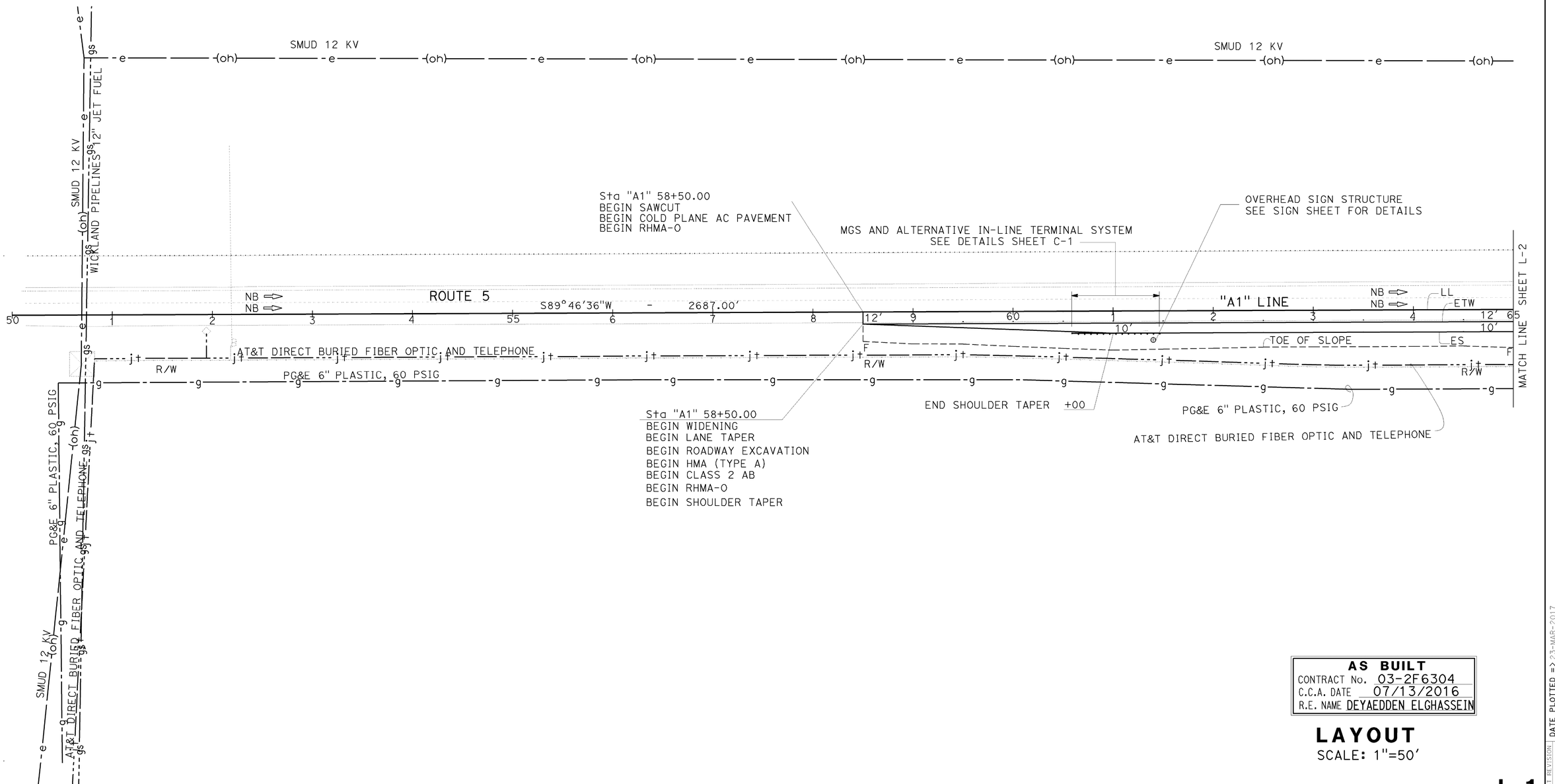
THE STATE OF CALIFORNIA OR ITS OFFICERS OR AGENTS SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF SCANNED COPIES OF THIS PLAN SHEET.

NOTES:

1. FOR ACCURATE RIGHT OF WAY DATA, CONTACT RIGHT OF WAY ENGINEERING AT THE DISTRICT OFFICE.
2. NOT ALL UTILITIES OUTSIDE OF THE STATE RIGHT OF WAY ARE SHOWN.
3. UTILITY OWNERSHIP:
   ELECTRIC - SACRAMENTO MUNICIPAL UTILITY DISTRICT (SMUD)
   FIBER OPTICS - AMERICAN TELEPHONE AND TELEGRAPH (AT&T)
   JET FUEL - WICKLAND PIPELINES
   GAS - PACIFIC GAS & ELECTRIC (PG&E)
   TELEPHONE - AMERICAN TELEPHONE AND TELEGRAPH (AT&T)
4. SB ROUTE 5 NOT SHOWN.

ABBREVIATIONS

LL LANE LINE



AS BUILT
CONTRACT No. 03-2F6304
C.C.A. DATE 07/13/2016
R.E. NAME DEYAEDDEN ELGHASSEIN

LAYOUT
SCALE: 1"=50'

L-1

A.G. CHIN	ERIC SOUZA	STEPHEN WRIGHT	STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION	TRAFFIC	Caltrans
CALCULATED-DESIGNED BY	CHECKED BY	FUNCTIONAL SUPERVISOR			

REVISED BY | DATE REVISED

LAST REVISION DATE PLOTTED => 23-MAR-2017
04-15-15 TIME PLOTTED => 15:21

BORDER LAST REVISED 7/2/2010 | USERNAME => s130875 | DGN FILE => 0313000316ea001.dgn | RELATIVE BORDER SCALE IS IN INCHES 0 1 2 3 | UNIT 0399 | PROJECT NUMBER & PHASE 03130003161

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
03	Sac	5	32.2/32.7	4	62

5-22-15
REGISTERED CIVIL ENGINEER DATE

6-1-15
PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER
ERIC NORMAN SOUZA
No. 75706
Exp. 6-30-16
CIVIL
STATE OF CALIFORNIA

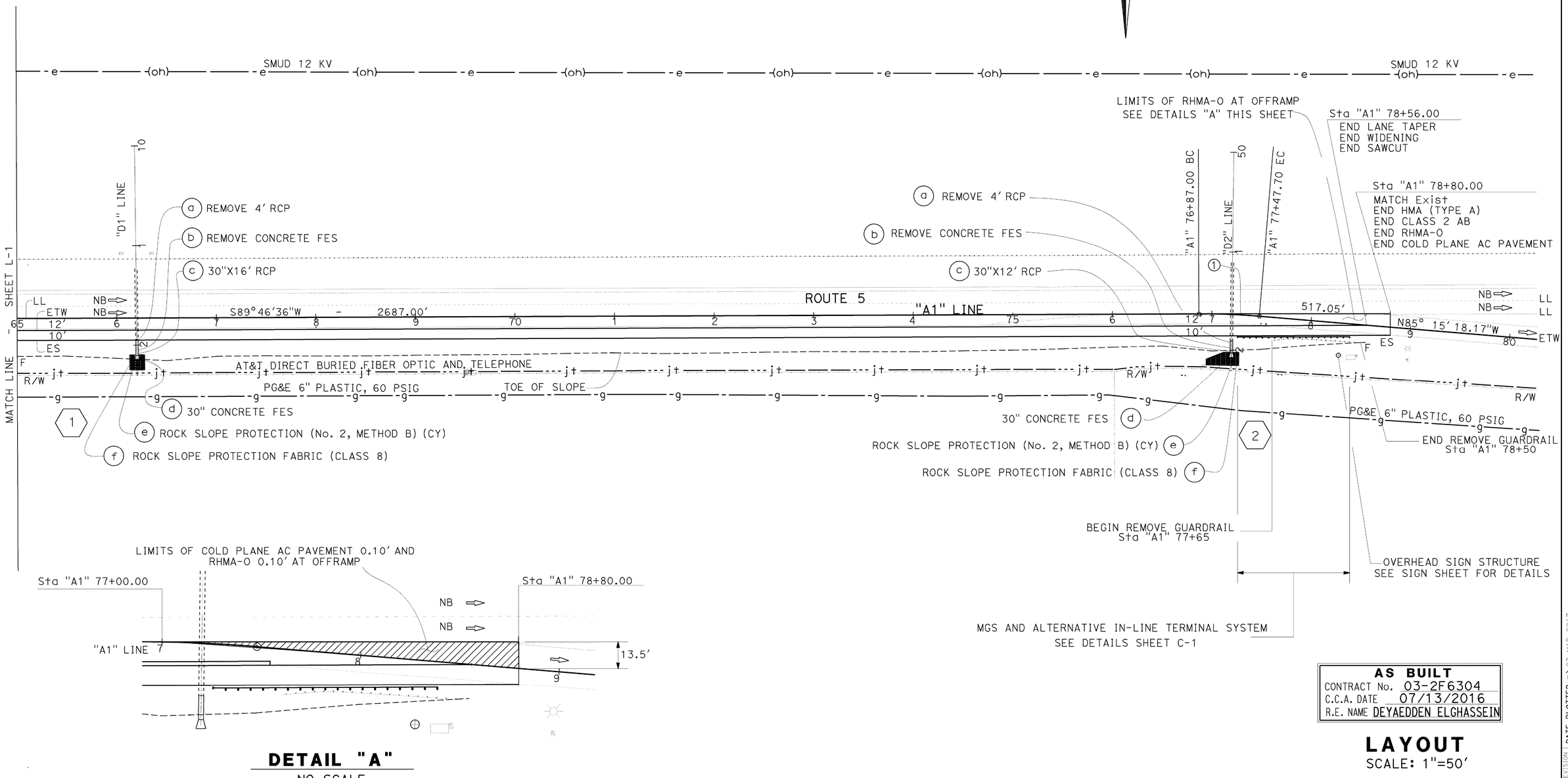
THE STATE OF CALIFORNIA OR ITS OFFICERS OR AGENTS SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF SCANNED COPIES OF THIS PLAN SHEET.

NOTES:

1. FOR ACCURATE RIGHT OF WAY DATA, CONTACT RIGHT OF WAY ENGINEERING AT THE DISTRICT OFFICE.
2. NOT ALL UTILITIES OUTSIDE OF THE STATE RIGHT OF WAY ARE SHOWN.
3. SOUTHBOUND ROUTE 5 NOT SHOWN.

CURVE DATA

No.	R	Δ	T	L
1	700′	04°58′06"	30.37′	60.70′



DETAIL "A"
NO SCALE

AS BUILT
CONTRACT No. 03-2F6304
C.C.A. DATE 07/13/2016
R.E. NAME DEYAEDDEN ELGHASSEIN

LAYOUT
SCALE: 1"=50′

L-2

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION
TRAFFIC
Caltrans
FUNCTIONAL SUPERVISOR: STEPHEN WRIGHT
CALCULATED-DESIGNED BY: A.G. CHIN
CHECKED BY: ERIC SOUZA
REVISED BY
DATE REVISED

LAST REVISION DATE PLOTTED => 23-MAR-2017
TIME PLOTTED => 15:21
11-07-14

BORDER LAST REVISED 7/2/2010
USERNAME => s130875
DGN FILE => 03130003161ea002.dgn
RELATIVE BORDER SCALE IS IN INCHES 0 1 2 3
UNIT 0399
PROJECT NUMBER & PHASE 03130003161

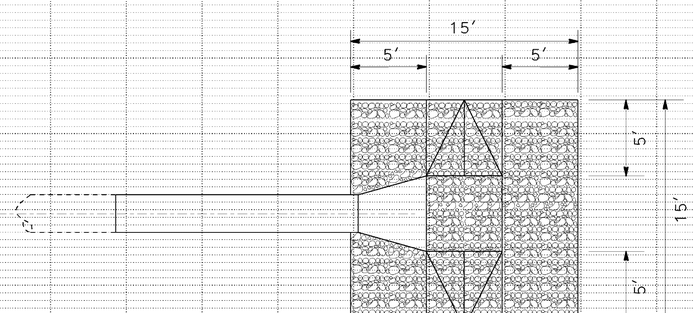
Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
03	Sac	5	32.2/32.7	9	62

5-22-15
REGISTERED CIVIL ENGINEER DATE

6-1-15
PLANS APPROVAL DATE

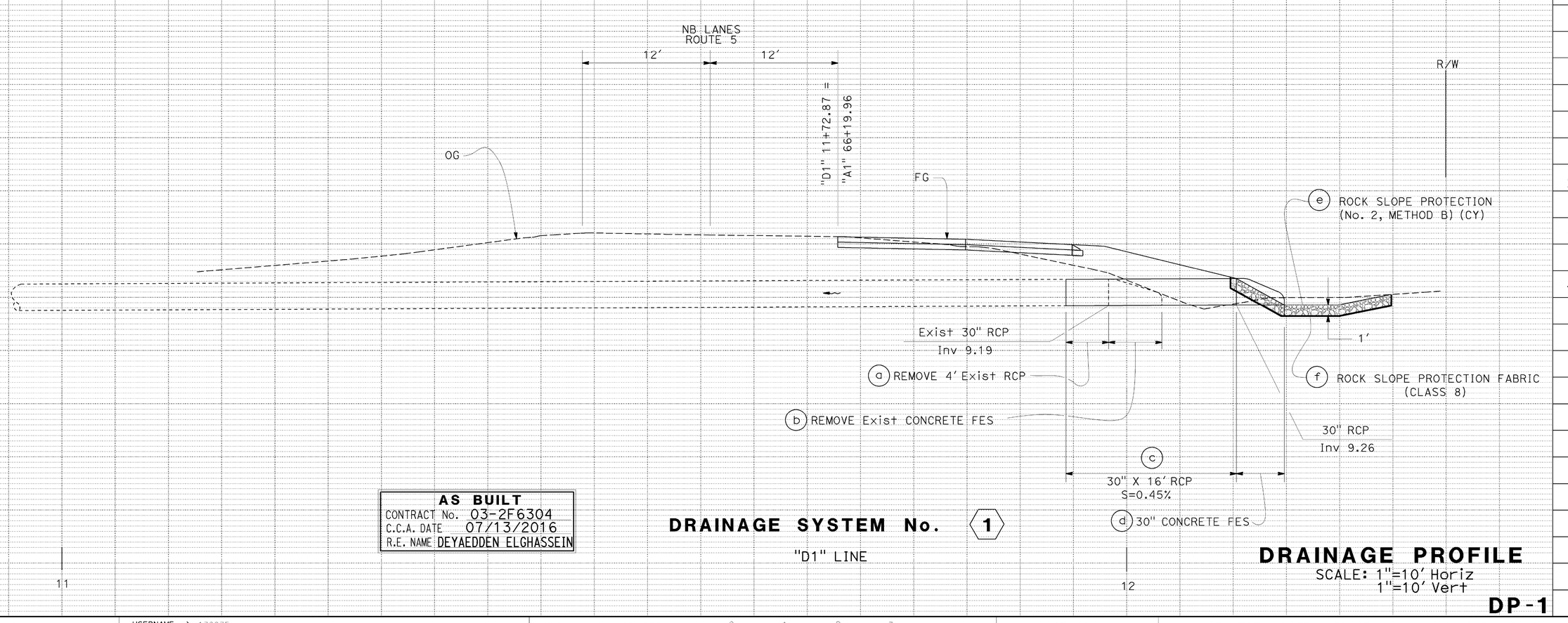
REGISTERED PROFESSIONAL ENGINEER
ERIC NORMAN SOUZA
No. 75706
Exp. 6-30-16
CIVIL
STATE OF CALIFORNIA

THE STATE OF CALIFORNIA OR ITS OFFICERS OR AGENTS SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF SCANNED COPIES OF THIS PLAN SHEET.



ROCK SLOPE PROTECTION PLAN DETAIL

NO SCALE



AS BUILT
CONTRACT No. 03-2F6304
C.C.A. DATE 07/13/2016
R.E. NAME DEYAEDDEN ELGHASSEIN

DRAINAGE SYSTEM No. 1

"D1" LINE

DRAINAGE PROFILE

SCALE: 1"=10' Horiz
1"=10' Vert

DP-1

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION
TRAFFIC
FUNCTIONAL SUPERVISOR: STEPHEN WRIGHT
CALCULATED-DESIGNED BY: A.G. CHIN
CHECKED BY: ERIC SOUZA
REVISED BY
DATE REVISED
Caltrans

LAST REVISION DATE PLOTTED => 23-MAR-2017
TIME PLOTTED => 15:21
10-27-14

BORDER LAST REVISED 7/2/2010
USERNAME => s130875
DGN FILE => 03130003161b001.dgn
RELATIVE BORDER SCALE IS IN INCHES 0 1 2 3
UNIT 0399
PROJECT NUMBER & PHASE 03130003161

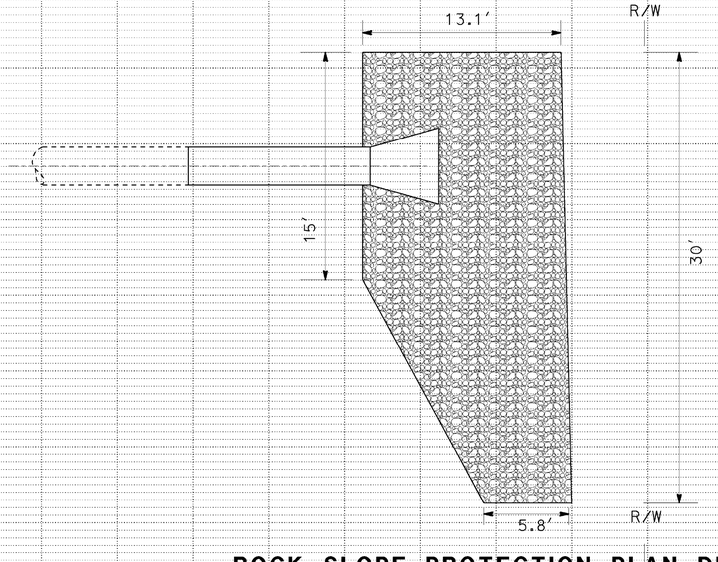
Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
03	Sac	5	32.2/32.7	10	62

5-22-15
REGISTERED CIVIL ENGINEER DATE

ERIC NORMAN SOUZA
No. 75706
Exp. 6-30-16
CIVIL
REGISTERED PROFESSIONAL ENGINEER
STATE OF CALIFORNIA

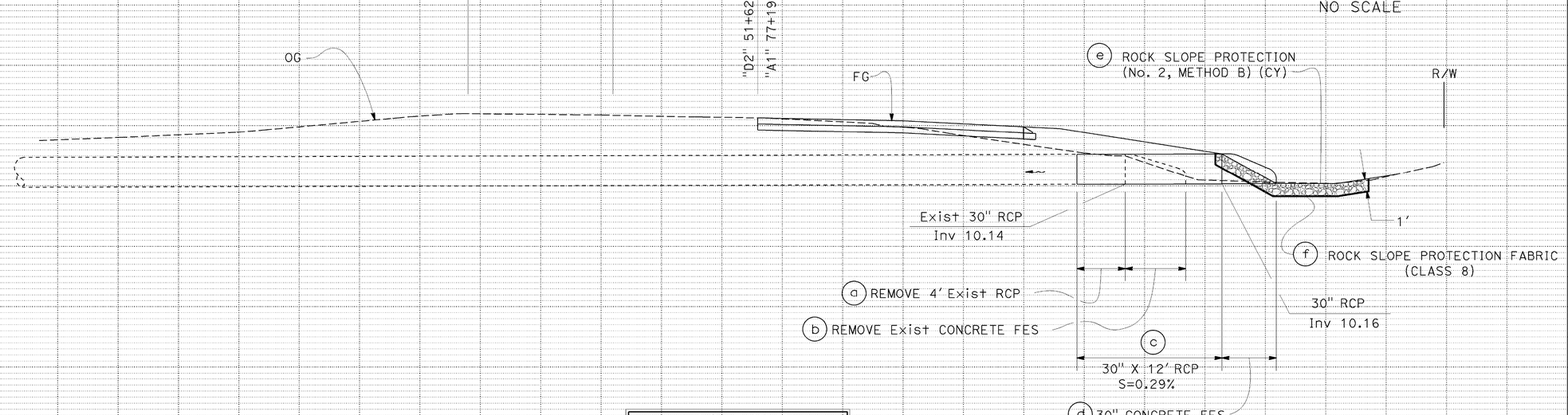
6-1-15
PLANS APPROVAL DATE

THE STATE OF CALIFORNIA OR ITS OFFICERS OR AGENTS SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF SCANNED COPIES OF THIS PLAN SHEET.



ROCK SLOPE PROTECTION PLAN DETAIL

NO SCALE



AS BUILT
CONTRACT No. 03-2F6304
C.C.A. DATE 07/13/2016
R.E. NAME DEYAEDDEN ELGHASSEIN

DRAINAGE SYSTEM No. 2

"D2" LINE

DRAINAGE PROFILE

SCALE: 1"=10' Horiz
1"=10' Vert

DP-2

51

52

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION
TRAFFIC
Caltrans
FUNCTIONAL SUPERVISOR: STEPHEN WRIGHT
CALCULATED-DESIGNED BY: A.G. CHIN
CHECKED BY: ERIC SOUZA
REVISED BY
DATE REVISED

LAST REVISION
DATE PLOTTED => 23-MAR-2017
TIME PLOTTED => 15:21
10-27-14

BORDER LAST REVISED 7/2/2010
USERNAME => s130875
DGN FILE => 03130003161b002.dgn
RELATIVE BORDER SCALE IS IN INCHES 0 1 2 3
UNIT 0399
PROJECT NUMBER & PHASE 03130003161

I-005-6(60)525

INDEX OF SHEETS

Sheet No.	1	Title Sheet
"	" 2-3	Typical Cross Sections
"	" 4	Standard Plans List
"	" 5-18	Plan and Profile
"	" 19-34	Roadside Rest Plans
"	" 35	Miscellaneous Details
"	" 36-37	Culvert List
"	" 38	Miscellaneous Lists
"	" 39-40	Superelevation Diagrams
"	" 41-53	Special Details
"	" 54-63	Lighting Plans
"	" 64-76	Sign Plans
"	" 77	Pavement Markers
"	" 78-90	Powerline Road O.C., Br.No. 24-221
"	" 91-103	Airport Blvd. O.C., Br.Nos. 24-239E & 24-240W
"	" 104	Barrier Railing Details Types 9,10,11,12
"	" 1-55	Cross Sections

STATE OF CALIFORNIA
TRANSPORTATION AGENCY
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

PROJECT PLANS FOR CONSTRUCTION ON STATE HIGHWAY

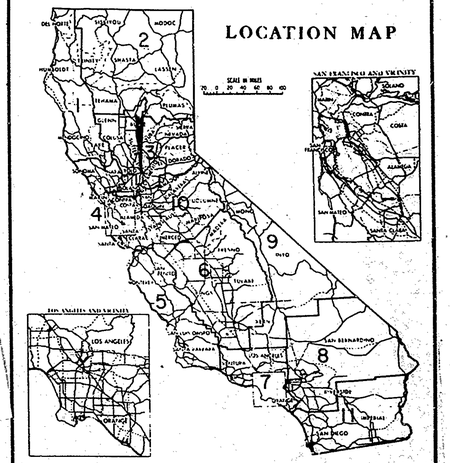
In Sacramento County between Route 99 in Sacramento and 0.5 mile east of Sacramento River near Elkhorn

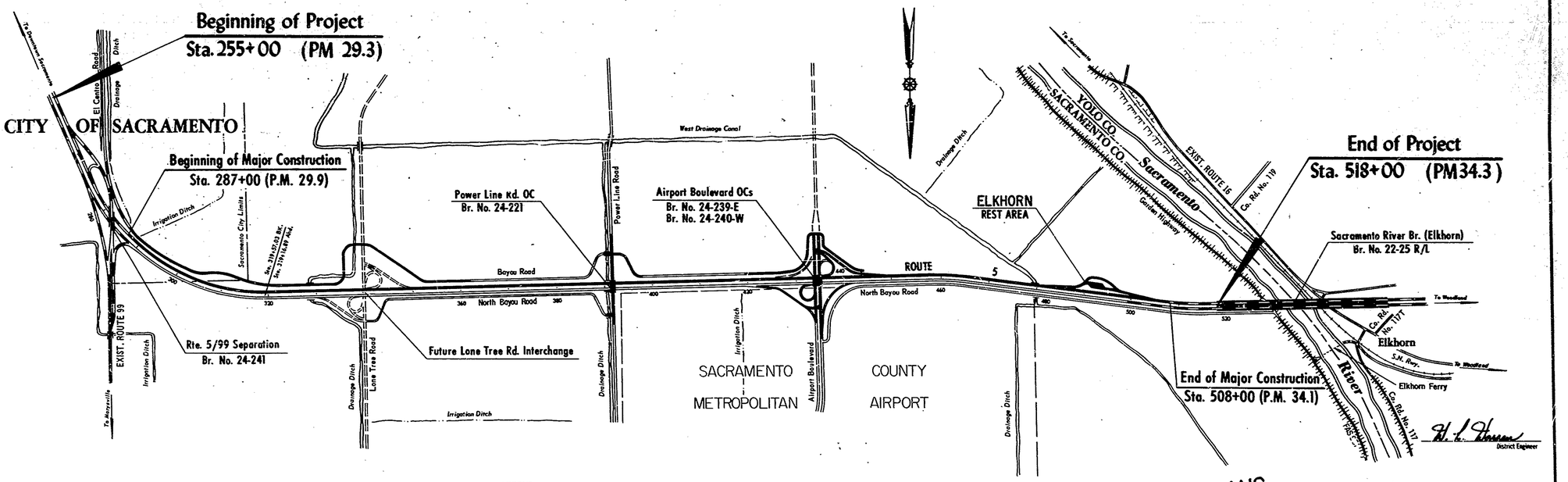
To be supplemented by Standard Plans dated November, 1966
being the detail plans of a portion of the route for the
State highway adopted by the California Highway Commission
May 24, 1961
FREEWAY
by resolution of the California Highway Commission
May 24, 1961

AS BUILT PLANS
Contract No. 03-100964
Date Completed 6-1969
Document No. 30000222

DIST.	COUNTY	ROUTE	POST MILE—TOTAL PROJECT	SHEET NO.	TOTAL SHEETS
03	Sac	5	293-343	1	104

LOCATION MAP





LEGEND
FUTURE CONSTRUCTION
HWY. UNDER CONSTRUCTION
PROPOSED CONSTRUCTION THIS PROJECT

SCALE IN FEET
1000 0 1000 2000

Length of Major Construction 4.2 Miles
Length of Project 5.0 Miles

W. L. Hanson
District Engineer

AS BUILT PLANS
CONTRACT NO. 03-100964
COMPLETED JUNE 1969
G.A. ELLIS, RES. ENG.

Approved February 13 1968
State Highway Engineer
Registered Civil Engineer No 5645

Samuel B. Nelson
Director of Public Works

Contract No. 03-100964

Project Engineer	Date	Design Engineer	Date	Approval Recommended By	Date

I-005-6(60)525

DESIGN DESIGNATION
ADT(1968)=19,950 D= 62 %
ADT(1988)=44,044 T= 5 %
DHV = 4,587 V=80 MPH

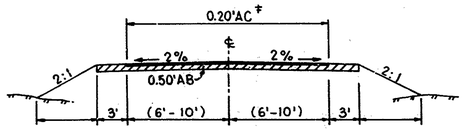
DIST.	COUNTY	ROUTE	POST MILES — TOTAL PROJECT	SHEET NO.	TOTAL SHEETS
03	SAC.	5	29.5 / 34.3	2	104

W. L. Warren
DISTRICT ENGINEER
DIST. 03

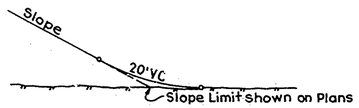
APPROVED February 13, 1968

J. A. LEGARRA
STATE HIGHWAY ENGINEER
REGISTERED CIVIL ENGINEER NO. 5049

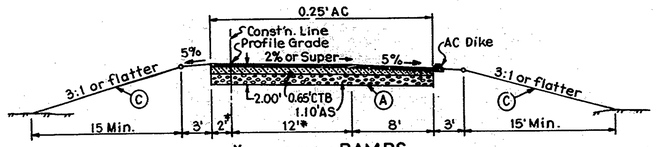
BY: Sam Helmer
DEPUTY STATE HIGHWAY ENGINEER
REGISTERED CIVIL ENGINEER NO. 9935



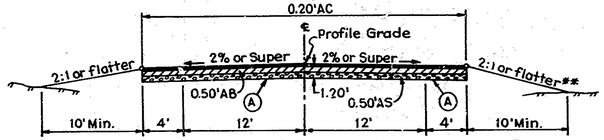
PRIVATE ROAD APPROACH
† 0.50'AB only, outside R/W



TOE OF SLOPE ROUNDING
To be used on all roads where side slopes are 3:1 or steeper except frontage roads & detours

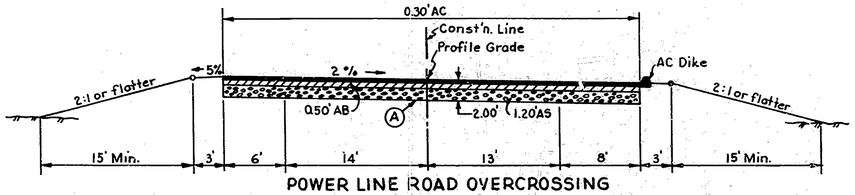


X4,5,6,8,9,&10 RAMPS
(AIRPORT INTERCHANGE)
* (X5 & X6 = 13')
† (X9 = 4')

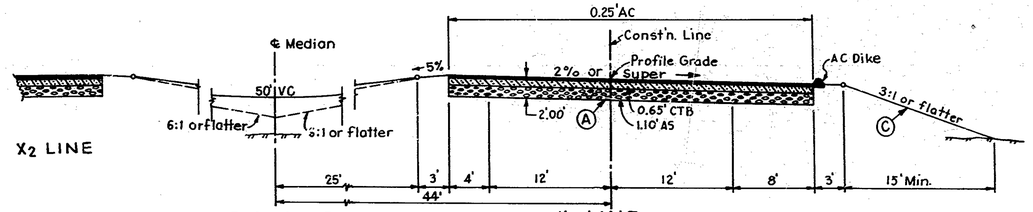


FRONTAGE ROADS & POWER LINE RD. DETOUR
F2,3,4,5,& 6

** See Outer Separation Typical Section below for Alternate of this Section



POWER LINE ROAD OVERCROSSING
W1 LINE



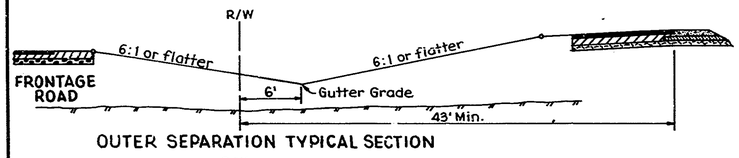
AIRPORT BLVD.
(HALF SECTION)

SYMBOLS & ABBREVIATIONS

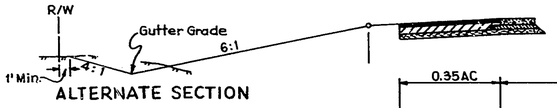
AC Asphalt Concrete (Type B)
AS Aggregate Subbase (Cl.1)
AB Aggregate Base (Cl.2)
CTB Cement Treated Base (Cl.B Plant Mixed)
PCCP Portland Cement Concrete Pav't.
LT Lime Treatment
Var. Variable
Const'n. Construction
℄ Center Line
Cl. Class
Rdwd. Redwood
Hinge Point Variable Slope
Original Ground Surface
Pav't. Pavement

NOTES

Dimensions are subject to the Tolerances specified in the Standard Specifications
AC Dike Type A required as shown on Plans (See Standard Plans for Detail)
(A) Same Slope as Traveled Way
(B) Extend CTB 1.0' Each Side of Traveled Way
(C) See 50 Scale Detail Plans for Variation in Slope Controls in Interchange Area.

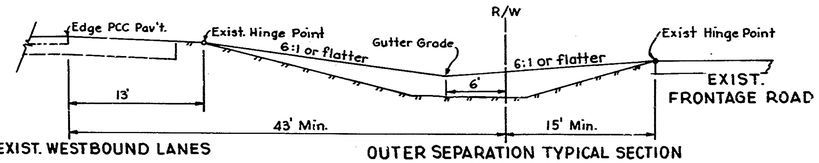


OUTER SEPARATION TYPICAL SECTION



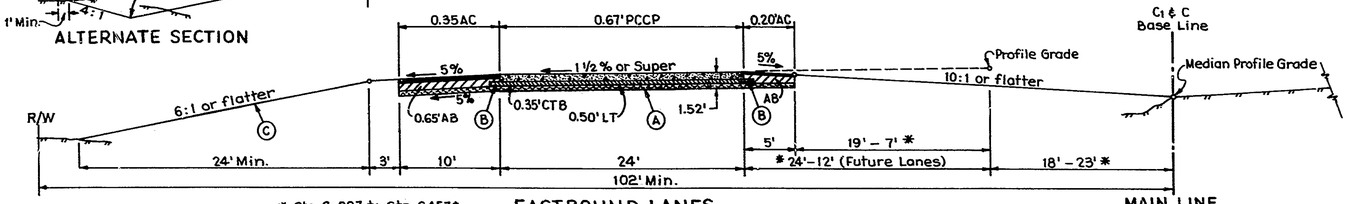
ALTERNATE SECTION

AS BUILT PLANS
Contract No. 03-100964
Date Completed 6-1969
Document No. 30000222



EXIST. WESTBOUND LANES

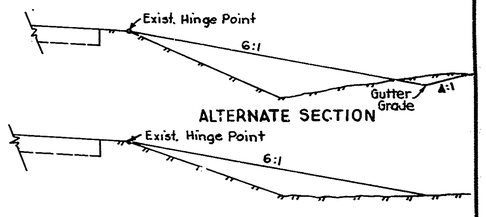
OUTER SEPARATION TYPICAL SECTION
Sta. C 345+80 to C 387+50



EASTBOUND LANES
MAIN LINE

Note:
Sta. C 457± to Sta. 466± Median Transitions and Profile Grade moves to Center of Traveled Way.

* Sta. C1 287 to Sta. C 457±
Ultimate 8 Lanes with 36' Median
Sta. C 466± to Sta. C 508
Ultimate 6 Lanes with 46' Median



ALTERNATE SECTION

EXIST. WESTBOUND LANES
Sta. C1 293 to C1 320+50
Sta. C 326 to C 334

AS BUILT PLANS
Cont. No. 03-100964
Completed June 1969

03-SAC-5-P.M. 29.3/34.3
Between Near Rte 99 & Sacramento River Near Elkhorn

EQUATION
C1 319 + 57.03 EC BK =
C 319 + 16.89 P.O.T. AHD

TYPICAL CROSS SECTIONS

Scale: 1" = 6'

Project Engineer	Date	Design Engineer	Date	Approval Recommended By	Date
D. A. BISHOP R. P. ADAMS	11-67	L. E. CHRISTMAN	11-67	C. D. HAMMA	11-67

03209 100961

FORM HD-76-PF

2

(A)

I-005-6(60)525

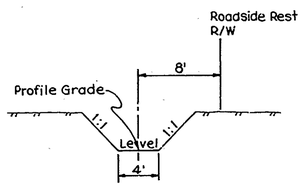
DIST.	COUNTY	ROUTE	POST MILES—TOTAL PROJECT	SHEET NO.	TOTAL SHEETS
03	SAC	5	29.3 / 34.3	3	104

W. L. Warren
DISTRICT ENGINEER DIST. 03

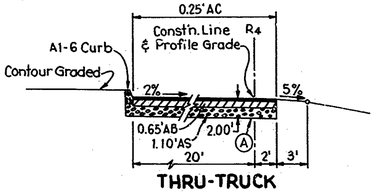
APPROVED February 13, 1968

J. A. LEGGARD
STATE HIGHWAY ENGINEER
REGISTERED CIVIL ENGINEER NO. 5645

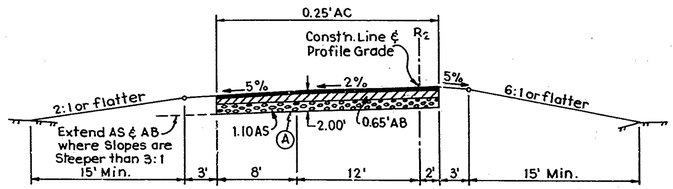
BY: Sam Helmer
DEPUTY STATE HIGHWAY ENGINEER
REGISTERED CIVIL ENGINEER NO. 6995



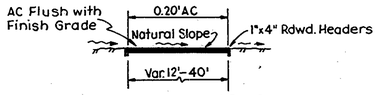
DRAINAGE DITCH
Lt. C 486 to Lt. C 498+40



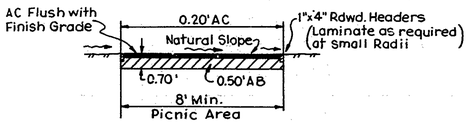
THRU-TRUCK



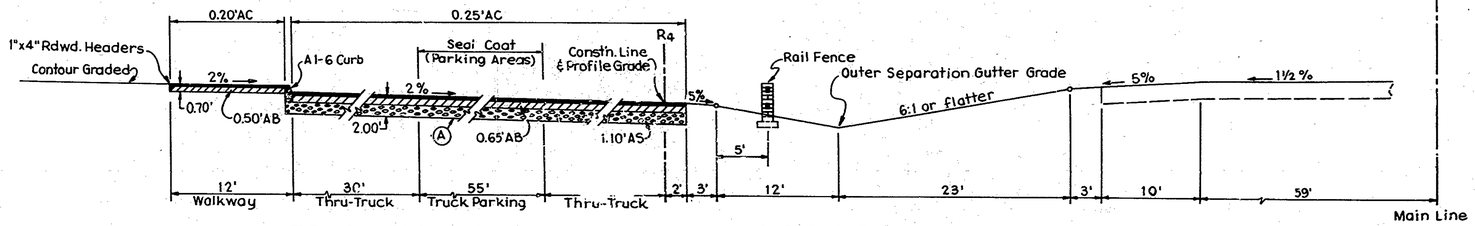
RAMP
R2 LINE



PICNIC TABLE APPROACH

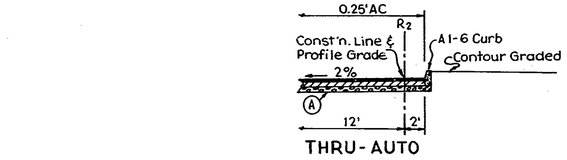


AC WALKWAYS
Scale: 1"=3'

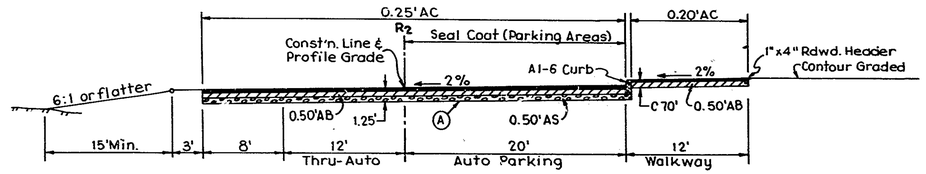


TRUCK PARKING
R4 LINE

OUTER SEPARATION

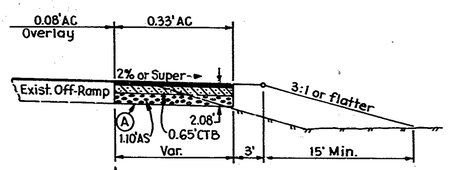


THRU-AUTO

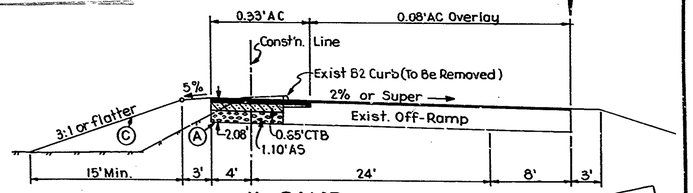


AUTO PARKING & THRU ROAD
R2 LINE

AS BUILT PLANS
Contract No. 03-100964
Date Completed 6-1969
Document No. 30000222



ALTERNATE SECTION
Sta. X31 33+00 ± to Sta. X31 37+80±



X31 RAMP
AIRPORT INTERCHANGE
Sta. X31 25+60 ± to Sta. X31 33+00 ±

AS BUILT PLANS
Cont. No. 03-100964
Completed June 1969

ELKHORN ROADSIDE REST
03-SAC-5-29.3/34.3
Between Near Rte. 99 & Sacramento River near Elkhorn

TYPICAL CROSS SECTIONS

Scale: 1"=6' (Except as Shown)

Project Engineer	Date	Design Engineer	Date	Approval Recommended By	Date
D.A. BISHOP R.P. ADAMS	11-67	L.E. CHRISTMAN	11-67	C. D. HAMMA	11-67

REVISED LTR 1-25-68

03209 100961 Rev. 1-18-68

3

B

D.W. Bishop R.P. Adams L.E. Christman K. Meier A.C. Stacy

DISTRICT	COUNTY	ROUTE	Post Miles - Total Project	SHEET NO.	TOTAL SHEETS
03	Sac	5	29.9/34.3	4	184

To accompany plans dated February 13, 1968

GENERAL ROAD WORK

- ☐ A35-6 P.C.C. Paving Details.
- ■ A62-A.1 Excavation and Backfill - Limits of payment (Miscellaneous)
- ☐ A62-B.1 Excavation and Backfill - Limits of payment (Bridges and Walls)
- ☐ A62-C.1 Excavation and Backfill - Limits of payment (Culvert, Pipe and Arch)
- ☐ A73-5 Timber Barricades, Raised Traffic Bars and Dikes.
- ☐ A74-12 Monuments and Markers.
- ☐ A76-A.1 Cable Barrier.
- ☐ A76-B.1 Cable Barrier.
- ☐ A77-A.1 Metal Beam Guard Railing and Metal Beam Barrier.
- ☐ A77-B.1 Metal Beam Guard Railing and Metal Beam Barrier.
- ■ A78-2 Fences.
- ☐ A79-A Guard Rail Flares.
- ☐ A79-B Exit Gore Installations.
- ☐ A80-1 Emergency Passageways.
- ☐ A81-3 Obstruction Deflectors and Metal Beam Barrier Transitions.
- ☐ A82 Cattle Guards (Metal).
- ☐ A83 Loadometer Scale Pit.
- ☐ C7-2 Reinforced Concrete Crib Wall.
- ☐ C8-A.1 Metal Crib Wall (Design Data)
- ☐ C8-B Metal Crib Wall (Construction Details)
- ☐ C9-1 Timber Crib Walls.
- ☐ D72-5 Storm Drain Inlets - OS, OL, GOL.
- ■ D73-6 Storm Drain Inlets - G1, G2, G3, G4, G5, G6.
- ☐ D74-6 Storm Drain Inlets - GT1, GT2, GT3, GT4, GO, GDO.
- ☐ D75-5 Pipe Drop Inlets - GMP, OMP, GCP, OCP.
- ☐ D76-5 Pipe Drop Inlets at Pumping Installations GMPI, OMPI, GCPI, OCPI.
- ■ D77-7 Grate Details.
- ☐ D78 Gutter Depressions.
- ☐ D79-1 Pipe Inlet Depressions.
- ☐ D80 Single Box Culverts.
- ☐ D81 Double Box Culverts.
- ☐ D82 Triple Box Culverts.
- ☐ D83-2 Box Culvert Miscellaneous Details.
- ☐ D84-1 Culvert Headwalls, Types "A" "B" & "C"
- ☐ D85-1 Culvert Headwalls, Types "D" & "E"
- ☐ D86 Reinforced Concrete Warped Wing Headwalls and Endwalls.
- ■ D87-A Underdrains and Overside Drains.
- ☐ D87-B Underdrains.
- ☐ D88 Construction Loads on Culverts.
- ■ D89-1 Pipe Headwalls and Strut Details.
- ☐ D90-1 Pipe Culvert Headwalls, Types "A" "B" & "C"
- ☐ D91 Special Single Box Culverts and Equipment Passes.
- ☐ D92 Special Double Box Culvert.
- ☐ D93-3 Storm Drain Risers Connections.
- ■ D94 Flared End Sections.
- ☐ D95 Concrete Arch Culverts
- ☐ D96 Pipe Riser with Debris Rack Cage.
- ☐ FSI-1 Federal Construction Identification Signs.
- ■ N8-3 Curbs and Driveways.
- ☐ N9 Pedestrian Walkway Approach to Bridge Sidewalk.

BRIDGE

- ☐ B1-11 Closure Wall Details - Box Girder.
- ■ B2-1 Concrete Pile Details.
- ☐ B3-1 Retaining Wall - Type I
- ☐ B3-2 Retaining Wall - Type I
- ☐ B3-3 Retaining Wall - Type I-A
- ☐ B3-4 Retaining Wall - Type 2
- ☐ B3-5 Counterfort Retaining Wall - Type 3
- ☐ B3-6 Counterfort Retaining Wall - Type 4
- ☐ B3-7 Retaining Wall - Type 5
- ☐ B3-8 Retaining Wall Details No. I
- ☐ B3-9 Retaining Wall Details No. 2
- ☐ B3-11 Retaining Wall Type 6 - 6' Max.
- ☐ B3-15 Wingwalls - Spread Footing.
- ☐ B3-16 Wingwalls - Pile Footing.
- ☐ B6-1 T-Beam Details No. I
- ☐ B6-19 T-Beam Hinge Detail, Elastomeric.
- ☐ B6-20 Steel Hinge Details, T-Beam.
- ■ B7-1 Box Girder Details No. I
- ☐ B7-3 Box Girder Hinge Detail, Elastomeric.
- ☐ B7-11 Utilities Detail No. 2
- ☐ B7-20 Steel Hinge Detail, Box Girder.
- ☐ B9-1 Steel Girder Details.
- ☐ B9-2 Drain Details.
- ☐ B9-3 Deck Drain, Type C.
- ☐ B9-4 Drain & Details, Type D-1
- ☐ B9-5 Drain & Details, Type D-2
- ☐ B11-0 Barrier Railing, Type I.
- ☐ B11-1 Barrier Railing, Type 2, 4 & 5.
- ☐ B11-2 Barrier Railing Details for Types 1, 2, 4 & 5.
- ☐ B11-3 Barrier Railing, Type 6.
- ☐ B11-4 Pipe Railing.
- ☐ B11-5 Picket Railing.
- ☐ B11-7 Chain Link Railing.
- ☐ B11-8 Chain Link Sidewalk Railing, Type 3.
- ☐ B11-9 Chain Link Sidewalk Railing, Type 4.
- ☐ B11-20 Mesh Median Barrier.
- ☐ B11-28 Chain Link Sidewalk Railing, Type 3L
- ☐ B11-30 Temporary Railings.
- ☐ B13-1 Embankment Protection Detail No. I.
- ☐ B13-2 Embankment Protection Detail No. 2
- ☐ B13-3 Expansion Joint Armor Detail.
- ☐ B13-4 Timber Detour Bridge.

SIGNS, SIGNALS & LIGHTING

- ☐ S1-7 Overhead Signs, Instructions and Examples.
- ☐ S2-6 Overhead Signs, Single Post Type, Post Type II thru VIII.
- ☐ S3-6 Overhead Signs, Two Post Type, Post Type I-S thru VII-S.
- ☐ S4-3 Overhead Signs, Single Post Type, Structural Frame Members.
- ☐ S5-3 Overhead Signs, Two Post Type, Structural Frame Members.
- ☐ S6-5 Overhead Signs, Structural Frame Details.
- ☐ S7-4 Overhead Signs, Frame Juncture Details.
- ☐ S8-6 Overhead Signs, Removable Sign Panel Frames.
- ☐ S9-7 Overhead Signs, Walkway Details.
- ☐ S10-5 Overhead Signs, Walkway Details No. 2.
- ☐ S11-6 Overhead Signs, Walkway Safety Railing Details.
- ☐ S12-5 Overhead Signs, Walkway-Mounted Ballast Box.
- ☐ S13-3 Overhead Signs, Alternate Pile Foundation.
- ☐ S14-2 Balanced Lightweight Signs (Single Steel Post), Post Foundation and Mounting Details.
- ☐ S15-3 Lightweight Signs, Type A, Connection Details.
- ☐ S16-3 Lightweight Signs, Type B, Connection Details.
- ☐ S17-3 Lightweight Signs, Type C, Connection Details.
- ☐ S18-2 Lightweight Signs (Laminated Panel) Sign Panel Mounting Detail.
- ☐ S19-4 Lightweight Signs (Framed Sheet Metal) Sign Panel Mounting Detail.
- ☐ S20-1 Lightweight Signs, Foundations.
- ☐ S42-7 Typical Installation Details, Roadside Signs Max. L = 15', Wood Post.
- ☐ S43-6 Roadside Signs, Post and Pole Details.
- ☐ S44-2 Roadside Signs, Typical Mounting Hardware.
- ■ S45-2 Minor Roadside Signs, Typical Location Details.

- ■ ES-1-3 Traffic Signal and Highway Lighting Installations, Detail No. 1.
- ☐ ES-2A-2 Traffic Signal and Highway Lighting Installations, Detail No. 2A.
- ☐ ES-2B-2 Traffic Signal and Highway Lighting Installations, Detail No. 2B.
- ■ ES-3A-1 Traffic Signal and Highway Lighting Installations, Detail No. 3A.
- ■ ES-3B-8 Traffic Signal and Highway Lighting Installations, Detail No. 3B.
- ■ ES-4-3 Traffic Signal and Highway Lighting Installations, Detail No. 4.
- ☐ ES-6-5 Traffic Signal and Lighting Standards, Types II, II-a, III, III-a, X, X-a & XIV, Details No. 6.
- ☐ ES-7A-3 Electrical Details, Bridge Sheet 1.
- ■ ES-7B-1 Electrical Details, Bridge Sheet 2.
- ☐ ES-8-9 Fluorescent Sign Lighting Equipment.
- ☐ ES-9 Cantilever Advance Flashing Beacon Installation.
- ☐ ES-11 Typical Electrolier Foundation Details No. 11.
- ☐ ES-12 Pedestrian Undercrossing Fluorescent Lighting Fixture.
- ☐ ES-13-1 Traffic Signal and Lighting Standards, Types XV, XVI and XVII.
- ☐ ES-14-2 Traffic Signal and Lighting Standards, Types XVIII and XIX.
- ☐ ES-15-3 Pedestrian Overcrossing Fluorescent Light Fixture.
- ☐ ES-16-1 Fluorescent Sign Lighting Equipment.
- ☐ ES-17 Lighting Standard, Type XXI.

SAFETY ROADSIDE REST

- ☐ PS-A-1 Picnic Shelter, Architectural Detail.
- ☐ PS-S-1 Picnic Shelter, Structural Detail.
- ☐ PT-1 Picnic Table.
- ☐ PT-2 Picnic Table.

AS BUILT PLANS
Contract No. 03-100964
Date Completed 6-1969
Document No. 30000222

AS BUILT PLANS
Cont. No. 03-100964
Completed June 1969

STATE OF CALIFORNIA
TRANSPORTATION AGENCY
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

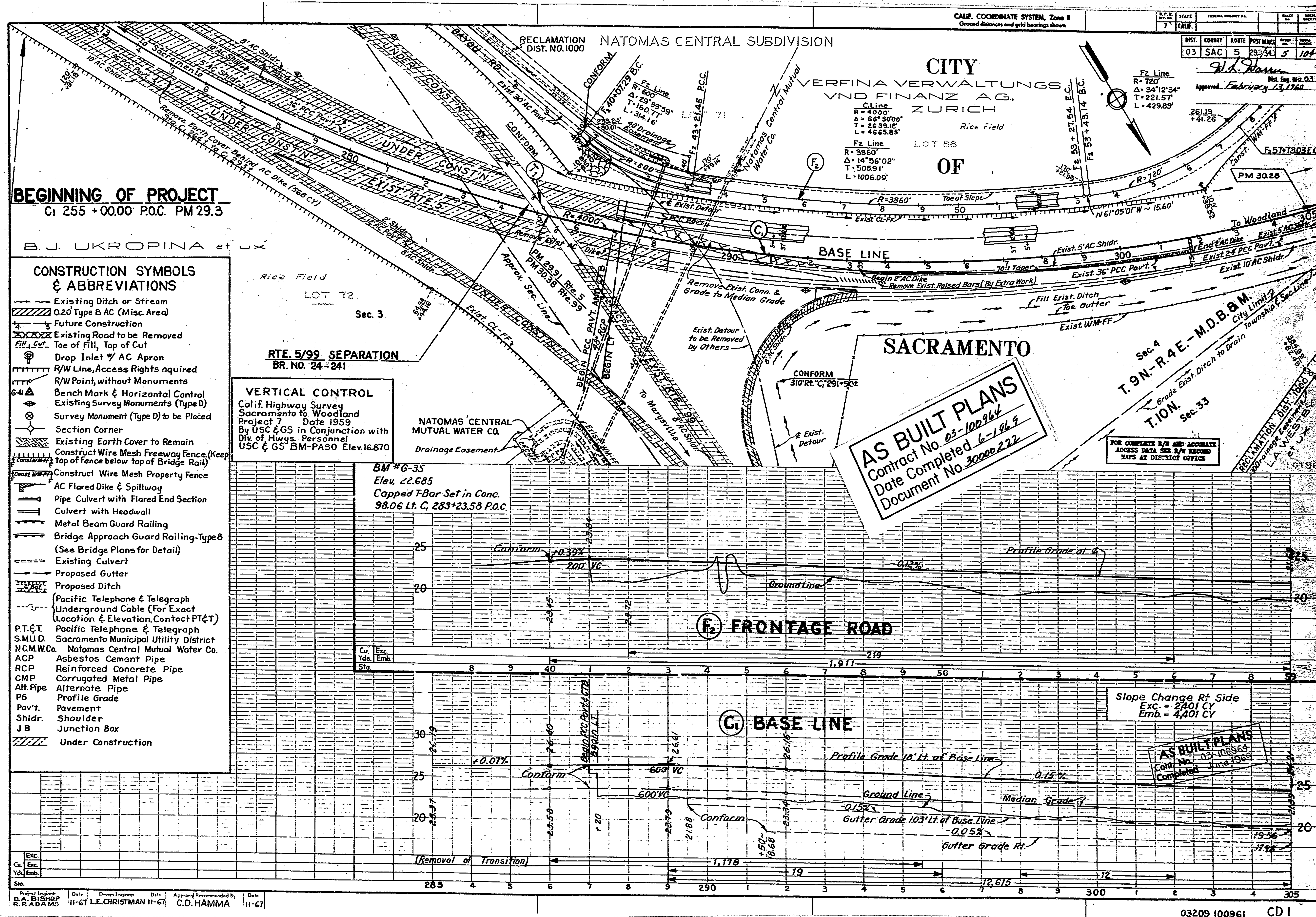
STANDARD PLANS LIST

The Standard Plan sheets indicated hereon are applicable to this contract.

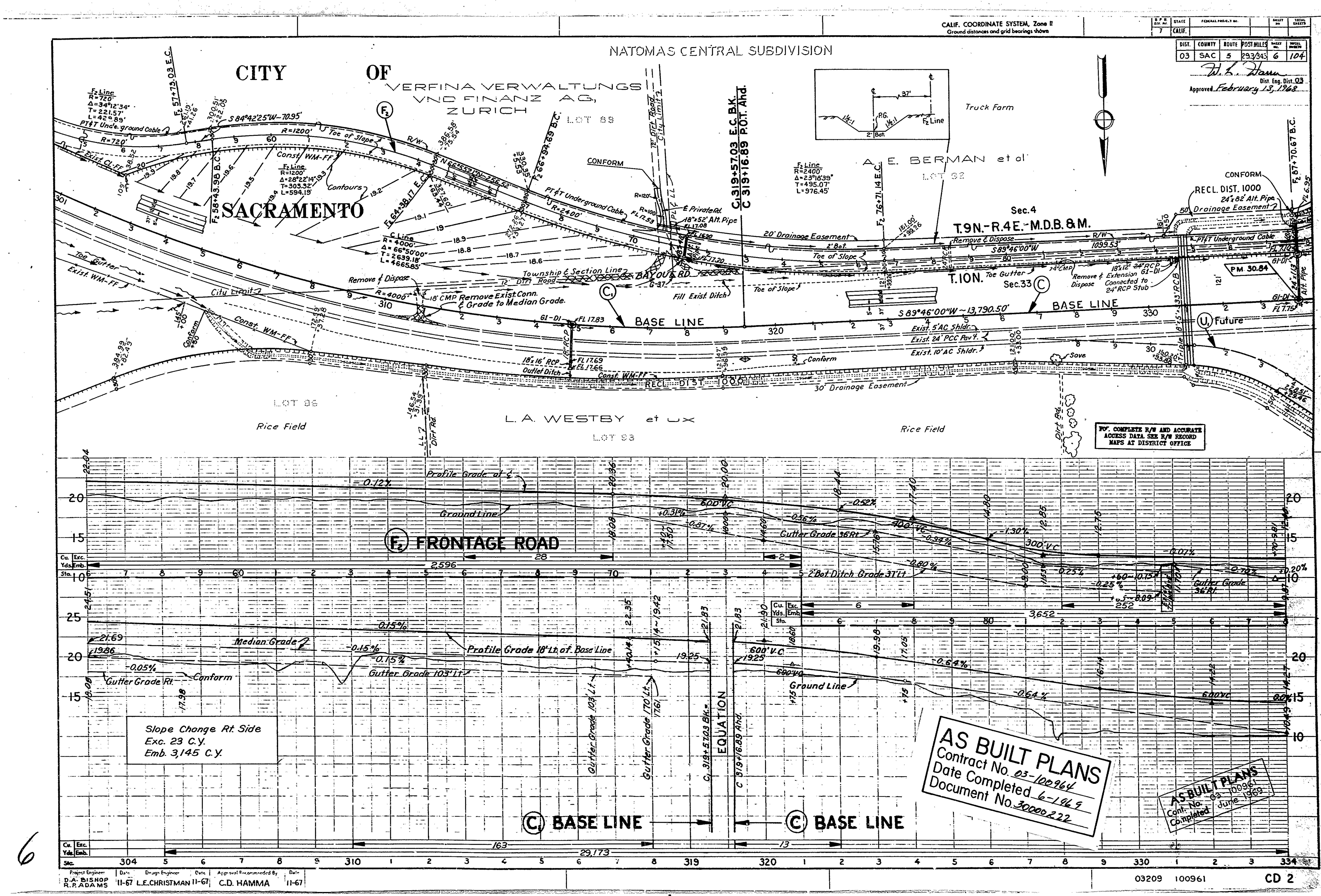
CONTRACT NO. 03-100964

4

Form H-0105


CALIF. COORDINATE SYSTEM, Zone II
Ground distances and grid bearings shown
7 CALIF.
DIST. 03 COUNTY SAC ROUTE 5 POST MILES 29.3/34.3 SHEET 5 TOTAL 104
Approved February 13, 1968
Dist. Eng. Dist. 03
BEGINNING OF PROJECT
C1 255 +00.00 P.O.C. PM 29.3
B.J. UKROPINA et ux
RECLAMATION DIST. NO. 1000
NATOMAS CENTRAL SUBDIVISION
CITY OF SACRAMENTO
VERFINA VERWALTUNGS VND FINANZ AG., ZURICH
Rice Field
LOT 71
LOT 72
LOT 88
Sec. 3
Sec. 4
Sec. 33
T. 9 N.-R. 4 E.-M.D.B.&M.
T. 10 N.
C1 Line R = 4000' Δ = 66°50'00" T = 2639.18' L = 4665.85'
F2 Line R = 3860' Δ = 14°56'02" T = 505.91' L = 1006.09'
F2 Line R = 600' Δ = 29°59'59" T = 160.77' L = 314.16'
F2 Line R = 720' Δ = 34°12'34" T = 221.57' L = 429.89'
F2 40+07.29 B.C.
F2 43+21.45 P.C.C.
F2 53+27.54 E.C.
F2 53+43.14 B.C.
F2 57+73.03 E.C.
PM 30.28
PM 29.91 Rte. 5
PM 30.38 Rte. 99
To Sacramento
To Woodland
To Marysville
BASE LINE
UNDER CONST'N.
EXIST. RTE. 5
EXIST. RTE. 99
BAYOU RD.
CONFORM
CONFORM 310' Rt. "C1" 291+50±
Remove Earth Cover Behind AC Dike (568 CY) Sta. C1 264± to C1 293±
Remove Exist. Conn. & Grade to Median Grade
Exist. Detour to be Removed by Others
Remove Exist. Raised Bars (By Extra Work)
Begin 2' AC Dike
End 2' AC Dike
Fill Exist. Ditch
Toe Gutter
Exist. WM-FF
Grade Exist. Ditch to Drain
City Limit
Township & Sec. Line
Approx. Sec. Line
N 61°05'01" W ~ 15.60'
RTE. 5/99 SEPARATION
BR. NO. 24-241
NATOMAS CENTRAL MUTUAL WATER CO.
Drainage Easement
RECLAMATION DIST. 1000
30' Drainage Easement
L.A. WESTBY et ux
LOT 96
FOR COMPLETE R/W AND ACCURATE ACCESS DATA SEE R/W RECORD MAPS AT DISTRICT OFFICE
CONSTRUCTION SYMBOLS & ABBREVIATIONS
Existing Ditch or Stream
0.20' Type B AC (Misc. Area)
Future Construction
Existing Road to be Removed
Toe of Fill, Top of Cut
Drop Inlet w/ AC Apron
R/W Line, Access Rights aquired
R/W Point, without Monuments
Bench Mark & Horizontal Control
Existing Survey Monuments (Type D)
Survey Monument (Type D) to be Placed
Section Corner
Existing Earth Cover to Remain
Construct Wire Mesh Freeway Fence (Keep top of Fence below top of Bridge Rail)
Construct Wire Mesh Property Fence
AC Flared Dike & Spillway
Pipe Culvert with Flared End Section
Culvert with Headwall
Metal Beam Guard Railing
Bridge Approach Guard Railing-Type 8 (See Bridge Plans for Detail)
Existing Culvert
Proposed Gutter
Proposed Ditch
Pacific Telephone & Telegraph Underground Cable (For Exact Location & Elevation, Contact PT&T)
P.T.&T. Pacific Telephone & Telegraph
S.M.U.D. Sacramento Municipal Utility District
N.C.M.W.Co. Natomas Central Mutual Water Co.
ACP Asbestos Cement Pipe
RCP Reinforced Concrete Pipe
CMP Corrugated Metal Pipe
Alt. Pipe Alternate Pipe
PG Profile Grade
Pav't. Pavement
Shldr. Shoulder
JB Junction Box
Under Construction
VERTICAL CONTROL
Calif. Highway Survey Sacramento to Woodland Project 7 Date 1959
By USC & GS in Conjunction with Div. of Hwys. Personnel
USC & GS BM-PASO Elev. 16.870
BM #G-35 Elev. 22.685 Capped T-Bar Set in Conc. 98.06 Lt. C1 283+23.58 P.O.C.
F2 FRONTAGE ROAD
Conform +0.39% 200' VC
0.12%
Profile Grade at ℄
Ground Line
C1 BASE LINE
Profile Grade 18' Lt. of Base Line
+0.07% 600' VC 0.15%
Ground Line -0.15%
Median Grade
Gutter Grade 103' Lt. of Base Line -0.05%
Gutter Grade Rt.
(Removal of Transition)
1,178
19
12,615
12
219
1,911
Slope Change Rt. Side Exc. = 2401 CY Emb. = 4,401 CY
AS BUILT PLANS Contract No. 03-100964 Date Completed 6-1969 Document No. 30000222
AS BUILT PLANS Cont. No. 03-100964 Completed June 1969
Project Engineer D.A. BISHOP R.P. ADAMS Date 11-67
Design Engineer L.E. CHRISTMAN Date 11-67
Approval Recommended By C.D. HAMMA Date 11-67
03209 100961 CD1

5


CALIF. COORDINATE SYSTEM, Zone II
Ground distances and grid bearings shown
B.P.R. DIV. NO. 7 STATE CALIF.
DIST. 03 COUNTY SAC ROUTE 5 POST MILES 29.3/34.3 SHEET NO. 6 TOTAL SHEETS 104
Dist. Eng. Dist. 03
Approved February 13, 1968
NATOMAS CENTRAL SUBDIVISION
CITY OF SACRAMENTO
VERFINA VERWALTUNGS VND FINANZ AG, ZURICH
LOT 89
A. E. BERMAN et al
LOT 92
L. A. WESTBY et ux
LOT 93
LOT 96
Rice Field
Truck Farm
Sec.4
T.9N.-R.4E.-M.D.B.&M.
T.10N.
Sec.33
BASE LINE
S 89°46'00"W ~ 13,790.50'
F2 Line R=720' Δ=34°12'34" T=221.57' L=429.89'
F2 Line R=1200' Δ=28°22'14" T=303.32' L=594.19'
C Line R=4000' Δ=66°50'00" T=2639.18' L=4665.85'
F2 Line R=2400' Δ=23°18'39" T=495.07' L=976.45'
C1 319+57.03 E.C. BK.
C 319+16.89 P.O.T. Ahd.
F2 57+73.03 E.C.
F2 58+43.98 B.C.
F2 64+38.17 E.C.
F2 66+94.69 B.C.
F2 76+71.14 E.C.
F2 87+70.67 B.C.
S 84°42'25"W-70.95'
N 66°55'21"W-256.52'
PT&T Underground Cable
Toe of Slope
Const. WM-FF
Exist. CL-FF
Exist. WM-FF
Toe Gutter
City Limit
Contours
Township & Section Line
12' Dirt Road
BAYOU RD
Remove & Dispose
18' CMP Remove Exist. Conn. & Grade to Median Grade.
G1-DI
FL 17.83
18"x16' RCP
Outlet Ditch
Fill Exist. Ditch
20' Drainage Easement
30' Drainage Easement
RECL. DIST. 1000
24"x82' Alt. Pipe
50' Drainage Easement
CONFORM
18"x52' Alt. Pipe
€ Private Rd.
Exist. 5' AC Shldr.
Exist. 24' PCC Pav't.
Exist. 10' AC Shldr.
Triple 8'x5'x133' RCB
U1 Future
PM 30.84
24"x113' Alt. Pipe
18"x12' 24" RCP G1-DI
Remove & Extension Connected to 24" RCP Stub
24" CMP
Save
Dirt Rd.
FOR COMPLETE R/W AND ACCURATE ACCESS DATA SEE R/W RECORD MAPS AT DISTRICT OFFICE
F2 FRONTAGE ROAD
Profile Grade at €
Ground Line
Gutter Grade 36' Rt.
2' Bot. Ditch Grade 31' Lt.
Median Grade
Profile Grade 18' Lt. of Base Line
Gutter Grade 103' Lt.
Gutter Grade 170' Lt.
Gutter Grade Rt.
Conform
EQUATION
C1 319+57.03 Bk. = C 319+16.89 Ahd.
Slope Change Rt. Side
Exc. 23 C.Y.
Emb. 3,145 C.Y.
C1 BASE LINE
C BASE LINE
2,596
28
29,173
163
13
3,652
252
AS BUILT PLANS
Contract No. 03-100964
Date Completed 6-1969
Document No. 30000222
AS BUILT PLANS
Cont. No. 03-100961
Completed June 1969
Project Engineer D.A. BISHOP R.P. ADAMS
Date 11-67
Design Engineer L.E. CHRISTMAN
Date 11-67
Approval Recommended By C.D. HAMMA
Date 11-67
03209 100961
CD 2
6

CALIF. COORDINATE SYSTEM, Zone II Ground distances and grid bearings shown							

DIST.	STATE	FEDERAL PROJECT NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
7	CALIF.				

DIST.	COUNTY	ROUTE	POST MILES	SHEET NO.	TOTAL SHEETS
03	SAC	5	29.3/34.3	7	104

W. L. Christman
CONTRACT ENGINEER
DIST 03

APPROVED February 13, 1968

AS BUILT PLANS
Contract No. 03-100964
Date Completed 6-1969
Document No. 30000222

NATOMAS CENTRAL SUBDIVISION

NATOMAS ELKHORN SUBDIVISION

A. E. BERMAN et al

LOT 92

LOT 1

AL NAHAS

LOT 2

LOT 3

LOT 4

L. A. WESTBY et ux

LOT 94

LOT 42

WILLIAM L. LINN

LOT 41

CHARLES M. BLUMFIELD et ux

LOT 40

HICOK & Co Inc

LOT 39

HAROLD C. LAUPPE

LOT 93

Rice Field

Pasture

Truck Farm

Sec. 4

Sec. 5

Sec. 32

Sec. 33

T.9N.-R4E-M.D.B.&M.

T.10N.

BASE LINE

LONE TREE ROAD

NORTH BAYOU RD.

Const. WM-FF

Fill Exist. Ditch & Grade to Drain

Fill Exist. Ditch

Exist. Toe Ditch

Toe Gutter

Toe of Slope

Pvt. Road & Canal R/W

Ditch Easement

Drainage Easement

Reclamation Dist. #1000 Drainage Easement

25' Irrigation Easement Natomas Central Mutual Water Co.

PT&T Underground Cable

Exist. 24' AC Pav't

Exist. 5' Ac Shldr.

Exist. 24' PCC Pav't

Exist. 16' AC Shldr.

Remove & Dispose Exist. Culvert

Remove Driveways

CONFORM

FOR COMPLETE R/W AND ACCURATE ACCESS DATA SEE R/W RECORD MAPS AT DISTRICT OFFICE

AS BUILT PLANS
Cont. No. 03-100963
Completed June 1969

LONE TREE ROAD INTERCHANGE (FUTURE)

Project Engineer	Date	Design Engineer	Date	Approval Recommended By	Date
R.A. BISHOP R.P. ADAMS	11-67	L.E. CHRISTMAN	11-67	C.D. HAMMA	11-67

03209 100961 CD 3

7

D.P.A. Gov. No.	STATE	FEDERAL PROJECT No.	FISCAL YEAR	SHEET No.	TOTAL SHEETS
7	CALIF.				

DIST.	COUNTY	ROUTE	POST MILES	SHEET No.	TOTAL SHEETS
03	SAC	5	27.2/29.3	8	104

W. L. Stanton
Dist. Eng. Dist. 03
Date Approved February 13, 1968

Filling Existing Ditch
Emb. 6091 C.Y.

AS BUILT PLANS
Contract No. 03-100964
Date Completed 6-1969
Document No. 300000222

Profile Grade at ℄ F
Ground Line
Conform
Ditch Grade 55' Lt.
Gutter Grade 12' Lt. ℄
Louise Tree Road
Ⓕ FRONTAGE ROAD

BM #G-38
El. 10.835'
Capped T Bar 1.0' Below OG
145.11' Lt. C 339+62.13 P.O.T.

Ⓒ BASE LINE
Outer Separation Rt.
Profile Grade 18' Lt. of Base Line
Median Grade
Gutter Grade 103' Rt. of Base Line

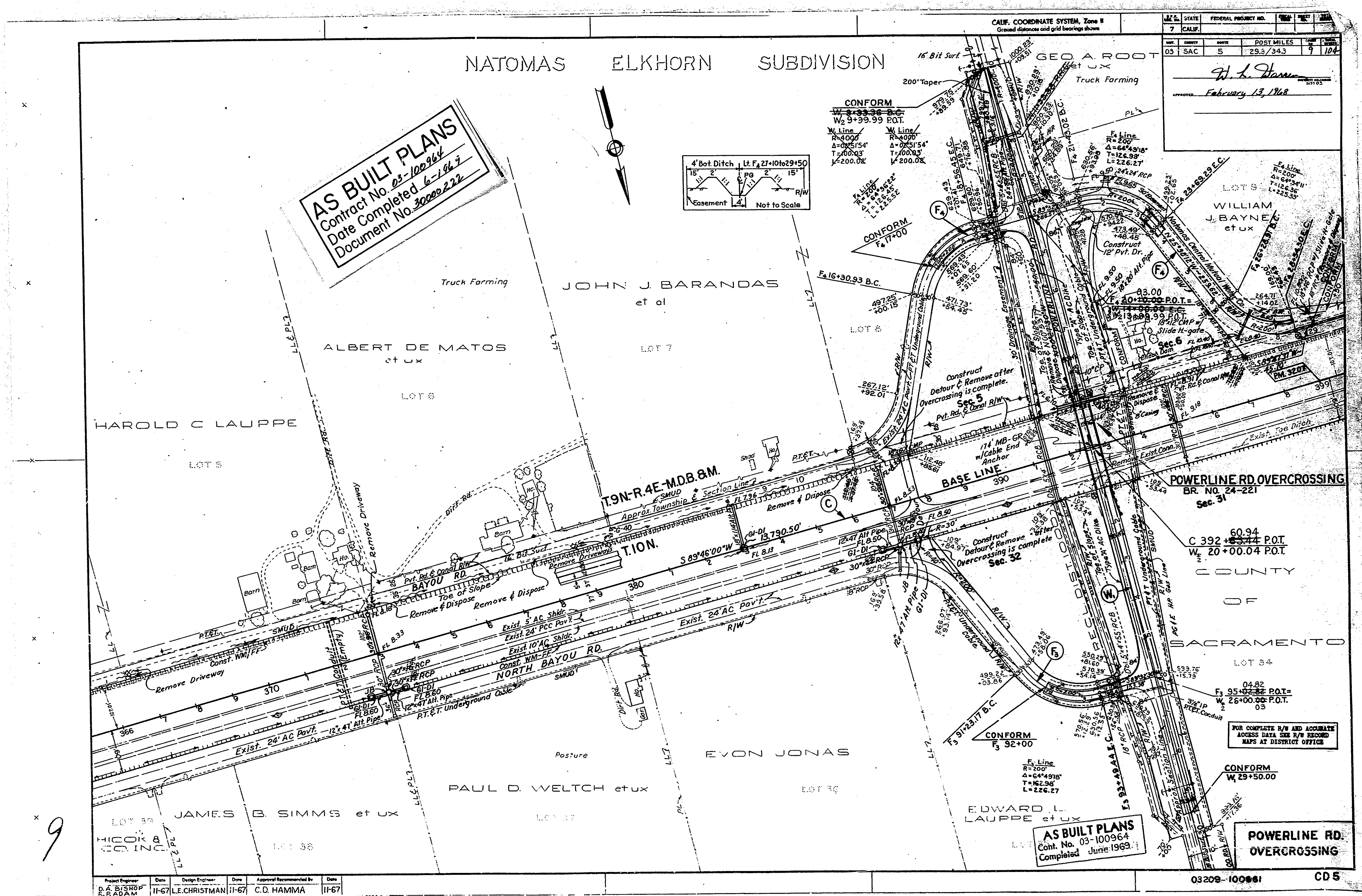
BM #G-39
El. 9.666'
Capped T Bar 1.0' Below OG
128.35' Lt. C 363+55.22 P.O.T.

AS BUILT PLANS
Cont. No. 03-160964
Completed June 1969

Project Engineer	Date	Design Engineer	Date	Approval Recommended By	Date
D.A. BISHOP R. RADAMS	11-67	L.E. CHRISTMAN	11-67	C. D. HAMMA	11-67

03209 100961 CD 4

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CALIF. COORDINATE SYSTEM, Zone II
Ground distances and grid bearings shown
7 CALIF.
03 SAC 5 29.3/34.3 9 104
February 13, 1968
NATOMAS ELKHORN SUBDIVISION
AS BUILT PLANS
Contract No. 03-100964
Date Completed 6-1969
Document No. 30000222
4' Bot. Ditch Lt. F4 27+10 to 29+50
Easement
Not to Scale
GEO. A. ROOT et ux
Truck Farming
CONFORM
W2 9+99.99 P.O.T.
CONFORM F4 17+00
F4 16+30.93 B.C.
JOHN J. BARANDAS et al
LOT 7
ALBERT DE MATOS et ux
LOT 6
HAROLD C LAUPPE
LOT 5
LOT 8
LOT 9
WILLIAM J. BAYNE et ux
Natomas Central Mutual Water Co.
Construct 12' Pvt. Dr.
F4 20+10.00 P.O.T. = W 13+99.99 P.O.T.
18"x12" CMP w/ Slide H-gate
Sec. 6
Sec. 5
Construct Detour & Remove after Overcrossing is complete.
Pvt. Rd. & Canal R/W
174' MB-GR w/Cable End Anchor
BASE LINE
390
399
P.M. 32.07
POWERLINE RD. OVERCROSSING
BR. NO. 24-221
Sec. 31
C 392+60.94 P.O.T.
W½ 20+00.04 P.O.T.
COUNTY OF SACRAMENTO
LOT 34
T.9N.-R.4E.-M.D.B.&M.
Approx. Township & Section Line
S 89°46'00"W 13,790.50'
Remove & Dispose
BAYOU RD.
NORTH BAYOU RD.
Exist. 24' AC Pav't.
Exist. 5' AC Shldr.
Exist. 24' PCC Pav't.
Exist. 10' AC Shldr.
Const. WM-FF
P.T.&T. Underground Cable
Remove Driveway
Remove Driveways
370
380
366
Construct Detour & Remove after Overcrossing is complete
Sec. 32
F3 95+04.82 P.O.T. = W½ 26+00.03 P.O.T.
F3 91+23.17 B.C.
CONFORM F3 92+00
F3 Line R=200' Δ=64°49'18" T=162.98' L=226.27
CONFORM W1 29+50.00
FOR COMPLETE R/W AND ACCURATE ACCESS DATA SEE R/W RECORD MAPS AT DISTRICT OFFICE
Posture
PAUL D. WELTCH et ux
EVON JONAS
JAMES B. SIMMS et ux
HICOK & CO. INC.
EDWARD L. LAUPPE et ux
AS BUILT PLANS
Cont. No. 03-100964
Completed June 1969
POWERLINE RD. OVERCROSSING
Project Engineer D.A. BISHOP R.P. ADAM Date 11-67
Design Engineer L.E. CHRISTMAN Date 11-67
Approval Recommended By C.D. HAMMA Date 11-67
03209-100961
CD 5
9

D.P.A. Div. No.	STATE	FEDERAL PROJECT No.	FISCAL YEAR	SHEET No.	TOTAL SHEETS
7	CALIF.				

DIST.	COUNTY	ROUTE	POST MILES	SHEET No.	TOTAL SHEETS
03	SAC	5	23.3/24.8	10	104

W. L. Warren
Dist. Eng. Dist 03
Date Approved February 13, 1968

AS BUILT PLANS
Contract No. 03-100964
Date Completed 6-1969
Document No. 30000222

POWERLINE RD. OVERCROSSING
BR. NO. 24-221

Profile Grade at Const. Line

Conform

Ground line

Lt. Gutter Profile

Rt. Gutter Profile

Ⓦ POWERLINE RD. OVERCROSSING
W2

Ⓒ BASE LINE

Ⓕ FRONTAGE RD.

Ⓡ FRONTAGE RD.

NATOMAS CENTRAL MUTUAL WATER CO. IRR. DITCH

Profile Grade at ℄

Ground line

℄ Rwy. Ditch

Profile Grade 18' Rt. of Base line

Median Grade

Gutter Grade 103' Rt of Base line

Ground line

(Outer Separation Rt.) 2,399

Removal of Exist. Conn. in Median

Removal of Exist. Conn. in Median

BM #G-40
El. 10.433'
Capped T-Bar 0.4 Below B.S.
138.05' Lt. C 379+82.28 P.O.T.

BM #G-41
El. 12.390'
Capped T-Bar 0.4' Below B.S.
138.74' Lt. C 292+40.97 P.O.T.

AS BUILT PLANS
Contract No. 03-100464
Completed June, 1969

Project Engineer	Date	Design Engineer	Date	Approval Recommended By	Date
D.A. BISHOP P.P. ADAMS	11-67	L.E. CHRISTMAN	11-67	C.D. HAMMA	11-67

03209 100961 CD 6

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CALIF. COORDINATE SYSTEM, Zone II
Ground distances and grid bearings shown

DIST.	COUNTY	ROUTE	POST MILE	SHEET NO.	TOTAL SHEETS
03	SAC	5	29.3/34.1	11	104

W. L. Warren
Dist. Eng. Dist. 03
Approved February 13, 1968

NATOMAS ELKHORN SUBDIVISION

FRANK V FRATES

WILLIAM J. BAYNE et ux

ADOLPH D. ANDERSON et ux

MANUEL J. BARANDAS et ux

Sec. 6

T. 9 N. - R. 4 E. - M.D.B. & M.

Sec. 31

COUNTY OF SACRAMENTO

Private Road & Canal R/W

Township & Section Line

BAYOU RD.

BASE LINE

S 89°46'00" W - 13790.50'

Exist. 5' AC Shldr.
Exist. 24' PCC Pav't.
Exist. 10' AC Shldr.

Exist. Toe Gutter

Const. WM-FF

Const. CL-FF

Remove Driveway

Remove & Dispose

Toe Ditch

Drain Ditch

12" x 12" Alt. Pipe

30" x 4' RCP

30" x 8' RCP

18" x 104 Alt. Pipe

Fa Line
R = 200'
Δ = 64°34'11"
T = 126.36'
L = 225.39'

Fs Line
R = 2000'
Δ = 04°40'11"
T = 81.55'
L = 163.00'

Fa 46+28.91 B.C.
Fa 28+54.30 E.C.
Fa 16+57.30 B.C.
Fa 18+20.30 E.C.

25' Irrigation Easement

¢ of Irr. Ditch Profile Grade

Not to Scale

Conform

See Detail Sht. CD 30

PM 32.62

Remove Temp. Conn. & Grade

N.C.M.W.Co. Irr. Ditch

LOT 29 · LOT 30 · LOT 31 · LOT 32 · LOT 33 · LOT 34

Truck Farming

FOR COMPLETE R/W AND ACCURATE ACCESS DATA SEE R/W RECORD MAPS AT DISTRICT OFFICE

REFERENCES — Sheet No.
50' Scale Contour Grading & Detail Plan CD-13

BM #C-42
Elev. 11.981
Copper T-Bar 0.3' Below B.S
136.27' Lt. ℄ 409+13.92

© BASE LINE

Profile Grade 18' Lt. of Base Line

Median Grade

Ground Line

+0.12% · +0.12% · 0.13% · +0.80% · -0.80% · 0.0% · +0.13% · 600' V.C.

Profile Grade at ℄ · +0.07% · -0.08%

Ground Line -0.01%

N.C.M.W.Co. Irr. Ditch Relocation Profile

Ⓕs FRONTAGE ROAD

Cu. Yd. Exc. / Emb. — 72 / 1,438

Sta. 23,846

AS BUILT PLANS
Contract No. 03-100964
Date Completed 6-1969
Document No. 30000222

AS BUILT PLANS
Cont. No. 03-100964
Completed June 1969

Project Engineer	Date	Design Engineer	Date	Approved Recommended By	Date
D.A. BISHOP R.P. ADAMS	11-67	L.E. CHRISTMAN	11-67	C.D. HAMMA	11-67

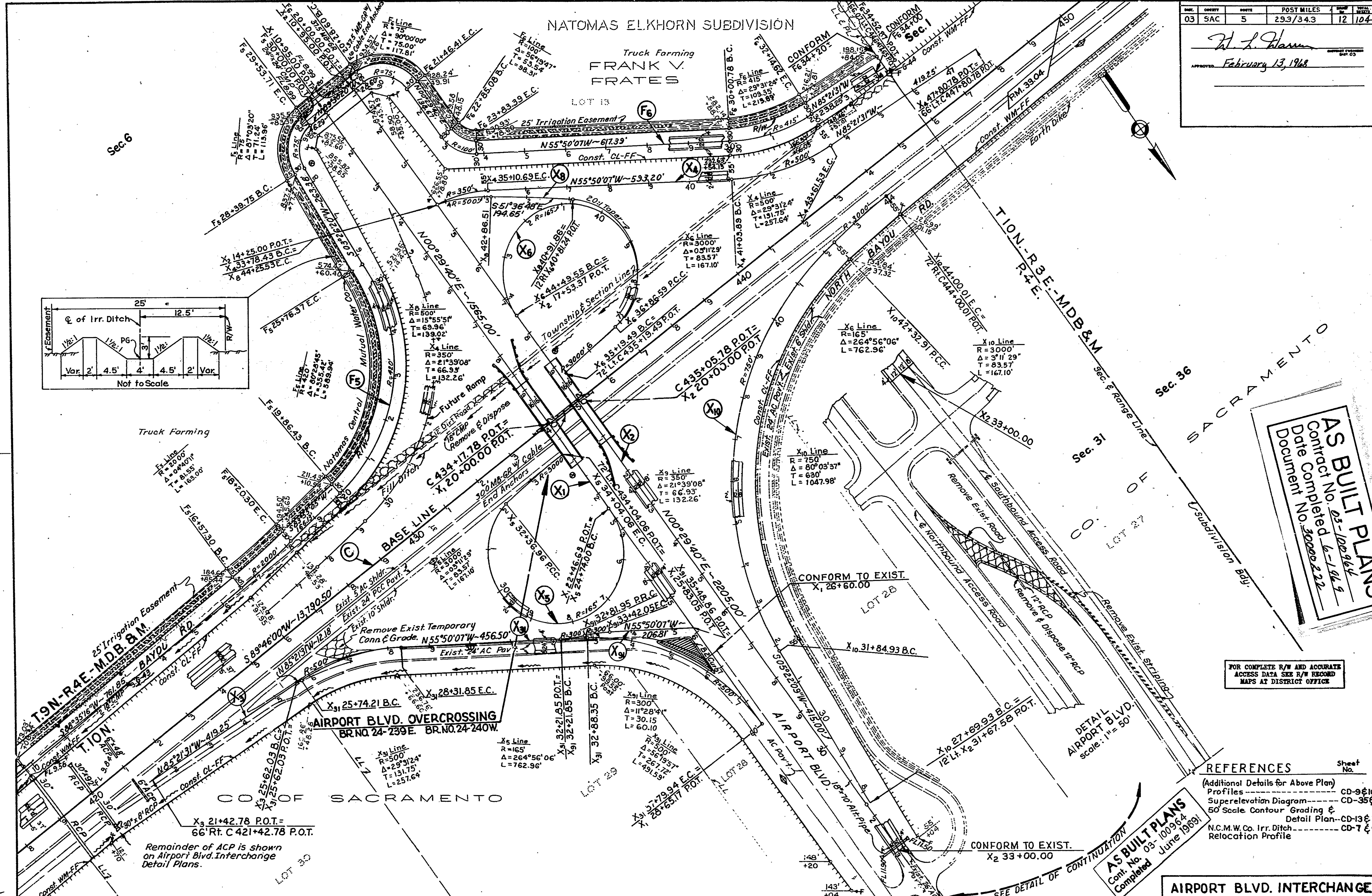
03209 100961 CD 7

CALIF. COORDINATE SYSTEM, Zone II
Ground distances and grid bearings shown

DIST.	STATE	FEDERAL PROJECT NO.	FISCAL YEAR	SHEET No.	TOTAL SHEETS
7	CALIF.				

DIST.	COUNTY	ROUTE	POST MILES	SHEET No.	TOTAL SHEETS
03	SAC	5	29.3/34.3	12	104

W. L. Warren
DISTRICT ENGINEER DIST. 03
APPROVED February 13, 1968



FOR COMPLETE R/W AND ACCURATE ACCESS DATA SEE R/W RECORD MAPS AT DISTRICT OFFICE

AS BUILT PLANS
Contract No. 03-100964
Date Completed 6-1969
Document No. 30000222

AS BUILT PLANS
Cont. No. 03-100964
Completed June 1969

REFERENCES | Sheet No.
(Additional Details for Above Plan)
Profiles ---------- CD-9 & 10
Superelevation Diagram ---------- CD-35 & 36
50' Scale Contour Grading & Detail Plan ---------- CD-13 & 14
N.C.M.W. Co. Irr. Ditch Relocation Profile ---------- CD-7 & 9

AIRPORT BLVD. INTERCHANGE

Project Engineer	Date	Design Engineer	Date	Approval Recommended By	Date
D. A. BISHOP R. P. ADAMS	11-67	L.E. CHRISTMAN	11-67	C. D. HAMMA	11-67

REVISED LTR 1-25-68

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D.P.A. Sec. No.	STATE	FEDERAL PROJECT No.	FISCAL YEAR	SHEET No.	TOTAL SHEETS
7	CALIF.				

DISTRICT	COUNTY	ROUTE	POST MILES	SHEET No.	TOTAL SHEETS
03	SAC	5	29.3/34.3	13	104

W. L. Warren
Dist. Eng. (Title)
Date Approved February 13, 1968

AS BUILT PLANS
Contract No. 03-140964
Date Completed 6-14-69
Document No. 30000232

AIRPORT BLVD. OVERCROSSING
BR. NO. 24-239E & BR. NO. 24-240W

Profile Grade at Const'n. Line
900' V.C.
Future Const'n. (By Others)
4.00%
400' V.C.
N.C.M.W. Co. Irr. Ditch Relocation
Ground Line
-0.98%
600' V.C.
Existing Roadway Profile
Conform to Ex. Line

(X1) & (X2) AIRPORT BLVD.

Note: Sta. 26+60 to Sta. 33+00 Embankment Quantities are for the ½ Line only.

Cu. Yds. Exc.	13	11	16	17	1	6
Cu. Yds. Emb.	70,143		Quantities Included in Main Line	Quantities Included in Main Line	60,979	7,075
Sta.	10 1 2 3 4 5 6 7 8 9		20 1 2	3 4 5 6 7 8 9	30 1 2 3 4	

(F5) FRONTAGE ROAD

Profile Grade of ℄
-0.68%
-0.61%
100' V.C.
+0.42%
+2.00%
Ground Line
N.C.M.W. Co. Irr. Ditch Relocation

(F6) FRONTAGE ROAD

Profile Grade at ℄
0.00%
2.00%
-0.98%
-0.01%
Conform
Ground Line
N.C.M.W. Co. Irr. Ditch Relocation

Cu. Yds. Exc.	914	9	277
Cu. Yd. Emb.		832	
Sta.	5 20 1 2 3 4 5 6 7 8 9 30	20 1 2 3 4 5 6 7 8 9 30 1 2 3 4	

(C) BASE LINE

Profile Grade 18'Lt. of Base Line
0.00%
600' V.C.
+0.13%
+0.10%
Toe Ditch Grade Lt.
0.12%
12.26
+0.12%
Median Grade
-0.06%
12.86
+0.12%
Ground Line
600' V.C.
0.00%
4.22%

AS BUILT PLANS
Cont. No. 03-100944
Completed June 1970

Cu. Yds. Exc.	2,558
Cu. Yds. Emb.	48,247
Sta.	420 1 2 3 4 5 6 7 8 9 430 2 3 4 5 6 7 8 9 440 1 2 3 4 5 6 7 8 9 450

Project Engineer	Date	Design Engineer	Date	Approval Recommended By	Date
D.A. BISHOP R.P. ADAMS	11-67	L.E. CHRISTMAN	11-67	C.D. HAMMA	11-67

03209 100961

CD 9

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FORM 979-52A

D.P.A. Proj. No.	STATE	FEDERAL PROJECT No.	FISCAL YEAR	SHEET No.	TOTAL SHEETS
7	CALIF.				

DISTRICT	COUNTY	ROUTE	POST MILES	SHEET No.	TOTAL SHEETS
03	SAC	5	299/343	14	104

W. L. Warren
Dist. Eng. Dist. 03

Date Approved February 13, 1968

X10 ON RAMP

Profile Grade at Const'n Line
Ground Line
-0.15%
-0.07%
+0.10%
-1.90
-12.57
-1.40
-14.40
12" Lt. X1-X2 = 27+67.58
X2 = 27+69.93
Cu. Yds. Exc. / Emb.
Sta. 27 9 30 1 2 3 4 5 6 7 8 9 40 1 2 3 44
Included in X1-X2 Line Quantities
Included in X1-X2 Line Quantities
Included in Main Line Quantities
Included in Main Line Quantities

X5 ON RAMP

Grade is controlled by X1 Ramp
Profile Grade at Const'n Line
-0.91%
100' VC
+0.88%
Ground Line
Cu. Yds. Exc. / Emb.
Sta. 25 6 7 8 9 30 1 2 3 4
Included in X1-X2 Line Quantities
Included in X1-X2 Line Quantities
Included in Main Line Quantities
Included in Main Line Quantities

X8 RAMP

Profile Grade at Const'n line
+0.27%
20' VC
+3.50%
Ground Line
Grade Controlled by X5 Ramp
Cu. Yds. Exc. / Emb.
Sta.
Included in X1-X2 Line Quantities

X9 RAMP

Controlled by X5 Ramp
+0.25%
Profile Grade at Const'n Line
Ground Line
Cu. Yds. Exc. / Emb.
Sta.
Included in X1-X2 Line Quantities

X6 ON RAMP

Profile Grade at Const'n Line
-0.26%
100' VC
+0.63%
100' VC
0.00%
150' VC
Ground Line
Cu. Yds. Exc. / Emb.
Sta. 35 6 7 8 9 40 1 2 3 4 45
Included in Main Line Quantities
Included in Main Line Quantities
Included in X1-X2 Line Quantities
Included in X1-X2 Line Quantities

X4 OFF RAMP

Profile Grade at Const'n Line
-8.67%
200' VC
+0.17%
Ground Line
-0.10%
Toe Ditch Grade 49.11
Cont'd on Main Line Profile Sheet CD 11
Cu. Yds. Exc. / Emb.
Sta. 33 4 5 6 7 8 9 40 1 2 3 4 5 6 7 48
Included in X1-X2 Line Quantities
Included in X1-X2 Line Quantities
Included in Main Line Quantities
Included in Main Line Quantities

AS BUILT PLANS
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Document No. 30000222

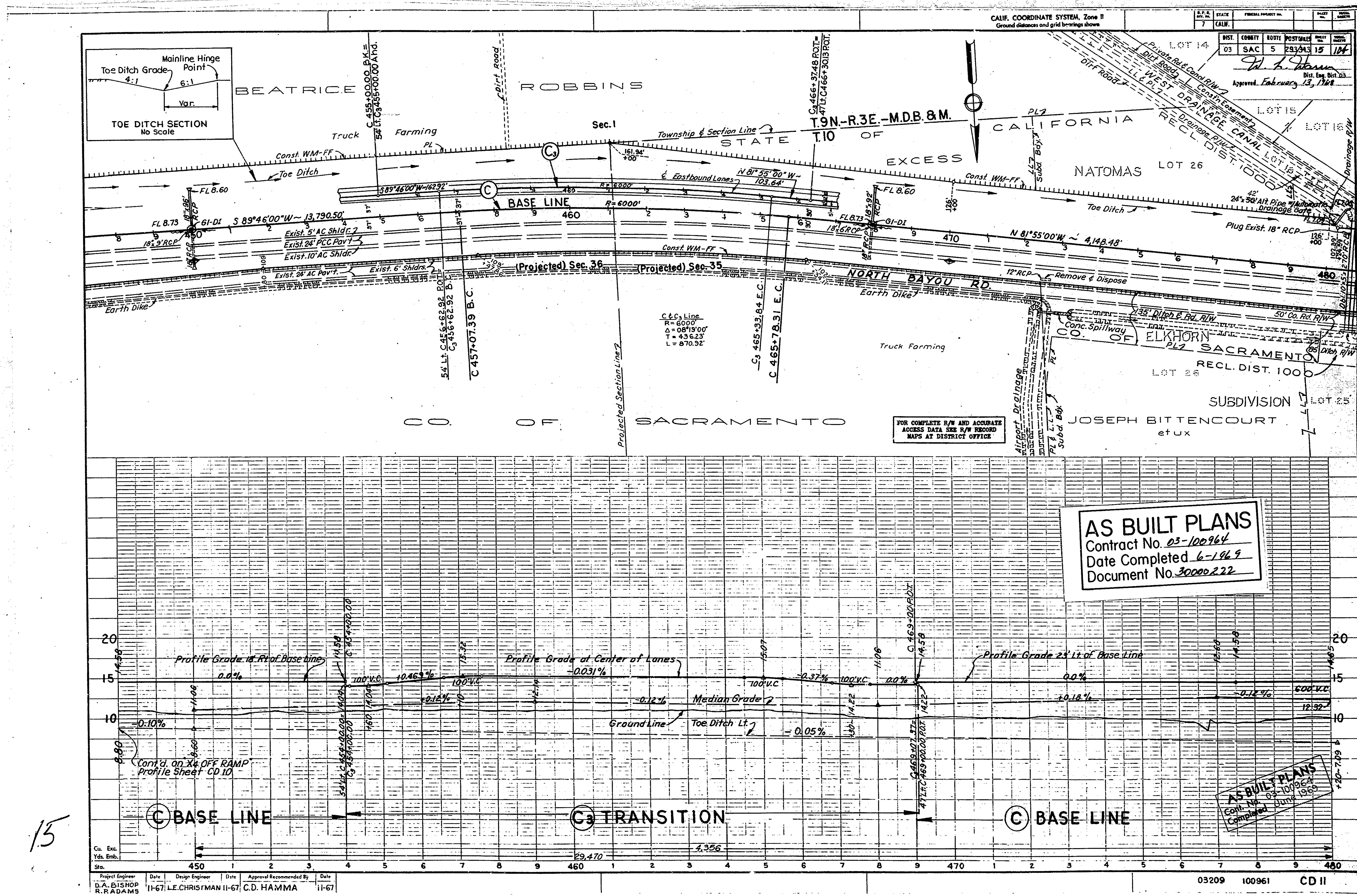
AS BUILT PLANS
Cont. No. 03-100961
Completed June 1969

Project Engineer	Date	Design Engineer	Date	Approval Recommended By	Date
D.A. BISHOP R.R.ADAMS	11-67	L.E.CHRISTMAN	11-67	C.D. HAMMA	11-67

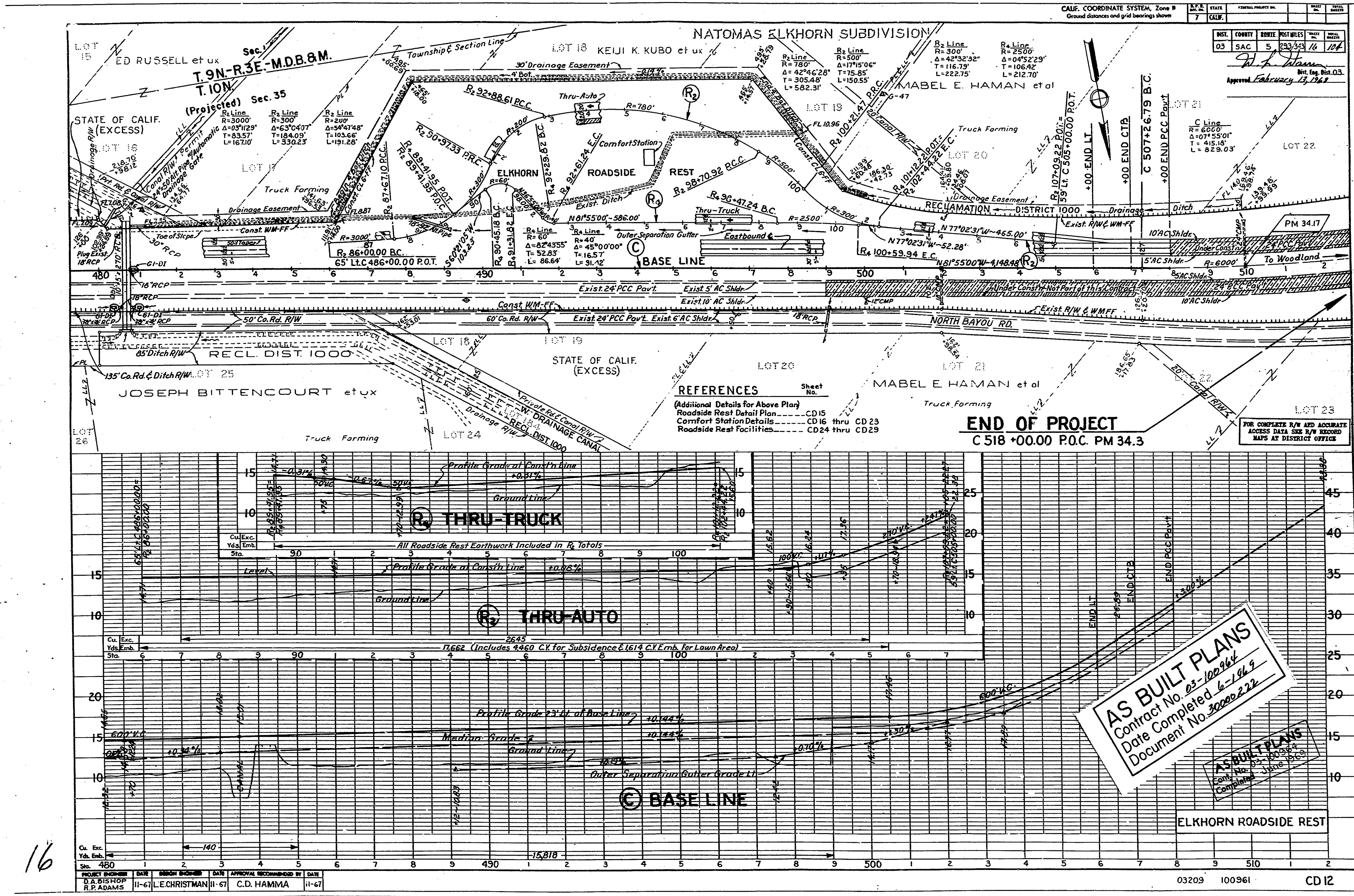
REVISED LTR 1-25-68

03209 100961 Rev. 1-18-68 CD 10

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CALIF. COORDINATE SYSTEM, Zone II
Ground distances and grid bearings shown
7 CALIF.
DIST. 03 COUNTY SAC ROUTE 5 POSTMILES 29.3/34.3 SHEET No. 15 TOTAL SHEETS 104
Dist. Eng. Dist. 03
Approved February 13, 1968
Mainline Hinge Point
Toe Ditch Grade
4:1
6:1
Var.
TOE DITCH SECTION
No Scale
BEATRICE
ROBBINS
STATE OF CALIFORNIA
EXCESS
NATOMAS
LOT 26
LOT 14
LOT 15
LOT 16
LOT 18
T.9N.-R.3E.-M.D.B.&M.
T.10
Sec.1
Township & Section Line
Truck Farming
Dirt Road
Private Rd.& Canal R/W
Const'n Easement
WEST DRAINAGE CANAL
RECL. DIST. 1000
Drainage R/W
Const. WM-FF
Toe Ditch
FL 8.60
FL 8.73
61-DI
18"x 9' RCP
18"x 96' RCP
S 89°46'00"W ~ 13,790.50'
S 89°46'00"W ~ 162.92'
N 81°55'00"W ~ 103.64'
N 81°55'00"W ~ 4,148.48'
Exist. 5' AC Shldr.
Exist. 24' PCC Pav't
Exist. 10' AC Shldr.
Exist. 24' AC Pav't.
Exist. 6' Shldrs.
Earth Dike
C 455+00.00 BK.= 54' Lt. C3 455+00.00 Ahd.
54' Lt. C 456+62.92 P.O.T.= C3 456+62.92 B.C.
C 457+07.39 B.C.
C3 465+33.84 E.C.
C 465+78.31 E.C.
C3 466+37.48 P.O.T.= 47' Lt. C 466+30.13 P.O.T.
BASE LINE
℄ Eastbound Lanes
R=6000'
(Projected) Sec. 36
(Projected) Sec. 35
Projected Section Line
C & C3 Line
R = 6000'
Δ = 08°19'00"
T = 436.23'
L = 870.92'
NORTH BAYOU RD.
12" RCP
Remove & Dispose
18"x 6' RCP
18"x 92' RCP
GI-DI
24"x 58' Alt. Pipe w/Automatic Drainage Gate
Plug Exist. 18" RCP
FL 7.09
135' Ditch & Rd. R/W
50' Co. Rd. R/W
85' Ditch R/W
Conc. Spillway
Airport Drainage
Subd. Bdy.
CO. OF SACRAMENTO
ELKHORN SUBDIVISION
JOSEPH BITTENCOURT et ux
LOT 25
FOR COMPLETE R/W AND ACCURATE ACCESS DATA SEE R/W RECORD MAPS AT DISTRICT OFFICE
AS BUILT PLANS
Contract No. 03-100964
Date Completed 6-1969
Document No. 30000222
Profile Grade 18' Rt of Base Line
Profile Grade at Center of Lanes
Profile Grade 23' Lt of Base Line
0.0%
+0.469%
-0.031%
-0.37%
100' V.C.
600' V.C.
+0.12%
-0.12%
+0.18%
-0.10%
-0.05%
Median Grade
Ground Line
Toe Ditch Lt.
Cont'd. on X4 OFF RAMP Profile Sheet CD 10
54' Lt. C 454+00.00 = C3 454+00.00
C 469+00 P.O.T.
C3 469+07.37 = 47' Lt. C 469+00.00 P.O.T.
C BASE LINE
C3 TRANSITION
29,470
4,356
AS BUILT PLANS
Cont. No. 03-100964
Completed June 1969
Cu. Yds. Exc. Emb.
Sta.
450
460
470
480
Project Engineer D.A. BISHOP R.P. ADAMS Date 11-67
Design Engineer L.E. CHRISTMAN Date 11-67
Approval Recommended By C.D. HAMMA Date 11-67
03209 100961 CD II

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CALIF. COORDINATE SYSTEM, Zone II
Ground distances and grid bearings shown
7 CALIF.
DIST. COUNTY ROUTE POST MILES SHEET No. TOTAL SHEETS
03 SAC 5 29.3/34.3 16 104
Dist. Eng. Dist. 03
Approved February 13, 1968
NATOMAS ELKHORN SUBDIVISION
LOT 15
ED RUSSELL et ux
T. 9N.-R.3E.-M.D.B.&M.
T. 10N.
(Projected) Sec. 35
Township & Section Line
LOT 18 KEIJI K. KUBO et ux
30' Drainage Easement
4' Bot.
STATE OF CALIF. (EXCESS)
LOT 16
LOT 17
Truck Farming
Drainage Easement
Const. WM-FF
Toe of Slope
30" RCP
Plug Exist. 18" RCP
G1-DI
16" RCP
18" RCP
50' Co. Rd. R/W
85' Ditch R/W
RECL. DIST. 1000
135' Co. Rd. & Ditch R/W
LOT 25
JOSEPH BITTENCOURT et ux
LOT 26
Truck Farming
R2 Line R=3000' Δ=03°11'29" T=83.57' L=167.10'
R2 Line R=300' Δ=63°04'07" T=184.09' L=330.23'
R2 Line R=200' Δ=54°47'48" T=103.66' L=191.28'
R2 Line R=780' Δ=42°46'28" T=305.48' L=582.31'
R2 Line R=500' Δ=17°15'06" T=75.85' L=150.55'
R2 Line R=300' Δ=42°32'32" T=116.79' L=222.75'
R4 Line R=2500' Δ=04°52'29" T=106.42' L=212.70'
R4 Line R=60' Δ=82°43'55" T=52.83' L=86.64'
R4 Line R=40' Δ=45°00'00" T=16.57' L=31.42'
C Line R=6000' Δ=07°55'01" T=415.18' L=829.03'
R2 86+00.00 B.C.
65' Lt. C 486+00.00 P.O.T.
R2 87+67.10 P.C.C.
R2 90+97.33 P.R.C.
R4 89+41.95 P.O.T.
R2 89+41.95 P.O.C.
R2 92+88.61 P.C.C.
R4 92+29.82 B.C.
R4 92+61.24 E.C.
R4 90+45.18 B.C.
R4 91+31.82 E.C.
S60°21'05"W 103.23'
N81°55'00"~586.00'
ELKHORN ROADSIDE REST
Thru-Auto
Comfort Station
Exist. Ditch
R2 98+70.92 P.C.C.
R4 96+47.24 B.C.
Thru-Truck
Outer Separation Gutter
Eastbound ℄
C BASE LINE
R2 100+21.47 P.R.C.
R4 101+12.22 P.O.T.=
R2 102+44.22 E.C.
R4 100+59.94 E.C.
N77°02'31"W~465.00'
N77°02'31"W~52.28'
N81°55'00"W~4,148.48'
R2 107+09.22 P.O.T.=
59' Lt. C 505+00.00 P.O.T.
+00 END LT
+00 END CTB
C 507+26.79 B.C.
+00 END PCC Pav't
LOT 19
LOT 20
LOT 21
LOT 22
LOT 23
LOT 24
MABEL E. HAMAN et al
RECLAMATION DISTRICT 1000
Drainage
Ditch
Exist. R/W & WM-FF
10' AC Shldr.
Under Constr.
24' PCC Pav't
5' AC Shldr.
PM 34.17
To Woodland
Exist. 24' PCC Pav't
Exist. 5' AC Shldr.
Exist. 10' AC Shldr.
Under Constr.-Not Part of this Contract
Const. WM-FF
60' Co. Rd. R/W
Exist. 24' PCC Pav't
Exist. 6' AC Shldr.
18" RCP
12" CMP
24" CMP
NORTH BAYOU RD.
Exist. R/W & WMFF
STATE OF CALIF. (EXCESS)
Private Rd. & Canal R/W
W. DRAINAGE CANAL
RECL. DIST. 1000
Drainage R/W
20' Canal R/W
REFERENCES Sheet No.
(Additional Details for Above Plan)
Roadside Rest Detail Plan ---- CD15
Comfort Station Details ---- CD16 thru CD23
Roadside Rest Facilities ---- CD24 thru CD29
END OF PROJECT
C 518 +00.00 P.O.C. PM 34.3
FOR COMPLETE R/W AND ACCURATE ACCESS DATA SEE R/W RECORD MAPS AT DISTRICT OFFICE
R4 THRU-TRUCK
Profile Grade at Const'n Line
Ground Line
All Roadside Rest Earthwork Included in R2 Totals
R2 THRU-AUTO
Level
Profile Grade at Const'n Line
2645
17,662 (Includes 4,460 C.Y. for Subsidence & 1,614 C.Y. Emb. for Lawn Area)
Profile Grade 23' Lt. of Base Line
Median Grade
Ground Line
Outer Separation Gutter Grade Lt.
CANAL
600' V.C.
END LT
END CTB
END PCC Pav't
C BASE LINE
140
15,818
Cu. Yds. Exc. Emb.
Sta. 480 490 500 510
AS BUILT PLANS
Contract No. 03-100964
Date Completed 6-1969
Document No. 30000222
AS BUILT PLANS
Cont. No. 03-100964
Completed June 1969
ELKHORN ROADSIDE REST
PROJECT ENGINEER D.A. BISHOP R.P. ADAMS DATE 11-67
DESIGN ENGINEER L.E. CHRISTMAN DATE 11-67
APPROVAL RECOMMENDED BY C.D. HAMMA DATE 11-67
03209 100961
CD 12
16

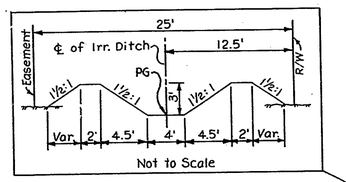
CALIF. COORDINATE SYSTEM, Zone II
Ground distances and grid bearings shown

J.P.C. DIST. No.	STATE	FEDERAL PROJECT NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
7	CALIF.				

DIST.	COUNTY	ROUTE	SECTION	SHEET NO.	TOTAL SHEETS
03	SAC	5	29.3/34.3	17	104

W. L. Isaacs
DISTRICT ENGINEER
DIST. 03

APPROVED February 13, 1968



AIRPORT BLVD. OVERCROSSING
BR. NO. 24-239 E BR. NO. 24-240 W

BASE LINE

FUTURE ON-RAMP

Ditch Easement

R/W

Begin Ramp Structural Section

Remove Exist. Shldr. C43+97 to 45+00 ±

Remove Exist. Connection

Remove AC Island

Remove Exist. Dike

Remove Exist. Curb

Begin 0.08' AC Overlay +07

Exist. Gutter

Toe Gutter

4' Bot. Ditch

Slope Paving (See Bridge Plans for Detail)

Type B BARR Flare

Type 2 BARR Flare

300' MB-GR w/ Cable End Anchors

Type A-AC Dike

AC Gutter

AC Spillway Detail CD 30

NORTH BAYOU RD. 24' AC Pvmt

Exist R2 Curb

0.08' AC Overlay

B2 Curb

Remove Exist. Dikes

CONFORM

MATCH LINE

End 0.08' AC Overlay

AS BUILT PLANS
Contract No. 03-100964
Date Completed 6-1969
Document No. 30000222

AS BUILT PLANS
Cont. No. 03-100964
Completed June 1969

FOR COMPLETE R/W AND ACCURATE ACCESS DATA SEE R/W RECORD MAPS AT DISTRICT OFFICE

REFERENCES

(Additional Details for Above Plan)	Sheet No.
Profiles	CD 9 & 10
Superelevation Diagram	CD 38 & 39
100 Scale Plan	CD 8
N.C.M.W. Co. Irr. Ditch Relocation Profile	CD 7 & 9

NOTE:
6" Asbestos cement pipe to be installed 3.5' below finished grade at locations indicated on plan. Conduit to extend min. 4' each side of structural section.

DETAIL PLAN
AIRPORT BLVD. INTERCHANGE
Scale 1"=50' Sheet 1 of 2

Project Engineer	Date	Design Engineer	Date	Approval Recommended By	Date
D. A. BISHOP R. P. ADAMS	11-67	L. E. CHRISTMAN	11-67	C. D. HAMMA	11-67

REVISED LTR 1-25-68

03209 - 100961 Rev. 1-18-68 CD 13

FORM WH23A

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CALIF. COORDINATE SYSTEM, Zone II
Ground distances and grid bearings shown

DIST.	STATE	FEDERAL PROJECT NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
7	CALIF.				

DIST.	COUNTY	ROUTE	SECTIONS	POST MILES	TOTAL PROJECT
03	SAC	5	29.3/34.3	18	104

W. L. Warren
APPROVED February 13, 1968

AS BUILT PLANS
Contract No. 03-100964
Date Completed 6-1969
Document No. 30000222

25'
℄ of Irr. Ditch
12.5'
Easement
R/W
P6
1½:1
3'
Var. 2' 4.5' 4' 4.5' 2' Var.
Not to Scale

END FRONTAGE RD. SECTION
BEGIN OVERCROSSING SECTION
12+60 — 12+60

AIRPORT BLVD. OVERCROSSING
BR. NO. 24-239 E BR. NO. 24-240 W

Begin Ramp Structural Section

℄ EASTBOUND

BASE LINE

NORTH BAYOU RD.

Ditch Easement
4' Bot. Ditch
R/W
Top Gutter
Type A AC Dike
Type B AC Dike
AC Gutter
Flume
Dr. Inlet
See AC Spillway Detail CD 30
Slope Paving (See Bridge Plans for Details)
Remove Exist. Shlder. Cstr. to Cast-in-Place Conc. Curb
Dr. Dip
Dr. Pipe
Alt. Pipe
Type B Flare
Type A Flare
Type B Flare
Tangent
Curve
Var.
Gr. Pipe
Gr. Inlet
Gr. Dip
Gr. Ditch
Ramp
Lane
Shldr.
Conc.
Cstr.
Exist.
Alt.
Dr.
Dia.
Elev.
Sta.
Bot.
Pvmt.
Ft.
Sec.
Min.
Max.
Avg.
Approx.
Typ.
Dwg.
Det.
Ref.
Sht.
Cont.
Comp.
Inst.
Rem.
Rel.
Prof.
Diag.
Plan
Co.
Irr.
Ditch
Pipe
Inlet
Dip
Gutter
Flume
Spillway
Slope
Paving
Bridge
Plans
Details
Structure
Section
Begin
Overcrossing
Frontage
Road
Base
Line
Bayou
North
Airport
Blvd.
Interchange
Eastbound
Westbound
Ramp
Tangent
Curve
Variable
Gravel
Pipe
Inlet
Dip
Ditch
Easement
Right of Way
Top
Gutter
Flume
Spillway
Slope
Paving
Bridge
Plans
Details
Structure
Section
Begin
Overcrossing
Frontage
Road
Base
Line
Bayou
North
Airport
Blvd.
Interchange
Eastbound
Westbound
Ramp
Tangent
Curve
Variable
Gravel
Pipe
Inlet
Dip
Ditch
Easement
Right of Way

FOR COMPLETE R/W AND ACCURATE ACCESS DATA SEE R/W RECORD MAPS AT DISTRICT OFFICE

NOTE:
6" Asbestos cement pipe to be installed 3.5' below finished grade at locations indicated on plan. Conduit to extend min. 4' each side of structural section.

REFERENCES

(Additional Details for Above Plan)	Sheet No.
Profiles	CD 9 & 10
Superelevation Diagrams	CD 38 & 39
100 Scale Plan	CD 8
N.C.M.W. Co. Irr. Ditch Relocation Profile	CD 7 & 9

AS BUILT PLANS
Contr. No. 03-100964
Completed June 1969

DETAIL PLAN
AIRPORT BLVD. INTERCHANGE
Scale 1"=50' Sheet 2 of 2

03209 - 100961 CD 14

Project Engineer	Date	Design Engineer	Date	Approval Recommended By	Date
D. A. BISHOP R. P. ADAMS	11-67	L. E. CHRISTMAN	11-67	C. D. HAMMA	11-67

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FORM WR23A

Appendix G. Sacramento International Airport - Previous Model

Appendix H. 200-Year Natomas Basin Interior Drainage Study

WEST YOST ASSOCIATES 25 YEARS 1990–2015

REGISTERED PROFESSIONAL ENGINEER
MARK O. KUBIK
No. 50963
Exp. 9-30-17
CIVIL
STATE OF CALIFORNIA

TECHNICAL MEMORANDUM

DATE: May 12, 2016

Project No.: 660-10-15-01
SENT VIA: EMAIL

TO: Ms. Connie Perkins, City of Sacramento

Mr. Stephen Sullivan, Mead & Hunt

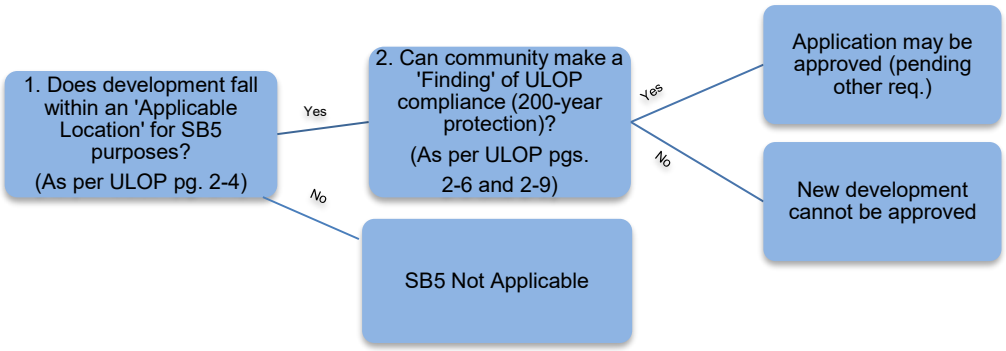
FROM: Mark Kubik, RCE #C50963

REVIEWED BY: Doug Moore, RCE #C058122

SUBJECT: 200-Year Natomas Basin Interior Drainage Study

INTRODUCTION AND BACKGROUND

The purpose of this study was to define the limits of the interior 200-year floodplain in the Natomas Basin. In addition, the interior 100-year floodplain was also evaluated. The passage of Senate Bill 5 (SB5) in 2007 changed the standard of flood protection for new developments in Sacramento-San Joaquin Valley communities. Among other requirements, SB5 requires all communities within the Valley to make findings related to an urban level of flood protection (i.e., 200-year protection) before entering into development agreements, issuing permits for new structures, or approving parcel maps in urban or urbanizing areas. When reviewing a new development application, communities with land-use authority must follow a three-step process established in the California Department of Water Resources (DWR) Urban Level of Flood Protection Criteria (ULOP):



West Yost Associates (West Yost), in conjunction with Mead & Hunt, performed a study to assist the City of Sacramento (City), Sacramento County, and Sutter County with making a finding related to the "Applicable Location" for areas within the Natomas Basin. The Natomas Basin covers approximately 83 square miles in the area bounded by the Sacramento River, American River, Natomas East Main Drainage Canal (i.e. Steelhead Creek), the Pleasant Grove Creek Canal, and the Natomas Cross Canal (see Figure 1). The basin, which is very topographically flat with some higher ground along the eastern edge, generally slopes from north to south. Most the area north of Elkhorn Boulevard is currently agricultural, while significant urban development has occurred south of Elkhorn Boulevard. However, future urban development is planned north of Elkhorn Road in Sacramento County and in southeast Sutter County. The Sacramento International Airport is also located in the basin.

Federal project levees that are part of the State Plan of Flood Control surround and protect the Natomas Basin against flooding from external flooding sources. For this Technical Memorandum (TM), external flooding sources are considered those that are located outside of the Natomas Basin. Interior or internal flood sources are those within the Natomas Basin. These perimeter levees around the Natomas Basin are not currently certified to provide 100-year or 200-year levels of protection. The Sacramento Area Flood Control Agency (SAFCA) and Corps of Engineers are planning, designing, and constructing projects that are intended to rehabilitate the levees to meet a 100-year level of protection and, ultimately, provide a 200-year level of protection. Even after the SAFCA and Corps of Engineers projects are completed, portions of the Natomas Basin will be subject to flooding from runoff that is generated within the basin. The primary purpose of this study was to define the limits of the interior 200-year floodplain in the Natomas Basin that will remain after the perimeter levees have been upgraded. In addition, the interior 100-year floodplain was also evaluated. As discussed later in this report, some flow from external sources can enter the Natomas Basin at Sankey Road and these were factored into the study. There is also a small agricultural area located east of the Natomas Basin (east of the exterior levee) that drains into the basin through five gated underdrains. This area is surrounded by uncertified levees and during a large storm event that threatens to breach the levees, the gates on the underdrains can be closed. For this study, it was assumed that the gates would be closed during a 100-year or 200-year storm event.

INTERIOR DRAINAGE FACILITIES

Reclamation District 1000 Drainage Facilities

Reclamation District 1000 (RD 1000), a public entity of the State of California formed by special act of the California Legislature under the California Water Code, was established in 1911 for the purpose of providing flood control and drainage within the Natomas Basin. RD 1000 operates and maintains a system of drainage canals, pumping plants, and levees to achieve this purpose. Figure 1 shows the major RD 1000 drains and pump stations. RD 1000 also operates and maintains numerous minor tributary drainage ditches that are not shown on Figure 1.

The RD1000 system collects and routes nearly all of the interior drainage within the basin and conveys the drainage flows to pumping plants that discharge water from the basin. As a result, the determination of the flood flows and water surface elevations along the major RD 1000 drains was the focus of this study.

City of Sacramento Facilities

The City owns and maintains drainage facilities that serve the developed portions of the basin within the City limits. These facilities include underground storm drain systems, detention basins, and pump stations. The City-owned pump stations are shown on Figure 1. Most of the City pump stations discharge runoff into the RD 1000 drainage system. Three of the City pump stations discharge urban storm drainage directly into either the Natomas East Main Drainage Canal, American River, or the Sacramento River.

County of Sacramento Facilities

The County of Sacramento owns and maintains drainage facilities that primarily serve the developed portions of the basin within unincorporated Sacramento County. These facilities include underground storm drain systems, detention basins, and pump stations. The County-owned pump stations are shown on Figure 1 and these pump stations discharge runoff into the RD 1000 drainage system. The County operates the drainage system within the Sacramento International Airport that drains by gravity into the RD 1000 system.

The County of Sacramento is also responsible for the drainage facilities constructed within the Metro Air Park development, which is a proposed industrial development project covering approximately 1,900 acres immediately east of the Sacramento International Airport. Grading has previously occurred at the site and some of the drainage infrastructure has been constructed including storm drains, channels and a pump station that will discharge runoff from the project site into the RD 1000 drainage system.

County of Sutter Facilities

The County of Sutter does not currently own or operate any drainage facilities within the Natomas Basin other than roadside ditches.

Caltrans

The State of California Department of Transportation owns and operates roadside ditches and culverts within the Highway 99/70, I-5, and I-80 right of way with gravity outlets to the RD 1000 system.

HYDROLOGIC AND HYDRAULIC MODELING APPROACH

West Yost performed hydrologic and hydraulic modeling to estimate the 100-year and 200-year flows and water surface elevations in the major RD 1000 drainage facilities. For this effort, West Yost started with an existing hydrologic/hydraulic model that was previously developed for RD 1000. This model was updated for use with this study. A description of the approach to the modeling follows.

RD 1000 EPA SWMM Model

In the early 1990s, RD 1000 developed a hydrologic and hydraulic model for their major drainage facilities. RD 1000 has used this model to perform flood control planning, analyze the effects of proposed development projects on their system, and to evaluate proposed system improvements. The RD 1000 model was prepared using a DOS-based Stormwater Management Model (SWMM) software package developed by the U.S. Environmental Protection Agency (EPA). The EPA SWMM model was calibrated to the February 1986 storm event, which was a major flood event that caused widespread overbank flooding of approximately 13,000 acres in the basin. The calibration effort was primarily a water balance effort to match inflows with recorded outflows, and helped the modelers develop runoff and storage relationships for the agricultural fields and also to estimate the infiltration capacity of the soils within the basin.

After the model was calibrated, it was used to simulate a 100-year, 10-day storm event. The 10-day design storm was chosen rather than a higher intensity short duration storm, such as the 24-hour storm, because short duration storms do not produce enough volume to stress the RD 1000 pumping capacity. There is significant storage in the agricultural fields within the basin and it takes a large volume storm event to fill that storage and produce large runoff rates. The 100-year, 10-day storm simulation was used as the basis of a Letter of Map Revision (LOMR) application that was submitted to the Federal Emergency Management Agency (FEMA) in December 1996. In 1997, FEMA approved the model and adopted the 100-year interior floodplain limits established using the model.

The RD 1000 model was also used in the late 1990's to evaluate the development of the North Natomas Community Plan area in the City of Sacramento. The model was used to determine the potential impacts of the development, to help develop a project to protect the development area from flooding, and to develop mitigation measures for the potential impacts of the project on the flood flows and water surface elevations in the RD 1000 system. The project, known as the Natomas Comprehensive Drainage Plan, consisted of increasing RD 1000's exterior pumping capacity, expansion of existing pump stations, construction of new interior lift pumps, construction of new levees along the RD 1000 drainage canals, and conveyance improvements to culverts and channels. FEMA accepted this modeling in 1997 as part of a Conditional Letter of Map Revision application.

Development of XPSWMM Model for 100-Year Storm Event

This DOS SWMM software package that the RD 1000 model was based on is outdated. It is no longer supported by the EPA, does not contain many of the features included with more modern software packages, and does not run on current Microsoft Windows-based computer systems. Therefore, for this study, the RD 1000 model was converted to the XP Solutions XPSWMM software.

The original RD 1000 model was imported into XPSWMM and used to simulate the 100-year, 10-day storm event. A number of adjustments were made to the model during the import process to account for differences in the software packages. In addition, based on input from Mead & Hunt, several revisions were made to represent known changes the RD 1000 drainage system that were not represented in the original RD 1000 model.

Summary of Model Changes during Development of the 100-Year Storm Event

The most significant adjustments to the input data during the conversion to XPSWMM are:

1. In the original EPA SWMM model, the subcatchment slopes in agricultural areas were set to 0.000025 feet per foot. This value is unusually flat and XPSWMM does not allow a slope less than 0.0001 feet per foot. (Note that the average slope from the north end to south end of the Natomas Basin is approximately 0.0002 feet per foot). Increasing the slope for these subcatchments to the minimum value caused the peak flows from these subcatchments to increase. Because the original slope values were set based on calibration analyses, West Yost adjusted the width parameter of the affected subcatchments so that the calculated peak flows from XPSWMM more closely matched the values from the original RD 1000 model. The subcatchment widths were typically reduced by 50 percent.
2. In the original RD 1000 model, there are numerous nodes or junctions where surface storage volume is defined by depth-area pairs. For 81 of these storage junctions, the first depth-area pair has the area set to zero. In XPSWMM, this produces a warning message when the model is run. To avoid the warning message, the first area value for these storage junctions was set to 0.0001 acres (about four square feet). This change did not affect the model results.
3. The converted XPSWMM model produced unstable flow results (large, rapid oscillations in flows) at Conduit 13813, which represents a small field culvert located north of Elverta Road and east of Highway 99. It was noted during a review of this issue that the conduit in question has a negative slope. To address the instability problem, the upstream invert of this conduit was raised from 12.75 feet to 15.01 feet to eliminate the negative slope. This eliminated the model instability and, although the resulting XPSWMM output flow hydrograph for this conduit was not an exact match to the EPA SWMM output, the overall results in the model were significantly improved (the XPSWMM and EPA SWMM results matched better at other nearby locations).
4. The original RD 1000 model includes many culverts throughout the Natomas Basin. The lengths of these culverts were set arbitrarily large (1,000 feet) to overcome stability problems with short conduits. The n values were adjusted downward to produce equivalent head losses through the culverts. Also, multiple barrels were combined into a single culvert of equivalent area. With XPSWMM, which uses a different computational procedure than EPA SWMM, some of these culverts appeared to be the source of excessive head loss. Since XPSWMM does not have the same problems with short culvert lengths, culverts with available as-built drawings were re-modeled with their actual lengths, standard n values, and multiple barrels, as applicable. Inlet and outlet losses were also included. The following conduits were revised:
    a. Conduit 13809 – Main Drainage Canal at I-80
    b. Conduit 13810 – East Drainage Canal at I-5
    c. Conduit 13811 – East Drainage Canal at San Juan Road
    d. Conduit 13012 – West Drainage Canal at El Centro Road

e. Conduit 13011 – West Drainage Canal at San Juan Road
f. Conduit 13013 – West Drainage Canal at Del Paso Road – No as-built plans were available. These culverts were replaced by Sacramento County after the Natomas Comprehensive Drainage Plan was completed. The size and type of culverts were identified by RD 1000 staff. Invert elevations were assumed to be the same as the previous culverts in the EPA SWMM model. The culvert lengths were determined from an aerial photo.
g. Conduit 13819 – West Drain at I-5
h. Conduit 13534 - N Drain at I-5
i. Conduit MUL1 – L Drain at I-5

5. The computational time step was changed from 30 seconds to 20 seconds to improve model stability.
6. A constant storage of 50 cubic feet per foot of depth was added to Node 1905 to reduce model instability. This is a negligible amount of storage that does not affect the results of the model, but improves the stability of the computations. This node is located in the industrial area south of the C1 Drainage Canal and is outside of the RD 1000 canal system.
7. The storage volumes were revised at five model nodes that lie within Natomas Levee Project borrow areas north of the International Airport and west of Fisherman's Lake. Material was excavated from these borrow areas in the late 2000's and this excavation increased the available floodplain storage. This change affected Nodes 138, 140, 141, 11404, and 1134.
8. The spill hydrograph at the Sankey Gap (see discussion below) was replaced with a hydrograph provided by MBK Engineers (MBK).
9. Adjustments were made to several catchment areas to represent changes caused by construction of a drainage canal for Giant Garter Snake habitat and to improve conveyance of drainage flows away from the Sacramento International Airport Runway Safety Area. Additionally, based upon further survey information for the GGS construction, sub-catchment area flow routings were corrected from the original model. The following changes were made:
    a. Subcatchment 1120 was reduced from 466 acres to 260 acres. The catchment width was changed from 5,075 to 2,832.
    b. Subcatchment 1121 was reduced from 981 acres to 659 acres. The catchment width was changed from 10,683 to 7,176.
    c. Subcatchment 1122 was increased from 460 acres to 904 acres. The catchment width was changed from 5,009 to 9,844. The runoff from this catchment was directed to Node 11582 instead of Node 1353.
    d. Subcatchment 1127 was increased from 538 acres to 622 acres. The catchment width was changed from 5,859 to 6,744.
10. Box culverts were added along the B Drain (south of I-80) at Fong Ranch Road and Bridgeford Drive.

11. The drainage system in the vicinity of the Elverta Road interchange on Highway 99 was revised represent the changes made by Caltrans for the interchange project.
12. A box culvert was added to the R Drain at Highway 99.
13. The area that receives Sankey Gap spill flow was modeled with 2-dimensional (2D) hydraulic modeling. The 2D modeling is described in more detail in a subsequent section.
14. The 100-year, 10-day precipitation hyetograph was updated to the current hyetograph produced using the procedures from Volume II of the Sacramento City/County Drainage Manual. The differences in the hyetographs are minor and this change did not significantly affect the results.

Vertical Datum

The elevation data in the original RD 1000 model is based on the National Geodetic Vertical Datum of 1929 (NGVD29). Because FEMA and most public agencies have adopted the North American Vertical Datum of 1988 (NAVD88), the elevation data in the RD 1000 model was converted to NAVD88 for this study. To do this, it was necessary to develop a conversion factor to relate the elevations from the two different datum. A conversion factor was determined using the National Oceanic and Atmospheric Administration VERTCON North American Vertical Datum Conversion website. The conversion between NGVD29 and NAVD88 was determined at 38 points spread throughout the Natomas Basin. The average conversion for the 38 points was:

NAVD88 [elevation in feet] = NGVD29 [elevation in feet] plus 2.42 feet

The difference between the maximum and minimum conversion values was less than 0.1 foot over the area of interest. As described in the Flood Insurance Study for Sacramento County, FEMA adopted a county-wide conversion of 2.43 feet when they switched from NGVD29 to NAVD88. Therefore, there is good agreement between the conversion factor adopted for this study and the one used by FEMA.

Sankey Gap Spill Flows

During very large storm events, additional flood flows generated from external watersheds can enter the Natomas Basin over a low section of the northeast perimeter levee at Sankey Road in Sutter County (the Sankey Gap). This low section of levee has been hardened so it will act like a weir during a major flood event. Therefore, spill flows at the Sankey Gap were included in this floodplain study.

The Sankey Gap spill flow hydrograph in the original RD 1000 hydraulic model was based on a study performed by Schaaf & Wheeler Consulting Civil Engineers in the 1990's. That study is considered to be outdated; therefore, the spill hydrograph at the Sankey Gap was replaced with a hydrograph provided by MBK Engineers (MBK). MBK is assisting SAFCA with the hydraulic analysis to support the Natomas Basin exterior levee improvement project and it was desired that this interior floodplain study be consistent with SAFCA's study. The spill hydrograph provided by MBK is based on the Central Valley Hydrology Study recently developed by the State DWR in conjunction with a hydraulic model for the Sacramento Basin originally prepared by the U.S.

Army Corps of Engineers, and refined by MBK. This modeling is described in the Draft TM: Determination of Central Valley Hydrology Study Compliant 1-in-100 and 1-in-200 Annual Exceedance Probability (AEP) Water Surface Profiles for Pleasant Grove Creek Canal, MBK, dated January 8, 2016. For the 100-year storm, the peak flow from the MBK hydrograph is smaller than the peak flow from EPA SWMM hydrograph (545 cfs versus 1,202 cfs), but the volumes are similar (3,400 acre-feet versus 3,740 acre-feet).

Based on information provided by MBK, it was determined that the peak of the Sankey Gap spill hydrograph occurs approximately 45 hours after the peak rainfall. This information was used to align the Sankey Gap spill hydrograph relative to the design precipitation used for this study.

2D Modeling for the Sankey Gap Spill Flow

Because the peak Sankey Gap spill flow is significantly larger than the capacity of the local agricultural drainage ditches that receive the spill, the flows will spread out across the agricultural fields in a somewhat unpredictable manner. Therefore, the area that receives the Sankey Gap spill flow was modeled in 2D. The limits of the 2D modeling are is shown on Figure 1. The 2D model limits were established in the area with the highest degree of uncertainty with regard to flows paths. The spill flow tends to pond behind Riego Road and Highway 99 near their intersection. Flows are predicted to spill over the roadways in this area and these spill flows are introduced into the 1D portion of the model. Although extending the 2D model limits could incrementally increase the model accuracy in the areas downstream of the roadway spills, based on consideration of the level of effort to expand the 2D model area, the resulting increase model run times, and the potential benefits, we determined that expanding the 2D limits was not justified.

The ground surface within the 2D model limits was defined using LiDAR topographic mapping developed by the State DWR in 2008 as a part of their Central Valley Floodplain Evaluation and Delineation Program. That data was used to create a Digital Terrain Model (DTM) within the 2D model limits. The DTM was used to create a gridded terrain surface with 50'x50' grid elements.

Metro Air Park

As discussed above, the Metro Air Park project in Sacramento County has been graded and some drainage infrastructure has been constructed. Only two streets have been constructed and none of the industrial lots have been developed. The RD 1000 EPA SWMM model represents the Metro Air Park site in its pre-project condition before any grading, roadway, or drainage improvements were constructed. There was concern that updating the modeling to represent existing conditions in the Metro Air Park would under-predict the ultimate flood flows from this area because the drainage facilities were constructed for a fully developed site and the site is currently almost entirely undeveloped with respect to impervious surfaces (i.e. there is very little impervious cover over the site). Because of this, it was decided to base the modeling in this area on pre-project conditions. Ultimately, when the project is developed, the project drainage system is intended to mitigate for potential impacts to the RD 1000. Therefore, representing the Metro Air Park area in it pre-project condition will produce similar water surface elevations and flows in the downstream RD 1000 system as for ultimate buildout.

Development of XPSWMM Model for 200-Year Storm Event

The model developed with XPSWMM for the 100-year storm event was also used to calculate the 200-year flows and water surface elevations in the major RD 1000 facilities. The following changes were made to the 100-year model to produce results for the 200-year storm event:

- The precipitation data in the model was updated with the 200-year, 10-day precipitation per Volume II of the Sacramento City/County Drainage Manual.
- The 100-year spill flow at the Sankey Gap was replaced with the 200-year spill flow provided by MBK. For the 200-year storm event, the peak spill flow is 1,332 cfs and the total spill volume is 7,065 acre-feet.
- Four City pump stations (Sumps 98, 129, 130, and 141) that pump runoff into the RD 1000 drainage system are not included in the model as pump stations. In the RD 1000 EPA SWMM model for the 100-year event, the flows from these pump stations were represented as input hydrographs. Because these pump stations have fixed capacities, the peak flows pumped into the RD 1000 system during a 200-year storm are not anticipated to change significantly from the peak flows during a 100-year storm. However, the duration that each pumping unit at the pump stations would operate would change due to the larger volume of runoff that would be produced during a 200-year event. To estimate the changes to pumped flows during a 200-year storm event, results from other pump stations that are included in the RD 1000 model were used. Several pump stations in the North Natomas Community Plan area are included in the RD 1000 model. The contributing watersheds to these pump stations are included in the model and the pumps stations are modeled with on-off elevations and capacities for each individual pumping unit. Therefore, for these pump stations, we reviewed the differences in the pumped hydrographs produced for the 100-year and 200-year storms and used this information to estimate changes the pumped hydrographs for the four pump stations that were not explicitly modeled. The total increase in the pumped volume was determined to be approximately 10 percent. More than 40 percent of the increased volume occurs in the middle of the storm while all of the pumps are running at the pump stations. The model results for peak conditions do not appear to be sensitive to these assumptions.

MODEL RESULTS AND FLOODPLAIN MAPPING

Model Results for the 100-year Storm Event

Calculated Water Surface Elevations for the 100-year Storm Event

Using the model created with XPSWMM, the 100-year water surface elevations were calculated along the major RD 1000 drainage canals. In general, the 100-year water surface elevations calculated with XPSWMM are reasonably close to those originally calculated with EPA SWMM. Table 1 provides an overview of the differences in the calculated water surface elevations in four of the major drainage canals in the RD 1000 system. As indicated in the table, the water surface elevations calculated with XPSWMM are close to the originally calculated values. The XPSWMM water surface elevations are lower in the East, Main and North Drainage Canals. The lower water

surface elevations in these waterways are largely the result of the revised Sankey Gap spill hydrograph, which has a significantly lower peak flow than the original hydrograph (545 cfs versus 1,200 cfs). The 2D modeling performed in area receiving the Sankey Gap spill flows also resulted in lower water surface elevations, especially north of Elkhorn Road. The relatively small average difference in water surface elevations along the West Drainage Canal indicates a reasonable modeling match. The small increases along the West Drainage Canal are primarily the result of revisions to the watershed boundaries in the area west of the Sacramento International Airport. The watershed boundaries were revised based on better survey data collected during design of a drainage canal for Giant Garter habitat and due to watershed changes resulting from the project.

Table 1. Comparison of 100-year Water Surface Elevations (Current XPSWMM values minus Previous EPA SWMM values)

Waterway	Maximum Difference, feet	Maximum Difference, feet	Average Difference, feet
Main Drainage Canal	-0.55	-0.31	-0.46
East Drainage Canal	-0.80	-0.20	-0.36
West Drainage Canal	-0.31	0.39	0.14
North Drainage Canal	-0.26	0.08	-0.10

Table 2 provides a full listing of the calculated 100-year water surface elevations along the major RD 1000 drains that were modeled with XPSWMM. The water surface elevations range from approximately 10.9 feet (NAVD88) at the south end of the basin to approximately 24.5 feet (NAVD88) at the north end of the basin. The locations of the XPSWMM model nodes listed in Table 2 are shown on Figure 1. For comparison, Table 2 includes both the original 100-year water surface elevations that were calculated with EPA SWMM (converted from NGVD29 to NAVD88 by adding 2.42 feet) and those that were calculated for this current study with XPSWMM.

Table 3 provides the approximate levee freeboard for locations that are protected by interior levees. The top of levee elevations were estimated from design drawings and LiDAR topographic mapping. No field surveying was performed to determine these levee elevations. Therefore, freeboard values listed in Table 3 are considered approximate. Note that generally, FEMA requires that levees provide three feet of freeboard against the 100-year water surface elevation. An additional one foot of freeboard is required within 100 feet of structures such as bridges. It appears that most of the existing levees provide adequate freeboard, but there may be deficiencies at the upstream end of the B Drain and also near bridges on the C Drain.

Table 2. Calculated Water Surface Elevations

Model Node Number	Original EPA SWMM 100-Year Water Surface Elev., ft, NAVD88	Current XPSWMM 100-Year Water Surface Elev., ft, NAVD88	Difference (XPSWMM value minus EPA SWMM value), ft, NAVD88	Current XPSWMM 200-Year Water Surface Elev., ft, NAVD88	Increase of 200-Year above XPSWMM 100-Year Water Surface Elev., ft, NAVD88	Notes
Main Drainage Canal						
174	11.42	10.87	-0.55	11.36	0.49	
11511	11.71	11.20	-0.51	11.67	0.47	
11558	11.79	11.29	-0.50	11.75	0.46	
1914	12.06	11.65	-0.41	12.06	0.40	
173	12.24	11.93	-0.31	12.32	0.39	
East Drainage Canal						
1910	12.48	12.18	-0.30	12.56	0.38	
1911	13.08	12.77	-0.31	13.21	0.44	
1912	13.17	12.87	-0.30	13.30	0.44	
1913	13.40	13.13	-0.27	13.60	0.47	
11559	13.49	13.22	-0.27	13.69	0.47	
176	13.52	13.25	-0.27	13.71	0.46	
11572	13.61	13.36	-0.25	13.78	0.42	
1906	13.71	13.49	-0.22	13.89	0.40	
11571	13.71	13.49	-0.23	13.89	0.41	
177	13.83	13.62	-0.21	14.01	0.39	
179	13.93	13.73	-0.20	14.10	0.37	
11103	14.09	13.88	-0.22	14.22	0.35	
1916	14.23	14.00	-0.24	14.34	0.35	
183	14.83	14.55	-0.28	14.82	0.27	
11108	15.20	14.85	-0.35	15.09	0.23	
184	15.47	15.09	-0.38	15.28	0.19	
11570	15.73	15.32	-0.41	15.47	0.15	
11109	15.73	15.32	-0.41	15.47	0.15	
185	15.81	15.38	-0.43	15.52	0.14	
197	16.05	15.56	-0.49	15.68	0.12	
188	16.55	16.04	-0.51	16.18	0.13	
11580	17.93	17.13	-0.80	17.27	0.13	
189	17.93	17.13	-0.80	17.26	0.13	
191	18.17	17.62	-0.55	17.77	0.15	
192	18.62	18.19	-0.43	18.38	0.20	
193	18.70	18.29	-0.42	18.50	0.21	
194	18.88	18.48	-0.40	18.74	0.26	
196	18.95	18.57	-0.38	18.82	0.25	
107	19.48	19.17	-0.31	19.44	0.26	
106	19.70	19.46	-0.24	19.71	0.25	
108	19.71	19.46	-0.25	19.72	0.25	
West Drainage Canal						
11520	12.25	11.95	-0.31	12.33	0.39	
11509	12.26	11.97	-0.29	12.35	0.37	
172	12.27	11.99	-0.28	12.36	0.37	
11008	12.87	12.97	0.10	13.15	0.18	
171	12.91	13.02	0.11	13.19	0.17	
170	12.92	13.03	0.11	13.20	0.16	
11010	12.95	13.07	0.12	13.22	0.16	
11011	13.28	13.51	0.23	13.74	0.23	
169	13.29	13.52	0.23	13.75	0.23	
168	13.29	13.52	0.23	13.75	0.23	
11012	13.30	13.54	0.24	13.77	0.23	
11013	13.50	13.66	0.16	13.89	0.23	

Table 2. Calculated Water Surface Elevations

Model Node Number	Original EPA SWMM 100-Year Water Surface Elev., ft, NAVD88	Current XPSWMM 100-Year Water Surface Elev., ft, NAVD88	Difference (XPSWMM value minus EPA SWMM value), ft, NAVD88	Current XPSWMM 200-Year Water Surface Elev., ft, NAVD88	Increase of 200-Year above XPSWMM 100-Year Water Surface Elev., ft, NAVD88	Notes
167	13.62	13.76	0.14	13.97	0.22	
166	13.63	13.78	0.15	13.99	0.21	
1103	13.71	13.88	0.17	14.07	0.20	
11014	13.72	13.90	0.18	14.09	0.19	
164	13.97	14.25	0.28	14.40	0.15	
163	14.11	14.47	0.36	14.62	0.15	
11581	14.27	14.63	0.36	14.78	0.15	
11582	14.30	14.69	0.39	14.84	0.15	
162	14.49	14.83	0.34	14.97	0.15	
161	15.67	15.64	-0.03	15.70	0.07	
J Sub-Drain System (tributary to West Drainage Canal)						
11523	12.14	11.97	-0.17	12.30	0.34	
11521	12.15	12.00	-0.15	12.30	0.31	
11518	12.16	12.02	-0.14	12.31	0.30	
11508	12.22	12.08	-0.14	12.37	0.28	
11517	12.38	12.86	0.48	12.94	0.08	
11516	12.48	12.93	0.45	13.01	0.08	
11514	13.35	13.60	0.25	13.68	0.08	
11513	13.35	13.61	0.26	13.69	0.08	
11524	12.21	12.00	-0.21	12.36	0.36	
11526	12.28	12.10	-0.18	12.41	0.32	
11532	12.34	12.17	-0.17	12.46	0.29	
11531	12.49	12.38	-0.11	12.63	0.25	
11529	12.51	12.40	-0.11	12.64	0.24	
11501	12.52	12.41	-0.12	12.65	0.25	
11503	12.52	12.41	-0.12	12.66	0.25	
Plant 3 Inlet Canal						
1108	13.16	13.38	0.22	13.62	0.24	
11577	13.22	13.45	0.23	13.69	0.23	
L Drain (Lone Tree Canal)						
11536	13.64	13.79	0.15	14.01	0.22	
11535	13.66	13.80	0.14	14.01	0.22	
1104	13.77	13.89	0.12	14.10	0.21	
11541	14.09	14.14	0.05	14.32	0.18	
11540	17.91	18.20	0.29	18.48	0.28	
11539	19.04	19.15	0.11	19.34	0.20	
11538	19.04	19.15	0.11	19.34	0.20	
11537	20.19	20.35	0.16	20.50	0.15	
199	20.20	20.35	0.15	20.50	0.15	
N Drain (Powerline Road Channel)						
11547	13.76	13.94	0.18	14.12	0.18	
11548	13.97	14.11	0.14	14.25	0.15	
11551	14.19	14.35	0.16	14.49	0.13	
1102	15.32	15.66	0.33	15.85	0.20	
1101	15.56	15.78	0.22	15.97	0.19	
Plant 5 Inlet Canal						
11578	13.99	14.36	0.37	14.51	0.15	
1106	13.96	14.29	0.33	14.45	0.16	
Airport West Drain						
165	14.38	14.71	0.33	14.86	0.15	

Table 2. Calculated Water Surface Elevations

Model Node Number	Original EPA SWMM 100-Year Water Surface Elev., ft, NAVD88	Current XPSWMM 100-Year Water Surface Elev., ft, NAVD88	Difference (XPSWMM value minus EPA SWMM value), ft, NAVD88	Current XPSWMM 200-Year Water Surface Elev., ft, NAVD88	Increase of 200-Year above XPSWMM 100-Year Water Surface Elev., ft, NAVD88	Notes
B Drain						
11569	13.51	13.22	-0.29	13.70	0.48	
11560	13.65	13.38	-0.27	13.85	0.47	
11561	13.86	13.58	-0.28	14.07	0.49	
11552	13.92	13.66	-0.27	14.13	0.48	
11006	14.47	14.21	-0.26	14.70	0.49	
11553	14.94	15.01	0.07	15.48	0.47	
11573	15.02	15.11	0.09	15.56	0.45	
11574	15.12	15.21	0.09	15.67	0.45	
11575	15.19	15.28	0.09	15.71	0.43	
11576	15.26	15.36	0.10	15.79	0.44	
11554	15.34	15.43	0.09	15.84	0.41	
C1 Canal (Plant 8 Inlet Canal)						
11007	13.81	13.61	-0.20	14.00	0.39	
11105	13.63	13.45	-0.18	13.86	0.41	
178	13.66	13.41	-0.26	13.82	0.42	
D2 and D3 Drains (East Drainage Canal Tributary Between Del Paso Road and Elkhorn Blvd.)						
11583	15.88	15.61	-0.27	15.82	0.21	
11107	15.88	15.62	-0.26	15.83	0.20	
11205	17.75	17.79	0.04	18.04	0.25	
D1 Drain (East Drainage Canal Trib. East along Elkhorn Blvd.)						
11593	15.41	15.25	-0.16	15.33	0.08	
11594	15.39	15.27	-0.12	15.35	0.08	
11595	15.54	15.45	-0.09	15.52	0.07	
11601	15.78	15.94	0.16	16.03	0.09	
11602	16.05	16.19	0.14	16.33	0.14	
11596	16.10	16.22	0.12	16.36	0.14	
11597	16.49	16.41	-0.08	16.64	0.23	
11598	16.49	16.31	-0.18	16.63	0.31	
11599	18.14	17.96	-0.18	18.13	0.17	
East Drainage Canal Trib. West along Elkhorn Blvd.						
11100	15.74	15.38	-0.36	15.52	0.14	
182	18.97	19.10	0.13	19.12	0.02	
E Drain (Plant 6 Inlet Canal)						
11111	15.95	15.45	-0.50	15.57	0.12	
187	16.03	15.43	-0.60	15.55	0.13	
G2 and G3 Drains (East Tributary to East Drainage Canal between Riego Road and Elverta Road)						
190	18.52	17.36	-1.16	17.51	0.14	
195	18.97	18.39	-0.58	18.48	0.09	
198	19.41	18.91	-0.50	19.02	0.11	
1999	22.42	22.42	0.00	22.42	0.00	
I Drain (West Tributary to East Drainage Canal along Elverta Road)						
11546	18.62	21.73	3.11	21.99	0.26	
11544	18.68	21.91	3.23	22.15	0.24	
11566	22.13	22.21	0.08	22.23	0.01	Original EPA SWMM value appears to be erroneous due to model intability.
11563	22.13	22.24	0.11	22.25	0.01	Original EPA SWMM value appears to be erroneous due to model intability.

Table 2. Calculated Water Surface Elevations

Model Node Number	Original EPA SWMM 100-Year Water Surface Elev., ft, NAVD88	Current XPSWMM 100-Year Water Surface Elev., ft, NAVD88	Difference (XPSWMM value minus EPA SWMM value), ft, NAVD88	Current XPSWMM 200-Year Water Surface Elev., ft, NAVD88	Increase of 200-Year above XPSWMM 100-Year Water Surface Elev., ft, NAVD88	Notes
11564	22.13	22.55	0.42	22.61	0.06	Original EPA SWMM value appears to be erroneous due to model intability.
G Drain (Tributary to East Drainage Canal at County Line)						
1113	18.90	18.49	-0.41	18.77	0.28	
North Drainage Canal						
105	19.73	19.49	-0.24	19.75	0.25	
11555	20.02	20.01	-0.01	20.32	0.31	
11556	20.03	20.03	0.00	20.34	0.31	
104	20.12	20.19	0.07	20.52	0.32	
103	20.12	20.19	0.07	20.52	0.32	
102	20.12	20.19	0.07	20.52	0.32	
11557	19.17	19.25	0.08	19.58	0.33	
122	19.75	19.51	-0.24	19.76	0.26	
110	19.79	19.54	-0.25	19.81	0.26	
111	19.78	19.54	-0.24	19.80	0.26	
112	19.81	19.57	-0.24	19.80	0.23	
113	19.81	19.58	-0.23	19.80	0.22	
114	19.79	19.56	-0.23	19.76	0.20	
115	19.77	19.51	-0.26	19.70	0.19	
P Drain System (South Tributary to Plant 2 Inlet Canal)						
160	20.14	20.21	0.07	20.53	0.32	
11400	21.47	21.58	0.11	21.69	0.11	
11403	23.24	22.83	-0.41	22.84	0.01	
R Drain System (North Drainage Canal East Tributary from Highway 99)						
121	20.69	21.69	1.00	21.85	0.17	
1202	#N/A	21.73	#N/A	21.91	0.18	XPSWMM Node for 2D Modeling
1201	#N/A	21.91	#N/A	22.13	0.22	XPSWMM Node for 2D Modeling
120	21.45	22.25	0.80	22.58	0.33	
V Drain System (North Drainage Canal North Tributary from Highway 99)						
124	19.83	19.61	-0.22	19.82	0.21	
123	19.83	19.61	-0.22	19.82	0.21	
119	23.98	24.47	0.49	24.58	0.11	
118	23.98	24.47	0.49	24.58	0.11	
T Drain (North Drainage Canal North Tributary from Cross Canal)						
116	19.85	19.67	-0.18	19.79	0.12	
117	19.85	19.68	-0.17	19.79	0.11	
Vestal Drain (Southwest Tributary to Plant 4)						
126	19.74	19.52	-0.22	19.70	0.18	

Table 3. Approximate Interior Levee Freeboard for 100-Year Storm					
Model Node Number	100-Year Water Surface Elev., ft, NAVD88	Approx. Top Elev. of Left Levee, ft, NAVD88	Approx. Top Elev. of Right Levee, ft, NAVD88	Approx. Freeboard Left Levee, ft	Approx. Freeboard Right Levee,ft
Main Drainage Canal					
11511	11.20	17.4	17.4	6.2	6.2
11558	11.29	17.4	17.4	6.1	6.1
1914	11.65	17.4	17.4	5.8	5.8
173	11.93	17.4	17.4	5.5	5.5
East Drainage Canal					
1910	12.18	17.4	17.4	5.2	5.2
1911	12.77	17.4	17.4	4.6	4.6
1912	12.87	17.4	17.4	4.6	4.6
1913	13.13	17.4	17.4	4.3	4.3
11559	13.22	17.4	17.4	4.2	4.2
176	13.25	17.4	17.4	4.2	4.2
11572	13.36	17.5	17.5	4.2	4.2
1906	13.49	17.5	17.5	4.0	4.0
11571	13.49	17.5	17.5	4.0	4.0
177	13.62	17.6	17.6	4.0	4.0
179	13.73	18.0	18.0	4.3	4.3
11103	13.88	18.4	18.4	4.5	4.5
1916	14.00	18.3	18.3	4.3	4.3
183	14.55	18.3	18.3	3.8	3.8
11108	14.85	18.7	18.7	3.9	3.9
184	15.09	18.9	18.9	3.8	3.8
11570	15.32	19.7	19.7	4.4	4.4
11109	15.32	19.9	19.9	4.6	4.6
West Drainage Canal					
11520	11.95	17.4	17.4	5.5	5.5
11509	11.97	17.4	17.4	5.4	5.4
172	11.99	17.4	17.4	5.4	5.4
11008	12.97	18.4	18.4	5.4	5.4
171	13.02	17.4	17.4	4.4	4.4
170	13.03	17.4	17.4	4.4	4.4
11010	13.07	17.7	17.7	4.7	4.7
11011	13.51	17.7	17.7	4.2	4.2
169	13.52	17.4	17.4	3.9	3.9
B Drain					
11569	13.22	17.4	17.4	4.2	4.2
11560	13.38	17.6	17.4	4.2	4.0
11561	13.58	17.6	17.6	4.0	4.0
11552	13.66	18.0	18.0	4.4	4.4
11006	14.21	18.0	18.0	3.8	3.8
11553	15.01	18.0	18.0	3.0	3.0
11573	15.11	18.0	18.0	2.9	2.9

Table 3. Approximate Interior Levee Freeboard for 100-Year Storm					
Model Node Number	100-Year Water Surface Elev., ft, NAVD88	Approx. Top Elev. of Left Levee, ft, NAVD88	Approx. Top Elev. of Right Levee, ft, NAVD88	Approx. Freeboard Left Levee, ft	Approx. Freeboard Right Levee,ft
C1 Canal (Plant 8 Inlet Canal)					
11007	13.61	17.0	17.0	3.4	3.4
11105	13.45	17.0	17.0	3.6	3.6
178	13.41	17.2	17.2	3.8	3.8
D1 Drain					
11593	15.25	19.9	19.9	4.7	4.7
11594	15.27	19.4	19.4	4.2	4.2
11595	15.45	19.4	19.4	4.0	4.0
11601	15.94	19.4	19.4	3.5	3.5
11602	16.19	19.4	19.4	3.2	3.2
11596	16.22	19.4	19.4	3.2	3.2
East Drainage Canal Trib. West along Elkhorn Blvd.					
11100	15.38	19.4	19.4	4.0	4.0

Floodplain Mapping for 100-Year Storm Event

Using the calculated water surface elevations in conjunction with LiDAR topographic mapping developed by the State DWR, the approximate limits of the 100-year floodplain was mapped along the major RD 1000 drainage canals. The 100-year floodplain limits are presented on Figure 2.

There are numerous interior levees that provide flood protection to areas within the City of Sacramento and unincorporated Sacramento County. These levees are shown on Figure 2. In the late 1990's, the interior levees in Natomas were certified to provide 100-year flood protection to the adjacent areas. Because the larger perimeter levees around Natomas Basin have been decertified, the entire Natomas Basin is now mapped within a FEMA 100-year floodplain (Zone A99). When the exterior levees are improved and the A99 Zone is removed from the Natomas Basin, it is possible that FEMA will require the interior levees to be recertified. Because levee evaluation requirements have changed since the interior levees were originally certified, it is uncertain whether these levees could be certified today. The 100-year floodplain map limits shown on Figure 2 are based on the assumption that the interior levees provide adequate protection to the adjacent areas. However, a more thorough investigation of the levees is required to verify whether they meet the current levee design criteria

Model Results for the 200-year Storm Event

Calculated Water Surface Elevations for the 200-year Storm Event

Table 2 provides a list of the calculated 200-year water surface elevations along the major RD 1000 drains that were modeled with XPSWMM. The water surface elevations range from approximately 11.4 feet (NAVD88) at the south end of the basin to approximately 24.6 feet (NAVD88) at the north end of the basin. The locations of the XPSWMM model nodes listed in Table 2 are shown on Figure 1. The 200-year water surface elevations are generally 0.2 to 0.5 feet higher than the 100-year water surface elevations, with an average increase of approximately 0.3 feet. Table 4 provides an estimate of the levee freeboard for the interior levees during a 200-year storm event.

Table 4. Approximate Interior Levee Freeboard for 200-Year Storm					
Model Node Number	200-Year Water Surface Elev., ft, NAVD88	Approx. Top Elev. of Left Levee, ft, NAVD88	Approx. Top Elev. of Right Levee, ft, NAVD88	Approx. Freeboard Left Levee, ft	Approx. Freeboard Right Levee, ft
Main Drainage Canal					
11511	11.67	17.4	17.4	5.8	5.8
11558	11.75	17.4	17.4	5.7	5.7
1914	12.06	17.4	17.4	5.4	5.4
173	12.32	17.4	17.4	5.1	5.1
East Drainage Canal					
1910	12.56	17.4	17.4	4.9	4.9
1911	13.21	17.4	17.4	4.2	4.2
1912	13.30	17.4	17.4	4.1	4.1
1913	13.60	17.4	17.4	3.8	3.8
11559	13.69	17.4	17.4	3.7	3.7
176	13.71	17.4	17.4	3.7	3.7
11572	13.78	17.5	17.5	3.7	3.7
1906	13.89	17.5	17.5	3.6	3.6
11571	13.89	17.5	17.5	3.6	3.6
177	14.01	17.6	17.6	3.6	3.6
179	14.10	18.0	18.0	3.9	3.9
11103	14.22	18.4	18.4	4.2	4.2
1916	14.34	18.3	18.3	4.0	4.0
183	14.82	18.3	18.3	3.5	3.5
11108	15.09	18.7	18.7	3.6	3.6
184	15.28	18.9	18.9	3.6	3.6
11570	15.47	19.7	19.7	4.3	4.3
11109	15.47	19.9	19.9	4.5	4.5
West Drainage Canal					
11520	12.33	17.4	17.4	5.1	5.1
11509	12.35	17.4	17.4	5.1	5.1
172	12.36	17.4	17.4	5.1	5.1
11008	13.15	18.4	18.4	5.3	5.3
171	13.19	17.4	17.4	4.2	4.2
170	13.20	17.4	17.4	4.2	4.2
11010	13.22	17.7	17.7	4.5	4.5
11011	13.74	17.7	17.7	4.0	4.0
169	13.75	17.4	17.4	3.7	3.7
C1 Canal (Plant 8 Inlet Canal)					
11007	14.00	17.4	17.4	3.4	3.4
11105	13.86	17.6	17.4	3.8	3.6
178	13.82	17.6	17.6	3.8	3.8
Note: Only waterways with tributary areas of 10 square miles or more are included in this table.					

Floodplain Mapping for 200-Year Storm Event

Using the calculated water surface elevations in conjunction with LiDAR topographic mapping developed by the State of California DWR, the approximate limits of the 200-year floodplain were mapped along the major RD 1000 drainage canals. The 200-year floodplain limits are presented on Figure 3. The Urban Level of Protection Criteria specify that communities must make findings relative the urban level of protection (i.e. 200-year flood protection) in watersheds that have a tributary area of 10 square miles or more. In addition, findings must only be made in those areas that have a potential 200-year flood depth above three feet. Therefore, the 200-year floodplain on Figure 3 is only shown for those locations where the tributary area of the waterway is 10 square miles or more. In the mapped areas, the full inundation area is shown along with those areas with a depth of three feet or more.

It is believed that the existing interior levees will not meet all of the requirements of the Urban Levee Design Criteria (ULDC) prepared by DWR, without exception. Most of the leveed waterways that have tributary areas of 10 square miles or more appear to have adequate freeboard (minimum of 3 feet per DWR ULDC) and levee geometry, but conformance with other requirements, such as wind setup and wave runup, geotechnical design criteria, erosion, encroachments, penetrations, etc. is uncertain. Additionally, other ULDC provisions such as right of way will require preparation of exceptions, and require development of plans for security and flood safety. For this study, it was assumed that the interior levees would not meet all of the design requirements and would fail during a 200-year storm event. Therefore, levee breaches were modeled to estimate the 200-year floodplain in areas that are protected by the levees. The approach to the levee breach modeling is described below.

Ten levee failure zones were identified and XPSWMM was used to estimate the 200-year floodplain limits in each zone that would result from a levee failure. Each of the zones is shown on Figure 4. The levee failure zones were distinct areas that are separated from each other by topographic features (based on DWR LiDAR, 2008) or by RD 1000 drains. For each of the zones, an elevation-storage relationship was defined using the LiDAR topographic data from DWR. Levee breaches were assumed to occur at the most critical location for each zone (the location that would produce the highest water surface elevation within the levee failure zone). The levee breach dimensions were estimated using the following criteria established by DWR for their Central Valley Floodplain Evaluation and Delineation Program (SB 1278/AB 1965 ULOP Information Floodplain Maps, Processes and Assumptions, California Department of Water Resources, October 2013):

- Breach Width – Set to 50 times the difference between the top of levee and land side toe elevations
- Breach Bottom Elevation – Set to the land side levee toe elevation
- Breach Weir Coefficient – Set to 2.0

For this study, it was assumed that the breach formed immediately at the beginning of the storm. This is a conservative assumption that most likely overestimates the volume of flow that would spill through the levee breach. Model runs for each of the levee failure zones were made with XPSWMM. Only one levee breach (the breach applicable to the zone of interest) was made in each model run. Table 5 presents the results from the levee breach modeling. The results indicate that, in the levee breach zones, the 200-year inundation areas with three feet of depth or more are limited to streets, detention basins and drainage channels. This conclusion is based on a review of the floodplain limits on aerial photography. Therefore, it may not be necessary for the local agencies to make a finding for the interior levees. However, this should be carefully evaluated by each affected agency based on the floodplain mapping shown on Figure 3.

There is one location along the West Drainage Canal where the levee was assumed to fail, but was not modeled with a levee breach simulation. This area is located along the west side of the West Drainage Canal, just north of Interstate 80. In this area, if the levee were to fail, the resultant flood depths on the land side of the levee would be very shallow and the floodplain storage volume would be small. Therefore, it is believe the floodplain elevations would in that area would be essentially equal to the water surface elevation in the West Drainage Canal. Therefore, the water surface elevations in the canal were used to estimate the floodplain at that location.

CONCLUSIONS AND RECOMMENDATIONS

The RD 1000 drainage system model that was originally created with EPA SWMM was successfully converted to XPSWMM. With XPSWMM, flood water surface elevations in the main RD 1000 drains were calculated for the 100-year and 200-year storms and estimated floodplain limits were mapped. Some conclusions, recommendations, and limitations related to the results from this study are provided below:

- The configuration of the RD 1000 drainage system was largely based on the system representation in the original RD 1000 model. Some portions of the drainage system in XPSWMM were updated where there were known changes to the system. However, the existing system covers a very large area and it was beyond the scope of this study to verify every drainage facility included in the model.
- The floodplain mapping for the 100-year storm (Figure 2) was based on the assumption that the interior levees provide adequate protection to the surrounding areas. Additional analyses are needed to determine whether the existing levees meet FEMA's freeboard criteria and other levee criteria.
- The floodplain limits for the 200-year storm (Figure 3) are only depicted along those waterways that have a tributary area of 10 square miles or more. These are the areas that are regulated under SB5. Additional areas may be inundated during a 200-year storm that are not depicted on the maps. For those areas that are potentially subject to more than 3 feet of flood depth during a 200-year storm event (the green areas on Figure 3), are subject to the Urban Level of Flood Protection requirements.

Table 5. Levee Breach Results for 200-year Storm

Levee Breach Zone	Levee Breach Width	Peak Spill, cfs	Maximum Water Surface Elevation, feet NAVD88
1	245	235	13.6
2a	285	394	14.3
2b	4500	462	13.4
3	230	186	9.8
4	235	63	12.4
5	285	390	14.1
6	250	203	6.9
7	220	14	8.4
8	565	190	12.1
9	700	220	13.3

RD 1000 Pumping Plant #4
RD 1000 Pumping Plant #2
RD 1000 Pumping Plant #5
RD 1000 Pumping Plant #3
RD 1000 Pumping Plant #6
RD 1000 Pumping Plant #8
RD 1000 Pumping Plant 1A & 1B
Natomas Cross Canal
Pleasant Grove Creek Canal
North Drainage Canal
T Drain
T1
V1
V2
V Drain
L Drain
R Drain
P Drain
N Drain
East Drainage Canal
West Drainage Canal
G2
G3
E Drain
C1 Drain
B Drain
D1
Pipeline
Main Drainage Channel
Natomas East Main Drainage Canal
Sacramento River
Yolo Bypass
Yolo Bypass Wildlife Area
American River
County of Sutter
County of Placer
County of Sacramento
County of Yolo
Sankey Rd
W Elverta Rd
W Elkhorn Blvd
Garden Hwy
E Levee Rd
Richards Blvd
Sacramento International Airport
Airport Blvd
Rio Linda Blvd
Elkhorn Blvd
16th St
Marysville Blvd
Raley Blvd
Main Ave
Norwood Ave
Northgate Blvd
Grove Ave
El Camino Ave
Del Paso Blvd
Arden Way
I80 (Bus Rte)
This Area Not Included in Hydrologic Model. Flows from City Pumps Manually Entered into Hydraulic Model.

Sacramento Co.

Legend

- 11529 Model Node and Number
- Main RD 1000 Drain
- Limits of 2D Model
- 11502 Approx. Shed Boundary and Number
- Interior Levees
- Exterior Levees
- RD 1000 Pumping Plant
- County of Sacramento Pumping Plant
- City of Sacramento Pumping Plant
- Road
- City of Sacramento Boundary
- County Boundary

N

0 3,000 6,000

Scale in Feet

WEST YOST ASSOCIATES

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Figure 1

Drainage Facilities and Model Layout

Natomas Basin 200-Year Interior Drainage Study

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RD 1000 Pumping Plant #4
Natomas Cross Canal
T Drain
North Drainage Canal
V Drain
Pleasant Grove Creek Canal
County of Sutter
County of Placer
25'
31'
24'
26'
28'
29'
33'
35'
23'
27'
Sankey Rd
36'
22'
20'
R Drain
21'
20'
19'
Canal
Drainage
North
County of Sutter
County of Sacramento
RD 1000 Pumping Plant #2
Canal
East Drainage
County of Placer
County of Sacramento
P Drain
18'
W Elverta Rd
17'
16'
RD 1000 Pumping Plant #6
E Drain
County of Yolo
County of Sacramento
Sacramento International Airport
N Drain
L Drain
Canal
W Elkhorn Blvd
Elkhorn Blvd
Rio Linda Blvd
16th St
15'
20'
14'
99
Airport Blvd
14'
14'
RD 1000 Pumping Plant #5
West Drainage Canal
5
15'
Drainage
14'
Main Ave
Main Ave
Marysville Blvd
Raley Blvd
RD 1000 Pumping Plant #8
C1 Drain
RD 1000 Pumping Plant #3
Sacramento River
East
Natomas East Main Drainage Canal
80
14'
B Drain
Norwood Ave
Northgate Blvd
San Juan Rd
13'
13'
12'
12'
13'
Truxel Rd
W El Camino Ave
El Camino Ave
Grove Ave
Yolo Bypass
Main Drainage Channel
11'
RD 1000 Pumping Plant 1A & 1B
Garden Hwy
E Levee Rd
American River
Del Paso Blvd
Arden Way
80
I80 (Bus Rte)
Yolo Bypass Wildlife Area
Richards Blvd

Sacramento Co.

Legend

- 100 Year Floodplain Limits
- 100 Year Water Surface Elevation (NAVD88)
- Main RD 1000 Drain
- Limits of 2D Model
- Interior Levees
- Exterior Levees
- RD 1000 Pumping Plant
- County of Sacramento Pumping Plant
- City of Sacramento Pumping Plant
- Road
- City of Sacramento Boundary
- County Boundary

N

0 3,000 6,000

Scale in Feet

WEST YOST ASSOCIATES

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Figure 2

100-Year Floodplain

Natomas Basin 200-Year Interior Drainage Study

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Note: The 200-Year floodplain is only shown for the waterways colored in red, which have tributary areas of 10 square miles or more.



Legend

- 200 Year Floodplain Limits
- 200 Year Floodplain Limits with Depth of 3' or Greater
- 200 Year Water Surface Elevation (NAVD88)
- Main RD 1000 Drain
- Main RD 1000 Drain w/ min. 10 sq mi Tributary Area
- Limits of 2D Model
- Interior Levees
- Exterior Levees
- RD 1000 Pumping Plant
- County of Sacramento Pumping Plant
- City of Sacramento Pumping Plant
- Road
- City of Sacramento Boundary
- County Boundary

0 3,000 6,000

Scale in Feet

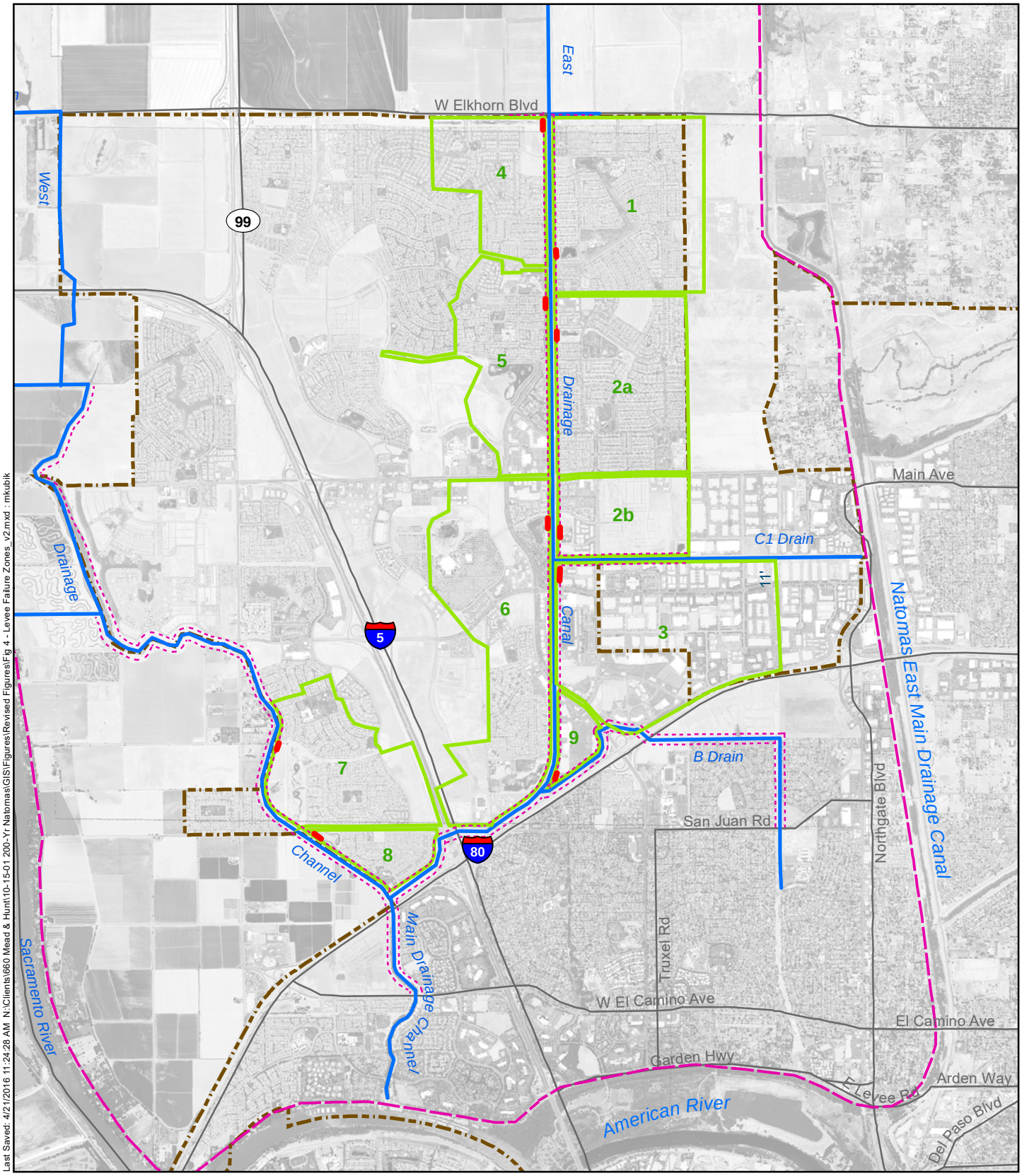
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Figure 3

200-Year Floodplain

Natomas Basin 200-Year Interior Drainage Study



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Legend

- Assumed Levee Breach Location
- Levee Failure Zone
- Interior Levees
- Levees_project selection
- Main RD 1000 Drain
- City of Sacramento Boundary

N

0 2,000 4,000

Scale in Feet

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Figure 4

Levee Failure Zones

Natomas Basin 200-Year Interior Drainage Study