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memorandum

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to San Joaquin County Resource Conservation District

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subject FINAL Paradise Cut Existing Conditions Technical Memorandum

Introduction & Summary

This memo is an early work product to inform the Paradise Cut Conservation and Flood Management Plan (PCCFMP). The San Joaquin County Resource Conservation District (RCD) has contracted Environmental Science Associates (ESA) to develop the PCCFMP to evaluate and refine design options for the Paradise Cut Expansion Project (PCEP) to improve flood management and provide opportunities to restore Delta fish and wildlife habitat.

This technical memorandum (TM) provides a summary of existing flood, ecosystem and related infrastructure and land management information in order to form a basis for future work in this project. That basis includes establishing a “baseline” of existing flood and environmental conditions so that the benefits of the proposed project configuration can be highlighted, and providing information on key pieces of infrastructure and site conditions that influence the development and configuration of the expanded floodway. The geographic scope of the existing conditions discussed in this memorandum is limited to the area within the white dashed lines in **Figure 1**. Existing conditions downstream and outside of the white dashed line may be discussed in the future as this planning effort and investigation proceeds.

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Project Background¹

This planning effort was funded by a Proposition 1 grant from the Sacramento-San Joaquin Delta Conservancy (Conservancy) to the San Joaquin County Resource Conservation District, and is supported with matching funds from the River Island Settlement Fund.

The overall purpose of this planning effort is to advance and refine the planning for the PCEP, a flood bypass concept that has been the subject of a variety of planning studies for over 15 years (**Figure 1**). In 2007, Senate Bill 5 directed the California Department of Water Resources (DWR) and the Central Valley Flood Protection Board (CVFPB) to evaluate the feasibility of significantly reducing flood stage in the San Joaquin River watershed upstream and south of Paradise Cut, through bypasses or floodways. The 2012 Central Valley Flood Protection Plan (CVFPP) included an expanded Paradise Cut as a part of the State Systemwide Investment Approach. The 2013 Delta Plan recommends implementation of a new flood bypass in this area, and prohibits encroachments in a planning area that is roughly coincident with the project area defined in **Figure 1** and focused on in this technical memo. The 2017 update to the CVFPP further proposes construction of a flood bypass in the lower San Joaquin River at Paradise Cut, as one of three priority system wide improvement projects.

Specifically, this project seeks to evaluate key physical and operational elements of an expanded Paradise Cut and to advance planning, design, and strategies for permitting and environmental compliance. Based on concepts in the CVFPP, this project will generate a refined conceptual-level design for a new flood bypass to reduce flood risk, improve fish and wildlife habitat, and sustain agricultural land in San Joaquin County along the San Joaquin River. The project will also develop a compliance and permitting strategy; prepare a draft California Environmental Quality Act/National Environmental Policy Act project description; quantify project costs and benefits; identify and advance near-term opportunities for restoration; and conduct outreach to agencies, officials, and landowners.

The project is supported by an effective, cross-sector partnership with relevant expertise, local support, and a history of these partners working together. The project is supported by a partnership including the South Delta Water Agency, Reclamation District (RD) 2062, Southern Delta Levee Protection and Channel Maintenance Authority (SDLPCMA; a joint powers authority comprised of the South Delta Water Agency and RD 2062; the joint powers authority may in the future include expanded membership to include RD 17 and other parties with an interest in the bypass, such as San Joaquin County), the San Joaquin Resource Conservation District, River Islands LLC, American Rivers, the Natural Resources Defense Council, ESA, MBK Engineers, and Consero Solutions.

Purpose and scope of this technical memorandum

This TM describes the existing conditions in the proposed project area at Paradise Cut. It identifies project boundaries, and includes a discussion of land cover, habitat, physical site conditions, flood infrastructure, and flood conveyance capacity. It forms a basis for better understanding conditions that influence the feasibility of key potential project components (for example, a levee setback, a larger weir, a new bridge). **This report is not intended to replace environmental review documentation under the*

¹ Portions of this section are adapted from the California Department of Fish and Wildlife's *Delta Conservation Framework* (2017) and the *Lower San Joaquin River Floodplain Bypass Proposal* (SDLPCMA 2011).

California Environmental Quality Act. As this project is refined and advanced, more information will become available and will inform environmental review.

This TM also informs development of a numerical modeling plan, which is concurrent with development of this TM. Because conveyance of floodwaters is a critical aspect of the project and because the standard approach for assessing flood conveyance for existing and potential future conditions (e.g., with a new levee or channel configuration) is via numerical modeling computer software, the conceptual designs in this project will be based in large part on modeling results for existing conditions with the relative change for any potential future configuration identified. Modeling is also an efficient way to understand the performance of various potential project components, and based on the modeling the designs can be refined with the costs of these components weighed against their cost and other relevant factors. With numerous potential project components to consider, their internal interaction and feedback (in terms of flood conveyance) can be complicating, which makes understanding the system (and component performance) difficult. To mitigate this potential pitfall and to efficiently complete the modeling for this project, the modeling plan was developed and will be delivered under separate cover.

History and Regional Setting

The land in and around Paradise Cut in the South Delta is predominately characterized by agriculture and is bordered by the cities of Manteca and Lathrop to the east and Tracy to the west. The main channel features include the San Joaquin River, Middle and Old Rivers, and Paradise Cut, a former distributary of the San Joaquin River (**Figure 1**). Tom Paine Slough, located just south of Paradise Cut, is another historical distributary channel which is now largely disconnected from the San Joaquin River (on the upstream section it is blocked by levees and the downstream section is blocked by a flap gate). Interstate 205 (I-205) and Interstate 5 (I-5) bisect the middle of the project area. Follow up communication after a June 5th 2018 Agency outreach meeting indicated that during wetter years, flap gates on Tom Paine slough are open and it therefore receives flows from upstream. Water then flows downstream into Sugar Cut and Old River.

Paradise Cut is a former slough located southwest of Lathrop that historically was one of the chief distributary branches of the San Joaquin River as it enters the Sacramento-San Joaquin Delta. Today, Paradise Cut plays a critical role in directing floodwaters away from the urbanizing floodplains in Lathrop and Stockton. The exact date of construction of Paradise Weir (also known as Paradise Dam) is unknown, though based on the date of project authorization, it is likely in either the late 1940s or early 1950s. The former distributary channel was “improved” to route high flows away from the constrained San Joaquin River with levees constructed on both sides, the channel presumably straightened, and a weir was constructed at the head to control the frequency and magnitude of flows discharged into the channel. Follow up communications from the June 5th Agency outreach meeting indicated that Paradise Cut was originally a component of an intended bypass forming part of the Corps of Engineers levee system.

The project area sits on a unique estuarine/river intersection: the transition from the fluvially (river flow)-dominated lower San Joaquin River with its multiple river distributary channels to the tidally (ocean tide)-dominated Delta. Although it is now nearly completely converted to agriculture, this portion of the Delta landscape was an important and unique habitat in the estuary: at the landscape

scale, the south Delta historically presented an array of tidal wetlands interwoven with distributary riverine channels and non-tidal floodplains across a broad transitional zone, or ecotone (Whipple et al. 2012).

Management, jurisdiction, and regional planning

The project area as shown in **Figure 2** falls in the jurisdiction of Reclamation Districts 2058 (Pescadero), RD 2095 (Paradise Junction), RD 2062 (Stewart Tract), and RD 2107 (Mossdale). The project is in State Senate District Number 5 and California State Assembly Districts 12 and 13.

The proposed project has been part of formal regional flood planning efforts since 2012, when it was first included in the CVFPP (DWR 2012). It is in the South Delta Regional Flood Planning Area and it borders the Lower San Joaquin River Flood Management Planning area (note, both areas were merged in the development of the 2014 *Lower San Joaquin River and Delta South Regional Flood Management Plan*). The bypass is also within the CVFPP Conservation Strategy's (CS, DWR 2016a) Lower San Joaquin River Conservation Planning Area (CPA). The Delta Stewardship Council (Council) in the 2013 *Delta Plan* identified Paradise Cut as an area that must evaluate and where feasible incorporate alternatives, including the use of setback levees, to increase floodplains and riparian habitats (see Ecosystem Restoration Policy 4 [ER P4]) and an area in which to not allow encroachment into the floodway (see Reduce Risk Policy 3 [RR P3] and Reduce Risk Policy 4 [RR P4]) (Council 2013). Finally, Paradise Cut is in the U.S. Army Corps of Engineers' (USACE) *Lower San Joaquin River Feasibility Study Area*; however, areas south of Paradise cut and west of the main-stem San Joaquin are not included in this area.

Site Conditions

Land Use

The dominant land use in the project area is agriculture, most of which is considered prime farmland (Farmland Mapping and Monitoring Program [FMMP] 2014). There are no formal recreation facilities inside this project's assumed project footprint; however, the River Islands Development adjacent to Paradise Cut (in RD 2062) contains a number of recreational opportunities. The River Islands Phase I Parks Masterplan identifies a number of neighborhood and community parks, sport fields, trails for hiking and biking, and waterfront linear parks that run both on the interior of the River Islands development and along the eastern/northern levee of Paradise Cut.

Land Cover

Land cover in the project area is predominantly agriculture. **Figure 3** shows a narrow strip of Valley/Foothill Riparian habitat adjacent to the river channel but agriculture dominates through the rest of the Paradise Cut channel/floodplain area. The River Islands draft EIS (USACE 2014) identifies the dominant biological communities in the project area as agricultural crops and ruderal grassland, where native vegetation is associated with riparian and wetland communities. Dominant riparian species include valley oak, California black walnut, box elder, Gooding's black willow, narrow-leaved willow, and Fremont cottonwood.

Infrastructure

Local Infrastructure

The following infrastructure items in the project area (see **Figure 4**) were identified via aerial imagery to support project design: agricultural infrastructure, boat facilities, houses, utility towers, business/commercial buildings, recreational facilities, dairy ponds, club and event facilities, water infrastructure, industrial infrastructure, mining infrastructure, trailer parks, power substations and other facilities. The purpose of identifying these items is to locate pieces of infrastructure that may lie within the eventual project footprint so that they can be addressed during project design. Some existing infrastructure may need to be protected from flooding in any new configuration of the existing floodway, and may also need to be considered in establishing the alignment and configuration of any new floodway configurations.

Regional Infrastructure

I-5 and I-205 run northeast-southwest through the project area, with the intersection of these two interstates occurring in the project area. Comments made during a July 11th 2018 outreach meeting with landowners suggest that the interstate crossing over Paradise Cut at Mossdale is the narrowest of the crossings. In addition, two railroad lines² run roughly parallel to the I-5 / I-205 alignment—one upstream and the other downstream—with bridges for each spanning across Paradise Cut. Two local roads of interest also run through the project area on the south (left bank) side of Paradise Cut: Manthey Road, located on the downstream side of I-5 and paralleling it with a crossing of Paradise Cut via a bridge, and Mancuso Road, running along the south (left) bank of Paradise Cut, ending upstream at the weir.

In addition, there are some noteworthy larger pieces of infrastructure in and near the project area (see **Figure 5**). The Deuel Vocational Institute (DVI) facility is a state prison located on the left floodplain, southwest of Paradise cut Weir and upstream of the Union Pacific Railroad line. In the same vicinity is a related water treatment facility and dairy. Another dairy is located on the left floodplain, just outside the levee system, downstream of RR2 (see **Figure 4c**).

The DVI facility opened in 1953 (California Department of Corrections and Rehabilitation 2018) and is situated just west of the project boundary. Adjacent is a 2-mile dry-land levee along its northeast boundary, wrapping around the south edge and the embankment for RR1 serves as a levee north of the site (Paradise Junction RD No. 2095 Emergency Operations Plan Basic Plan 2015). DVI presently operates a reverse osmosis water treatment plant with a brine concentrator system and four evaporation ponds (California Regional Water Quality Control Board 2006). The Class II surface impoundments are used for containing discharge of hypersaline wastewater used in producing potable drinking water and are located north of the facility and adjacent a drainage canal along the dry-land levee. (The surface impoundments are required to be protected from a flood with a 100-year return period).

² In the Basin-Wide Feasibility Study - San Joaquin Basin (DWR 2017b) the railroads in this area were called out based on geography (i.e., “the northernmost railroad crossing”) or in reference to flow direction (i.e., “the downstream railroad”). On some figures, there are numbered. We adopt a similar convention where the upstream (southern) railroad is to be designated RR1 and the downstream, northern railroad is RR2. Historically, it seems that RR1 was a part of the Western Pacific Railroad, though today both lines appear to be a part of the Union Pacific Railroad.

Irrigation & Drainage

Immediately upstream of the project area is a canal/waterway (the Banta Carbona Irrigation District [BCID] Canal) that confluences with the San Joaquin River. The Project levees along the river turn and run up the two banks of this canal approximately 2,700 feet, where they taper toward meeting the surrounding ground elevation. The canal continues another approximately 2,800 feet upstream where it meets a pumping station that lifts flow into another segment of canal and feeds the district's irrigation system. Pumps divert water from the BCID Canal into smaller canals and ditches, some of which enter the Project area.

Figure 6 illustrates irrigation and drainage (as described by local landowners) for the upstream portion of the Project area. Pumping of drainage from DVI to the drainage ditch flowing to its east still needs to be identified. Similarly, the entities responsible for operations and maintenance of this levee and any pump facilities have not been identified at this time. Drainage collected into the ditch that flows north to RR1 then runs NNE to Paradise Cut, where aerial imagery indicates a set of connecting pumps. Imagery from May 2017 shows discharge from the canal to Paradise Cut. A downstream set of pumps visible in the May 2017 image may be the "Six Pack" pump, installed after the 1983 flood event and to support drainage during high water conditions. These pumps were reportedly removed after being worn out in 2017. Downstream, other pumps may divert water for irrigation at and downstream of RR1, but are as yet unmapped in this project.

Land Ownership

The San Joaquin County General Plan 2035 (San Joaquin County Council of Governments [SJCOG] 2017) has Paradise Cut zoned as Resource Conservation and all land adjacent to the left bank of Paradise Cut—as well as up and downstream of Paradise Cut—is zoned General Agriculture. Stewart Tract which borders the right bank of Paradise Cut is part of the City of Lathrop and is residential.

It is assumed that one or more parcels of agricultural lands in the Project area include agricultural easements and/or are enrolled in the Williamson Act. Additional detail on this may be identified through the SJCRCD's companion acquisition project and incorporated into this project, as available. Nearby the Project area, the Larson Preserve, the Dutra Family Preserve, and Martin Family Delta Avenue Preserve adjacent Paradise Cut were acquired and placed under conservation easement to meet the mitigation needs of the San Joaquin Multi Species Habitat Conservation Plan. The reserves are used to grow row and field crops. **Figure 2** shows some conservation easements, and conversations with the implementing agency for the San Joaquin Multi Species Habitat Conservation Plan indicate there are more easements than those displayed in Figure 2.

Listed Species, Target Species, & Important Habitats

The riparian brush rabbit (*Sylvilagus bachmani riparius*) is a small cottontail, one of eight subspecies of brush rabbits native to California, and is listed as endangered under the Federal Endangered Species Act. The riparian brush rabbit has been documented in Paradise Cut, roughly 1.5 miles southwest of Mossdale (DWR 2016a). In addition, the CVFPP CS (DWR 2016a) identifies target species for areas in and adjacent to the flood system. The target species are those species that can most benefit from

implementation of conservation actions listed in the CS. The CS outlines the following target species for the Lower San Joaquin River CPA, the CPA covering the Project area:

- Delta button-celery
- Slough thistle
- Valley elderberry longhorn beetle
- California Central Valley Steelhead
- Chinook Salmon—Central Valley fall/late fall—run ESU
- Green Sturgeon—Southern DPS
- Giant Garter snake
- California black rail
- Greater sandhill crane
- Least Bell’s vireo
- Swainson’s hawk
- Western yellow-billed cuckoo
- Riparian brush rabbit
- Riparian (San Joaquin Valley) woodrat

Existing habitat in the Project area is relatively limited (see **Figure 3**). The CS identifies the potential for marsh, riparian, and inundated floodplain restoration in the project area. Existing habitats in the reach from Stanislaus River to Stockton (slightly larger than the project area) includes floodplains with complex topography and oxbow lakes; tidal marsh is limited.

Previous ecosystem restoration planning in Paradise Cut

The Basin-Wide Feasibility Study - San Joaquin Basin (BWFS, DWR 2017b) identifies three alternatives for restoration concepts (DWR 2017b). Option A (see BWFS Figure 4-2) includes fresh emergent wetland habitat along the downstream right bank levee setback, with riparian scrub restored in Paradise Cut. Option D (see BWFS Figure 4-3) of the BWFS includes riparian scrub restoration from the northernmost railroad crossing to Old River while maintaining existing vegetation and agriculture from the inlet weir to the north of railroad crossing. The right bank setback levee from Paradise Cut weir to I-5 could be planted with riparian woodland vegetation and annual grassland/oak savannah; planting annual grassland and oak woodland habitat from the right bank setback levee at Railroad Bridge 1 to I-5; planting emergent freshwater and tidal marsh habitat at the setback levee and excavated channel downstream of Railroad Bridge 2. The final option identified in the BWFS, Option M-Ag will restore shaded riparian aquatic (SRA) habitat along the degraded San Joaquin River levee, and restore the southern part of the in-channel for floodplain rearing habitat. Most land within the setback area would stay in agriculture. A variant of this option would convert the existing agriculture within the setback area to riparian and grassland habitat.

Land elevation and flow direction

The land adjacent Paradise Cut is flat, and gradually slopes toward Paradise Cut. **Figure 7** shows the topography in the project area. The data used to develop this figure are also used in the numerical flood modeling for this project and can be manipulated to support other analyses.

Surficial geology

Figure 8 illustrates the surficial geology in the project area as depicted in a publication for DWR’s Non-Urban Levee Evaluations (NULE) Program from 2011. Much of the project area is comprised of relatively-coarse soils, indicating that they are of relatively-recent San Joaquin River deposits and ultimately suggests that there may be buried stream channel deposits, which could be susceptible to underseepage. (See also *Levee system conditions* below, for more information on underseepage).

Deeper investigation into surface and subsurface soils and geologic conditions will be necessary when designing the configuration of any new levees or other related features.

Flood Management

As a distributary channel of the San Joaquin River, Paradise Cut functions as a flood bypass when flows in the San Joaquin River reach sufficient stage to spill over Paradise Weir into Paradise Cut. The floodwaters are then carried downstream to the confluence with Old River, effectively diverting a portion of flood flows from the mainstem San Joaquin River and decreasing flood flows past the populated areas in Lathrop and Stockton. An increase in conveyance capacity of Paradise Cut (through a modified weir and/or floodway) would potentially further decrease flood risk for Lathrop and Stockton.

The majority of the Project area is designated by the Federal Emergency Management Agency (FEMA) as lying within Zone AE Special Flood Hazard Area (**Figure 9**). Zone AE are areas that have a 1% probability of flooding every year (also known as the "100-year floodplain"), and where predicted flood water elevations above mean sea level have been established. Properties in Zone AE are considered to be at high risk of flooding under the National Flood Insurance Program (NFIP). Base Flood Elevation for the 1% probability flood at Paradise Weir is 27 feet (zone AE). Noteworthy is that much of the land in the Project area that is protected by levees (discussed more, below) is still within Zone AE. Further, the DVI, similar to the land just to its east, is located within Zone AE despite the fact that it is protected by the secondary, non-Project³ "dry-land levee" that sits just to its east.

The majority of the levees in the Project area are Project levees that are now a part of the State Plan of Flood Control (SPFC) facilities. SPFC facilities along Paradise Cut include levees on both sides of the channel from the San Joaquin River to the confluence with the Old River. The design channel capacity is 15,000 cubic feet per second (cfs) based on the original USACE O&M manuals. The right-bank levee (see O&M Manual SJR9) is 5.9 miles long, and is maintained by RD 2062 and RD 2107. This levee is intended to reduce flood risk to Stewart Tract and the developing area of Lathrop. The left-bank levee (see O&M Manual SJR10) is 6.2 miles long, and is maintained by RD 2058 and RD 2095. The dry-land levee adjacent to the DVI is a non-Project levee.

Unlike the Sacramento River basin where State responsibility for channel maintenance is clearly specified in the California Water Code, there is no similar condition for channels for the San Joaquin basin in this area. In addition, research for preparation of the Lower San Joaquin River Regional Flood Management Plan (LSJRFMP) could find no defined maintenance responsibility for some facilities such as the Paradise Cut weir (called Paradise Dam in the USACE operation and maintenance manuals for the adjoining levees (San Joaquin Area Flood Control Agency 2014)).

Surface drainage at the DVI facility is toward the San Joaquin River (see **Figure 7**), and though the dry-land levee provides some protection to the facility from San Joaquin River flooding, the area is also susceptible to "upslope flooding" that originates in the Corral Hollow Creek⁴ watershed and/or other

³ Project levees are those levees originally designed and constructed as federal projects by the USACE.

⁴ Corral Hollow Creek, originally El Arroyo de los Buenos Ayres (The Creek of the Good Winds), later Buenos Ayres Creek, is a stream and tributary of the San Joaquin River, flowing through Alameda County and San Joaquin County, Central California (Wikipedia 2018).

drainages that head in the Coastal Range. The DVI has a documented history of flooding (Chaddock 2015), the largest of which occurred in 1950 before it was opened (**Figure 10**), and in 1983. In 1950, the facility flooded when Paradise Cut overflowed its banks. In 1983, however, water flowed from Corral Hollow Canyon across fields, along ditches and into the facility (Matthews 2017). On March 3, 1983, two feet of water flowed over Kasson Road into the prison (**Figure 11**); it remained flooded for two weeks and required pumps to move the sheetflow over the levee (San Joaquin County Office of Emergency Services [SJCOES] 2015)). Floodwater was pumped into nearby farmland and slough. We identified no records available on actions that were taken to mitigate future floods, but one article notes that the ground level of the prison entrance was elevated to serve as a barrier to future floods (Matthews 2017). The same article states that flood waters are diverted to ditches parallel to the railroad tracks on the north side of the DVI. It is unclear when the present dry-land levee/embankment was constructed and by whom; however, it appears in photographs sometime between 1950 (Figure 10) and 1997 (**Figure 12**).

Flood Infrastructure and Conveyance Capacity:⁵

The estimated channel capacity of Paradise Cut is 16,000 cfs (see Table B-2, DWR 2017b; see also **Figure 13**), which is considered sufficient by the state inspection system. (This differs slightly from the aforementioned design capacity). Levees line both sides of the channel to Old River and are SPFC facilities. The right-bank levee of Paradise Cut (see O&M Manual SJR9) is 5.9 miles long, and protects Stewart Tract and Lathrop. The left-bank levee (see O&M Manual SJR10) is 6.2 miles long and protects the rural Pescadero Tract, which has numerous houses. The levees are maintained by RD 2058 and RD 2062, though according to the LSJRFMP, there is no defined maintenance responsibility for Paradise Weir—it is not an SPFC facility.

Levee system conditions

Levees in the subject area are regularly inspected and graded according to various criteria. The ongoing inspection processes provide information necessary for maintenance actions and upgrades to levees, which are handled by local Reclamation Districts.

Accounts of localized flooding⁶

In 1997 water backed up on Tom Paine Slough and flowed through culverts on I-5 from south to north (SJCOES 2015). It is expected that if Corral Hollow Creek floods, then water will threaten DVI and RD 2095, and will flow into Tom Paine Slough, traveling north. In 1997 a levee failed in RD 2095 one half mile south of I-5. Water flowed north into Tom Paine Slough, and flow that continued further north was constrained by 36" culverts under the coffer dam near Tom Paine Slough. This caused flood water to back up against the DVI. Comments made at the July 11th outreach meeting with landowners suggest that in 1997, Stewart Tract was the last levee break because many other levees failed in advance, relieving pressure on Stewart Tract levees. A 1998 flash flood on Corral Hollow Creek caused sheet flow toward Paradise Cut and the San Joaquin River, which threatened DVI.

⁵ Parts of this section are paraphrased from the Lower San Joaquin River Regional Flood Management Plan and the State Plan of Flood Control Descriptive Document (DWR 2010).

⁶ Text in this section adapted from San Joaquin County Office of Emergency Services (2015).

Comments at the July 11th outreach meeting with landowners suggest that many of the bridge crossings are too small and constrain flood flows, and also that brush, sediment, and debris accumulate underneath the freeway bridge (I-5/205 crossing). This clogs the bridge opening during a flood and potentially exacerbates flood conditions.

Ongoing Work and Next Steps

At the time of this TM (November 2018), the project team is in the process of running and analyzing a hydraulic model of the project using a range of hydrologic events and scenarios. The model will assess existing flood conditions and help to refine conceptual project designs based on hydraulic impacts. Potential project concepts will be refined to a single project description based on the effects of the proposed Paradise Cut Expansion Project on land cover, habitat, agriculture, flood conveyance, and other factors. The information gained from this TM was used to inform the hydraulic modeling process, and it serves to establish baseline conditions in order to prepare for future monitoring and evaluation of the project.

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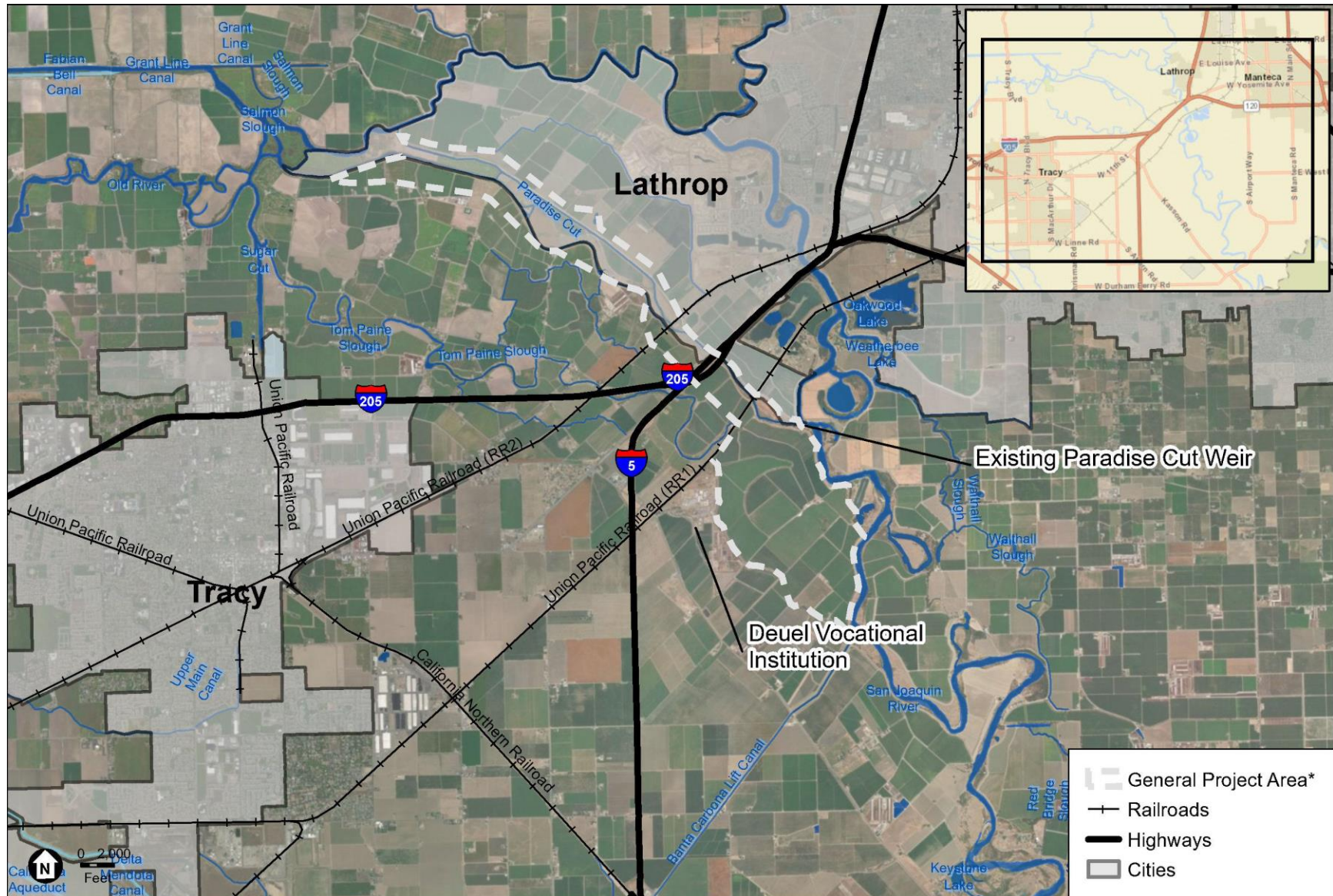
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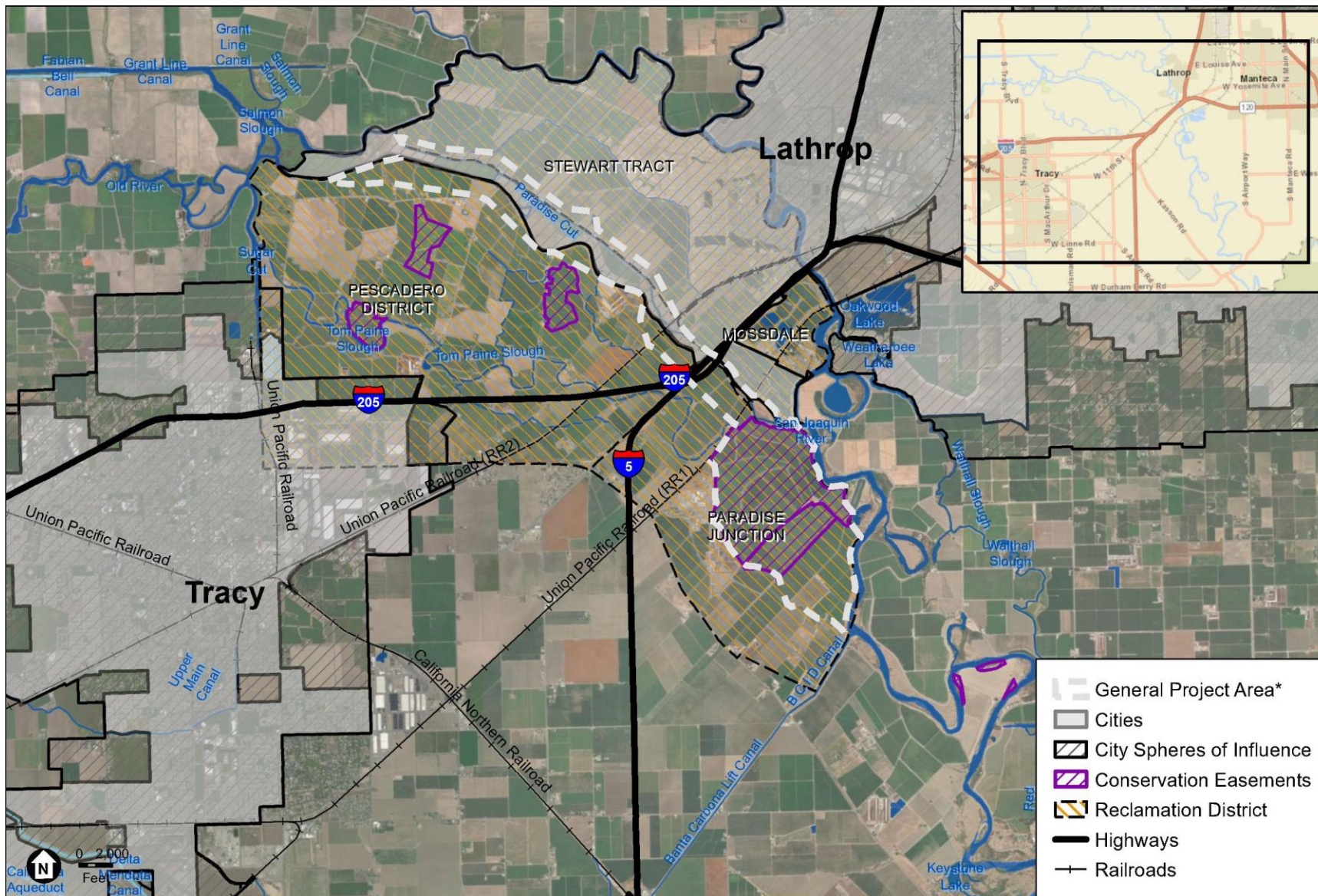
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Attachment 1: Figures



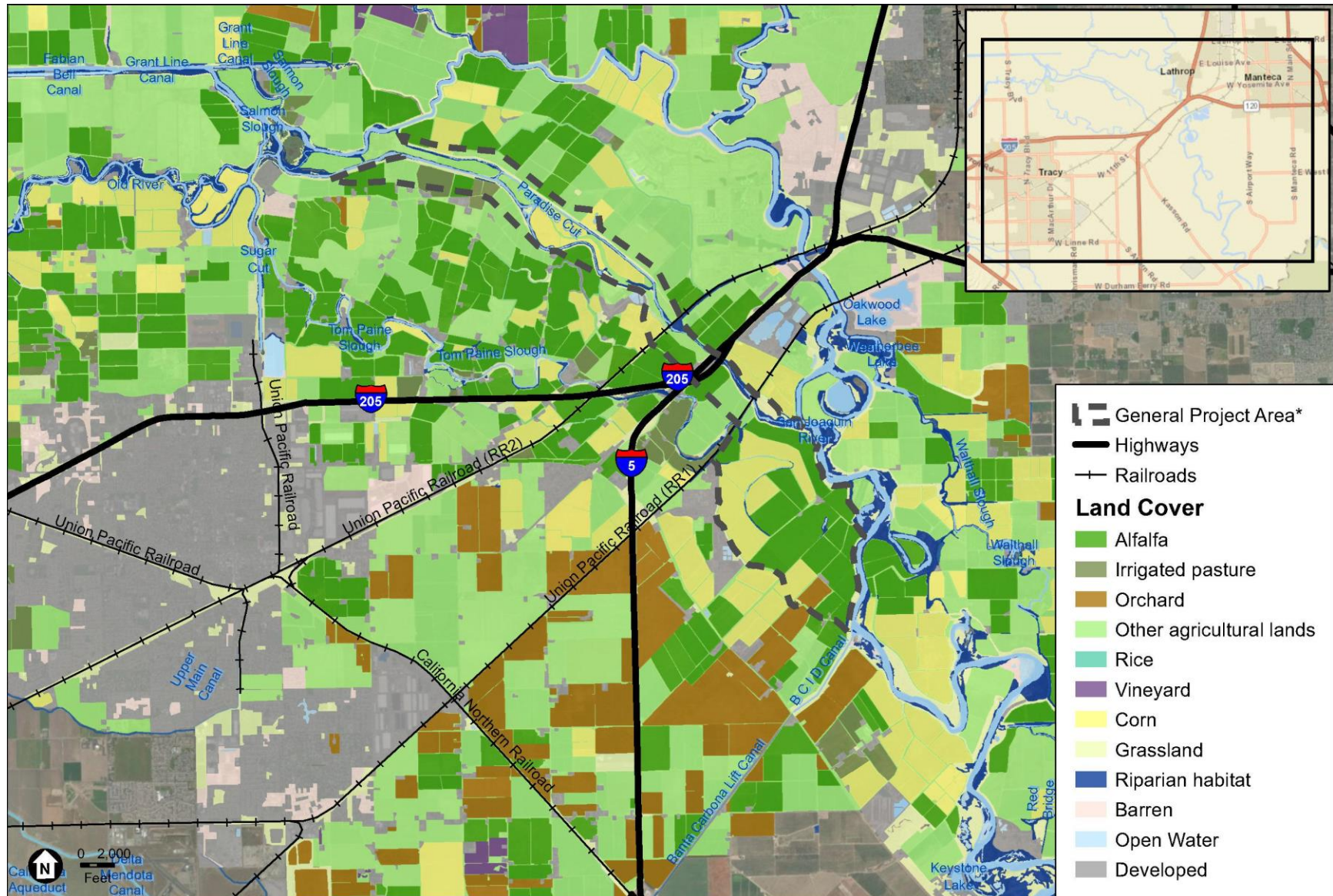
SJCRCD Paradise Cut Planning

Figure 1
Paradise Cut Regional Map



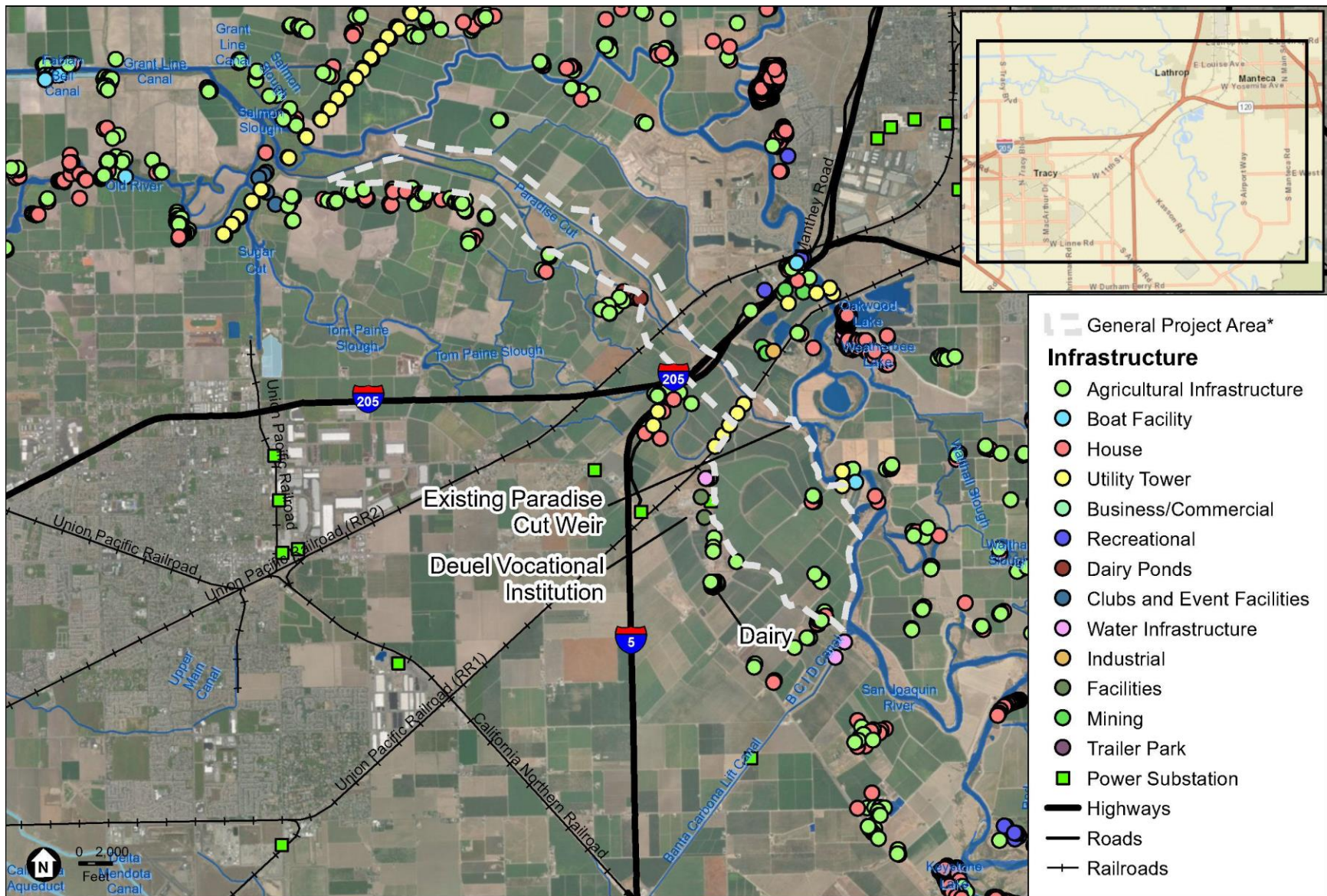
SJCRCD Paradise Cut Planning

Figure 2
Paradise Cut Reclamation Districts and Easements



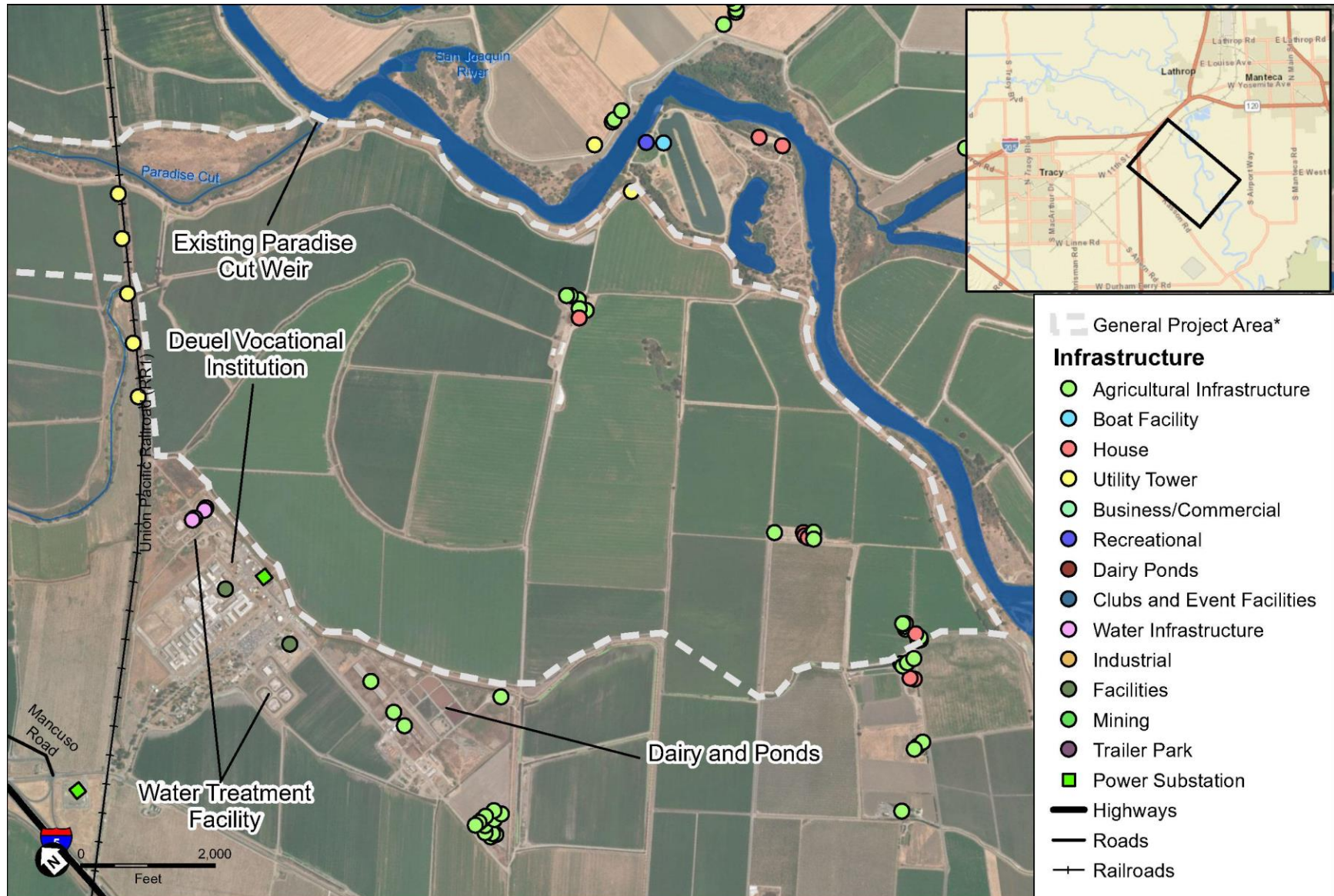
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Figure 3
Paradise Cut Landcover



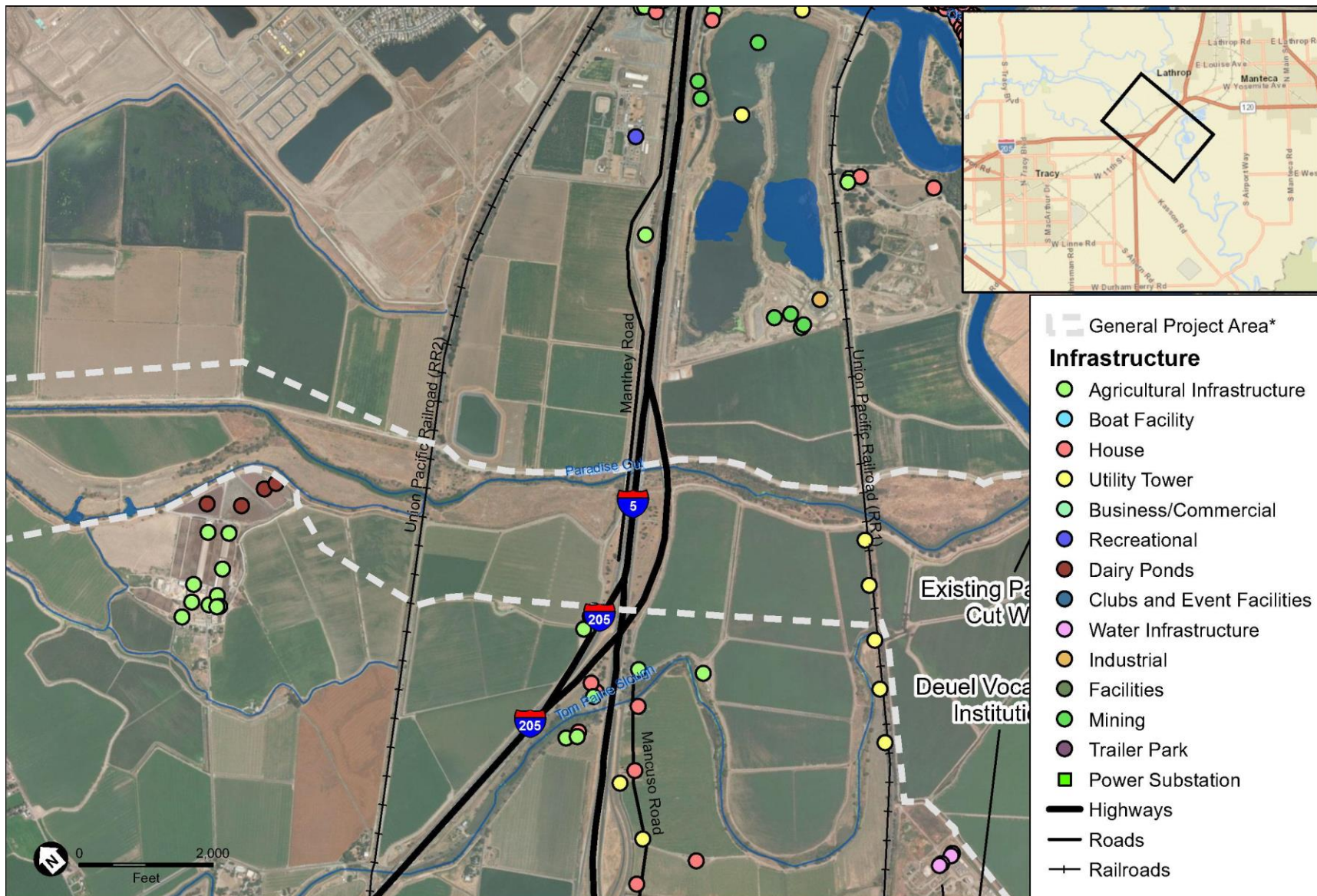
SJCRCD Paradise Cut Planning

Figure 4a
Paradise Cut Infrastructure



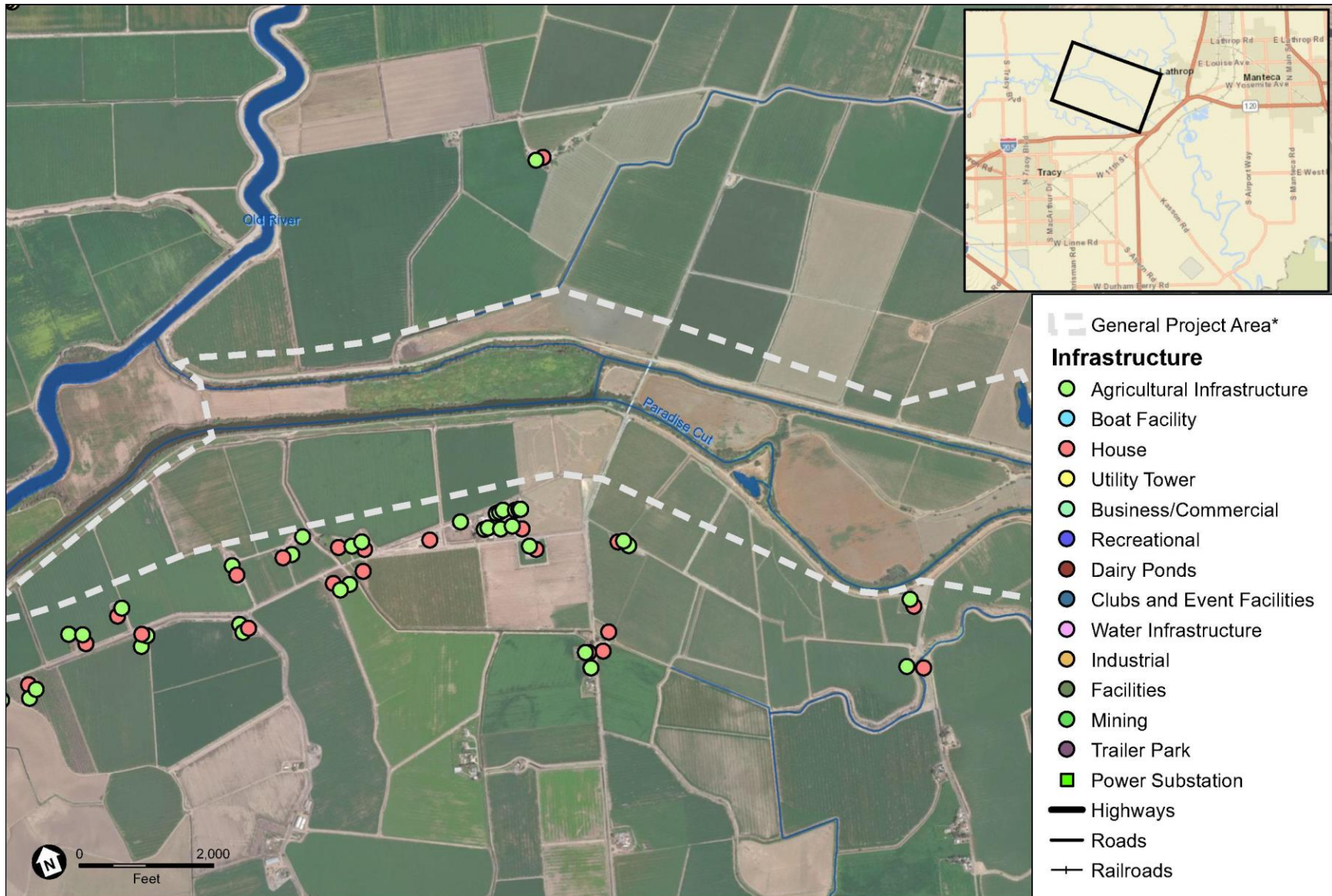
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Figure 4b
Paradise Cut Infrastructure



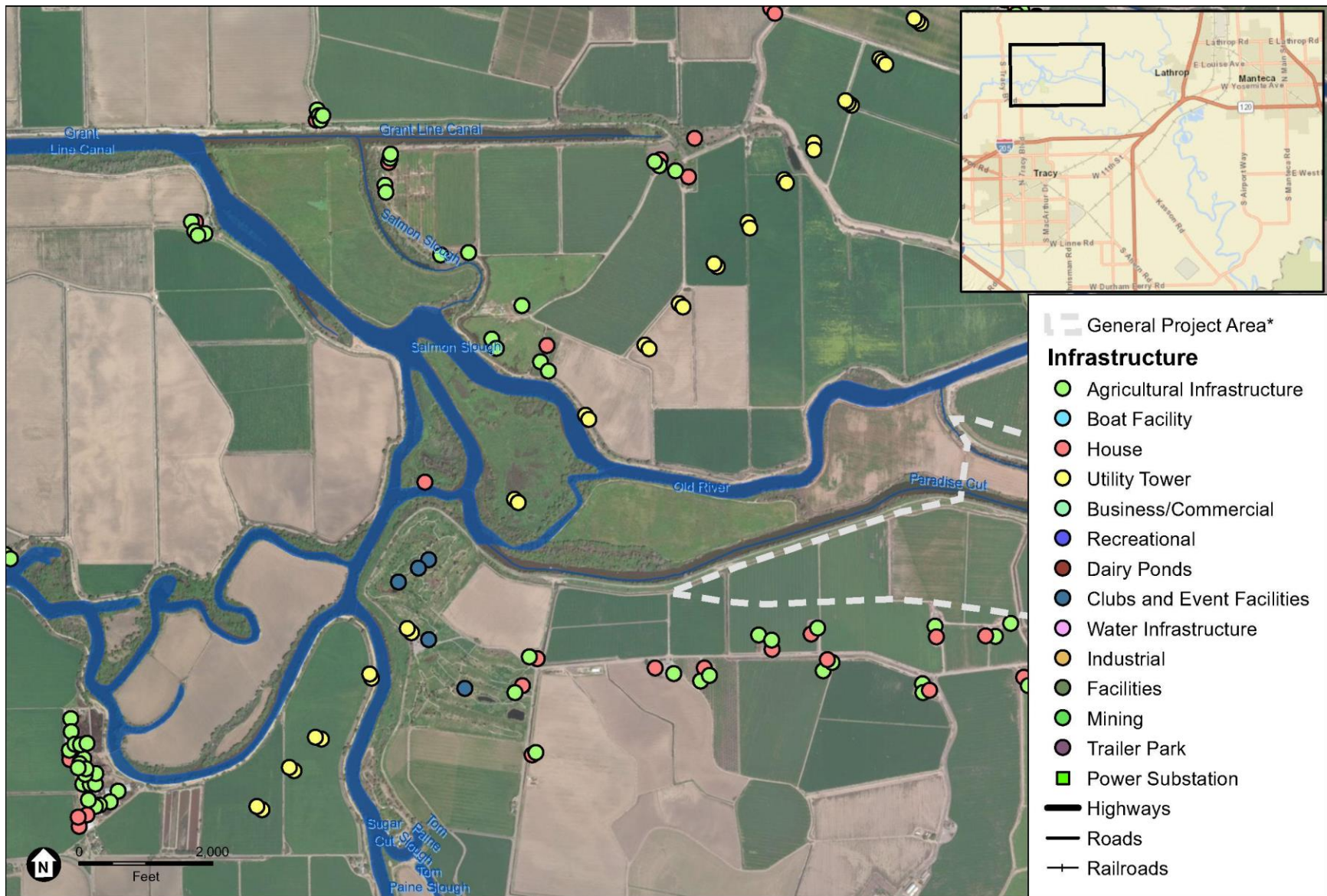
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Figure 4c
Paradise Cut Infrastructure



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Figure 4d
Paradise Cut Infrastructure



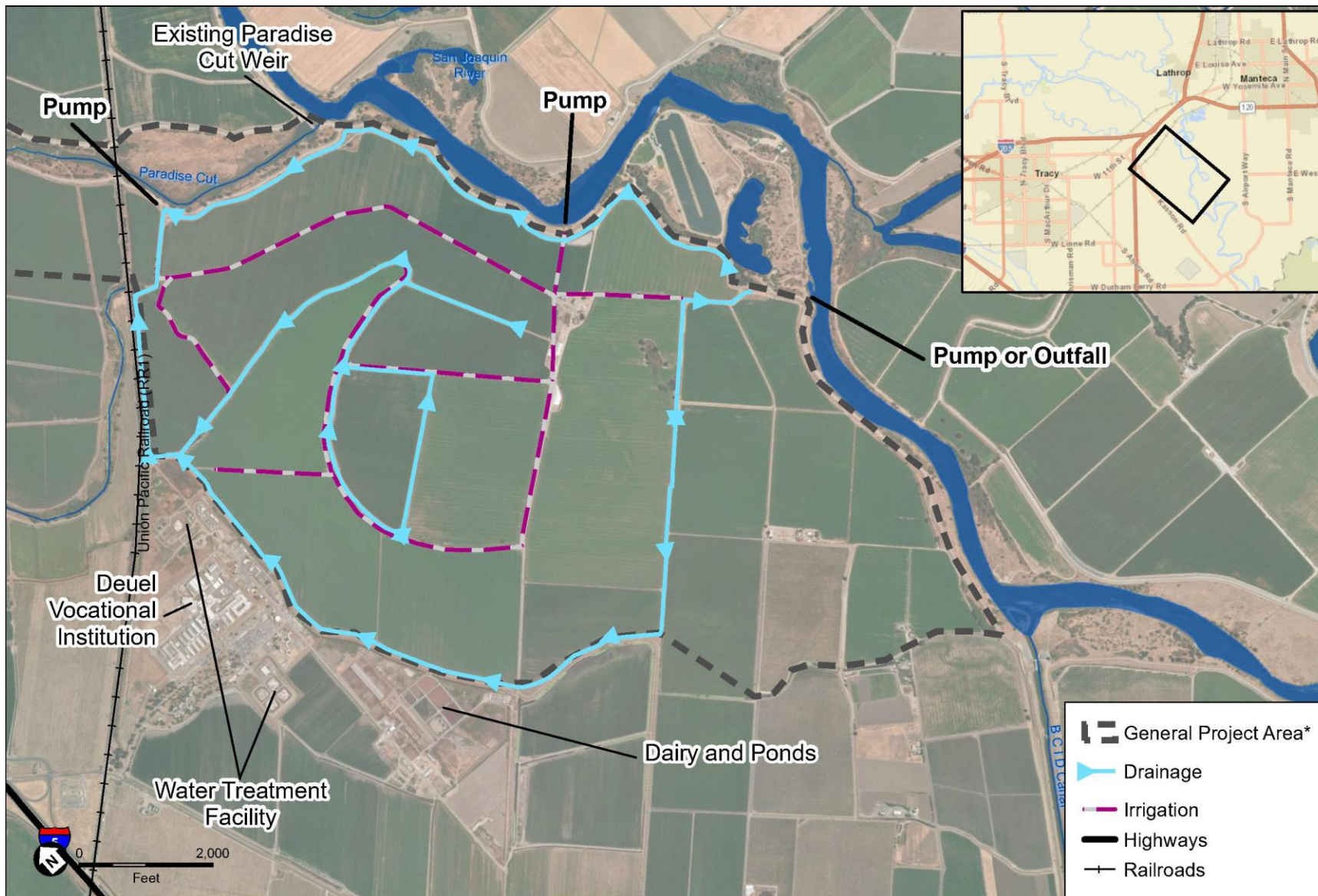
SJCRCDD Paradise Cut Planning

Figure 4e
Paradise Cut Infrastructure



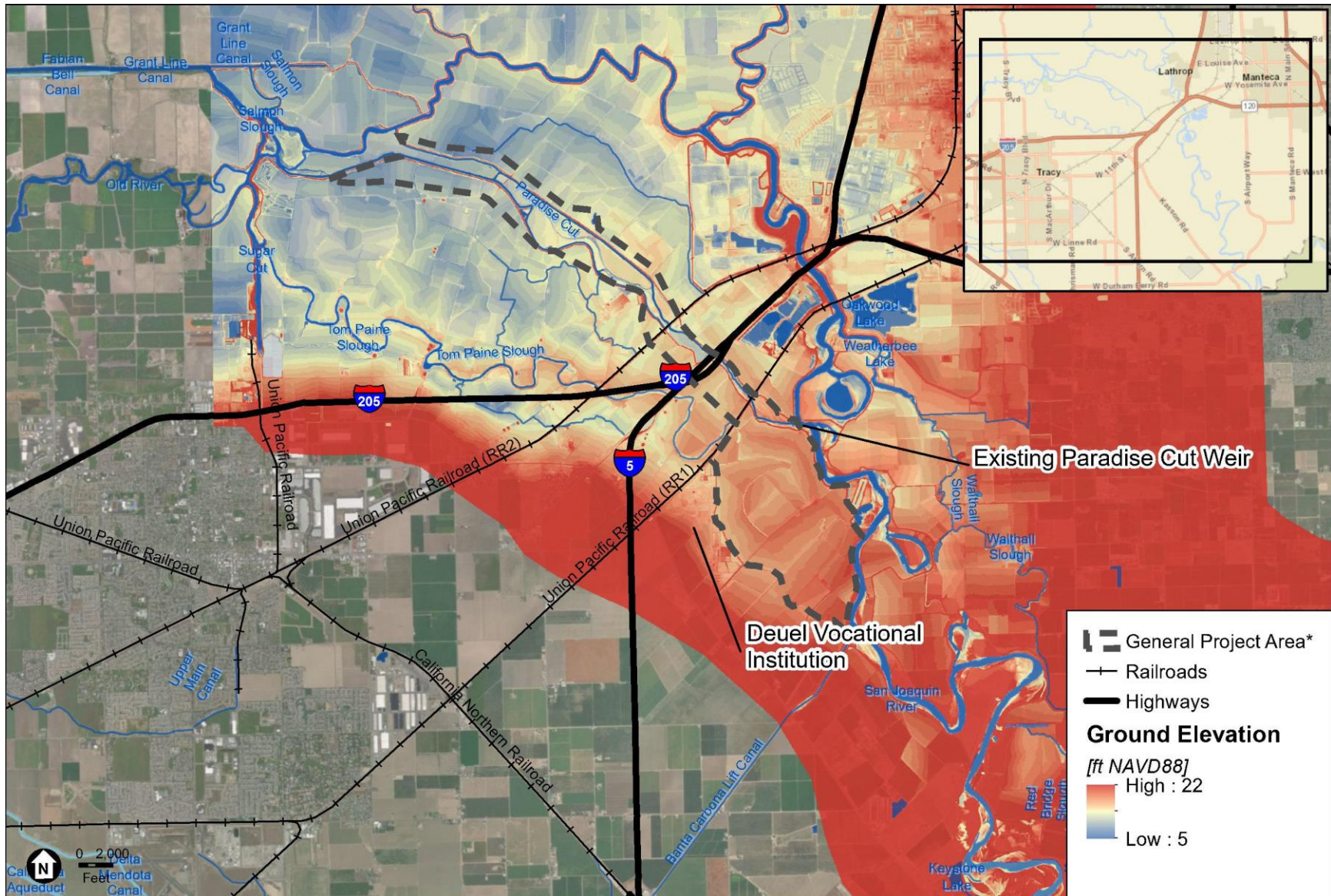
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Figure 5
Paradise Cut Infrastructure (Deuel Vocational Institute)



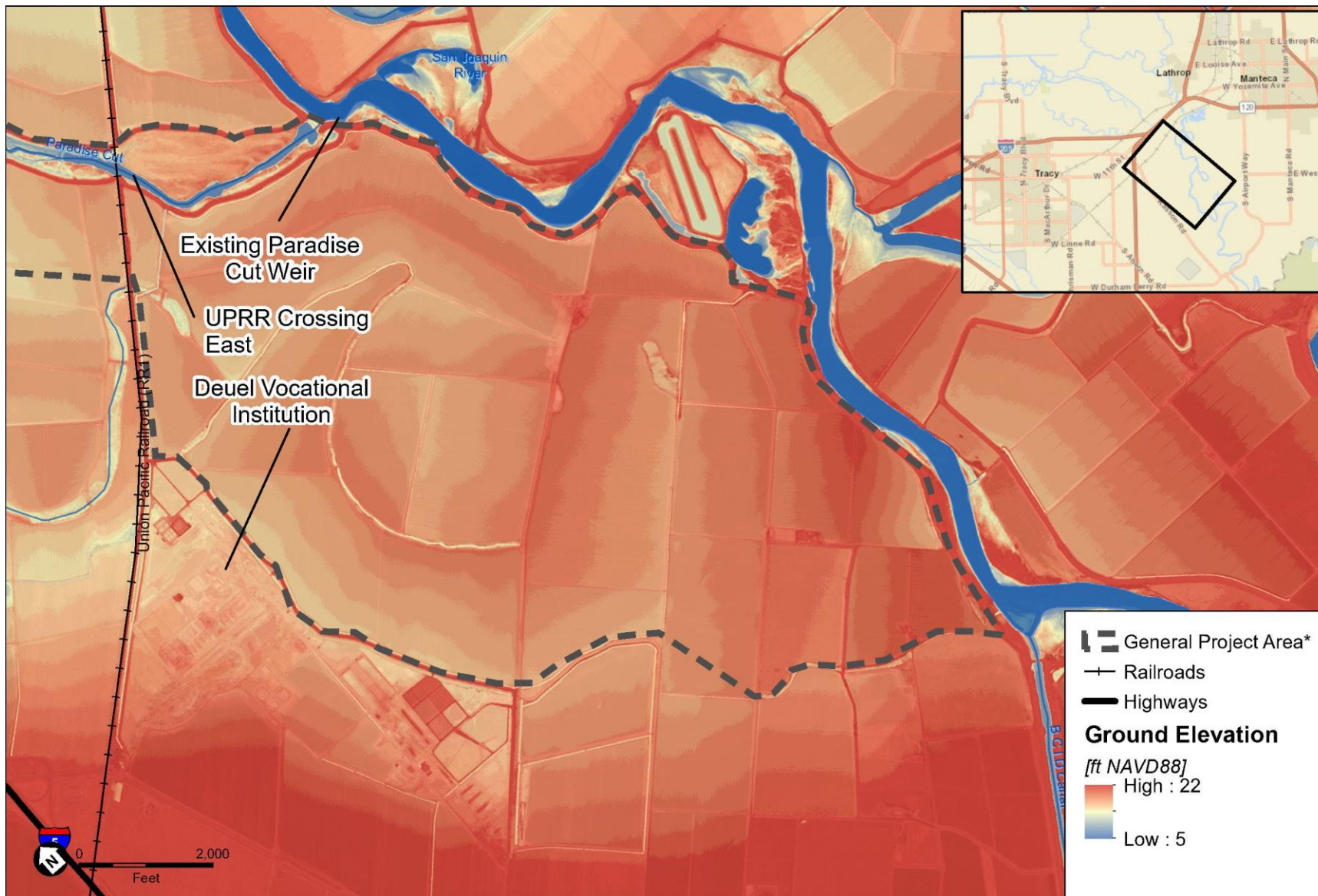
SJCRCD Paradise Cut Planning

Figure 6
Paradise Cut Infrastructure Irrigation Detail



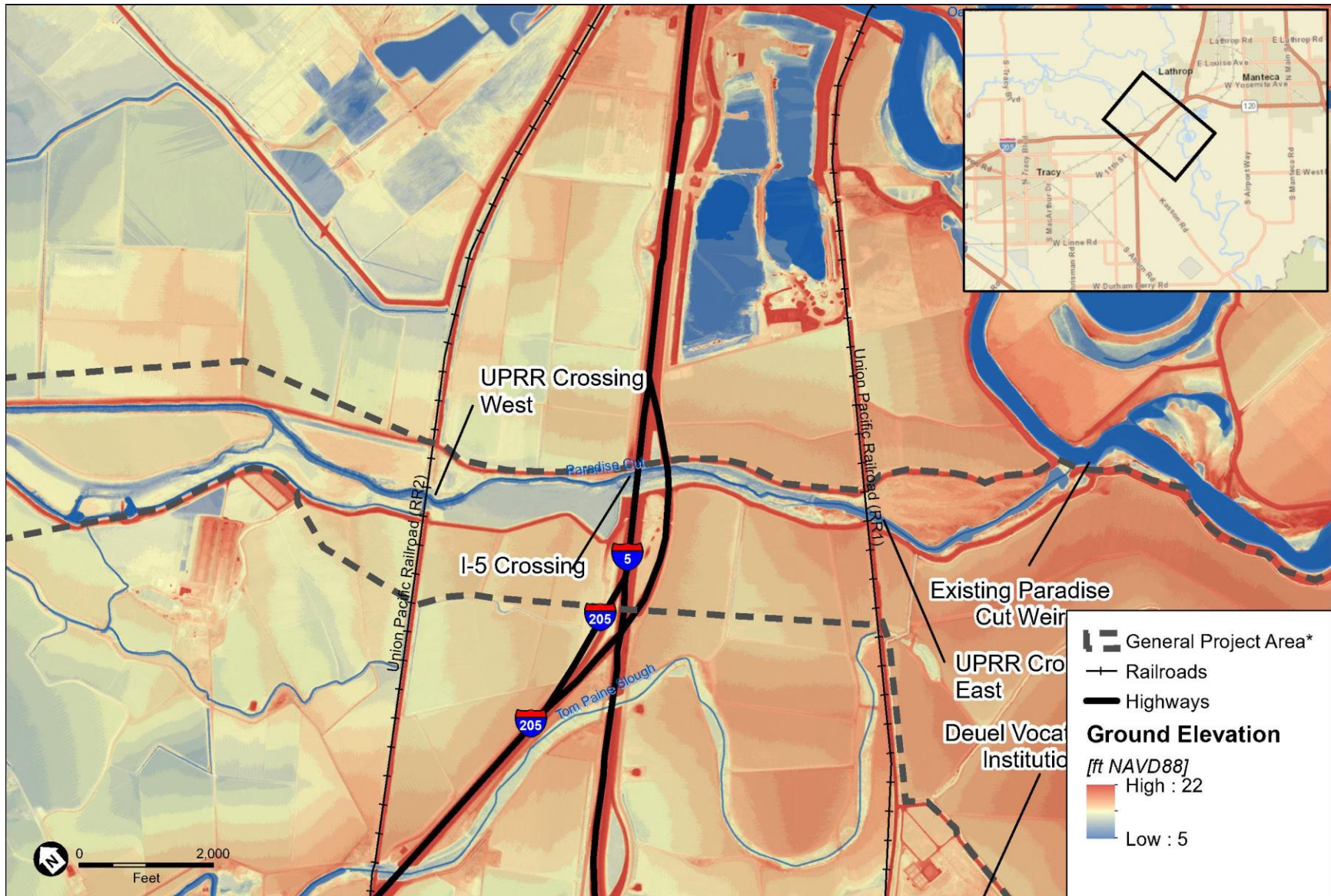
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Figure 7a
Paradise Cut Topography



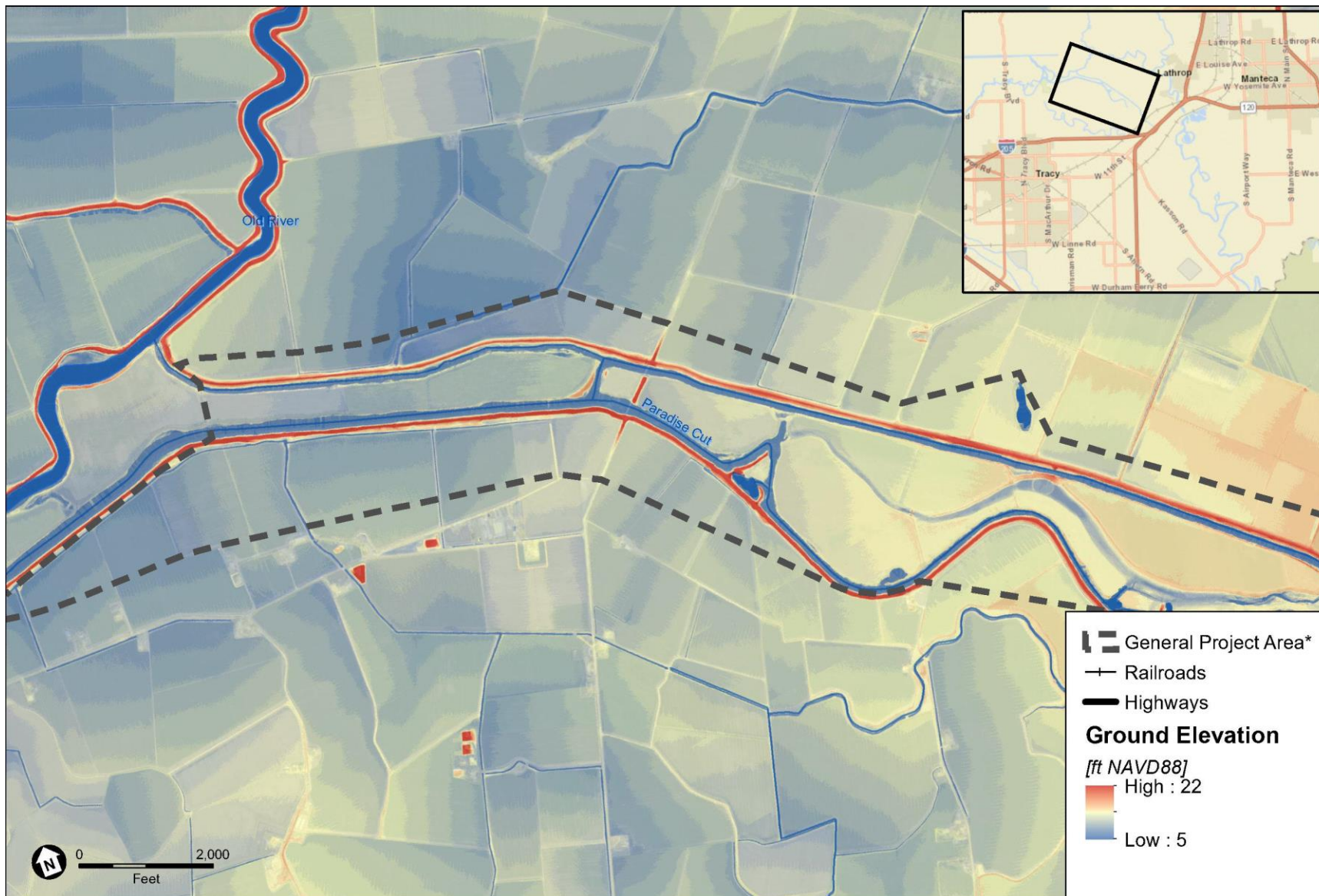
SJCRCDD Paradise Cut Planning

Figure 7b
Paradise Cut Topography



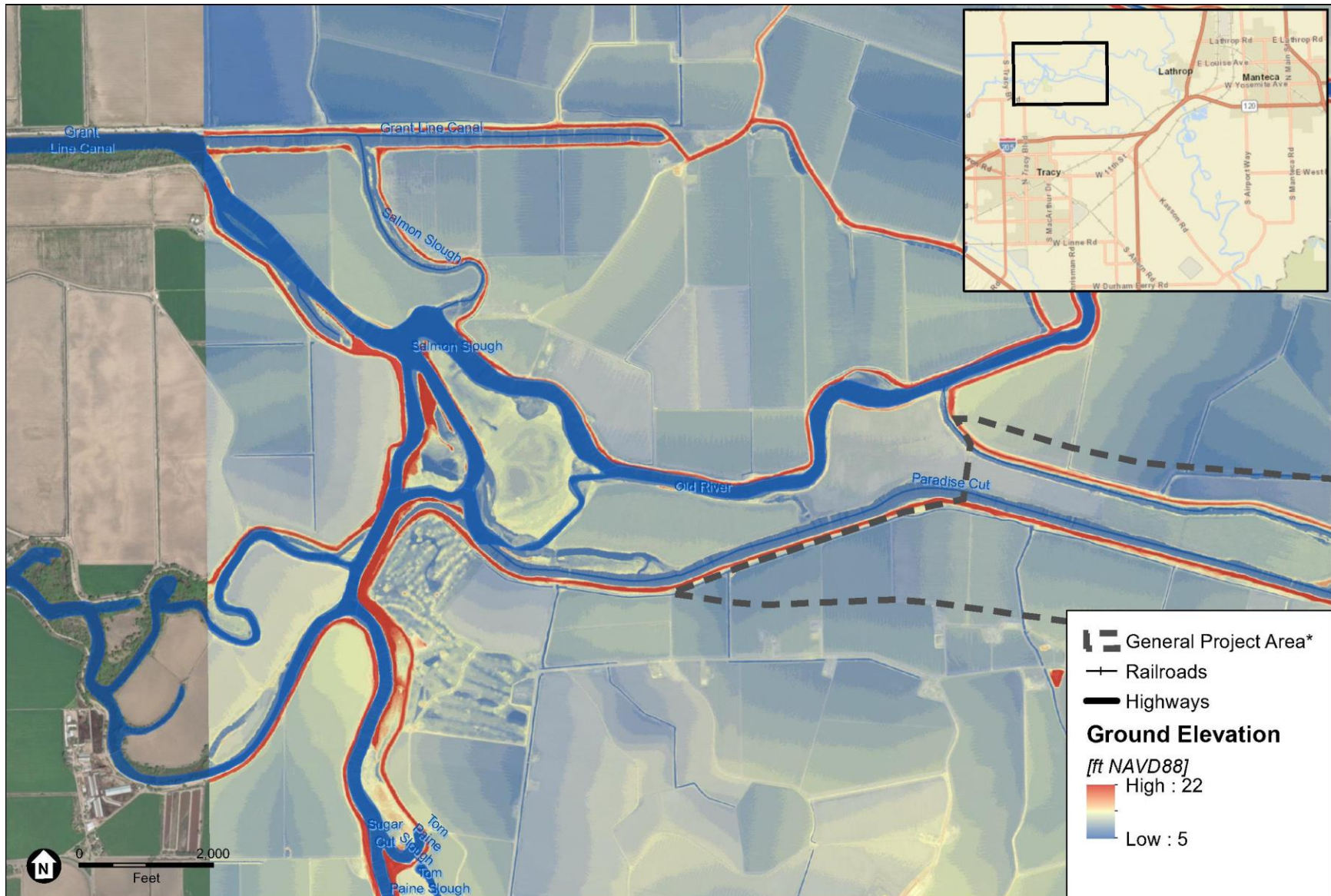
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Figure 7c
Paradise Cut Topography



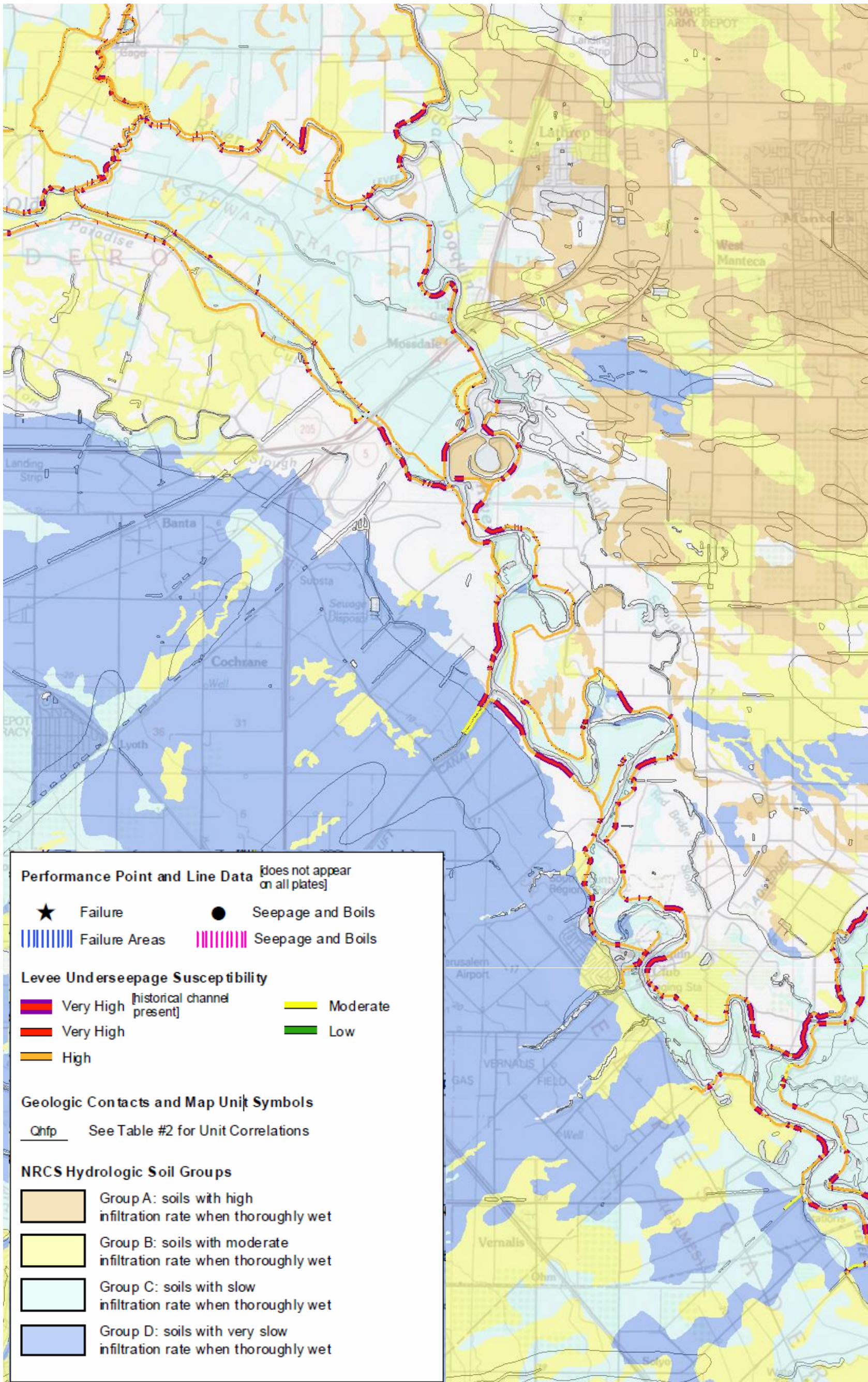
SJCRCDD Paradise Cut Planning

Figure 7d
Paradise Cut Topography



SJCRCDD Paradise Cut Planning

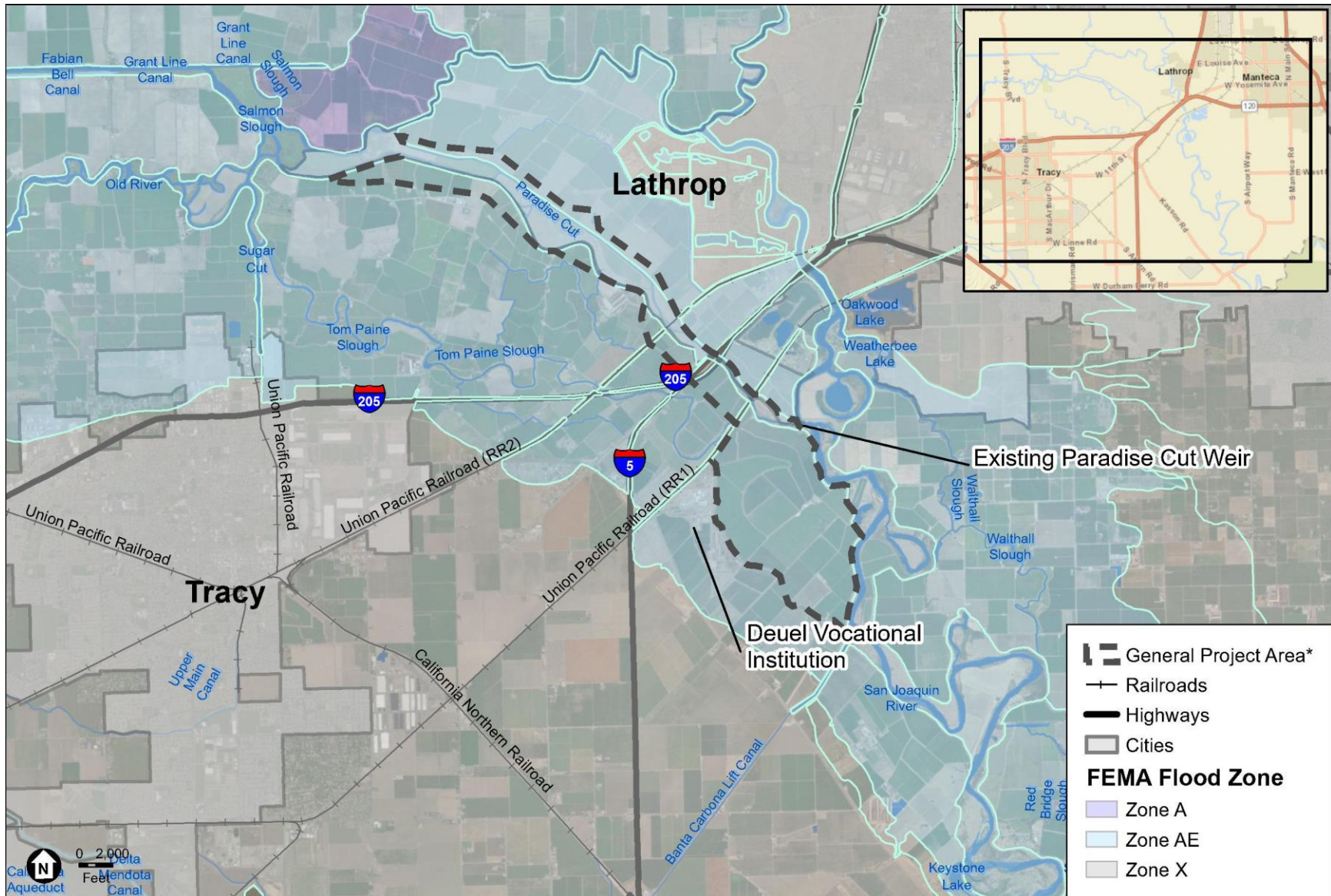
Figure 7e
Paradise Cut Topography



SOURCE: DWR, 2011

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Figure 8
Surficial Geology



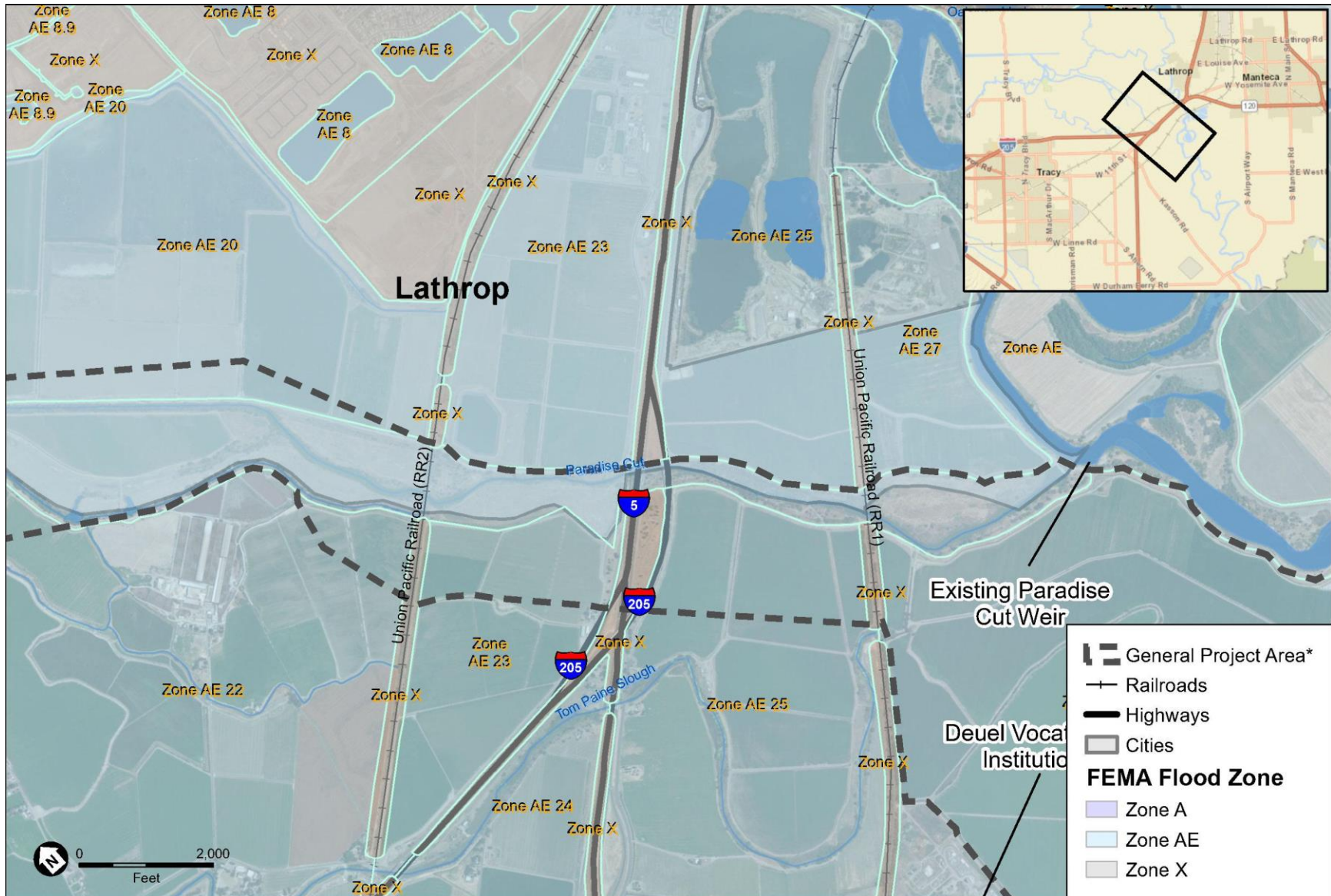
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Figure 9a
FEMA Special Flood Hazard Area



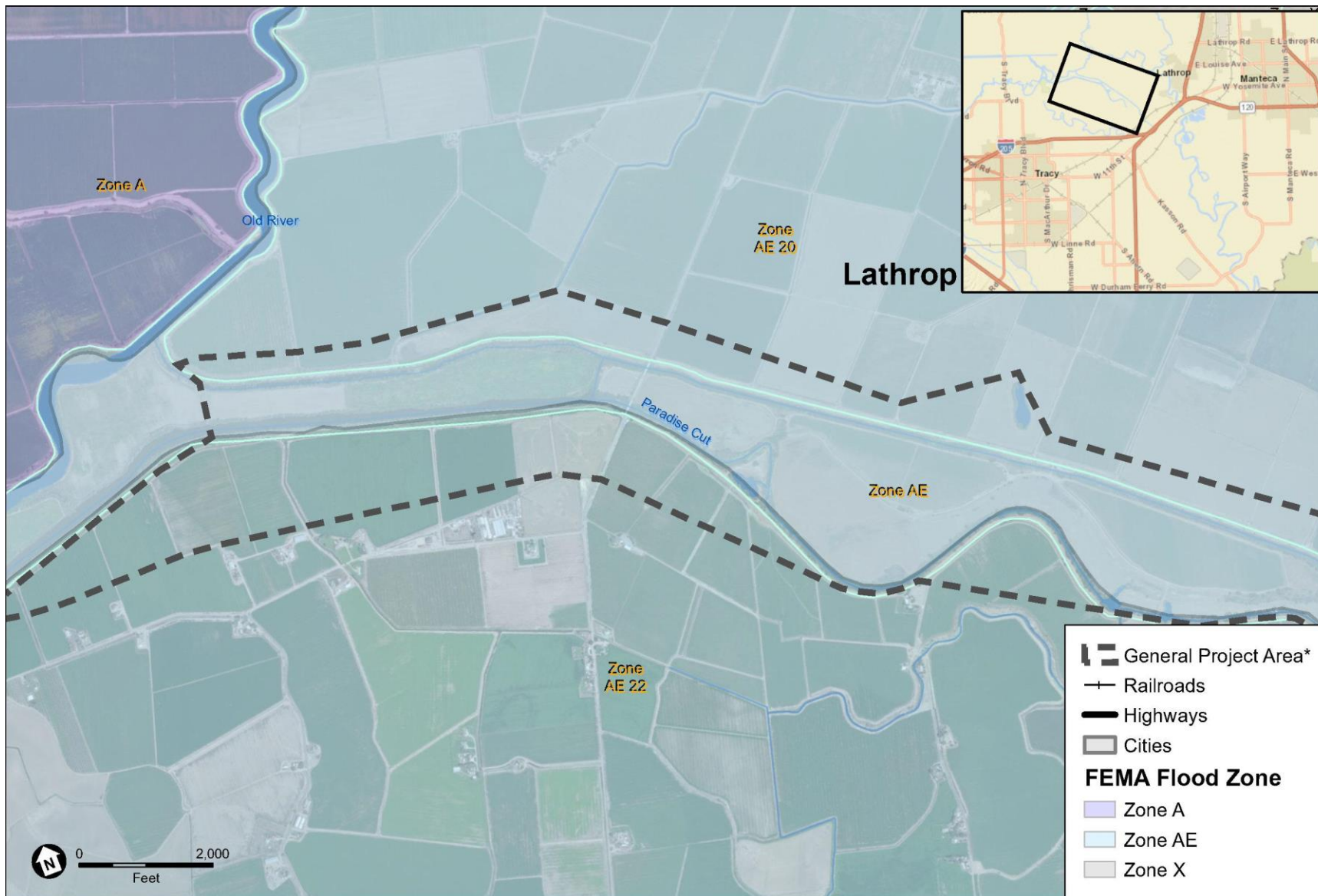
SJCRCD Paradise Cut Planning

Figure 9b
FEMA Special Flood Hazard Area



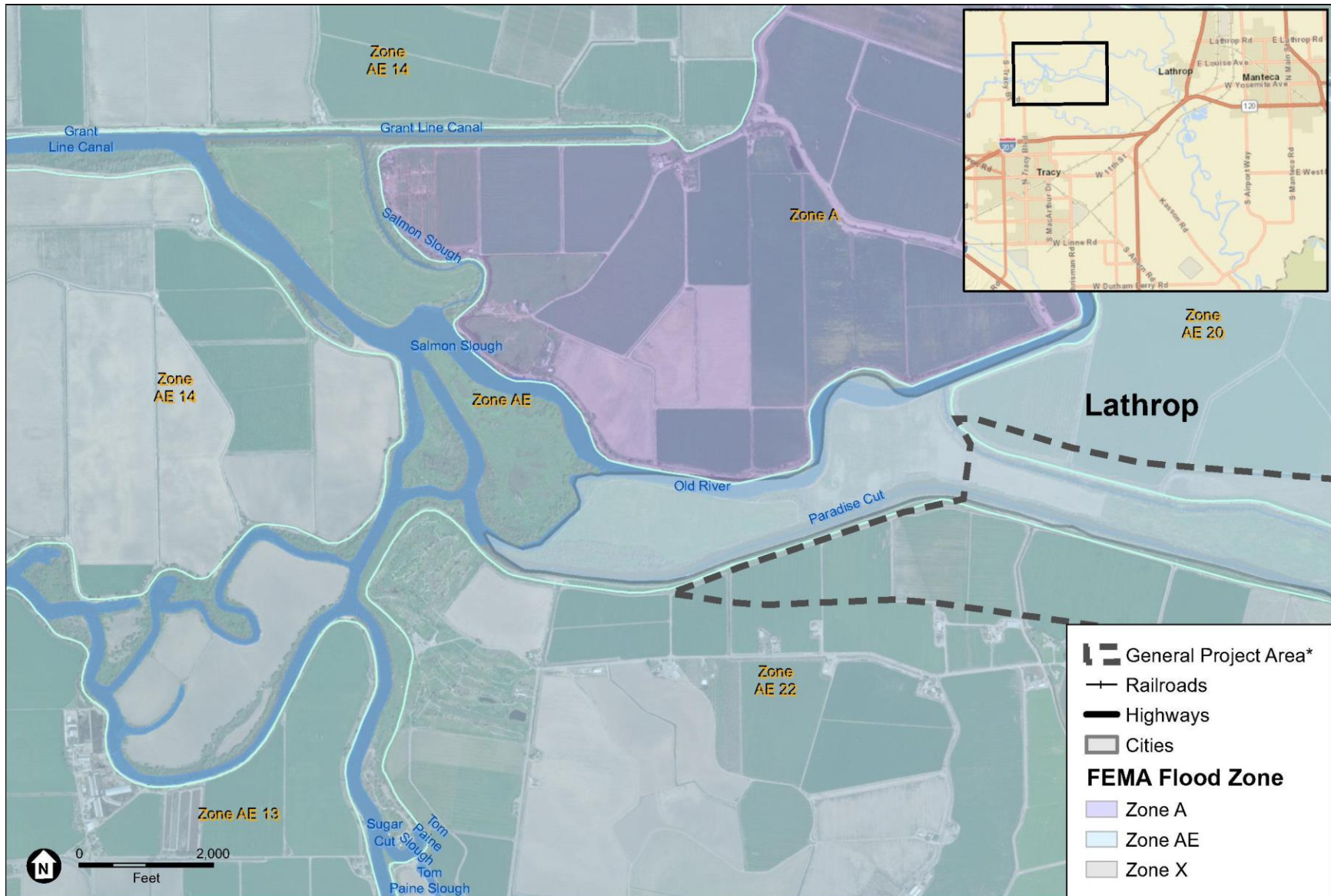
SJCRCDD Paradise Cut Planning

Figure 9c
FEMA Special Flood Hazard Area



SJCRCDD Paradise Cut Planning

Figure 9d
FEMA Special Flood Hazard Area



SJCRCD Paradise Cut Planning

Figure 9e
FEMA Special Flood Hazard Area



Source: Chaddock 2015

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Figure 10
Flooding at Deuel Vocational Institute 1950



Source: Matthews 2017

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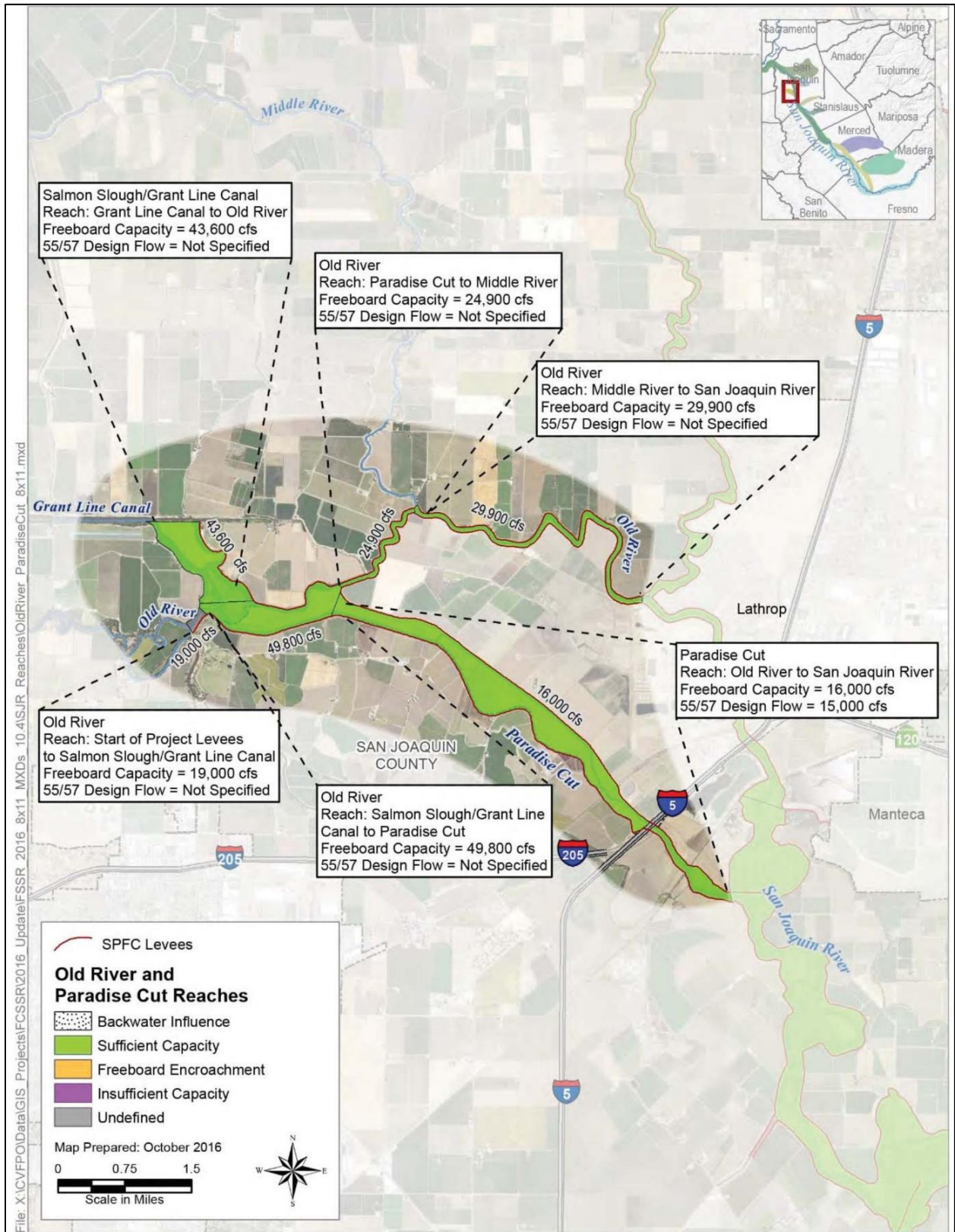
Figure 11
Flooding at Deuel Vocational in 1983



Source: Chaddock 2015

SJCRC D Paradise Cut Planning

Figure 12
Flooding at Deuel Vocational Institute in 1997



Source: Adapted from the Flood System Status Report (DWR, 2016)

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Figure 13
Stated Flood Conveyance Capacities in the Project Area

Attachment 2: Baseline Conditions Monitoring Plan

Prepared by American Rivers

This baseline conditions monitoring plan establishes seven categories to be measured for the Paradise Cut Expansion Project, and basic methods for measurement. The Existing Conditions Technical Memo (TM) provides baseline information for some of the categories, as indicated below.

1) Land use

- a) Methods: ArcGIS layers - potential source: Farmland Mapping and Monitoring Program (FMMP) (https://www.conservation.ca.gov/dlrp/fmmp/Pages/county_info.aspx)
- b) TM: Analysis of current land use is in the report.

2) Land cover/ crop type

- a) Methods: ArcGIS layers - potential source: Farmland Mapping and Monitoring Program (FMMP) (https://www.conservation.ca.gov/dlrp/fmmp/Pages/county_info.aspx)
- b) TM: Analysis of current land cover is in the report.

3) Topography

- a) Methods: ArcGIS layers of CVFED lidar data
- b) TM: Current topography of the local area is in the report.

4) Drainage network

- a) Methods: Aerial imagery inspection, interviews with local landowners
- b) TM: Current drainage network is in the report.

5) Target species and habitats

- a) Methods: Habitat Quantification Tool (HQT) to determine local habitat conditions for targeted species such as the Swainson's hawk
- b) TM: General information about target species is in the report and documented in the 2016 Conservation Strategy prepared by DWR for the 2017 CVFPP Update.

6) Groundwater depth and quality

- a) Method: Install network of piezometers to measure depth, take samples to measure ground water quality (TDS, boron, nitrates)
- b) TM: No data available

7) Surface water quality in Paradise Cut

- a) Method: Integrate data (including turbidity, dissolved oxygen, temperature, mercury) from existing nearby stations listed in the CEDEN database (<http://ceden.org/>); if needed, take water samples
- b) TM: No data available