I-15 Express Lanes Project Southern Extension (ELPSE)

PRELIMINARY DRAINAGE REPORT

Project Limits:
08-RIV-15 (PM 20.3/PM 40.1)
Project ID: 0818000063

EA: 08-0J0820

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Prepared for:

Riverside County Transportation Commission
4080 Lemon Street

Riverside, CA 92501

California Department of Transportation - District 8
464 West 4th Street
San Bernardino, CA 92401

REGISTERED CIVIL ENGINEER CERTIFICATION

This Drainage Report has been prepared by The Alliance Group Enterprise, Inc. under the direction of the following Registered Civil Engineer. The undersigned attests to the technical information contained herein and the qualifications of any technical specialist providing engineering data upon which recommendations, conclusions, and decisions are based:

Andy Duong DATE
REGISTERED CIVIL ENGINEER No. 73103
State of California
Exp. Dec. 31, 2022

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1.0 INTRODUCTION

1.1 General Information

The Riverside County Transportation Commission (RCTC) in cooperation with the California Department of Transportation (Caltrans) is proposing to construct new lanes along Interstate I-15 between Post Mile [PM] 21.2 and PM 38.1 in Riverside County, California. The primary component of the I-15 Express Lanes Project Southern Extension (ELPSE) would be the addition of two tolled express lanes in both the northbound and southbound directions within the median of I-15 from State Route (SR-) 74 (Central Avenue) (PM 22.3) in the city of Lake Elsinore, through the unincorporated Riverside County community of Temescal Valley, to El Cerrito Road (PM 38.1) in the city of Corona for approximately 15.8 miles. The proposed project would also add southbound auxiliary lanes between both Main Street (PM 21.2) off-ramp and SR-74 (Central Avenue) on-ramp (approximately 0.75 mile), and SR-74 (Central Avenue) off-ramp and Nichols Road on-ramp (PM 23.9) (approximately one mile).

In addition to the lane additions, which extend from PM 21.2 to 38.1, the proposed project would include: widening of up to 14 bridges; potential construction of noise barriers, retaining walls, drainage systems; and implementation of electronic toll collection equipment and signs. Associated improvements for the toll lanes, including advance signage and transition striping, would extend approximately two miles from each end of the express lane limits to PM 20.3 in the south and PM 40.1 in the north. The proposed lane additions and supporting infrastructure are expected to be constructed primarily within the existing State right of way.

The project is also included in the 2019 Federal Transportation Improvement Program (FTIP) as Project ID RIV170901. It is also included in the Southern California Association of Government's (SCAG) Connect SoCal Plan 2020-2045 Regional Transportation Plan (RTP)/Sustainable Communities Strategy (SCS) as Project ID 316001.

The Project is subject to both state and federal environmental review requirements because the use of federal funds from the Federal Highway Administration (FHWA) is anticipated for the Project. Project documentation has been prepared in compliance with both the California Environmental Quality Act (CEQA) and the National Environmental Policy Act (NEPA). Caltrans is the lead agency under both CEQA and NEPA.

1.2 ELPSE Location and Setting

The I-15 ELPSE Improvements are located within the jurisdiction of the Caltrans District 8 (Caltrans) and the County of Riverside. More specifically, the corridor location is within the cities of Lake Elsinore and Corona, and the County of Riverside. The proposed improvements would extend from SR-74 (Central Avenue) (PM 22.3) in Lake Elsinore, through the unincorporated Riverside County community of Temescal Valley to El Cerrito Road (PM 38.1) in Corona. The freeway travels through Temescal Valley and runs parallel to Temescal Wash until a crossing point at the Temescal Wash Bridge PM 28.1. All freeway stormwater runoff

eventually enters Temescal Wash. Refer to **Figure 1-1** and **Figure 1-2** for the regional vicinity and ELPSE location maps, respectively.

The existing condition along I-15 within the ELPSE limits is a six-lane highway with three 12-foot-wide mixed flow lanes in each direction. The paved inside shoulders and outside shoulders are 8 feet and 10 feet wide, respectively, except for bridges where the outside shoulders vary in width between 10 and 20 feet. Additionally, there is a segment of approximately 1,000 feet running south from the Bedford Wash in which the western outer shoulder has a width of 15 feet. The existing median is 70 feet wide and is unpaved beyond the shoulders. The structural section of the existing mainline varies between asphalt concrete pavement and Portland cement concrete pavement. The horizontal alignment within the ELPSE's limits can be described as a series of multiple curves connected by tangents up to Temescal Canyon Road where the alignment turns generally straight going north. The vertical alignment is, in general, gentle rolling profiles. There is a total of 17 bridge structures within the project limits, 8 overpassing an interchange and 9 overpassing a stream. As noted in section **1.1 General Information** only 14 bridges will be widened as part of this project.

In total the ELPSE crosses eleven streambeds, only four of these streambeds (Temescal Wash Bedford Canyon Wash, Stovepipe Canyon Creek, and Arroyo del Toro) are found in a flood hazard area per Federal Emergency Management Agency's (FEMA) Flood Insurance Rate Map (FIRM). Please note that a total of five flood hazard locations exist throughout the ELPSE, but this section focuses only on streambeds. For information on all flood hazard areas refer to **Section 2.1.4 FEMA Flood Zones**. **Table 1-1** provides the streams at the I-15 crossing post mile marker.

Table 1-1: ELPSE Stream Crossings

I-15 Crossing Post Marker	FEMA	Caltrans
PM 21.6	Wasson Canyon Creek	Wasson Canyon Creek
PM 22.65	Arroyo del Toro	Arroyo del Toro
PM 23.0	Stovepipe Canyon Creek	Stovepipe Canyon Creek
PM 25.56	*	Gavilan Wash
PM 28.06	Temescal Wash	Temescal Wash
PM 29.14	Horsethief Canyon Creek	Horsethief Canyon Creek
PM 30.1	*	Indian Wash
PM 32.0	*	Mayhew Wash
PM 33.0	*	Coldwater Wash
PM 34.7	*	Brown Canyon Wash
PM 36.6	Bedford Canyon Wash	Bedford Canyon Wash

* Stream not named in FEMA FIRM

1.2.1 Adjacent Land Use

Current land use along the ELPSE varies greatly depending upon location along the corridor. As the I-15 meanders from Lake Elsinore through unincorporated areas of Riverside County up to the City of Corona, industrial, commercial, and residential developments abut the I-15 right of way. Commercial developments tend to be concentrated along or near the on/off-ramp entrances

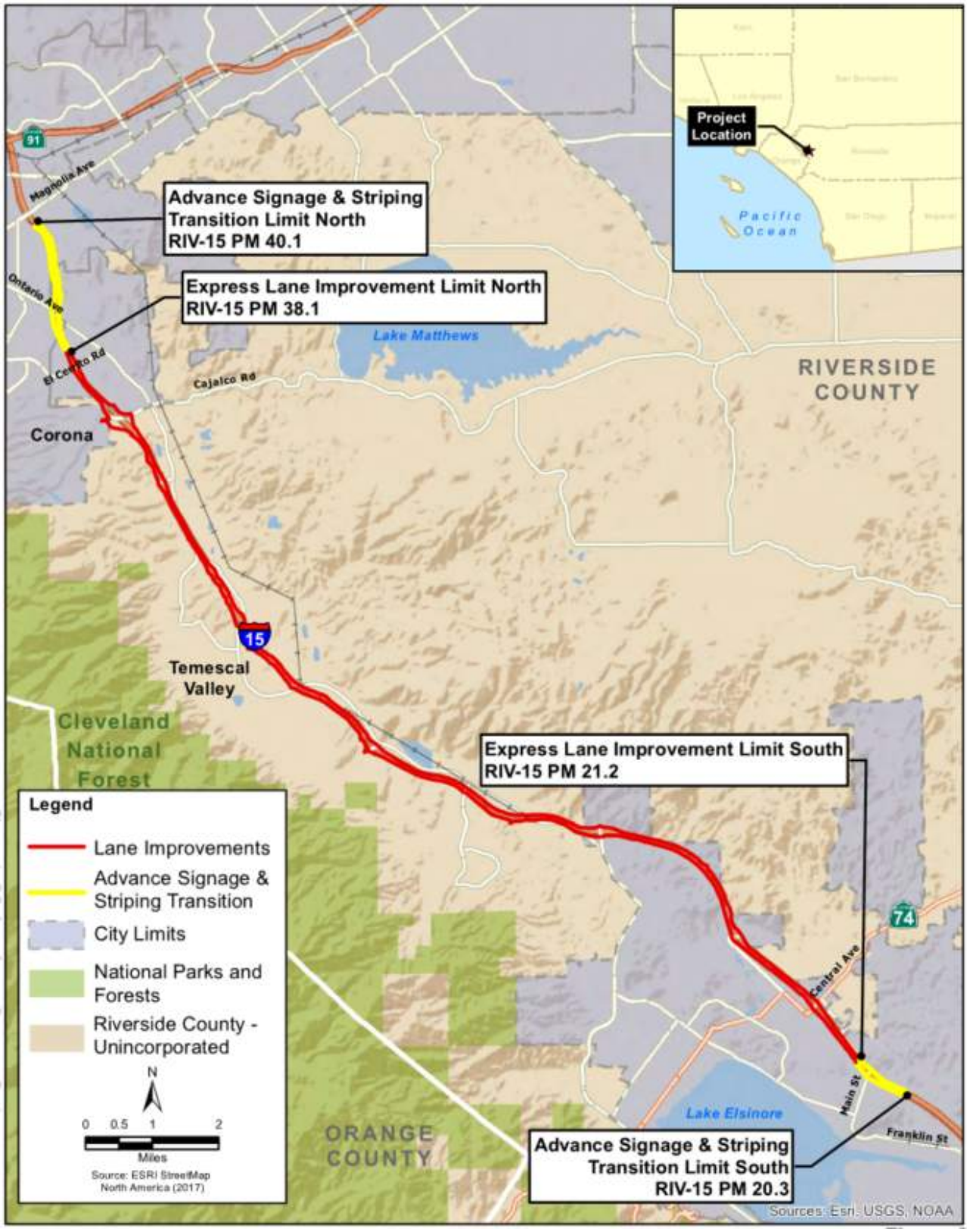
and exits for ease of access by the public, while the residential developments tend to be located between the on/off-ramps. In addition to the developed areas, undeveloped commercial, industrial, and residential parcels, hills, and/or floodplains coexist within the developed areas. In some of the unincorporated parts of Riverside County (areas between the city boundaries), there are large open space areas with native habitat that exist alongside the ELPSE. In these situations, there is a greater potential that an environmentally sensitive area (ESA) could exist.

1.2.2 Topography

Topographic maps of the site vicinity are provided by the United States Geological Survey (USGS): Corona South (1997), Lake Mathews (1997), Lake Elsinore (1997), and Alberhill (1997) quadrangles. The project location is depicted as 15.8 miles of the I-15 corridor, beginning at the City of Lake Elsinore near Central Ave (SR-74) and ending at the City of Corona North of Cajalco Road. The elevation of the subject site (ranging from south to north) begins at approximately 1,314 feet above mean sea level (amsl) near Central Ave (SR-74), descending to approximately 845 feet amsl near Cajalco Road.

Figure 1-1 Regional Vicinity

Figure 1-2 Project Location



1.3 Purpose and Need for the ELPSE

1.3.1 Purpose

The purpose of the proposed project is to:

- Improve and manage traffic operations, congestion, and travel times along the corridor
- Expand travel mode choice along the corridor
- Provide an option for travel time reliability
- Provide a cost-effective mobility solution
- Expand and maintain compatibility with the express lane network in the region

1.3.2 Need

Existing traffic volumes often exceed current highway capacity along several segments of I-15 between SR-74 (Central Avenue) and El Cerrito Road. Due to forecasted population growth, and the continued development to support the projected growth in the region, the I-15 corridor is expected to continue to experience increased congestion and longer commute times that are projected to negatively affect traffic operations along the freeway mainline.

The adopted SCAG 2016 RTP Growth Forecast estimates a 36.7 percent increase in population in Riverside County between 2015 and 2040. SCAG's recently adopted the Connect SoCal (2020-2045 RTP/SCS) Growth Forecast estimates a 30.4 percent increase in population in Riverside County between 2020 and 2045, with the number of households and employment increasing by approximately 38.3 percent and 30.0 percent, respectively. In the City of Corona, the 2020-2045 RTP/SCS Growth Forecast estimates an 11.6 percent increase in population from 2016 to 2045 and an 11.7 percent increase in households. The 2020-2045 RTP/SCS also found of the top three counties that Los Angeles residents migrate to, Riverside County places third. In 2017, the number of Los Angeles migrants to Riverside County was approximately 11,000. Additionally, the City of Corona General Plan 2020-2040, Land Use Section, estimates a 11.3 percent increase in population in the City of Corona between 2018 and 2040.

Once completed in 2021, the terminus of the I-15 Express Lanes network will terminate at Cajalco Road. Under Existing Conditions (2019) during the AM peak hour, northbound I-15 experiences heavy congestion at the Cajalco Road interchange due to commuter traffic along the corridor. This heavy congestion during the AM peak hour results in a bottleneck at the Cajalco Road on-ramp that extends to the Indian Truck Trail off-ramp. Through the project limits, during PM peak hour, the southbound direction experiences heavy congestion due to commuter traffic. The southbound I-15 bottleneck at the Cajalco Road on-ramp extends to the Magnolia Avenue on-ramp during the PM peak hour. Currently, north-south mobility options for motorists are limited through this portion of Riverside County. Besides local streets, the only parallel route for motorists is I-215, which is over ten miles east of I-15 and generally serves a different region within Riverside County.

1.4 Proposed Improvements

Two alternatives are being considered for the proposed ELPSE: a No-Build Alternative and Build Alternative.

1.4.1 No-Build Alternative

The No-Build Alternative would maintain the facility in its current condition. No improvements would be implemented at this time and therefore, no capital cost is associated with this alternative. As development continues and the traffic demand increases, traffic operational characteristics would further deteriorate, which may result in an increase in congestion and vehicle delays. The No-Build Alternative would not address or alleviate the forecasted operational issues along I-15 within the Project limits and would not satisfy the purpose and need.

1.4.2 Build Alternative

The proposed project includes construction of two tolled express lanes in both the northbound and southbound directions within the median of I-15 from SR-74 (Central Avenue) (PM 22.3) in the city of Lake Elsinore, through the unincorporated Riverside County community of Temescal Valley, to El Cerrito Road (PM 38.1) in the city of Corona for a distance of approximately 15.8 miles. The proposed project would also add southbound auxiliary lanes between both Main Street (PM 21.2) Off-Ramp and SR-74 (Central Avenue) On-Ramp (approximately 0.75 mile), and SR-74 (Central Avenue) Off-Ramp and Nichols Road On-Ramp (PM 23.9) (approximately one mile). The proposed project would be constructed within the existing right of way. These improvements would enhance regional mobility and offer greater user flexibility of the regional transportation system. Sign modifications and the installation of new signs would also be included to support the new tolled express lanes. Advanced signage is required to be posted a minimum of two miles prior to the start of the tolled express lanes and southbound auxiliary lanes. Signage will be located within the project limits between PM 20.3 and PM 40.1. The Build Alternative would not add any new connections and will not improve any existing ramps.

In addition to the features described above, the proposed project includes additional components, such as retaining walls, noise barriers, stormwater runoff treatment devices, and bridge widening, in order to accommodate the tolled express lanes. The proposed project is planned to be constructed within the existing Caltrans right of way.

The project would include multiple entrance and exit points to access the tolled express lane facility. The tolled express lanes would be separated from the general-purpose lanes with delineators and would be restricted for various lengths. Locations where vehicles are permitted to enter the tolled express lanes are termed “ingress” locations; locations where vehicles may leave the tolled express lanes are referred to as “egress” locations. The proposed project utilizes combined access locations with weave zones.

1.5 Report Objectives

This report is intended to provide a preliminary on-site hydrologic and conceptual hydraulic analysis for the proposed I-15 ELPSE improvements. The analysis is based on the Caltrans Drainage criteria.

A qualitative assessment has been made for existing drainage systems to assess potential deficiencies, possible upsizing, and relocation requirements.

This report contains sections addressing: Design Criteria; Existing Drainage Conditions and Facilities; Hydrologic Analysis; Proposed Drainage Conditions and Facilities; Adjacent Roadway Improvement Projects; Conclusions and Recommendations; and References.

2.0 DESIGN CRITERIA

2.1 Regional Flood Protection Requirements and Design Criteria

The flood protection requirements for the culvert and channel designs are based on the Caltrans Highway Design Manual (HDM). Per HDM 7th Edition section 821.3, culverts under freeways should be sized per the following:

- At least a 10 percent probability flood (10-year) without causing the headwater elevation to rise above the inlet top of the culvert
- A 1 percent probability flood (100-year) without headwaters rising above an elevation that would cause objectionable backwater depth or outlet velocities

2.1.1 Right of Way

All the improvements for the ELPSE are expected to take place within the existing Caltrans Right of Way.

2.1.2 General Agency Agreements, Permits, and Approvals

Regional drainage facilities owned by the Riverside County Flood Control District are found crossing the Caltrans Right of Way. Some of the existing runoff collected within the right of way discharges to the County owned drainage facilities. As a result, some of the proposed drainage lines will be expected to connect to the County-owned facilities, which may require approval and permits from the County of Riverside to be issued during the final design phase of the ELPSE.

In addition, approvals and permits will be obtained from Caltrans District 8. If the County's Greenbook standards differ from Caltrans standards, a Nonstandard Special Provision request will be prepared.

2.1.3 General Environmental

CEQA applies to all discretionary activities proposed or approved by California public agencies, including state, regional, county, and local agencies, unless an exemption applies. CEQA applies

only to government activities that are defined as a project. This document is being prepared to support the CEQA documentation for the ELPSE.

2.1.4 FEMA Flood Zones

The majority of the ELPSE is located within FEMA Zone X, which is described as a being outside of the 100-year floodplain zone. However, there are three locations in which the ELPSE's proposed improvements are adjacent to or crossing a known FEMA-designated, 100-year floodplain zone, Zone A, Zone AE, and Zone AO. FEMA describes these flood zones in their mapping as follows:

- Zone X – area determined to be outside the 0.2 percent annual chance flood
- Zone X (Shaded) – areas of 0.2 percent annual chance flood; areas of 1 percent annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile and areas protected by levees from the 1-percent annual chance flood
- Zone A – special flood hazard areas subject to inundation by the 1 percent annual chance flood event; no base flood elevations (BFEs) determined
- Zone AE – special flood hazard areas subject to inundation by the 1 percent annual chance flood event; BFEs determined.
- Zone AO – flood depths of 1 to 3 feet (usually areas of ponding); BFEs determined.

Further analysis of these areas was conducted by comparing available as-builts and proposed ELPSE roadway cross-sections to the base flood elevations as indicated by the pertinent FEMA FIRM. Based upon the results of these analyses, it was determined that the project improvements would not adversely impact the FEMA flood plains. All FIRMs that depict the ELPSE corridor, along with the PM locations at which the FEMA flood plains intersect the ELPSE's alignment, are listed on **Table 2-1**.

Table 2-1: FEMA Flood Plain Crossings and FIRM #

Regional Water Quality Control Board	Approximate Location of 100-year Floodplain Crossings (PM)	FIRM #
Santa Ana Regional Water Quality Control Board (SARWQCB)	36.6	06065C1360G
	N/A	06065C1370G
	N/A	06065C1390G
	N/A	06065C2005G
	28.0	06065C2006G
	N/A	06065C2007G
	N/A	06065C2026G
	22.8	06065C2028G

Source: FEMA FIRMettes

Bedford Canyon Wash (PM 36.6) is designated as a Zone A at the point of intersection with the ELPSE. Flood profile 19(a)P shows a flood elevation of 806 ft (NAVD 88) for the 1 percent Annual Chance Flood.

Temescal Wash (PM 28.0) is designated as a Zone AE at the point of intersection with the ELPSE. Flood profile 244P shows a flood elevation of 1184 ft (NAVD 88) for the 1 percent Annual Chance Flood.

Stovepipe Canyon Creek (PM 23.5) is designated as Zone AO at the point of intersection with the ELPSE. Flood Insurance Rate Map shows an average flood depth of 1-foot for the 1% annual flood.

PM 22.0 – Roadway section is found within a zone AO. Flood Insurance Rate Map shows an average flood depth of 1-foot for the 1% annual flood.

Arroyo del Toro (PM 22.6) is designated as Zone A at the point of intersection with the ELPSE.

Implementation of the ELPSE would not appreciably modify the characteristics of any of the stream hydraulics. The changes in water surface elevations within the proposed ELPSE are insignificant. Refer to Appendix A for floodplain maps and flood profiles.

2.1.5 Regulatory Permits/Jurisdictional Delineation

Construction of the ELPSE will likely require environmental regulatory permits as the project is adjacent to existing regional drainage facilities. **Table 2-2** shows the jurisdictional agencies that would be involved in permits and their approval.

Table 2-2: Regulatory Permits/Approvals

Agency	Permit/Approval	Status
ACOE	Section 404 Nationwide Permit	RCTC to obtain permit
	Section 408 Approval Process	No alterations to ACOE facilities are anticipated, therefore the 408 Permit is not expected to be required
SARWQCB and SWRCB	Section 401 Water Quality Certification	RCTC to obtain permit
	Section 402 NPDES (Construction Activity)/Caltrans NPDES Permit CAS000003 and CAS000002 (General Permit)	RCTC to initiate CGP permit as applicant and legally responsible entity for the NOI
CDFW	Section 1602 Approval Process	RCTC to obtain permit

ACOE = US Army Corps of Engineers
Caltrans = California Department of Transportation
NOI = Notice of Intent
NPDES = National Pollutant Discharge Elimination System
RCTC = Riverside County Transportation Comission
SARWQCB = Santa Ana Regional Water Quality Control Board
SWRCB = State Water Resources Control Board
CDFW = California Department of Fish and Wildlife

This ELPSE is subject to the *National Pollutant Discharge Elimination System (NPDES) Statewide Storm Water Permit Waste Discharge Requirements (WDRs) for State of California Department of Transportation* (Order Number 2012-0011-DWQ, NPDES Number CAS000003, Effective July 1, 2013). An updated "conformed" permit was produced by the SWRCB and became effective on April 7, 2015.

2.2 On-site Flood Protection Requirements and Design Criteria

This ELPSE lies within the Caltrans Right of Way. The hydrology and hydraulic methodology used in this design is per the requirements of Caltrans HDM.

Design guidance is also provided from the FHWA, *Hydraulic Design Series* (HDS) No. 2, HDS No. 5, and *Hydraulic Engineer Circular* (HEC) 22. Within these key technical resources, methods and procedures are given for the hydraulic design of storm drainage systems.

On-site drainage systems are designed for the 25-year storm event except for sag locations that are designed for a 50-year storm event. For a detailed explanation on hydrologic design criteria and characteristics for the ELPSE refer to **Section 4.1 – Design Criteria and Characteristics**.

Table 2-3 is a brief list of key design criteria.

Table 2-3 Freeway Design Criteria, per Caltrans HDM (7th Edition)

Issue	Control	Max/Min	HDM Reference
Spread Width	Shoulder Width	Shoulder width max	Table 831.3
Flow Across Roadway	Concentrations of sheet flow	0.1 cfs max	Section 831.4(1)
Pipe Diameter	Trunk and lateral	18" min	Table 838.4
Pipe Slope	Self-cleaning velocity	3 fps min	Section 838.4
Manhole Spacing	Pipe diameter < 48"	300' to 700' max	Section 838.5 (1)(c)
Manhole Spacing	Self-cleaning velocity	700' max	Section 838.5

2.2.1 Hydraulics

Hydraulics for the on-site systems require that inlet spacing conforms to HDM Table 831.3, which requires water spread in the roadway area be contained to the shoulder. Storm drain hydraulics can be pressure flow granted that the hydraulic gradient is 0.75 feet or more below the intake lip of any inlet. For maintenance access, storm drains less than 48 inches will have manholes/inlets at a minimum of every 300 feet. For a detailed explanation on Hydraulic design parameters applied to the ELPSE refer to Section 5 - Proposed Drainage Conditions and Facilities.

3.0 EXISTING DRAINAGE CONDITIONS AND FACILITIES

3.1 Regional Drainage System

The ELPSE site crosses eight major regional drainage systems, four of which are located within a FEMA critical flood area – Bedford Canyon Wash, Temescal Wash, Arroyo del Toro, and Stovepipe Canyon Creek as covered in Section **2.1.4 FEMA Flood Zones**. Below is a description and crossing location for each of the regional drainage system crossing the ELPSE.

3.1.1 Temescal Wash

The Temescal Wash is the main regional drainage system to which all the runoff produced within the ELPSE limits and vicinity will ultimately be discharged to. The Temescal Wash begins as the Elsinore Spillway Channel, an overflow channel for Lake Elsinore that now confines its upper reaches through the middle of downtown Lake Elsinore. The wash then turns and passes northwestward into Warm Springs Valley, past its confluence with Wasson Canyon wash on the right until it is past the water treatment plant. From there, it is permitted to spread out into a natural creek.

The Temescal Wash runs parallel to the I-15 alignment continuously until it crosses the freeway just south of Horsethief Canyon Road at approximately I-15 PM 28.1; it continues running parallel to the I-15 past the ELPSE limits gathering all the Creeks that cross the project limits. Throughout the alignment, the Temescal Wash is characterized as a natural, meandering channel.

3.1.2 Wasson Canyon Creek

Wasson Canyon Creek crosses the I-15 at approximately I-15 PM 21.58. At this location, Wasson Creek is a Zone x floodplain per FEMA Panel 06065C2037G and considered to be outside the 0.2% annual chance flood plain.

East of the project, Wasson Creek is a natural meandering creek that crosses under an I-15 bridge through an earthen channel to then flow through a culvert box under Collier Ave which outlets onto Wasson Basin west of the project.

3.1.3 Arroyo del Toro

Arroyo del Toro is located just north of Central Ave and crosses the I-15 at approximately I-15 PM 22.6. At this location Arroyo del toro is a Zone A floodplain per FEMA Panels 06065C2028G and 06065C2029G and considered to be within a special flood hazard area subject to inundation by the 1% annual chance flood.

East of the project, Arroyo del toro is a concrete rectangular channel that crosses Dexter Avenue through a quintuple 14-feet by 10-feet reinforced concrete box (RCB. The RCB's outlet into a detention basin between Dexter Avenue and the I-15 Northbound roadway. From the detention basin, ten 36-inch and five 48-inch culverts convey the flow under the I-15 to a rectangular channel parallel to the I-15 southbound roadway.

3.1.4 Stovepipe Canyon Creek

Stovepipe Canyon Creek crosses the I-15 at approximately I-15 PM 23.5. At this location Arroyo del toro is both a Zone AO and Zone X floodplain per FEMA Panel 06065C2028G and considered to be within a special flood hazard area subject to flood elevation depths of up to 1-feet by the 1% annual chance flood.

East of the project, Stovepipe Canyon Creek is a natural earthen channel that crosses the I-15 through a 14-feet by 8-feet reinforced concrete box (RCB). The RCB outlets into the Temescal Wash west of the project.

3.1.5 Gavilan Wash

Gavilan Wash is located south of Lake Street and north of Cajalco Road within the City of Lake Elsinore and crosses under an I-15 bridge at approximately I-15 PM 25.6. Flowing westerly, Gavilan Wash converges to Temescal Wash at approximately 450 feet west of the I-15. In general, the Gavilan Wash Creek can be characterized as a natural channel with an earthen stream bed and banks with low vegetation. The channel's segment crossing the I-15 has both streambed and stream banks covered in riprap with no vegetation.

3.1.6 Horsethief Canyon Wash

Horsethief Canyon Wash is located just north of Horsethief Road within the unincorporated area of Riverside County and crosses under the I-15 at approximately PM 29.1. Flowing north, Horsethief Canyon Wash converges to Temescal Wash at approximately 1,400 feet east of the I-15. Horsethief Canyon Wash is characterized as a natural channel having both stream bed and banks composed of soil with low vegetation. The channel's segment crossing the I-15 has a stream bed covered by soil with low vegetation while the stream banks are covered in riprap.

3.1.7 Indian Wash

Indian Wash is located just south of Indian Truck Trail within the Riverside County unincorporated area and crosses the I-15 at approximately PM 30.1. Indian Wash flows north and converges to Temescal Wash at approximately 1,500 feet west of the I-15. Indian Wash is characterized as a natural channel having both stream bed and banks composed of soil with low vegetation and has the same characteristics for the segment crossing under the I-15 bridge. No armor cover exists on either stream bed or banks within said section.

3.1.8 Mayhew Wash

Mayhew Wash is located just north of Temescal Canyon Road and crosses an I-15 bridge at approximately PM 31.1. Mayhew Wash flows east and converges to Temescal Wash at approximately 2,000 feet east of the I-15. Mayhew Wash is characterized as a natural channel having both stream bed and banks composed of soil with heavy vegetation (low bushes) within the segment crossing under the I-15 bridge. No armor cover exists on either stream bed or banks within said section, but both have a natural vegetation cover.

3.1.9 Cold Water Wash

Cold Water Wash is located just south of Temescal Canyon Road (third Temescal Canyon Road crossroad going north) and crosses an I-15 bridge at approximately I-15 PM 33.0. Cold Water Wash flows north and has an alignment parallel to Temescal Canyon Road until it converges with Temescal Wash. Cold Water Wash is characterized as a natural earthen channel densely vegetated with bushes and trees. The channel's segment crossing the I-15 has a stream bed covered in soil and stream banks covered in riprap; it is highly vegetated with bushes and trees.

3.1.10 Brown Canyon Wash

Brown Canyon Wash is a concrete channel located south of Weirick Road/Dos Lagos Drive within Riverside's unincorporated area and crosses an I-15 bridge at approximately I-15 PM 34.7. Brown Canyon Wash flows east and discharges onto Lee Lake at approximately 1,200 feet east of the I-15, ultimately discharging to Temescal Wash.

3.1.11 Bedford Canyon Wash

Bedford Canyon Wash is located just south of Cajalco Road and passes under an I-15 Bridge at approximately I-15 PM 36.6. The upstream reach of Bedford Canyon Wash (just west from I-15) is an earthen channel that transitions into a natural, meandering channel after crossing the I-15 and continues downstream until it converges with the Temescal Wash.

3.2 Existing Local Drainage Conditions

Throughout the length of the proposed ELPSE, the general transversal flow pattern is from either east to west or west to east depending on the location. Longitudinally, water flows either north to south or vice versa depending on the location. As it currently exists, the ELPSE uses several methods to convey stormwater runoff off and through its right of way. Existing storm drain facilities run parallel (via roadside ditches and shoulder dikes), as well as intersects (via pipes and culverts) the alignment of the ELPSE as the drainage conditions dictate.

In the freeway sections within straight horizontal geometry, each road section (northbound and southbound) tends to drain toward the center median beginning at the inside edge of travel way, while the travel ways tend to drain toward the outside shoulders. In roadway sections within a superelevation, the superelevated travel way drains toward the center median.

The center median is largely a native soil "channel" that collects and conveys runoff from the existing roadway to the nearest inlet via a series of graded high points, flow-through situations, and sag locations. The shoulder areas typically sheet flow to graded swales and to AC dikes to direct flow to the nearest inlet or low point. Water collected by the median, shoulder dikes, and swales is conveyed through concrete pipes and culverts running transversely. The collected water is then discharged onto marshes, creeks, and other surface depressions and ultimately to the Temescal Creek Wash.

3.3 Existing Local Drainage Systems

Existing storm drain systems within the ELPSE's limits range from 12 inches to 84 inches diameter for circular conduit and varying dimensions for box culverts. A variety of culvert material was used within the ELPSE's limits, such as Reinforced Concrete Pipe (RCP), Reinforced Concrete Box (RCB), Corrugated Steel Pipe (CSP), Corrugated Metal Pipe (CMP), and Alternative Pipe Culvert (APC). In addition, several drainage systems are employed in a series, whereas most are a single pipe system conveying flow from one side of the freeway to the other.

As-builts were reviewed and field investigations conducted to document the approximate centerline location of the existing drainage facilities within the ELPSE corridor. An inventory of the existing drainage facilities was created listing the approximate location, size, and type of material.

The existing drainage facilities inventory can be found in **Appendix F**. Additionally, all existing drainage facilities are depicted on the Existing Drainage Systems Map and Proposed Hydrology Map in **Appendix B**.

4.0 HYDROLOGIC ANALYSIS

Hydrology maps showing the proposed layout of the proposed drainage systems are in **Appendix B**. The hydrology subareas are broken by receiving inlet identifications (IDs). The inlet ID naming convention is based on the roadbed direction and lowest 100th station it falls within. For example, Inlet N-1805 is for an inlet draining the northbound roadbed and located within STA 1805+00 and STA 1806+00. For multiple inlets within a station range, a distinction will be made between inlets by adding a letter at the end of the ID, e.g., two inlets within STA 1805 and STA 1806 in the northbound roadbed will have the ID N-1805A and N-1806B.

4.1 Design Criteria and Characteristics

Hydrology calculations are based on the rational method as recommended by HDM 819.2. The most pertinent design criteria are summarized as follows:

- Rational Method is used to determine all on-site design discharges.
- On-site hydrologic calculations are based on a 25-year return frequency storm event with a minimum 5-minute duration (duration is assumed to equal the time of concentration).
- On-site sag conditions are based on a 50-year return frequency storm event with a minimum 5-minute duration.

4.1.1 Rational Method

The design discharge (Q) was calculated for all on-site design discharges using the Rational Formula. The Rational Formula is suitable for hydrologic analysis because the drainage areas that are delineated in the hydrology maps found in **Appendix B** are "small simple watershed areas, no larger than 320 acres." Per HDM 819.2, the Rational Formula is defined as:

Q = CiA

Where:

Q = Design discharge in cubic feet per second.

C = Coefficient of runoff. Design values used are explained in **Section 4.1.3 Runoff Coefficient**.

i = Average rainfall intensity in inches per hour for the selected frequency and for a duration equal to the time of concentration. Design values used are explained in **Section 4.1.2 Rainfall Intensity**.

A = Drainage area in acres. As delineated in the hydrology map in **Appendix B.1**

4.1.2 Rainfall Intensity

NOAA Atlas 14 data (link below) was used to establish the rainfall intensities pertaining to the design frequencies as shown on **Section 4.2 – Methodology and Computation Procedures**.

https://hdsc.nws.noaa.gov/hdsc/pfds/pfds_map_cont.html?bkmrk=ca

Because the rainfall intensity varies throughout the 16.9 miles stretch of the proposed ELPSE, a total of four rainfall intensity (I) data points were chosen to be applied within segments of the ELPSE. **Table 4–1** shows the Rainfall I Values for each of four ELPSE sections, each one analyzed to determine the most conservative rainfall intensity (i) for that given area. Refer to **Appendix C** for NOAA Atlas Map and Tables.

Table 4-1 Rainfall Intensities

Roadway Segment Ranges		Rain Intensity (I) (in/hr)	
From	To	I_{25}	I_{50}
Central Avenue (SR-74)	Lake Street	3.2	3.73
Lake Street	Indian Truck Trail	3.29	3.8
Indian Truck Trail	Temescal Canyon Road	3.47	4.03
Temescal Canyon Road	Cajalco Road	3.61	4.2

4.1.3 Coefficient of Runoff

The runoff coefficient for all undeveloped and developed areas within Caltrans Right of Way are obtain from the HDM 819, Figure 819.2A and Table 819.2B respectively. The runoff coefficients given in Figure 819.2A and Table 819.2B are applicable for storms of up to 5- or 10-

year frequencies. The adjustment of the rational method for use with major storms can be made by multiplying the coefficient by a frequency factor, C(f). Values of C(f) are given below. Under no circumstances should the product C(f) time C exceed 1.0

Frequency (yrs)	C(f)
25	1.1
50	1.2
100	1.25

For this project all paved areas, the 25-year runoff coefficient, $C_{25,}$ is determined to be 0.99. This value includes the 10 percent increase upon a value of 0.90 (from Table 819.2B) for Streets: Concrete (0.80-0.95). The undeveloped runoff coefficient was determined to be 0.63 for the 25-year event, which considers the 10 percent increase as recommended by HDM 819. A calculation for the runoff undeveloped runoff coefficient is provided in **Appendix E**.

Should a watershed area contain both developed (paved) and undeveloped (unpaved) area, a weighted runoff coefficient for the entire basin can be determined as:

$$C = \frac{C1A1+C2A2}{A1+A2}$$

Where:

C = Weighted Coefficient of runoff

C_1 = Coefficient of runoff for developed areas

C_2 = Coefficient of runoff for undeveloped areas

A_1 = Paved area

A_2 = Unpaved area

Table 4-2 summarizes the standardized drainage area runoff coefficients to be used for this design for all drainage areas within Caltrans Right of Way. These values include the application of the 10 percent increase for the 25-year event.

Table 4-2 Design Runoff Coefficients

Type of Drainage Area	C_{25}	Applies
Unimproved Areas	0.63	Cut slopes, earthen median along freeway, roadside ditches
Streets (Asphaltic or Concrete)	0.99	Freeway

4.2 Methodology and Computation Procedures

Watershed areas are delineated based upon the existing topographic mapping, proposed grading, and survey data. The hydrology maps illustrate the on-site watershed areas and flow paths for the ELPSE. The on-site hydrology map can be found in **Appendix B**.

Peak discharge rates for on-site improvements are calculated using the Rational Method per **Section 4.1.1 – Rational Method**. Effective runoff coefficients were derived for each area per **Section 4.1.3 – Runoff Coefficient**. On-site (local facility) hydrologic summary tables are contained within the Proposed Hydrology Maps in **Appendix B.2**.

4.3 Calculation Software

Application	Software
Hydraulics: • Inlet Spacing – Spread Analysis • Outer Shoulder Dike Modeling	 Caltrans OndrainE Version 7.5d Caltrans OndrainE Version 7.5d

4.4 Results

The proposed Hydrology Map depicting the proposed hydrology areas, their point of discharge, and hydrologic information is in **Appendix B.2**.

5.0 PROPOSED DRAINAGE CONDITIONS AND FACILITIES

5.1 Regional

A Location Hydraulic Study and Summary of Floodplain Evaluation Report (SFER) for each stream crossing within the project limits will be prepared by Michael Baker International. No major regional impacts are expected due to the ELPSE improvements.

5.2 On-site Drainage

The overall proposed drainage condition concept will remain similar to the existing drainage condition with respect to direction of flow. However, there are some changes due to the proposed ELPSE improvements that will alter the method by which stormwater will be conveyed. No diversion from watersheds is planned.

This change is due to its proposed improvements eliminating the median "channel" that currently exists in favor of paved lanes/shoulders, as well as the addition of retaining walls. These improvements and additions will necessitate the removal of existing inlets and adding new inlets along the new edge of shoulder to intercept stormwater runoff. Additionally, new longitudinal storm drain lines running parallel to the roadway's alignment will be constructed to connect the new inlets to the existing transversal storm drain lines. Hydraulic analysis will be required in the

final design phase to confirm new storm drain connections do not create adverse conditions in existing storm drain facilities. Refer to Appendix F for assumed existing flow rate capacities based on as-built information for pipe size, slope and material.

Please note that the proposed inlets along the new median edge of shoulder are only needed for superelevated roadway segments. In general, water will be directed away from the median onto the outer shoulders.

The following describes the potential hydraulic features that could be employed to convey stormwater runoff for the Build Alternative.

5.2.1 Median Shoulder

With the proposed improvements, the ELPSE will no longer contain a native soil median, but rather a concrete barrier between the northbound and southbound travel ways with paved toll express lanes and shoulder. For the proposed condition, the median shoulder width varies between Central Avenue (I-15 STA 1775+00) up to approximately 0.76 mile north of Nichols Road (I-15 STA 1300), in which the shoulder width ranges between 10 and 20 feet. From 0.76 mile north of Nichols Drive (I-15 STA 1300+00) up to the northern limit of the ELPSE, about 500 feet north of Cajalco Road (I-15 STA 1950+00), the shoulder width is a consistent 8 feet.

For roadway segments having a tangential horizontal alignment a 2 percent cross slope was used. For roadway segments in superelevation, and curve transitions, a projected plane paving approach was used in the design of the proposed pavement, therefore, the cross slope follows that of the existing adjacent pavement and varies. When the I-15 roadway is superelevated toward the median barrier on both sag and flow-by condition, the runoff will be collected by a series of grated inlets (G1 or GDO) and connected to nearby existing transversal storm drain lines. The new longitudinal systems will be designed to contain water runoff within the median shoulder and in some cases, a combination of grated inlets and slotted drains will be necessary to mitigate spread issues. Hydraulic analysis will be required in the final design phase to confirm new storm drain connections do not create adverse conditions in existing storm drain facilities. Refer to Appendix F for assumed existing flow rate capacities based on as-built information for pipe size, slope, and material.

Refer to the Proposed Hydrology Exhibit Maps in **Appendix B** and the spread analysis results summary tables and calculations in **Appendix D** for the full evaluation of the ELPSE roadway's hydraulic conditions.

5.2.2 Shoulder Dikes

The ELPSE improvements will involve the construction of about 0.85 mile of continuous outer shoulder dike on the southbound roadway segment located 0.25 mile north of Dos Lagos Rd and 0.09 mile south of Cajalco Road. Additionally, because of the proposed geometry, some of the surface runoff previously collected by the median ditch under existing conditions will now being directed toward the outer shoulders. For most of the ELSPE's alignment, runoff directed toward

the outer shoulders sheet flows onto existing roadside swales. However, there are a few freeway segments in which water will be collected by existing outer shoulder dikes.

An analysis was performed on outer shoulder dikes to ensure that the additional runoff does not compromise the hydraulic capability, and that water is contained within allowable spread. Refer to **Appendix D.3** for the hydraulic analysis and results of spread on the existing outer shoulder dikes affected by the proposed geometry.

5.2.3 Bridge Deck Drainage

This report does not cover the design of bridge deck drainage systems, however, it provides recommendations and items for further study at the next phase of design. In roadway sections where water is conveyed by the center median shoulder, new inlets are provided upstream of bridges to intercept all flow from adjacent roadways sections. Runoff generated within bridge decks in flow-through conditions will be collected by inlets located downstream of the bridge and routed to stormwater treatment BMPs where possible.

Within the project limits, there are existing bridge deck drains that discharge surface flows directly to blue line streams below. These conditions will require coordination, analysis and potential drainage system retrofit during the next phase of design to maintain NPDES and SARWQCB compliance. Additionally, there are also potential flooded width issues that should be analyzed and addressed in the next phase of design. Temescal Wash (Br.No. 56-0690 R/L) and Mayhew Wash (Br.No. 56-0674 R/L) are both located within a sag condition on the I-15. Currently, neither of the two overcrossings have an existing deck drainage system and may present spread and ponding issues. There are also some areas that will require coordination with the structures design to mitigate spread issues within the bridge structure aprons. These potential deck drain and flooded width issues are identified in **Table 5-1** below. Refer **Appendix D** for the Spread Analysis Results Summary Tables and Calculations. Also, for additional information, see the Advance Planning Studies (APS).

Table 5-1 Bridge Structures with Potential Deck Drain and Flood Issues

	Bridge Name	Concern	Mitigation
(S01)	Gavilan Wash	Potential bridge structure flooded width issue for northbound structure	Bridge deck drainage analysis to be evaluated at next phase of design
(S04)	Temescal Wash	Both northbound and southbound bridges are in a sag condition Existing deck drains that outlet to blue line stream below	Proposed drainage system for adjacent roadway segments upstream of bridge have been designed to capture all water for a 50-yr storm event. Hydraulic evaluation of southbound and northbound bridge structures recommended

			during next phase of design.
(S05)	Horsethief Canyon Road UC	Potential bridge structure flooded width issues for northbound structure	Bridge deck drainage analysis to be evaluated at next phase of design
(S07)	Indian Wash	Potential bridge structure flooded width issues for northbound structure Existing deck drains that outlet to blue line stream below	Bridge deck drainage analysis to be evaluated at next phase of design
(S10)	Mayhew Wash	Both northbound and southbound bridges are in a sag condition Existing deck drains that outlet to blue line stream below	Proposed drainage system for adjacent roadway segments upstream of bridge have been designed to capture all water for a 50-yr storm event. Hydraulic evaluation of southbound and northbound bridge structures recommended during next phase of design.
(S11)	Coldwater Wash	Potential bridge structure flooded width issues for southbound structure	Bridge deck drainage analysis to be evaluated at next phase of design

5.2.4 Roadside Ditches

For tributary areas where the travel way drains toward the existing roadside ditches, no proposed inlets or ditch modifications are expected based on the channel capacities. However, a thorough analysis of existing roadside ditch capacity is encouraged during the next phase of the ELPSE to rule out any need for additional inlets.

Additionally, there are two areas of concern in which runoff from adjacent hillsides is not being contained within the existing roadside ditch; instead, it concentrates and flows across the travel way toward the center median. Under existing conditions, this flow is collected by the center median ditch however, the proposed conditions eliminate the median ditch in favor of paved lanes/shoulder and retaining barrier. The proposed median shoulder is not adequate to collect the additional runoff flowing from the hillsides, as it causes issues with spread. It is recommended

that the existing outside shoulder ditches be regraded within these roadway stretches to contain the hillside runoff as follows:

- The first outside shoulder ditch that needs regrading is a stretch of about 500 feet in length (I-15 STA 1437+00 to STA 1442+00) located 2,600 feet south of first Temescal Canyon Road crossing (going north) and adjacent to the northbound travel way.
- The second outside shoulder ditch stretch is 300 feet in length (I-15 STA 1558+00 to STA 1561+00) and located 3,300 feet north of Horsethief Canyon Road adjacent to the southbound travel way.

5.2.5 Slotted Drains

Slotted drains are used where the full generated runoff is required to be captured and may not be accomplished by grated inlets. Instances include areas upstream from bridges and along segments of superelevation transitions to prevent concentrated runoff greater than 0.1 cfs from flowing across the mainline. When slotted drains are utilized, drop inlets or other type of cleanout should be provided at intervals of about 100 feet (See HDM section 830). Refer to the Proposed Hydrology Exhibit Maps in **Appendix B** and the spread analysis results summary tables and calculations in **Appendix D** for the full evaluation of the ELPSE roadway's hydraulic conditions and locations where slotted drains are anticipated.

5.3 50-yr Storm Event Design for Sag Conditions

Per HDM section 831.3 a 2% (50 yrs) design storm is to be considered for all freeway sections located within a sag condition. Within the project limits there is a total of five sag locations which have been evaluated under the 50-yr storm event. The proposed hydraulic system is adequate to drain the runoff from a 50-year storm event without causing any flood concerns at sag low points. Refer to Appendix D.5 for calculations.

5.3.1 Flanking Inlets

It is recommended that flanking inlets be considered at sag points in accordance with 4.4.6.3 of HEC 22. The purpose of the flanking inlets is to act in relief of the inlet at the low point if it should become clogged or if the design spread is exceeded. For this phase (PAED) proposed flanking inlets are shown within sag points in a rough estimated location as shown in **Appendix B.2 Proposed Hydrology Map**. Please note that for sag locations within bridge structures no proposed inlets are shown as part of this submittal. Bridge deck drainage is to be evaluated at next phase of design. The exact location and design of flanking inlets is to be performed during the final design phase of the project.

6.0 ADJACENT ROADWAY IMPROVEMENT PROJECTS

6.1 I-15/SR-74 Interchange Improvements (EA: 0F310)

The I-15/SR-74 Project consists of improvements to Central Avenue (SR-74) including roadway widening, widening of the existing on- and off-ramps to the I-15 on both southbound and

northbound directions, and a new I-15 northbound loop off-ramp. The ELPSE improvements will have a direct impact, hydraulically, on the SR-74 Project's southbound off-ramp widening as water from the I-15 median will sheet flow onto the ramp. Coordination between both projects is necessary for proper runoff conveyance. Refer to the Hydrology Exhibit in **Appendix B** for the delineation of the proposed I-15/SR-74 Interchange improvements.

6.2 I-15 Cajalco Road Interchange Improvements (EA: 0J6104)

The Cajalco Road Interchange Project consists of improvements to the Cajalco Road Overpass with the I-15 including the construction of two looping On-ramps, one for each travel way direction, a new NB slip On-ramp, and widening of existing off-ramps in both travel way directions. The project completed construction and opened to traffic in late 2019. A portion of the runoff produced from the ELPSE improvements will be directed towards an existing Cajalco Interchange drainage system. Refer to Sheet 11 on the Hydrology Exhibit in **Appendix B** for the delineation of the Cajalco Interchange Project and ELPSE tributary areas contributing runoff to it.

6.3 I-15 Express Lanes Project (ELP) Improvements (EA: 0J0801)

The I-15 ELP Project proposes to construct toll lanes along the I-15 and joins the ELPSE at the north end of the project limits at approximately STA 1957+00 just north of the Cajalco Road interchange. The ELPSE improvements do not contribute any runoff to the I-15 ELP site, however, a portion of the I-15 ELP drains toward the limits of the ELPSE, and such runoff is considered in the hydrology tributaries delineated in the Hydrology map found in **Appendix B**.

6.4 Culvert Repair Project (EA 1L820)

This project proposes to repair/replace culverts on the I-15 between 0.4 miles south of Indian Truck Trail UC Bridge (PM 30.0) and 1.1 miles north of Temescal Canyon Road UC Bridge (PM 33.0) in Riverside County. Specifically, the project proposes to repair 12 existing culverts and replace 2 existing culverts in poor condition. The project is currently in the Project Initiation phase and construction for the culvert repair project is expected in mid-2026. Coordination with EA 1L820 design should be considered in the next phase of design.

7.0 CONCLUSION AND RECOMMENDATIONS

This report is intended to provide a preliminary hydrology and hydraulics account for the Project Approval and Environmental Document (PA/ED) phase of the ELPSE. The report and attachments contain sufficient data to provide a conceptual analysis of the proposed on-site drainage improvements associated with this project.

A preliminary hydrology and hydraulics study was performed for the project conditions and proposed drainage improvements. It is recommended that the data contained in this report be used to develop a more detailed analysis and assist with the preparation of a Final Drainage Report, to be used as the Drainage Design Criteria for the final design phase for this project. A

detailed hydrology study and hydraulic analysis of the inlets and storm drains are recommended to design the drainage improvements.

Preliminary inlet sizing and spacing has been performed to a level that allows for accurate programming of costs for budget purposes. Further refinements will be required during final design.

Based on this preliminary analysis the following recommendations are necessary to flood-protect the project's travel way, note that quantities for each hydraulic structure are also given:

- Install G1/G2 inlets to be along the center median shoulder for superelevated roadway segments, along outer shoulder dikes with flood issues, and to replace existing inlets affected by widening of outer shoulder dikes where it happens – *218 Inlets*

- Install GDO Inlets to be along the center median shoulder for superelevated roadway segments – *145 Inlets*

- Install Slotted Drain Inlets for total flow interception upstream from bridges, cross flow reduction, and spread mitigation – *3293 LF*

- Coordination with Caltrans District 8 regarding roadway segments with water spread lengths exceeding the median shoulder widths as identified in the Spread Analysis Summary Tables in Appendix D.1

The noted drainage inlets and conveyance facility remediations were determined to be necessary at locations where the stormwater runoff exceeded the conveyance facility's capacity and posed a threat to the proposed travel way of the ELPSE. Refer to Proposed Hydrology Map in **Appendix B.2** and Spread Analysis Summary Tables in **Appendix D.1** for the exact location of proposed inlets. In addition to the inlets, new longitudinal drainage pipes varying between 18-inches and 24-inches in diameter are necessary to tie the proposed inlets to the existing drainage systems.

8.0 REFERENCES

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Federal Emergency Management Agency (FEMA). Flood Insurance Study. Riverside County, CA. 2008

NPDES General Permit for Storm Water Discharges Associated with Construction and Land Disturbance Activities (NPDES Number CA000002, Order No. 2009-0009-DWQ) (Construction General Permit or CGP)

Appendix A

FEMA Maps and FEMA Flood Profiles

Appendix A.1

FEMA Maps

NOTES TO USERS

This map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. The **community map repository** should be consulted for possible updated or additional flood hazard information.

To obtain more detailed information in areas where **Base Flood Elevations** (BFEs) and/or **floodways** have been determined, users are encouraged to consult the Flood Profiles and Floodway Data and/or Summary of Stillwater Elevations tables contained within the Flood Insurance Study (FIS) report that accompanies this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded whole-foot elevations. These BFEs are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS report should be utilized in conjunction with the FIRM for purposes of construction and/or floodplain management.

Coastal Base Flood Elevations shown on this map apply only landward of 0.0' North American Vertical Datum of 1988 (NAVD 88). Users of this FIRM should be aware that coastal flood elevations are also provided in the Summary of Stillwater Elevations tables in the Flood Insurance Study report for this jurisdiction. Elevations shown in the Summary of Stillwater Elevations tables should be used for construction and/or floodplain management purposes when they are higher than the elevations shown on this FIRM.

Boundaries of the **floodways** were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Flood Insurance Study report for this jurisdiction.

Certain areas not in Special Flood Hazard Areas may be protected by **flood control structures**. Refer to Section 2.4 "Flood Protection Measures" of the Flood Insurance Study report for information on flood control structures for this jurisdiction.

The **projection** used in the preparation of this map was Universal Transverse Mercator (UTM) zone 11. The **horizontal datum** was NAD 83, GRS80 spheroid. Differences in datum, spheroid, projection or UTM zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of this FIRM.

Flood elevations on this map are referenced to the North American Vertical Datum of 1988. These flood elevations must be compared to structure and ground elevations referenced to the same **vertical datum**. For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at http://www.ngs.noaa.gov or contact the National Geodetic Survey at the following address:

NGS Information Services
NOAA, N/NGS12
National Geodetic Survey
SSMC-3, #9202
1315 East-West Highway
Silver Spring, Maryland 20910-3282
(301) 713-3242

To obtain current elevation, description, and/or location information for **bench marks** shown on this map, please contact the Information Services Branch of the National Geodetic Survey at **(301) 713-3242**, or visit its website at http://www.ngs.noaa.gov.

Base map information shown on this FIRM was derived from U.S. Geological Survey Digital Orthophoto Quadrangles produced at a scale of 1:12,000 from photography dated 1994 or later.

This map may reflect more detailed and up-to-date **stream channel configurations** than those shown on the previous FIRM for this jurisdiction. The floodplains and floodways that were transferred from the previous FIRM may have been adjusted to conform to these new stream channel configurations. As a result, the Flood Profiles and Floodway Data in the Flood Insurance Study Report (which contains authoritative hydraulic data) may reflect stream channel distances that differ from what is shown on this map.

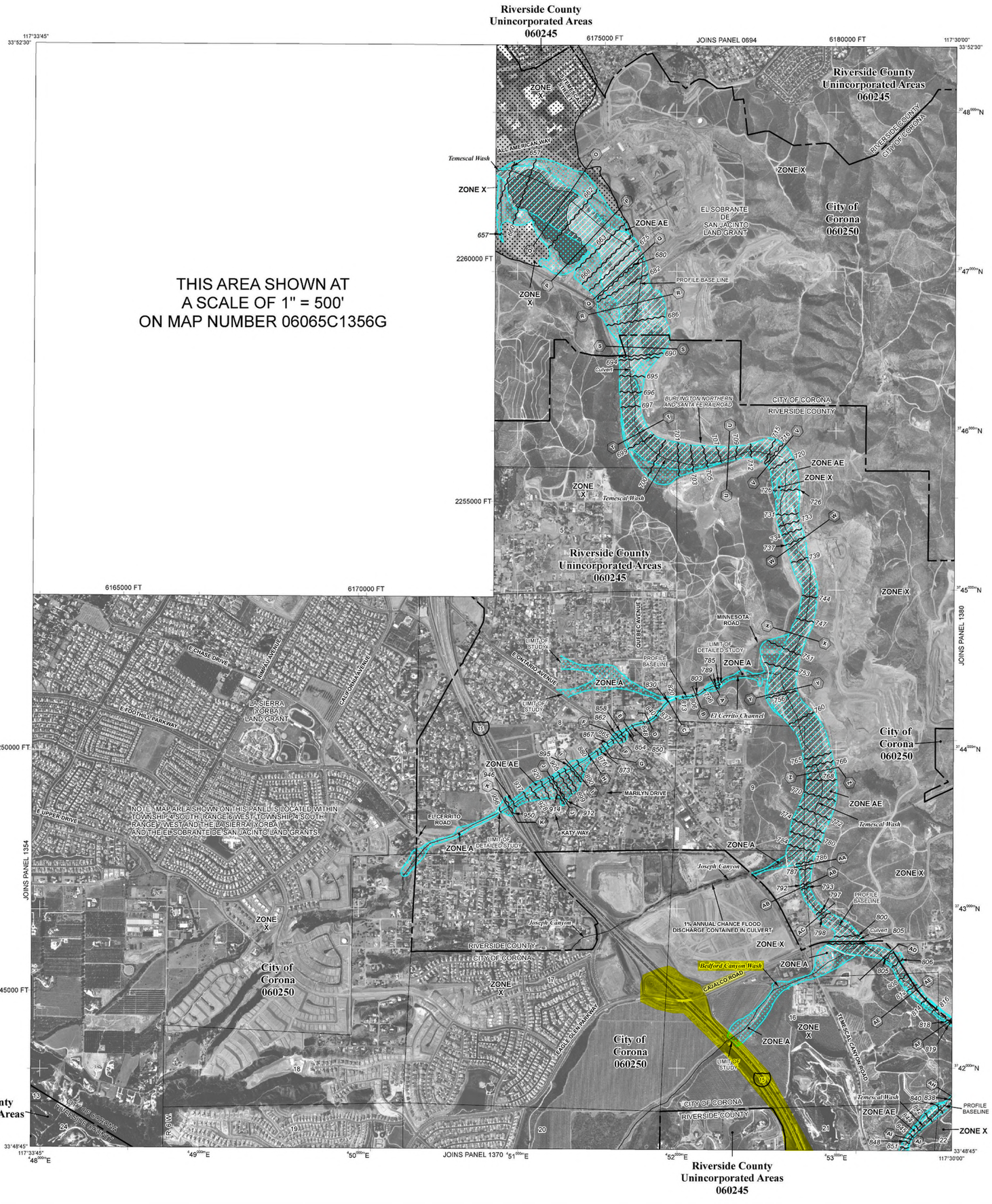
Corporate limits shown on this map are based on the best data available at the time of publication. Because changes due to annexations or de-annexations may have occurred after this map was published, map users should contact appropriate community officials to verify current corporate limit locations.

Please refer to the separately printed **Map Index** for an overview map of the county showing the layout of map panels; community map repository addresses; and a Listing of Communities table containing National Flood Insurance Program dates for each community as well as a listing of the panels on which each community is located.

Contact the **FEMA Map Service Center** at 1-800-358-9616 for information on available products associated with this FIRM. Available products may include previously issued Letters of Map Change, a Flood Insurance Study report, and/or digital versions of this map. The FEMA Map Service Center may also be reached by Fax at 1-800-358-9620 and its website at http://msc.fema.gov.

If you have **questions about this map** or questions concerning the National Flood Insurance Program in general, please call **1-877-FEMA MAP** (1-877-336-2627) or visit the FEMA website at http://www.fema.gov.

THIS AREA SHOWN AT
A SCALE OF 1" = 500'
ON MAP NUMBER 06065C1356G



LEGEND

SPECIAL FLOOD HAZARD AREAS SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

ZONE A	No Base Flood Elevations determined.
ZONE AE	Base Flood Elevations determined.
ZONE AH	Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
ZONE AO	Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
ZONE AR	Special Flood Hazard Area formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
ZONE A99	Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.
ZONE V	Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
ZONE VE	Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X	Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X	Areas determined to be outside the 0.2% annual chance floodplain.
ZONE D	Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

	1% annual chance floodplain boundary
	0.2% annual chance floodplain boundary
	Floodway boundary
	Zone D boundary
	CBRS and OPA boundary
	Boundary dividing Special Flood Hazard Area Zones and boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities.
513	Base Flood Elevation line and value; elevation in feet*
(EL. 987)	Base Flood Elevation value where uniform within zone; elevation in feet*

* Referenced to the North American Vertical Datum of 1988

A — A	Cross section line
23 — 23	Transect line
87°07'45", 32°22'30"	Geographic coordinates referenced to the North American Datum of 1983 (NAD 83), Western Hemisphere
4276000mN	1000-meter Universal Transverse Mercator grid values, zone 11N
600000 FT	5000-foot grid ticks: California State Plane coordinate system, zone VI (FIPSZONE 0406), Lambert Conformal Conic projection
DX5510 X	Bench mark (see explanation in Notes to Users section of this FIRM panel)
M1.5	River Mile

MAP REPOSITORY
Refer to listing of Map Repositories on Map Index

EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP
August 28, 2008

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL

For community map revision history prior to countywide mapping, refer to the Community Map History table located in the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in this community, contact your Insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

MAP SCALE 1" = 1000'
500 0 1000 2000 FEET
300 0 300 600 METERS

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 1360G

FIRM

FLOOD INSURANCE RATE MAP

RIVERSIDE COUNTY, CALIFORNIA AND INCORPORATED AREAS

PANEL 1360 OF 3805

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
CORONA, CITY OF	060250	1360	G
RIVERSIDE COUNTY	060245	1360	G

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
06065C1360G

EFFECTIVE DATE
AUGUST 28, 2008

Federal Emergency Management Agency

NOTES TO USERS

This map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. The **community map repository** should be consulted for possible updated or additional flood hazard information.

To obtain more detailed information in areas where **Base Flood Elevations** (BFEs) and/or **floodways** have been determined, users are encouraged to consult the Flood Profiles and Floodway Data and/or Summary of Stillwater Elevations tables contained within the Flood Insurance Study (FIS) report that accompanies this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded whole-foot elevations. These BFEs are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS report should be utilized in conjunction with the FIRM for purposes of construction and/or floodplain management.

Coastal Base Flood Elevations shown on this map apply only landward of 0.0' North American Vertical Datum of 1988 (NAVD 88). Users of this FIRM should be aware that coastal flood elevations are also provided in the Summary of Stillwater Elevations tables in the Flood Insurance Study report for this jurisdiction. Elevations shown in the Summary of Stillwater Elevations tables should be used for construction and/or floodplain management purposes when they are higher than the elevations shown on this FIRM.

Boundaries of the **floodways** were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Flood Insurance Study report for this jurisdiction.

Certain areas not in Special Flood Hazard Areas may be protected by **flood control structures**. Refer to Section 2.4 "Flood Protection Measures" of the Flood Insurance Study report for information on flood control structures for this jurisdiction.

The **projection** used in the preparation of this map was Universal Transverse Mercator (UTM) zone 11. The **horizontal datum** was NAD 83, GRS80 spheroid. Differences in datum, spheroid, projection or UTM zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of this FIRM.

Flood elevations on this map are referenced to the North American Vertical Datum of 1988. These flood elevations must be compared to structure and ground elevations referenced to the same **vertical datum**. For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at http://www.ngs.noaa.gov or contact the National Geodetic Survey at the following address:

NGS Information Services
NOAA, N/NGS12
National Geodetic Survey
SSMC-3, #9202
1315 East-West Highway
Silver Spring, Maryland 20910-3282
(301) 713-3242

To obtain current elevation, description, and/or location information for **bench marks** shown on this map, please contact the Information Services Branch of the National Geodetic Survey at **(301) 713-3242**, or visit its website at http://www.ngs.noaa.gov.

Base map information shown on this FIRM was derived from U.S. Geological Survey Digital Orthophoto Quadrangles produced at a scale of 1:12,000 from photography dated 1994 or later.

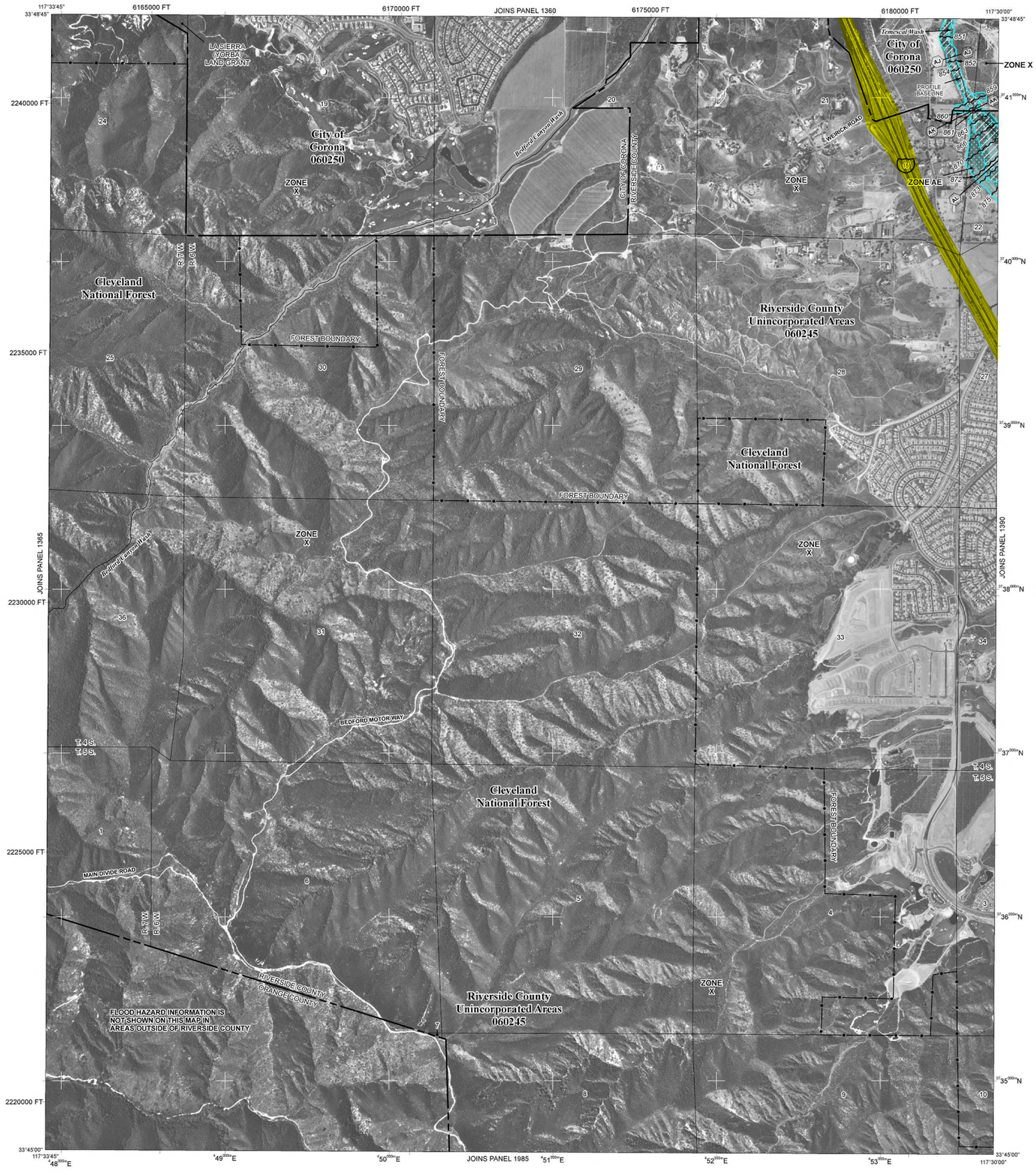
This map may reflect more detailed and up-to-date **stream channel configurations** than those shown on the previous FIRM for this jurisdiction. The floodplains and floodways that were transferred from the previous FIRM may have been adjusted to conform to these new stream channel configurations. As a result, the Flood Profiles and Floodway Data in the Flood Insurance Study Report (which contains authoritative hydraulic data) may reflect stream channel distances that differ from what is shown on this map.

Corporate limits shown on this map are based on the best data available at the time of publication. Because changes due to annexations or de-annexations may have occurred after this map was published, map users should contact appropriate community officials to verify current corporate limit locations.

Please refer to the separately printed **Map Index** for an overview map of the county showing the layout of map panels; community map repository addresses; and a Listing of Communities table containing National Flood Insurance Program dates for each community as well as a listing of the panels on which each community is located.

Contact the **FEMA Map Service Center** at 1-800-358-9616 for information on available products associated with this FIRM. Available products may include previously issued Letters of Map Change, a Flood Insurance Study report, and/or digital versions of this map. The FEMA Map Service Center may also be reached by Fax at 1-800-358-9620 and its website at http://msc.fema.gov.

If you have **questions about this map** or questions concerning the National Flood Insurance Program in general, please call **1-877-FEMA MAP** (1-877-336-2627) or visit the FEMA website at http://www.fema.gov.



LEGEND

SPECIAL FLOOD HAZARD AREAS SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

ZONE A	No Base Flood Elevations determined.
ZONE AE	Base Flood Elevations determined.
ZONE AH	Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
ZONE AO	Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
ZONE AR	Special Flood Hazard Area formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
ZONE A99	Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.
ZONE V	Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
ZONE VE	Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X	Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X	Areas determined to be outside the 0.2% annual chance floodplain.
ZONE D	Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

1% annual chance floodplain boundary

0.2% annual chance floodplain boundary

Floodway boundary

Zone D boundary

CBRS and OPA boundary

Boundary dividing Special Flood Hazard Area Zones and boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities.

513 — Base Flood Elevation line and value; elevation in feet*

(EL 987) — Base Flood Elevation value where uniform within zone; elevation in feet*

* Referenced to the North American Vertical Datum of 1988

A — A — Cross section line

23 — 23 — Transect line

87°07'45", 32°22'30" — Geographic coordinates referenced to the North American Datum of 1983 (NAD 83), Western Hemisphere

2776000mN — 1000-meter Universal Transverse Mercator grid values, zone 11N

600000 FT — 5000-foot grid ticks: California State Plane coordinate system, zone VI (FIPSZONE 0406), Lambert Conformal Conic projection

DX5510 × — Bench mark (see explanation in Notes to Users section of this FIRM panel)

●M1.5 — River Mile

MAP REPOSITORY
Refer to listing of Map Repositories on Map Index

EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP
August 28, 2008

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL

For community map revision history prior to countywide mapping, refer to the Community Map History table located in the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in this community, contact your Insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

MAP SCALE 1" = 1000'
500 0 1000 2000 FEET
300 0 300 600 METERS

NFIP
NATIONAL FLOOD INSURANCE PROGRAM

PANEL 1370G

FIRM
FLOOD INSURANCE RATE MAP

RIVERSIDE COUNTY, CALIFORNIA
AND INCORPORATED AREAS

PANEL 1370 OF 3805
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
CORONA, CITY OF	060250	1370	G
RIVERSIDE COUNTY	060245	1370	G

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
06065C1370G

EFFECTIVE DATE
AUGUST 28, 2008

Federal Emergency Management Agency

NOTES TO USERS

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Coastal Base Flood Elevations shown on this map apply only landward of 0.0' North American Vertical Datum of 1988 (NAVD 88). Users of this FIRM should be aware that coastal flood elevations are also provided in the Summary of Stillwater Elevations tables in the Flood Insurance Study report for this jurisdiction. Elevations shown in the Summary of Stillwater Elevations tables should be used for construction and/or floodplain management purposes when they are higher than the elevations shown on this FIRM.

Boundaries of the **floodways** were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Flood Insurance Study report for this jurisdiction.

Certain areas not in Special Flood Hazard Areas may be protected by **flood control structures**. Refer to Section 2.4 "Flood Protection Measures" of the Flood Insurance Study report for information on flood control structures for this jurisdiction.

The **projection** used in the preparation of this map was Universal Transverse Mercator (UTM) zone 11. The **horizontal datum** was NAD 83, GRS80 spheroid. Differences in datum, spheroid, projection or UTM zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of this FIRM.

Flood elevations on this map are referenced to the North American Vertical Datum of 1988. These flood elevations must be compared to structure and ground elevations referenced to the same **vertical datum**. For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at http://www.ngs.noaa.gov or contact the National Geodetic Survey at the following address:

NGS Information Services
NOAA, N/NGS12
National Geodetic Survey
SSMC-3, #9202
1315 East-West Highway
Silver Spring, Maryland 20910-3282
(301) 713-3242

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Base map information shown on this FIRM was derived from U.S. Geological Survey Digital Orthophoto Quadrangles produced at a scale of 1:12,000 from photography dated 1994 or later.

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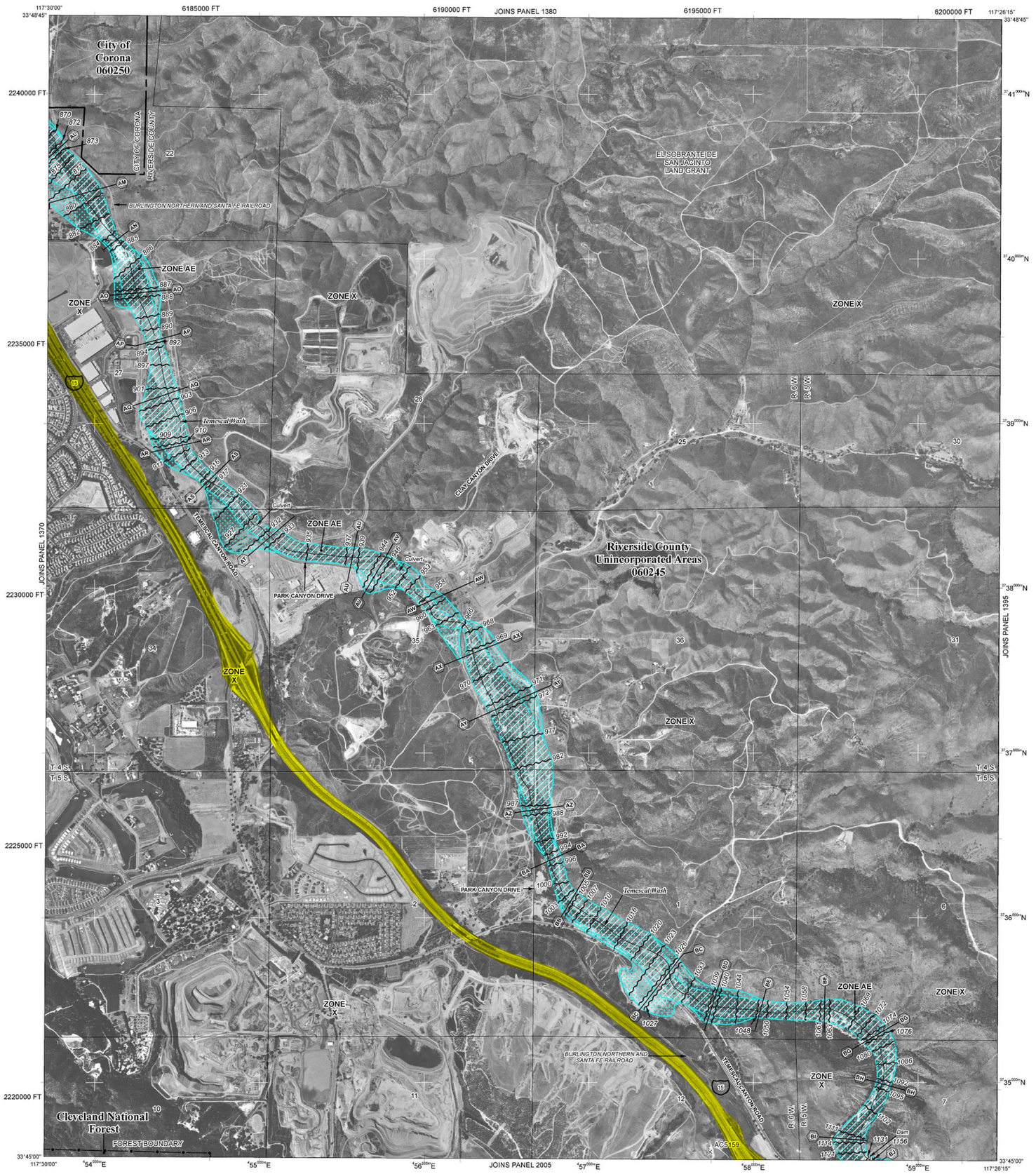

LEGEND

SPECIAL FLOOD HAZARD AREAS SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

ZONE A	No Base Flood Elevations determined.
ZONE AE	Base Flood Elevations determined.
ZONE AH	Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
ZONE AO	Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
ZONE AR	Special Flood Hazard Area formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
ZONE A99	Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.
ZONE V	Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
ZONE VE	Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X	Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X	Areas determined to be outside the 0.2% annual chance floodplain.
ZONE D	Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

- 1% annual chance floodplain boundary
- 0.2% annual chance floodplain boundary
- Floodway boundary
- Zone D boundary
- CBRS and OPA boundary
- Boundary dividing Special Flood Hazard Area Zones and boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities.
- 513 — Base Flood Elevation line and value; elevation in feet*
- (EL 987) — Base Flood Elevation value where uniform within zone; elevation in feet*

* Referenced to the North American Vertical Datum of 1988

- A — A — Cross section line
- 23 — 23 — Transect line
- 87°07'45", 32°22'30" — Geographic coordinates referenced to the North American Datum of 1983 (NAD 83), Western Hemisphere
- 4276000mN — 1000-meter Universal Transverse Mercator grid values, zone 11N
- 600000 FT — 5000-foot grid ticks: California State Plane coordinate system, zone VI (FIPSZONE 0406), Lambert Conformal Conic projection
- DX5510 × — Bench mark (see explanation in Notes to Users section of this FIRM panel)
- ●M1.5 — River Mile

MAP REPOSITORY
Refer to listing of Map Repositories on Map Index

EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP
August 28, 2008

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL

For community map revision history prior to countywide mapping, refer to the Community Map History table located in the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in this community, contact your Insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

MAP SCALE 1" = 1000'
500 0 1000 2000 FEET
300 0 300 600 METERS

NFIP
NATIONAL FLOOD INSURANCE PROGRAM

PANEL 1390G

FIRM
FLOOD INSURANCE RATE MAP

RIVERSIDE COUNTY, CALIFORNIA
AND INCORPORATED AREAS

PANEL 1390 OF 3805
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
CORONA, CITY OF	060250	1390	G
RIVERSIDE COUNTY	060245	1390	G

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
06065C1390G

EFFECTIVE DATE
AUGUST 28, 2008

Federal Emergency Management Agency

NOTES TO USERS

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Coastal Base Flood Elevations shown on this map apply only landward of 0.0' North American Vertical Datum of 1988 (NAVD 88). Users of this FIRM should be aware that coastal flood elevations are also provided in the Summary of Stillwater Elevations tables in the Flood Insurance Study report for this jurisdiction. Elevations shown in the Summary of Stillwater Elevations tables should be used for construction and/or floodplain management purposes when they are higher than the elevations shown on this FIRM.

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The **projection** used in the preparation of this map was Universal Transverse Mercator (UTM) zone 11. The **horizontal datum** was NAD 83, GRS80 spheroid. Differences in datum, spheroid, projection or UTM zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of this FIRM.

Flood elevations on this map are referenced to the North American Vertical Datum of 1988. These flood elevations must be compared to structure and ground elevations referenced to the same **vertical datum**. For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at http://www.ngs.noaa.gov or contact the National Geodetic Survey at the following address:

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National Geodetic Survey
SSMC-3, #9202
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LEGEND

SPECIAL FLOOD HAZARD AREAS SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

ZONE A	No Base Flood Elevations determined.
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FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X	Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X	Areas determined to be outside the 0.2% annual chance floodplain.
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COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

	1% annual chance floodplain boundary
	0.2% annual chance floodplain boundary
	Floodway boundary
	Zone D boundary
	CBRS and OPA boundary
	Boundary dividing Special Flood Hazard Area Zones and boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities.
513	Base Flood Elevation line and value; elevation in feet*
(EL. 987)	Base Flood Elevation value where uniform within zone; elevation in feet*

* Referenced to the North American Vertical Datum of 1988

A A	Cross section line
23 23	Transect line
87°07'45", 32°22'30"	Geographic coordinates referenced to the North American Datum of 1983 (NAD 83), Western Hemisphere
4 276 000mN	1000-meter Universal Transverse Mercator grid values, zone 11N
600000 FT	5000-foot grid ticks: California State Plane coordinate system, zone VI (FIPSZONE 0406), Lambert Conformal Conic projection
DX5510 ×	Bench mark (see explanation in Notes to Users section of this FIRM panel)
●M1.5	River Mile

MAP REPOSITORY
Refer to listing of Map Repositories on Map Index

EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP
August 28, 2008

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL

For community map revision history prior to countywide mapping, refer to the Community Map History table located in the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in this community, contact your Insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

MAP SCALE 1" = 1000'
500 0 1000 2000 FEET
300 0 300 600 METERS

NFIP NATIONAL FLOOD INSURANCE PROGRAM

PANEL 2005G

FIRM
FLOOD INSURANCE RATE MAP

RIVERSIDE COUNTY, CALIFORNIA
AND INCORPORATED AREAS

PANEL 2005 OF 3805
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
RIVERSIDE COUNTY	060245	2005	G

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
06065C2005G

EFFECTIVE DATE
AUGUST 28, 2008

Federal Emergency Management Agency

NOTES TO USERS

This map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. The **community map repository** should be consulted for possible updated or additional flood hazard information.

To obtain more detailed information in areas where **Base Flood Elevations** (BFEs) and/or **floodways** have been determined, users are encouraged to consult the Flood Profiles and Floodway Data and/or Summary of Stillwater Elevations tables contained within the Flood Insurance Study (FIS) report that accompanies this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded whole-foot elevations. These BFEs are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS report should be utilized in conjunction with the FIRM for purposes of construction and/or floodplain management.

Coastal Base Flood Elevations shown on this map apply only landward of 0.0' North American Vertical Datum of 1988 (NAVD 88). Users of this FIRM should be aware that coastal flood elevations are also provided in the Summary of Stillwater Elevations tables in the Flood Insurance Study report for this jurisdiction. Elevations shown in the Summary of Stillwater Elevations tables should be used for construction and/or floodplain management purposes when they are higher than the elevations shown on this FIRM.

Boundaries of the **floodways** were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Flood Insurance Study report for this jurisdiction.

Certain areas not in Special Flood Hazard Areas may be protected by **flood control structures**. Refer to Section 2.4 "Flood Protection Measures" of the Flood Insurance Study report for information on flood control structures for this jurisdiction.

The **projection** used in the preparation of this map was Universal Transverse Mercator (UTM) zone 11. The **horizontal datum** was NAD 83, GRS80 spheroid. Differences in datum, spheroid, projection or UTM zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of this FIRM.

Flood elevations on this map are referenced to the North American Vertical Datum of 1988. These flood elevations must be compared to structure and ground elevations referenced to the same **vertical datum**. For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at http://www.ngs.noaa.gov or contact the National Geodetic Survey at the following address:

NGS Information Services
NOAA, N/NGS12
National Geodetic Survey
SSMC-3, #9202
1315 East-West Highway
Silver Spring, Maryland 20910-3282
(301) 713-3242

To obtain current elevation, description, and/or location information for **bench marks** shown on this map, please contact the Information Services Branch of the National Geodetic Survey at **(301) 713-3242**, or visit its website at http://www.ngs.noaa.gov.

Base map information shown on this FIRM was derived from U.S. Geological Survey Digital Orthophoto Quadrangles produced at a scale of 1:12,000 from photography dated 1994 or later.

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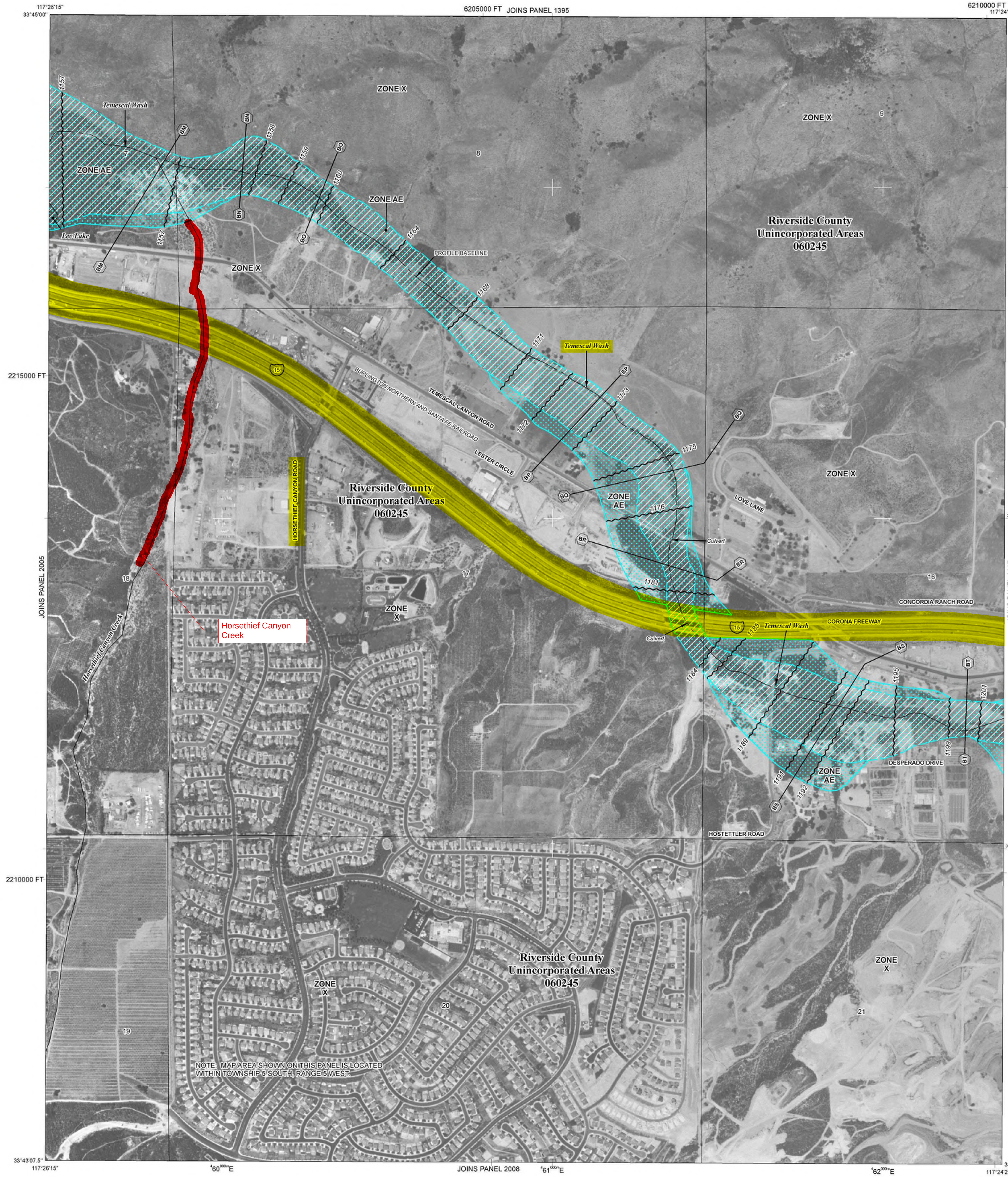
Corporate limits shown on this map are based on the best data available at the time of publication. Because changes due to annexations or de-annexations may have occurred after this map was published, map users should contact appropriate community officials to verify current corporate limit locations.

Please refer to the separately printed **Map Index** for an overview map of the county showing the layout of map panels; community map repository addresses; and a Listing of Communities table containing National Flood Insurance Program dates for each community as well as a listing of the panels on which each community is located.

Contact the **FEMA Map Service Center** at 1-800-358-9616 for information on available products associated with this FIRM. Available products may include previously issued Letters of Map Change, a Flood Insurance Study report, and/or digital versions of this map. The FEMA Map Service Center may also be reached by Fax at 1-800-358-9620 and its website at http://msc.fema.gov.

If you have **questions about this map** or questions concerning the National Flood Insurance Program in general, please call **1-877-FEMA MAP** (1-877-336-2627) or visit the FEMA website at http://www.fema.gov.



LEGEND

SPECIAL FLOOD HAZARD AREAS SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

ZONE A	No Base Flood Elevations determined.
ZONE AE	Base Flood Elevations determined.
ZONE AH	Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
ZONE AO	Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
ZONE AR	Special Flood Hazard Area formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
ZONE A99	Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.
ZONE V	Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
ZONE VE	Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X	Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X	Areas determined to be outside the 0.2% annual chance floodplain.
ZONE D	Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

	1% annual chance floodplain boundary
	0.2% annual chance floodplain boundary
	Floodway boundary
	Zone D boundary
	CBRS and OPA boundary
	Boundary dividing Special Flood Hazard Area Zones and boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities.
513	Base Flood Elevation line and value; elevation in feet*
(EL 987)	Base Flood Elevation value where uniform within zone; elevation in feet*

* Referenced to the North American Vertical Datum of 1988

(A)—(A)	Cross section line
(23)- - - -(23)	Transect line
87°07'45", 32°22'30"	Geographic coordinates referenced to the North American Datum of 1983 (NAD 83), Western Hemisphere
2476000mN	1000-meter Universal Transverse Mercator grid values, zone 11N
600000 FT	5000-foot grid ticks: California State Plane coordinate system, zone VI (FIPSZONE 0406), Lambert Conformal Conic projection
DX5510 ×	Bench mark (see explanation in Notes to Users section of this FIRM panel)
● M1.5	River Mile

MAP REPOSITORY
Refer to listing of Map Repositories on Map Index

EFFECTIVE DATE OF COUNTYWIDE
FLOOD INSURANCE RATE MAP
August 28, 2008

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL

For community map revision history prior to countywide mapping, refer to the Community Map History table located in the Flood Insurance Study report for this jurisdiction.

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MAP SCALE 1" = 500'

250 0 500 1000 FEET
150 0 150 300 METERS

NFIP

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 2006G

FIRM
FLOOD INSURANCE RATE MAP

RIVERSIDE COUNTY, CALIFORNIA
AND INCORPORATED AREAS

PANEL 2006 OF 3805
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
RIVERSIDE COUNTY	060245	2006	G

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
06065C2006G

EFFECTIVE DATE
AUGUST 28, 2008

Federal Emergency Management Agency

NOTES TO USERS

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To obtain more detailed information in areas where **Base Flood Elevations** (BFEs) and/or **floodways** have been determined, users are encouraged to consult the Flood Profiles and Floodway Data and/or Summary of Stillwater Elevations tables contained within the Flood Insurance Study (FIS) report that accompanies this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded whole-foot elevations. These BFEs are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS report should be utilized in conjunction with the FIRM for purposes of construction and/or floodplain management.

Coastal Base Flood Elevations shown on this map apply only landward of 0.0' North American Vertical Datum of 1988 (NAVD 88). Users of this FIRM should be aware that coastal flood elevations are also provided in the Summary of Stillwater Elevations tables in the Flood Insurance Study report for this jurisdiction. Elevations shown in the Summary of Stillwater Elevations tables should be used for construction and/or floodplain management purposes when they are higher than the elevations shown on this FIRM.

Boundaries of the **floodways** were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Flood Insurance Study report for this jurisdiction.

Certain areas not in Special Flood Hazard Areas may be protected by **flood control structures**. Refer to Section 2.4 "Flood Protection Measures" of the Flood Insurance Study report for information on flood control structures for this jurisdiction.

The **projection** used in the preparation of this map was Universal Transverse Mercator (UTM) zone 11. The **horizontal datum** was NAD 83, GRS80 spheroid. Differences in datum, spheroid, projection or UTM zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of this FIRM.

Flood elevations on this map are referenced to the North American Vertical Datum of 1988. These flood elevations must be compared to structure and ground elevations referenced to the same **vertical datum**. For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at http://www.ngs.noaa.gov or contact the National Geodetic Survey at the following address:

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National Geodetic Survey
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Silver Spring, Maryland 20910-3282
(301) 713-3242

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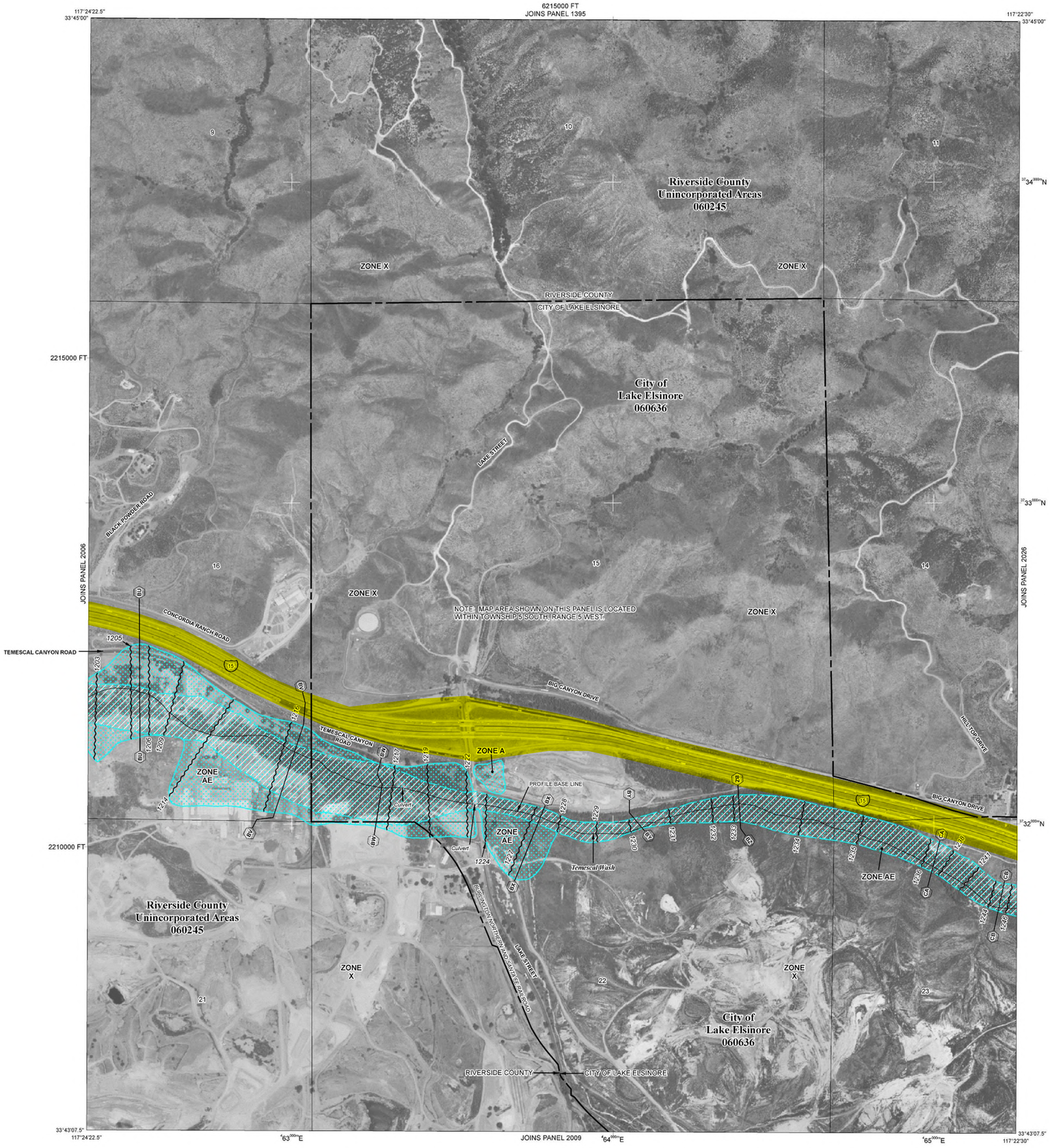

LEGEND

SPECIAL FLOOD HAZARD AREAS SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

ZONE A	No Base Flood Elevations determined.
ZONE AE	Base Flood Elevations determined.
ZONE AH	Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
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ZONE AR	Special Flood Hazard Area formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
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ZONE V	Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
ZONE VE	Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X	Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X	Areas determined to be outside the 0.2% annual chance floodplain.
ZONE D	Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

- 1% annual chance floodplain boundary
- 0.2% annual chance floodplain boundary
- Floodway boundary
- Zone D boundary
- CBRS and OPA boundary
- Boundary dividing Special Flood Hazard Area Zones and boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities.
- 513 — Base Flood Elevation line and value; elevation in feet*
- (EL 987) — Base Flood Elevation value where uniform within zone; elevation in feet*

* Referenced to the North American Vertical Datum of 1988

- A — A: Cross section line
- 23 — 23: Transect line
- 87°07'45", 32°22'30" — Geographic coordinates referenced to the North American Datum of 1983 (NAD 83), Western Hemisphere
- 2776000mN — 1000-meter Universal Transverse Mercator grid values, zone 11N
- 600000 FT — 5000-foot grid ticks: California State Plane coordinate system, zone VI (FIPSZONE 0406), Lambert Conformal Conic projection
- DX5510 — Bench mark (see explanation in Notes to Users section of this FIRM panel)
- M1.5 — River Mile

MAP REPOSITORY
Refer to listing of Map Repositories on Map Index

EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP
August 28, 2008

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL

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MAP SCALE 1" = 500'
250 0 500 1000 FEET
150 0 150 300 METERS

NFIP
NATIONAL FLOOD INSURANCE PROGRAM

PANEL 2007G

FIRM

FLOOD INSURANCE RATE MAP

RIVERSIDE COUNTY, CALIFORNIA
AND INCORPORATED AREAS

PANEL 2007 OF 3805
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
LAKE ELSINORE, CITY OF	060636	2007	G
RIVERSIDE COUNTY	060245	2007	G

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
06065C2007G

EFFECTIVE DATE
AUGUST 28, 2008

Federal Emergency Management Agency

NOTES TO USERS

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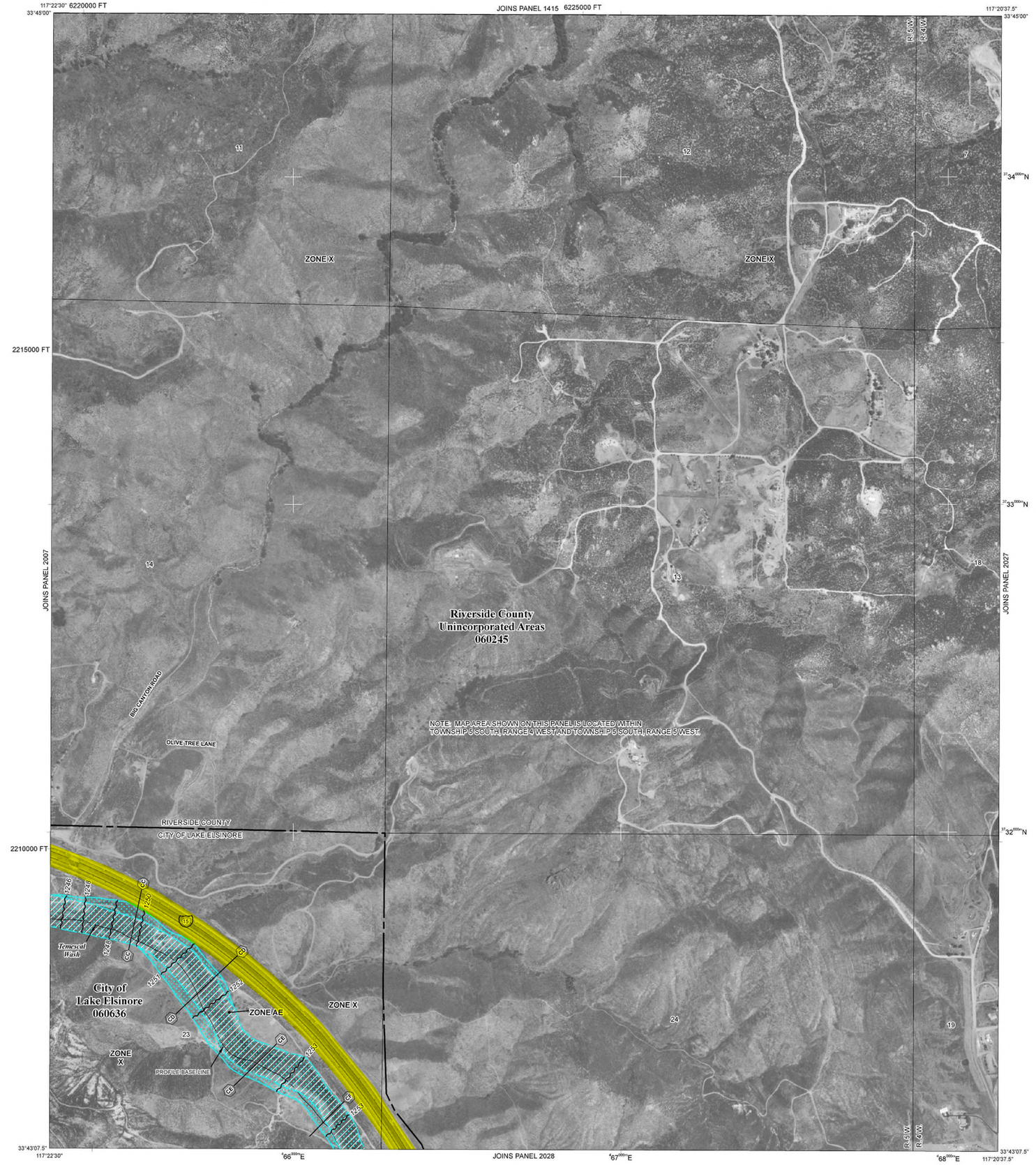

LEGEND

SPECIAL FLOOD HAZARD AREAS SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

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ZONE A	No Base Flood Elevations determined.
ZONE AE	Base Flood Elevations determined.
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ZONE V	Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
ZONE VE	Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X	Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X	Areas determined to be outside the 0.2% annual chance floodplain.
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COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

- 1% annual chance floodplain boundary
- 0.2% annual chance floodplain boundary
- Floodway boundary
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- Boundary dividing Special Flood Hazard Area Zones and boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities.
- 513 — Base Flood Elevation line and value; elevation in feet*
- (EL 987) — Base Flood Elevation value where uniform within zone; elevation in feet*

* Referenced to the North American Vertical Datum of 1988

- A — A — Cross section line
- 23 — 23 — Transect line
- 87°07'45", 32°22'30" — Geographic coordinates referenced to the North American Datum of 1983 (NAD 83), Western Hemisphere
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- DX5510 × — Bench mark (see explanation in Notes to Users section of this FIRM panel)
- M1.5 — River Mile

MAP REPOSITORY
Refer to listing of Map Repositories on Map Index

EFFECTIVE DATE OF COUNTYWIDE
FLOOD INSURANCE RATE MAP
August 28, 2008

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL

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MAP SCALE 1" = 500'

250 0 500 1000 FEET

150 0 150 300 METERS

NFIP

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 2026G

FIRM

FLOOD INSURANCE RATE MAP

RIVERSIDE COUNTY, CALIFORNIA AND INCORPORATED AREAS

PANEL 2026 OF 3805

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
LAKE ELSINORE, CITY OF	060636	2026	G
RIVERSIDE COUNTY	060245	2026	G

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
06065C2026G

EFFECTIVE DATE
AUGUST 28, 2008

Federal Emergency Management Agency

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National Geodetic Survey
SSMC-3, #9202
1315 East-West Highway
Silver Spring, Maryland 20910-3282
(301) 713-3242

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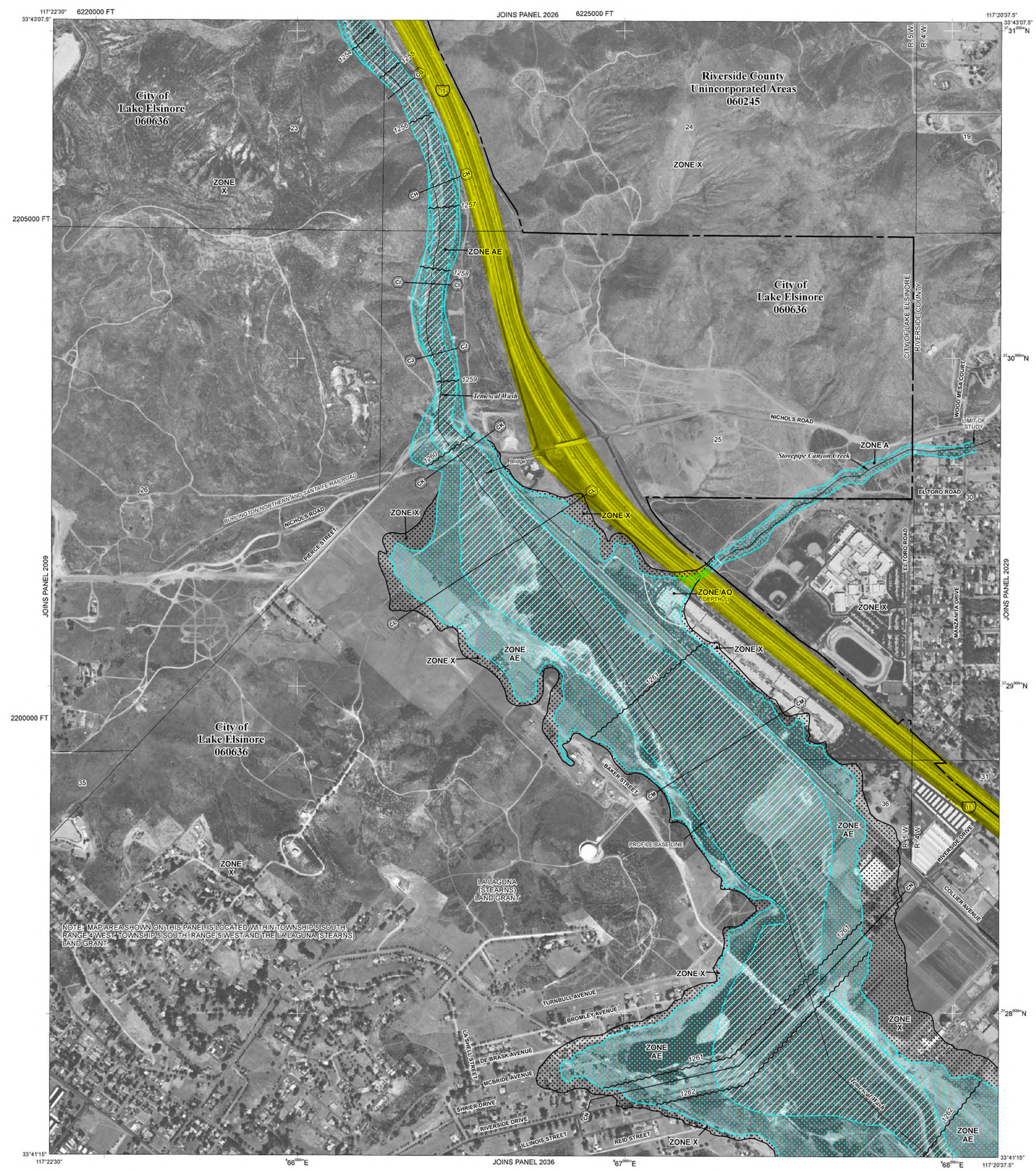

LEGEND

SPECIAL FLOOD HAZARD AREAS SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

ZONE A	No Base Flood Elevations determined.
ZONE AE	Base Flood Elevations determined.
ZONE AH	Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
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ZONE AR	Special Flood Hazard Area formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
ZONE A99	Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.
ZONE V	Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
ZONE VE	Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X	Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X	Areas determined to be outside the 0.2% annual chance floodplain.
ZONE D	Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

- 1% annual chance floodplain boundary
- 0.2% annual chance floodplain boundary
- Floodway boundary
- Zone D boundary
- CBRS and OPA boundary
- Boundary dividing Special Flood Hazard Area Zones and boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities.
- 513 — Base Flood Elevation line and value; elevation in feet*
- (EL 987) — Base Flood Elevation value where uniform within zone; elevation in feet*

* Referenced to the North American Vertical Datum of 1988

- A — A: Cross section line
- 23 — 23: Transect line
- 87°07'45", 32°22'30" — Geographic coordinates referenced to the North American Datum of 1983 (NAD 83), Western Hemisphere
- 4276000mN — 1000-meter Universal Transverse Mercator grid values, zone 11N
- 600000 FT — 5000-foot grid ticks: California State Plane coordinate system, zone VI (FIPSZONE 0406), Lambert Conformal Conic projection
- DX5510 × — Bench mark (see explanation in Notes to Users section of this FIRM panel)
- M1.5 — River Mile

MAP REPOSITORY
Refer to listing of Map Repositories on Map Index

EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP
August 28, 2008

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL

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To determine if flood insurance is available in this community, contact your Insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

MAP SCALE 1" = 500'
250 0 500 1000 FEET
150 0 150 300 METERS

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 2028G

FIRM

FLOOD INSURANCE RATE MAP

RIVERSIDE COUNTY, CALIFORNIA AND INCORPORATED AREAS

PANEL 2028 OF 3805

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
LAKE ELSINORE, CITY OF	060636	2028	G
RIVERSIDE COUNTY	060245	2028	G

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
06065C2028G

EFFECTIVE DATE
AUGUST 28, 2008

Federal Emergency Management Agency

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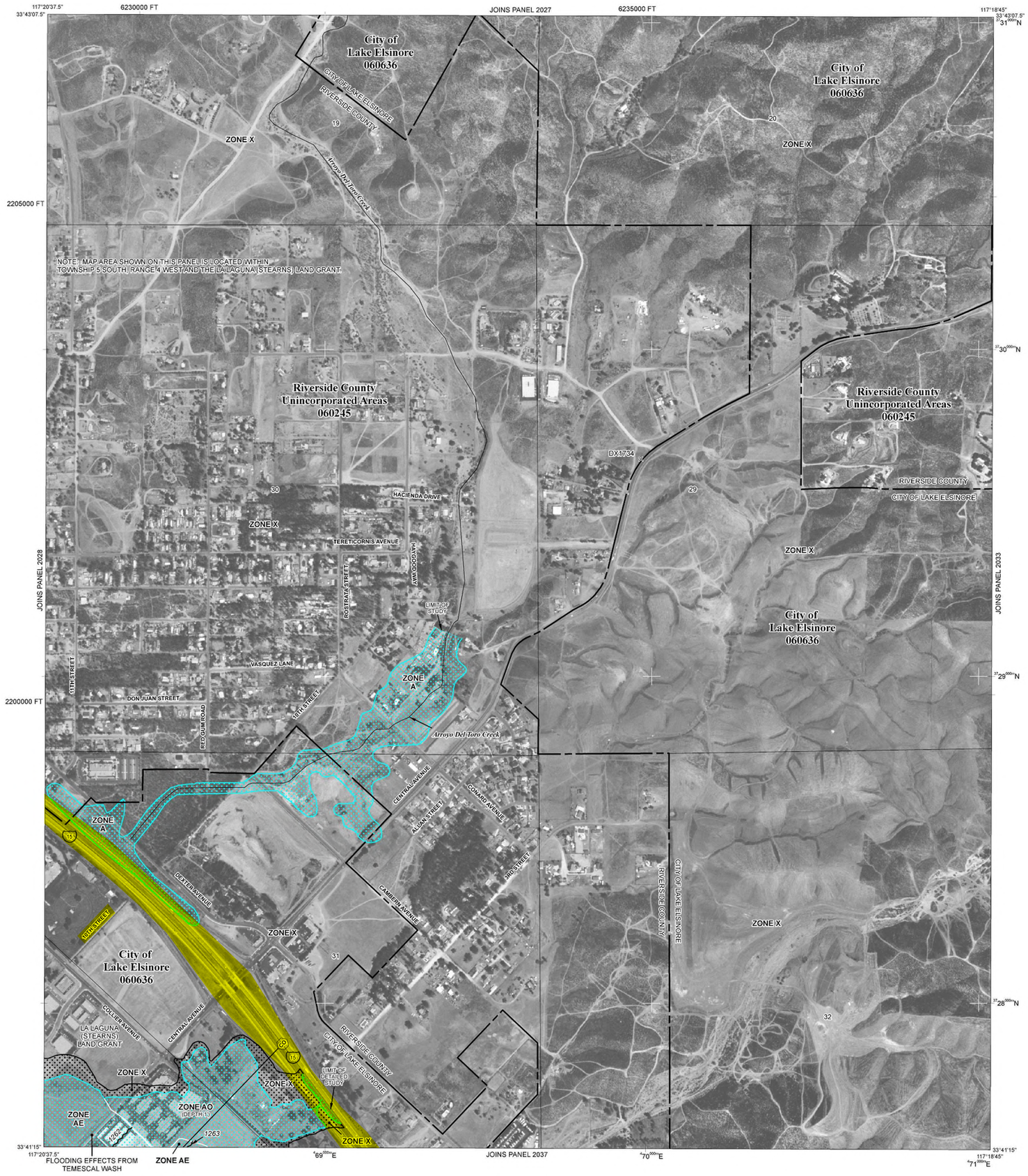

LEGEND

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- 600000 FT — 5000-foot grid ticks: California State Plane coordinate system, zone VI (FIPSZONE 0406), Lambert Conformal Conic projection
- DX5510 — Bench mark (see explanation in Notes to Users section of this FIRM panel)
- M1.5 — River Mile

MAP REPOSITORY
Refer to listing of Map Repositories on Map Index

EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP
August 28, 2008

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL

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250 0 500 1000 FEET
150 0 150 300 METERS

NFIP
NATIONAL FLOOD INSURANCE PROGRAM

PANEL 2029G

FIRM

FLOOD INSURANCE RATE MAP

RIVERSIDE COUNTY, CALIFORNIA AND INCORPORATED AREAS

PANEL 2029 OF 3805

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
LAKE ELSINORE, CITY OF	060636	2029	G
RIVERSIDE COUNTY	060245	2029	G

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MAP NUMBER
06065C2029G

EFFECTIVE DATE
AUGUST 28, 2008

Federal Emergency Management Agency

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LEGEND

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FLOODWAY AREAS IN ZONE AE

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OTHER FLOOD AREAS

ZONE X	Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

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OTHERWISE PROTECTED AREAS (OPAs)

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	1% annual chance floodplain boundary
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	Floodway boundary
	Zone D boundary
	CBRS and OPA boundary
	Boundary dividing Special Flood Hazard Area Zones and boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities.
~~ 513 ~~~	Base Flood Elevation line and value; elevation in feet*
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* Referenced to the North American Vertical Datum of 1988

(A)———(A)	Cross section line
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87°07'45", 32°22'30"	Geographic coordinates referenced to the North American Datum of 1983 (NAD 83), Western Hemisphere
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600000 FT	5000-foot grid ticks: California State Plane coordinate system, zone VI (FIPSZONE 0406), Lambert Conformal Conic projection
DX5510 ×	Bench mark (see explanation in Notes to Users section of this FIRM panel)
● M1.5	River Mile

MAP REPOSITORY
Refer to listing of Map Repositories on Map Index

EFFECTIVE DATE OF COUNTYWIDE
FLOOD INSURANCE RATE MAP
August 28, 2008

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL

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250 0 500 1000 FEET

150 0 150 300 METERS

NFIP

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 2037G

FIRM
FLOOD INSURANCE RATE MAP

RIVERSIDE COUNTY, CALIFORNIA
AND INCORPORATED AREAS

PANEL 2037 OF 3805
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
LAKE ELSINORE, CITY OF	060636	2037	G
RIVERSIDE COUNTY	060245	2037	G

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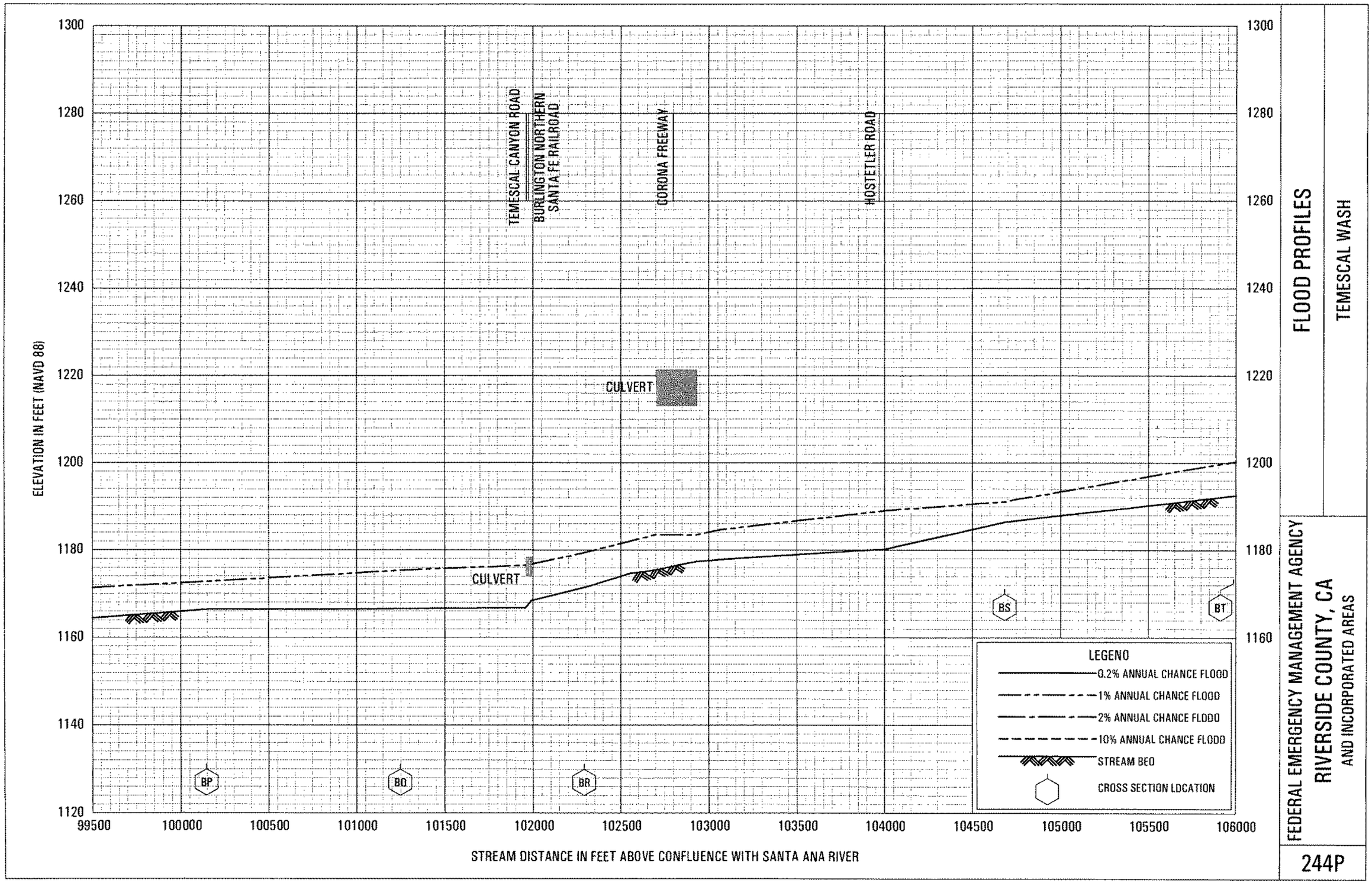
MAP NUMBER
06065C2037G

EFFECTIVE DATE
AUGUST 28, 2008

Federal Emergency Management Agency

Appendix A.2

FEMA Flood Profiles

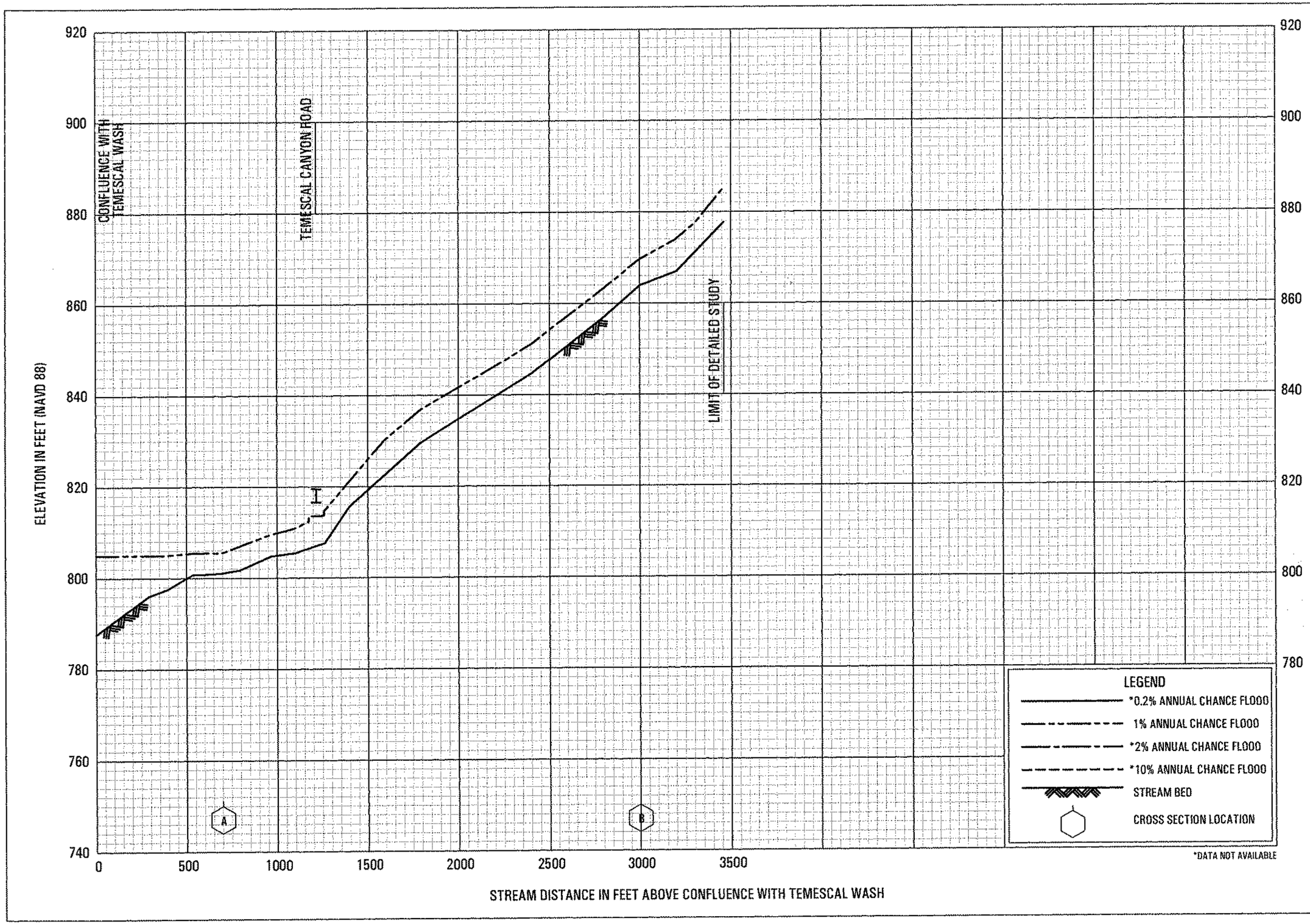


FLOOD PROFILES

TEMESCAL WASH

FEDERAL EMERGENCY MANAGEMENT AGENCY
RIVERSIDE COUNTY, CA
AND INCORPORATED AREAS

244P



FLOOD PROFILES

BEDFORD CANYON WASH

FEDERAL EMERGENCY MANAGEMENT AGENCY

RIVERSIDE COUNTY, CA

AND INCORPORATED AREAS

19(a)P

Appendix B

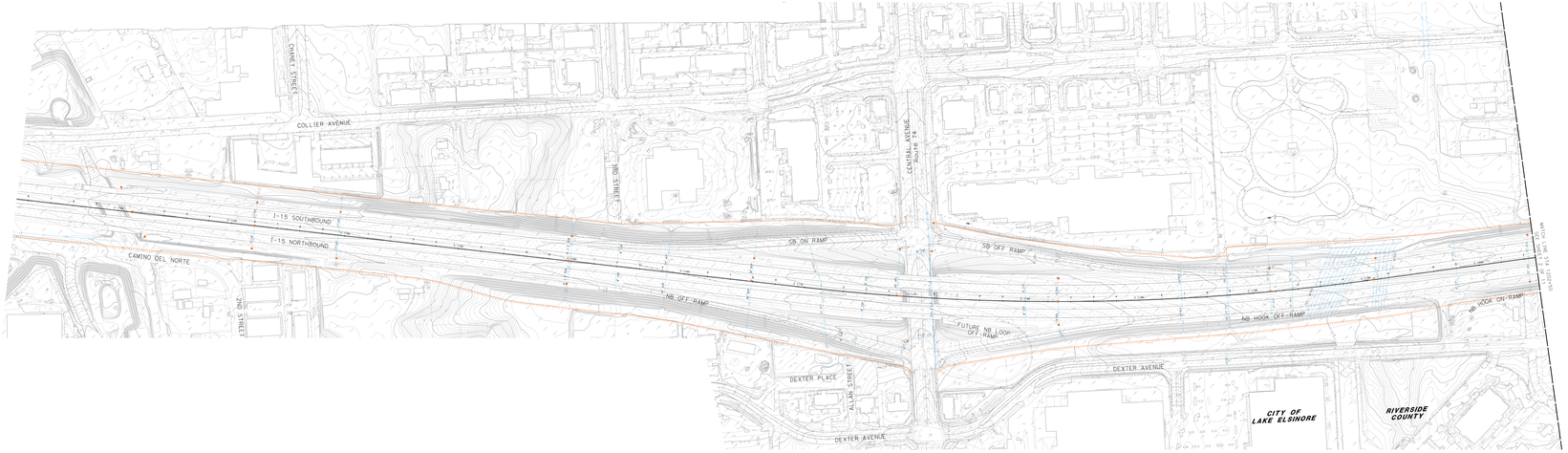
On-site Hydrology Maps

Appendix B.1

Existing Drainage Systems Map

NOTE:
FOR ACCURATE RIGHT OF WAY DATA, CONTACT RIGHT OF WAY ENGINEERING AT THE DISTRICT OFFICE.

LEGEND:
- EXISTING RIGHT OF WAY
- EXISTING CITY R/W
- EXISTING STORM DRAIN LINE
- EXISTING STORM DRAIN INLET



EXISTING DRAINAGE SYSTEMS

RCTC RIVERSIDE COUNTY TRANSPORTATION COMMISSION | Interstate 15 EXPRESS LANES PROJECT Southern Extension

THE ALLIANCE GROUP ENTERPRISE INC.

GRAPHIC SCALE
100 50 0 100 200
SCALE: 1" = 100'

CONCEPTUAL
NOT FOR CONSTRUCTION
I-15 EXPRESS LANES PROJECT
SOUTHERN EXTENSION (ELPSE)
EA 0J0820
EXISTING DRAINAGE SYSTEMS

05/17/2021 | SHEET 1 OF 11

NOTE:
FOR ACCURATE RIGHT OF WAY DATA, CONTACT
RIGHT OF WAY ENGINEERING AT THE DISTRICT OFFICE.

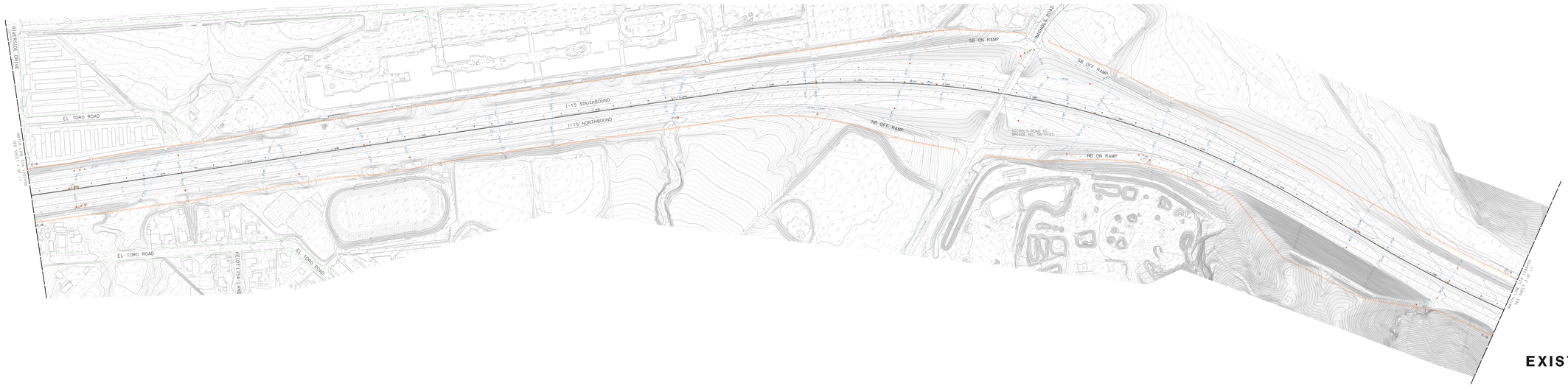
LEGEND:

EXISTING RIGHT OF WAY

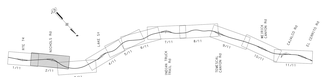
EXISTING CITY RIGHT OF WAY

EXISTING STORM DRAIN LINE

EXISTING STORM DRAIN INLET



EXISTING DRAINAGE SYSTEMS



RCTC RIVERSIDE COUNTY TRANSPORTATION COMMISSION

Interstate 15
EXPRESS LANES PROJECT
Southern Extension

THE ALLIANCE GROUP ENTERPRISE INC.

GRAPHIC SCALE 0 50 100
SCALE: 1" = 100'

CONCEPTUAL
NOT FOR CONSTRUCTION

I-15 EXPRESS LANES PROJECT
SOUTHERN EXTENSION (ELPSE)
EA 0J0820

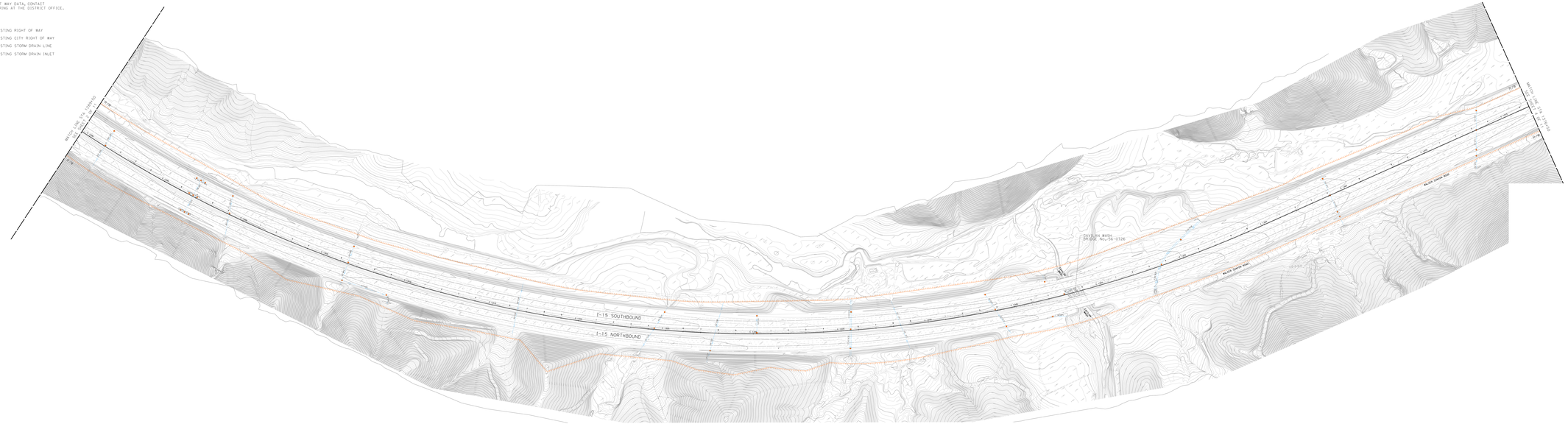
EXISTING DRAINAGE SYSTEMS

05/17/2021 | SHEET 2 OF 11

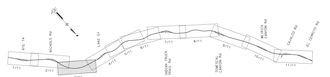
NOTE:
FOR ACCURATE RIGHT OF WAY DATA, CONTACT
RIGHT OF WAY ENGINEERING AT THE DISTRICT OFFICE.

LEGEND:

- EXISTING RIGHT OF WAY
- EXISTING CITY RIGHT OF WAY
- EXISTING STORM DRAIN LINE
- EXISTING STORM DRAIN INLET



EXISTING DRAINAGE SYSTEMS



RCTC RIVERSIDE COUNTY TRANSPORTATION COMMISSION

Interstate 15
EXPRESS LANES PROJECT
Southern Extension

THE ALLIANCE GROUP ENTERPRISE INC.

GRAPHIC SCALE
SCALE: 1" = 100'

CONCEPTUAL
NOT FOR CONSTRUCTION

I-15 EXPRESS LANES PROJECT
SOUTHERN EXTENSION (ELPSE)
EA 0J0820

EXISTING DRAINAGE SYSTEMS

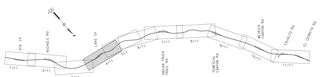
05/17/2021 | SHEET 3 OF 11

NOTE:
FOR ACCURATE RIGHT OF WAY DATA, CONTACT
RIGHT OF WAY ENGINEERING AT THE DISTRICT OFFICE.

LEGEND:

EXISTING RIGHT OF WAY
EXISTING CITY RIGHT OF WAY
EXISTING STORM DRAIN LINE
EXISTING STORM DRAIN INLET

EXISTING DRAINAGE SYSTEMS



RCTC RIVERSIDE COUNTY TRANSPORTATION COMMISSION
Interstate 15 EXPRESS LANES PROJECT Southern Extension

THE ALLIANCE GROUP ENTERPRISE INC.

GRAPHIC SCALE
SCALES 1" = 100'

CONCEPTUAL
NOT FOR CONSTRUCTION

I-15 EXPRESS LANES PROJECT
SOUTHERN EXTENSION (ELPSE)
EA 0J0820

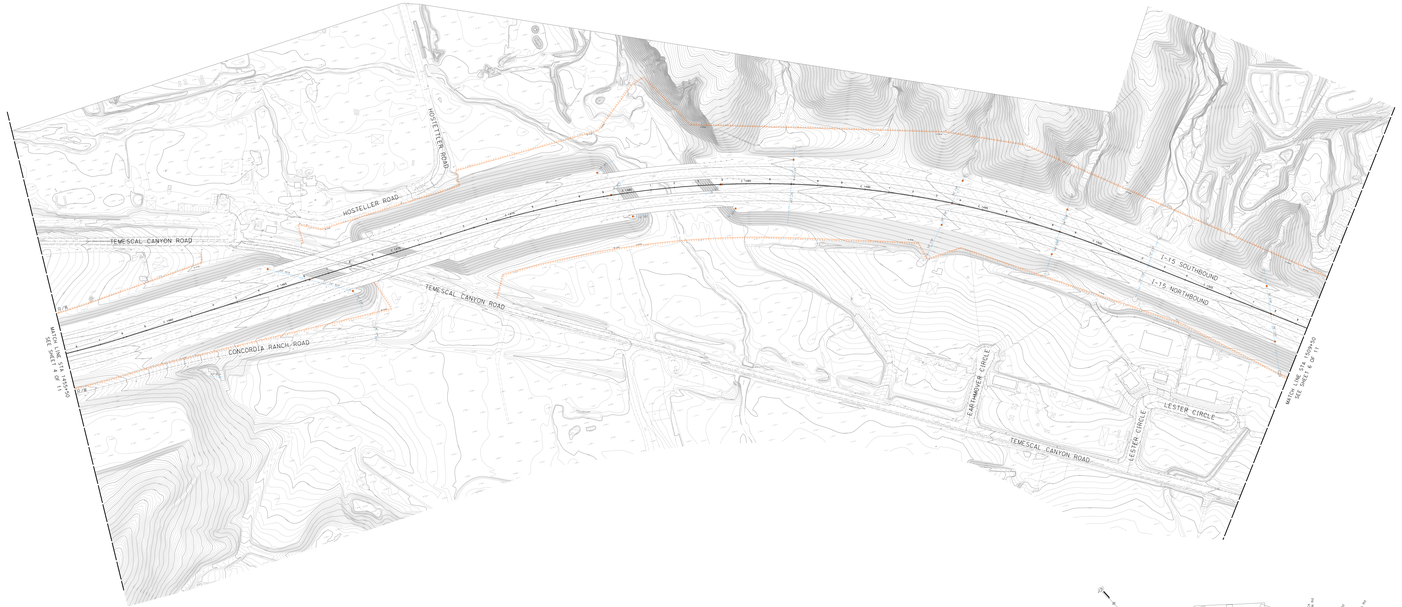
EXISTING DRAINAGE SYSTEMS

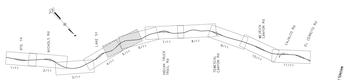
05/17/2021 | SHEET 4 OF 11

NOTE:
FOR ACCURATE RIGHT OF WAY DATA, CONTACT
RIGHT OF WAY ENGINEERING AT THE DISTRICT OFFICE.

LEGEND:

EXISTING RIGHT OF WAY
EXISTING CITY RIGHT OF WAY
EXISTING STORM DRAIN LINE
EXISTING STORM DRAIN INLET





KEY MAP

EXISTING DRAINAGE SYSTEMS

RCTC RIVERSIDE COUNTY TRANSPORTATION COMMISSION

Interstate 15
EXPRESS LANES PROJECT
Southern Extension

THE ALLIANCE GROUP ENTERPRISE INC.

GRAPHIC SCALE
SCALES: 1" = 150'

CONCEPTUAL
NOT FOR CONSTRUCTION

I-15 EXPRESS LANES PROJECT
SOUTHERN EXTENSION (ELPSE)
EA 0J820

EXISTING DRAINAGE SYSTEMS

05/17/2021 | SHEET 5 OF 11

NOTE:
FOR ACCURATE RIGHT OF WAY DATA, CONTACT
RIGHT OF WAY ENGINEERING AT THE DISTRICT OFFICE.

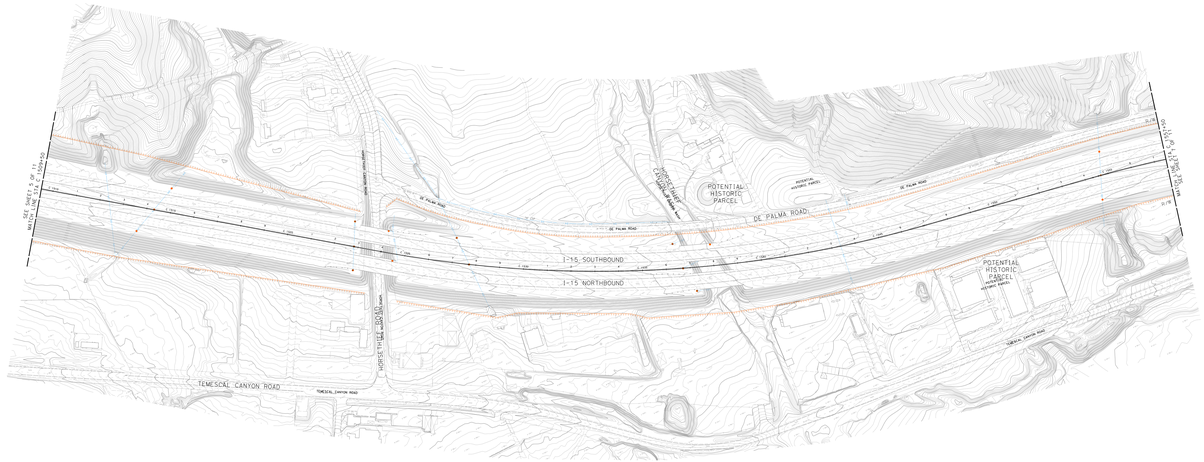
LEGEND:

EXISTING RIGHT OF WAY

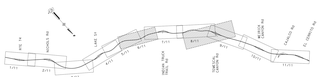
EXISTING CITY ROW

EXISTING STORM DRAIN LINE

EXISTING STORM DRAIN INLET



EXISTING DRAINAGE SYSTEMS



RCTC RIVERSIDE COUNTY TRANSPORTATION COMMISSION

Interstate 15
EXPRESS LANES PROJECT
Southern Extension

THE ALLIANCE GROUP ENTERPRISE INC.

GRAPHIC SCALE
SCALES 1" = 100'

CONCEPTUAL
NOT FOR CONSTRUCTION

I-15 EXPRESS LANES PROJECT
SOUTHERN EXTENSION (ELPSE)
EA 0J0820

EXISTING DRAINAGE SYSTEMS

05/17/2021 | SHEET 6 OF 11

NOTE:
FOR ACCURATE RIGHT OF WAY DATA, CONTACT
RIGHT OF WAY ENGINEERING AT THE DISTRICT OFFICE.

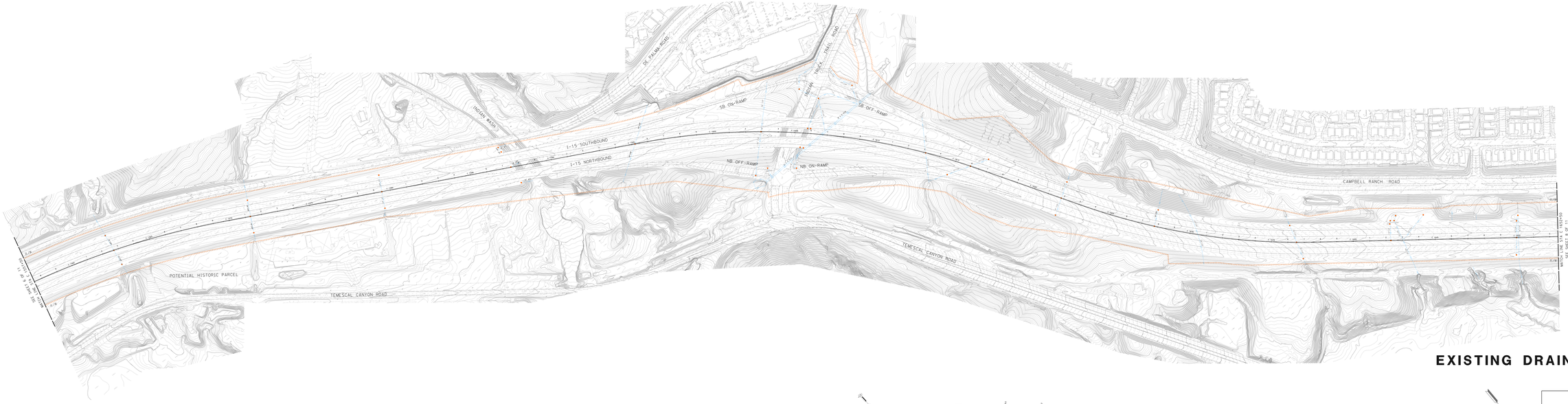
LEGEND:

EXISTING RIGHT OF WAY

EXISTING CITY RIGHT OF WAY

EXISTING STORM DRAIN LINE

EXISTING STORM DRAIN INLET



EXISTING DRAINAGE SYSTEMS

RCTC RIVERSIDE COUNTY TRANSPORTATION COMMISSION

Interstate 15
EXPRESS LANES PROJECT
Southern Extension

THE ALLIANCE GROUP ENTERPRISE INC.

GRAPHIC SCALE
SCALES 1" = 100'

CONCEPTUAL
NOT FOR CONSTRUCTION

I-15 EXPRESS LANES PROJECT
SOUTHERN EXTENSION (ELPSE)
EA 0J0820

EXISTING DRAINAGE SYSTEMS

05/17/2021 | SHEET 7 OF 11

NOTE:
FOR ACCURATE RIGHT OF WAY DATA, CONTACT
RIGHT OF WAY ENGINEERING AT THE DISTRICT OFFICE.

LEGEND:

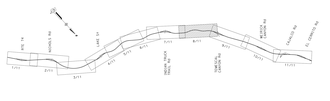
EXISTING RIGHT OF WAY

EXISTING CITY RIGHT OF WAY

EXISTING STORM DRAIN LINE

EXISTING STORM DRAIN INLET

EXISTING DRAINAGE SYSTEMS



RCTC RIVERSIDE COUNTY TRANSPORTATION COMMISSION

Interstate 15
EXPRESS LANES PROJECT
Southern Extension

THE ALLIANCE GROUP ENTERPRISE INC.

GRAPHIC SCALE
SCALES 1" = 100'

CONCEPTUAL
NOT FOR CONSTRUCTION

I-15 EXPRESS LANES PROJECT
SOUTHERN EXTENSION (ELPSE)
EA 0J0820

EXISTING DRAINAGE SYSTEMS

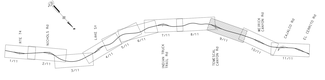
05/17/2021 | SHEET 8 OF 11

NOTE:
FOR ACCURATE RIGHT OF WAY DATA, CONTACT RIGHT OF WAY ENGINEERING AT THE DISTRICT OFFICE.

LEGEND:

- EXISTING RIGHT OF WAY
- EXISTING CITY RIGHT OF WAY
- EXISTING STORM DRAIN LINE
- EXISTING STORM DRAIN INLET

EXISTING DRAINAGE SYSTEMS



KEY MAP

RCTC RIVERSIDE COUNTY TRANSPORTATION COMMISSION | Interstate 15 EXPRESS LANES PROJECT Southern Extension

Caltrans

HDR

THE ALLIANCE GROUP ENTERPRISE INC.

GRAPHIC SCALE
100 50 0 100 200
SCALE: 1" = 100'

CONCEPTUAL
NOT FOR CONSTRUCTION

I-15 EXPRESS LANES PROJECT
SOUTHERN EXTENSION (ELPSE)
EA 0J0820

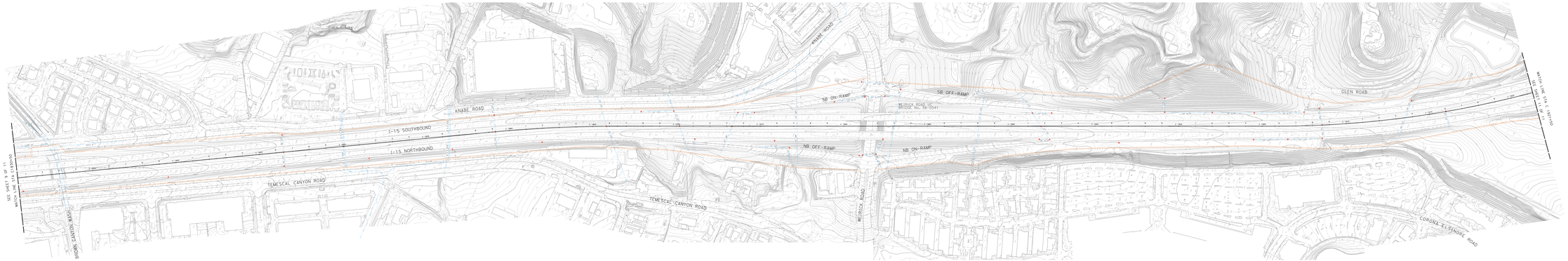
EXISTING DRAINAGE SYSTEMS

05/17/2021 | SHEET 9 OF 11

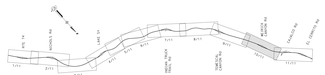
NOTE:
FOR ACCURATE RIGHT OF WAY DATA, CONTACT
RIGHT OF WAY ENGINEERING AT THE DISTRICT OFFICE.

LEGEND:

EXISTING RIGHT OF WAY
EXISTING CITY RIGHT OF WAY
EXISTING STORM DRAIN LINE
EXISTING STORM DRAIN INLET



EXISTING DRAINAGE SYSTEMS



KEY MAP

RIVERSIDE COUNTY TRANSPORTATION COMMISSION
Interstate 15
EXPRESS LANES PROJECT
Southern Extension

THE ALLIANCE GROUP ENTERPRISE INC.

GRAPHIC SCALE
SCALES 1" = 100'

CONCEPTUAL
NOT FOR CONSTRUCTION

I-15 EXPRESS LANES PROJECT
SOUTHERN EXTENSION (ELPSE)
EA 0J0820

EXISTING DRAINAGE SYSTEMS

05/17/2021 | SHEET 10 OF 11

NOTE:
FOR ACCURATE RIGHT OF WAY DATA, CONTACT
RIGHT OF WAY ENGINEERING AT THE DISTRICT OFFICE.

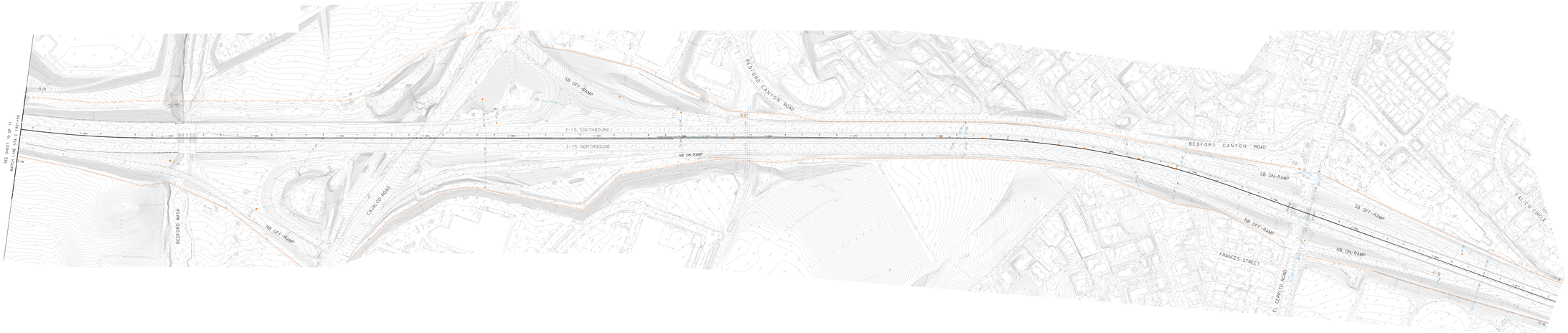
LEGEND:

EXISTING RIGHT OF WAY

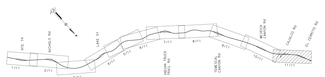
EXISTING CITY RIGHT OF WAY

EXISTING STORM DRAIN LINE

EXISTING STORM DRAIN INLET



EXISTING DRAINAGE SYSTEMS



KEY MAP

RCTC RIVERSIDE COUNTY TRANSPORTATION COMMISSION

Interstate 15
EXPRESS LANES PROJECT
Southern Extension

THE ALLIANCE GROUP ENTERPRISE INC.

GRAPHIC SCALE
SCALES AT 11" x 17"

CONCEPTUAL
NOT FOR CONSTRUCTION

I-15 EXPRESS LANES PROJECT
SOUTHERN EXTENSION (ELPSE)
EA 0J0820

EXISTING DRAINAGE SYSTEMS

05/17/2021 | SHEET 11 OF 11

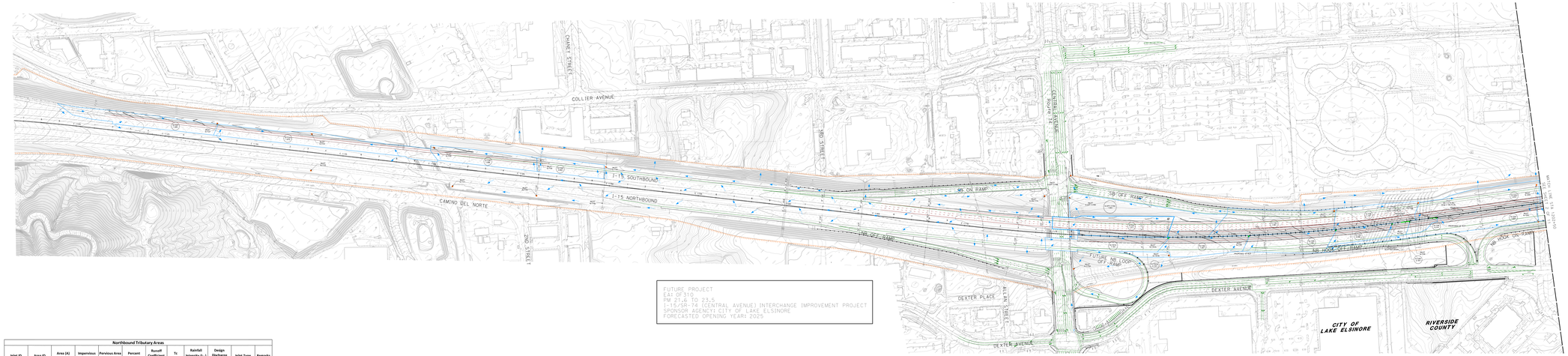
Appendix B.2

Proposed Hydrology Map

NOTE:
FOR ACCURATE RIGHT OF WAY DATA, CONTACT
RIGHT OF WAY ENGINEERING AT THE DISTRICT OFFICE.

LEGEND:

- EXISTING RIGHT OF WAY
- EXISTING CITY RIGHT OF WAY
- I-15 ELPSE ROADWAY IMPROVEMENTS
- I-15/SR-74 IMPROVEMENTS
- EXISTING STORM DRAIN LINE
- PROPOSED STORM DRAIN LINE
- PROPOSED TRIBUTARY AREA BOUNDARY
- PROPOSED SLOTTED DRAIN
- EXISTING STORM DRAIN INLET
- PROPOSED STORM DRAIN INLET
- FLOW DIRECTION
- POC — Point of Connection to Existing Pipe
- 0.03 / A.AA — TRIBUTARY AREA ID



FUTURE PROJECT
EA1 OF 31Q
PM 21.6 TO 23.5
I-15/SR-74 (CENTRAL AVENUE) INTERCHANGE IMPROVEMENT PROJECT
SPONSOR AGENCY: CITY OF LAKE ELSINORE
FORECASTED OPENING YEAR: 2025

Northbound Tributary Areas

Inlet ID	Area ID	Area (A) (ac)	Impervious Area (ac)	Pervious Area (ac)	Percent Impervious	Runoff Coefficient (C)	Tc (min)	Rainfall Intensity (I_{tc}) (in/hr)	Design Discharge (Q_D = CIA (cfs)	Inlet Type	Remarks
N-1185A	N-1183A	1.191	0.89	0.31	0.74	0.80	5	3.30	**3.42**	G1	
N-1181B	N-1181B	0.157	0.09	0.16	0.00	0.63	5	3.30	**0.32**	Existing	
N-1185	N-1183	1.051	0.97	0.08	0.92	0.96	5	3.30	**3.24**	G1	
N-1190	N-1190	1.183	1.14	0.04	0.97	0.98	5	3.20	**3.70**	G1	
N-1195	N-1196	0.585	0.58	0.00	1.00	0.99	5	3.30	**1.91**	G1	
N-1197	N-1196	0.191	0.19	0.00	1.00	0.99	5	3.30	**0.63**	G1	
N-1196	N-1196	0.218	0.21	0.00	1.00	0.99	5	3.30	**0.69**	G1	
N-1202	N-1202	1.629	1.52	0.11	0.93	0.97	5	3.20	**5.03**	Existing	

Southbound Tributary Areas

Inlet ID	Area ID	Area (A) (ac)	Impervious Area (ac)	Pervious Area (ac)	Percent Impervious	Runoff Coefficient (C)	Tc (min)	Rainfall Intensity (I_{tc}) (in/hr)	Design Discharge (Q_D = CIA (cfs)	Inlet Type	Remarks
S-1127	S-1127	1.263	1.26	0.00	1.00	0.99	5	3.20	**4.00**	Existing	
S-1133	S-1133	1.875	1.88	0.00	1.00	0.99	5	3.20	**5.96**	Existing	
S-1140	S-1140	1.088	1.08	0.00	1.00	0.99	5	3.20	**3.45**	Existing	
S-1145	S-1145	0.985	0.69	0.30	0.70	0.78	5	3.20	**2.46**	Existing	
S-1145 (A)	S-1145(A)	0.183	0.13	0.05	0.70	0.78	5	3.20	**0.46**	Existing	
S-1181	S-1181	1.571	1.44	0.13	0.92	0.96	5	3.20	**4.83**	Existing	
S-1186	S-1186	1.961	1.78	0.20	0.90	0.95	5	3.20	**6.05**	Existing	
S-1196	S-1196	1.187	0.93	0.25	0.79	0.91	5	3.20	**3.87**	Existing	
S-1202	S-1202	1.672	1.34	0.53	0.72	0.89	5	3.20	**5.32**	Existing	

* Weighted Runoff Coefficient based on C=0.99 for impervious surfaces and C=0.63 for pervious surfaces. Refer to section 4.1.3 Runoff Coefficient for design justification for C values.

* Rainfall intensity (I) per section 4.1.2 Rainfall Intensity of this report.

* Refer to section 4.1.1 Rational Method for design discharge (Q) methodology.

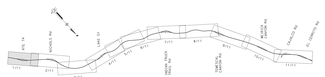
* Area (A) corresponds to total sub-area drainage in acres and is identified with the same ID as receiving inlet.

* Refer to section 4 Hydraulic Analysis for a full breakdown of methodology for table components.

Notes:
For POC callouts:

Qin = Flow discharged from proposed system to existing drainage system.

Qcap = Full flow capacity of existing drainage system.



KEY MAP

PROPOSED HYDROLOGY MAP

RIVERSIDE COUNTY TRANSPORTATION COMMISSION
Interstate 15 EXPRESS LANES PROJECT Southern Extension
THE ALLIANCE GROUP ENTERPRISE INC.

GRAPHIC SCALE
SCALES 1" = 100'

CONCEPTUAL NOT FOR CONSTRUCTION

I-15 EXPRESS LANES PROJECT SOUTHERN EXTENSION (ELPSE) EA 0J0820

HYDROLOGY EXHIBIT DRAWING

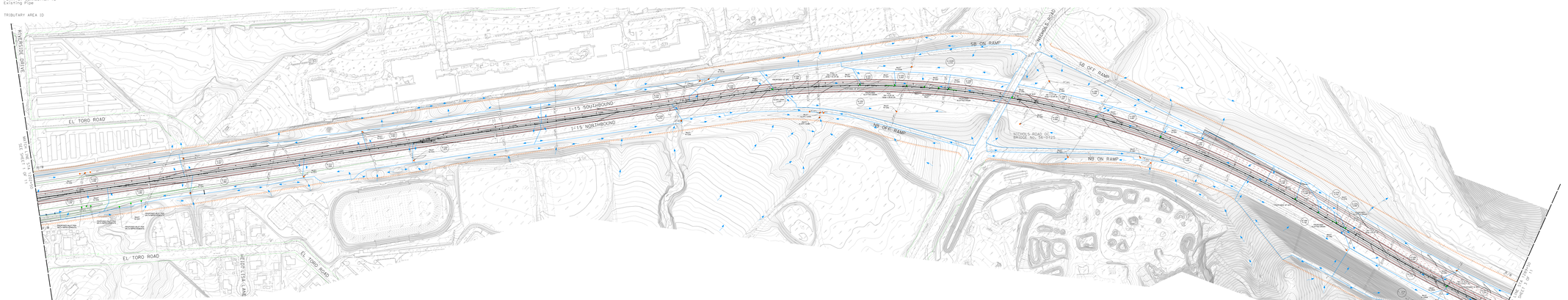
07/01/2021 | SHEET 1 OF 11

NOTE:
FOR ACCURATE RIGHT OF WAY DATA, CONTACT RIGHT OF WAY ENGINEERING AT THE DISTRICT OFFICE.

LEGEND:

- EXISTING RIGHT OF WAY
- EXISTING CITY RIGHT OF WAY
- I-15 ELPSE ROADWAY IMPROVEMENTS
- I-15/SR-74 IMPROVEMENTS
- EXISTING STORM DRAIN LINE
- PROPOSED STORM DRAIN LINE
- PROPOSED TRIBUTARY AREA BOUNDARY
- PROPOSED SLOTTED DRAIN
- EXISTING STORM DRAIN INLET
- PROPOSED STORM DRAIN INLET
- FLOW DIRECTION
- POC — Point of Connection to Existing Pipe
- S-SS / A-AA — TRIBUTARY AREA ID

FUTURE PROJECT
EA: OF310
PM 21.6 TO 23.6
I-15/SR-74 (CENTRAL AVENUE) INTERCHANGE IMPROVEMENT PROJECT
SPONSOR AGENCY: CITY OF LAKE ELSINORE
FORECASTED OPENING YEAR: 2025



PROPOSED HYDROLOGY MAP

Northbound Tributary Areas

Inlet ID	Area ID	Area (A) (ac)	Impervious Area (ac)	Pervious Area (ac)	Percent Impervious	Runoff Coefficient (C)	Tc (min)	Rainfall Intensity (I_{10}) (in/hr)	Design Discharge Q_{10} = CIA (cfs)	Inlet Type	Remarks
N-1205	N-1205	1.230	0.97	0.26	0.79	0.91	5	3.20	**3.60**		
N-1211	N-1211	1.247	1.10	0.15	0.88	0.93	5	3.20	**3.71**	Existing	
N-1212	N-1212	1.667	1.16	0.46	0.72	0.88	5	3.20	**4.61**	Existing	
N-1217	N-1217	1.853	1.15	0.66	0.64	0.86	5	3.20	**5.11**	Existing	
N-1224	N-1224	1.973	1.39	0.48	0.74	0.90	5	3.20	**5.58**	Existing	
N-1228	N-1228	2.074	1.49	0.58	0.72	0.89	5	3.20	**5.90**	Existing	
N-CP1-1267	N-CP1-12680	2.202	1.97	1.55	0.45	0.80	5	3.20	**5.71**	Existing	
N-1252	N-1252	1.411	2.35	3.32	0.43	0.79	5	3.20	**13.57**	Existing	
N-1256	N-1256	1.451	2.35	3.32	0.43	0.79	5	3.20	**13.57**	Existing	
N-1267	N-1267	1.956	1.76	0.06	0.97	0.98	5	3.20	**6.68**	Existing	
N-1280	N-1280	6.142	1.56	2.58	0.38	0.77	5	3.20	**30.55**	Existing	
N-10854	N-10854	1.172	1.17	0.00	1.00	0.99	5	3.20	**3.71**	G1	
N-10858	N-10858	2.034	0.13	1.90	0.06	0.65	5	3.20	**4.25**	Existing	
N-1288	N-1288	0.492	0.49	0.00	1.00	0.99	5	3.20	**1.55**	G1	

Southbound Tributary Areas

Inlet ID	Area ID	Area (A) (ac)	Impervious Area (ac)	Pervious Area (ac)	Percent Impervious	Runoff Coefficient (C)	Tc (min)	Rainfall Intensity (I_{10}) (in/hr)	Design Discharge Q_{10} = CIA (cfs)	Inlet Type	Remarks
S-1205	S-1205	2.499	1.64	0.86	0.66	0.87	5	3.20	**6.92**	Existing	
S-1211	S-1211	1.247	1.10	0.15	0.88	0.93	5	3.20	**3.71**	Existing	
S-1212	S-1212	2.667	2.52	0.52	0.79	0.91	5	3.20	**7.85**	Existing	
S-1241	S-1241	2.349	2.08	0.27	0.89	0.95	5	3.20	**7.13**	Existing	
S-1245	S-1245	1.046	1.04	0.01	0.99	0.99	5	3.20	**3.32**	G1	
S-1250	S-1250	1.386	1.36	0.03	0.98	0.98	5	3.20	**4.36**	G1	
S-1251	S-1251	0.923	0.43	0.02	0.96	0.97	5	3.20	**1.92**	G1	
S-12528	S-12528	3.018	0.60	2.42	0.20	0.70	5	3.20	**6.78**	Existing	
S-1253	S-1253	0.433	0.41	0.02	0.96	0.97	5	3.20	**1.34**	G1	
S-1254	S-1254	0.999	0.99	0.00	1.00	0.99	5	3.20	**3.09**	G1	
S-1256	S-1256	1.001	1.00	0.00	1.00	0.99	5	3.20	**3.17**	G1	
S-1260	S-1260	2.603	0.45	2.15	0.17	0.69	5	3.20	**5.76**	Existing	
S-1263	S-1263	0.667	0.68	0.00	1.00	0.99	5	3.20	**2.18**	G1	
S-1267	S-1267	1.655	1.64	0.00	1.00	0.99	5	3.20	**5.18**	G1	
S-1276	S-1276	0.489	0.49	0.00	1.00	0.99	5	3.20	**1.55**	GDO	
S-1277	S-1277	0.286	0.28	0.00	1.00	0.99	5	3.20	**0.91**	G1	
S-1278	S-1278	0.343	0.34	0.00	1.00	0.99	5	3.20	**1.08**	GDO	
S-1279	S-1279	0.343	0.34	0.00	1.00	0.99	5	3.20	**1.08**	GDO	
S-1280	S-1280	2.065	1.45	0.66	0.68	0.87	5	3.20	**5.78**	Existing	
S-1291	S-1291	1.224	0.91	0.32	0.74	0.90	5	3.20	**3.51**	G1	

Tributary Areas for Inlet S-1253 (Sag Condition)

Inlet ID	Area ID	Area (A) (ac)	Impervious Area (ac)	Pervious Area (ac)	Percent Impervious	Runoff Coefficient (C)	Tc (min)	Rainfall Intensity (I_{10}) (in/hr)	Design Discharge Q_{10} = CIA (cfs)	Inlet Type	Remarks
S-1245	S-1245	1.046	1.04	0.01	0.99	0.99	5	3.73	**3.85**	G1	
S-1250	S-1250	1.386	1.36	0.03	0.98	0.98	5	3.73	**5.08**	G1	
S-1251	S-1251	0.433	0.41	0.02	0.96	0.97	5	3.73	**1.58**	G1	
S-1253	S-1253	0.599	0.59	0.00	1.00	0.99	5	3.73	**2.19**	G1	Sag
S-1255	S-1255	0.631	0.63	0.00	1.00	0.99	5	3.73	**2.32**	G1	
S-1258	S-1258	1.001	1.00	0.00	1.00	0.99	5	3.73	**3.70**	G1	
S-1263	S-1263	0.667	0.68	0.00	1.00	0.99	5	3.73	**2.54**	G1	
S-1267	S-1267	1.655	1.65	0.00	1.00	0.99	5	3.73	**6.04**	G1	

RIVERSIDE COUNTY TRANSPORTATION COMMISSION
Interstate 15 EXPRESS LANES PROJECT Southern Extension

THE ALLIANCE GROUP ENTERPRISE INC.

GRAPHIC SCALE: 0 50 100
SCALES: 1" = 100'

CONCEPTUAL NOT FOR CONSTRUCTION

I-15 EXPRESS LANES PROJECT SOUTHERN EXTENSION (ELPSE) EA 0J0820

HYDROLOGY EXHIBIT DRAWING

07/01/2021 | SHEET 2 OF 11

NOTE:

FOR ACCURATE RIGHT OF WAY DATA, CONTACT RIGHT OF WAY ENGINEERING AT THE DISTRICT OFFICE.

LEGEND:

- EXISTING RIGHT OF WAY
- EXISTING CITY RIGHT OF WAY
- I-15 ELPSE ROADWAY IMPROVEMENTS
- sd EXISTING STORM DRAIN LINE
- SD PROPOSED STORM DRAIN LINE
- PROPOSED TRIBUTARY AREA BOUNDARY
- PROPOSED SLOTTED DRAIN
- EXISTING STORM DRAIN INLET
- PROPOSED STORM DRAIN INLET
- FLOW DIRECTION
- POC — Point of Connection to Existing Pipe
- S-SS A.AA — TRIBUTARY AREA ID

Tributary Areas for Inlet N-1296A (Sag Condition)

Inlet ID	Area ID	Area (A) (ac)	Impervious Area (ac)	Pervious Area (ac)	Percent Impervious	Runoff Coefficient (C)	Tc (min)	Rainfall Intensity (I_{50}) (in/hr)	Design Discharge Q_{50} = CIA (cfs)	Inlet Type	Remarks
N-1285A	N-1285A	1.172	1.17	0.00	1.00	0.99	5	3.73	**4.33**	G1	
N-1285B	N-1285B	2.034	0.13	1.90	0.06	0.65	5	3.73	**4.96**	Existing	
N-1288	N-1288	0.490	0.49	0.00	1.00	0.99	5	3.73	**1.81**	G1	
N-1291	N-1291	0.633	0.63	0.00	1.00	0.99	5	3.73	**2.34**	G1	
N-1294	N-1294	0.528	0.52	0.00	1.00	0.99	5	3.73	**1.95**	G1	
N-1295	N-1295	0.165	0.16	0.00	1.00	0.99	5	3.73	**0.61**	G1	
N-1296A	N-1296A	0.499	0.49	0.00	1.00	0.99	5	3.73	**1.84**	G1	Sag
N-1298	N-1298	0.186	0.18	0.00	1.00	0.99	5	3.73	**0.69**	GDO	
N-1299A	N-1298	0.103	0.10	0.00	1.00	0.99	5	3.73	**0.38**	G1	
N-1299B	N-1299	0.230	0.23	0.00	1.00	0.99	5	3.73	**0.85**	GDO	
N-1301A	N-1301	0.148	0.14	0.00	1.00	0.99	5	3.73	**0.55**	GDO	
N-1301B	N-1302	0.165	0.16	0.00	1.00	0.99	5	3.73	**0.61**	GDO	
N-1302	N-1302	0.171	0.17	0.00	1.00	0.99	5	3.73	**0.63**	GDO	
N-1303	N-1303	0.189	0.18	0.00	1.00	0.99	5	3.73	**0.70**	GDO	
N-1304	N-1304	0.188	0.18	0.00	1.00	0.99	5	3.73	**0.69**	GDO	
N-1305	N-1305	0.153	0.15	0.00	1.00	0.99	5	3.73	**0.56**	G1	
N-1306A	N-1306A	0.139	0.13	0.00	1.00	0.99	5	3.73	**0.51**	G1	
N-1307	N-1307	0.181	0.18	0.00	1.00	0.99	5	3.73	**0.67**	G1	
N-1308	N-1308	0.198	0.19	0.00	1.00	0.99	5	3.73	**0.73**	GDO	
N-1309	N-1309	0.192	0.19	0.00	1.00	0.99	5	3.73	**0.71**	GDO	
N-1310	N-1310	0.178	0.17	0.00	1.00	0.99	5	3.73	**0.66**	GDO	
N-1311	N-1311	0.184	0.18	0.00	1.00	0.99	5	3.73	**0.68**	GDO	
N-1312	N-1312	0.189	0.18	0.00	1.00	0.99	5	3.73	**0.70**	GDO	
N-1313	N-1313	0.374	0.37	0.00	1.00	0.99	5	3.73	**1.38**	G1	
N-1315	N-1315	0.190	0.19	0.00	1.00	0.99	5	3.73	**0.70**	G1	
N-1316	N-1316	0.156	0.15	0.00	1.00	0.99	5	3.20	**0.49**	GDO	

Southbound Tributary Areas

Inlet ID	Area ID	Area (A) (ac)	Impervious Area (ac)	Pervious Area (ac)	Percent Impervious	Runoff Coefficient (C)	Tc (min)	Rainfall Intensity (I_{25}) (in/hr)	Design Discharge Q_{25} = CIA (cfs)	Inlet Type	Remarks
S-1291	S-1291	1.224	0.91	0.32	0.74	0.90	5	3.20	**3.51**	Existing	Ditch
S-1297	S-1297	2.178	1.65	0.53	0.76	0.90	5	3.20	**6.29**	Existing	Ditch
S-1299	S-1299	1.949	1.42	0.53	0.73	0.89	5	3.54	**6.16**	Existing	Ditch - Sag
S-1306	S-1306	2.750	1.97	0.78	0.72	0.89	5	3.20	**7.82**	Existing	Ditch
S-1325	S-1325	2.047	1.48	0.57	0.72	0.89	5	3.20	**5.83**	Existing	Ditch
S-1330	S-1330	1.408	1.05	0.36	0.75	0.90	5	3.20	**4.05**	Existing	Ditch
S-1336	S-1336	1.623	1.07	0.55	0.66	0.87	5	3.20	**4.51**	Existing	Ditch
S-1343	S-1343	1.974	1.52	0.45	0.77	0.91	5	3.20	**5.74**	Existing	Ditch
S-1347	S-1347	1.103	0.89	0.22	0.80	0.92	5	3.20	**3.24**	Existing	Ditch
S-1355	S-1355	1.802	1.41	0.40	0.78	0.91	5	3.20	**5.25**	Existing	Ditch
S-1364	S-1364	2.218	1.66	0.56	0.75	0.90	5	3.20	**6.38**	Existing	Ditch
S-1373	S-1373	2.562	1.90	0.66	0.74	0.90	5	3.20	**7.35**	Existing	Ditch

* Weighted Runoff Coefficient based on C=0.99 for impervious surfaces and C=0.63 for pervious surfaces. Refer to section **4.1.3 Runoff Coefficient** for design justification for C values.

* Rainfall intensity (I) per section **4.1.2 Rainfall Intensity** of this report.

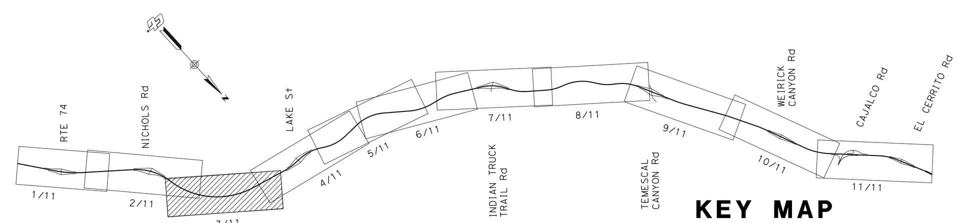
* Refer to section **4.1.1 Rational Method** for design discharge (Q) methodology.

* Area (A) corresponds to total sub-area drainage in acres and is identified with the same ID as receiving inlet.

* Refer to section **4 Hydraulic Analysis** for a full breakdown of methodology for table components.

Northbound Tributary Areas

Inlet ID	Area ID	Area (A) (ac)	Impervious Area (ac)	Pervious Area (ac)	Percent Impervious	Runoff Coefficient (C)	Tc (min)	Rainfall Intensity (I_{25}) (in/hr)	Design Discharge Q_{25} = CIA (cfs)	Inlet Type	Remarks
N-1291	N-1291	0.633	0.63	0.00	1.00	0.99	5	3.20	**2.01**	G1	
N-1294	N-1294	0.528	0.52	0.00	1.00	0.99	5	3.20	**1.67**	G1	
N-1295	N-1295	0.165	0.16	0.00	1.00	0.99	5	3.20	**0.52**	G1	
N-1296A	N-1296A	0.499	0.49	0.00	1.00	0.99	5	3.20	**1.58**	G1	
N-1298	N-1298	0.186	0.18	0.00	1.00	0.99	5	3.20	**0.59**	GDO	
N-1299A	N-1299A	0.103	0.10	0.00	1.00	0.99	5	3.20	**0.33**	G1	
N-1299B	N-1299B	0.230	0.23	0.00	1.00	0.99	5	3.20	**0.73**	GDO	
N-1301A	N-1301A	0.148	0.15	0.00	1.00	0.99	5	3.20	**0.47**	GDO	
N-1301B	N-1301B	0.165	0.17	0.00	1.00	0.99	5	3.20	**0.52**	GDO	
N-1302	N-1302	0.171	0.17	0.00	1.00	0.99	5	3.20	**0.54**	GDO	
N-1303	N-1303	0.189	0.18	0.00	1.00	0.99	5	3.20	**0.60**	GDO	
N-1304	N-1304	0.188	0.18	0.00	1.00	0.99	5	3.20	**0.60**	GDO	
N-1305	N-1305	0.153	0.15	0.00	1.00	0.99	5	3.20	**0.48**	G1	
N-1306A	N-1306A	0.139	0.13	0.00	1.00	0.99	5	3.20	**0.44**	G1	
N-1307	N-1307	0.181	0.18	0.00	1.00	0.99	5	3.20	**0.57**	G1	
N-1308	N-1308	0.198	0.19	0.00	1.00	0.99	5	3.20	**0.63**	GDO	
N-1309	N-1309	0.192	0.19	0.00	1.00	0.99	5	3.20	**0.61**	GDO	
N-1310	N-1310	0.178	0.17	0.00	1.00	0.99	5	3.20	**0.56**	GDO	
N-1311	N-1311	0.184	0.18	0.00	1.00	0.99	5	3.20	**0.58**	GDO	
N-1312	N-1312	0.189	0.18	0.00	1.00	0.99	5	3.20	**0.60**	GDO	
N-1313	N-1313	0.374	0.37	0.00	1.00	0.99	5	3.20	**1.18**	G1	
N-1315	N-1315	0.190	0.19	0.00	1.00	0.99	5	3.20	**0.60**	G1	
N-1316	N-1316	0.156	0.15	0.00	1.00	0.99	5	3.20	**0.49**	GDO	
N-1317	N-1317	0.128	0.12	0.00	1.00	0.99	5	3.20	**0.41**	GDO	
N-1318A	N-1318A	0.096	0.09	0.00	1.00	0.99	5	3.20	**0.30**	GDO	
N-1318B	N-1318B	0.120	0.12	0.00	1.00	0.99	5	3.20	**0.38**	GDO	
N-1319	N-1319	0.121	0.12	0.00	1.00	0.99	5	3.20	**0.38**	GDO	
N-1320A	N-1320A	0.127	0.12	0.00	1.00	0.99	5	3.20	**0.40**	GDO	
N-1320B	N-1320B	0.122	0.12	0.00	1.00	0.99	5	3.20	**0.39**	GDO	
N-1321A	N-1321A	0.104	0.10	0.00	1.00	0.99	5	3.20	**0.33**	G1	
N-1321B	N-1321B	0.092	0.09	0.00	1.00	0.99	5	3.20	**0.29**	G1	
N-1322	N-1322	0.131	0.13	0.00	1.00	0.99	5	3.20	**0.42**	GDO	
N-1323A	N-1323A	0.141	0.14	0.00	1.00	0.99	5	3.20	**0.45**	GDO	
N-1323B	N-1323B	0.152	0.15	0.00	1.00	0.99	5	3.20	**0.48**	GDO	
N-1324	N-1324	0.142	0.14	0.00	1.00	0.99	5	3.20	**0.45**	GDO	
N-1325	N-1325	0.131	0.13	0.00	1.00	0.99	5	3.20	**0.42**	GDO	
N-1326A	N-1326A	0.122	0.12	0.00	1.00	0.99	5	3.20	**0.39**	GDO	
N-1326B	N-1326B	0.136	0.13	0.00	1.00	0.99	5	3.20	**0.43**	GDO	
N-1327	N-1327	0.149	0.14	0.00	1.00	0.99	5	3.20	**0.47**	GDO	
N-1328	N-1328	0.154	0.15	0.00	1.00	0.99	5	3.20	**0.49**	GDO	
N-1329A	N-1329A	0.134	0.13	0.00	1.00	0.99	5	3.20	**0.42**	G1	
N-1329B	N-1329B	0.113	0.11	0.00	1.00	0.99	5	3.20	**0.36**	G1	
N-1330A	N-1330A	0.137	0.13	0.00	1.00	0.99	5	3.20	**0.43**	GDO	
N-1330B	N-1330B	0.063	0.06	0.00	1.00	0.99	5	3.20	**0.20**	GDO	
N-1331	N-1331	0.156	0.15	0.00	1.00	0.99	5	3.20	**0.49**	GDO	
N-1332	N-1332	0.143	0.14	0.00	1.00	0.99	5	3.20	**0.45**	GDO	
N-1333A	N-1333A	0.149	0.14	0.00	1.00	0.99	5	3.20	**0.47**	G1	
N-1333B	N-1333B	0.094	0.09	0.00	1.00	0.99	5	3.20	**0.30**	GDO	
N-1334A	N-1334A	0.096	0.10	0.00	1.00	0.99	5	3.20	**0.30**	GDO	
N-1334B	N-1334B	0.085	0.08	0.00	1.00	0.99	5	3.20	**0.27**	G1	
N-1335A	N-1335A	0.078	0.08	0.00	1.00	0.99	5	3.20	**0.25**	G1	
N-1335B	N-1335B	0.082	0.08	0.00	1.00	0.99	5	3.20	**0.26**	GDO	
N-1336A	N-1336A	0.102	0.10	0.00	1.00	0.99	5	3.20	**0.32**	G1	
N-1336B	N-1336B	0.129	0.12	0.00	1.00	0.99	5	3.20	**0.41**	G1	
N-1337	N-1337	0.097	0.09	0.00	1.00	0.99	5	3.20	**0.31**	GDO	
N-1338	N-1338	0.153	0.15	0.00	1.00	0.99	5	3.20	**0.48**	GDO	
N-1339	N-1339	0.148	0.14	0.00	1.00	0.99	5	3.20	**0.47**	GDO	
N-1340A	N-1340A	0.111	0.11	0.00	1.00	0.99	5	3.20	**0.35**	GDO	
N-1340B	N-1340B	0.143	0.14	0.00	1.00	0.99	5	3.20	**0.45**	G1	
N-1341	N-1341	0.105	0.10	0.00	1.00	0.99	5	3.20	**0.33**	G1	
N-1342A	N-1342A	0.071	0.02	0.05	0.30	0.74	5	3.20	**0.17**	G1	
N-1342B	N-1342B	0.108	0.10	0.00	1.00	0.99	5	3.20	**0.34**	GDO	
N-1343	N-1343	0.140	0.14	0.00	1.00	0.99	5	3.20	**0.44**	GDO	
N-1344A	N-1344A	0.134	0.13	0.00	1.00	0.99	5	3.20	**0.42**	GDO	
N-1344B	N-1344B	0.144	0.14	0.00	1.00	0.99	5	3.20	**0.46**	GDO	
N-1345	N-1345	0.144	0.14	0.00	1.00	0.99	5	3.20	**0.46**	GDO	
N-1346	N-1346	0.123	0.12	0.00	1.00	0.99	5	3.20	**0.39**	GDO	
N-1347A	N-1347A	0.184	0.18	0.00	1.00	0.99	5	3.20	**0.58**	GDO	
N-1347B	N-1347B	0.177	0.17	0.00	1.00	0.99	5	3.20	**0.56**	G1	
N-1349	N-1349	0.289	0.28	0.00	1.00	0.99	5	3.20	**0.92**	GDO	
N-1350	N-1350	0.172	0.17	0.00	0.91	0.99	5	3.20	**0.54**	GDO	
N-1352	N-1352	0.280	0.28	0.00	1.00	0.99	5	3.20	**0.89**	GDO	
N-1353A	N-1353A	0.260	0.26	0.00	1.00	0.99	5	3.20	**0.82**	G1	
N-1353B	N-1353B	0.195	0.19	0.00	1.00	0.99	5	3.20	**0.62**	GDO	
N-1356	N-1356	0.378	0.37	0.00	1.00	0.99	5	3.20	**1.20**	GDO	
N-1358	N-1358	0.385	0.38	0.00	1.00	0.99	5	3.20	**1.22**	G1	
N-1359	N-1359	0.185	0.19	0.00	1.00	0.99	5	3.20	**0.59**	G1	
N-1360A	N-1360A	0.184	0.18	0.00	1.00	0.99	5	3.20	**0.58**	GDO	
N-1360B	N-1360B	0.065	0.06	0.00	1.00	0.99	5	3.20	**0.21**	GDO	
N-1364	N-1364	1.963	0.67	1.29	0.34	0.75	5	3.20	**4.73**	Existing	Ditch
N-1373	N-1373	2.406	1.73	0.68	0.72	0.89	5	3.20	**6.84**	Existing	Ditch



KEY MAP

PROPOSED HYDROLOGY MAP

RIVERSIDE COUNTY TRANSPORTATION COMMISSION | Interstate 15 EXPRESS LANES PROJECT Southern Extension

HDR

THE ALLIANCE GROUP ENTERPRISE INC.

GRAPHIC SCALE 100 50 0 100 200

SCALE: 1" = 100'

CONCEPTUAL
NOT FOR CONSTRUCTION

I-15 EXPRESS LANES PROJECT
SOUTHERN EXTENSION (ELPSE)
EA 0J0820

HYDROLOGY EXHIBIT DRAWING

07/01/2021 | SHEET 3 OF 11

NOTE:

FOR ACCURATE RIGHT OF WAY DATA, CONTACT
RIGHT OF WAY ENGINEERING AT THE DISTRICT OFFICE.

LEGEND:

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- EXISTING CITY RIGHT OF WAY
- I-15 ELPSE ROADWAY IMPROVEMENTS
- sd EXISTING STORM DRAIN LINE
- SD PROPOSED STORM DRAIN LINE
- PROPOSED TRIBUTARY AREA BOUNDARY
- PROPOSED SLOTTED DRAIN
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- PROPOSED STORM DRAIN INLET
- FLOW DIRECTION
- POC: Point of Connection to Existing Pipe
- S-SS A.AA: TRIBUTARY AREA ID

Tributary Areas for Inlet S-1440A (Sag Condition)

Inlet ID	Area ID	Area (A) (ac)	Impervious Area (ac)	Pervious Area (ac)	Percent Impervious	Runoff Coefficient (C)	Tc (min)	Rainfall Intensity (I_{50}) (in/hr)	Design Discharge Q_{50} = CIA (cfs)	Inlet Type	Remarks
N-1436A	N-1436A	0.404	0.40	0.00	1.00	0.99	5	3.80	**1.52**	G1	
N-1436B	N-1436B	0.507	0.50	0.00	1.00	0.99	5	3.80	**1.91**	G1	
N-1437	N-1437	0.285	0.28	0.00	1.00	0.99	5	3.80	**1.07**	G1	
N-1439	N-1439	0.248	0.24	0.00	1.00	0.99	5	3.80	**0.93**	GDO	
N-1440A	N-1440A	0.473	0.47	0.00	1.00	0.99	5	3.80	**1.78**	G1	Sag
N-1441A	N-1441A	0.137	0.13	0.00	1.00	0.99	5	3.80	**0.51**	G1	
N-1441B	N-1441B	0.164	0.16	0.00	1.00	0.99	5	3.80	**0.62**	G1	
N-1442	N-1442	0.431	0.43	0.00	1.00	0.99	5	3.80	**1.62**	G1	
N-1444	N-1444	0.463	0.46	0.00	1.00	0.99	5	3.80	**1.74**	G1	
N-1447	N-1447	0.418	0.41	0.00	1.00	0.99	5	3.80	**1.57**	G1	
N-1449	N-1449	0.183	0.18	0.00	1.00	0.99	5	3.80	**0.69**	G1	
N-1450	N-1450	0.494	0.49	0.00	1.00	0.99	5	3.80	**1.86**	G1	
N-1453	N-1453	0.222	0.22	0.00	1.00	0.99	5	3.80	**0.84**	G1	

Northbound Tributary Areas

Inlet ID	Area ID	Area (A) (ac)	Impervious Area (ac)	Pervious Area (ac)	Percent Impervious	Runoff Coefficient (C)	Tc (min)	Rainfall Intensity (I_{25}) (in/hr)	Design Discharge Q_{25} = CIA (cfs)	Inlet Type	Remarks
N-1377	N-1377	1.632	0.89	0.74	0.55	0.83	5	3.20	**4.32**	Existing	
N-1383	N-1383	4.855	2.80	2.05	0.58	0.84	5	3.29	**13.38**	Existing	
N-1391	N-1391	0.124	0.12	0.00	1.00	0.99	5	3.29	**0.40**	GDO	
N-1392	N-1392	0.160	0.16	0.00	1.00	0.99	5	3.29	**0.52**	G1	
N-1393	N-1393	0.227	0.22	0.00	1.00	0.99	5	3.29	**0.74**	GDO	
N-1394A	N-1394A	0.182	0.18	0.00	1.00	0.99	5	3.29	**0.59**	GDO	
N-1394B	N-1394B	0.355	0.34	0.01	0.96	0.98	5	3.29	**1.14**	G1	
N-1395	N-1395	0.312	0.21	0.10	0.68	0.87	5	3.29	**0.90**	G1	
N-1397	N-1397	0.184	0.18	0.00	1.00	0.99	5	3.29	**0.60**	GDO	
N-1398	N-1398	0.310	0.31	0.00	1.00	0.99	5	3.29	**1.01**	GDO	
N-1399	N-1399	0.160	0.16	0.00	1.00	0.99	5	3.29	**0.52**	GDO	
N-1400	N-1400	0.287	0.29	0.00	1.00	0.99	5	3.29	**0.93**	G1	
N-1401	N-1401	0.208	0.20	0.00	1.00	0.99	5	3.29	**0.68**	GDO	
N-1403	N-1403	0.211	0.21	0.00	1.00	0.99	5	3.29	**0.69**	G1	
N-1404	N-1404	0.145	0.14	0.00	1.00	0.99	5	3.29	**0.47**	G1	
N-1405	N-1405	0.117	0.11	0.00	1.00	0.99	5	3.29	**0.38**	G1	
N-1409	N-1409	0.[redacted]	0.26	0.00	1.00	0.99	5	3.29	**0.86**		Bridge
N-OFF-1409	N-OFF-1409	3.699	1.28	2.42	0.35	0.75	5	3.29	**9.18**		
N-ON-1410	N-ON-1410	5.209	2.46	2.75	0.47	0.80	5	3.29	**13.71**	Existing	
N-ON-1411	N-ON-1411	2.615	0.19	2.43	0.07	0.66	5	3.29	**5.64**	Existing	
N-1428	N-1428	3.769	1.66	2.11	0.44	0.79	5	3.29	**9.78**	Existing	
N-1432	N-1432	1.682	1.30	0.38	0.77	0.91	5	3.29	**5.03**	Existing	
N-1436A	N-1436A	0.404	0.40	0.00	1.00	0.99	5	3.29	**1.32**	GDO	
N-1436B	N-1436B	0.507	0.50	0.00	1.00	0.99	5	3.29	**1.65**	G1	
N-1437	N-1437	0.285	0.18	0.00	1.00	0.99	5	3.29	**0.93**	G1	
N-1439	N-1439	0.248	0.24	0.00	1.00	0.99	5	3.29	**0.81**	GDO	
N-1440A	N-1440A	0.473	0.47	0.00	1.00	0.99	5	3.29	**1.54**	G1	
N-1440B	N-1440B	2.943	1.89	1.05	0.64	0.86	5	3.29	**8.34**	Existing	
N-1441A	N-1441A	0.137	0.13	0.00	1.00	0.99	5	3.29	**0.45**	GDO	
N-1441B	N-1441B	0.164	0.16	0.00	1.00	0.99	5	3.29	**0.53**	G1	
N-1442	N-1442	0.431	0.43	0.00	1.00	0.99	5	3.29	**1.40**	G1	
N-1444	N-1444	0.463	0.46	0.00	1.00	0.99	5	3.29	**1.51**	GDO	
N-1447	N-1447	0.418	0.41	0.00	1.00	0.99	5	3.29	**1.36**	G1	
N-1449	N-1449	0.183	0.18	0.00	1.00	0.99	5	3.29	**0.60**	G1	
N-1450	N-1450	0.494	0.49	0.00	1.00	0.99	5	3.29	**1.61**	G1	
N-1452	N-1452	0.222	0.22	0.00	1.00	0.99	5	3.29	**0.72**	G1	
N-1455	N-1455	0.237	0.23	0.00	1.00	0.99	5	3.29	**0.77**	GDO	

Southbound Tributary Areas

Inlet ID	Area ID	Area (A) (ac)	Impervious Area (ac)	Pervious Area (ac)	Percent Impervious	Runoff Coefficient (C)	Tc (min)	Rainfall Intensity (I_{25}) (in/hr)	Design Discharge Q_{25} = CIA (cfs)	Inlet Type	Remarks
S-1383	S-1383	6.048	5.51	0.54	0.91	0.96	5	3.29	**19.06**	Existing	
S -ON-1408	S-ON-1408	4.422	2.36	2.06	0.53	0.82	5	3.29	**11.96**	Existing	
S-ON-1409	S-ON-1409	2.726	0.05	2.68	0.02	0.64	5	3.29	**5.71**	Existing	
S-1409	S-1409	0.060	0.06	0.00	1.00	0.99	5	3.29	**0.20**	GDO	
S-1410A	S-1410A	0.109	0.10	0.00	1.00	0.99	5	3.29	**0.36**	GDO	
S-1410B	S-1410B	0.117	0.11	0.00	1.00	0.99	5	3.29	**0.38**	G1	
S-1411	S-1411	0.123	0.12	0.00	1.00	0.99	5	3.29	**0.40**	G1	
S-1412	S-1412	0.253	0.25	0.00	1.00	0.99	5	3.29	**0.82**	G1	
S-1413	S-1413	0.471	0.47	0.00	1.00	0.99	5	3.29	**1.53**	G1	
S-1417	S-1417	0.230	0.23	0.00	1.00	0.99	5	3.29	**0.75**	G1	
S-1418	S-1418	0.191	0.19	0.00	1.00	0.99	5	3.29	**0.62**	G1	
S-1419	S-1419	0.212	0.21	0.00	1.00	0.99	5	3.29	**0.69**	G1	
S-1420	S-1420	0.204	0.12	0.08	0.61	0.85	5	3.29	**0.57**	G1	
S-1421	S-1421	0.375	0.22	0.15	0.59	0.84	5	3.29	**1.04**	G1	
S-1422	S-1422	0.339	0.29	0.05	0.86	0.94	5	3.29	**1.05**	G1	
S-1425	S-1425	0.565	0.56	0.00	1.00	0.99	5	3.29	**1.84**	G1	
S-1426	S-1426	0.267	0.26	0.00	0.98	0.98	5	3.29	**0.86**	G1	
S-1427	S-1427	0.300	0.26	0.04	0.86	0.94	5	3.29	**0.93**	G1	
S-1428	S-1428	0.330	0.26	0.07	0.78	0.91	5	3.29	**0.99**	G1	
S-1430	S-1430	0.370	0.29	0.08	0.80	0.92	5	3.29	**1.12**	G1	
S-1431	S-1431	0.294	0.22	0.08	0.74	0.90	5	3.29	**0.87**	G1	
S-1432	S-1432	0.120	0.12	0.00	1.00	0.99	5	3.29	**0.39**	G1	
S-1433	S-1433	0.219	0.22	0.00	1.00	0.99	5	3.29	**0.71**	GDO	
S-1440	S-1440	4.099	2.94	1.16	0.72	0.89	5	3.29	**11.97**	Existing	
S-1448	S-1448	1.472	1.07	0.40	0.73	0.89	5	3.29	**4.32**	Existing	

* Weighted Runoff Coefficient based on C=0.99 for impervious surfaces and C=0.63 for pervious surfaces.
Refer to section **4.1.3 Runoff Coefficient** for design justification for C values.

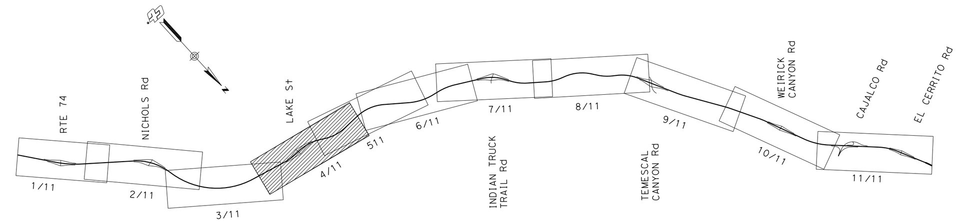
* Rainfall intensity (I) per section **4.1.2 Rainfall Intensity** of this report.

* Refer to section **4.1.1 Rational Method** for design discharge (Q) methodology.

* Area (A) corresponds to total sub-area drainage in acres and is identified with the same ID as receiving inlet.

* Refer to section **4 Hydraulic Analysis** for a full breakdown of methodology for table components.

PROPOSED HYDROLOGY MAP



KEY MAP

RIVERSIDE COUNTY TRANSPORTATION COMMISSION

Interstate 15 EXPRESS LANES PROJECT Southern Extension

THE ALLIANCE GROUP ENTERPRISE INC.

GRAPHIC SCALE 100 50 0 100 200

SCALE: 1" = 100'

CONCEPTUAL
NOT FOR CONSTRUCTION

I-15 EXPRESS LANES PROJECT
SOUTHERN EXTENSION (ELPSE)
EA 0J0820

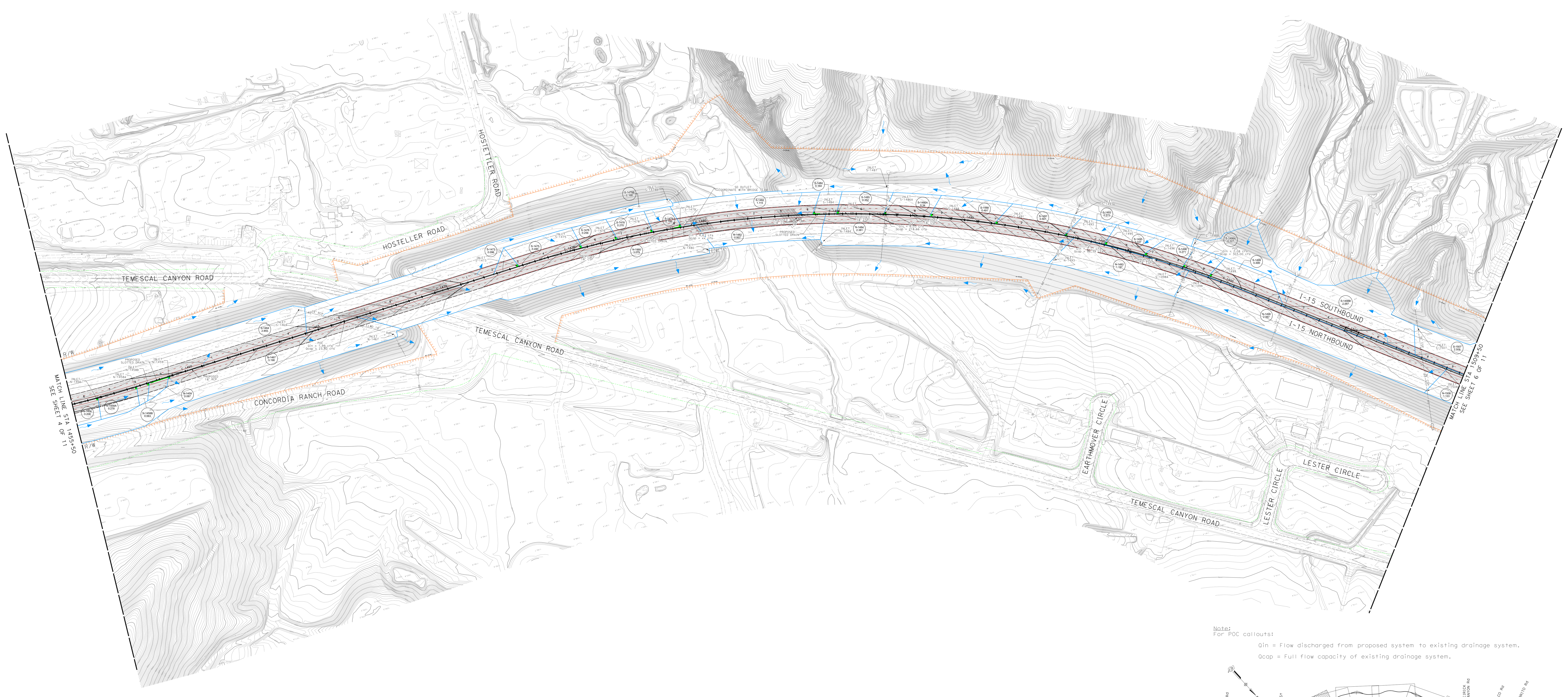
HYDROLOGY EXHIBIT DRAWING

07/01/2021	SHEET 4 OF 11

NOTE:
FOR ACCURATE RIGHT OF WAY DATA, CONTACT RIGHT OF WAY ENGINEERING AT THE DISTRICT OFFICE.

LEGEND:

- EXISTING RIGHT OF WAY
- EXISTING CITY RIGHT OF WAY
- I-15 ELPSE ROADWAY IMPROVEMENTS
- EXISTING STORM DRAIN LINE (sd)
- PROPOSED STORM DRAIN LINE (SD)
- PROPOSED TRIBUTARY AREA BOUNDARY
- PROPOSED SLOTTED DRAIN
- EXISTING STORM DRAIN INLET
- PROPOSED STORM DRAIN INLET
- FLOW DIRECTION
- POC — Point of Connection to Existing Pipe
- S-SS A.AA — TRIBUTARY AREA ID



Northbound Tributary Areas

Inlet ID	Area ID	Area (A) (ac)	Impervious Area (ac)	Pervious Area (ac)	Percent Impervious	Runoff Coefficient (C)	Tc (min)	Rainfall Intensity (I_{25}) (in/hr)	Design Discharge Q_{25} = CIA (cfs)	Inlet Type	Remarks
N-1456	N-1456	0.208	0.20	0.00	1.00	0.99	5	3.29	**0.68**	GDO	
N-1458A	N-1458A	0.278	0.27	0.00	1.00	0.99	5	3.29	**0.91**	GDO	
N-1458B	N-1458B	0.063	0.06	0.00	1.00	0.99	5	3.29	**0.21**	GDO	
N-1459	N-1459	0.087	0.08	0.00	1.00	0.99	5	3.29	**0.28**	G1	
N-1467	N-1467	3.198	1.64	1.56	0.51	0.81	5	3.29	**8.57**	Existing	
N-1480	N-1480	3.079	2.50	0.58	0.81	0.92	5	3.29	**9.34**	Existing	
	N-1482	0.957	0.95	0.00	1.00	0.99	5	3.29	**3.12**		Bridge
N-1484	N-1484	2.381	1.74	0.64	0.73	0.89	5	3.29	**7.00**	Existing	
N-1493	N-1493	1.197	0.85	0.35	0.71	0.88	5	3.29	**3.48**	Existing	
N-1498	N-1498	2.567	1.89	0.68	0.74	0.89	5	3.29	**7.56**	Existing	
N-1508	N-1508	1.133	0.78	0.35	0.69	0.88	5	3.29	**3.28**	Existing	

* Weighted Runoff Coefficient based on C=0.99 for impervious surfaces and C=0.63 for pervious surfaces. Refer to section **4.1.3 Runoff Coefficient** for design justification for C values.

* Rainfall intensity (I) per section **4.1.2 Rainfall Intensity** of this report.

* Refer to section **4.1.1 Rational Method** for design discharge (Q) methodology.

* Area (A) corresponds to total sub-area drainage in acres and is identified with the same ID as receiving inlet.

* Refer to section **4 Hydraulic Analysis** for a full breakdown of methodology for table components.

Southbound Tributary Areas

Inlet ID	Area ID	Area (A) (ac)	Impervious Area (ac)	Pervious Area (ac)	Percent Impervious	Runoff Coefficient (C)	Tc (min)	Rainfall Intensity (I_{25}) (in/hr)	Design Discharge Q_{25} = CIA (cfs)	Inlet Type	Remarks
S-1464	S-1464	2.855	2.60	0.26	0.91	0.96	5	3.29	**8.99**	Existing	
S-1473	S-1473	0.096	0.10	0.00	1.00	0.99	5	3.29	**0.31**	G1	
S-1475	S-1475	0.490	0.49	0.00	1.00	0.99	5	3.29	**1.60**	G1	
S-1476	S-1476	0.256	0.25	0.00	1.00	0.99	5	3.29	**0.83**	G1	
S-1478	S-1478	0.270	0.27	0.00	1.00	0.99	5	3.29	**0.88**	G1	
S-1478B	S-1478B	2.168	1.55	0.62	0.71	0.89	5	3.29	**6.33**	Existing	
S-1479	S-1479	0.199	0.19	0.00	1.00	0.99	5	3.29	**0.65**	G1	
	S-1482	1.115	1.12	0.00	1.00	0.99	5	3.29	**3.63**		Bridge
S-1484	S-1484	0.164	0.16	0.00	1.00	0.99	5	3.29	**0.53**	G1	
S-1485	S-1485	0.352	0.35	0.00	1.00	0.99	5	3.29	**1.15**	G1	
S-1486A	S-1486A	0.335	0.33	0.00	1.00	0.99	5	3.29	**1.09**	G1	
S-1488	S-1488	0.491	0.49	0.00	1.00	0.99	5	3.29	**1.60**	G1	
S-1491	S-1491	0.507	0.50	0.00	1.00	0.99	5	3.29	**1.65**	G1	
S-1493	S-1493	0.272	0.27	0.00	1.00	0.99	5	3.29	**0.89**	G1	
S-1495	S-1495	0.337	0.33	0.00	1.00	0.99	5	3.29	**1.10**	G1	
S-1496	S-1496	0.271	0.27	0.00	1.00	0.99	5	3.29	**0.88**	G1	
S-1498A	S-1498A	0.227	0.22	0.00	1.00	0.99	5	3.29	**0.74**	G1	
S-1498B	S-1498B	2.587	1.09	1.50	0.42	0.78	5	3.29	**6.65**	Existing	
S-1499	S-1499	0.499	0.50	0.00	1.00	0.99	5	3.29	**1.63**	G1	
S-1507	S-1507	2.509	1.40	1.11	0.56	0.83	5	3.29	**6.86**	Existing	

Tributary Areas for Inlet S-1482 (Sump Condition)

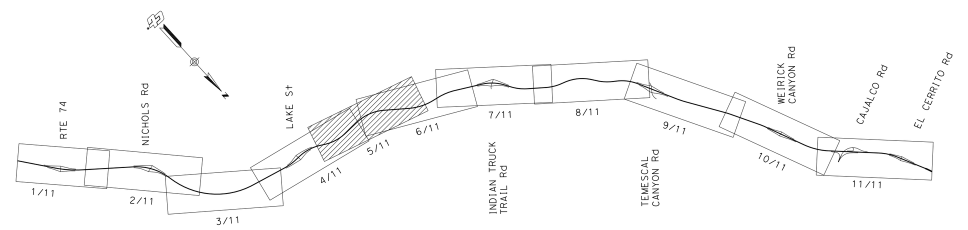
Inlet ID	Area ID	Area (A) (ac)	Impervious Area (ac)	Pervious Area (ac)	Percent Impervious	Runoff Coefficient (C)	Tc (min)	Rainfall Intensity (I_{50}) (in/hr)	Design Discharge Q_{50} = CIA (cfs)	Inlet Type	Remarks
S-1473	S-1473	0.096	0.09	0.00	1.00	0.99	5	3.73	**0.35**	G1	
S-1475	S-1475	0.490	0.49	0.00	1.00	0.99	5	3.73	**1.81**	G1	
S-1476	S-1475	0.256	0.25	0.00	1.00	0.99	5	3.73	**0.95**	G1	
S-1478	S-1478	0.270	0.27	0.00	1.00	0.99	5	3.73	**1.00**	G1	
S-1479	S-1479	0.199	0.19	0.00	1.00	0.99	5	3.73	**0.73**	G1	
	S-1482	1.115	1.11	0.00	1.00	0.99	5	3.73	**4.12**		Bridge-Sag
S-1484	S-1484	0.164	0.16	0.00	1.00	0.99	5	3.73	**0.61**	G1	
S-1485	S-1485	0.352	0.35	0.00	1.00	0.99	5	3.73	**1.30**	G1	
S-1486A	S-1486A	0.335	0.33	0.00	1.00	0.99	5	3.73	**1.24**	G1	
S-1488	S-1488	0.491	0.49	0.00	1.00	0.99	5	3.73	**1.81**	G1	
S-1491	S-1491	0.507	0.50	0.00	1.00	0.99	5	3.73	**1.87**	G1	
S-1493	S-1493	0.272	0.27	0.00	1.00	0.99	5	3.73	**1.00**	G1	
S-1495	S-1495	0.337	0.33	0.00	1.00	0.99	5	3.73	**1.24**	G1	
S-1496	S-1496	0.271	0.27	0.00	1.00	0.99	5	3.73	**1.00**	G1	
S-1498A	S-1498A	0.227	0.22	0.00	1.00	0.99	5	3.73	**0.84**	G1	
S-1499	S-1499	0.499	0.49	0.00	1.00	0.99	5	3.73	**1.84**	G1	

PROPOSED HYDROLOGY MAP

Note:
For POC callouts:

Qin = Flow discharged from proposed system to existing drainage system.

Qcap = Full flow capacity of existing drainage system.



KEY MAP

RIVERSIDE COUNTY TRANSPORTATION COMMISSION

Interstate 15
EXPRESS LANES PROJECT
Southern Extension

THE ALLIANCE GROUP ENTERPRISE INC.

GRAPHIC SCALE
100 50 0 100 200
SCALE: 1" = 100'

CONCEPTUAL
NOT FOR CONSTRUCTION

I-15 EXPRESS LANES PROJECT
SOUTHERN EXTENSION (ELPSE)
EA 0J0820

HYDROLOGY EXHIBIT DRAWING

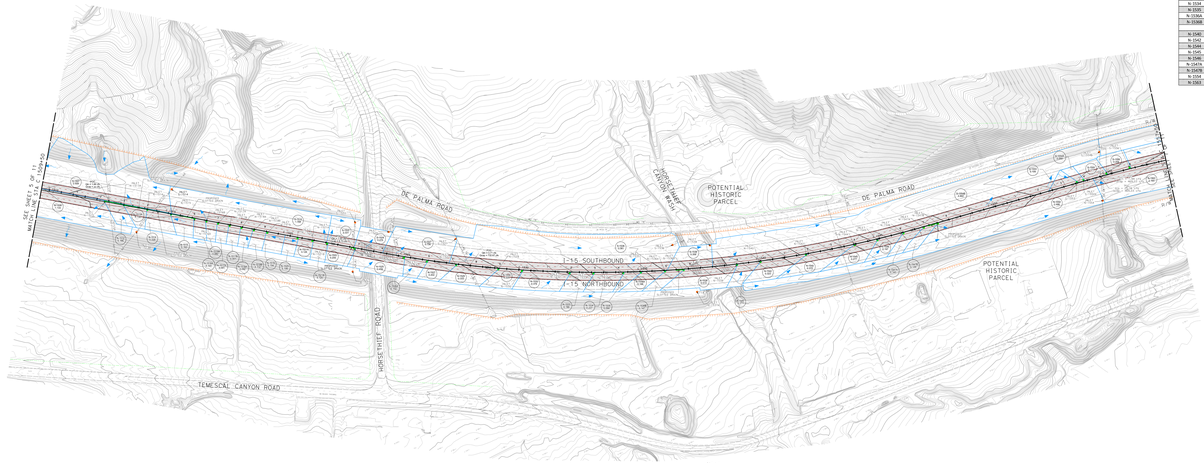
07/01/2021 | SHEET 5 OF 11

$DATE
$REQUEST

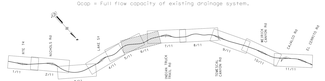
NOTE:
FOR ACCURATE RIGHT OF WAY DATA, CONTACT
RIGHT OF WAY ENGINEERING AT THE DISTRICT OFFICE.

LEGEND:

- EXISTING RIGHT OF WAY
- EXISTING CITY RIGHT OF WAY
- I-15 ELPSE ROADWAY IMPROVEMENTS
- EXISTING STORM DRAIN LINE
- PROPOSED STORM DRAIN LINE
- PROPOSED TRIBUTARY AREA BOUNDARY
- PROPOSED SLOTTED DRAIN
- EXISTING STORM DRAIN INLET
- PROPOSED STORM DRAIN INLET
- FLOW DIRECTION
- POC — Point of Connection to Existing Pipe
- S-03 A,AA — TRIBUTARY AREA ID



Notes:
For POC callouts:
Q25 = Flow discharged from proposed system to existing drainage system.
Qcap = Full flow capacity of existing drainage system.



KEY MAP

Northbound Tributary Areas

Inlet ID	Area ID	Area (A) (ac)	Impervious Area (ac)	Pervious Area (ac)	Percent Impervious	Runoff Coefficient (C)	Tc (min)	Rainfall Intensity (I_{25}) (in/hr)	Design Discharge $Q_{25} = CIA$ (cfs)	Inlet Type	Remarks
N-1508	N-1508	1.335	0.78	0.55	0.69	0.76	5	3.29	**3.58**	Existing	
N-1512	N-1512	0.395	0.26	0.00	1.00	0.99	5	3.29	**0.54**	GDO	
N-1516A	N-1516A	0.136	0.13	0.00	1.00	0.99	5	3.29	**0.45**	GDO	
N-1514	N-1514	0.229	0.22	0.00	1.00	0.99	5	3.29	**0.75**	GDO	
N-1531	N-1531	0.304	0.18	0.00	1.00	0.99	5	3.29	**0.59**	G1	
N-1516A	N-1516A	0.320	0.32	0.00	1.00	0.99	5	3.29	**0.94**	GDO	
N-1516B	N-1516B	0.103	0.10	0.00	1.00	0.99	5	3.29	**0.34**	GDO	
N-1517A	N-1517A	0.096	0.09	0.00	1.00	0.99	5	3.29	**0.30**	G1	
N-1517B	N-1517B	0.091	0.09	0.00	1.00	0.99	5	3.29	**0.30**	G1	
N-1518A	N-1518A	0.062	0.06	0.00	1.00	0.99	5	3.29	**0.20**	G1	
N-1518B	N-1518B	0.112	0.11	0.00	1.00	0.99	5	3.29	**0.36**	G1	
N-1519	N-1519	0.154	0.15	0.00	1.00	0.99	5	3.29	**0.50**	G1	
N-1520	N-1520	0.326	0.33	0.00	1.00	0.99	5	3.29	**0.85**	G1	
N-1521	N-1521	0.120	0.12	0.00	1.00	0.99	5	3.29	**0.39**	G1	
N-1518A	N-1518A	0.120	0.12	0.00	1.00	0.99	5	3.29	**0.39**	GDO	
N-1522	N-1522	0.209	0.20	0.00	1.00	0.99	5	3.29	**0.66**	G1	
N-1523	N-1523	0.454	0.45	0.00	1.00	0.99	5	3.29	**1.50**	G1	Bridge
N-1526A	N-1526A	0.152	0.15	0.00	1.00	0.99	5	3.29	**0.50**	G1	
N-1527	N-1527	0.202	0.20	0.00	1.00	0.99	5	3.29	**0.66**	GDO	
N-1529	N-1529	0.333	0.33	0.00	1.00	0.99	5	3.29	**1.08**	G1	
N-1527	N-1527	0.076	0.08	0.00	1.00	0.99	5	3.29	**0.25**	GDO	
N-1532	N-1532	0.224	0.07	0.00	1.00	0.99	5	3.29	**0.73**	GDO	
N-1533	N-1533	0.390	0.19	0.00	1.00	0.99	5	3.29	**0.62**	G1	
N-1534	N-1534	0.237	0.24	0.00	1.00	0.99	5	3.29	**0.77**	G1	
N-1535	N-1535	0.094	0.09	0.00	1.00	0.99	5	3.29	**0.31**	G1	
N-1536A	N-1536A	0.168	0.18	0.00	1.00	0.99	5	3.29	**0.61**	G1	
N-1536B	N-1536B	0.147	0.14	0.00	1.00	0.99	5	3.29	**0.48**	G1	
	N-1539	0.511	0.51	0.00	1.00	0.99	5	3.29	**1.67**	GDO	Bridge
N-1540	N-1540	0.173	0.17	0.00	1.00	0.99	5	3.29	**0.56**	GDO	
N-1542	N-1542	0.103	0.10	0.00	1.00	0.99	5	3.29	**0.34**	GDO	
N-1544	N-1544	0.372	0.37	0.00	1.00	0.99	5	3.29	**1.21**	G1	
N-1545	N-1545	0.277	0.27	0.00	1.00	0.99	5	3.29	**0.90**	GDO	
N-1546	N-1546	0.197	0.19	0.00	1.00	0.99	5	3.29	**0.64**	GDO	
N-1547A	N-1547A	0.142	0.14	0.00	1.00	0.99	5	3.29	**0.46**	G1	
N-1547B	N-1547B	0.123	0.12	0.00	1.00	0.99	5	3.29	**0.40**	GDO	
N-1554	N-1554	2.486	2.48	0.00	1.00	0.99	5	3.29	**8.10**	Existing	
N-1561	N-1561	2.305	1.59	0.36	1.00	0.99	5	3.29	**7.05**	G1	

Southbound Tributary Areas

Inlet ID	Area ID	Area (A) (ac)	Impervious Area (ac)	Pervious Area (ac)	Percent Impervious	Runoff Coefficient (C)	Tc (min)	Rainfall Intensity (I_{25}) (in/hr)	Design Discharge $Q_{25} = CIA$ (cfs)	Inlet Type	Remarks
S-1507	S-1507	3.329	1.40	1.33	0.51	0.63	5	3.29	**6.90**	Existing	
S-1514	S-1514	1.768	1.29	0.48	0.73	0.89	5	3.29	**5.39**	Existing	
S-1502	S-1502	0.321	0.23	0.10	0.70	0.86	5	3.29	**0.91**	Existing	
S-1524	S-1524	0.276	0.27	0.00	1.00	0.99	5	3.29	**0.90**	Existing	Bridge
S-1507	S-1507	0.750	0.54	0.22	0.71	0.87	5	3.29	**2.20**	Existing	
S-1536	S-1536	3.981	1.95	1.43	0.58	0.84	5	3.29	**9.32**	Existing	
S-1538	S-1538	0.309	0.31	0.00	1.00	0.99	5	3.29	**1.01**	Existing	Bridge
S-1559	S-1559	0.329	0.33	0.00	1.00	0.99	5	3.29	**1.08**	G1	
S-1556A	S-1556A	0.068	0.07	0.00	1.00	0.99	5	3.29	**0.22**	G1	
S-1556B	S-1556B	4.862	2.69	2.17	0.55	0.81	5	3.29	**13.03**	Existing	
S-1555	S-1555	0.177	0.18	0.00	1.00	0.99	5	3.29	**0.58**	G1	
S-1556	S-1556	0.309	0.00	0.00	1.00	0.99	5	3.29	**0.68**	GDO	

* Weighted Runoff Coefficient based on C=0.99 for impervious surfaces and C=0.63 for pervious surfaces.
Refer to section 4.1.3 Runoff Coefficient for design justification for C-values.

* Rainfall intensity (I) per section 4.1.2 Rainfall Intensity of this report.

* Refer to section 4.1.1 Rational Method for design discharge (Q) methodology.

* Area (A) corresponds to total sub-area drainage in acres and is identified with the same ID as receiving inlet.

* Refer to section 4 Hydraulic Analysis for a full breakdown of methodology for table components.

PROPOSED HYDROLOGY MAP

RCTC RIVERSIDE COUNTY TRANSPORTATION COMMISSION
Interstate 15 EXPRESS LANES PROJECT Southern Extension
HDR
THE ALLIANCE GROUP ENTERPRISE INC.

GRAPHIC SCALE
0 20 40
SCALES 1" = 20'

CONCEPTUAL
NOT FOR CONSTRUCTION
I-15 EXPRESS LANES PROJECT
SOUTHERN EXTENSION (ELPSE)
EA 0J0820
HYDROLOGY EXHIBIT DRAWING
05/25/2021 | SHEET 6 OF 11

NOTE:
FOR ACCURATE RIGHT OF WAY DATA, CONTACT
RIGHT OF WAY ENGINEERING AT THE DISTRICT OFFICE.

LEGEND:

- EXISTING RIGHT OF WAY
- EXISTING CITY RIGHT OF WAY
- I-15 ELPSE ROADWAY IMPROVEMENTS
- EXISTING STORM DRAIN LINE
- PROPOSED STORM DRAIN LINE
- PROPOSED TRIBUTARY AREA BOUNDARY
- PROPOSED SLOTTED DRAIN
- EXISTING STORM DRAIN INLET
- PROPOSED STORM DRAIN INLET
- FLOW DIRECTION
- POC — Point of Connection to Existing Pipe
- S-03 A.AA — TRIBUTARY AREA ID

Northbound Tributary Areas

Inlet ID	Area ID	Area (A) (ac)	Impervious Area (ac)	Pervious Area (ac)	Percent Impervious	Runoff Coefficient (C)	Tc (min)	Rainfall Intensity (I_{10}) (in/hr)	Design Discharge (Q_D = CIA) (cfs)	Inlet Type	Remarks
N-15A3	N-15A3	2.345	1.59	0.57	0.74	0.89	5	3.29	**6.37**	Existing	
N-15C1	N-15C1	2.203	1.63	0.59	0.75	0.90	5	3.29	**6.52**	Existing	
N-15D8	N-15D8	2.358	1.68	0.57	0.75	0.90	5	3.29	**6.66**	Existing	
N-15H4	N-15H4	2.954	2.49	0.57	0.81	0.96	5	3.47	**9.25**	Existing	
N-15N4	N-15N4	1.574	1.54	0.03	0.98	0.96	5	3.47	**5.26**	Existing	
N-16D3	N-16D3	3.384	2.17	1.21	0.64	0.86	5	3.47	**10.11**	Existing	
N-16N4	N-16N4	0.800	0.27	0.53	0.34	0.75	5	3.47	**2.08**	Existing	
	N-16O5	0.451	0.45	0.00	1.00	0.99	5	3.47	**1.55**		Bridge
N-16N5B	N-16N5B	0.468	0.31	0.16	0.66	0.79	5	3.47	**1.29**	Existing	
N-16O5	N-16O5	1.414	1.41	0.00	1.00	0.99	5	3.47	**4.86**	Existing	
N-16Q1	N-16Q1	0.300	0.30	0.00	1.00	0.99	5	3.47	**1.03**	Q1	
N-16Q2	N-16Q2	2.260	0.95	1.39	0.41	0.78	5	3.47	**6.30**	Existing	
N-16Q3	N-16Q3	0.851	0.85	0.00	1.00	0.99	5	3.47	**2.92**	Q1	
N-16Q4	N-16Q4	0.237	0.23	0.00	1.00	0.99	5	3.47	**0.81**	Q1	
N-16Q5	N-16Q5	0.232	0.23	0.00	1.00	0.99	5	3.47	**0.80**	Q1	
N-16Q7	N-16Q7	0.469	0.46	0.00	1.00	0.99	5	3.47	**1.60**	Q1	
N-16Q8	N-16Q8	0.488	0.49	0.00	1.00	0.99	5	3.47	**1.68**	GDO	
N-16Q9	N-16Q9	0.488	0.49	0.00	1.00	0.99	5	3.47	**1.68**	GDO	
N-16R6	N-16R6	0.750	0.75	0.00	1.00	0.99	5	3.47	**2.58**	GDO	
N-16S1	N-16S1	0.450	0.45	0.00	1.00	0.99	5	3.47	**1.55**	GDO	
N-16S7B	N-16S7B	0.131	0.13	0.00	1.00	0.99	5	3.47	**0.45**	GDO	
N-16S8	N-16S8	0.137	0.13	0.00	1.00	0.99	5	3.47	**0.47**	GDO	
N-16S9	N-16S9	3.178	2.35	1.00	0.68	0.87	5	3.47	**9.63**	Existing	

Southbound Tributary Areas

Inlet ID	Area ID	Area (A) (ac)	Impervious Area (ac)	Pervious Area (ac)	Percent Impervious	Runoff Coefficient (C)	Tc (min)	Rainfall Intensity (I_{10}) (in/hr)	Design Discharge (Q_D = CIA) (cfs)	Inlet Type	Remarks
S-15S6	S-15S6	0.382	0.38	0.00	1.00	0.99	5	3.29	**1.24**	Q1	
S-15S9	S-15S9	0.588	0.18	0.00	1.00	0.99	5	3.29	**0.95**	GDO	
S-15W2	S-15W2	0.228	0.23	0.00	1.00	0.99	5	3.29	**0.74**	Q1	
S-15W3	S-15W3	0.227	0.23	0.00	1.00	0.99	5	3.29	**0.74**	Q1	
S-15W4	S-15W4	0.302	0.30	0.00	1.00	0.99	5	3.29	**0.97**	Q1	
S-15W8	S-15W8	1.902	0.90	1.00	0.00	0.63	5	3.29	**3.70**	Existing	
S-15W9A	S-15W9A	0.173	0.17	0.00	1.00	0.99	5	3.29	**0.56**	Q1	
S-15W9A	S-15W9A	0.188	0.18	0.00	1.00	0.99	5	3.29	**0.61**	Q1	
S-15W9B	S-15W9B	0.171	0.17	0.00	1.00	0.99	5	3.29	**0.56**	GDO	
S-15W9A	S-15W9A	0.253	0.25	0.00	1.00	0.99	5	3.29	**0.82**	Q1	
S-15W9B	S-15W9B	0.255	0.25	0.00	1.00	0.99	5	3.29	**0.83**	Q1	
S-15X8	S-15X8	0.301	0.30	0.00	1.00	0.99	5	3.29	**0.98**	GDO	
S-15X9	S-15X9	0.169	0.16	0.00	1.00	0.99	5	3.29	**0.55**	GDO	
S-15Y6A	S-15Y6A	0.152	0.15	0.00	1.00	0.99	5	3.47	**0.52**	Q1	
S-15Y6B	S-15Y6B	0.056	0.05	0.00	1.00	0.99	5	3.47	**0.19**	GDO	
S-15Y1	S-15Y1	1.547	1.54	0.00	1.00	0.63	5	3.47	**3.30**	Existing	
S-15Y9	S-15Y9	2.881	1.73	1.17	0.59	0.84	5	3.47	**8.42**	Existing	
S-15Z1	S-15Z1	0.473	0.47	0.00	1.00	0.99	5	3.47	**1.62**	Existing	
S-15Z6	S-15Z6	0.477	0.48	0.00	1.00	0.99	5	3.47	**1.64**	GDO	
S-15W8	S-15W8	2.260	1.46	0.43	0.73	0.89	5	3.47	**3.88**	Existing	
S-15W	S-15W	0.526	0.45	0.08	0.81	0.94	5	3.47	**1.71**	Q1	
S-16X5	S-16X5	0.403	0.38	0.02	0.95	0.97	5	3.47	**1.35**	Q1	
S-16X1	S-16X1	0.326	0.19	0.00	1.00	0.99	5	3.47	**1.12**	Q1	
S-16X2	S-16X2	0.202	0.20	0.00	1.00	0.99	5	3.47	**0.69**	Q1	
S-16X3A	S-16X3A	0.305	0.30	0.01	0.95	0.97	5	3.47	**1.02**	Q1	
S-16X8	S-16X8	1.029	0.20	0.83	0.20	0.70	5	3.47	**2.50**	Existing	
S-16Y1	S-16Y1	0.326	0.19	0.00	1.00	0.99	5	3.47	**1.12**	Existing	
S-17P-16D5	S-17P-16D5	2.162	0.00	2.18	0.00	0.63	5	3.47	**4.77**	Existing	
S-16D6	S-16D6	0.514	0.51	0.00	1.00	0.99	5	3.47	**1.77**	Q1	Bridge
S-17P-16D5	S-17P-16D8	2.425	0.60	1.83	0.25	0.72	5	3.47	**6.04**	Existing	
S-16B7	S-16B7	0.136	0.13	0.00	1.00	0.99	5	3.47	**0.47**	Q1	
S-16B5	S-16B5	0.395	0.39	0.00	1.00	0.99	5	3.47	**1.36**	Q1	
S-16S2	S-16S2	0.495	0.49	0.00	1.00	0.99	5	3.47	**1.70**	GDO	
S-16S3	S-16S3	0.492	0.49	0.00	1.00	0.99	5	3.47	**1.70**	GDO	
S-16S5A	S-16S5A	0.162	0.16	0.00	1.00	0.99	5	3.47	**0.56**	GDO	
S-16S5B	S-16S5B	0.984	0.27	0.71	0.26	0.73	5	3.47	**2.49**	Existing	
S-16S7	S-16S7	0.245	0.24	0.00	1.00	0.99	5	3.47	**0.84**	GDO	
S-16Z2	S-16Z2	2.570	0.49	2.08	0.19	0.70	5	3.47	**6.23**	Existing	
S-16Z6	S-16Z6	2.409	2.04	0.80	0.72	0.89	5	3.47	**8.75**	Existing	
S-16Z6	S-16Z6	2.917	1.62	1.30	0.55	0.83	5	3.47	**8.40**	Existing	
S-16W1	S-16W1	1.860	1.49	1.32	0.44	0.81	5	3.47	**5.26**	Existing	
S-16S5A	S-16S5A	3.057	1.49	1.52	0.48	0.80	5	3.47	**8.42**	Existing	

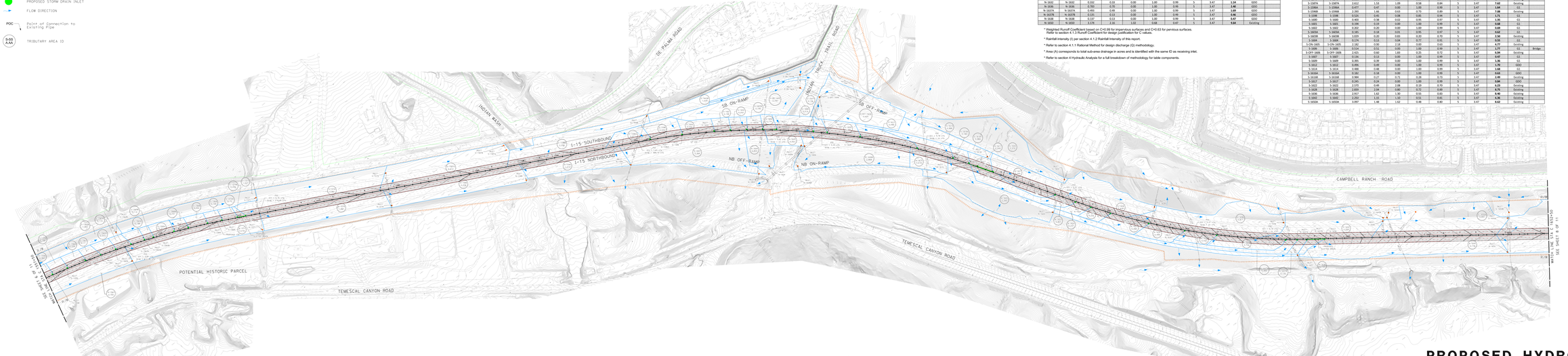
[1] Weighted Runoff Coefficient based on C=0.99 for impervious surfaces and C=0.63 for pervious surfaces. Refer to section 4.1.3 Runoff Coefficient for design justification for C values.

[2] Rainfall intensity (I) per section 4.1.2 Rainfall Intensity of this report.

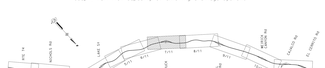
[3] Refer to section 4.1.1 Rational Method for design discharge (Q) methodology.

[4] Area (A) corresponds to total sub-area drainage in acres and is identified with the same ID as receiving inlet.

[5] Refer to section 4 Hydraulic Analysis for a full breakdown of methodology for table components.



Notes:
For POC callouts:
Qin = Flow discharged from proposed system to existing drainage system.
Qcap = Full flow capacity of existing drainage system.



KEY MAP

PROPOSED HYDROLOGY MAP

RCTC RIVERSIDE COUNTY TRANSPORTATION COMMISSION
Interstate 15 EXPRESS LANES PROJECT Southern Extension
THE ALLIANCE GROUP ENTERPRISE INC.

GRAPHIC SCALE
SCALES 1" = 400'

CONCEPTUAL NOT FOR CONSTRUCTION
I-15 EXPRESS LANES PROJECT SOUTHERN EXTENSION (ELPSE) EA 0J0820
HYDROLOGY EXHIBIT DRAWING

05/25/2021	SHEET 7 OF 11

NOTE:
FOR ACCURATE RIGHT OF WAY DATA, CONTACT
RIGHT OF WAY ENGINEERING AT THE DISTRICT OFFICE.

LEGEND:

- EXISTING RIGHT OF WAY
- EXISTING CITY RIGHT OF WAY
- I-15 ELPSE ROADWAY IMPROVEMENTS
- EXISTING STORM DRAIN LINE (sd)
- PROPOSED STORM DRAIN LINE (SD)
- PROPOSED TRIBUTARY AREA BOUNDARY
- PROPOSED SLOTTED DRAIN
- EXISTING STORM DRAIN INLET
- PROPOSED STORM DRAIN INLET
- FLOW DIRECTION
- POC — Point of Connection to Existing Pipe
- S-SS A.AA — TRIBUTARY AREA ID

Tributary Areas for Inlet S-1688 (Sump Condition)

Inlet ID	Area ID	Area (A) (ac)	Impervious Area (ac)	Pervious Area (ac)	Percent Impervious	Runoff Coefficient (C)	Tc (min)	Rainfall Intensity (I_{50}) (in/hr)	Design Discharge Q_{50} = CIA (cfs)	Inlet Type	Remarks
S-1674A	S-1674A	0.411	0.41	0.00	1.00	0.99	5	4.03	**1.64**	G1	
S-1675	S-1675	0.208	0.20	0.00	1.00	0.99	5	4.03	**0.83**	G1	
S-1677A	S-1677A	0.197	0.19	0.00	1.00	0.99	5	4.03	**0.78**	G1	
S-1678A	S-1678A	0.195	0.19	0.00	1.00	0.99	5	4.03	**0.78**	G1	
S-1680	S-1680	0.453	0.39	0.06	0.86	0.94	5	4.03	**1.72**	G1	
S-1681	S-1681	0.256	0.19	0.06	0.75	0.90	5	4.03	**0.93**	G1	
S-1682	S-1682	0.232	0.18	0.06	0.76	0.90	5	4.03	**0.85**	G1	
S-1683	S-1683	0.285	0.21	0.08	0.73	0.89	5	4.03	**1.02**	G1	
S-1685	S-1685	0.580	0.58	0.00	1.00	0.99	5	4.03	**2.31**	GDO	Bridge
S-1686	S-1686	0.225	0.22	0.00	0.98	0.98	5	4.03	**0.89**	G1	
	S-1688	0.540	0.54	0.00	1.00	0.99	5	4.03	**2.15**		Bridge-Sag
S-1689A	S-1689A	0.290	0.29	0.00	1.00	0.99	5	4.03	**1.16**	G1	
S-1690	S-1690	0.093	0.09	0.00	1.00	0.99	5	4.03	**0.37**	G1	
S-1691	S-1691	0.193	0.19	0.00	1.00	0.99	5	4.03	**0.77**	G1	
S-1692	S-1692	0.186	0.18	0.00	1.00	0.99	5	4.03	**0.74**	G1	
S-1693	S-1693	0.223	0.22	0.00	1.00	0.99	5	4.03	**0.89**	G1	
S-1694	S-1694	0.190	0.19	0.00	1.00	0.99	5	4.03	**0.76**	G1	
S-1695A	S-1695A	0.154	0.15	0.00	1.00	0.99	5	4.03	**0.62**	G1	
S-1695B	S-1695B	0.127	0.12	0.00	1.00	0.99	5	4.03	**0.51**	G1	
S-1696B	S-1696B	0.307	0.30	0.00	1.00	0.99	5	4.03	**1.23**	G1	
S-1698	S-1698	0.415	0.41	0.00	1.00	0.99	5	4.03	**1.66**	G1	
S-1700	S-1700	0.461	0.46	0.00	1.00	0.99	5	4.03	**1.84**	G1	

Northbound Tributary Areas

Inlet ID	Area ID	Area (A) (ac)	Impervious Area (ac)	Pervious Area (ac)	Percent Impervious	Runoff Coefficient (C)	Tc (min)	Rainfall Intensity (I_{25}) (in/hr)	Design Discharge Q_{25} = CIA (cfs)	Inlet Type	Remarks
N-1656B	N-1656B	1.422	0.94	0.48	0.66	0.87	5	3.47	**4.28**	Existing	
N-1657	N-1657	0.628	0.62	0.00	1.00	0.99	5	3.47	**2.16**	GDO	
N-1660	N-1660	0.450	0.45	0.00	1.00	0.99	5	3.47	**1.55**	G1	
N-1662	N-1662	0.365	0.36	0.00	1.00	0.99	5	3.47	**1.25**	G1	
N-1663	N-1663	0.185	0.18	0.00	1.00	0.99	5	3.47	**0.63**	G1	
N-1664	N-1664	0.190	0.19	0.00	1.00	0.99	5	3.47	**0.65**	G1	
N-1666	N-1666	0.386	0.38	0.00	1.00	0.99	5	3.47	**1.33**	G1	
N-1667	N-1667	0.190	0.19	0.00	1.00	0.99	5	3.47	**0.65**	G1	
N-1668	N-1668	0.180	0.18	0.00	1.00	0.99	5	3.47	**0.62**	G1	
N-1669A	N-1669A	0.183	0.18	0.00	1.00	0.99	5	3.47	**0.63**	G1	
N-1669B	N-1669B	0.124	0.12	0.00	1.00	0.99	5	3.47	**0.42**	GDO	
N-1670A	N-1670A	0.075	0.07	0.00	1.00	0.99	5	3.47	**0.26**	G1	
N-1670B	N-1670B	0.118	0.11	0.00	1.00	0.99	5	3.47	**0.41**	GDO	
N-1675	N-1675	2.596	0.89	1.71	0.34	0.75	5	3.47	**6.78**	Existing	
N-1678	N-1678	0.920	0.91	0.01	0.99	0.99	5	3.47	**3.15**	Existing	
N-1682	N-1682	0.946	0.94	0.01	0.99	0.99	5	3.47	**3.24**	Existing	
	N-1684	0.468	0.46	0.00	1.00	0.99	5	3.47	**1.61**		Bridge
N-1685	N-1685	0.474	0.47	0.00	1.00	0.99	5	3.47	**1.63**	G1	
N-1689B	N-1689B	2.596	2.01	0.59	0.77	0.91	5	3.47	**8.18**	Existing	
N-1696	N-1696	2.157	1.17	0.99	0.54	0.82	5	3.47	**6.17**	Existing	
N-1702A	N-1702A	0.077	0.07	0.00	1.00	0.99	5	3.47	**0.26**	G1	
N-1702B	N-1702B	0.122	0.12	0.00	1.00	0.99	5	3.47	**0.42**	GDO	
N-1703	N-1703	0.131	0.13	0.00	1.00	0.99	5	3.47	**0.45**	G1	
N-1704	N-1704	0.102	0.10	0.00	1.00	0.99	5	3.47	**0.35**	G1	
N-1705A	N-1705A	0.099	0.09	0.00	1.00	0.99	5	3.47	**0.34**	G1	
N-1705B	N-1705B	0.553	0.55	0.00	1.00	0.99	5	3.47	**1.90**	G1	
N-1709	N-1709	0.382	0.38	0.00	1.00	0.99	5	3.47	**1.31**	G1	
N-1711	N-1711	0.271	0.27	0.00	1.00	0.99	5	3.47	**0.93**	G1	
N-1714	N-1714	0.287	0.28	0.00	1.00	0.99	5	3.47	**0.99**	G1	
N-1715	N-1715	0.201	0.20	0.00	1.00	0.99	5	3.47	**0.69**	G1	
N-1717A	N-1717A	0.351	0.35	0.00	1.00	0.99	5	3.47	**1.21**	GDO	
N-1718A	N-1718A	0.191	0.19	0.00	1.00	0.99	5	3.47	**0.66**	G1	
N-1718B	N-1718B	0.103	0.10	0.00	1.00	0.99	5	3.47	**0.35**	GDO	
N-1719	N-1719	0.117	0.11	0.00	1.00	0.99	5	3.47	**0.40**	GDO	
N-1720	N-1720	0.096	0.09	0.00	1.00	0.99	5	3.47	**0.33**	G1	
N-1727	N-1727	2.274	1.29	0.99	0.57	0.83	5	3.47	**6.58**	Existing	
N-1731	N-1731	1.529	0.73	0.80	0.48	0.80	5	3.47	**4.26**	Existing	
N-1735	N-1735	1.663	0.74	0.92	0.45	0.79	5	3.47	**4.56**	Existing	
N-1738	N-1738	1.199	0.49	0.71	0.41	0.78	5	3.47	**3.24**	Existing	

Southbound Tributary Areas

Inlet ID	Area ID	Area (A) (ac)	Impervious Area (ac)	Pervious Area (ac)	Percent Impervious	Runoff Coefficient (C)	Tc (min)	Rainfall Intensity (I_{25}) (in/hr)	Design Discharge Q_{25} = CIA (cfs)	Inlet Type	Remarks
S-1656	S-1656	2.372	1.27	1.11	0.53	0.82	5	3.47	**6.77**	Existing	
S-1660	S-1660	1.255	0.78	0.48	0.62	0.85	5	3.47	**3.71**	Existing	
S-1668	S-1668	2.635	1.20	1.44	0.45	0.79	5	3.47	**7.26**	Existing	
S-1674A	S-1674A	0.411	0.41	0.00	1.00	0.99	5	3.47	**1.41**	G1	
S-1674B	S-1674B	2.294	1.19	1.10	0.52	0.82	5	3.47	**6.51**	Existing	
S-1675	S-1675	0.208	0.21	0.00	1.00	0.99	5	3.47	**0.71**	G1	
S-1677A	S-1677A	0.197	0.19	0.00	1.00	0.99	5	3.47	**0.68**	G1	
S-1678A	S-1678A	0.195	0.19	0.00	1.00	0.99	5	3.47	**0.67**	G1	
S-1680	S-1680	0.453	0.39	0.06	0.86	0.94	5	3.47	**1.48**	G1	
S-1681	S-1681	0.256	0.19	0.06	0.75	0.90	5	3.47	**0.80**	G1	
S-1682	S-1682	0.232	0.18	0.06	0.76	0.90	5	3.47	**0.73**	G1	
S-1683	S-1683	0.285	0.21	0.08	0.73	0.89	5	3.47	**0.88**	G1	
S-1685	S-1685	0.580	0.58	0.00	1.00	0.99	5	3.47	**1.99**	GDO	Bridge
S-1686	S-1686	0.225	0.22	0.00	0.98	0.98	5	3.47	**0.77**	G1	
	S-1688	0.540	0.54	0.00	1.00	0.99	5	3.47	**1.86**		Bridge
S-1689A	S-1689A	0.290	0.29	0.00	1.00	0.99	5	3.47	**1.00**	G1	
S-1690	S-1690	0.093	0.09	0.00	1.00	0.99	5	3.47	**0.32**	G1	
S-1691	S-1691	0.193	0.19	0.00	1.00	0.99	5	3.47	**0.66**	G1	
S-1692	S-1692	0.186	0.18	0.00	1.00	0.99	5	3.47	**0.64**	G1	
S-1693	S-1693	0.223	0.22	0.00	1.00	0.99	5	3.47	**0.77**	G1	
S-1694	S-1694	0.190	0.19	0.00	1.00	0.99	5	3.47	**0.65**	G1	
S-1695A	S-1695A	0.154	0.15	0.00	1.00	0.99	5	3.47	**0.53**	G1	
S-1695B	S-1695B	0.127	0.13	0.00	1.00	0.99	5	3.47	**0.43**	G1	
S-1696A	S-1696A	2.061	0.74	1.32	0.36	0.76	5	3.47	**5.43**	Existing	
S-1696B	S-1696B	0.307	0.31	0.00	1.00	0.99	5	3.47	**1.06**	G1	
S-1698	S-1698	0.415	0.41	0.00	1.00	0.99	5	3.47	**1.43**	GDO	
S-1700	S-1700	0.461	0.46	0.00	1.00	0.99	5	3.47	**1.58**	GDO	
S-1706	S-1706	2.470	0.90	1.57	0.36	0.76	5	3.47	**6.52**	Existing	
S-1720	S-1720	3.124	1.39	1.73	0.45	0.79	5	3.47	**8.57**	Existing	
S-1722	S-1722	0.370	0.24	0.13	0.65	0.86	5	3.47	**1.11**	G1	
S-1724	S-1724	0.634	0.58	0.06	0.91	0.96	5	3.47	**2.11**	G1	
S-1725	S-1725	0.364	0.24	0.13	0.65	0.86	5	3.47	**1.09**	G1	
S-1727	S-1727	0.753	0.45	0.30	0.60	0.85	5	3.47	**2.21**	G1	
S-1728	S-1728	0.408	0.22	0.19	0.53	0.82	5	3.47	**1.16**	G1	
S-1729	S-1729	0.546	0.28	0.27	0.50	0.81	5	3.47	**1.53**	GDO	
S-1730	S-1730	0.711	0.25	0.46	0.37	0.76	5	3.47	**1.87**	GDO	
S-1732	S-1732	0.742	0.44	0.30	0.60	0.84	5	3.47	**2.17**	G1	
S-1733	S-1733	0.213	0.21	0.00	1.00	0.99	5	3.47	**0.73**	G1	
S-1735	S-1735	0.497	0.49	0.00	1.00	0.99	5	3.47	**1.71**	GDO	
S-1738B	S-1738B	0.704	0.70	0.00	1.00	0.99	5	3.47	**2.42**	G1	

* Weighted Runoff Coefficient based on C=0.99 for impervious surfaces and C=0.63 for pervious surfaces. Refer to section **4.1.3 Runoff Coefficient** for design justification for C values.

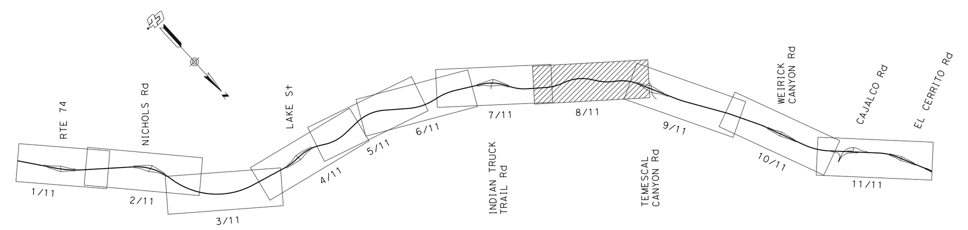
* Rainfall intensity (I) per section **4.1.2 Rainfall Intensity** of this report.

* Refer to section **4.1.1 Rational Method** for design discharge (Q) methodology.

* Area (A) corresponds to total sub-area drainage in acres and is identified with the same ID as receiving inlet.

* Refer to section **4 Hydraulic Analysis** for a full breakdown of methodology for table components.

PROPOSED HYDROLOGY MAP



RIVERSIDE COUNTY TRANSPORTATION COMMISSION

Interstate 15 EXPRESS LANES PROJECT Southern Extension

THE ALLIANCE GROUP ENTERPRISE INC.

GRAPHIC SCALE 100 50 0 100 200
SCALE: 1" = 100'

CONCEPTUAL
NOT FOR CONSTRUCTION

I-15 EXPRESS LANES PROJECT
SOUTHERN EXTENSION (ELPSE)
EA 0J0820

HYDROLOGY EXHIBIT DRAWING

07/01/2021 | SHEET 8 OF 11

NOTE:
FOR ACCURATE RIGHT OF WAY DATA, CONTACT
RIGHT OF WAY ENGINEERING AT THE DISTRICT OFFICE.

LEGEND:

- EXISTING RIGHT OF WAY
- EXISTING CITY RIGHT OF WAY
- I-15 ELPSE ROADWAY IMPROVEMENTS
- EXISTING STORM DRAIN LINE
- PROPOSED STORM DRAIN LINE
- PROPOSED TRIBUTARY AREA BOUNDARY
- PROPOSED SLOTTED DRAIN
- EXISTING STORM DRAIN INLET
- PROPOSED STORM DRAIN INLET
- FLOW DIRECTION
- POC — Point of Connection to Existing Pipe
- 0-03 A,AA — TRIBUTARY AREA ID

Northbound Tributary Areas

Inlet ID	Area ID	Area (A) (ac)	Impervious Area (ac)	Pervious Area (ac)	Percent Impervious	Runoff Coefficient (C)	Tc (min)	Rainfall Intensity (I_{10}) (in/hr)	Design Discharge ($Q_{10} = CIA$ (cfs)	Inlet Type	Remarks
N-175B	N-175B	1.189	0.49	0.71	0.41	0.76	5	3.47	**3.34**	Existing	
N-175A	N-175A	0.550	0.08	0.47	0.15	0.66	5	3.47	**1.26**	Existing	
N-176C	N-176C	0.160	0.08	0.08	0.50	0.78	5	3.47	**0.43**		Bridge
N-176D	N-176D	0.800	0.52	0.28	0.65	0.86	5	3.47	**2.40**	Existing	
N-OFF-175E	N-OFF-175E	1.511	1.51	0.00	1.00	0.95	5	3.47	**5.30**	Existing	Low Point
N-175S	N-175S	3.232	1.07	2.16	0.33	0.75	5	3.47	**8.40**	Existing	
	N-175SA	0.305	0.30	0.00	1.00	0.95	5	3.47	**1.32**		Bridge
N-175X	N-175X	2.655	0.44	1.20	0.27	0.73	5	3.47	**4.12**	Existing	
N-177C	N-177C	1.995	0.75	1.24	0.38	0.76	5	3.47	**5.26**	Existing	
N-177J	N-177J	0.886	0.34	0.54	0.38	0.76	5	3.47	**2.34**	Existing	
	N-177L	1.584	1.58	0.00	1.00	0.95	5	3.61	**5.06**		
N-177M	N-177M	0.328	0.13	0.20	1.00	0.95	5	3.61	**0.45**	G1	
N-177W	N-177W	0.312	0.31	0.00	1.00	0.95	5	3.61	**1.12**	Existing	
N-178E	N-178D	0.132	0.13	0.00	1.00	0.95	5	3.61	**0.47**	G1	
N-178JA	N-178JA	0.080	0.09	0.00	1.00	0.95	5	3.61	**0.32**	G1	
N-178JB	N-178JB	0.260	0.26	0.00	1.00	0.95	5	3.61	**0.94**	GGO	
N-178J	N-178J	0.312	0.14	0.30	1.00	0.95	5	3.61	**0.53**	GGO	
N-178J	N-178J	0.081	0.08	0.00	1.00	0.95	5	3.61	**0.29**	GGO	
N-178K	N-178K	0.270	0.27	0.00	1.00	0.95	5	3.61	**1.00**	G1	
N-178SA	N-178SA	0.160	0.16	0.00	1.00	0.95	5	3.61	**0.57**	G1	
N-178NB	N-178NB	0.094	0.09	0.00	1.00	0.95	5	3.61	**0.34**	GGO	
N-178L	N-178L	0.114	0.11	0.00	1.00	0.95	5	3.61	**0.41**	GGO	
N-178TA	N-178TA	0.432	0.22	0.00	1.00	0.95	5	3.61	**0.79**	GGO	
N-178TB	N-178TB	0.206	0.20	0.00	1.00	0.95	5	3.61	**0.74**	G1	
N-178T	N-178T	0.079	0.08	0.00	1.00	0.95	5	3.61	**0.28**	G1	
N-179S	N-179D	0.181	0.18	0.00	1.00	0.95	5	3.61	**0.66**	G1	
N-179C	N-179C	1.551	1.18	0.37	0.76	0.90	5	3.61	**3.96**	Existing	
N-180AB	N-180AB	3.869	1.86	1.99	0.48	0.80	5	3.61	**11.17**	Existing	
N-180A	N-180A	3.660	3.66	0.00	1.00	0.95	5	3.61	**10.08**	Existing	
N-182A	N-182A	0.845	0.84	0.00	1.00	0.95	5	3.61	**3.02**	G1	

Southbound Tributary Areas

Inlet ID	Area ID	Area (A) (ac)	Impervious Area (ac)	Pervious Area (ac)	Percent Impervious	Runoff Coefficient (C)	Tc (min)	Rainfall Intensity (I_{10}) (in/hr)	Design Discharge ($Q_{10} = CIA$ (cfs)	Inlet Type	Remarks
S-178BA	S-178BA	0.704	0.70	0.00	1.00	0.99	5	3.47	**2.42**	G1	
S-178B	S-178B	0.204	0.20	0.00	1.00	0.99	5	3.47	**0.70**	GGO	
S-178Z	S-178Z	0.787	0.78	0.00	1.00	0.99	5	3.47	**2.70**	GGO	Bridge
S-178Y	S-178Y	0.197	0.19	0.00	1.00	0.99	5	3.47	**0.68**	Existing	
S-175C	S-175C	1.000	0.60	0.40	0.60	0.78	5	3.47	**2.89**	Existing	
S-ON-175A	S-ON-175A	2.733	1.57	1.16	0.58	0.84	5	3.47	**7.88**	Existing	
S-OFF-175S	S-OFF-175S	2.229	0.99	1.24	0.45	0.75	5	3.47	**5.81**	Existing	
	S-175BB	0.457	0.45	0.00	1.00	0.99	5	3.47	**1.57**		Bridge
S-176BA	S-176BA	1.004	0.63	0.41	0.63	0.85	5	3.61	**3.35**	Existing	
S-176AB	S-176AB	0.869	0.01	0.56	0.01	0.76	5	3.61	**2.37**	Existing	
S-176A	S-176A	0.440	0.01	0.43	0.01	0.76	5	3.61	**1.20**	Existing	
S-177SA	S-177SA	2.683	1.27	1.58	0.45	0.75	5	3.61	**8.33**	Existing	
S-178S	S-178S	3.326	2.10	1.23	0.63	0.86	5	3.61	**10.20**	Existing	
S-179T	S-179T	1.208	1.49	1.82	0.45	0.79	5	3.61	**3.42**	Existing	
S-180C	S-180C	3.923	1.81	2.11	0.46	0.80	5	3.61	**11.28**	Existing	
S-181J	S-181J	1.781	1.78	0.00	1.00	0.99	5	3.61	**4.95**	Existing	
S-181S	S-181S	1.704	1.70	0.00	1.00	0.99	5	3.61	**4.99**	Existing	
S-182C	S-182C	0.535	0.53	0.00	1.00	0.99	5	3.61	**1.49**	Existing	
S-182S	S-182S	0.133	0.13	0.00	1.00	0.99	5	3.61	**0.43**	G1	
S-182N	S-182N	0.097	0.09	0.00	1.00	0.99	5	3.61	**0.31**	GGO	
S-182T	S-182T	0.185	0.18	0.00	1.00	0.99	5	3.61	**0.52**	GGO	
S-182B	S-182B	0.148	0.14	0.00	1.00	0.99	5	3.61	**0.53**	G1	
S-182P	S-182P	0.208	0.20	0.00	1.00	0.99	5	3.61	**0.76**	G1	

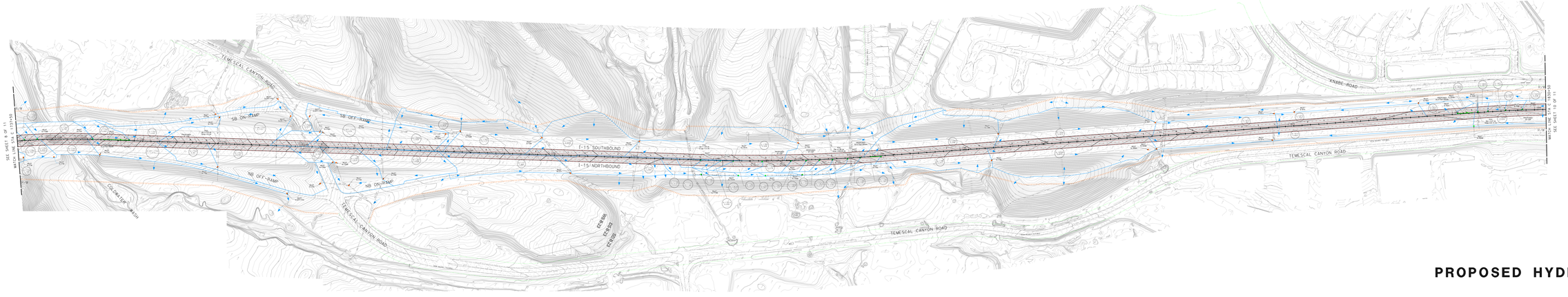
* Weighted Runoff Coefficient based on CH0.99 for impervious surfaces and CH0.83 for pervious surfaces.
Refer to section 4.1.5 Runoff Coefficient for design justification for C values.

* Rainfall intensity (I) per section 4.1.2 Rainfall Intensity of this report.

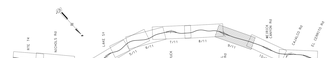
* Refer to section 4.1.1 Rational Method for design discharge (Q) methodology.

* Area (A) corresponds to total sub-area drainage in acres and is identified with the same ID as receiving inlet.

* Refer to section 4 Hydraulic Analysis for a full breakdown of methodology for table components.



PROPOSED HYDROLOGY MAP



KEY MAP

RIVERSIDE COUNTY TRANSPORTATION COMMISSION

Interstate 15
EXPRESS LANES PROJECT
Southern Extension

THE ALLIANCE GROUP ENTERPRISE INC.

GRAPHIC SCALE
0 50
SCALES 1" = 50'

CONCEPTUAL
NOT FOR CONSTRUCTION

I-15 EXPRESS LANES PROJECT
SOUTHERN EXTENSION (ELPSE)
EA 0J0820

HYDROLOGY EXHIBIT DRAWING

07/01/2021 | SHEET 9 OF 11

NOTE:
FOR ACCURATE RIGHT OF WAY DATA, CONTACT
RIGHT OF WAY ENGINEERING AT THE DISTRICT OFFICE.

LEGEND:

- EXISTING RIGHT OF WAY
- EXISTING CITY RIGHT OF WAY
- I-15 ELPSE ROADWAY IMPROVEMENTS
- EXISTING STORM DRAIN LINE
- PROPOSED STORM DRAIN LINE
- PROPOSED TRIBUTARY AREA BOUNDARY
- PROPOSED SLOTTED DRAIN
- EXISTING STORM DRAIN INLET
- PROPOSED STORM DRAIN INLET
- FLOW DIRECTION
- POC — Point of Connection to Existing Pipe
- S-01 A.AA — TRIBUTARY AREA ID

Northbound Tributary Areas

Inlet ID	Area ID	Area (A) (ac)	Impervious Area (ac)	Pervious Area (ac)	Percent Impervious	Runoff Coefficient (C)	Tc (min)	Rainfall Intensity (I_{10}) (in/hr)	Design Discharge Q_{10} = CIA (cfs)	Inlet Type	Remarks
N-1830	N-1830	0.351	0.35	0.00	1.00	0.99	5	3.61	**1.25**	Existing	
N-1859	N-1859	1.283	1.28	0.00	1.00	0.99	5	3.61	**4.59**	Existing	
N-1940	N-1940	1.396	1.39	0.00	1.00	[redacted]	5	3.61	**4.63**	Existing	
N-1851	N-1851	1.902	1.90	0.00	1.00	0.99	5	3.61	**6.80**	Existing	
N-1862	N-1862	0.963	0.96	0.00	1.00	0.99	5	3.61	**3.44**	Existing	
N-1863	N-1863	1.063	1.06	0.00	1.00	0.99	5	3.61	**3.79**	Existing	
N-1871	N-1871	0.911	0.91	0.00	1.00	0.99	5	3.61	**3.26**	Existing	
N-1875	N-1875	1.268	1.24	0.03	1.00	0.99	5	3.61	**4.46**	Existing	
N-1880	N-1880	1.409	0.25	1.16	0.18	0.85	5	3.61	**1.53**	Existing	
N-1892	N-1892	0.409	0.40	0.00	1.00	0.99	5	3.61	**1.75**	Existing	
N-1892	N-1892	1.340	1.34	0.00	1.00	0.99	5	3.61	**4.79**	Existing	
N-1896	N-1896	0.952	0.95	0.00	1.00	0.99	5	3.61	**3.39**	Existing	
N-1904A	N-1904A	0.176	0.04	0.14	0.25	0.90	5	3.61	**0.60**	Existing	
N-1904	N-1904	0.339	0.17	0.17	0.50	0.93	5	3.61	**1.14**	Existing	
N-1907	N-1907	0.141	0.14	0.00	1.00	0.99	5	3.61	**0.51**	G1	
N-1909A	N-1909A	0.131	0.13	0.00	1.00	[redacted]	5	3.61	**0.46**	G1	
N-1909B	N-1909B	0.329	0.33	0.00	1.00	0.99	5	3.61	**0.99**	GDO	
N-1910	N-1910	0.199	0.19	0.00	1.00	0.99	5	3.61	**0.71**	GDO	
N-1911	N-1911	0.090	0.09	0.00	1.00	0.99	5	3.61	**0.71**	G1	
N-1912	N-1912	0.202	0.20	0.00	1.00	0.99	5	3.61	**0.73**	G1	
N-1913	N-1913	0.200	0.20	0.00	1.00	0.99	5	3.61	**0.72**	G1	
N-1914	N-1914	1.973	1.97	0.00	1.00	0.99	5	3.61	**7.06**	G1	
N-1915	N-1915	1.922	1.92	0.00	1.00	0.99	5	3.61	**6.96**	G1	
N-19158	N-19158	**0.207**	0.21	0.00	1.00	0.99	5	3.61	**0.74**	G1	
N-1917	N-1917	**0.210**	**0.21**	0.00	1.00	0.99	5	3.61	**0.75**	G1	
N-1918	N-1918	0.306	0.31	0.00	1.00	0.99	5	3.61	**0.74**	G1	
N-1919	N-1919	0.189	0.19	0.00	1.00	0.99	5	3.61	**0.68**	G1	
N-1920	N-1920	0.274	0.27	0.00	1.00	0.99	5	3.61	**0.98**	GDO	
N-1921	N-1921	0.254	0.25	0.00	1.00	0.99	5	3.61	**0.91**	GDO	

Southbound Tributary Areas

Inlet ID	Area ID	Area (A) (ac)	Impervious Area (ac)	Pervious Area (ac)	Percent Impervious	Runoff Coefficient (C)	Tc (min)	Rainfall Intensity (I_{10}) (in/hr)	Design Discharge Q_{10} = CIA (cfs)	Inlet Type	Remarks
S-1832	S-1832	0.181	0.18	1.00	0.99	5	3.61	**0.65**	G1		
S-1886	S-1886	3.868	2.70	1.17	0.70	0.88	5	3.61	**12.30**	Existing	
S-1855	S-1855	1.286	0.95	0.34	0.73	0.89	5	3.61	**4.25**		
S-1857	S-1857	0.095	0.09	0.00	1.00	0.99	5	3.61	**0.34**	G1	
S-1859	S-1859	0.105	0.10	0.00	1.00	0.99	5	3.61	**0.38**	GDO	
S-1860	S-1860	0.175	0.18	0.00	1.00	0.99	5	3.61	**0.63**	G1	
S-1861	S-1861	0.199	0.20	0.00	1.00	0.99	5	3.61	**0.72**	G1	
S-1863	S-1863	0.199	0.19	0.00	1.00	0.99	5	3.61	**0.71**	GDO	
S-1864	S-1864	0.229	0.22	0.00	1.00	0.99	5	3.61	**0.81**	G1	
S-1866	S-1866	0.233	0.23	0.00	1.00	0.99	5	3.61	**0.83**	G1	
S-1867	S-1867	0.891	0.56	0.33	0.63	0.92	5	3.61	**3.30**	Existing	
S-1869	S-1869	0.665	0.53	0.07	0.89	0.95	5	3.61	**2.86**	Existing	
S-1873	S-1873	0.203	0.20	0.00	1.00	0.99	5	3.61	**0.73**	Existing	
S-1874	S-1874	0.202	0.20	0.00	1.00	0.99	5	3.61	**0.72**	Existing	
S-CH-1870	S-CH-1870	0.888	0.56	0.33	0.63	0.92	5	3.61	**3.31**	Existing	
S-CH-1880	S-CH-1880	1.552	0.69	0.86	0.45	0.79	5	3.61	**4.43**	Existing	
S-1881	S-1881	0.983	0.98	0.00	1.00	0.99	5	3.61	**3.51**	Existing	Bridge
S-CH-1882	S-CH-1882	1.257	0.01	1.25	0.01	0.83	5	3.61	**3.87**	Existing	
S-1881	S-1881	1.501	1.50	0.00	1.00	0.99	5	3.61	**5.35**	Existing	
S-1882	S-1882	0.247	0.24	0.00	1.00	0.99	5	3.61	**0.88**	Existing	
S-1883	S-1883	0.204	0.20	0.00	1.00	0.99	5	3.61	**0.73**	Existing	
S-1902	S-1902	1.764	1.63	1.05	0.93	0.76	5	3.61	**4.70**	Existing	
S-1904	S-1904	1.617	0.70	0.92	0.43	0.79	5	3.61	**4.57**	Existing	
S-1907	S-1907	0.449	0.44	0.00	1.00	0.99	5	3.61	**1.59**	Existing	
S-1908	S-1908	1.601	0.17	1.43	0.11	0.47	5	3.61	**3.86**	Existing	
S-1913	S-1913	1.377	1.37	0.00	1.00	0.99	5	3.61	**4.92**		

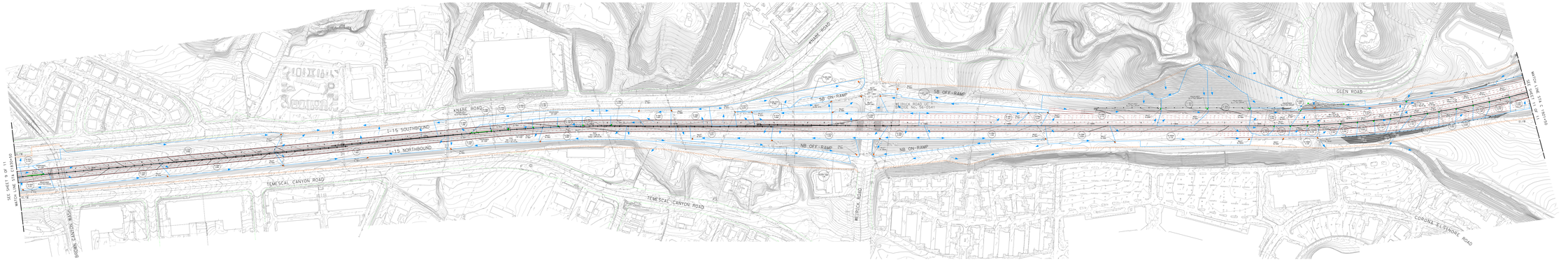
* Weighted Runoff Coefficient based on CH5-99 for impervious surfaces and CH5-83 for pervious surfaces.
Refer to section **4.1.3 Runoff Coefficient** for design justification for C values.

* Rainfall intensity (I) per section **4.1.2 Rainfall Intensity** of this report.

* Refer to section **4.1.1 Rational Method** for design discharge (Q) methodology.

* Area (A) corresponds to total sub-area drainage in acres and is identified with the same ID as receiving inlet.

* Refer to section **4 Hydraulic Analysis** for a full breakdown of methodology for table components.



PROPOSED HYDROLOGY MAP

KEY MAP

RIVERSIDE COUNTY TRANSPORTATION COMMISSION

Interstate 15 EXPRESS LANES PROJECT Southern Extension

THE ALLIANCE GROUP ENTERPRISE INC.

GRAPHIC SCALE
SCALES 1" = 100'

CONCEPTUAL NOT FOR CONSTRUCTION

I-15 EXPRESS LANES PROJECT SOUTHERN EXTENSION (ELPSE) EA 0J0820

HYDROLOGY EXHIBIT DRAWING

07/01/2021 | SHEET 10 OF 11

NOTE:
FOR ACCURATE RIGHT OF WAY DATA, CONTACT
RIGHT OF WAY ENGINEERING AT THE DISTRICT OFFICE.

LEGEND:

- EXISTING RIGHT OF WAY
- EXISTING CITY RIGHT OF WAY
- I-15 ELPSE ROADWAY IMPROVEMENTS
- I-15 ELP IMPROVEMENTS
- CAJALCO INTERCHANGE IMPROVEMENTS
- sd — EXISTING STORM DRAIN LINE
- SD — PROPOSED STORM DRAIN LINE
- PROPOSED TRIBUTARY AREA BOUNDARY
- PROPOSED SLOTTED DRAIN
- EXISTING STORM DRAIN INLET
- PROPOSED STORM DRAIN INLET
- FLOW DIRECTION
- POC — Point of Connection to Existing Pipe
- S-SS A.AA — TRIBUTARY AREA ID

Northbound Tributary Areas											
Inlet ID	Area ID	Area (A) (ac)	Impervious Area (ac)	Pervious Area (ac)	Percent Impervious	Runoff Coefficient (C)	Tc (min)	Rainfall Intensity (I_{25}) (in/hr)	Design Discharge Q_{25} = CIA (cfs)	Inlet Type	Remarks
N-1922	N-1922	0.258	0.25	0.00	1.00	0.99	5	3.61	**0.92**	GDO	
N-1923	N-1923	0.255	0.25	0.00	1.00	0.99	5	3.61	**0.91**	G1	
N-1925	N-1925	0.153	0.15	0.00	1.00	0.99	5	3.61	**0.55**	G1	
N-1926	N-1926	0.158	0.15	0.00	1.00	0.99	5	3.61	**0.56**	GDO	
N-1928A	N-1928A	0.266	0.26	0.00	1.00	0.99	5	3.61	**0.95**	G1	
N-1928B	N-1928B	0.098	0.09	0.00	1.00	0.99	5	3.61	**0.35**	G1	
N-1929A	N-1929A	0.044	0.04	0.00	1.00	0.99	5	3.61	**0.16**	G1	
N-1929B	N-1929B	0.070	0.07	0.00	1.00	0.99	5	3.61	**0.25**	GDO	
N-1930	N-1930	0.854	0.00	0.85	0.00	0.63	5	3.61	**1.95**	Existing	
N-1935	N-1935	4.767	1.84	2.93	0.39	0.77	5	3.61	**13.23**	Existing	
	N-1942	6.056	2.06	4.00	0.34	0.75	5	3.61	**16.45**		
	N-1945	4.687	2.30	2.39	0.49	0.81	5	3.61	**13.64**		

Southbound Tributary Areas											
Inlet ID	Area ID	Area (A) (ac)	Impervious Area (ac)	Pervious Area (ac)	Percent Impervious	Runoff Coefficient (C)	Tc (min)	Rainfall Intensity (I_{25}) (in/hr)	Design Discharge Q_{25} = CIA (cfs)	Inlet Type	Remarks
S-1930	S-1930	3.790	3.79	0.00	1.00	0.99	5	3.61	**13.55**	Existing	
S-1935	S-1935	1.180	1.18	0.00	1.00	0.99	5	3.61	**4.22**	Existing	
S-1949	S-1949	4.816	1.84	2.98	0.38	0.77	5	3.61	**13.34**	Existing	
	S-1955	4.616	2.67	1.95	0.58	0.84	5	3.61	**13.96**	Existing	

* Weighted Runoff Coefficient based on C=0.99 for impervious surfaces and C=0.63 for pervious surfaces. Refer to section **4.1.3 Runoff Coefficient** for design justification for C values.

* Rainfall intensity (I) per section **4.1.2 Rainfall Intensity** of this report.

* Refer to section **4.1.1 Rational Method** for design discharge (Q) methodology.

* Area (A) corresponds to total sub-area drainage in acres and is identified with the same ID as receiving inlet.

* Refer to section **4 Hydraulic Analysis** for a full breakdown of methodology for table components.

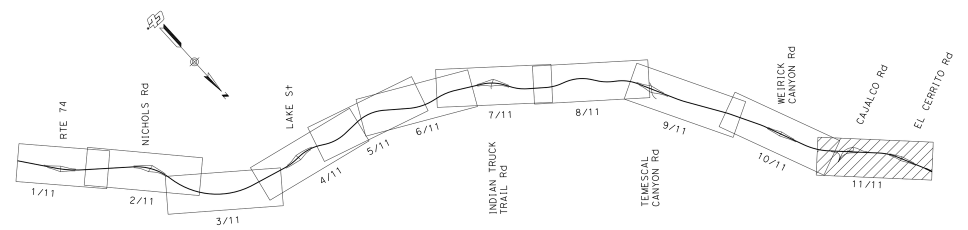
CURRENT PROJECT
EA: 0J0801
I-15 EXPRESS LANES PROJECT (ELP) DESIGN-BUILD
SPONSOR AGENCY: RCTC
OPENING YEAR: DECEMBER 2020

CURRENT PROJECT
EA: 0J6104
I-15 CAJALCO ROAD INTERCHANGE
SPONSOR AGENCY: CITY OF CORONA
OPENING YEAR: MARCH 2020

Note:
For POC callouts:

Qin = Flow discharged from proposed system to existing drainage system.

Qcap = Full flow capacity of existing drainage system.



KEY MAP

PROPOSED HYDROLOGY MAP

RIVERSIDE COUNTY TRANSPORTATION COMMISSION
Interstate 15 EXPRESS LANES PROJECT Southern Extension

Caltrans

HDR

THE ALLIANCE GROUP ENTERPRISE INC.

GRAPHIC SCALE
100 50 0 100 200
SCALE: 1" = 100'

CONCEPTUAL
NOT FOR CONSTRUCTION

I-15 EXPRESS LANES PROJECT
SOUTHERN EXTENSION (ELPSE)
EA 0J0820

HYDROLOGY EXHIBIT DRAWING

07/02/2021 | SHEET 11 OF 11

$DATE $REQUEST

Appendix C

NOAA Atlas 14 Data

POINT PRECIPITATION FREQUENCY (PF) ESTIMATES

WITH 90% CONFIDENCE INTERVALS AND SUPPLEMENTARY INFORMATION
NOAA Atlas 14, Volume 6, Version 2

NOAA Atlas 14, Volume 6, Version 2
Location name: Lake Elsinore, California, USA*
Latitude: 33.7299°, Longitude: -117.3947°
Elevation: 1234.84 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Sarah Dietz, Sarah Heim, Lillian Hiner, Kazungu Maitaria, Deborah Martin, Sandra Pavlovic, Ishani Roy, Carl Trypaluk, Dale Unruh, Fenglin Yan, Michael Yekta, Tan Zhao, Geoffrey Bonnin, Daniel Brewer, Li-Chuan Chen, Tye Parzybok, John Yarchoan

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches/hour)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	**1.09** (0.912-1.32)	**1.51** (1.26-1.82)	**2.08** (1.73-2.51)	**2.54** (2.10-3.11)	**3.20** (2.56-4.06)	**3.73** (2.92-4.82)	**4.27** (3.25-5.68)	**4.85** (3.58-6.62)	**5.65** (4.00-8.06)	**6.29** (4.28-9.31)
10-min	**0.786** (0.654-0.942)	**1.09** (0.906-1.31)	**1.49** (1.24-1.80)	**1.82** (1.51-2.23)	**2.30** (1.84-2.90)	**2.67** (2.09-3.46)	**3.06** (2.33-4.06)	**3.47** (2.57-4.75)	**4.05** (2.86-5.78)	**4.51** (3.07-6.68)
15-min	**0.632** (0.528-0.760)	**0.872** (0.732-1.06)	**1.20** (1.00-1.45)	**1.47** (1.22-1.80)	**1.85** (1.48-2.34)	**2.15** (1.68-2.78)	**2.47** (1.88-3.28)	**2.80** (2.07-3.83)	**3.26** (2.31-4.66)	**3.64** (2.48-5.38)
30-min	**0.480** (0.402-0.580)	**0.664** (0.556-0.802)	**0.912** (0.762-1.11)	**1.12** (0.926-1.37)	**1.41** (1.13-1.78)	**1.64** (1.28-2.12)	**1.88** (1.43-2.49)	**2.13** (1.57-2.91)	**2.48** (1.76-3.55)	**2.77** (1.89-4.10)
60-min	**0.358** (0.300-0.431)	**0.494** (0.414-0.597)	**0.679** (0.566-0.822)	**0.833** (0.689-1.02)	**1.05** (0.837-1.33)	**1.22** (0.952-1.58)	**1.40** (1.06-1.85)	**1.59** (1.17-2.17)	**1.85** (1.31-2.64)	**2.06** (1.40-3.05)
2-hr	**0.270** (0.226-0.326)	**0.355** (0.297-0.429)	**0.471** (0.393-0.570)	**0.569** (0.470-0.695)	**0.706** (0.564-0.894)	**0.816** (0.637-1.06)	**0.931** (0.708-1.24)	**1.05** (0.778-1.44)	**1.22** (0.864-1.75)	**1.36** (0.926-2.01)
3-hr	**0.223** (0.187-0.269)	**0.290** (0.242-0.350)	**0.380** (0.317-0.460)	**0.456** (0.377-0.557)	**0.563** (0.450-0.713)	**0.649** (0.507-0.840)	**0.739** (0.562-0.981)	**0.834** (0.616-1.14)	**0.967** (0.684-1.38)	**1.07** (0.732-1.59)
6-hr	**0.159** (0.134-0.192)	**0.205** (0.172-0.248)	**0.267** (0.223-0.323)	**0.319** (0.264-0.390)	**0.392** (0.313-0.496)	**0.450** (0.352-0.583)	**0.511** (0.389-0.679)	**0.575** (0.425-0.787)	**0.665** (0.471-0.951)	**0.737** (0.503-1.09)
12-hr	**0.104** (0.087-0.125)	**0.137** (0.114-0.165)	**0.180** (0.150-0.218)	**0.216** (0.179-0.264)	**0.267** (0.213-0.337)	**0.306** (0.239-0.395)	**0.346** (0.263-0.459)	**0.388** (0.287-0.531)	**0.446** (0.315-0.637)	**0.492** (0.335-0.729)
24-hr	**0.069** (0.061-0.079)	**0.094** (0.083-0.108)	**0.127** (0.112-0.147)	**0.154** (0.134-0.179)	**0.190** (0.161-0.229)	**0.219** (0.181-0.269)	**0.247** (0.200-0.312)	**0.277** (0.219-0.359)	**0.318** (0.241-0.428)	**0.349** (0.256-0.487)
2-day	**0.041** (0.036-0.047)	**0.058** (0.051-0.067)	**0.079** (0.070-0.092)	**0.097** (0.085-0.114)	**0.122** (0.103-0.147)	**0.141** (0.117-0.173)	**0.160** (0.130-0.201)	**0.180** (0.142-0.233)	**0.207** (0.157-0.279)	**0.229** (0.168-0.319)
3-day	**0.029** (0.026-0.034)	**0.042** (0.037-0.048)	**0.059** (0.052-0.068)	**0.072** (0.063-0.084)	**0.091** (0.077-0.110)	**0.106** (0.088-0.130)	**0.121** (0.098-0.152)	**0.136** (0.108-0.176)	**0.158** (0.120-0.213)	**0.175** (0.128-0.244)
4-day	**0.024** (0.021-0.027)	**0.034** (0.030-0.040)	**0.048** (0.042-0.056)	**0.060** (0.052-0.070)	**0.075** (0.064-0.091)	**0.088** (0.073-0.108)	**0.101** (0.082-0.127)	**0.114** (0.090-0.148)	**0.133** (0.101-0.179)	**0.148** (0.108-0.206)
7-day	**0.015** (0.014-0.018)	**0.022** (0.020-0.026)	**0.032** (0.028-0.037)	**0.039** (0.034-0.046)	**0.050** (0.043-0.061)	**0.059** (0.049-0.073)	**0.068** (0.055-0.086)	**0.078** (0.062-0.101)	**0.092** (0.070-0.124)	**0.103** (0.075-0.143)
10-day	**0.011** (0.010-0.013)	**0.017** (0.015-0.019)	**0.024** (0.021-0.027)	**0.030** (0.026-0.035)	**0.038** (0.032-0.046)	**0.045** (0.037-0.056)	**0.052** (0.042-0.066)	**0.060** (0.047-0.078)	**0.071** (0.054-0.096)	**0.080** (0.059-0.112)
20-day	**0.007** (0.006-0.008)	**0.010** (0.009-0.011)	**0.014** (0.013-0.017)	**0.018** (0.016-0.021)	**0.024** (0.020-0.028)	**0.028** (0.023-0.035)	**0.033** (0.027-0.042)	**0.038** (0.030-0.049)	**0.046** (0.035-0.062)	**0.052** (0.038-0.073)
30-day	**0.005** (0.005-0.006)	**0.008** (0.007-0.009)	**0.011** (0.010-0.013)	**0.014** (0.012-0.017)	**0.019** (0.016-0.023)	**0.022** (0.019-0.027)	**0.026** (0.021-0.033)	**0.031** (0.024-0.040)	**0.037** (0.028-0.050)	**0.042** (0.031-0.059)
45-day	**0.004** (0.004-0.005)	**0.006** (0.005-0.007)	**0.009** (0.008-0.010)	**0.011** (0.010-0.013)	**0.015** (0.012-0.017)	**0.017** (0.014-0.021)	**0.021** (0.017-0.026)	**0.024** (0.019-0.031)	**0.029** (0.022-0.039)	**0.033** (0.025-0.047)
60-day	**0.004** (0.003-0.004)	**0.005** (0.005-0.006)	**0.007** (0.006-0.009)	**0.009** (0.008-0.011)	**0.012** (0.010-0.015)	**0.015** (0.012-0.018)	**0.017** (0.014-0.022)	**0.020** (0.016-0.026)	**0.025** (0.019-0.033)	**0.029** (0.021-0.040)

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

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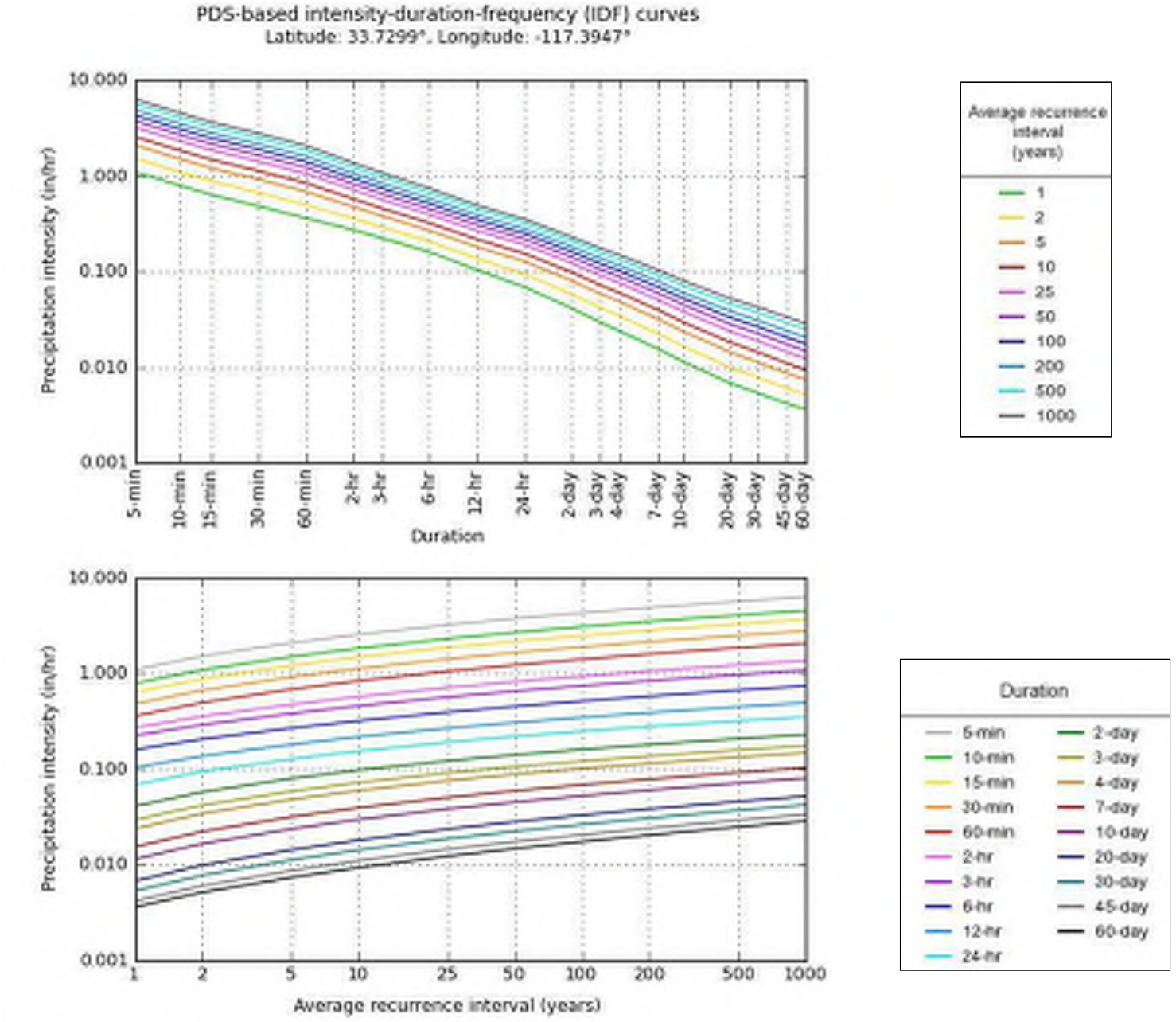
PF graphical



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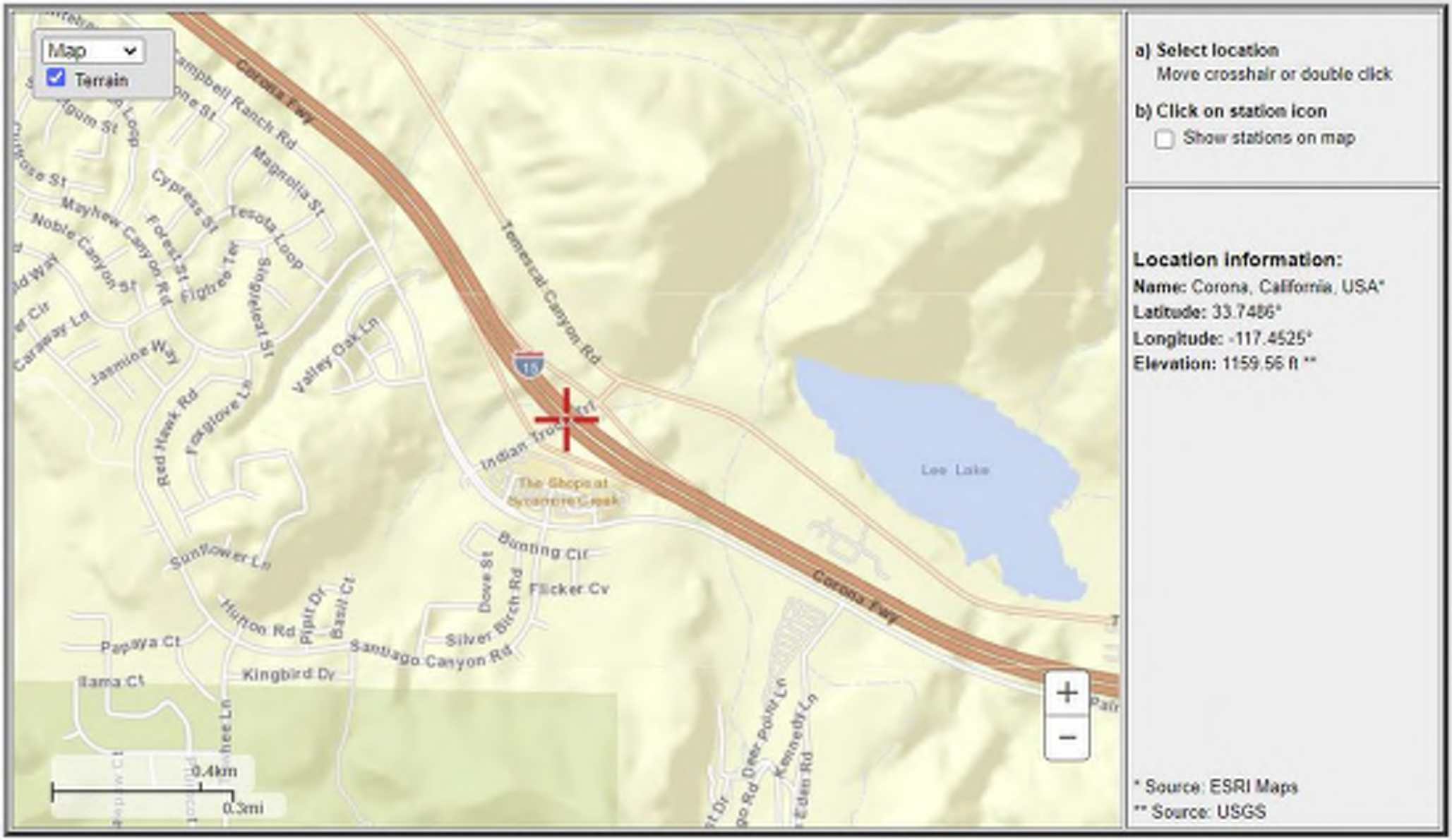
Maps & aerials

Small scale terrain



POINT PRECIPITATION FREQUENCY (PF) ESTIMATES

WITH 90% CONFIDENCE INTERVALS AND SUPPLEMENTARY INFORMATION
NOAA Atlas 14, Volume 6, Version 2

NOAA Atlas 14, Volume 6, Version 2
Location name: Corona, California, USA*
Latitude: 33.7486°, Longitude: -117.4525°
Elevation: 1159.56 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Sarah Dietz, Sarah Heim, Lillian Hiner, Kazungu Maitaria, Deborah Martin, Sandra Pavlovic, Ishani Roy, Carl Trypaluk, Dale Unruh, Fenglin Yan, Michael Yekta, Tan Zhao, Geoffrey Bonnin, Daniel Brewer, Li-Chuan Chen, Tye Parzybok, John Yarchoan

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches/hour)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	**1.12** (0.936-1.34)	**1.55** (1.30-1.87)	**2.14** (1.79-2.59)	**2.62** (2.17-3.20)	**3.29** (2.63-4.15)	**3.80** (2.96-4.92)	**4.33** (3.30-5.76)	**4.90** (3.61-6.68)	**5.65** (4.00-8.08)	**6.25** (4.26-9.25)
10-min	**0.798** (0.666-0.960)	**1.11** (0.930-1.34)	**1.53** (1.28-1.85)	**1.88** (1.55-2.29)	**2.35** (1.88-2.98)	**2.72** (2.13-3.53)	**3.11** (2.36-4.13)	**3.50** (2.59-4.79)	**4.05** (2.86-5.79)	**4.48** (3.05-6.63)
15-min	**0.644** (0.536-0.776)	**0.896** (0.752-1.08)	**1.24** (1.03-1.50)	**1.52** (1.25-1.85)	**1.90** (1.52-2.40)	**2.20** (1.72-2.84)	**2.50** (1.91-3.33)	**2.83** (2.09-3.86)	**3.26** (2.31-4.66)	**3.61** (2.46-5.35)
30-min	**0.482** (0.404-0.582)	**0.674** (0.564-0.814)	**0.928** (0.774-1.12)	**1.14** (0.940-1.39)	**1.43** (1.14-1.80)	**1.65** (1.29-2.14)	**1.88** (1.43-2.50)	**2.12** (1.57-2.90)	**2.45** (1.73-3.51)	**2.71** (1.85-4.02)
60-min	**0.351** (0.294-0.423)	**0.490** (0.410-0.592)	**0.675** (0.563-0.817)	**0.827** (0.684-1.01)	**1.04** (0.828-1.31)	**1.20** (0.937-1.55)	**1.37** (1.04-1.82)	**1.54** (1.14-2.11)	**1.78** (1.26-2.55)	**1.97** (1.34-2.92)
2-hr	**0.260** (0.218-0.314)	**0.345** (0.288-0.416)	**0.460** (0.383-0.556)	**0.555** (0.459-0.678)	**0.689** (0.550-0.872)	**0.795** (0.621-1.03)	**0.906** (0.689-1.20)	**1.02** (0.754-1.40)	**1.18** (0.836-1.69)	**1.31** (0.893-1.94)
3-hr	**0.214** (0.179-0.258)	**0.278** (0.233-0.336)	**0.366** (0.306-0.444)	**0.441** (0.364-0.538)	**0.545** (0.435-0.690)	**0.628** (0.491-0.813)	**0.715** (0.544-0.949)	**0.807** (0.596-1.10)	**0.935** (0.661-1.34)	**1.04** (0.706-1.54)
6-hr	**0.150** (0.126-0.181)	**0.193** (0.161-0.233)	**0.252** (0.210-0.305)	**0.302** (0.249-0.368)	**0.372** (0.297-0.470)	**0.428** (0.334-0.553)	**0.486** (0.370-0.646)	**0.549** (0.405-0.750)	**0.636** (0.450-0.908)	**0.705** (0.481-1.05)
12-hr	**0.097** (0.081-0.116)	**0.127** (0.106-0.153)	**0.167** (0.140-0.203)	**0.201** (0.166-0.246)	**0.249** (0.198-0.315)	**0.286** (0.223-0.370)	**0.325** (0.247-0.431)	**0.366** (0.270-0.500)	**0.422** (0.298-0.603)	**0.467** (0.318-0.692)
24-hr	**0.064** (0.056-0.073)	**0.086** (0.076-0.099)	**0.116** (0.102-0.134)	**0.141** (0.123-0.164)	**0.175** (0.148-0.211)	**0.201** (0.167-0.248)	**0.229** (0.185-0.288)	**0.257** (0.203-0.333)	**0.296** (0.224-0.399)	**0.327** (0.239-0.455)
2-day	**0.038** (0.034-0.044)	**0.053** (0.047-0.061)	**0.072** (0.064-0.084)	**0.089** (0.077-0.103)	**0.111** (0.094-0.133)	**0.128** (0.106-0.157)	**0.146** (0.118-0.183)	**0.164** (0.129-0.212)	**0.189** (0.143-0.255)	**0.209** (0.153-0.291)
3-day	**0.028** (0.024-0.032)	**0.039** (0.034-0.045)	**0.053** (0.047-0.062)	**0.066** (0.057-0.077)	**0.083** (0.070-0.100)	**0.096** (0.079-0.118)	**0.109** (0.089-0.138)	**0.123** (0.097-0.160)	**0.143** (0.108-0.193)	**0.158** (0.116-0.221)
4-day	**0.022** (0.020-0.026)	**0.032** (0.028-0.036)	**0.044** (0.039-0.051)	**0.054** (0.047-0.063)	**0.069** (0.058-0.083)	**0.080** (0.066-0.098)	**0.091** (0.074-0.115)	**0.103** (0.081-0.134)	**0.120** (0.091-0.162)	**0.133** (0.098-0.186)
7-day	**0.014** (0.013-0.017)	**0.021** (0.018-0.024)	**0.029** (0.025-0.034)	**0.036** (0.031-0.042)	**0.046** (0.039-0.055)	**0.054** (0.045-0.066)	**0.062** (0.050-0.078)	**0.071** (0.056-0.091)	**0.083** (0.063-0.111)	**0.092** (0.068-0.129)
10-day	**0.011** (0.009-0.012)	**0.015** (0.014-0.018)	**0.022** (0.019-0.025)	**0.027** (0.024-0.032)	**0.035** (0.030-0.042)	**0.041** (0.034-0.051)	**0.048** (0.039-0.060)	**0.055** (0.043-0.071)	**0.064** (0.049-0.087)	**0.072** (0.053-0.101)
20-day	**0.006** (0.006-0.007)	**0.009** (0.008-0.011)	**0.013** (0.012-0.015)	**0.017** (0.014-0.019)	**0.021** (0.018-0.026)	**0.026** (0.021-0.031)	**0.030** (0.024-0.038)	**0.035** (0.027-0.045)	**0.041** (0.031-0.056)	**0.047** (0.034-0.065)
30-day	**0.005** (0.004-0.006)	**0.007** (0.006-0.008)	**0.010** (0.009-0.012)	**0.013** (0.011-0.015)	**0.017** (0.015-0.021)	**0.021** (0.017-0.025)	**0.024** (0.020-0.030)	**0.028** (0.022-0.036)	**0.034** (0.025-0.045)	**0.038** (0.028-0.053)
45-day	**0.004** (0.003-0.004)	**0.006** (0.005-0.006)	**0.008** (0.007-0.009)	**0.010** (0.009-0.012)	**0.013** (0.011-0.016)	**0.016** (0.013-0.020)	**0.019** (0.015-0.024)	**0.022** (0.017-0.029)	**0.027** (0.020-0.036)	**0.030** (0.022-0.042)
60-day	**0.003** (0.003-0.004)	**0.005** (0.004-0.006)	**0.007** (0.006-0.008)	**0.009** (0.008-0.010)	**0.011** (0.010-0.014)	**0.014** (0.011-0.017)	**0.016** (0.013-0.020)	**0.019** (0.015-0.024)	**0.023** (0.017-0.031)	**0.026** (0.019-0.036)

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

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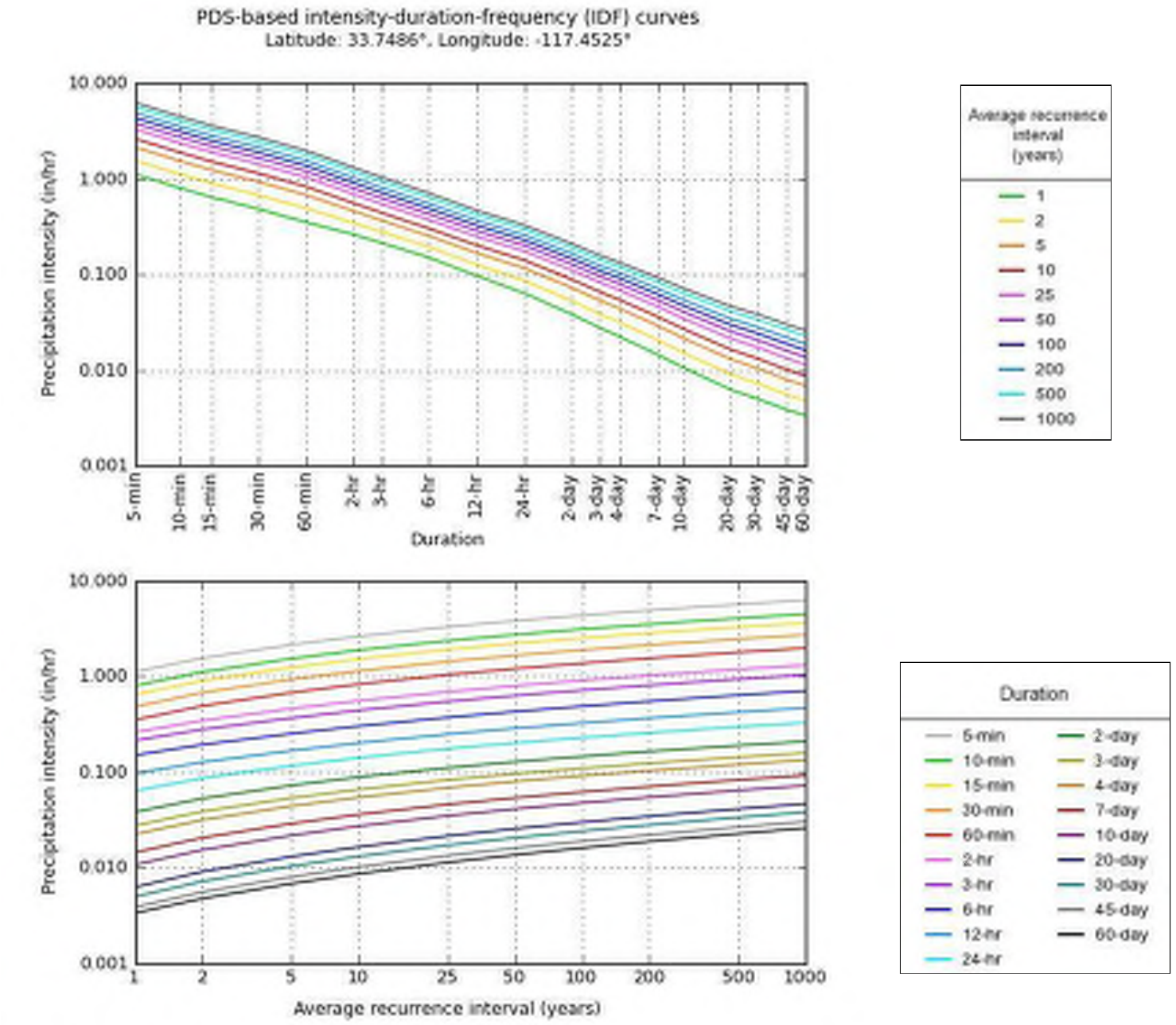
PF graphical



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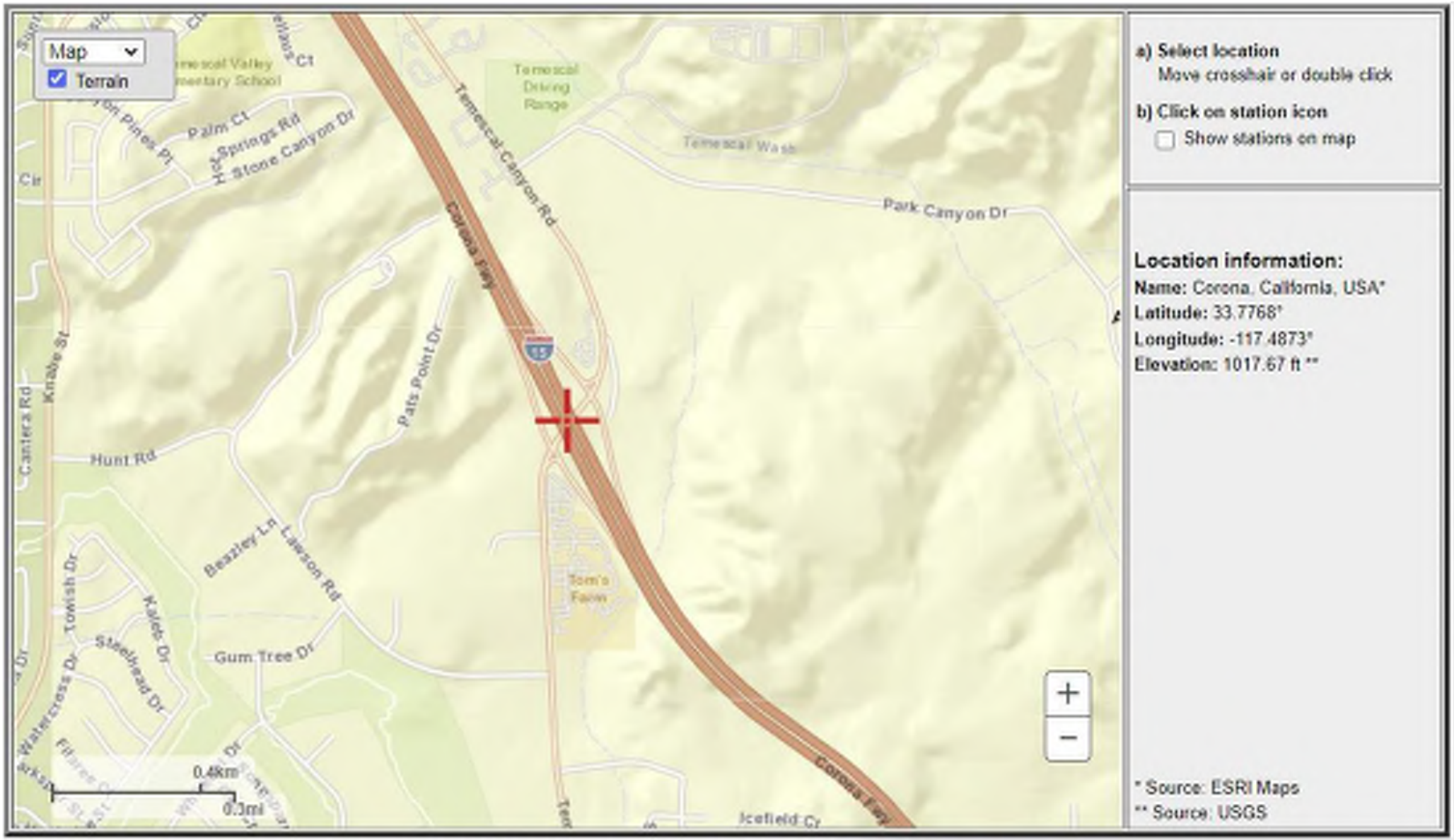

POINT PRECIPITATION FREQUENCY (PF) ESTIMATES

WITH 90% CONFIDENCE INTERVALS AND SUPPLEMENTARY INFORMATION
NOAA Atlas 14, Volume 6, Version 2

NOAA Atlas 14, Volume 6, Version 2
Location name: Corona, California, USA*
Latitude: 33.7768°, Longitude: -117.4873°
Elevation: 1017.67 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Sarah Dietz, Sarah Heim, Lillian Hiner, Kazungu Maitaria, Deborah Martin, Sandra Pavlovic, Ishani Roy, Carl Trypaluk, Dale Unruh, Fenglin Yan, Michael Yekta, Tan Zhao, Geoffrey Bonnin, Daniel Brewer, Li-Chuan Chen, Tye Parzybok, John Yarchoan

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches/hour)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	**1.13** (0.948-1.36)	**1.61** (1.34-1.93)	**2.23** (1.86-2.71)	**2.76** (2.28-3.36)	**3.47** (2.77-4.39)	**4.03** (3.14-5.21)	**4.61** (3.50-6.11)	**5.21** (3.84-7.12)	**6.02** (4.26-8.62)	**6.67** (4.55-9.89)
10-min	**0.810** (0.678-0.972)	**1.15** (0.960-1.39)	**1.60** (1.34-1.94)	**1.97** (1.63-2.41)	**2.49** (1.99-3.15)	**2.89** (2.26-3.74)	**3.30** (2.51-4.38)	**3.73** (2.75-5.10)	**4.32** (3.05-6.17)	**4.78** (3.26-7.09)
15-min	**0.652** (0.544-0.784)	**0.928** (0.776-1.12)	**1.29** (1.08-1.56)	**1.59** (1.32-1.94)	**2.00** (1.60-2.54)	**2.33** (1.82-3.01)	**2.66** (2.02-3.53)	**3.01** (2.22-4.11)	**3.48** (2.46-4.98)	**3.86** (2.63-5.72)
30-min	**0.482** (0.404-0.582)	**0.686** (0.574-0.830)	**0.958** (0.798-1.16)	**1.18** (0.976-1.44)	**1.49** (1.19-1.88)	**1.73** (1.35-2.23)	**1.97** (1.50-2.62)	**2.23** (1.65-3.05)	**2.58** (1.82-3.69)	**2.86** (1.95-4.24)
60-min	**0.350** (0.293-0.422)	**0.497** (0.416-0.601)	**0.693** (0.578-0.840)	**0.854** (0.706-1.04)	**1.08** (0.859-1.36)	**1.25** (0.976-1.62)	**1.43** (1.09-1.90)	**1.61** (1.19-2.21)	**1.87** (1.32-2.67)	**2.07** (1.41-3.07)
2-hr	**0.262** (0.219-0.316)	**0.351** (0.294-0.424)	**0.472** (0.393-0.571)	**0.572** (0.473-0.700)	**0.714** (0.570-0.904)	**0.826** (0.645-1.07)	**0.942** (0.717-1.25)	**1.07** (0.787-1.46)	**1.24** (0.874-1.77)	**1.37** (0.936-2.03)
3-hr	**0.216** (0.181-0.261)	**0.285** (0.238-0.344)	**0.378** (0.315-0.458)	**0.457** (0.377-0.558)	**0.567** (0.453-0.718)	**0.655** (0.511-0.848)	**0.748** (0.568-0.993)	**0.845** (0.624-1.16)	**0.982** (0.694-1.40)	**1.09** (0.744-1.62)
6-hr	**0.153** (0.128-0.185)	**0.198** (0.166-0.240)	**0.261** (0.217-0.315)	**0.313** (0.259-0.382)	**0.387** (0.309-0.490)	**0.447** (0.349-0.578)	**0.509** (0.387-0.676)	**0.576** (0.425-0.787)	**0.669** (0.473-0.956)	**0.744** (0.507-1.10)
12-hr	**0.100** (0.083-0.120)	**0.131** (0.109-0.158)	**0.173** (0.144-0.210)	**0.208** (0.172-0.255)	**0.258** (0.206-0.327)	**0.298** (0.232-0.385)	**0.339** (0.258-0.450)	**0.383** (0.283-0.523)	**0.444** (0.313-0.634)	**0.492** (0.336-0.730)
24-hr	**0.066** (0.058-0.076)	**0.089** (0.078-0.102)	**0.119** (0.105-0.138)	**0.144** (0.126-0.168)	**0.179** (0.152-0.216)	**0.207** (0.171-0.254)	**0.235** (0.191-0.296)	**0.265** (0.209-0.343)	**0.307** (0.232-0.413)	**0.340** (0.249-0.473)
2-day	**0.040** (0.035-0.046)	**0.055** (0.048-0.063)	**0.074** (0.066-0.086)	**0.091** (0.079-0.106)	**0.113** (0.096-0.136)	**0.131** (0.109-0.161)	**0.149** (0.121-0.188)	**0.168** (0.132-0.218)	**0.194** (0.147-0.262)	**0.215** (0.157-0.299)
3-day	**0.029** (0.025-0.033)	**0.040** (0.035-0.046)	**0.054** (0.048-0.063)	**0.066** (0.058-0.078)	**0.083** (0.070-0.100)	**0.096** (0.080-0.119)	**0.110** (0.089-0.139)	**0.124** (0.098-0.161)	**0.144** (0.109-0.194)	**0.160** (0.117-0.222)
4-day	**0.023** (0.021-0.027)	**0.032** (0.029-0.037)	**0.045** (0.039-0.052)	**0.055** (0.048-0.064)	**0.069** (0.058-0.083)	**0.080** (0.066-0.099)	**0.092** (0.074-0.115)	**0.104** (0.082-0.134)	**0.120** (0.091-0.162)	**0.134** (0.098-0.186)
7-day	**0.015** (0.013-0.017)	**0.021** (0.019-0.025)	**0.030** (0.026-0.034)	**0.037** (0.032-0.043)	**0.046** (0.039-0.056)	**0.054** (0.045-0.067)	**0.062** (0.050-0.078)	**0.071** (0.056-0.091)	**0.083** (0.063-0.111)	**0.092** (0.067-0.128)
10-day	**0.011** (0.010-0.013)	**0.016** (0.014-0.018)	**0.022** (0.020-0.026)	**0.028** (0.024-0.033)	**0.036** (0.030-0.043)	**0.042** (0.035-0.051)	**0.048** (0.039-0.061)	**0.055** (0.043-0.071)	**0.064** (0.049-0.087)	**0.072** (0.053-0.100)
20-day	**0.007** (0.006-0.008)	**0.010** (0.008-0.011)	**0.014** (0.012-0.016)	**0.017** (0.015-0.020)	**0.022** (0.019-0.027)	**0.026** (0.022-0.032)	**0.030** (0.025-0.038)	**0.035** (0.027-0.045)	**0.041** (0.031-0.056)	**0.047** (0.034-0.065)
30-day	**0.005** (0.005-0.006)	**0.008** (0.007-0.009)	**0.011** (0.009-0.012)	**0.014** (0.012-0.016)	**0.018** (0.015-0.021)	**0.021** (0.017-0.026)	**0.024** (0.020-0.031)	**0.028** (0.022-0.037)	**0.034** (0.026-0.045)	**0.038** (0.028-0.053)
45-day	**0.004** (0.004-0.005)	**0.006** (0.005-0.007)	**0.008** (0.007-0.010)	**0.011** (0.009-0.012)	**0.014** (0.012-0.017)	**0.016** (0.014-0.020)	**0.019** (0.016-0.024)	**0.023** (0.018-0.029)	**0.027** (0.021-0.037)	**0.031** (0.023-0.043)
60-day	**0.004** (0.003-0.004)	**0.005** (0.004-0.006)	**0.007** (0.006-0.008)	**0.009** (0.008-0.010)	**0.012** (0.010-0.014)	**0.014** (0.012-0.017)	**0.017** (0.013-0.021)	**0.019** (0.015-0.025)	**0.023** (0.018-0.031)	**0.027** (0.020-0.037)

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

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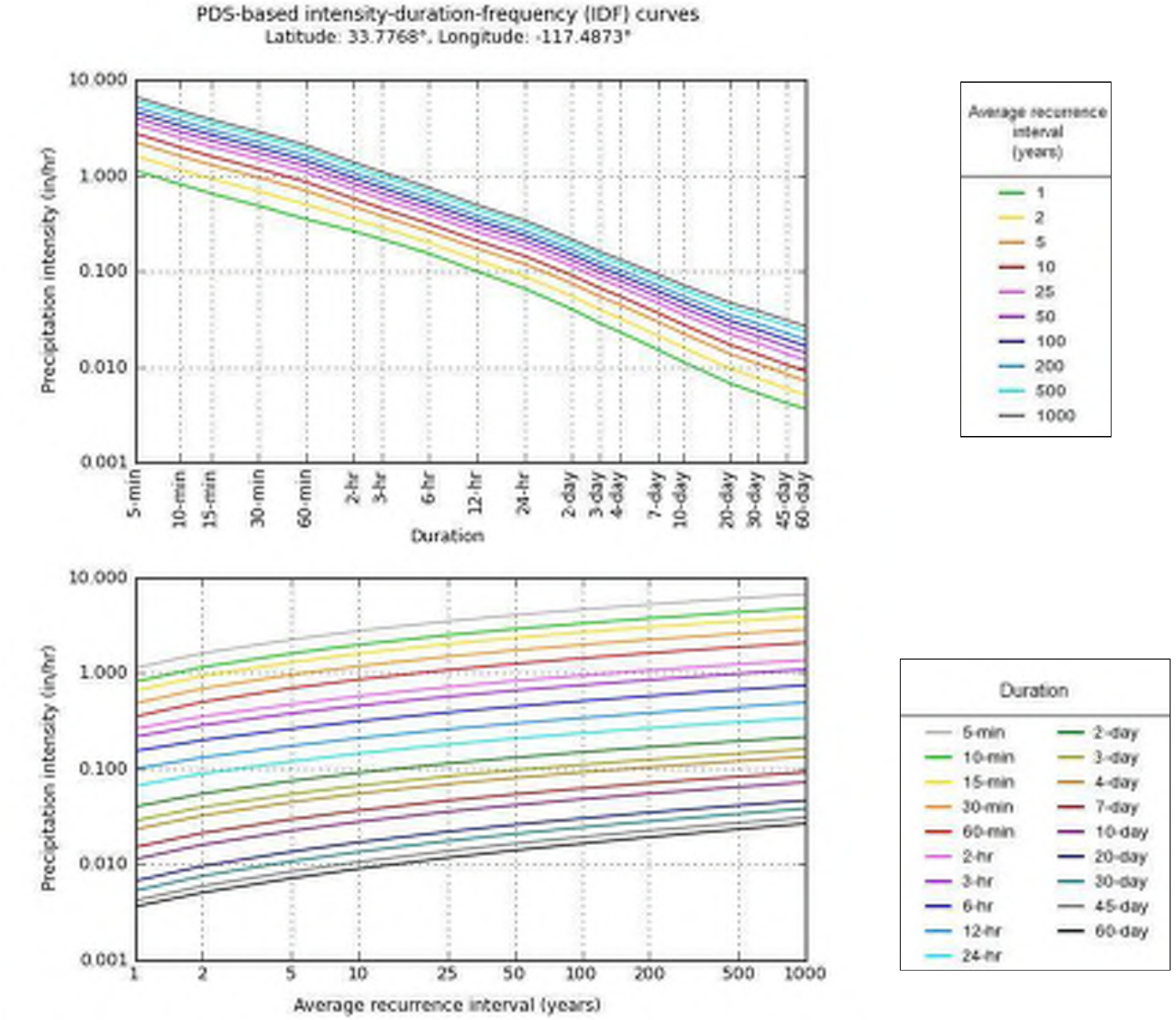
PF graphical



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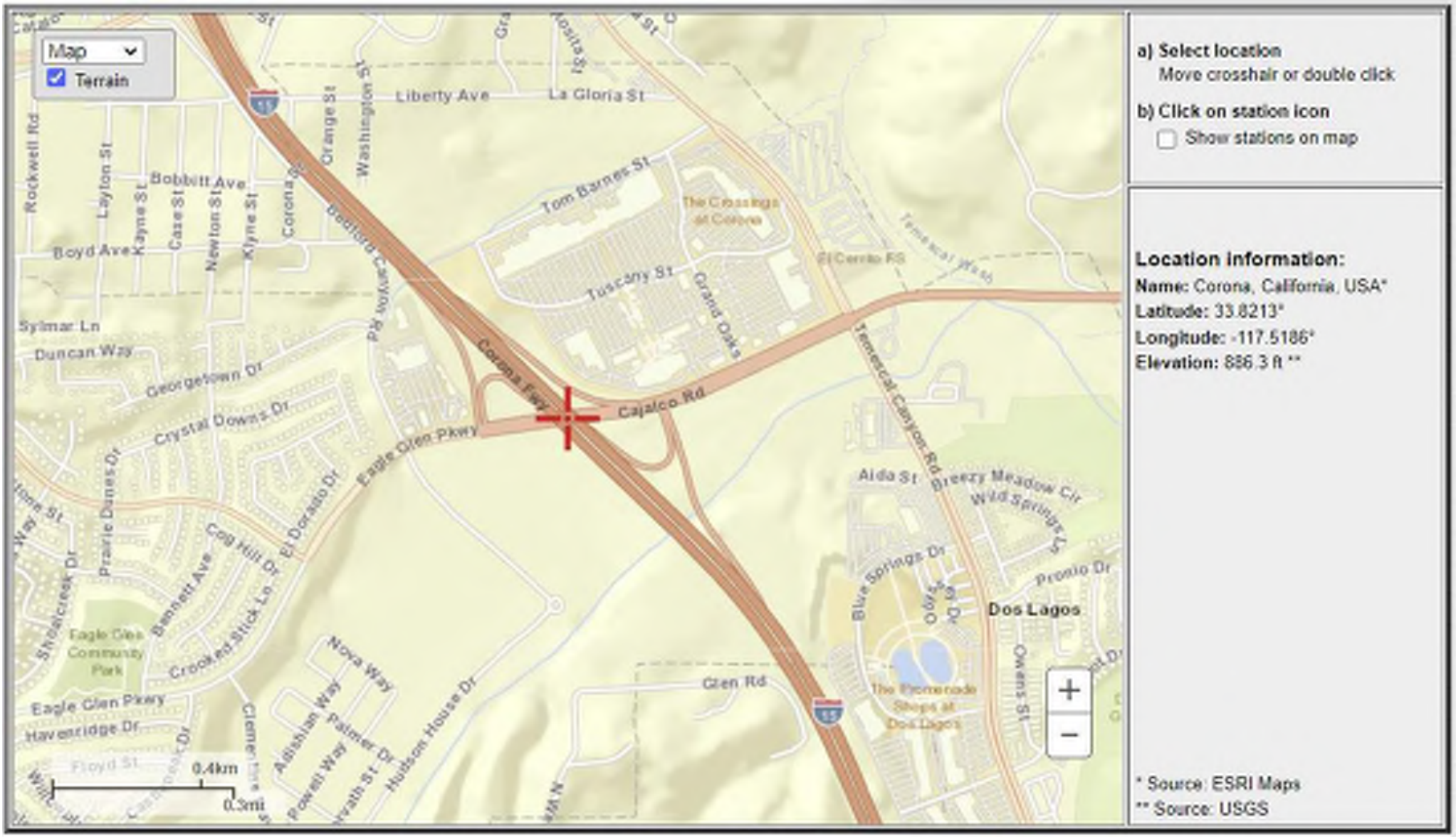

POINT PRECIPITATION FREQUENCY (PF) ESTIMATES

WITH 90% CONFIDENCE INTERVALS AND SUPPLEMENTARY INFORMATION
NOAA Atlas 14, Volume 6, Version 2

NOAA Atlas 14, Volume 6, Version 2
Location name: Corona, California, USA*
Latitude: 33.8216°, Longitude: -117.5188°
Elevation: 887.74 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Sarah Dietz, Sarah Heim, Lillian Hiner, Kazungu Maitaria, Deborah Martin, Sandra Pavlovic, Ishani Roy, Carl Trypaluk, Dale Unruh, Fenglin Yan, Michael Yekta, Tan Zhao, Geoffrey Bonnin, Daniel Brewer, Li-Chuan Chen, Tye Parzybok, John Yarchoan

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches/hour)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	**1.19** (0.996-1.44)	**1.68** (1.40-2.03)	**2.33** (1.94-2.82)	**2.87** (2.38-3.50)	**3.61** (2.88-4.57)	**4.20** (3.28-5.44)	**4.81** (3.66-6.38)	**5.45** (4.02-7.45)	**6.34** (4.48-9.06)	**7.04** (4.80-10.4)
10-min	**0.858** (0.714-1.03)	**1.21** (1.01-1.46)	**1.67** (1.39-2.02)	**2.06** (1.70-2.51)	**2.59** (2.06-3.28)	**3.01** (2.35-3.90)	**3.44** (2.62-4.58)	**3.91** (2.88-5.34)	**4.54** (3.21-6.49)	**5.05** (3.44-7.48)
15-min	**0.688** (0.576-0.832)	**0.972** (0.812-1.17)	**1.35** (1.12-1.63)	**1.66** (1.37-2.03)	**2.09** (1.67-2.64)	**2.43** (1.89-3.14)	**2.78** (2.11-3.69)	**3.15** (2.32-4.31)	**3.66** (2.59-5.23)	**4.07** (2.77-6.03)
30-min	**0.508** (0.424-0.612)	**0.714** (0.596-0.862)	**0.990** (0.826-1.20)	**1.22** (1.01-1.49)	**1.54** (1.23-1.94)	**1.79** (1.39-2.31)	**2.04** (1.55-2.71)	**2.31** (1.71-3.17)	**2.69** (1.90-3.85)	**2.99** (2.04-4.44)
60-min	**0.371** (0.311-0.448)	**0.523** (0.437-0.632)	**0.725** (0.604-0.879)	**0.892** (0.737-1.09)	**1.12** (0.897-1.42)	**1.31** (1.02-1.69)	**1.50** (1.14-1.99)	**1.70** (1.25-2.32)	**1.97** (1.39-2.82)	**2.19** (1.49-3.25)
2-hr	**0.278** (0.234-0.336)	**0.374** (0.312-0.452)	**0.504** (0.420-0.610)	**0.612** (0.506-0.748)	**0.764** (0.610-0.968)	**0.886** (0.690-1.15)	**1.01** (0.770-1.34)	**1.15** (0.846-1.57)	**1.33** (0.943-1.91)	**1.49** (1.01-2.20)
3-hr	**0.231** (0.194-0.279)	**0.306** (0.256-0.370)	**0.408** (0.340-0.495)	**0.494** (0.408-0.603)	**0.615** (0.490-0.778)	**0.711** (0.555-0.921)	**0.813** (0.618-1.08)	**0.920** (0.679-1.26)	**1.07** (0.758-1.53)	**1.20** (0.814-1.77)
6-hr	**0.164** (0.138-0.198)	**0.215** (0.180-0.260)	**0.284** (0.237-0.344)	**0.343** (0.283-0.419)	**0.425** (0.339-0.538)	**0.491** (0.383-0.636)	**0.561** (0.426-0.745)	**0.635** (0.469-0.869)	**0.740** (0.523-1.06)	**0.825** (0.562-1.22)
12-hr	**0.107** (0.090-0.129)	**0.142** (0.118-0.171)	**0.188** (0.157-0.228)	**0.228** (0.188-0.278)	**0.283** (0.225-0.358)	**0.327** (0.255-0.423)	**0.373** (0.283-0.495)	**0.421** (0.311-0.577)	**0.490** (0.346-0.701)	**0.546** (0.372-0.809)
24-hr	**0.071** (0.063-0.082)	**0.096** (0.085-0.111)	**0.129** (0.114-0.149)	**0.157** (0.137-0.183)	**0.195** (0.165-0.235)	**0.225** (0.187-0.277)	**0.257** (0.208-0.324)	**0.291** (0.229-0.376)	**0.337** (0.255-0.454)	**0.374** (0.274-0.522)
2-day	**0.044** (0.039-0.051)	**0.060** (0.053-0.069)	**0.081** (0.071-0.094)	**0.099** (0.086-0.115)	**0.123** (0.104-0.148)	**0.142** (0.118-0.175)	**0.163** (0.132-0.205)	**0.184** (0.145-0.238)	**0.213** (0.161-0.287)	**0.236** (0.173-0.330)
3-day	**0.031** (0.028-0.036)	**0.043** (0.038-0.050)	**0.059** (0.052-0.068)	**0.072** (0.063-0.083)	**0.090** (0.076-0.108)	**0.104** (0.086-0.128)	**0.119** (0.096-0.150)	**0.134** (0.106-0.174)	**0.156** (0.118-0.211)	**0.174** (0.127-0.242)
4-day	**0.025** (0.023-0.029)	**0.035** (0.031-0.041)	**0.048** (0.042-0.056)	**0.059** (0.052-0.069)	**0.074** (0.063-0.089)	**0.086** (0.071-0.106)	**0.098** (0.080-0.124)	**0.112** (0.088-0.144)	**0.130** (0.098-0.175)	**0.144** (0.106-0.201)
7-day	**0.017** (0.015-0.019)	**0.023** (0.020-0.027)	**0.032** (0.028-0.037)	**0.039** (0.034-0.046)	**0.050** (0.042-0.060)	**0.058** (0.048-0.071)	**0.066** (0.054-0.083)	**0.075** (0.059-0.097)	**0.088** (0.067-0.118)	**0.098** (0.072-0.137)
10-day	**0.013** (0.011-0.015)	**0.018** (0.016-0.020)	**0.024** (0.021-0.028)	**0.030** (0.026-0.035)	**0.038** (0.032-0.046)	**0.044** (0.037-0.055)	**0.051** (0.041-0.064)	**0.058** (0.046-0.075)	**0.068** (0.052-0.092)	**0.076** (0.056-0.106)
20-day	**0.008** (0.007-0.009)	**0.011** (0.009-0.012)	**0.015** (0.013-0.017)	**0.018** (0.016-0.021)	**0.023** (0.020-0.028)	**0.027** (0.023-0.034)	**0.032** (0.026-0.040)	**0.037** (0.029-0.047)	**0.043** (0.033-0.058)	**0.049** (0.036-0.068)
30-day	**0.006** (0.005-0.007)	**0.008** (0.007-0.010)	**0.012** (0.010-0.014)	**0.015** (0.013-0.017)	**0.019** (0.016-0.023)	**0.022** (0.018-0.027)	**0.026** (0.021-0.032)	**0.030** (0.023-0.038)	**0.035** (0.027-0.048)	**0.040** (0.029-0.056)
45-day	**0.005** (0.004-0.006)	**0.007** (0.006-0.008)	**0.009** (0.008-0.011)	**0.012** (0.010-0.013)	**0.015** (0.013-0.018)	**0.018** (0.015-0.022)	**0.021** (0.017-0.026)	**0.024** (0.019-0.031)	**0.029** (0.022-0.039)	**0.033** (0.024-0.046)
60-day	**0.004** (0.004-0.005)	**0.006** (0.005-0.007)	**0.008** (0.007-0.009)	**0.010** (0.009-0.011)	**0.013** (0.011-0.015)	**0.015** (0.012-0.018)	**0.018** (0.014-0.022)	**0.021** (0.016-0.027)	**0.025** (0.019-0.033)	**0.028** (0.021-0.040)

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

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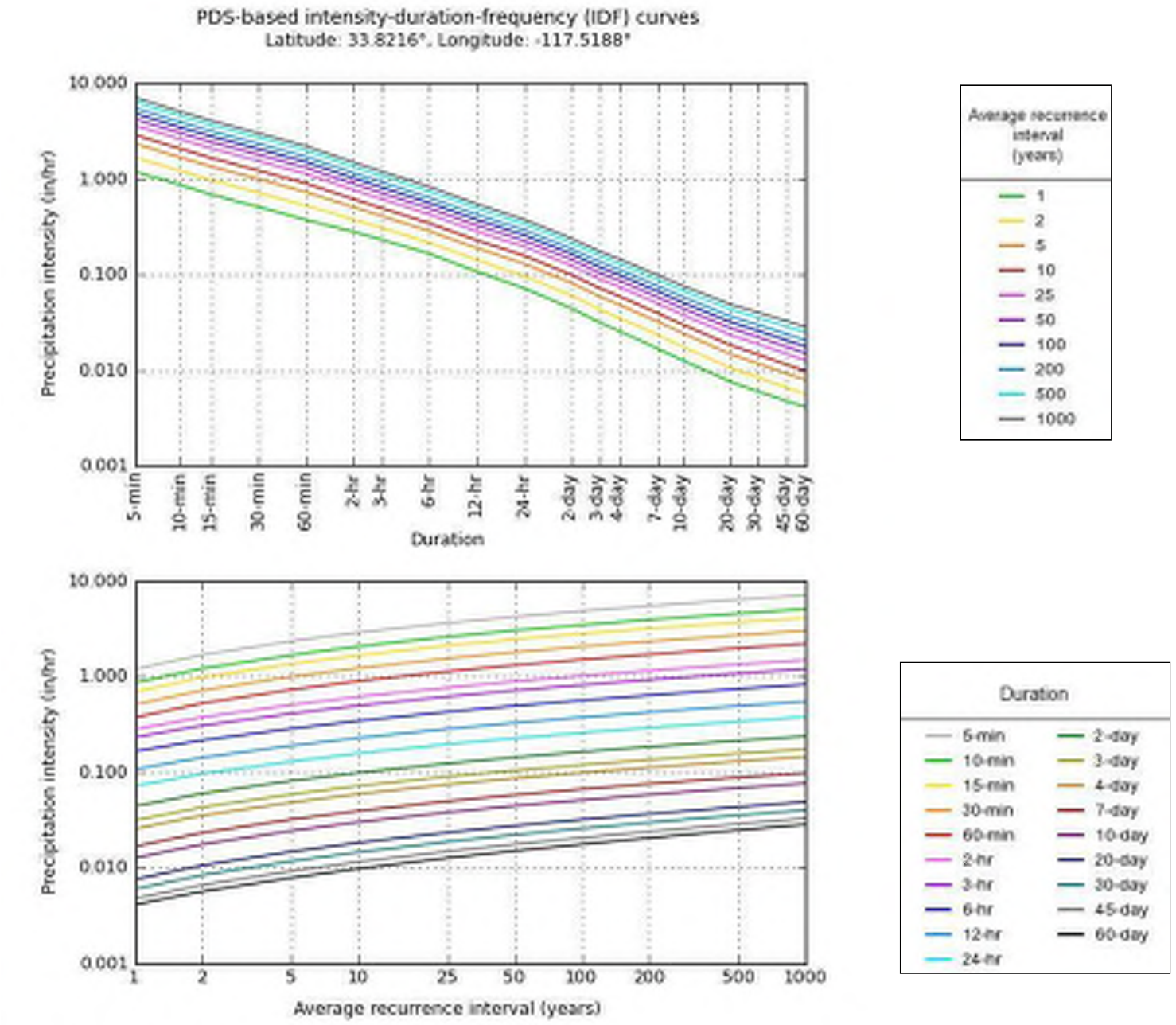
PF graphical



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Appendix D

Hydrology and Hydraulic Calculations

Appendix D.1

Inlet Spacing Calculations Results Summary

Northbound Runs

Inlet Spacing Computation Results Summary - Median

Travel Way Direction - Northbound

Inlet ID	STA	Inlet Type	Q25 (cfs)	Flow Depth (in)	Spread (ft)	Sag Inlet Capacity (cfs)	Allowable Spread (ft)	Slotted Drain Length (ft)	Bypass Q (cfs)	Remarks
N-1181A	1181+52	G1	4.02	3.86	10.73	-	18	-	1.90	
N-1185	1185+80	G1	5.13	3.36	9.66	-	18	-	2.54	
N-1190	1190+80	G1	6.24	4.39	8.71	-	18	-	2.78	
N-1194	1194+00	G1	4.64	2.49	14.85	-	18	-	2.97	
N-1195	1195+00	G1	3.54	2.36	15.15	-	18	62	0.00	Slotted-Grate Inlet Combination
N-1196	1196+52	G1	0.69	1.02	16.99	-	18	45	0.00	Slotted-Grate Inlet Combination
End of Run										
N-1285A	1285+98	G1	3.71	2.73	11.39	-	18	-	2.01	
N-1288	1288+59	G1	3.56	2.58	10.76	-	18	-	1.89	
N-1291	1291+26	G1	4.85	3.02	12.59	-	16	-	2.81	
N-1294	1294+00	SLOTTED	4.48	3.25	13.52	-	14	-	2.58	
N-1295	1295+00	G1	3.10	2.91	12.13	-	13	42	0.00	Slotted-Grate Inlet Combination
N-1296	1296+50	G1	1.58	-	SAG	2.01	11	-	SAG	
End of Run										
N-1316	1316+00	GDO	0.49	1.66	6.90	-	7	-	0.03	
N-1315	1315+00	G1	0.15	1.06	4.43	-	7	95	0.01	Slotted-Grate Inlet Combination
N-1314	1314+00	G1	0.12	0.97	4.05		7	100		Slotted-Grate Inlet Combination
N-1313	1313+00	GDO	0.11	0.87	3.63	-	7	90	0.00	Slotted-Grate Inlet Combination
N-1312	1312+00	GDO	0.60	1.66	6.90	-	7	-	0.04	
N-1311	1311+00	GDO	0.62	1.68	6.99	-	7	-	0.05	
N-1310	1310+00	GDO	0.61	1.57	6.56	-	7	-	0.04	
N-1309	1309+00	GDO	0.65	1.61	6.72	-	7	-	0.04	
N-1308	1308+00	GDO	0.67	1.57	6.55	-	7	-	0.04	
N-1307	1307+00	G1	0.61	1.52	6.32	-	7	-	0.17	
N-1306A	1306+32	G1	0.63	1.53	6.39	-	7	-	0.18	
N-1305	1305+50	G1	0.66	1.56	6.49	-	7	-	0.19	
N-1304	1304+50	GDO	0.79	1.67	6.95	-	7	-	0.06	

Inlet Spacing Computation Results Summary - Median

Travel Way Direction - Northbound

Inlet ID	STA	Inlet Type	Q25 (cfs)	Flow Depth (in)	Spread (ft)	Sag Inlet Capacity (cfs)	Allowable Spread (ft)	Slotted Drain Length (ft)	Bypass Q (cfs)	Remarks
N-1303	1303+50	GDO	0.66	1.56	6.51	-	7	-	0.04	
N-1302	1302+50	GDO	0.58	1.49	6.19	-	7	-	0.03	
N-1301B	1301+75	GDO	0.55	1.45	6.06	-	7	-	0.02	
N-1301A	1301+00	GDO	0.49	1.40	5.83	-	7	-	0.02	
N-1299B	1299+80	GDO	0.75	1.63	6.81	-	7	-	0.05	
N-1299A	1299+10	G1	0.39	1.28	5.33		7	-	0.08	
N-1298	1298+00	G1	0.67	1.57	6.54		11	23	0.00	Slotted-Grate Inlet Combination
N-1296A	1296+50	G1	1.58	-	SAG	1.85	11	-	SAG	
End of Run										
N-1317	1317+50	GDO	0.41	1.67	6.98	-	7	-	0.02	
N-1318A	1318+00	GDO	0.32	1.53	6.37	-	7	-	0.01	
N-1318B	1318+50	GDO	0.39	1.65	6.86	-	7	-	0.02	
N-1319	1319+32	G1	0.40	1.66	6.91	-	7	12	0.00	Slotted-Grate Inlet Combination
N-1320A	1320+00	GDO	0.40	1.66	6.91	-	7	-	0.02	
N-1320B	1320+50	GDO	0.41	1.68	6.98	-	7	-	0.02	
N-1321A	1321+15	GDO	0.35	1.58	6.59	-	7	-	0.07	
N-1321B	1321+70	GDO	0.36	1.59	6.63	-	7	-	0.07	
N-1322	1322+30	GDO	0.49	1.66	6.91	-	7	-	0.03	
N-1323A	1323+05	G1	0.48	1.65	6.86	-	7	15	0.00	Slotted-Grate Inlet Combination
N-1323B	1323+90	G2	0.48	1.65	6.86	-	7	-	0.03	
N-1324	1324+65	G3	0.48	1.64	6.85	-	7	-	0.03	
N-1325	1325+32	G4	0.45	1.60	6.69	-	7	-	0.02	
N-1326A	1326+00	GDO	0.41	1.56	6.49	-	7	-	0.02	
N-1326B	1326+50	GDO	0.45	1.61	6.69	-	7	-	0.02	
N-1327	1327+50	G1	0.49	1.66	6.93	-	7	-	0.00	
N-1328	1328+50	GDO	0.49	1.66	6.91	-	7	-	0.03	
N-1329A	1329+00	GDO	0.45	1.61	6.70	-	7	-	0.02	

Inlet Spacing Computation Results Summary - Median

Travel Way Direction - Northbound

Inlet ID	STA	Inlet Type	Q25 (cfs)	Flow Depth (in)	Spread (ft)	Sag Inlet Capacity (cfs)	Allowable Spread (ft)	Slotted Drain Length (ft)	Bypass Q (cfs)	Remarks
N-1330A	1330+32	GDO	0.45	1.61	6.72	-	7	-	0.02	
N-1330B	1330+70	GDO	0.22	1.24	5.16	-	7	-	0.00	
N-1331	1331+40	GDO	0.49	1.66	6.93	-	7	-	0.03	
N-1332	1332+25	GDO	0.48	1.65	6.86	-	7	-	0.03	
N-1333A	1333+00	G1	0.50	1.67	6.96	-	7	-	0.12	
N-1333B	1333+50	GDO	0.42	1.57	6.55	-	7	-	0.02	
N-1334A	1334+00	GDO	0.32	1.53	6.36	-	7	-	0.01	
N-1334B	1334+50	G1	0.28	1.35	5.61	-	7	-	0.05	
N-1335A	1335+04	G1	0.30	1.49	6.19	-	7	-	0.05	
N-1335B	1335+57	GDO	0.31	1.40	5.83	-	7	-	0.01	
N-1336A	1336+20	G1	0.33	1.30	5.40	-	7	15	0.00	Slotted-Grate Inlet Combination
N-1336B	1336+88	G1	0.41	1.67	6.98	-	7	-	0.09	
N-1337	1337+50	GDO	0.40	1.45	6.06	-	7	-	0.01	
N-1338	1338+50	GDO	0.49	1.66	6.94	-	7	-	0.03	
N-1339	1339+40	GDO	0.50	1.67	6.97	-	7	-	0.03	
N-1340A	1340+00	GDO	0.38	1.51	6.29	-	7	-	0.02	
N-1340B	1340+87	G1	0.47	1.63	6.78	-	7	-	0.11	
N-1341	1341+63	G1	0.44	1.59	6.65	-	7	-	0.10	
N-1342A	1342+00	G1	0.27	1.33	5.54	-	7	-	0.05	
N-1342B	1342+51	GDO	0.39	1.52	6.32	-	7	-	0.02	
N-1343	1343+25	GDO	0.46	1.61	6.73	-	7	-	0.02	
N-1344A	1344+00	GDO	0.44	1.60	6.67	-	7	-	0.02	
N-1344B	1344+70	GDO	0.48	1.65	6.86	-	7	-	0.03	
N-1345	1345+50	GDO	0.49	1.66	6.90	-	7	-	0.03	
N-1346	1346+12	GDO	0.42	1.48	6.18	-	7	-	0.02	
N-1347A	1347+00	GDO	0.60	1.62	6.76	-	7	-	0.04	
N-1347B	1347+83	G1	0.60	1.63	6.77	-	7	19	0.00	Slotted-Grate Inlet Combination

Inlet Spacing Computation Results Summary - Median

Travel Way Direction - Northbound

Inlet ID	STA	Inlet Type	Q25 (cfs)	Flow Depth (in)	Spread (ft)	Sag Inlet Capacity (cfs)	Allowable Spread (ft)	Slotted Drain Length (ft)	Bypass Q (cfs)	Remarks
N-1349	1349+27	GDO	0.92	1.85	7.69	-	7	-	0.10	Potential bridge structure flooded width issue to be evaluated at next phase of design
N-1350	1350+05	GDO	0.64	1.61	6.71	-	7	-	0.04	
N-1351	1351+65	GDO	0.94	1.76	7.34	-	8	-	0.09	
N-1353A	1353+00	G1	0.91	1.74	7.26	-	8		0.31	
N-1353B	1353+88	GDO	0.93	1.72	7.15	-	8	27	0.00	Slotted-Grate Inlet Combination
N-1356	1356+00	GDO	1.20	1.89	7.87	-	8	-	0.15	
N-1358	1358+00	G1	1.37	1.80	7.52	-	8	-	0.53	
N-1359	1359+00	GDO	1.12	1.62	6.73	-	8	-	0.09	
N-1360A	1360+00	GDO	0.15	1.08	5.16	-	8	60	0.00	Slotted-Grate Inlet Combination
N-1360B	1360+70	GDO	0.13	0.43	7.19	-	8	70	0.01	Slotted-Grate Inlet Combination
End of Run										
N-1405	1405+07	G1	0.14	0.65	6.02	-	8	99	0.03	Slotted-Grate Inlet Combination
N-1404	1404+40	G1	0.50	1.35	6.59	-	8	-	0.14	
N-1403	1403+15	G1	0.83	1.73	7.20	-	8	-	0.27	
N-1401	1401+90	GDO	0.95	1.81	7.56	-	8	-	0.10	
N-1400	1400+67	G1	1.03	1.87	7.79	-	8	-	0.37	
N-1399	1399+81	GDO	0.89	1.77	7.38	-	8	-	0.09	
N-1398	1398+15	GDO	1.10	1.92	7.98	-	10	-	0.14	
N-1397	1397+32	GDO	0.74	1.65	6.87	-	11	-	0.06	
N-1395	1395+91	G1	0.96	1.82	7.58	-	14	-	0.33	
N-1394B	1394+81	G1	1.47	2.14	8.91	-	14	-	0.61	
N-1394A	1394+00	GDO	1.20	1.98	8.26	-	14	-	0.17	
N-1393	1393+15	GDO	0.86	1.75	7.28	-	14	-	0.08	
N-1392	1392+55	G1	0.60	1.37	7.62	-	14	-	0.21	
N-1391	1391+65	GDO	0.05	0.30	8.20	-	14	90	0.01	Slotted-Grate Inlet Combination

Inlet Spacing Computation Results Summary - Median

Travel Way Direction - Northbound

Inlet ID	STA	Inlet Type	Q25 (cfs)	Flow Depth (in)	Spread (ft)	Sag Inlet Capacity (cfs)	Allowable Spread (ft)	Slotted Drain Length (ft)	Bypass Q (cfs)	Remarks
End of Run										
N-1452	1452+92	G1	0.72	2.41	6.69	-	8	12	0.00	Slotted-Grate Inlet Combination
N-1450	1450+27	G1	1.61	2.86	7.94	-	8	-	0.54	
N-1449	1449+26	G1	1.14	2.51	6.97	-	8	-	0.32	
N-1447	1447+12.6	G1	1.69	2.45	6.81	-	8	-	0.56	
N-1444	1444+69	GDO	2.06	2.64	7.33	-	8	-	0.21	
N-1442	1442+42	G1	1.61	2.74	7.62	-	8	-	0.54	
N-1441B	1441+72	G1	1.06	2.58	7.16	-	8	-	0.28	
N-1441A	1441+13	GDO	0.74	2.77	7.71	-	8	11	0.00	Slotted-Grate Inlet Combination
N-1440	1440+00	GDO	1.54	-	SAG	2.11	8	-	SAG	
End of Run										
N-1436A	1436+00	GDO	1.32	1.74	7.99	-	8	-	0.18	
N-1436B	1436+63	G1	1.84	2.15	7.80	-	8	-	0.74	
N-1437	1437+82	G1	1.68	2.78	7.74	-	8	-	0.57	
N-1439	1439+00	GDO	1.38	2.59	7.19	-	8	21	0.00	Slotted-Grate Inlet Combination
N-1440A	1440+00	G1	1.54	-	SAG	2.11	8	-	SAG	
End of Run										
N-1455	1455+43	GDO	0.78	2.48	6.89	-	8	-	0.04	
N-1456	1456+50	GDO	0.72	2.74	7.62	-	8	-	0.04	
N-1458A	1458+00	GDO	0.95	2.09	7.92	-	8	-	0.10	
N-1458B	1458+50	GDO	0.30	1.18	6.55	-	8	-	0.02	
N-1459	1459+25	G1	0.02	0.19	7.99	-	8	65	0.01	Slotted-Grate Inlet Combination
End of Run										
N-1519	1519+00	G1	0.50	1.77	7.76	-	8	-	0.13	
N-1518B	1518+50	G1	0.49	1.59	7.36	-	8	-	0.13	
N-1518A	1518+00	G1	0.43	1.49	7.29	-	8	-	0.11	
N-1517B	1517+50	G1	0.41	1.46	7.18	-	8	-	0.11	

Inlet Spacing Computation Results Summary - Median

Travel Way Direction - Northbound

Inlet ID	STA	Inlet Type	Q25 (cfs)	Flow Depth (in)	Spread (ft)	Sag Inlet Capacity (cfs)	Allowable Spread (ft)	Slotted Drain Length (ft)	Bypass Q (cfs)	Remarks
N-1517A	1517+00	G1	0.41	1.46	7.13	-	8	-	0.10	
N-1516B	1516+50	GDO	0.37	1.41	6.91	-	8	-	0.02	
N-1516A	1516+00	GDO	0.36	1.24	6.45	-	8	-	0.02	
N-1515	1515+00	G1	0.14	0.99	6.53	-	8	97	0.04	Slotted-Grate Inlet Combination
N-1514	1514+00	GDO	0.18	0.60	7.93	-	10	100	0.02	Slotted-Grate Inlet Combination
N-1513A	1513+00	GDO	0.07	0.35	7.32	-	13	100	0.01	Slotted-Grate Inlet Combination
N-1512	1512+20	GDO	0.15	0.40	13.37	-	14	86	0.05	Slotted-Grate Inlet Combination
End of Run										
N-1520	1520+50	G1	0.35	1.46	6.09	-	8	-	0.07	
N-1521A	1521+10	GDO	0.48	1.65	6.86	-	8	-	0.03	
N-1522	1522+91	G1	0.69	1.88	7.85	-	8	17	0.00	Slotted-Grate Inlet Combination
N-1525	1525+00	G1	1.50	2.52	10.52	-	8	-	0.62	Potential bridge structure flooded width issue to be evaluated at next phase of design
N-1526A	1526+00	G1	1.12	1.84	7.67	-	8	-	0.41	
N-1527	1527+23	GDO	1.07	1.72	7.15	-	8	-	0.10	
N-1529	1529+00	G1	1.18	1.78	7.42	-	8	-	0.44	
N-1530	1530+00	G1	1.17	1.72	7.17	-	8	-	0.12	
N-1532	1532+00	G1	1.38	1.83	7.64	-	8	-	0.54	
N-1533	1533+00	G1	1.16	1.72	7.15	-	8	-	0.42	
N-1534	1534+25	G1	1.19	1.67	6.96	-	8	-	0.43	
N-1535	1535+00	G1	0.74	1.40	5.82	-	8	-	0.21	
N-1536A	1536+00	G1	0.82	1.45	6.05	-	8	-	0.24	
N-1536B	1536+93	G1	0.72	1.39	5.77	-	8	30	0.00	Slotted-Grate Inlet Combination
N-1539	1539+50	GDO	1.67	1.90	7.91	-	8	-	0.23	Bridge
N-1540	1540+00	GDO	0.79	1.43	5.97	-	8	-	0.04	
N-1542	1542+00	G1	1.09	1.62	6.74	-	8	-	0.37	

Inlet Spacing Computation Results Summary - Median

Travel Way Direction - Northbound

Inlet ID	STA	Inlet Type	Q25 (cfs)	Flow Depth (in)	Spread (ft)	Sag Inlet Capacity (cfs)	Allowable Spread (ft)	Slotted Drain Length (ft)	Bypass Q (cfs)	Remarks
N-1544	1544+00	G1	1.58	1.86	7.76	-	8	-	0.64	
N-1545	1545+00	GDO	1.54	1.84	7.67	-	8	-	0.19	
N-1546	1546+00	GDO	0.83	1.41	7.37	-	8	-	0.09	
N-1547A	1447+00	G1	0.55	1.12	7.17	-	8	-	0.19	
N-1547B	1547+60	GDO	0.12	0.44	7.35	-	8	40	0.01	Slotted-Grate Inlet Combination
End of Run										
N-1621	1621+50	GDO	1.03	1.30	7.73	-	8	45	0.00	Slotted-Grate Inlet Combination
N-1623	1623+00	G1	2.92	2.39	7.95	-	8	-	1.25	
N-1624	1624+00	G1	2.06	2.24	6.23	-	7	-	0.66	
N-1625	1625+29	G1	1.46	1.97	5.48	-	7	-	0.39	
N-1627	1627+75	G1	2.07	2.25	6.24	-	7	-	0.67	
N-1630	1630+00	GDO	2.35	2.35	6.54	-	8	-	0.17	
N-1632	1632+00	GDO	1.31	1.89	5.26	-	8	-	0.03	
N-1636	1636+30	GDO	2.43	2.42	6.73	-	8	-	0.20	
N-1637A	1637+00	GDO	1.89	2.29	6.36	-	8	-	0.12	
N-1637B	1637+59	GDO	0.58	1.26	5.26	-	8	-	0.01	
N-1638	1638+60	G1	0.08	0.30	7.86	-	8	82	0.03	Slotted-Grate Inlet Combination
End of Run										
N-1657	1657+75	GDO	2.16	2.87	7.98	-	8	-	0.28	
N-1660	1660+16	G1	1.83	2.70	7.50	-	8	-	0.64	
N-1662	1662+00	G1	1.89	2.73	7.59	-	8	-	0.67	
N-1663	1663+00	G1	1.30	2.38	6.60	-	8	-	0.39	
N-1664	1664+00	G1	1.04	2.18	6.06	-	8	-	0.27	
N-1666	1666+00	G1	1.60	2.57	7.13	-	8	-	0.53	
N-1667	1667+00	G1	1.18	2.29	6.36	-	8	-	0.33	
N-1668	1668+00	G1	0.95	2.11	5.87	-	8	-	0.23	
N-1669A	1669+00	G1	0.87	1.85	6.70	-	8	-	0.26	

Inlet Spacing Computation Results Summary - Median

Travel Way Direction - Northbound

Inlet ID	STA	Inlet Type	Q25 (cfs)	Flow Depth (in)	Spread (ft)	Sag Inlet Capacity (cfs)	Allowable Spread (ft)	Slotted Drain Length (ft)	Bypass Q (cfs)	Remarks
N-1669B	1669+60	GDO	0.68	1.54	7.12	-	8	-	0.06	
N-1670A	1670+25	G1	0.32	0.99	6.91	-	8	-	0.10	
N-1670B	1670+90	GDO	0.10	0.46	7.72	-	8	52	0.01	Slotted-Grate Inlet Combination
End of Run										
N-1711	1711+00	G1	0.93	2.65	7.36	-	8	-	0.22	
N-1709	1709+00	G1	1.53	2.69	7.48	-	8	-	0.50	
N-1705B	1705+86	G1	2.40	2.85	7.92	-	8	-	0.93	
N-1705A	1705+26	G1	1.27	2.33	7.20	-	8	-	0.41	
N-1704	1704+00	G1	0.76	1.41	6.52	-	8	-	0.24	
N-1703	1703+40	G1	0.69	1.14	7.92	-	8	-	0.28	
N-1702B	1702+50	GDO	0.18	0.53	7.34	-	8	90	0.00	Slotted-Grate Inlet Combination
N-1702A	1702+00	G1	0.07	0.32	6.74	-	8	50	0.02	Slotted-Grate Inlet Combination
End of Run										
N-1714	1714+00	G1	0.99	2.09	5.81	-	8	-	0.25	
N-1715	1715+00	G1	0.94	2.24	6.22	-	8	-	0.23	
N-1717A	1717+00	GDO	1.44	2.54	7.07	-	8	-	0.12	
N-1718A	1718+00	G1	0.78	1.86	7.04	-	8	-	0.23	
N-1718B	1718+65	GDO	0.58	1.22	6.35	-	8	-	0.03	
N-1719	1719+44	GDO	0.14	0.56	6.66	-	8	40	0.01	Slotted-Grate Inlet Combination
N-1719B	1719+76	G1	0.08	0.39	6.51	-	8	54	0.02	Slotted-Grate Inlet Combination
N-1720	1720+28	G1	0.07	0.36	7.45	-	8	51	0.03	Slotted-Grate Inlet Combination
End of Run										
N-1779A	1779+10	G1	0.49	1.20	5.90	-	8	-	0.13	
N-1780	1780+30	G1	0.60	1.38	5.76	-	8	-	0.16	
N-1781A	1781+10	G1	0.48	1.27	5.28	-	8	-	0.11	
N-1782	1782+81	GDO	1.37	1.88	7.83	-	8	33	0.00	Slotted-Grate Inlet Combination
N-1784	1784+69	G1	1.00	1.67	6.97	-	7	-	0.34	

Inlet Spacing Computation Results Summary - Median

Travel Way Direction - Northbound

Inlet ID	STA	Inlet Type	Q25 (cfs)	Flow Depth (in)	Spread (ft)	Sag Inlet Capacity (cfs)	Allowable Spread (ft)	Slotted Drain Length (ft)	Bypass Q (cfs)	Remarks
N-1785A	1785+49	G1	0.91	1.62	6.73	-	7	-	0.30	
N-1786	1786+29	GDO	0.71	1.47	6.13	-	7	-	0.03	
N-1787A	`1787+10	GDO	0.82	1.55	6.47	-	7	-	0.05	
N-1787B	1788+00	G1	0.79	1.47	6.82	-	7	-	0.26	
N-1788	1788+83	G1	0.64	1.36	6.31	-	7	-	0.19	
N-1790	1790+00	G1	0.10	0.41	6.89	-	7	77	0.03	Slotted-Grate Inlet Combination
End of Run										
N-1906	1906+00	G1	0.62	1.55	6.44	-	7	-	0.17	
N-1907	1907+00	G1	0.68	1.60	6.68	-	7	-	0.20	
N-1908A	1908+00	G1	0.68	1.60	6.68	-	7	-	0.20	
N-1908B	1908+73	GDO	0.59	1.52	6.33	-	7	-	0.03	
N-1910	1910+00	GDO	0.74	1.65	6.89	-	7	-	0.06	
N-1911	1911+00	GDO	0.77	1.67	6.97	-	7	-	0.06	
N-1912	1912+00	GDO	0.77	1.68	6.99	-	7	-	0.06	
N-1913	1913+00	GDO	0.61	1.58	6.59	-	7	-	0.04	
N-1914	1914+25	GDO	0.74	1.54	6.43	-	7	-	0.04	
N-1915	1915+25	G1	0.73	1.65	6.86	-	7	23	0.00	Slotted-Grate Inlet Combination
N-1915B	1915+95	G1	0.74	1.65	6.88	-	7	23	0.00	Slotted-Grate Inlet Combination
N-1917	1917+00	G1	0.75	1.66	6.92	-	7	23	0.00	Slotted-Grate Inlet Combination
N-1918	1918+00	GDO	0.74	1.65	6.88	-	7	-	0.06	
N-1919	1919+00	G1	0.74	1.65	6.87	-	7	23	0.00	Slotted-Grate Inlet Combination
N-1920	1920+25	GDO	0.99	1.67	6.94	-	7	-	0.08	
N-1921	1921+50	GDO	1.01	1.68	6.99	-	7	-	0.09	
N-1922	1922+50	GDO	1.01	1.68	6.99	-	7	-	0.09	
N-1923	1923+90	G1	1.00	1.67	6.96	-	7	-	0.34	
N-1925	1925+00	G1	0.89	1.60	6.68	-	7	-	0.29	
N-1926	1926+10	GDO	0.85	1.57	6.55	-	7	-	0.06	

Inlet Spacing Computation Results Summary - Median

Travel Way Direction - Northbound

Inlet ID	STA	Inlet Type	Q25 (cfs)	Flow Depth (in)	Spread (ft)	Sag Inlet Capacity (cfs)	Allowable Spread (ft)	Slotted Drain Length (ft)	Bypass Q (cfs)	Remarks
N-1928A	1928+00	G1	1.01	1.68	6.99	-	7	-	0.35	
N-1928B	1928+75	G1	0.70	1.40	6.50	-	7	-	0.22	
N-1929A	1929+23	GDO	0.38	0.96	6.65	-	7	-	0.03	
N-1929B	1929+92	GDO	0.06	0.28	7.78		8	55	0.01	Slotted-Grate Inlet Combination
End of Northbound Superelevation Runs										

Southbound Runs

Inlet Spacing Computation Results Summary - Median

Travel Way Direction - Southbound

Inlet ID	STA	Inlet Type	Q25 (cfs)	Flow Depth (in)	Spread (ft)	Sag Inlet Capacity (cfs)	Allowable Spread (ft)	Slotted Drain Length (ft)	Bypass Q (cfs)	Remarks
S-1276	1276+00	GDO	1.55	2.17	12.08	-	18	-	0.42	
S-1277	1277+55	G1	1.33	1.62	16.88	-	18	-	0.79	
S-1278	1278+68	GDO	0.45	0.92	11.01	-	18	54	0.11	Slotted-Grate Inlet Combination
S-1279	1279+30	GDO	0.18	0.51	14.12	-	18	45	0.06	Slotted-Grate Inlet Combination
End of Run										
S-1267	1267+40	G1	5.19	3.81	15.87		18	-	3.07	
S-1263	1263+56	G1	5.25	3.22	13.42		18	-	3.11	
S-1258	1258+62	G1	6.71	3.53	14.71		18	-	4.18	
S-1255	1255+00	G1	6.18	3.42	14.27		18	65	0.00	Slotted-Grate Inlet Combination
S-1253	1253+50	G1	1.88	-	SAG	3.88	18	-	SAG	
End of Run										
S-1245	1245+00	G1	3.32	8.92	11.30		18	-	1.77	
S-1250	1250+00	G1	6.19	11.89	14.28		18	-	3.79	
S-1251	1252+00	G1	5.15	0.00	13.33		18	60	0.00	Slotted-Grate Inlet Combination
S-1253	1253+50	G1	1.88	-	SAG	3.88	18	-	SAG	
End of Run										
S-1413	1413+47	G1	1.53	2.46	6.84	-	8	-	0.49	
S-1412	1412+80	G1	1.30	-	SAG	2.11	8	-	SAG	
End of Run										
S-1411	1411+53	G1	0.39	1.77	4.93	-	8	-	0.05	
S-1410B	1410+88	G1	0.44	1.86	5.16	-	8	-	0.07	
S-1410A	1410+40	GDO	0.43	1.83	5.09	-	8	-	0.00	
S-1409	1409+83	GDO	0.20	0.99	6.85	-	8	-	0.01	
End of Run										
S-1417	1417+11	G1	0.75	1.81	5.02	-	8	-	0.15	
S-1418	1418+20	G1	0.77	1.83	5.07	-	8	-	0.16	
S-1419	1419+30	G1	0.84	1.88	5.23	-	8	-	0.18	

Inlet Spacing Computation Results Summary - Median

Travel Way Direction - Southbound

Inlet ID	STA	Inlet Type	Q25 (cfs)	Flow Depth (in)	Spread (ft)	Sag Inlet Capacity (cfs)	Allowable Spread (ft)	Slotted Drain Length (ft)	Bypass Q (cfs)	Remarks
S-1420	1420+39	G1	0.75	1.81	5.03	-	8	-	0.15	
S-1421	1421+40	G1	1.19	2.15	5.97	-	8	-	0.32	
S-1422	1422+74	G1	1.37	2.27	6.30	-	8	-	0.41	
S-1425	1425+23	G1	2.27	2.74	7.60	-	8	-	0.85	
S-1426	1226+49	G1	1.73	2.48	6.88	-	8	-	0.58	
S-1427	1427+69	G1	1.47	2.33	6.46	-	8	-	0.45	
S-1428	1428+69	G1	1.44	2.31	6.42	-	8	-	0.44	
S-1430	1430+22	G1	1.56	2.38	6.61	-	8	-	0.49	
S-1431	1431+32	G1	1.36	2.26	6.28	-	8	-	0.40	
S-1432	1432+05	G1	0.79	1.80	5.35	-	8	-	0.18	
S-1433	1433+20	GDO	0.22	0.66	7.85	-	8	90	0.03	Slotted-Grate Inlet Combination
End of Run										
S-1473	1473+00	G1	0.33	0.97	6.23	-	8	-	0.09	
S-1475	1475+47	G1	1.69	2.45	6.82	-	8	-	0.56	
S-1476	1476+82	G1	1.41	2.29	6.36	-	8	-	0.42	
S-1478	1478+18	G1	1.30	2.22	6.18	-	8	-	0.37	
S-1479	1479+77	G1	1.02	2.03	5.64	-	8	24	0.00	Slotted-Grate Inlet Combination
End of Run										
S-1499	1499+25	G1	1.63	2.27	6.31	-	15	-	0.51	
S-1498A	1498+29	G1	1.25	2.05	5.71	-	15	-	0.33	
S-1496	1496+66	G1	1.21	2.03	5.65	-	13	-	0.32	
S-1495	1495+17	G1	1.42	2.16	5.99	-	11	-	0.41	
S-1493	1493+65	G1	1.30	2.09	5.79	-	8	-	0.36	
S-1491	1491+00	G1	2.01	2.45	6.82	-	8	-	0.69	
S-1488	1488+63	G1	2.29	2.58	7.17	-	8	-	0.84	
S-1486A	1486+94	G1	1.93	2.42	6.72	-	8	-	0.65	
S-1485	1485+16	G1	1.81	2.36	6.56	-	8	-	0.59	

Inlet Spacing Computation Results Summary - Median

Travel Way Direction - Southbound

Inlet ID	STA	Inlet Type	Q25 (cfs)	Flow Depth (in)	Spread (ft)	Sag Inlet Capacity (cfs)	Allowable Spread (ft)	Slotted Drain Length (ft)	Bypass Q (cfs)	Remarks
S-1484	1484+25	G1	1.12	1.98	5.49	-	8	27	0.00	Slotted-Grate Inlet Combination
End of Run										
S-1553	1553+70	G1	0.36	1.18	4.91	-	8	-	0.07	
S-1554A	1554+00	G1	0.30	1.10	4.58	-	8	-	0.05	
S-1555	1555+00	G1	0.63	1.45	6.05	-	8	-	0.17	
S-1556	1556+00	GDO	0.85	1.63	6.79	-	8	-	0.07	
S-1558	1558+00	G1	1.31	1.91	7.97	-	8	-	0.51	
S-1559	1559+00	GDO	1.12	1.81	7.52	-	8	-	0.12	
S-1560	1560+22	G1	0.86	1.87	7.77	-	8	-	0.29	
S-1561	1561+22	GDO	0.84	1.85	7.69	-	8	-	0.09	
S-1562A	1562+22	G1	0.76	1.78	7.41	-	8	-	0.24	
S-1563A	1563+23	G1	0.80	1.81	7.55	-	8	-	0.26	
S-1564A	1564+08	G1	0.87	1.87	7.79	-	8	-	0.29	
S-1564B	1564+66	GDO	0.65	1.68	6.99	-	8	-	0.05	
S-1566A	1566+00	G1	0.87	1.87	7.79	-	8	-	0.29	
S-1566B	1566+90	GDO	0.78	1.80	7.49	-	8	-	0.07	
S-1568	1568+12	G1	0.73	1.75	7.31	-	8	-	0.06	
S-1569	1569+02	GDO	0.55	1.58	6.58	-	8	-	0.03	
S-1570A	1570+00	GDO	0.55	1.33	7.92	-	8	-	0.19	
S-1570B	1570+50	GDO	0.03	0.27	5.72	-	8	48	0.00	Slotted-Grate Inlet Combination
End of Run										
S-1596A	1596+00	G1	1.68	2.55	7.09	-	8	-	0.56	
S-1598	1598+00	G1	2.32	2.88	7.99	-	8	-	0.89	
S-1600	1600+00	G1	2.29	2.86	7.96	-	8	-	0.88	
S-1601	1601+00	G1	1.60	2.51	6.96	-	8	-	0.52	
S-1602	1602+00	G1	1.26	2.29	6.36	-	8	-	0.36	
S-1603A	1603+00	G1	1.11	2.19	6.07	-	8	-	0.30	

Inlet Spacing Computation Results Summary - Median

Travel Way Direction - Southbound

Inlet ID	STA	Inlet Type	Q25 (cfs)	Flow Depth (in)	Spread (ft)	Sag Inlet Capacity (cfs)	Allowable Spread (ft)	Slotted Drain Length (ft)	Bypass Q (cfs)	Remarks
S-1604	1603+87	G1	1.00	2.10	5.84	-	8	21	0.00	Slotted-Grate Inlet Combination
S-1606	1606+15	G1	1.77	2.60	7.23	-	8	-	0.61	Bridge
S-1607	1607+00	G1	0.28	2.15	5.98	-	8	-	0.28	
S-1609	1609+00	G1	0.54	2.53	7.02	-	8	-	0.54	
S-1612	1612+50	GDO	0.28	2.84	7.90	-	8	-	0.28	
S-1614	1615+00	G1	0.71	2.70	7.51	-	8	-	0.71	
S-1616A	1616+00	GDO	0.10	2.28	6.79	-	8	-	0.10	
S-1616B	1616+50	GDO	0.38	0.78	5.23	-	8	-	0.01	
S-1617	1617+50	GDO	0.04	0.28	7.69	-	8	88	0.00	Slotted-Grate Inlet Combination
End of Run										
S-1674A	1674+90	G1	1.41	2.45	6.80	-	8	-	0.44	
S-1675	1675+96	G1	1.15	2.27	6.30	-	8	-	0.32	
S-1677A	1677+00	G1	1.00	2.15	5.97	-	8	-	0.25	
S-1678A	1678+00	G1	0.92	2.09	5.81	-	8	-	0.22	
S-1680	1680+00	G1	1.70	2.63	7.31	-	8	-	0.58	
S-1681	1681+00	G1	1.38	2.43	6.75	-	8	-	0.42	
S-1682	1682+00	G1	1.15	2.27	6.31	-	8	-	0.32	
S-1683	1683+00	G1	1.20	2.30	6.40	-	8	25	0.00	Slotted-Grate Inlet Combination
S-1685	1685+64	GDO	2.12	3.63	7.93	-	8	-	0.26	Bridge
S-1686	1686+62	G1	1.30	0.00	6.59	-	8	23	0.00	Slotted-Grate Inlet Combination
End of Run										
S-1700	1700+08	GDO	1.58	1.82	8.00	-	8	-	0.22	
S-1698	1698+00	GDO	1.65	1.89	7.88	-	8	-	0.22	
S-1696B	1696+46	G1	1.28	1.72	7.17	-	8	-	0.48	
S-1695B	1695+77	G1	0.91	1.51	6.29	-	8	-	0.28	
S-1695A	1695+00	G1	0.81	1.45	6.04	-	8	-	0.24	
S-1694	1694+00	G1	0.89	1.50	6.25	-	8	-	0.28	

Inlet Spacing Computation Results Summary - Median

Travel Way Direction - Southbound

Inlet ID	STA	Inlet Type	Q25 (cfs)	Flow Depth (in)	Spread (ft)	Sag Inlet Capacity (cfs)	Allowable Spread (ft)	Slotted Drain Length (ft)	Bypass Q (cfs)	Remarks
S-1693	1693+00	G1	1.05	1.76	7.33	-	8	-	0.37	
S-1692	1692+00	G1	1.01	1.74	7.24	-	8	-	0.36	
S-1691	1691+00	G1	1.04	1.76	7.32	-	8	-	0.37	
S-1690	1690+50	G1	0.69	1.50	6.27	-	8	-	0.20	
S-1689A	1689+10	G1	1.20	1.85	7.72	-	8	33	0.00	Slotted-Grate Inlet Combination
End of Run										
S-1722	1722+00	G1	1.39	1.76	7.31	-	8	-	0.53	
S-1724	1724+00	G1	2.88	2.58	7.18	-	8	-	1.10	
S-1725	1725+00	G1	2.41	2.63	7.31	-	8	-	0.90	
S-1727	1727+00	G1	3.40	2.80	7.77	-	8	-	1.41	
S-1728	1728+00	G1	3.03	2.61	7.25	-	8	-	0.33	
S-1729	1729+00	GDO	2.69	2.56	7.12	-	8		0.02	
S-1730	1730+00	GDO	2.52	2.46	6.83	-	7		0.01	
S-1732	1732+00	G1	2.75	2.50	6.93	-	7		0.01	
S-1733	1733+00	G1	1.08	1.90	5.28	-	7	-	0.26	
S-1735	1735+00	GDO	1.97	2.20	6.12	-	7	38	0.00	Slotted-Grate Inlet Combination
S-1738A	1738+00	G1	2.42	2.49	6.91	-	7	-	0.88	
S-1738B	1738+77	G1	1.58	1.98	5.51	-	7	38	0.00	Slotted-Grate Inlet Combination
S-1742	1742+16	GDO	2.70	2.40	7.99	-	7	-	0.39	Potential bridge structure flooded width issue to be evaluated at next phase of design
S-1743	1743+80	G1	0.17	0.69	3.84	-	8	100	0.02	Slotted-Grate Inlet Combination
S-1744A	1744+29	GDO	0.08	0.32	6.64		8	49	0.01	Slotted-Grate Inlet Combination
S-1744B	1744+38	GDO	0.08	0.31	6.51	-	8	-	0.01	
End of Run										
S-1832	1832+08	G1	0.15	0.75	6.93	-	8	98	0.00	Slotted-Grate Inlet Combination
End of Run										

Inlet Spacing Computation Results Summary - Median

Travel Way Direction - Southbound

Inlet ID	STA	Inlet Type	Q25 (cfs)	Flow Depth (in)	Spread (ft)	Sag Inlet Capacity (cfs)	Allowable Spread (ft)	Slotted Drain Length (ft)	Bypass Q (cfs)	Remarks
S-1829	1829+00	G1	0.74	1.83	7.65	-	8	-	0.23	
S-1828	1828+00	G1	0.76	1.85	7.72	-	8	-	0.24	
S-1827	1827+00	GDO	0.76	1.85	7.72	-	8	-	0.08	
S-1826	1826+30	GDO	0.39	1.22	7.84	-	8	-	0.01	
S-1825B	1825+70	G1	0.03	0.31	6.35	-	8	55	0.01	Slotted-Grate Inlet Combination
S-1825	1825+10	G1	0.05	0.36	7.51	-	8	60	0.01	Slotted-Grate Inlet Combination
End of Run										
S-1866	1866+20	G1	0.83	0.00	7.98	-	8	-	0.00	Slotted-Grate Inlet Combination
S-1864	1864+50	GDO	0.81	3.43	7.91	-	8	-	0.09	
S-1863	1863+00	GDO	0.80	3.39	7.86	-	8	-	0.08	
S-1861	1861+00	GDO	0.78	3.34	7.81	-	8	-	0.08	
S-1860	1860+00	G1	0.71	4.82	7.53	-	8	-	0.22	
S-1859	1859+00	GDO	0.60	2.64	7.05	-	8	-	0.04	
S-1857	1857+80	G1	0.01	0.16	4.33	-	8	100	0.00	Slotted-Grate Inlet Combination
End of Southbound Superelevation Runs										

Appendix D.2

Inlet Spacing Calculations (On-drain)

Northbound Runs

HYDRAULIC CALCULATOR FOR ONSITE DRAINAGE (English Units)

Date: 08/03/21

RCTC I-15 ELPSE

Note: "Subarea discharge Qsa (cfs)" was obtained from "Design Discharge" column of Hydrological Tables found within the hydrology maps in Appendix B.2, and inputted as "Additional discharge (cfs)" below.

	Starting Point	N-1181A	N-1185	N-1190	N-1194	N-1195	N-1196		
Location station (ft):	1176+43.0	1181+52.0	1185+80.0	1190+80.0	1194+00.0	1195+00.0	1196+52.0		
Longitudinal profile ("on-grade" or "sag"):		on-grade	on-grade	on-grade	on-grade	on-grade	on-grade		
Calculation Type ("grate", "side opening", or "shoulder hydraulics only"):		grate	grate	grate	grate	side opening	side opening		
Longitudinal slope, S:		0.50%	1.60%	1.20%	1.50%	1.00%	0.50%		
Shoulder cross-slope, Sx:		3.00%	2.90%	4.20%	1.40%	1.30%	0.50%		
Average watershed paved width (ft):		0.00	0.00	0.00	0.00	0.00	0.00		
Shoulder Manning's n:		0.016	0.016	0.016	0.016	0.016	0.016		
Inlet description (optional):									
Clogging factor for on-grade grates:		33%	33%	33%	33%	33%	33%		
Grate width (ft):		2.00	2.00	2.00	2.00	2.00	2.00		
Grate length (ft):		3.00	3.00	3.00	3.00	3.00	3.00		
Precipitation intensity (in/hr):		3.20	3.20	3.20	3.20	3.20	3.20		
Runoff Coefficient for paved areas, "C_p":		0.99	0.99	0.99	0.99	0.99	0.99		
Runoff Coefficient for unpaved areas, "C_u":		0.63	0.63	0.63	0.63	0.63	0.63		
Unpaved area contributing to this inlet (acres):		0.000	0.000	0.000	0.000	0.000	0.000		
Watershed paved length (ft):		509.0	428.0	500.0	320.0	100.0	152.0		
Paved area contributing to this inlet (acres):		0.000	0.000	0.000	0.000	0.000	0.000		
Subarea discharge Q_{sa} (cfs):		0.00	0.000	0.000	0.000	0.000	0.000		
Additional discharge (cfs):		4.020	3.230	3.700	1.860	0.570	0.690		
Total discharge Q_t, including any upstream by-pass (cfs):		4.020	5.134	6.244	4.642	3.536	0.690		
By-pass Q (cfs): *Describe here source of bypass:*	0.000	1.90	2.54	2.78	2.97	0.00	0.00		
DEPRESSION CALCULATION:									
Width of depression "w" (ft):									
Depression depth "a" (from flowline w/o depression) (in):									
Depression cross-slope (Sw=Sx+a/12w):									
Fraction of flow over the depression (Eo):									
Discharge-weighted equivalent cross-slope (Se):									
Q_s (first guess: **Qt - 0.001**, after iteration should be same as next line)		0.005			0.013	0.024	0.000		
Q_s over shoulder (excluding flow over the depression) (cfs):									
Q=Q_w+Q_s (cfs) (after iterations must match **Q_t** value):									
HYDRAULIC RESULTS:									
Flooded Width T for Q_t, upstream of inlet (ft):		10.73	9.66	8.71	14.85	15.15	16.99		
Flooded Width T at depression (if any) (ft):		10.73	9.66	8.71	14.85	15.15	16.99		
Flooded Width T for BYPASS Q downstream of inlet (ft):	0.00	8.11	7.43	6.43	12.55	0.00	0.00		
Water depth at curb (with or without depression) (in):		3.86	3.36	4.39	2.49	2.36	1.02		
Water cross-area at shoulder (without depression) (sq.ft.):		1.73	1.35	1.59	1.54	1.49	0.72		
Water velocity immediately u/s from inlet (w/o depression) (fps):		2.33	3.79	3.92	3.01	2.37	0.96		
Average water velocity for the segment to this inlet (fps):		0.87	1.79	1.86	1.23	1.11	0.36		
Flowtime from the previous inlet to this one (min):		9.76	3.99	4.48	4.32	1.50	7.12		
GRATE INLETS ON-GRADE:									
Splash-over V for effective length of grate (type P-1 3/8) (fps):		6.81	6.81	6.81	6.81				
Effective length of grate considering clogging factor (ft):		2.01	2.01	2.01	2.01				
Ratio of grate frontal flow to total flow:		0.42	0.461	0.501	0.320				
Fraction of frontal flow intercepted (Rf):		100.0%	100.0%	100.0%	100.0%				
Fraction of side flow interception (Rs):		17.9%	8.0%	10.7%	6.0%				
Total flow intercepted (cfs):		2.12	2.590	3.462	1.676				
Grate Efficiency (E):		52.6%	50.4%	55.4%	36.1%				
Grate flow-through flow (cfs):		1.90	2.544	2.782	2.966				
SLOTTED DRAINS & SIDE-OPENING INLETS ON-GRADE:									
Length required for total interception (ft):						41.47	30.08		
Length of inlet provided L (ft):						62.00	45.00		
Efficiency for length L:						100.0%	100.0%		
Interception for length L (cfs):						3.536	0.690		
Side opening flow-through flow (cfs):						0.000	0.000		
INTERCEPTION CAPACITY OF INLETS IN SAG LOCATION:									
Maximum allowable flooded width (including the depression) (ft):									
Max. head at sag w/o exceeding allowable flooded width (ft):									
Capacity of grate in a sag (3-sided weir) (cfs):									
Length provided of curb-opening inlet at sag (ft):									
Capacity of curb-opening inlet in a sag (weir) (cfs):									

ONDRAIN_English Version 7.5d, developed by Fernando Manzanera, Caltrans District 1, Hydraulics Capital Support (December 2010).

Notes: -This program utilizes the equations presented in the FHA Hydraulic Engineering Circular 22 (HEC-22), FHWA-NHI-10-009.

- Underlined values are calculated by the program, the others are input by the user.

Separate Run

HYDRAULIC CALCULATOR FOR ONSITE DRAINAGE (English Units)

Date: 08/03/21

RCTC I-15 ELPSE

Note: "Subarea discharge Qsa (cfs)" was obtained from "Design Discharge" column of Hydrological Tables found within the hydrology maps in Appendix B.2, and inputted as "Additional discharge (cfs)" below.

	Starting Point	N-1285A	N-1288	N-1291	N-1294	N-1295	N-1296A		
Location station (ft):	1279+07.0	1285+98.0	1288+59.0	1291+26.0	1294+00.0	1295+00.0	1296+50.0		
Longitudinal profile ("on-grade" or "sag"):		on-grade	on-grade	on-grade	on-grade	on-grade	sag		
Calculation Type ("grate", "side opening", or "shoulder hydraulics only"):		grate	grate	grate	grate	side opening	grate		
Longitudinal slope, S:		1.20%	1.50%	1.20%	0.70%	0.60%			
Shoulder cross-slope, Sx:		2.00%	2.00%	2.00%	2.00%	2.00%	2.00%		
Average watershed paved width (ft):		0.00	0.00	0.00	0.00	0.00	0.00		
Shoulder Manning's n:		0.016	0.016	0.016	0.016	0.016	0.016		
Inlet description (optional):									
Clogging factor for on-grade grates:		33%	33%	33%	33%	33%	33%		
Grate width (ft):		2.00	2.00	2.00	2.00	2.00	2.00		
Grate length (ft):		3.00	3.00	3.00	3.00	3.00	3.00		
Precipitation intensity (in/hr):		3.20	3.20	3.20	3.20	3.20	3.20		
Runoff Coefficient for paved areas, "C_p":		0.99	0.99	0.99	0.99	0.99	0.99		
Runoff Coefficient for unpaved areas, "C_u":		0.63	0.63	0.63	0.63	0.63	0.63		
Unpaved area contributing to this inlet (acres):		0.000	0.000	0.470	0.000	0.000	0.000		
Watershed paved length (ft):		691.0	261.0	267.0	274.0	100.0	150.0		
Paved area contributing to this inlet (acres):		0.000	0.000	0.000	0.000	0.000	0.000		
Subarea discharge Q_{sa} (cfs):		0.00	0.000	0.948	0.000	0.000	0.000		
Additional discharge (cfs):		3.710	1.550	2.010	1.670	0.520	1.580		
Total discharge Q_t, including any upstream by-pass (cfs):		3.710	3.565	4.852	4.480	3.102	1.580		
By-pass Q (cfs): *Describe here source of bypass:*	0.000	2.01	1.89	2.81	2.58	0.00	SAG		
DEPRESSION CALCULATION:									
Width of depression "w" (ft):									
Depression depth "a" (from flowline w/o depression) (in):									
Depression cross-slope (Sw=Sx+a/12w):									
Fraction of flow over the depression (Eo):									
Discharge-weighted equivalent cross-slope (Se):									
Q_s (first guess: **Qt - 0.001**, after iteration should be same as next line)		0.005			0.013	0.024	0.000		
Q_s over shoulder (excluding flow over the depression) (cfs):									
Q=Q_w+Q_s (cfs) (after iterations must match **Q_t** value):									
HYDRAULIC RESULTS:									
Flooded Width T for Q_t, upstream of inlet (ft):		11.39	10.76	12.59	13.52	12.13	SAG		
Flooded Width T at depression (if any) (ft):		11.39	10.76	12.59	13.52	12.13	SAG		
Flooded Width T for BYPASS Q downstream of inlet (ft):	0.00	9.06	8.49	10.26	11.00	0.00	SAG		
Water depth at curb (with or without depression) (in):		2.73	2.58	3.02	3.25	2.91			
Water cross-area at shoulder (without depression) (sq.ft.):		1.30	1.16	1.59	1.83	1.47			
Water velocity immediately u/s from inlet (w/o depression) (fps):		2.86	3.08	3.06	2.45	2.11			
Average water velocity for the segment to this inlet (fps):		1.07	1.45	1.36	1.12	1.02			
Flowtime from the previous inlet to this one (min):		10.79	2.99	3.27	4.06	1.64			
GRATE INLETS ON-GRADE:									
Splash-over V for effective length of grate (type P-1 3/8) (fps):		6.81	6.81	6.81	6.81				
Effective length of grate considering clogging factor (ft):		2.01	2.01	2.01	2.01				
Ratio of grate frontal flow to total flow:		0.40	0.422	0.369	0.347				
Fraction of frontal flow intercepted (Rf):		100.0%	100.0%	100.0%	100.0%				
Fraction of side flow interception (Rs):		9.1%	8.1%	8.2%	11.7%				
Total flow intercepted (cfs):		1.70	1.671	2.042	1.898				
Grate Efficiency (E):		45.7%	46.9%	42.1%	42.4%				
Grate flow-through flow (cfs):		2.01	1.894	2.810	2.582				
SLOTTED DRAINS & SIDE-OPENING INLETS ON-GRADE:									
Length required for total interception (ft):						26.00			
Length of inlet provided L (ft):						42.00			
Efficiency for length L:						100.0%			
Interception for length L (cfs):						3.102			
Side opening flow-through flow (cfs):						0.000			
INTERCEPTION CAPACITY OF INLETS IN SAG LOCATION:									
Maximum allowable flooded width (including the depression) (ft):							11.61		
Max. head at sag w/o exceeding allowable flooded width (ft):							0.23		
Capacity of grate in a sag (3-sided weir) (cfs):							2.007		
Length provided of curb-opening inlet at sag (ft):									
Capacity of curb-opening inlet in a sag (weir) (cfs):									

ONDRAIN_English Version 7.5d, developed by Fernando Manzanera, Caltrans District 1, Hydraulics Capital Support (December 2010).

Notes: -This program utilizes the equations presented in the FHA Hydraulic Engineering Circular 22 (HEC-22), FHWA-NHI-10-009.

- Underlined values are calculated by the program, the others are input by the user.

Separate Run

HYDRAULIC CALCULATOR FOR ONSITE DRAINAGE (English Units)

Date: 08/03/21

RCTC I-15 ELPSE

Note: "Subarea discharge Qsa (cfs)" was obtained from "Design Discharge" column of Hydrological Tables found within the hydrology maps in Appendix B.2, and inputted as "Additional discharge (cfs)" below.

	Starting Point							
		N-1316	SLOTTED	SLOTTED	SLOTTED	SLOTTED	SLOTTED	N-1315	SLOTTED
Location station (ft):	1316+83.0	1316+00.0	1315+85.0	1315+70.0	1315+55.0	1315+40.0	1315+25.0	1315+00.0	1314+80.0
Longitudinal profile ("on-grade" or "sag"):		on-grade	on-grade	on-grade	on-grade	on-grade	on-grade	on-grade	on-grade
Calculation Type ("grate", "side opening", or "shoulder hydraulics only"):		grate	side opening	side opening	side opening	side opening	side opening	grate	side opening
Longitudinal slope, S:		0.20%	0.20%	0.20%	0.20%	0.20%	0.20%	0.20%	0.20%
Shoulder cross-slope, Sx:		2.00%	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%
Average watershed paved width (ft):		0.00	82.76	82.76	82.76	82.76	82.76	82.76	81.46
Shoulder Manning's n:		0.013	0.013	0.013	0.013	0.013	0.013	0.013	0.013
Inlet description (optional):									
Clogging factor for on-grade grates:		33%						33%	
Grate width (ft):		4.00						2.00	
Grate length (ft):		3.00						3.00	
Precipitation intensity (in/hr):		3.20	3.20	3.20	3.20	3.20	3.20	3.20	3.20
Runoff Coefficient for paved areas, "C_p":		0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Runoff Coefficient for unpaved areas, "C_u":		0.63	0.60	0.60	0.60	0.60	0.60	0.60	0.60
Unpaved area contributing to this inlet (acres):		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Watershed paved length (ft):		83.0	15.0	15.0	15.0	15.0	15.0	25.0	20.0
Paved area contributing to this inlet (acres):		0.000	0.028	0.028	0.028	0.028	0.028	0.047	0.037
Subarea discharge Q_{sa} (cfs):		0.00	0.090	0.090	0.090	0.090	0.090	0.150	0.118
Additional discharge (cfs):		0.490							
Total discharge Q_t, including any upstream by-pass (cfs):		**0.490**	**0.120**	**0.090**	**0.090**	**0.090**	**0.090**	**0.150**	**0.133**
By-pass Q *Describe here source of bypass:*	**0.000**	**0.03**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.01**	**0.00**
DEPRESSION CALCULATION:									
Width of depression "w" (ft):									
Depression depth "a" (from flowline w/o depression) (in):									
Depression cross-slope (Sw=Sx+a/12w):									
Fraction of flow over the depression (Eo):									
Discharge-weighted equivalent cross-slope (Se):									
Q_s (first guess: **Qt - 0.001**, after iteration should be same as next line)		0.005			0.013	0.024	0.000	0.005	0.000
Q_s over shoulder (excluding flow over the depression) (cfs):									
Q=Q_w+Q_s (cfs) (after iterations must match **Q_t** value):									
HYDRAULIC RESULTS:									
Flooded Width T for Q_t, upstream of inlet (ft):		**6.90**	**4.07**	**3.66**	**3.66**	**3.66**	**3.66**	**4.43**	**4.23**
Flooded Width T at depression (if any) (ft):		**6.90**	**4.07**	**3.66**	**3.66**	**3.66**	**3.66**	**4.43**	**4.23**
Flooded Width T for BYPASS Q downstream of inlet (ft):	**0.00**	**2.41**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**1.85**	**0.00**
Water depth at curb (with or without depression) (in):		1.66	0.98	0.88	0.88	0.88	0.88	1.06	1.02
Water cross-area at shoulder (without depression) (sq.ft.):		0.48	0.17	0.13	0.13	0.13	0.13	0.20	0.18
Water velocity immediately u/s from inlet (w/o depression) (fps):		1.03	0.72	0.67	0.67	0.67	0.67	0.77	0.74
Average water velocity for the segment to this inlet (fps):		0.38	0.31	0.25	0.25	0.25	0.25	0.28	0.30
Flowtime from the previous inlet to this one (min):		3.61	0.80	1.00	1.00	1.00	1.00	1.46	1.10
GRATE INLETS ON-GRADE:									
Splash-over V for effective length of grate (type P-1 3/8) (fps):		6.81						6.81	
Effective length of grate considering clogging factor (ft):		2.01						2.01	
Ratio of grate frontal flow to total flow:		0.90						0.798	
Fraction of frontal flow intercepted (Rf):		100.0%						100.0%	
Fraction of side flow interception (Rs):		38.7%						51.8%	
Total flow intercepted (cfs):		0.46						0.136	
Grate Efficiency (E):		93.9%						90.3%	
Grate flow-through flow (cfs):		**0.03**						**0.015**	
SLOTTED DRAINS & SIDE-OPENING INLETS ON-GRADE:									
Length required for total interception (ft):			5.41	4.80	4.80	4.80	4.80		5.65
Length of inlet provided L (ft):		12.00	10.00	15.00	15.00	15.00	15.00	25.00	20.00
Efficiency for length L:			100.0%	100.0%	100.0%	100.0%	100.0%		100.0%
Interception for length L (cfs):			0.120	0.090	0.090	0.090	0.090		0.133
Side opening flow-through flow (cfs):			**0.000**	**0.000**	**0.000**	**0.000**	**0.000**		**0.000**
INTERCEPTION CAPACITY OF INLETS IN SAG LOCATION:									
Maximum allowable flooded width (including the depression) (ft):									
Max. head at sag w/o exceeding allowable flooded width (ft):									
Capacity of grate in a sag (3-sided weir) (cfs):									
Length provided of curb-opening inlet at sag (ft):									
Capacity of curb-opening inlet in a sag (weir) (cfs):									

ONDRAIN_English Version 7.5d, developed by Fernando Manzanera, Caltrans District 1, Hydraulics Capital Support (December 2010).

Notes: -This program utilizes the equations presented in the FHA Hydraulic Engineering Circular 22 (HEC-22), FHWA-NHI-10-009.

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North 1300's

HYDRAULIC CALCULATOR FOR ONSITE DRAINAGE (English Units)

Date: 08/03/21

RCTC I-15 ELPSE

Note: "Subarea discharge Qsa (cfs)" was obtained from "Design Discharge" column of Hydrological Tables found within the hydrology maps in Appendix B.2, and inputted as "Additional discharge (cfs)" below.

	Starting Point								
		SLOTTED	SLOTTED	SLOTTED	SLOTTED	N-1314	SLOTTED	SLOTTED	SLOTTED
Location station (ft):	1315+00.0	1314+80.0	1314+60.0	1314+40.0	1314+20.0	1314+00.0	1313+80.0	1313+60.0	1313+40.0
Longitudinal profile ("on-grade" or "sag"):		on-grade	on-grade	on-grade	on-grade	on-grade	on-grade	on-grade	on-grade
Calculation Type ("grate", "side opening", or "shoulder hydraulics only"):		side opening	side opening	side opening	side opening	grate	side opening	side opening	side opening
Longitudinal slope, S:		0.20%	0.20%	0.20%	0.20%	0.20%	0.20%	0.20%	0.20%
Shoulder cross-slope, Sx:		2.00%	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%
Average watershed paved width (ft):		81.46	81.46	81.46	81.46	81.46	81.46	81.46	81.46
Shoulder Manning's n:		0.013	0.013	0.013	0.013	0.013	0.013	0.013	0.013
Inlet description (optional):									
Clogging factor for on-grade grates:						33%			
Grate width (ft):						2.00			
Grate length (ft):						3.00			
Precipitation intensity (in/hr):		3.20	3.20	3.20	3.20	3.20	3.20	3.20	3.20
Runoff Coefficient for paved areas, "C_p":		0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Runoff Coefficient for unpaved areas, "C_u":		0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60
Unpaved area contributing to this inlet (acres):		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Watershed paved length (ft):		20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0
Paved area contributing to this inlet (acres):		0.037	0.037	0.037	0.037	0.037	0.037	0.037	0.037
Subarea discharge Q_{sa} (cfs):		0.12	0.118	0.118	0.118	0.118	0.118	0.118	0.118
Additional discharge (cfs):									
Total discharge Q_t, including any upstream by-pass (cfs):		0.118	0.118	0.118	0.118	0.118	0.127	0.118	0.118
By-pass Q — *Describe here source of bypass:*	0.000	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00
DEPRESSION CALCULATION:									
Width of depression "w" (ft):									
Depression depth "a" (from flowline w/o depression) (in):									
Depression cross-slope (Sw=Sx+a/12w):									
Fraction of flow over the depression (Eo):									
Discharge-weighted equivalent cross-slope (Se):									
Q_s (first guess: **Qt - 0.001**, after iteration should be same as next line)		0.005			0.013	0.024	0.000	0.005	0.000
Q_s over shoulder (excluding flow over the depression) (cfs):									
Q=Q_w+Q_s (cfs) (after iterations must match **Q_t** value):									
HYDRAULIC RESULTS:									
Flooded Width T for Q_t, upstream of inlet (ft):		4.05	4.05	4.05	4.05	4.05	4.16	4.05	4.05
Flooded Width T at depression (if any) (ft):		4.05	4.05	4.05	4.05	4.05	4.16	4.05	4.05
Flooded Width T for BYPASS Q downstream of inlet (ft):	0.00	0.00	0.00	0.00	0.00	1.53	0.00	0.00	0.00
Water depth at curb (with or without depression) (in):		0.97	0.97	0.97	0.97	0.97	1.00	0.97	0.97
Water cross-area at shoulder (without depression) (sq.ft.):		0.16	0.16	0.16	0.16	0.16	0.17	0.16	0.16
Water velocity immediately u/s from inlet (w/o depression) (fps):		0.72	0.72	0.72	0.72	0.72	0.73	0.72	0.72
Average water velocity for the segment to this inlet (fps):		0.27	0.27	0.27	0.27	0.27	0.29	0.27	0.27
Flowtime from the previous inlet to this one (min):		1.24	1.24	1.24	1.24	1.24	1.13	1.24	1.24
GRATE INLETS ON-GRADE:									
Splash-over V for effective length of grate (type P-1 3/8) (fps):						6.81			
Effective length of grate considering clogging factor (ft):						2.01			
Ratio of grate frontal flow to total flow:						0.837			
Fraction of frontal flow intercepted (Rf):						100.0%			
Fraction of side flow interception (Rs):						54.4%			
Total flow intercepted (cfs):						0.110			
Grate Efficiency (E):						92.6%			
Grate flow-through flow (cfs):						0.009			
SLOTTED DRAINS & SIDE-OPENING INLETS ON-GRADE:									
Length required for total interception (ft):		5.38	5.38	5.38	5.38		5.54	5.38	5.38
Length of inlet provided L (ft):		20.00	20.00	20.00	20.00	20.00	10.00	25.00	25.00
Efficiency for length L:		100.0%	100.0%	100.0%	100.0%		100.0%	100.0%	100.0%
Interception for length L (cfs):		0.12	0.118	0.118	0.118		0.127	0.118	0.118
Side opening flow-through flow (cfs):		0.00	0.000	0.000	0.000		0.000	0.000	0.000
INTERCEPTION CAPACITY OF INLETS IN SAG LOCATION:									
Maximum allowable flooded width (including the depression) (ft):								12.00	
Max. head at sag w/o exceeding allowable flooded width (ft):									
Capacity of grate in a sag (3-sided weir) (cfs):									
Length provided of curb-opening inlet at sag (ft):									
Capacity of curb-opening inlet in a sag (weir) (cfs):									

ONDRAIN_English Version 7.5d, developed by Fernando Manzanera, Caltrans District 1, Hydraulics Capital Support (December 2010).

Notes: -This program utilizes the equations presented in the FHA Hydraulic Engineering Circular 22 (HEC-22), FHWA-NHI-10-009.

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HYDRAULIC CALCULATOR FOR ONSITE DRAINAGE (English Units)

Date: 08/03/21

RCTC I-15 ELPSE

Note: "Subarea discharge Qsa (cfs)" was obtained from "Design Discharge" column of Hydrological Tables found within the hydrology maps in Appendix B.2, and inputted as "Additional discharge (cfs)" below.

	Starting Point	SLOTTED	N-1313	N-1312	N-1311	N-1310	N-1309	N-1308	N-1307
Location station (ft):	1313+40.0	1313+20.0	1313+00.0	1312+00.0	1311+00.0	1310+00.0	1309+00.0	1308+00.0	1307+00.0
Longitudinal profile ("on-grade" or "sag"):		on-grade	on-grade	on-grade	on-grade	on-grade	on-grade	on-grade	on-grade
Calculation Type ("grate", "side opening", or "shoulder hydraulics only"):		side opening	grate	grate	grate	grate	grate	grate	grate
Longitudinal slope, S:		0.20%	0.30%	0.30%	0.30%	0.40%	0.40%	0.50%	0.50%
Shoulder cross-slope, Sx:		2.00%	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%
Average watershed paved width (ft):		81.46	74.13	0.00	0.00	0.00	0.00	0.00	0.00
Shoulder Manning's n:		0.013	0.013	0.013	0.013	0.013	0.013	0.013	0.013
Inlet description (optional):									
Clogging factor for on-grade grates:			33%	33%	33%	33%	33%	33%	33%
Grate width (ft):			4.00	4.00	4.00	4.00	4.00	4.00	2.00
Grate length (ft):			3.00	3.00	3.00	3.00	3.00	3.00	3.00
Precipitation intensity (in/hr):		3.20	3.20	3.20	3.20	3.20	3.20	3.20	3.20
Runoff Coefficient for paved areas, "C_p":		0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Runoff Coefficient for unpaved areas, "C_u":		0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63
Unpaved area contributing to this inlet (acres):		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Watershed paved length (ft):		20.0	20.0	100.0	100.0	100.0	100.0	100.0	100.0
Paved area contributing to this inlet (acres):		0.037	0.034	0.000	0.000	0.000	0.000	0.000	0.000
Subarea discharge Q_{sa} (cfs):		0.12	0.108	0.000	0.000	0.000	0.000	0.000	0.000
Additional discharge (cfs):				0.600	0.580	0.560	0.610	0.630	0.570
Total discharge Q_t, including any upstream by-pass (cfs):		0.118	0.108	0.600	0.621	0.605	0.646	0.673	0.612
By-pass Q *Describe here source of bypass:*	0.000	0.00	0.00	0.04	0.05	0.04	0.04	0.04	0.17
DEPRESSION CALCULATION:									
Width of depression "w" (ft):									
Depression depth "a" (from flowline w/o depression) (in):									
Depression cross-slope (Sw=Sx+a/12w):									
Fraction of flow over the depression (Eo):									
Discharge-weighted equivalent cross-slope (Se):									
Q_s (first guess: **Qt - 0.001**, after iteration should be same as next line)		0.005			0.013	0.024	0.000	0.005	0.000
Q_s over shoulder (excluding flow over the depression) (cfs):									
Q=Q_w+Q_s (cfs) (after iterations must match **Q_t** value):									
HYDRAULIC RESULTS:									
Flooded Width T for Q_t, upstream of inlet (ft):		4.05	3.63	6.90	6.99	6.56	6.72	6.55	6.32
Flooded Width T at depression (if any) (ft):		4.05	3.63	6.90	6.99	6.56	6.72	6.55	6.32
Flooded Width T for BYPASS Q downstream of inlet (ft):	0.00	0.00	0.00	2.53	2.61	2.28	2.43	2.31	3.90
Water depth at curb (with or without depression) (in):		0.97	0.87	1.66	1.68	1.57	1.61	1.57	1.52
Water cross-area at shoulder (without depression) (sq.ft.):		0.16	0.13	0.48	0.49	0.43	0.45	0.43	0.40
Water velocity immediately u/s from inlet (w/o depression) (fps):		0.72	0.82	1.26	1.27	1.41	1.43	1.57	1.53
Average water velocity for the segment to this inlet (fps):		0.27	0.31	0.47	0.51	0.57	0.57	0.63	0.61
Flowtime from the previous inlet to this one (min):		1.24	1.09	3.55	3.28	2.93	2.93	2.64	2.71
GRATE INLETS ON-GRADE:									
Splash-over V for effective length of grate (type P-1 3/8) (fps):			6.81	6.81	6.81	6.81	6.81	6.81	6.81
Effective length of grate considering clogging factor (ft):			2.01	2.01	2.01	2.01	2.01	2.01	2.01
Ratio of grate frontal flow to total flow:			1.000	0.901	0.896	0.919	0.910	0.919	0.638
Fraction of frontal flow intercepted (Rf):			100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Fraction of side flow interception (Rs):			0.0%	30.5%	30.1%	26.4%	25.9%	22.8%	23.5%
Total flow intercepted (cfs):			0.108	0.559	0.576	0.569	0.603	0.631	0.442
Grate Efficiency (E):			100.0%	93.1%	92.7%	94.0%	93.3%	93.8%	72.3%
Grate flow-through flow (cfs):			0.000	0.041	0.045	0.036	0.043	0.042	0.170
SLOTTED DRAINS & SIDE-OPENING INLETS ON-GRADE:									
Length required for total interception (ft):		5.38							
Length of inlet provided L (ft):		15.00	15.00						
Efficiency for length L:		100.0%							
Interception for length L (cfs):		0.12							
Side opening flow-through flow (cfs):		0.00							
INTERCEPTION CAPACITY OF INLETS IN SAG LOCATION:									
Maximum allowable flooded width (including the depression) (ft):								12.00	
Max. head at sag w/o exceeding allowable flooded width (ft):									
Capacity of grate in a sag (3-sided weir) (cfs):									
Length provided of curb-opening inlet at sag (ft):									
Capacity of curb-opening inlet in a sag (weir) (cfs):									

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Notes: -This program utilizes the equations presented in the FHA Hydraulic Engineering Circular 22 (HEC-22), FHWA-NHI-10-009.

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North 1300's

HYDRAULIC CALCULATOR FOR ONSITE DRAINAGE (English Units)

Date: 08/03/21

RCTC I-15 ELPSE

Note: "Subarea discharge Qsa (cfs)" was obtained from "Design Discharge" column of Hydrological Tables found within the hydrology maps in Appendix B.2, and inputted as "Additional discharge (cfs)" below.

	Starting Point	N-1306A	N-1305	N-1304	N-1303	N-1302	N-1301B	N-1301A	N-1299B
Location station (ft):	1307+00.0	1306+32.0	1305+50.0	1304+50.0	1303+50.0	1302+50.0	1301+75.0	1301+00.0	1299+80.0
Longitudinal profile ("on-grade" or "sag"):		on-grade	on-grade	on-grade	on-grade	on-grade	on-grade	on-grade	on-grade
Calculation Type ("grate", "side opening", or "shoulder hydraulics only"):		grate	grate	grate	grate	grate	grate	grate	grate
Longitudinal slope, S:		0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%
Shoulder cross-slope, Sx:		2.00%	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%
Average watershed paved width (ft):		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Shoulder Manning's n:		0.013	0.013	0.013	0.013	0.013	0.013	0.013	0.013
Inlet description (optional):									
Clogging factor for on-grade grates:		33%	33%	33%	33%	33%	33%	33%	33%
Grate width (ft):		2.00	2.00	4.00	4.00	4.00	4.00	4.00	4.00
Grate length (ft):		3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00
Precipitation intensity (in/hr):		3.20	3.20	3.20	3.20	3.20	3.20	3.20	3.20
Runoff Coefficient for paved areas, "C_p":		0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Runoff Coefficient for unpaved areas, "C_u":		0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63
Unpaved area contributing to this inlet (acres):		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Watershed paved length (ft):		68.0	82.0	100.0	100.0	100.0	75.0	75.0	120.0
Paved area contributing to this inlet (acres):		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Subarea discharge Q_{sa} (cfs):		0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Additional discharge (cfs):		0.440	0.480	0.600	0.600	0.540	0.520	0.470	0.730
Total discharge Q_t, including any upstream by-pass (cfs):		**0.630**	**0.657**	**0.790**	**0.663**	**0.580**	**0.548**	**0.493**	**0.747**
By-pass Q *Describe here source of bypass:*	**0.190**	**0.18**	**0.19**	**0.06**	**0.04**	**0.03**	**0.02**	**0.02**	**0.05**
DEPRESSION CALCULATION:									
Width of depression "w" (ft):									
Depression depth "a" (from flowline w/o depression) (in):									
Depression cross-slope (Sw=Sx+a/12w):									
Fraction of flow over the depression (Eo):									
Discharge-weighted equivalent cross-slope (Se):									
Q_s (first guess: **Qt - 0.001**, after iteration should be same as next line)		0.005			0.013	0.024	0.000	0.005	0.000
Q_s over shoulder (excluding flow over the depression) (cfs):									
Q=Q_w+Q_s (cfs) (after iterations must match **Q_t** value):									
HYDRAULIC RESULTS:									
Flooded Width T for Q_t, upstream of inlet (ft):		**6.39**	**6.49**	**6.95**	**6.51**	**6.19**	**6.06**	**5.83**	**6.81**
Flooded Width T at depression (if any) (ft):		**6.39**	**6.49**	**6.95**	**6.51**	**6.19**	**6.06**	**5.83**	**6.81**
Flooded Width T for BYPASS Q downstream of inlet (ft):	**0.00**	**3.97**	**4.07**	**2.69**	**2.28**	**1.98**	**1.85**	**1.64**	**2.56**
Water depth at curb (with or without depression) (in):		1.53	1.56	1.67	1.56	1.49	1.45	1.40	1.63
Water cross-area at shoulder (without depression) (sq.ft.):		0.41	0.42	0.48	0.42	0.38	0.37	0.34	0.46
Water velocity immediately u/s from inlet (w/o depression) (fps):		1.54	1.56	1.63	1.56	1.51	1.49	1.45	1.61
Average water velocity for the segment to this inlet (fps):		0.58	0.68	0.70	0.64	0.61	0.59	0.57	0.62
Flowtime from the previous inlet to this one (min):		1.97	2.01	2.36	2.62	2.75	2.12	2.18	3.21
GRATE INLETS ON-GRADE:									
Splash-over V for effective length of grate (type P-1 3/8) (fps):		6.81	6.81	6.81	6.81	6.81	6.81	6.81	6.81
Effective length of grate considering clogging factor (ft):		2.01	2.01	2.01	2.01	2.01	2.01	2.01	2.01
Ratio of grate frontal flow to total flow:		0.63	0.626	0.898	0.921	0.937	0.944	0.955	0.906
Fraction of frontal flow intercepted (Rf):		100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Fraction of side flow interception (Rs):		23.3%	22.9%	21.5%	22.9%	24.0%	24.4%	25.3%	21.9%
Total flow intercepted (cfs):		0.45	0.468	0.727	0.623	0.553	0.524	0.477	0.692
Grate Efficiency (E):		71.8%	71.2%	92.0%	93.9%	95.2%	95.8%	96.6%	92.7%
Grate flow-through flow (cfs):		**0.18**	**0.190**	**0.063**	**0.040**	**0.028**	**0.023**	**0.017**	**0.055**
SLOTTED DRAINS & SIDE-OPENING INLETS ON-GRADE:									
Length required for total interception (ft):									
Length of inlet provided L (ft):		15.00	15.00				15.00		
Efficiency for length L:									
Interception for length L (cfs):									
Side opening flow-through flow (cfs):									
INTERCEPTION CAPACITY OF INLETS IN SAG LOCATION:									
Maximum allowable flooded width (including the depression) (ft):									
Max. head at sag w/o exceeding allowable flooded width (ft):									
Capacity of grate in a sag (3-sided weir) (cfs):									
Length provided of curb-opening inlet at sag (ft):									
Capacity of curb-opening inlet in a sag (weir) (cfs):									

ONDRAIN_English Version 7.5d, developed by Fernando Manzanera, Caltrans District 1, Hydraulics Capital Support (December 2010).

Notes: -This program utilizes the equations presented in the FHA Hydraulic Engineering Circular 22 (HEC-22), FHWA-NHI-10-009.

- Underlined values are calculated by the program, the others are input by the user.

North 1300's

HYDRAULIC CALCULATOR FOR ONSITE DRAINAGE (English Units)

Date: 08/03/21

RCTC I-15 ELPSE

Note: "Subarea discharge Qsa (cfs)" was obtained from "Design Discharge" column of Hydrological Tables found within the hydrology maps in Appendix B.2, and inputted as "Additional discharge (cfs)" below.

	Starting Point	N-1299A	N-1298	N-1296A					
Location station (ft):	**1299+80.0**	**1299+10.0**	**1298+00.0**	**1296+50.0**					
Longitudinal profile ("on-grade" or "sag"):		on-grade	on-grade	sag					
Calculation Type ("grate", "side opening", or "shoulder hydraulics only"):		grate	side opening	grate					
Longitudinal slope, S:		0.50%	0.50%	0.50%					
Shoulder cross-slope, Sx:		2.00%	2.00%	2.00%					
Average watershed paved width (ft):		0.00	0.00	0.00					
Shoulder Manning's n:		0.013	0.013	0.013					
Inlet description (optional):									
Clogging factor for on-grade grates:		33%	33%	33%					
Grate width (ft):		2.00	4.00	2.00					
Grate length (ft):		3.00	3.00	3.00					
Precipitation intensity (in/hr):		3.20	3.20	3.20					
Runoff Coefficient for paved areas, "C_p":		0.99	0.99	0.99					
Runoff Coefficient for unpaved areas, "C_u":		0.63	0.63	0.63					
Unpaved area contributing to this inlet (acres):		0.000	0.000	0.000					
Watershed paved length (ft):		70.0	110.0	150.0					
Paved area contributing to this inlet (acres):		0.000	0.000	0.000					
Subarea discharge Q_{sa} (cfs):		0.00	0.000	0.000					
Additional discharge (cfs):		0.330	0.590	1.580					
Total discharge Q_t, including any upstream by-pass (cfs):		**0.390**	**0.671**	**1.580**					
By-pass Q *Describe here source of bypass:*	**0.060**	**0.08**	**0.00**	**SAG**					
DEPRESSION CALCULATION:									
Width of depression "w" (ft):									
Depression depth "a" (from flowline w/o depression) (in):									
Depression cross-slope (Sw=Sx+a/12w):									
Fraction of flow over the depression (Eo):									
Discharge-weighted equivalent cross-slope (Se):									
Q_s (first guess: **Qt - 0.001**, after iteration should be same as next line)		0.005							
Q_s over shoulder (excluding flow over the depression) (cfs):									
Q=Q_w+Q_s (cfs) (after iterations must match **Q_t** value):									
HYDRAULIC RESULTS:									
Flooded Width T for Q_t, upstream of inlet (ft):		**5.33**	**6.54**	**SAG**					
Flooded Width T at depression (if any) (ft):		**5.33**	**6.54**	**SAG**					
Flooded Width T for BYPASS Q downstream of inlet (ft):	**0.00**	**2.96**	**0.00**	**SAG**					
Water depth at curb (with or without depression) (in):		1.28	1.57						
Water cross-area at shoulder (without depression) (sq.ft.):		0.28	0.43						
Water velocity immediately u/s from inlet (w/o depression) (fps):		1.37	1.57						
Average water velocity for the segment to this inlet (fps):		0.51	0.65						
Flowtime from the previous inlet to this one (min):		2.29	2.84						
GRATE INLETS ON-GRADE:									
Splash-over V for effective length of grate (type P-1 3/8) (fps):		6.81							
Effective length of grate considering clogging factor (ft):		2.01							
Ratio of grate frontal flow to total flow:		0.71							
Fraction of frontal flow intercepted (Rf):		100.0%							
Fraction of side flow interception (Rs):		27.4%							
Total flow intercepted (cfs):		0.31							
Grate Efficiency (E):		79.2%							
Grate flow-through flow (cfs):		**0.08**							
SLOTTED DRAINS & SIDE-OPENING INLETS ON-GRADE:									
Length required for total interception (ft):			14.66						
Length of inlet provided L (ft):			23.00						
Efficiency for length L:			100.0%						
Interception for length L (cfs):			0.671						
Side opening flow-through flow (cfs):			**0.000**						
INTERCEPTION CAPACITY OF INLETS IN SAG LOCATION:									
Maximum allowable flooded width (including the depression) (ft):				**11.00**					
Max. head at sag w/o exceeding allowable flooded width (ft):				0.22					
Capacity of grate in a sag (3-sided weir) (cfs):				***1.851***					
Length provided of curb-opening inlet at sag (ft):									
Capacity of curb-opening inlet in a sag (weir) (cfs):									

ONDRAIN_English Version 7.5d, developed by Fernando Manzanera, Caltrans District 1, Hydraulics Capital Support (December 2010).

Notes: -This program utilizes the equations presented in the FHA Hydraulic Engineering Circular 22 (HEC-22), FHWA-NHI-10-009.

- Underlined values are calculated by the program, the others are input by the user.

Separate Run

HYDRAULIC CALCULATOR FOR ONSITE DRAINAGE (English Units)

Date: 08/03/21

RCTC I-15 ELPSE

Note: "Subarea discharge Qsa (cfs)" was obtained from "Design Discharge" column of Hydrological Tables found within the hydrology maps in Appendix B.2, and inputted as "Additional discharge (cfs)" below.

	Starting Point	N-1317	N-1318A	N-1318B	N-1319	N-1320A	N-1320B	N-1321A	N-1321B
Location station (ft):	1316+83.0	1317+50.0	1318+00.0	1318+50.0	1319+32.0	1320+00.0	1320+50.0	1321+15.0	1321+70.6
Longitudinal profile ("on-grade" or "sag"):		on-grade	on-grade	on-grade	on-grade	on-grade	on-grade	on-grade	on-grade
Calculation Type ("grate", "side opening", or "shoulder hydraulics only"):		grate	grate	grate	side opening	grate	grate	grate	grate
Longitudinal slope, S:		0.20%	0.20%	0.20%	0.20%	0.20%	0.20%	0.20%	0.20%
Shoulder cross-slope, Sx:		2.00%	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%
Average watershed paved width (ft):		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Shoulder Manning's n:		0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016
Inlet description (optional):									
Clogging factor for on-grade grates:		33%	33%	33%	33%	33%	33%	33%	33%
Grate width (ft):		4.00	4.00	4.00	4.00	4.00	4.00	2.00	2.00
Grate length (ft):		3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00
Precipitation intensity (in/hr):		3.20	3.20	3.20	3.20	3.20	3.20	3.20	3.20
Runoff Coefficient for paved areas, "C_p":		0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Runoff Coefficient for unpaved areas, "C_u":		0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63
Unpaved area contributing to this inlet (acres):		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Watershed paved length (ft):		67.0	50.0	50.0	82.0	68.0	50.0	65.0	55.6
Paved area contributing to this inlet (acres):		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Subarea discharge Q_{sa} (cfs):		0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Additional discharge (cfs):		0.410	0.300	0.380	0.380	0.400	0.390	0.330	0.290
Total discharge Q_t, including any upstream by-pass (cfs):		**0.410**	**0.322**	**0.392**	**0.400**	**0.400**	**0.411**	**0.352**	**0.358**
By-pass Q *Describe here source of bypass:*	**0.000**	**0.02**	**0.01**	**0.02**	**0.00**	**0.02**	**0.02**	**0.07**	**0.07**
DEPRESSION CALCULATION:									
Width of depression "w" (ft):									
Depression depth "a" (from flowline w/o depression) (in):									
Depression cross-slope (Sw=Sx+a/12w):									
Fraction of flow over the depression (Eo):									
Discharge-weighted equivalent cross-slope (Se):									
Q_s (first guess: **Qt - 0.001**, after iteration should be same as next line)		0.005			0.013	0.024	0.000	0.005	0.000
Q_s over shoulder (excluding flow over the depression) (cfs):									
Q=Q_w+Q_s (cfs) (after iterations must match **Q_t** value):									
HYDRAULIC RESULTS:									
Flooded Width T for Q_t, upstream of inlet (ft):		**6.98**	**6.37**	**6.86**	**6.91**	**6.91**	**6.98**	**6.59**	**6.63**
Flooded Width T at depression (if any) (ft):		**6.98**	**6.37**	**6.86**	**6.91**	**6.91**	**6.98**	**6.59**	**6.63**
Flooded Width T for BYPASS Q downstream of inlet (ft):	**0.00**	**2.34**	**1.83**	**2.24**	**0.00**	**2.28**	**2.34**	**3.56**	**3.60**
Water depth at curb (with or without depression) (in):		1.67	1.53	1.65	1.66	1.66	1.68	1.58	1.59
Water cross-area at shoulder (without depression) (sq.ft.):		0.49	0.41	0.47	0.48	0.48	0.49	0.43	0.44
Water velocity immediately u/s from inlet (w/o depression) (fps):		0.84	0.79	0.83	0.84	0.84	0.84	0.81	0.81
Average water velocity for the segment to this inlet (fps):		0.31	0.32	0.32	0.33	0.31	0.33	0.32	0.35
Flowtime from the previous inlet to this one (min):		3.56	2.62	2.57	4.13	3.63	2.50	3.34	2.68
GRATE INLETS ON-GRADE:									
Splash-over V for effective length of grate (type P-1 3/8) (fps):		6.81	6.81	6.81		6.81	6.81	6.81	6.81
Effective length of grate considering clogging factor (ft):		2.01	2.01	2.01		2.01	2.01	2.01	2.01
Ratio of grate frontal flow to total flow:		0.90	0.928	0.903		0.900	0.897	0.619	0.616
Fraction of frontal flow intercepted (Rf):		100.0%	100.0%	100.0%		100.0%	100.0%	100.0%	100.0%
Fraction of side flow interception (Rs):		47.5%	50.2%	48.0%		47.8%	47.5%	49.2%	49.0%
Total flow intercepted (cfs):		0.39	0.311	0.372		0.379	0.389	0.284	0.288
Grate Efficiency (E):		94.6%	96.4%	95.0%		94.8%	94.6%	80.6%	80.4%
Grate flow-through flow (cfs):		**0.02**	**0.012**	**0.020**		**0.021**	**0.022**	**0.068**	**0.070**
SLOTTED DRAINS & SIDE-OPENING INLETS ON-GRADE:									
Length required for total interception (ft):					7.91				
Length of inlet provided L (ft):					12.00				
Efficiency for length L:					100.0%				
Interception for length L (cfs):					0.400				
Side opening flow-through flow (cfs):					**0.000**				
INTERCEPTION CAPACITY OF INLETS IN SAG LOCATION:									
Maximum allowable flooded width (including the depression) (ft):									
Max. head at sag w/o exceeding allowable flooded width (ft):									
Capacity of grate in a sag (3-sided weir) (cfs):									
Length provided of curb-opening inlet at sag (ft):									
Capacity of curb-opening inlet in a sag (weir) (cfs):									

ONDRAIN_English Version 7.5d, developed by Fernando Manzanera, Caltrans District 1, Hydraulics Capital Support (December 2010).

Notes: -This program utilizes the equations presented in the FHA Hydraulic Engineering Circular 22 (HEC-22), FHWA-NHI-10-009.

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HYDRAULIC CALCULATOR FOR ONSITE DRAINAGE (English Units)

Date: 08/03/21

RCTC I-15 ELPSE

Note: "Subarea discharge Qsa (cfs)" was obtained from "Design Discharge" column of Hydrological Tables found within the hydrology maps in Appendix B.2, and inputted as "Additional discharge (cfs)" below.

	Starting Point	N-1322	N-1323A	N-1323B	N-1324	N-1325	N-1326A	N-1326B	N-1327
Location station (ft):	1321+50.0	1322+30.0	1323+05.0	1323+90.0	1324+65.0	1325+32.4	1326+00.0	1326+50.0	1327+50.0
Longitudinal profile ("on-grade" or "sag"):		on-grade	on-grade	on-grade	on-grade	on-grade	on-grade	on-grade	on-grade
Calculation Type ("grate", "side opening", or "shoulder hydraulics only"):		grate	side opening	grate	grate	grate	grate	grate	side opening
Longitudinal slope, S:		0.30%	0.30%	0.30%	0.30%	0.30%	0.30%	0.30%	0.30%
Shoulder cross-slope, Sx:		2.00%	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%
Average watershed paved width (ft):		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Shoulder Manning's n:		0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016
Inlet description (optional):									
Clogging factor for on-grade grates:		33%	33%	33%	33%	33%	33%	33%	33%
Grate width (ft):		4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
Grate length (ft):		3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00
Precipitation intensity (in/hr):		3.20	3.20	3.20	3.20	3.20	3.20	3.20	3.20
Runoff Coefficient for paved areas, "C_p":		0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Runoff Coefficient for unpaved areas, "C_u":		0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63
Unpaved area contributing to this inlet (acres):		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Watershed paved length (ft):		80.0	75.0	85.0	75.0	67.4	67.6	50.0	100.0
Paved area contributing to this inlet (acres):		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Subarea discharge Q_{sa} (cfs):		0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Additional discharge (cfs):		0.420	0.450	0.480	0.450	0.420	0.390	0.430	0.470
Total discharge Q_t, including any upstream by-pass (cfs):		**0.490**	**0.480**	**0.480**	**0.478**	**0.448**	**0.414**	**0.449**	**0.494**
By-pass Q *Describe here source of bypass:*	0.070	**0.03**	**0.00**	**0.03**	**0.03**	**0.02**	**0.02**	**0.02**	**0.00**
DEPRESSION CALCULATION:									
Width of depression "w" (ft):									
Depression depth "a" (from flowline w/o depression) (in):									
Depression cross-slope (Sw=Sx+a/12w):									
Fraction of flow over the depression (Eo):									
Discharge-weighted equivalent cross-slope (Se):									
Q_s (first guess: **Qt - 0.001**, after iteration should be same as next line)		0.005			0.013	0.024	0.000	0.005	0.000
Q_s over shoulder (excluding flow over the depression) (cfs):									
Q=Q_w+Q_s (cfs) (after iterations must match **Q_t** value):									
HYDRAULIC RESULTS:									
Flooded Width T for Q_t, upstream of inlet (ft):		**6.91**	**6.86**	**6.86**	**6.85**	**6.69**	**6.49**	**6.69**	**6.93**
Flooded Width T at depression (if any) (ft):		**6.91**	**6.86**	**6.86**	**6.85**	**6.69**	**6.49**	**6.69**	**6.93**
Flooded Width T for BYPASS Q downstream of inlet (ft):	0.00	**2.42**	**0.00**	**2.38**	**2.37**	**2.22**	**2.05**	**2.22**	**0.00**
Water depth at curb (with or without depression) (in):		1.66	1.65	1.65	1.64	1.60	1.56	1.61	1.66
Water cross-area at shoulder (without depression) (sq.ft.):		0.48	0.47	0.47	0.47	0.45	0.42	0.45	0.48
Water velocity immediately u/s from inlet (w/o depression) (fps):		1.03	1.02	1.02	1.02	1.00	0.98	1.00	1.03
Average water velocity for the segment to this inlet (fps):		0.38	0.41	0.38	0.41	0.40	0.39	0.39	0.41
Flowtime from the previous inlet to this one (min):		3.49	3.07	3.73	3.08	2.81	2.88	2.11	4.10
GRATE INLETS ON-GRADE:									
Splash-over V for effective length of grate (type P-1 3/8) (fps):		6.81		6.81	6.81	6.81	6.81	6.81	
Effective length of grate considering clogging factor (ft):		2.01		2.01	2.01	2.01	2.01	2.01	
Ratio of grate frontal flow to total flow:		0.90		0.903	0.903	0.912	0.922	0.912	
Fraction of frontal flow intercepted (Rf):		100.0%		100.0%	100.0%	100.0%	100.0%	100.0%	
Fraction of side flow interception (Rs):		38.8%		39.1%	39.1%	39.8%	40.7%	39.8%	
Total flow intercepted (cfs):		0.46		0.452	0.450	0.424	0.395	0.425	
Grate Efficiency (E):		93.9%		94.1%	94.1%	94.7%	95.4%	94.7%	
Grate flow-through flow (cfs):		**0.03**		**0.028**	**0.028**	**0.024**	**0.019**	**0.024**	
SLOTTED DRAINS & SIDE-OPENING INLETS ON-GRADE:									
Length required for total interception (ft):			9.64						9.76
Length of inlet provided L (ft):		12.00	15.00	12.00	12.00	12.00		10.00	10.00
Efficiency for length L:			100.0%						100.0%
Interception for length L (cfs):			0.480						0.494
Side opening flow-through flow (cfs):			**0.000**						**0.000**
INTERCEPTION CAPACITY OF INLETS IN SAG LOCATION:									
Maximum allowable flooded width (including the depression) (ft):									
Max. head at sag w/o exceeding allowable flooded width (ft):									
Capacity of grate in a sag (3-sided weir) (cfs):									
Length provided of curb-opening inlet at sag (ft):									
Capacity of curb-opening inlet in a sag (weir) (cfs):									

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Notes: -This program utilizes the equations presented in the FHA Hydraulic Engineering Circular 22 (HEC-22), FHWA-NHI-10-009.

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North 1300's

HYDRAULIC CALCULATOR FOR ONSITE DRAINAGE (English Units)

Date: 08/03/21

RCTC I-15 ELPSE

Note: "Subarea discharge Qsa (cfs)" was obtained from "Design Discharge" column of Hydrological Tables found within the hydrology maps in Appendix B.2, and inputted as "Additional discharge (cfs)" below.

	Starting Point	N-1328	N-1329A	N-1330A	N-1330B	N-1331	N-1332	N-1333A	N-1333B
Location station (ft):	1327+50.0	1328+50.0	1329+00.0	1330+32.0	1330+70.0	1331+40.0	1332+25.0	1333+00.0	1333+50.0
Longitudinal profile ("on-grade" or "sag"):		on-grade	on-grade	on-grade	on-grade	on-grade	on-grade	on-grade	on-grade
Calculation Type ("grate", "side opening", or "shoulder hydraulics only"):		grate	grate	grate	grate	grate	grate	grate	grate
Longitudinal slope, S:		0.30%	0.30%	0.30%	0.30%	0.30%	0.30%	0.30%	0.30%
Shoulder cross-slope, Sx:		2.00%	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%
Average watershed paved width (ft):		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Shoulder Manning's n:		0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016
Inlet description (optional):									
Clogging factor for on-grade grates:		33%	33%	33%	33%	33%	33%	33%	33%
Grate width (ft):		4.00	4.00	4.00	4.00	4.00	4.00	2.00	4.00
Grate length (ft):		3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00
Precipitation intensity (in/hr):		3.20	3.20	3.20	3.20	3.20	3.20	3.20	3.20
Runoff Coefficient for paved areas, "C_p":		0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Runoff Coefficient for unpaved areas, "C_u":		0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63
Unpaved area contributing to this inlet (acres):		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Watershed paved length (ft):		100.0	50.0	132.0	38.0	70.0	85.0	75.0	50.0
Paved area contributing to this inlet (acres):		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Subarea discharge Q_{sa} (cfs):		0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Additional discharge (cfs):		0.490	0.420	0.430	0.200	0.490	0.450	0.470	0.300
Total discharge Q_t, including any upstream by-pass (cfs):		**0.490**	**0.450**	**0.454**	**0.225**	**0.492**	**0.480**	**0.498**	**0.424**
By-pass Q *Describe here source of bypass:*	0.000	**0.03**	**0.02**	**0.02**	**0.00**	**0.03**	**0.03**	**0.12**	**0.02**
DEPRESSION CALCULATION:									
Width of depression "w" (ft):									
Depression depth "a" (from flowline w/o depression) (in):									
Depression cross-slope (Sw=Sx+a/12w):									
Fraction of flow over the depression (Eo):									
Discharge-weighted equivalent cross-slope (Se):									
Q_s (first guess: **Qt - 0.001**, after iteration should be same as next line)		0.005			0.013	0.024	0.000	0.005	0.000
Q_s over shoulder (excluding flow over the depression) (cfs):									
Q=Q_w+Q_s (cfs) (after iterations must match **Q_t** value):									
HYDRAULIC RESULTS:									
Flooded Width T for Q_t, upstream of inlet (ft):		**6.91**	**6.70**	**6.72**	**5.16**	**6.93**	**6.86**	**6.96**	**6.55**
Flooded Width T at depression (if any) (ft):		**6.91**	**6.70**	**6.72**	**5.16**	**6.93**	**6.86**	**6.96**	**6.55**
Flooded Width T for BYPASS Q downstream of inlet (ft):	0.00	**2.42**	**2.23**	**2.25**	**0.91**	**2.43**	**2.38**	**4.13**	**2.10**
Water depth at curb (with or without depression) (in):		1.66	1.61	1.61	1.24	1.66	1.65	1.67	1.57
Water cross-area at shoulder (without depression) (sq.ft.):		0.48	0.45	0.45	0.27	0.48	0.47	0.48	0.43
Water velocity immediately u/s from inlet (w/o depression) (fps):		1.03	1.00	1.01	0.84	1.03	1.02	1.03	0.99
Average water velocity for the segment to this inlet (fps):		0.38	0.40	0.40	0.35	0.39	0.41	0.41	0.43
Flowtime from the previous inlet to this one (min):		4.36	2.07	5.52	1.83	3.01	3.48	3.05	1.93
GRATE INLETS ON-GRADE:									
Splash-over V for effective length of grate (type P-1 3/8) (fps):		6.81	6.81	6.81	6.81	6.81	6.81	6.81	6.81
Effective length of grate considering clogging factor (ft):		2.01	2.01	2.01	2.01	2.01	2.01	2.01	2.01
Ratio of grate frontal flow to total flow:		0.90	0.912	0.910	0.981	0.900	0.903	0.595	0.919
Fraction of frontal flow intercepted (Rf):		100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Fraction of side flow interception (Rs):		38.8%	39.8%	39.7%	47.4%	38.8%	39.1%	38.7%	40.4%
Total flow intercepted (cfs):		0.46	0.426	0.429	0.222	0.462	0.452	0.375	0.403
Grate Efficiency (E):		93.9%	94.7%	94.6%	99.0%	93.9%	94.1%	75.2%	95.2%
Grate flow-through flow (cfs):		**0.03**	**0.024**	**0.025**	**0.002**	**0.030**	**0.028**	**0.124**	**0.020**
SLOTTED DRAINS & SIDE-OPENING INLETS ON-GRADE:									
Length required for total interception (ft):									
Length of inlet provided L (ft):		12.00	12.00	12.00	12.00	12.00	10.00	10.00	
Efficiency for length L:									
Interception for length L (cfs):									
Side opening flow-through flow (cfs):									
INTERCEPTION CAPACITY OF INLETS IN SAG LOCATION:									
Maximum allowable flooded width (including the depression) (ft):									
Max. head at sag w/o exceeding allowable flooded width (ft):									
Capacity of grate in a sag (3-sided weir) (cfs):									
Length provided of curb-opening inlet at sag (ft):									
Capacity of curb-opening inlet in a sag (weir) (cfs):									

ONDRAIN_English Version 7.5d, developed by Fernando Manzanera, Caltrans District 1, Hydraulics Capital Support (December 2010).

Notes: -This program utilizes the equations presented in the FHA Hydraulic Engineering Circular 22 (HEC-22), FHWA-NHI-10-009.

- Underlined values are calculated by the program, the others are input by the user.

HYDRAULIC CALCULATOR FOR ONSITE DRAINAGE (English Units)

Date: 08/03/21

RCTC I-15 ELPSE

Note: "Subarea discharge Qsa (cfs)" was obtained from "Design Discharge" column of Hydrological Tables found within the hydrology maps in Appendix B.2, and inputted as "Additional discharge (cfs)" below.

	Starting Point	N-1334A	N-1334B	N-1335A	N-1335B	N-1336A	N-1336B	N-1337	N-1338
Location station (ft):	1333+50.0	1334+00.0	1334+50.0	1335+04.0	1335+57.0	1336+20.0	1336+88.0	1337+50.0	1338+50.0
Longitudinal profile ("on-grade" or "sag"):		on-grade	on-grade	on-grade	on-grade	on-grade	on-grade	on-grade	on-grade
Calculation Type ("grate", "side opening", or "shoulder hydraulics only"):		grate	grate	grate	grate	side opening	grate	grate	grate
Longitudinal slope, S:		0.20%	0.30%	0.20%	0.30%	0.50%	0.20%	0.40%	0.30%
Shoulder cross-slope, Sx:		2.00%	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%
Average watershed paved width (ft):		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Shoulder Manning's n:		0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016
Inlet description (optional):									
Clogging factor for on-grade grates:		33%	33%	33%	33%	33%	33%	33%	33%
Grate width (ft):		4.00	2.00	2.00	4.00	2.00	2.00	4.00	4.00
Grate length (ft):		3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00
Precipitation intensity (in/hr):		3.20	3.20	3.20	3.20	3.20	3.20	3.20	3.20
Runoff Coefficient for paved areas, "C_p":		0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Runoff Coefficient for unpaved areas, "C_u":		0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63
Unpaved area contributing to this inlet (acres):		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Watershed paved length (ft):		50.0	50.0	54.0	53.0	63.0	68.0	62.0	100.0
Paved area contributing to this inlet (acres):		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Subarea discharge Q_{sa} (cfs):		0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Additional discharge (cfs):		0.300	0.270	0.250	0.260	0.320	0.410	0.310	0.480
Total discharge Q_t, including any upstream by-pass (cfs):		**0.320**	**0.281**	**0.298**	**0.311**	**0.328**	**0.410**	**0.397**	**0.494**
By-pass Q *Describe here source of bypass:*	**0.020**	**0.01**	**0.05**	**0.05**	**0.01**	**0.00**	**0.09**	**0.01**	**0.03**
DEPRESSION CALCULATION:									
Width of depression "w" (ft):									
Depression depth "a" (from flowline w/o depression) (in):									
Depression cross-slope (Sw=Sx+a/12w):									
Fraction of flow over the depression (Eo):									
Discharge-weighted equivalent cross-slope (Se):									
Q_s (first guess: **Qt - 0.001**, after iteration should be same as next line)		0.005			0.013	0.024	0.000	0.005	0.000
Q_s over shoulder (excluding flow over the depression) (cfs):									
Q=Q_w+Q_s (cfs) (after iterations must match **Q_t** value):									
HYDRAULIC RESULTS:									
Flooded Width T for Q_t, upstream of inlet (ft):		**6.36**	**5.61**	**6.19**	**5.83**	**5.40**	**6.98**	**6.06**	**6.94**
Flooded Width T at depression (if any) (ft):		**6.36**	**5.61**	**6.19**	**5.83**	**5.40**	**6.98**	**6.06**	**6.94**
Flooded Width T for BYPASS Q downstream of inlet (ft):	**0.00**	**1.81**	**2.89**	**3.20**	**1.48**	**0.00**	**3.91**	**1.73**	**2.44**
Water depth at curb (with or without depression) (in):		1.53	1.35	1.49	1.40	1.30	1.67	1.45	1.66
Water cross-area at shoulder (without depression) (sq.ft.):		0.40	0.32	0.38	0.34	0.29	0.49	0.37	0.48
Water velocity immediately u/s from inlet (w/o depression) (fps):		0.79	0.89	0.78	0.92	1.12	0.84	1.08	1.03
Average water velocity for the segment to this inlet (fps):		0.29	0.35	0.32	0.39	0.44	0.31	0.48	0.40
Flowtime from the previous inlet to this one (min):		2.83	2.36	2.80	2.27	2.40	3.61	2.17	4.19
GRATE INLETS ON-GRADE:									
Splash-over V for effective length of grate (type P-1 3/8) (fps):		6.81	6.81	6.81	6.81		6.81	6.81	6.81
Effective length of grate considering clogging factor (ft):		2.01	2.01	2.01	2.01		2.01	2.01	2.01
Ratio of grate frontal flow to total flow:		0.93	0.691	0.647	0.954		0.594	0.944	0.899
Fraction of frontal flow intercepted (Rf):		100.0%	100.0%	100.0%	100.0%		100.0%	100.0%	100.0%
Fraction of side flow interception (Rs):		50.3%	44.9%	51.1%	43.8%		47.5%	36.5%	38.8%
Total flow intercepted (cfs):		0.31	0.233	0.246	0.303		0.323	0.383	0.464
Grate Efficiency (E):		96.5%	83.0%	82.7%	97.4%		78.7%	96.4%	93.8%
Grate flow-through flow (cfs):		**0.01**	**0.048**	**0.051**	**0.008**		**0.087**	**0.014**	**0.031**
SLOTTED DRAINS & SIDE-OPENING INLETS ON-GRADE:									
Length required for total interception (ft):						9.58			
Length of inlet provided L (ft):		12.00	12.00	12.00	12.00	15.00		10.00	
Efficiency for length L:						100.0%			
Interception for length L (cfs):						0.328			
Side opening flow-through flow (cfs):						**0.000**			
INTERCEPTION CAPACITY OF INLETS IN SAG LOCATION:									
Maximum allowable flooded width (including the depression) (ft):									
Max. head at sag w/o exceeding allowable flooded width (ft):									
Capacity of grate in a sag (3-sided weir) (cfs):									
Length provided of curb-opening inlet at sag (ft):									
Capacity of curb-opening inlet in a sag (weir) (cfs):									

ONDRAIN_English Version 7.5d, developed by Fernando Manzanera, Caltrans District 1, Hydraulics Capital Support (December 2010).

Notes: -This program utilizes the equations presented in the FHA Hydraulic Engineering Circular 22 (HEC-22), FHWA-NHI-10-009.

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HYDRAULIC CALCULATOR FOR ONSITE DRAINAGE (English Units)

Date: 08/03/21

RCTC I-15 ELPSE

Note: "Subarea discharge Qsa (cfs)" was obtained from "Design Discharge" column of Hydrological Tables found within the hydrology maps in Appendix B.2, and inputted as "Additional discharge (cfs)" below.

	Starting Point	N-1339	N-1340A	N-1340B	N-1341	N-1342A	N-1342B	N-1343	N-1344A
Location station (ft):	1338+50.0	1339+40.0	1340+00.0	1340+87.0	1341+63.0	1342+00.0	1342+51.0	1343+25.0	1344+00.0
Longitudinal profile ("on-grade" or "sag"):		on-grade	on-grade	on-grade	on-grade	on-grade	on-grade	on-grade	on-grade
Calculation Type ("grate", "side opening", or "shoulder hydraulics only"):		grate	grate	grate	grate	grate	grate	grate	grate
Longitudinal slope, S:		0.30%	0.30%	0.30%	0.30%	0.30%	0.30%	0.30%	0.30%
Shoulder cross-slope, Sx:		2.00%	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%
Average watershed paved width (ft):		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Shoulder Manning's n:		0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016
Inlet description (optional):									
Clogging factor for on-grade grates:		33%	33%	33%	33%	33%	33%	33%	33%
Grate width (ft):		4.00	4.00	2.00	2.00	2.00	4.00	4.00	4.00
Grate length (ft):		3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00
Precipitation intensity (in/hr):		3.20	3.20	3.20	3.20	3.20	3.20	3.20	3.20
Runoff Coefficient for paved areas, "C_p":		0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Runoff Coefficient for unpaved areas, "C_u":		0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63
Unpaved area contributing to this inlet (acres):		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Watershed paved length (ft):		90.0	60.0	87.0	76.0	37.0	51.0	74.0	75.0
Paved area contributing to this inlet (acres):		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Subarea discharge Q_{sa} (cfs):		0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Additional discharge (cfs):		0.470	0.350	0.450	0.330	0.170	0.340	0.440	0.420
Total discharge Q_t, including any upstream by-pass (cfs):		**0.500**	**0.381**	**0.465**	**0.441**	**0.272**	**0.385**	**0.456**	**0.445**
By-pass Q *Describe here source of bypass:*	0.030	**0.03**	**0.02**	**0.11**	**0.10**	**0.05**	**0.02**	**0.02**	**0.02**
DEPRESSION CALCULATION:									
Width of depression "w" (ft):									
Depression depth "a" (from flowline w/o depression) (in):									
Depression cross-slope (Sw=Sx+a/12w):									
Fraction of flow over the depression (Eo):									
Discharge-weighted equivalent cross-slope (Se):									
Q_s (first guess: **Qt - 0.001**, after iteration should be same as next line)		0.005			0.013	0.024	0.000	0.005	0.000
Q_s over shoulder (excluding flow over the depression) (cfs):									
Q=Q_w+Q_s (cfs) (after iterations must match **Q_t** value):									
HYDRAULIC RESULTS:									
Flooded Width T for Q_t, upstream of inlet (ft):		**6.97**	**6.29**	**6.78**	**6.65**	**5.54**	**6.32**	**6.73**	**6.67**
Flooded Width T at depression (if any) (ft):		**6.97**	**6.29**	**6.78**	**6.65**	**5.54**	**6.32**	**6.73**	**6.67**
Flooded Width T for BYPASS Q downstream of inlet (ft):	0.00	**2.47**	**1.88**	**3.96**	**3.84**	**2.83**	**1.90**	**2.26**	**2.20**
Water depth at curb (with or without depression) (in):		1.67	1.51	1.63	1.59	1.33	1.52	1.61	1.60
Water cross-area at shoulder (without depression) (sq.ft.):		0.49	0.40	0.46	0.44	0.31	0.40	0.45	0.44
Water velocity immediately u/s from inlet (w/o depression) (fps):		1.03	0.96	1.01	1.00	0.88	0.97	1.01	1.00
Average water velocity for the segment to this inlet (fps):		0.38	0.39	0.39	0.43	0.40	0.40	0.39	0.40
Flowtime from the previous inlet to this one (min):		3.91	2.57	3.67	2.93	1.56	2.14	3.13	3.14
GRATE INLETS ON-GRADE:									
Splash-over V for effective length of grate (type P-1 3/8) (fps):		6.81	6.81	6.81	6.81	6.81	6.81	6.81	6.81
Effective length of grate considering clogging factor (ft):		2.01	2.01	2.01	2.01	2.01	2.01	2.01	2.01
Ratio of grate frontal flow to total flow:		0.90	0.932	0.606	0.615	0.697	0.931	0.910	0.913
Fraction of frontal flow intercepted (Rf):		100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Fraction of side flow interception (Rs):		38.6%	41.5%	39.4%	40.0%	45.3%	41.4%	39.6%	39.9%
Total flow intercepted (cfs):		0.47	0.366	0.354	0.339	0.227	0.370	0.431	0.422
Grate Efficiency (E):		93.7%	96.0%	76.1%	76.9%	83.4%	96.0%	94.6%	94.8%
Grate flow-through flow (cfs):		**0.03**	**0.015**	**0.111**	**0.102**	**0.045**	**0.016**	**0.025**	**0.023**
SLOTTED DRAINS & SIDE-OPENING INLETS ON-GRADE:									
Length required for total interception (ft):									
Length of inlet provided L (ft):		12.00	12.00	12.00	12.00	12.00		10.00	
Efficiency for length L:									
Interception for length L (cfs):									
Side opening flow-through flow (cfs):									
INTERCEPTION CAPACITY OF INLETS IN SAG LOCATION:									
Maximum allowable flooded width (including the depression) (ft):									
Max. head at sag w/o exceeding allowable flooded width (ft):									
Capacity of grate in a sag (3-sided weir) (cfs):									
Length provided of curb-opening inlet at sag (ft):									
Capacity of curb-opening inlet in a sag (weir) (cfs):									

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Notes: -This program utilizes the equations presented in the FHA Hydraulic Engineering Circular 22 (HEC-22), FHWA-NHI-10-009.

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HYDRAULIC CALCULATOR FOR ONSITE DRAINAGE (English Units)

Date: 08/03/21

RCTC I-15 ELPSE

Note: "Subarea discharge Qsa (cfs)" was obtained from "Design Discharge" column of Hydrological Tables found within the hydrology maps in Appendix B.2, and inputted as "Additional discharge (cfs)" below.

	Starting Point	N-1344B	N-1345	N-1346	N-1347A	N-1347B	N-1349	N-1350	N-1351
Location station (ft):	1344+00.0	1344+70.0	1345+50.0	1346+11.8	1347+00.0	1347+83.0	1349+27.1	1350+05.0	1351+65.0
Longitudinal profile ("on-grade" or "sag"):		on-grade	on-grade	on-grade	on-grade	on-grade	on-grade	on-grade	on-grade
Calculation Type ("grate", "side opening", or "shoulder hydraulics only"):		grate	grate	grate	grate	side opening	grate	grate	grate
Longitudinal slope, S:		0.30%	0.30%	0.40%	0.50%	0.50%	0.60%	0.60%	0.80%
Shoulder cross-slope, Sx:		2.00%	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%
Average watershed paved width (ft):		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.60
Shoulder Manning's n:		0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016
Inlet description (optional):									
Clogging factor for on-grade grates:		33%	33%	33%	33%	33%	33%	33%	33%
Grate width (ft):		4.00	4.00	4.00	4.00	2.00	4.00	4.00	4.00
Grate length (ft):		3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00
Precipitation intensity (in/hr):		3.20	3.20	3.20	3.20	3.20	3.20	3.20	3.20
Runoff Coefficient for paved areas, "C_p":		0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Runoff Coefficient for unpaved areas, "C_u":		0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63
Unpaved area contributing to this inlet (acres):		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Watershed paved length (ft):		70.0	80.0	61.8	88.2	83.0	144.1	77.9	160.0
Paved area contributing to this inlet (acres):		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002
Subarea discharge Q_{sa} (cfs):		0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.007
Additional discharge (cfs):		0.460	0.460	0.390	0.580	0.560	0.920	0.540	0.890
Total discharge Q_t, including any upstream by-pass (cfs):		**0.480**	**0.488**	**0.420**	**0.597**	**0.599**	**0.920**	**0.640**	**0.939**
By-pass Q — *Describe here source of bypass:*	0.020	**0.03**	**0.03**	**0.02**	**0.04**	**0.00**	**0.10**	**0.04**	**0.09**
DEPRESSION CALCULATION:									
Width of depression "w" (ft):									
Depression depth "a" (from flowline w/o depression) (in):									
Depression cross-slope (Sw=Sx+a/12w):									
Fraction of flow over the depression (Eo):									
Discharge-weighted equivalent cross-slope (Se):									
Q_s (first guess: **Qt - 0.001**, after iteration should be same as next line)		0.005			0.013	0.024	0.000	0.005	0.000
Q_s over shoulder (excluding flow over the depression) (cfs):									
Q=Q_w+Q_s (cfs) (after iterations must match **Q_t** value):									
HYDRAULIC RESULTS:									
Flooded Width T for Q_t, upstream of inlet (ft):		**6.86**	**6.90**	**6.18**	**6.76**	**6.77**	**7.69**	**6.71**	**7.34**
Flooded Width T at depression (if any) (ft):		**6.86**	**6.90**	**6.18**	**6.76**	**6.77**	**7.69**	**6.71**	**7.34**
Flooded Width T for BYPASS Q downstream of inlet (ft):	0.00	**2.38**	**2.42**	**1.85**	**2.43**	**0.00**	**3.34**	**2.42**	**3.08**
Water depth at curb (with or without depression) (in):		1.65	1.66	1.48	1.62	1.63	1.85	1.61	1.76
Water cross-area at shoulder (without depression) (sq.ft.):		0.47	0.48	0.38	0.46	0.46	0.59	0.45	0.54
Water velocity immediately u/s from inlet (w/o depression) (fps):		1.02	1.02	1.10	1.30	1.31	1.56	1.42	1.74
Average water velocity for the segment to this inlet (fps):		0.38	0.41	0.44	0.51	0.52	0.58	0.59	0.69
Flowtime from the previous inlet to this one (min):		3.07	3.27	2.32	2.89	2.65	4.14	2.18	3.86
GRATE INLETS ON-GRADE:									
Splash-over V for effective length of grate (type P-1 3/8) (fps):		6.81	6.81	6.81	6.81		6.81	6.81	6.81
Effective length of grate considering clogging factor (ft):		2.01	2.01	2.01	2.01		2.01	2.01	2.01
Ratio of grate frontal flow to total flow:		0.90	0.901	0.938	0.908		0.859	0.911	0.877
Fraction of frontal flow intercepted (Rf):		100.0%	100.0%	100.0%	100.0%		100.0%	100.0%	100.0%
Fraction of side flow interception (Rs):		39.1%	38.9%	35.9%	29.2%		23.1%	26.1%	19.6%
Total flow intercepted (cfs):		0.45	0.459	0.403	0.558		0.820	0.598	0.847
Grate Efficiency (E):		94.1%	93.9%	96.0%	93.5%		89.1%	93.4%	90.2%
Grate flow-through flow (cfs):		**0.03**	**0.030**	**0.017**	**0.039**		**0.100**	**0.042**	**0.092**
SLOTTED DRAINS & SIDE-OPENING INLETS ON-GRADE:									
Length required for total interception (ft):						12.34			
Length of inlet provided L (ft):						19.00			
Efficiency for length L:						100.0%			
Interception for length L (cfs):						0.599			
Side opening flow-through flow (cfs):						**0.000**			
INTERCEPTION CAPACITY OF INLETS IN SAG LOCATION:									
Maximum allowable flooded width (including the depression) (ft):									
Max. head at sag w/o exceeding allowable flooded width (ft):									
Capacity of grate in a sag (3-sided weir) (cfs):									
Length provided of curb-opening inlet at sag (ft):									
Capacity of curb-opening inlet in a sag (weir) (cfs):									

ONDRAIN_English Version 7.5d, developed by Fernando Manzanera, Caltrans District 1, Hydraulics Capital Support (December 2010).

Notes: -This program utilizes the equations presented in the FHA Hydraulic Engineering Circular 22 (HEC-22), FHWA-NHI-10-009.

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HYDRAULIC CALCULATOR FOR ONSITE DRAINAGE (English Units)

Date: 08/03/21

RCTC I-15 ELPSE

Note: "Subarea discharge Qsa (cfs)" was obtained from "Design Discharge" column of Hydrological Tables found within the hydrology maps in Appendix B.2, and inputted as "Additional discharge (cfs)" below.

	Starting Point	N-1353A	N-1353B	N-1356	N-1358	N-1359	SLOTTED	N-1360A	SLOTTED
Location station (ft):	1352+00.0	1353+00.0	1353+88.0	1356+00.0	1358+00.0	1359+00.0	1359+75.0	1360+00.0	1360+25.0
Longitudinal profile ("on-grade" or "sag"):		on-grade	on-grade	on-grade	on-grade	on-grade	on-grade	on-grade	on-grade
Calculation Type ("grate", "side opening", or "shoulder hydraulics only"):		grate	side opening	grate	grate	grate	side opening	grate	side opening
Longitudinal slope, S:		0.80%	0.90%	0.90%	1.50%	1.80%	1.80%	1.80%	1.80%
Shoulder cross-slope, Sx:		2.00%	2.00%	2.00%	2.00%	2.00%	1.20%	0.90%	0.50%
Average watershed paved width (ft):		0.00	0.00	0.00	0.00	0.00	80.15	80.15	40.44
Shoulder Manning's n:		0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016
Inlet description (optional):									
Clogging factor for on-grade grates:		33%	33%	33%	33%	33%	33%	33%	33%
Grate width (ft):		2.00	4.00	4.00	2.00	4.00	4.00	4.00	4.00
Grate length (ft):		3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00
Precipitation intensity (in/hr):		3.20	3.20	3.20	3.20	3.20	3.20	3.20	3.20
Runoff Coefficient for paved areas, "C_p":		0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Runoff Coefficient for unpaved areas, "C_u":		0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63
Unpaved area contributing to this inlet (acres):		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Watershed paved length (ft):		100.0	88.0	212.0	200.0	100.0	75.0	25.0	25.0
Paved area contributing to this inlet (acres):		0.000	0.000	0.000	0.000	0.000	0.138	0.046	0.023
Subarea discharge Q_{sa} (cfs):		0.00	0.000	0.000	0.000	0.000	0.437	0.146	0.074
Additional discharge (cfs):		0.820	0.620	1.200	1.220	0.590			
Total discharge Q_t, including any upstream by-pass (cfs):		0.910	0.929	1.200	1.370	1.119	0.527	0.146	0.076
By-pass Q — *Describe here source of bypass:*	0.090	0.31	0.00	0.15	0.53	0.09	0.00	0.00	0.00
DEPRESSION CALCULATION:									
Width of depression "w" (ft):									
Depression depth "a" (from flowline w/o depression) (in):									
Depression cross-slope (Sw=Sx+a/12w):									
Fraction of flow over the depression (Eo):									
Discharge-weighted equivalent cross-slope (Se):									
Q_s (first guess: **Qt - 0.001**, after iteration should be same as next line)		0.005			0.013	0.024	0.000	0.005	0.000
Q_s over shoulder (excluding flow over the depression) (cfs):									
Q=Q_w+Q_s (cfs) (after iterations must match **Q_t** value):									
HYDRAULIC RESULTS:									
Flooded Width T for Q_t, upstream of inlet (ft):		7.26	7.15	7.87	7.52	6.73	6.99	5.16	5.84
Flooded Width T at depression (if any) (ft):		7.26	7.15	7.87	7.52	6.73	6.99	5.16	5.84
Flooded Width T for BYPASS Q downstream of inlet (ft):	0.00	4.84	0.00	3.61	5.26	2.61	0.00	1.08	0.00
Water depth at curb (with or without depression) (in):		1.74	1.72	1.89	1.80	1.62	1.01	0.56	0.35
Water cross-area at shoulder (without depression) (sq.ft.):		0.53	0.51	0.62	0.57	0.45	0.29	0.12	0.09
Water velocity immediately u/s from inlet (w/o depression) (fps):		1.73	1.82	1.94	2.42	2.47	1.80	1.21	0.89
Average water velocity for the segment to this inlet (fps):		0.64	0.81	0.72	1.01	1.14	0.72	0.45	0.34
Flowtime from the previous inlet to this one (min):		2.59	1.81	4.90	3.30	1.46	1.73	0.92	1.23
GRATE INLETS ON-GRADE:									
Splash-over V for effective length of grate (type P-1 3/8) (fps):		6.81		6.81	6.81	6.81		6.81	
Effective length of grate considering clogging factor (ft):		2.01		2.01	2.01	2.01		2.01	
Ratio of grate frontal flow to total flow:		0.58		0.849	0.562	0.910		0.981	
Fraction of frontal flow intercepted (Rf):		100.0%		100.0%	100.0%	100.0%		100.0%	
Fraction of side flow interception (Rs):		19.9%		16.8%	11.9%	11.6%		17.4%	
Total flow intercepted (cfs):		0.60		1.050	0.841	1.030		0.143	
Grate Efficiency (E):		66.1%		87.5%	61.4%	92.0%		98.4%	
Grate flow-through flow (cfs):		0.31		0.150	0.529	0.090		0.002	
SLOTTED DRAINS & SIDE-OPENING INLETS ON-GRADE:									
Length required for total interception (ft):			17.69				23.32		17.47
Length of inlet provided L (ft):			27.00				35.00	25.00	25.00
Efficiency for length L:			100.0%				100.0%		100.0%
Interception for length L (cfs):			0.929				0.527		0.076
Side opening flow-through flow (cfs):			0.000				0.000		0.000
INTERCEPTION CAPACITY OF INLETS IN SAG LOCATION:									
Maximum allowable flooded width (including the depression) (ft):									
Max. head at sag w/o exceeding allowable flooded width (ft):									
Capacity of grate in a sag (3-sided weir) (cfs):									
Length provided of curb-opening inlet at sag (ft):									
Capacity of curb-opening inlet in a sag (weir) (cfs):									

ONDRAIN_English Version 7.5d, developed by Fernando Manzanera, Caltrans District 1, Hydraulics Capital Support (December 2010).

Notes: -This program utilizes the equations presented in the FHA Hydraulic Engineering Circular 22 (HEC-22), FHWA-NHI-10-009.

- Underlined values are calculated by the program, the others are input by the user.

HYDRAULIC CALCULATOR FOR ONSITE DRAINAGE (English Units)

Date: 08/03/21

RCTC I-15 ELPSE

Note: "Subarea discharge Qsa (cfs)" was obtained from "Design Discharge" column of Hydrological Tables found within the hydrology maps in Appendix B.2, and inputted as "Additional discharge (cfs)" below.

	Starting Point	N-1360B							
Location station (ft):	**1360+25.0**	**1360+70.0**							
Longitudinal profile ("on-grade" or "sag"):		on-grade							
Calculation Type ("grate", "side opening", or "shoulder hydraulics only"):		grate							
Longitudinal slope, S:		1.80%							
Shoulder cross-slope, Sx:		0.50%							
Average watershed paved width (ft):		40.44							
Shoulder Manning's n:		0.016							
Inlet description (optional):									
Clogging factor for on-grade grates:		33%							
Grate width (ft):		4.00							
Grate length (ft):		3.00							
Precipitation intensity (in/hr):		3.20							
Runoff Coefficient for paved areas, "C_p":		0.99							
Runoff Coefficient for unpaved areas, "C_u":		0.63							
Unpaved area contributing to this inlet (acres):		0.000							
Watershed paved length (ft):		45.0							
Paved area contributing to this inlet (acres):		0.042							
Subarea discharge Q_{sa} (cfs):		0.13							
Additional discharge (cfs):									
Total discharge Q_t, including any upstream by-pass (cfs):		0.132							
By-pass Q *Describe here source of bypass:*	**0.000**	**0.01**							
DEPRESSION CALCULATION:									
Width of depression "w" (ft):									
Depression depth "a" (from flowline w/o depression) (in):									
Depression cross-slope (Sw=Sx+a/12w):									
Fraction of flow over the depression (Eo):									
Discharge-weighted equivalent cross-slope (Se):									
Q_s (first guess: **Qt - 0.001**, after iteration should be same as next line)		0.005			0.013	0.024			
Q_s over shoulder (excluding flow over the depression) (cfs):									
Q=Q_w+Q_s (cfs) (after iterations must match **Q_t** value):									
HYDRAULIC RESULTS:									
Flooded Width T for Q_t, upstream of inlet (ft):		**7.19**							
Flooded Width T at depression (if any) (ft):		**7.19**							
Flooded Width T for BYPASS Q downstream of inlet (ft):	**0.00**	**3.02**							
Water depth at curb (with or without depression) (in):		0.43							
Water cross-area at shoulder (without depression) (sq.ft.):		0.13							
Water velocity immediately u/s from inlet (w/o depression) (fps):		1.02							
Average water velocity for the segment to this inlet (fps):		0.38							
Flowtime from the previous inlet to this one (min):		1.98							
GRATE INLETS ON-GRADE:									
Splash-over V for effective length of grate (type P-1 3/8) (fps):		6.81							
Effective length of grate considering clogging factor (ft):		2.01							
Ratio of grate frontal flow to total flow:		0.89							
Fraction of frontal flow intercepted (Rf):		100.0%							
Fraction of side flow interception (Rs):		13.7%							
Total flow intercepted (cfs):		0.12							
Grate Efficiency (E):		90.1%							
Grate flow-through flow (cfs):		**0.01**							
SLOTTED DRAINS & SIDE-OPENING INLETS ON-GRADE:									
Length required for total interception (ft):									
Length of inlet provided L (ft):		45.00							
Efficiency for length L:									
Interception for length L (cfs):									
Side opening flow-through flow (cfs):									
INTERCEPTION CAPACITY OF INLETS IN SAG LOCATION:									
Maximum allowable flooded width (including the depression) (ft):									
Max. head at sag w/o exceeding allowable flooded width (ft):									
Capacity of grate in a sag (3-sided weir) (cfs):									
Length provided of curb-opening inlet at sag (ft):									
Capacity of curb-opening inlet in a sag (weir) (cfs):									

ONDRAIN_English Version 7.5d, developed by Fernando Manzanera, Caltrans District 1, Hydraulics Capital Support (December 2010).

Notes: -This program utilizes the equations presented in the FHA Hydraulic Engineering Circular 22 (HEC-22), FHWA-NHI-10-009.

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Separate Run

HYDRAULIC CALCULATOR FOR ONSITE DRAINAGE (English Units)

Date: 08/03/21

RCTC I-15 ELPSE

Note: "Subarea discharge Qsa (cfs)" was obtained from "Design Discharge" column of Hydrological Tables found within the hydrology maps in Appendix B.2, and inputted as "Additional discharge (cfs)" below.

	Starting Point	SLOTTED	SLOTTED	SLOTTED	SLOTTED	SLOTTED	N-1405	N-1404	N-1403
Location station (ft):	1406+15.0	1405+91.0	1405+75.0	1405+63.0	1405+50.0	1405+25.0	1405+07.0	1404+40.0	1403+15.0
Longitudinal profile ("on-grade" or "sag"):		on-grade	on-grade	on-grade	on-grade	on-grade	on-grade	on-grade	on-grade
Calculation Type ("grate", "side opening", or "shoulder hydraulics only"):		side opening	side opening	side opening	side opening	side opening	grate	grate	grate
Longitudinal slope, S:		0.70%	0.70%	0.70%	0.70%	0.70%	0.70%	0.70%	0.70%
Shoulder cross-slope, Sx:		0.20%	0.25%	0.30%	0.30%	0.60%	0.90%	1.70%	2.00%
Average watershed paved width (ft):		5.45	24.50	36.30	43.56	71.44	101.64	0.00	0.00
Shoulder Manning's n:		0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016
Inlet description (optional):									
Clogging factor for on-grade grates:							33%	33%	33%
Grate width (ft):							2.00	2.00	2.00
Grate length (ft):							3.00	3.00	3.00
Precipitation intensity (in/hr):		3.29	3.29	3.29	3.29	3.29	3.29	3.29	3.29
Runoff Coefficient for paved areas, "C_p":		0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Runoff Coefficient for unpaved areas, "C_u":		0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63
Unpaved area contributing to this inlet (acres):		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Watershed paved length (ft):		24.0	16.0	12.0	13.0	25.0	18.0	67.0	125.0
Paved area contributing to this inlet (acres):		0.003	0.009	0.010	0.013	0.041	0.042	0.000	0.000
Subarea discharge Q_{sa} (cfs):		0.01	0.029	0.033	0.042	0.134	0.137	0.000	0.000
Additional discharge (cfs):								0.470	0.690
Total discharge Q_t, including any upstream by-pass (cfs):		0.010	0.029	0.033	0.042	0.134	0.137	0.503	0.835
By-pass Q *Describe here source of bypass:*	0.000	0.00	0.00	0.00	0.00	0.00	0.03	0.14	0.27
DEPRESSION CALCULATION:									
Width of depression "w" (ft):									
Depression depth "a" (from flowline w/o depression) (in):									
Depression cross-slope (Sw=Sx+a/12w):									
Fraction of flow over the depression (Eo):									
Discharge-weighted equivalent cross-slope (Se):									
Q_s (first guess: **Qt - 0.001**, after iteration should be same as next line)		0.005			0.013	0.024	0.000	0.005	0.000
Q_s over shoulder (excluding flow over the depression) (cfs):									
Q=Q_w+Q_s (cfs) (after iterations must match **Q_t** value):									
HYDRAULIC RESULTS:									
Flooded Width T for Q_t, upstream of inlet (ft):		5.73	7.52	6.98	7.71	7.70	6.02	6.59	7.20
Flooded Width T at depression (if any) (ft):		5.73	7.52	6.98	7.71	7.70	6.02	6.59	7.20
Flooded Width T for BYPASS Q downstream of inlet (ft):	0.00	0.00	0.00	0.84	1.31	0.00	3.53	4.13	4.74
Water depth at curb (with or without depression) (in):		0.14	0.23	0.25	0.28	0.55	0.65	1.35	1.73
Water cross-area at shoulder (without depression) (sq.ft.):		0.03	0.07	0.07	0.09	0.18	0.16	0.37	0.52
Water velocity immediately u/s from inlet (w/o depression) (fps):		0.30	0.41	0.45	0.48	0.75	0.84	1.36	1.61
Average water velocity for the segment to this inlet (fps):		0.11	0.15	0.16	0.18	0.29	0.31	0.58	0.69
Flowtime from the previous inlet to this one (min):		3.64	1.74	1.21	1.22	1.46	0.96	1.94	3.01
GRATE INLETS ON-GRADE:									
Splash-over V for effective length of grate (type P-1 3/8) (fps):							6.81	6.81	6.81
Effective length of grate considering clogging factor (ft):							2.01	2.01	2.01
Ratio of grate frontal flow to total flow:							0.659	0.619	0.580
Fraction of frontal flow intercepted (Rf):							100.0%	100.0%	100.0%
Fraction of side flow interception (Rs):							29.1%	24.5%	22.0%
Total flow intercepted (cfs):							0.104	0.358	0.561
Grate Efficiency (E):							75.8%	71.2%	67.2%
Grate flow-through flow (cfs):							0.033	0.145	0.274
SLOTTED DRAINS & SIDE-OPENING INLETS ON-GRADE:									
Length required for total interception (ft):		9.65	13.38	12.54	14.02	14.98			
Length of inlet provided L (ft):		15.00	16.00	12.00	13.00	25.00	18.00		
Efficiency for length L:		100.0%	100.0%	99.7%	99.1%	100.0%			
Interception for length L (cfs):		0.01	0.029	0.032	0.042	0.134			
Side opening flow-through flow (cfs):		0.00	0.000	0.000	0.000	0.000			
INTERCEPTION CAPACITY OF INLETS IN SAG LOCATION:									
Maximum allowable flooded width (including the depression) (ft):									
Max. head at sag w/o exceeding allowable flooded width (ft):									
Capacity of grate in a sag (3-sided weir) (cfs):									
Length provided of curb-opening inlet at sag (ft):									
Capacity of curb-opening inlet in a sag (weir) (cfs):									

ONDRAIN_English Version 7.5d, developed by Fernando Manzanera, Caltrans District 1, Hydraulics Capital Support (December 2010).

Notes: -This program utilizes the equations presented in the FHA Hydraulic Engineering Circular 22 (HEC-22), FHWA-NHI-10-009.

- Underlined values are calculated by the program, the others are input by the user.

North 1400's

HYDRAULIC CALCULATOR FOR ONSITE DRAINAGE (English Units)

Date: 08/03/21

RCTC I-15 ELPSE

Note: "Subarea discharge Qsa (cfs)" was obtained from "Design Discharge" column of Hydrological Tables found within the hydrology maps in Appendix B.2, and inputted as "Additional discharge (cfs)" below.

	Starting Point	N-1401	N-1400	N-1399	N-1398	N-1397	N-1395	N-1394B	N-1394A
Location station (ft):	1408+07.0	1401+90.0	1400+67.0	1399+81.0	1398+14.7	1397+31.4	1395+87.2	1394+81.0	1394+00.0
Longitudinal profile ("on-grade" or "sag"):		on-grade	on-grade	on-grade	on-grade	on-grade	on-grade	on-grade	on-grade
Calculation Type ("grate", "side opening", or "shoulder hydraulics only"):		grate	grate	grate	grate	grate	grate	grate	grate
Longitudinal slope, S:		0.70%	0.70%	0.70%	0.70%	0.70%	0.70%	0.70%	0.70%
Shoulder cross-slope, Sx:		2.00%	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%
Average watershed paved width (ft):		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Shoulder Manning's n:		0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016
Inlet description (optional):									
Clogging factor for on-grade grates:		33%	33%	33%	33%	33%	33%	33%	33%
Grate width (ft):		4.00	2.00	4.00	4.00	4.00	2.00	2.00	4.00
Grate length (ft):		3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00
Precipitation intensity (in/hr):		3.29	3.29	3.29	3.29	3.29	3.29	3.29	3.29
Runoff Coefficient for paved areas, "C_p":		0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Runoff Coefficient for unpaved areas, "C_u":		0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63
Unpaved area contributing to this inlet (acres):		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Watershed paved length (ft):		617.0	123.0	86.0	166.3	83.3	144.2	106.2	81.0
Paved area contributing to this inlet (acres):		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Subarea discharge Q_{sa} (cfs):		0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Additional discharge (cfs):		0.680	0.930	0.520	1.010	0.600	0.900	1.140	0.590
Total discharge Q_t, including any upstream by-pass (cfs):		**0.950**	**1.031**	**0.892**	**1.097**	**0.737**	**0.956**	**1.473**	**1.204**
By-pass Q — *Describe here source of bypass:*	0.270	**0.10**	**0.37**	**0.09**	**0.14**	**0.06**	**0.33**	**0.61**	**0.17**

DEPRESSION CALCULATION:

Width of depression "w" (ft):								
Depression depth "a" (from flowline w/o depression) (in):								
Depression cross-slope (Sw=Sx+a/12w):								
Fraction of flow over the depression (Eo):								
Discharge-weighted equivalent cross-slope (Se):								
Q_s (first guess: **Qt - 0.001**, after iteration should be same as next line)	0.005			0.013	0.024	0.000	0.005	0.000
Q_s over shoulder (excluding flow over the depression) (cfs):								
Q=Q_w+Q_s (cfs) (after iterations must match **Q_t** value):								

HYDRAULIC RESULTS:

Flooded Width T for Q_t, upstream of inlet (ft):	**7.56**	**7.79**	**7.38**	**7.98**	**6.87**	**7.58**	**8.91**	**8.26**
Flooded Width T at depression (if any) (ft):	**7.56**	**7.79**	**7.38**	**7.98**	**6.87**	**7.58**	**8.91**	**8.26**
Flooded Width T for BYPASS Q downstream of inlet (ft): 0.00	**3.26**	**5.32**	**3.09**	**3.66**	**2.61**	**5.11**	**6.42**	**3.93**
Water depth at curb (with or without depression) (in):	1.81	1.87	1.77	1.92	1.65	1.82	2.14	1.98
Water cross-area at shoulder (without depression) (sq.ft.):	0.57	0.61	0.55	0.64	0.47	0.57	0.79	0.68
Water velocity immediately u/s from inlet (w/o depression) (fps):	1.66	1.70	1.64	1.72	1.56	1.66	1.85	1.76
Average water velocity for the segment to this inlet (fps):	0.62	0.69	0.74	0.70	0.66	0.66	0.80	0.81
Flowtime from the previous inlet to this one (min):	16.60	2.96	1.94	3.99	2.10	3.63	2.22	1.66

GRATE INLETS ON-GRADE:

Splash-over V for effective length of grate (type P-1 3/8) (fps):	6.81	6.81	6.81	6.81	6.81	6.81	6.81	6.81
Effective length of grate considering clogging factor (ft):	2.01	2.01	2.01	2.01	2.01	2.01	2.01	2.01
Ratio of grate frontal flow to total flow:	0.87	0.546	0.875	0.844	0.902	0.558	0.492	0.829
Fraction of frontal flow intercepted (Rf):	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Fraction of side flow interception (Rs):	21.0%	20.4%	21.5%	20.0%	23.0%	21.0%	17.9%	19.3%
Total flow intercepted (cfs):	0.85	0.659	0.805	0.960	0.682	0.622	0.859	1.038
Grate Efficiency (E):	89.4%	63.9%	90.2%	87.5%	92.5%	65.1%	58.3%	86.2%
Grate flow-through flow (cfs):	**0.10**	**0.372**	**0.087**	**0.137**	**0.056**	**0.333**	**0.614**	**0.166**

SLOTTED DRAINS & SIDE-OPENING INLETS ON-GRADE:

Length required for total interception (ft):								
Length of inlet provided L (ft):	12.00	12.00	12.00	12.00	12.00	20.00	20.00	12.00
Efficiency for length L:								
Interception for length L (cfs):								
Side opening flow-through flow (cfs):								

INTERCEPTION CAPACITY OF INLETS IN SAG LOCATION:

Maximum allowable flooded width (including the depression) (ft):								
Max. head at sag w/o exceeding allowable flooded width (ft):								
Capacity of grate in a sag (3-sided weir) (cfs):								
Length provided of curb-opening inlet at sag (ft):								
Capacity of curb-opening inlet in a sag (weir) (cfs):								

ONDRAIN_English Version 7.5d, developed by Fernando Manzanera, Caltrans District 1, Hydraulics Capital Support (December 2010).

Notes: -This program utilizes the equations presented in the FHA Hydraulic Engineering Circular 22 (HEC-22), FHWA-NHI-10-009.

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North 1400's

HYDRAULIC CALCULATOR FOR ONSITE DRAINAGE (English Units)

Date: 08/03/21

RCTC I-15 ELPSE

Note: "Subarea discharge Qsa (cfs)" was obtained from "Design Discharge" column of Hydrological Tables found within the hydrology maps in Appendix B.2, and inputted as "Additional discharge (cfs)" below.

	Starting Point	N-1393	N-1392	SLOTTED	SLOTTED	SLOTTED	SLOTTED	SLOTTED	SLOTTED
Location station (ft):	1393+98.0	1393+15.0	1392+55.0	1392+40.0	1392+15.0	1392+05.0	1391+95.0	1391+85.0	1391+75.0
Longitudinal profile ("on-grade" or "sag"):		on-grade	on-grade	on-grade	on-grade	on-grade	on-grade	on-grade	on-grade
Calculation Type ("grate", "side opening", or "shoulder hydraulics only"):		grate	grate	side opening	side opening	side opening	side opening	side opening	side opening
Longitudinal slope, S:		0.70%	0.70%	0.70%	0.70%	0.70%	0.70%	0.70%	0.70%
Shoulder cross-slope, Sx:		2.00%	1.50%	1.30%	0.80%	0.70%	0.70%	0.60%	0.30%
Average watershed paved width (ft):		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Shoulder Manning's n:		0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016
Inlet description (optional):									
Clogging factor for on-grade grates:		33%	33%						
Grate width (ft):		4.00	2.00						
Grate length (ft):		3.00	3.00						
Precipitation intensity (in/hr):		3.29	3.29	3.29	3.29	3.29	3.29	3.29	3.29
Runoff Coefficient for paved areas, "C_p":		0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Runoff Coefficient for unpaved areas, "C_u":		0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63
Unpaved area contributing to this inlet (acres):		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Watershed paved length (ft):		83.0	60.0	15.0	25.0	10.0	10.0	10.0	10.0
Paved area contributing to this inlet (acres):		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Subarea discharge Q_{sa} (cfs):		0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Additional discharge (cfs):		0.740	0.520	0.160	0.130	0.010	0.020	0.020	0.050
Total discharge Q_t, including any upstream by-pass (cfs):		**0.860**	**0.600**	**0.368**	**0.130**	**0.010**	**0.020**	**0.020**	**0.050**
By-pass Q — *Describe here source of bypass:*	0.120	**0.08**	**0.21**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.01**

DEPRESSION CALCULATION:

Width of depression "w" (ft):								
Depression depth "a" (from flowline w/o depression) (in):								
Depression cross-slope (Sw=Sx+a/12w):								
Fraction of flow over the depression (Eo):								
Discharge-weighted equivalent cross-slope (Se):								
Q_s (first guess: **Qt - 0.001**, after iteration should be same as next line)	0.005			0.013	0.024	0.000	0.005	0.000
Q_s over shoulder (excluding flow over the depression) (cfs):								
Q=Q_w+Q_s (cfs) (after iterations must match **Q_t** value):								

HYDRAULIC RESULTS:

Flooded Width T for Q_t, upstream of inlet (ft):	**7.28**	**7.62**	**6.94**	**6.36**	**2.64**	**3.43**	**3.77**	**8.20**
Flooded Width T at depression (if any) (ft):	**7.28**	**7.62**	**6.94**	**6.36**	**2.64**	**3.43**	**3.77**	**8.20**
Flooded Width T for BYPASS Q downstream of inlet (ft): 0.00	**2.99**	**5.12**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**3.91**
Water depth at curb (with or without depression) (in):	1.75	1.37	1.08	0.61	0.22	0.29	0.27	0.30
Water cross-area at shoulder (without depression) (sq.ft.):	0.53	0.44	0.31	0.16	0.02	0.04	0.04	0.10
Water velocity immediately u/s from inlet (w/o depression) (fps):	1.62	1.38	1.18	0.80	0.41	0.49	0.47	0.50
Average water velocity for the segment to this inlet (fps):	0.60	0.56	0.53	0.30	0.15	0.18	0.17	0.18
Flowtime from the previous inlet to this one (min):	2.29	1.80	0.47	1.40	1.10	0.92	0.96	0.91

GRATE INLETS ON-GRADE:

Splash-over V for effective length of grate (type P-1 3/8) (fps):	6.81	6.81						
Effective length of grate considering clogging factor (ft):	2.01	2.01						
Ratio of grate frontal flow to total flow:	0.88	0.556						
Fraction of frontal flow intercepted (Rf):	100.0%	100.0%						
Fraction of side flow interception (Rs):	21.8%	21.8%						
Total flow intercepted (cfs):	0.78	0.392						
Grate Efficiency (E):	90.7%	65.3%						
Grate flow-through flow (cfs):	**0.08**	**0.208**						

SLOTTED DRAINS & SIDE-OPENING INLETS ON-GRADE:

Length required for total interception (ft):			14.41	12.45	4.59	6.15	6.74	15.01
Length of inlet provided L (ft):	12.00	12.00	15.00	25.00	10.00	10.00	10.00	10.00
Efficiency for length L:			100.0%	100.0%	100.0%	100.0%	100.0%	86.1%
Interception for length L (cfs):			0.368	0.130	0.010	0.020	0.020	0.043
Side opening flow-through flow (cfs):			**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.007**

INTERCEPTION CAPACITY OF INLETS IN SAG LOCATION:

Maximum allowable flooded width (including the depression) (ft):	**8.00**						**8.00**	
Max. head at sag w/o exceeding allowable flooded width (ft):								
Capacity of grate in a sag (3-sided weir) (cfs):								
Length provided of curb-opening inlet at sag (ft):								
Capacity of curb-opening inlet in a sag (weir) (cfs):								

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Notes: -This program utilizes the equations presented in the FHA Hydraulic Engineering Circular 22 (HEC-22), FHWA-NHI-10-009.

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HYDRAULIC CALCULATOR FOR ONSITE DRAINAGE (English Units)

Date: 08/03/21

RCTC I-15 ELPSE

Note: "Subarea discharge Qsa (cfs)" was obtained from "Design Discharge" column of Hydrological Tables found within the hydrology maps in Appendix B.2, and inputted as "Additional discharge (cfs)" below.

	Starting Point	N-1391							
Location station (ft):	**1391+75.0**	**1391+65.0**							
Longitudinal profile ("on-grade" or "sag"):		on-grade							
Calculation Type ("grate", "side opening", or "shoulder hydraulics only"):		grate							
Longitudinal slope, S:		0.70%							
Shoulder cross-slope, Sx:		0.30%							
Average watershed paved width (ft):		0.00							
Shoulder Manning's n:		0.016							
Inlet description (optional):									
Clogging factor for on-grade grates:		33%							
Grate width (ft):		4.00							
Grate length (ft):		3.00							
Precipitation intensity (in/hr):		3.29							
Runoff Coefficient for paved areas, "C_p":		0.99							
Runoff Coefficient for unpaved areas, "C_u":		0.63							
Unpaved area contributing to this inlet (acres):		0.000							
Watershed paved length (ft):		10.0							
Paved area contributing to this inlet (acres):		0.000							
Subarea discharge Q_{sa} (cfs):		0.00							
Additional discharge (cfs):		0.050							
Total discharge Q_t, including any upstream by-pass (cfs):		**0.050**							
By-pass Q *Describe here source of bypass:*	**0.000**	**0.01**							
DEPRESSION CALCULATION:									
Width of depression "w" (ft):									
Depression depth "a" (from flowline w/o depression) (in):									
Depression cross-slope (Sw=Sx+a/12w):									
Fraction of flow over the depression (Eo):									
Discharge-weighted equivalent cross-slope (Se):									
Q_s (first guess: **Qt - 0.001**, after iteration should be same as next line)		0.005							
Q_s over shoulder (excluding flow over the depression) (cfs):									
Q=Q_w+Q_s (cfs) (after iterations must match **Q_t** value):									
HYDRAULIC RESULTS:									
Flooded Width T for Q_t, upstream of inlet (ft):		**8.20**							
Flooded Width T at depression (if any) (ft):		**8.20**							
Flooded Width T for BYPASS Q downstream of inlet (ft):	**0.00**	**3.75**							
Water depth at curb (with or without depression) (in):		0.30							
Water cross-area at shoulder (without depression) (sq.ft.):		0.10							
Water velocity immediately u/s from inlet (w/o depression) (fps):		0.50							
Average water velocity for the segment to this inlet (fps):		0.18							
Flowtime from the previous inlet to this one (min):		0.91							
GRATE INLETS ON-GRADE:									
Splash-over V for effective length of grate (type P-1 3/8) (fps):		6.81							
Effective length of grate considering clogging factor (ft):		2.01							
Ratio of grate frontal flow to total flow:		0.83							
Fraction of frontal flow intercepted (Rf):		100.0%							
Fraction of side flow interception (Rs):		26.1%							
Total flow intercepted (cfs):		0.04							
Grate Efficiency (E):		87.6%							
Grate flow-through flow (cfs):		**0.01**							
SLOTTED DRAINS & SIDE-OPENING INLETS ON-GRADE:									
Length required for total interception (ft):									
Length of inlet provided L (ft):		10.00							
Efficiency for length L:									
Interception for length L (cfs):									
Side opening flow-through flow (cfs):									
INTERCEPTION CAPACITY OF INLETS IN SAG LOCATION:									
Maximum allowable flooded width (including the depression) (ft):		**8.00**							
Max. head at sag w/o exceeding allowable flooded width (ft):									
Capacity of grate in a sag (3-sided weir) (cfs):									
Length provided of curb-opening inlet at sag (ft):									
Capacity of curb-opening inlet in a sag (weir) (cfs):									

ONDRAIN_English Version 7.5d, developed by Fernando Manzanera, Caltrans District 1, Hydraulics Capital Support (December 2010).

Notes: -This program utilizes the equations presented in the FHA Hydraulic Engineering Circular 22 (HEC-22), FHWA-NHI-10-009.

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Separate Run

HYDRAULIC CALCULATOR FOR ONSITE DRAINAGE (English Units)

Date: 08/03/21

RCTC I-15 ELPSE

Note: "Subarea discharge Qsa (cfs)" was obtained from "Design Discharge" column of Hydrological Tables found within the hydrology maps in Appendix B.2, and inputted as "Additional discharge (cfs)" below.

	Starting Point	N-1452	N-1450	N-1449	N-1447	N-1444	N-1442	N-1441B	N-1441A
Location station (ft):	**1454+15.0**	**1452+92.2**	**1450+27.3**	**1449+25.7**	**1447+12.6**	**1444+69.3**	**1442+42.0**	**1441+72.0**	**1441+13.0**
Longitudinal profile ("on-grade" or "sag"):		on-grade	on-grade	on-grade	on-grade	on-grade	on-grade	on-grade	on-grade
Calculation Type ("grate", "side opening", or "shoulder hydraulics only"):		side opening	grate	grate	grate	grate	grate	grate	side opening
Longitudinal slope, S:		0.20%	0.40%	0.40%	1.00%	1.00%	0.50%	0.30%	0.10%
Shoulder cross-slope, Sx:		3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%
Average watershed paved width (ft):		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Shoulder Manning's n:		0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016
Inlet description (optional):									
Clogging factor for on-grade grates:		33%	33%	33%	33%	33%	33%	33%	33%
Grate width (ft):		2.00	2.00	2.00	2.00	4.00	2.00	2.00	2.00
Grate length (ft):		3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00
Precipitation intensity (in/hr):		3.29	3.29	3.29	3.29	3.29	3.29	3.29	3.29
Runoff Coefficient for paved areas, "C_p":		0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Runoff Coefficient for unpaved areas, "C_u":		0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63
Unpaved area contributing to this inlet (acres):		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Watershed paved length (ft):		122.8	264.9	101.6	213.1	243.3	227.3	70.0	59.0
Paved area contributing to this inlet (acres):		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Subarea discharge Q_{sa} (cfs):		0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Additional discharge (cfs):		0.720	1.610	0.600	1.370	1.500	1.400	0.520	0.460
Total discharge Q_t, including any upstream by-pass (cfs):		**0.720**	**1.610**	**1.137**	**1.689**	**2.056**	**1.612**	**1.058**	**0.743**
By-pass Q — *Describe here source of bypass:*	**0.000**	**0.00**	**0.54**	**0.32**	**0.56**	**0.21**	**0.54**	**0.28**	**0.00**
DEPRESSION CALCULATION:									
Width of depression "w" (ft):									
Depression depth "a" (from flowline w/o depression) (in):									
Depression cross-slope (Sw=Sx+a/12w):									
Fraction of flow over the depression (Eo):									
Discharge-weighted equivalent cross-slope (Se):									
Q_s (first guess: **Qt - 0.001**, after iteration should be same as next line)		0.005			0.013	0.024	0.000	0.005	0.000
Q_s over shoulder (excluding flow over the depression) (cfs):									
Q=Q_w+Q_s (cfs) (after iterations must match **Q_t** value):									
HYDRAULIC RESULTS:									
Flooded Width T for Q_t, upstream of inlet (ft):		**6.69**	**7.94**	**6.97**	**6.81**	**7.33**	**7.62**	**7.16**	**7.71**
Flooded Width T at depression (if any) (ft):		**6.69**	**7.94**	**6.97**	**6.81**	**7.33**	**7.62**	**7.16**	**7.71**
Flooded Width T for BYPASS Q downstream of inlet (ft):	**0.00**	**0.00**	**5.26**	**4.33**	**4.49**	**3.13**	**5.05**	**4.37**	**0.00**
Water depth at curb (with or without depression) (in):		2.41	2.86	2.51	2.45	2.64	2.74	2.58	2.77
Water cross-area at shoulder (without depression) (sq.ft.):		0.67	0.95	0.73	0.70	0.81	0.87	0.77	0.89
Water velocity immediately u/s from inlet (w/o depression) (fps):		1.07	1.70	1.56	2.43	2.55	1.85	1.38	0.83
Average water velocity for the segment to this inlet (fps):		0.40	0.64	0.71	1.07	1.11	0.75	0.62	0.36
Flowtime from the previous inlet to this one (min):		5.11	6.95	2.37	3.33	3.65	5.03	1.88	2.75
GRATE INLETS ON-GRADE:									
Splash-over V for effective length of grate (type P-1 3/8) (fps):			6.81	6.81	6.81	6.81	6.81	6.81	
Effective length of grate considering clogging factor (ft):			2.01	2.01	2.01	2.01	2.01	2.01	
Ratio of grate frontal flow to total flow:			0.539	0.594	0.604	0.878	0.556	0.582	
Fraction of frontal flow intercepted (Rf):			100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	
Fraction of side flow interception (Rs):			27.7%	30.9%	16.8%	15.6%	24.8%	35.9%	
Total flow intercepted (cfs):			1.073	0.818	1.133	1.844	1.073	0.775	
Grate Efficiency (E):			66.6%	72.0%	67.1%	89.7%	66.6%	73.3%	
Grate flow-through flow (cfs):			**0.537**	**0.319**	**0.556**	**0.212**	**0.538**	**0.283**	
SLOTTED DRAINS & SIDE-OPENING INLETS ON-GRADE:									
Length required for total interception (ft):		7.94							6.54
Length of inlet provided L (ft):		12.00							11.00
Efficiency for length L:		100.0%							100.0%
Interception for length L (cfs):		0.72							0.743
Side opening flow-through flow (cfs):		**0.00**							**0.000**
INTERCEPTION CAPACITY OF INLETS IN SAG LOCATION:									
Maximum allowable flooded width (including the depression) (ft):									
Max. head at sag w/o exceeding allowable flooded width (ft):									
Capacity of grate in a sag (3-sided weir) (cfs):									
Length provided of curb-opening inlet at sag (ft):									
Capacity of curb-opening inlet in a sag (weir) (cfs):									

ONDRAIN_English Version 7.5d, developed by Fernando Manzanera, Caltrans District 1, Hydraulics Capital Support (December 2010).

Notes: -This program utilizes the equations presented in the FHA Hydraulic Engineering Circular 22 (HEC-22), FHWA-NHI-10-009.

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HYDRAULIC CALCULATOR FOR ONSITE DRAINAGE (English Units)

Date: 08/03/21

RCTC I-15 ELPSE

Note: "Subarea discharge Qsa (cfs)" was obtained from "Design Discharge" column of Hydrological Tables found within the hydrology maps in Appendix B.2, and inputted as "Additional discharge (cfs)" below.

	Starting Point	N-1440							
Location station (ft):	**1441+72.0**	**1440+00.0**							
Longitudinal profile ("on-grade" or "sag"):		sag							
Calculation Type ("grate", "side opening", or "shoulder hydraulics only"):		grate							
Longitudinal slope, S:									
Shoulder cross-slope, Sx:		3.00%							
Average watershed paved width (ft):		0.00							
Shoulder Manning's n:		0.013							
Inlet description (optional):									
Clogging factor for on-grade grates:									
Grate width (ft):		2.00							
Grate length (ft):		3.00							
Precipitation intensity (in/hr):		3.29							
Runoff Coefficient for paved areas, "C_p":		0.99							
Runoff Coefficient for unpaved areas, "C_u":		0.63							
Unpaved area contributing to this inlet (acres):		0.000							
Watershed paved length (ft):		172.0							
Paved area contributing to this inlet (acres):		0.000							
Subarea discharge Q_{sa} (cfs):		0.00							
Additional discharge (cfs):		1.540							
Total discharge Q_t, including any upstream by-pass (cfs):		1.540							
By-pass Q *Describe here source of bypass:*	0.000	SAG							

DEPRESSION CALCULATION:

Width of depression "w" (ft):								
Depression depth "a" (from flowline w/o depression) (in):								
Depression cross-slope (Sw=Sx+a/12w):								
Fraction of flow over the depression (Eo):								
Discharge-weighted equivalent cross-slope (Se):								
Q_s (first guess: **Qt - 0.001**, after iteration should be same as next line)	0.005							
Q_s over shoulder (excluding flow over the depression) (cfs):								
Q=Q_w+Q_s (cfs) (after iterations must match **Q_t** value):								

HYDRAULIC RESULTS:

Flooded Width T for Q_t, upstream of inlet (ft):	SAG							
Flooded Width T at depression (if any) (ft):	SAG							
Flooded Width T for BYPASS Q downstream of inlet (ft):	0.00	SAG							
Water depth at curb (with or without depression) (in):								
Water cross-area at shoulder (without depression) (sq.ft.):								
Water velocity immediately u/s from inlet (w/o depression) (fps):								
Average water velocity for the segment to this inlet (fps):								
Flowtime from the previous inlet to this one (min):								

GRATE INLETS ON-GRADE:

Splash-over V for effective length of grate (type P-1 3/8) (fps):								
Effective length of grate considering clogging factor (ft):								
Ratio of grate frontal flow to total flow:								
Fraction of frontal flow intercepted (Rf):								
Fraction of side flow interception (Rs):								
Total flow intercepted (cfs):								
Grate Efficiency (E):								
Grate flow-through flow (cfs):								

SLOTTED DRAINS & SIDE-OPENING INLETS ON-GRADE:

Length required for total interception (ft):								
Length of inlet provided L (ft):								
Efficiency for length L:								
Interception for length L (cfs):								
Side opening flow-through flow (cfs):								

INTERCEPTION CAPACITY OF INLETS IN SAG LOCATION:

Maximum allowable flooded width (including the depression) (ft):	8.00	8.00						
Max. head at sag w/o exceeding allowable flooded width (ft):	0.24							
Capacity of grate in a sag (3-sided weir) (cfs):	***2.11***							
Length provided of curb-opening inlet at sag (ft):								
Capacity of curb-opening inlet in a sag (weir) (cfs):								

ONDRAIN_English Version 7.5d, developed by Fernando Manzanera, Caltrans District 1, Hydraulics Capital Support (December 2010).

Notes: -This program utilizes the equations presented in the FHA Hydraulic Engineering Circular 22 (HEC-22), FHWA-NHI-10-009.

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North 1400's

Separate Run

HYDRAULIC CALCULATOR FOR ONSITE DRAINAGE (English Units)

Date: 08/03/21

RCTC I-15 ELPSE

Note: "Subarea discharge Qsa (cfs)" was obtained from "Design Discharge" column of Hydrological Tables found within the hydrology maps in Appendix B.2, and inputted as "Additional discharge (cfs)" below.

	Starting Point	N-1436A	N-1436B	N-1437	N-1439	N-1440A			
Location station (ft):	1431+58.0	1436+00.0	1436+63.0	1437+83.0	1439+00.0	1440+00.0			
Longitudinal profile ("on-grade" or "sag"):		on-grade	on-grade	on-grade	on-grade	sag			
Calculation Type ("grate", "side opening", or "shoulder hydraulics only"):		grate	grate	grate	side opening	grate			
Longitudinal slope, S:		1.40%	1.40%	0.50%	0.50%				
Shoulder cross-slope, Sx:		1.81%	2.30%	3.00%	3.00%	3.00%			
Average watershed paved width (ft):		0.00	0.00	0.00	0.00	0.00			
Shoulder Manning's n:		0.016	0.016	0.016	0.016	0.016			
Inlet description (optional):									
Clogging factor for on-grade grates:		33%	33%	33%	33%	0%			
Grate width (ft):		4.00	2.00	2.00	4.00	2.00			
Grate length (ft):		3.00	3.00	3.00	3.00	3.00			
Precipitation intensity (in/hr):		3.29	3.29	3.29	3.29	3.29			
Runoff Coefficient for paved areas, "C_p":		0.99	0.99	0.99	0.99	0.99			
Runoff Coefficient for unpaved areas, "C_u":		0.63	0.63	0.63	0.63	0.63			
Unpaved area contributing to this inlet (acres):		0.000	0.000	0.000	0.000	0.000			
Watershed paved length (ft):		442.0	63.0	120.0	117.0	100.0			
Paved area contributing to this inlet (acres):		0.000	0.000	0.000	0.000	0.000			
Subarea discharge Q_{sa} (cfs):		0.00	0.000	0.000	0.000	0.000			
Additional discharge (cfs):		1.320	1.660	0.940	0.810	1.540			
Total discharge Q_t, including any upstream by-pass (cfs):		1.320	1.843	1.678	1.381	1.540			
By-pass Q — *Describe here source of bypass:*	0.000	0.18	0.74	0.57	0.00	SAG			
DEPRESSION CALCULATION:									
Width of depression "w" (ft):									
Depression depth "a" (from flowline w/o depression) (in):									
Depression cross-slope (Sw=Sx+a/12w):									
Fraction of flow over the depression (Eo):									
Discharge-weighted equivalent cross-slope (Se):									
Q_s (first guess: **Qt - 0.001**, after iteration should be same as next line)		0.005			0.013	0.024	0.000	0.005	0.000
Q_s over shoulder (excluding flow over the depression) (cfs):									
Q=Q_w+Q_s (cfs) (after iterations must match **Q_t** value):									
HYDRAULIC RESULTS:									
Flooded Width T for Q_t, upstream of inlet (ft):		7.99	7.80	7.74	7.19	SAG			
Flooded Width T at depression (if any) (ft):		7.99	7.80	7.74	7.19	SAG			
Flooded Width T for BYPASS Q downstream of inlet (ft):	0.00	3.81	5.53	5.16	0.00	SAG			
Water depth at curb (with or without depression) (in):		1.74	2.15	2.78	2.59				
Water cross-area at shoulder (without depression) (sq.ft.):		0.58	0.70	0.90	0.78				
Water velocity immediately u/s from inlet (w/o depression) (fps):		2.28	2.63	1.87	1.78				
Average water velocity for the segment to this inlet (fps):		0.85	1.10	0.84	0.80				
Flowtime from the previous inlet to this one (min):		8.66	0.96	2.37	2.42				
GRATE INLETS ON-GRADE:									
Splash-over V for effective length of grate (type P-1 3/8) (fps):		6.81	6.81	6.81					
Effective length of grate considering clogging factor (ft):		2.01	2.01	2.01					
Ratio of grate frontal flow to total flow:		0.84	0.546	0.550					
Fraction of frontal flow intercepted (Rf):		100.0%	100.0%	100.0%					
Fraction of side flow interception (Rs):		12.0%	11.8%	24.4%					
Total flow intercepted (cfs):		1.14	1.105	1.107					
Grate Efficiency (E):		86.2%	60.0%	66.0%					
Grate flow-through flow (cfs):		0.18	0.738	0.571					
SLOTTED DRAINS & SIDE-OPENING INLETS ON-GRADE:									
Length required for total interception (ft):					13.74				
Length of inlet provided L (ft):					21.00				
Efficiency for length L:					100.0%				
Interception for length L (cfs):					1.381				
Side opening flow-through flow (cfs):					0.000				
INTERCEPTION CAPACITY OF INLETS IN SAG LOCATION:									
Maximum allowable flooded width (including the depression) (ft):						8.00			
Max. head at sag w/o exceeding allowable flooded width (ft):						0.24			
Capacity of grate in a sag (3-sided weir) (cfs):						2.109			
Length provided of curb-opening inlet at sag (ft):									
Capacity of curb-opening inlet in a sag (weir) (cfs):									

ONDRAIN_English Version 7.5d, developed by Fernando Manzanera, Caltrans District 1, Hydraulics Capital Support (December 2010).

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Separate Run

HYDRAULIC CALCULATOR FOR ONSITE DRAINAGE (English Units)

Date: 08/03/21

RCTC I-15 ELPSE

Note: "Subarea discharge Qsa (cfs)" was obtained from "Design Discharge" column of Hydrological Tables found within the hydrology maps in Appendix B.2, and inputted as "Additional discharge (cfs)" below.

	Starting Point	N-1455	N-1456	N-1458A	N-1458B	SLOTTED	SLOTTED	SLOTTED	SLOTTED
Location station (ft):	1454+15.0	1455+43.0	1456+50.0	1458+00.0	1458+50.0	1458+75.0	1459+00.0	1459+05.0	1459+10.0
Longitudinal profile ("on-grade" or "sag"):		on-grade	on-grade	on-grade	on-grade	on-grade	on-grade	on-grade	on-grade
Calculation Type ("grate", "side opening", or "shoulder hydraulics only"):		grate	grate	grate	grate	side opening	side opening	side opening	side opening
Longitudinal slope, S:		0.20%	0.10%	0.40%	0.40%	0.40%	0.40%	0.40%	0.40%
Shoulder cross-slope, Sx:		3.00%	3.00%	2.20%	1.50%	1.00%	0.60%	0.50%	0.50%
Average watershed paved width (ft):		0.00	0.00	0.00	0.00	67.95	41.82	43.56	43.56
Shoulder Manning's n:		0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016
Inlet description (optional):									
Clogging factor for on-grade grates:		33%	33%	33%	33%				
Grate width (ft):		4.00	4.00	4.00	4.00				
Grate length (ft):		3.00	3.00	3.00	3.00				
Precipitation intensity (in/hr):		3.29	3.29	3.29	3.29	3.20	3.20	3.20	3.20
Runoff Coefficient for paved areas, "C_p":		0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Runoff Coefficient for unpaved areas, "C_u":		0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63
Unpaved area contributing to this inlet (acres):		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Watershed paved length (ft):		128.0	107.0	150.0	50.0	25.0	25.0	5.0	5.0
Paved area contributing to this inlet (acres):		0.000	0.000	0.000	0.000	0.039	0.024	0.005	0.005
Subarea discharge Q_{sa} (cfs):		0.00	0.000	0.000	0.000	0.124	0.076	0.016	0.016
Additional discharge (cfs):		0.780	0.680	0.910	0.200				
Total discharge Q_t, including any upstream by-pass (cfs):		**0.780**	**0.722**	**0.951**	**0.303**	**0.139**	**0.076**	**0.016**	**0.016**
By-pass Q — *Describe here source of bypass:*	0.000	**0.04**	**0.04**	**0.10**	**0.02**	**0.00**	**0.00**	**0.00**	**0.00**
DEPRESSION CALCULATION:									
Width of depression "w" (ft):									
Depression depth "a" (from flowline w/o depression) (in):									
Depression cross-slope (Sw=Sx+a/12w):									
Fraction of flow over the depression (Eo):									
Discharge-weighted equivalent cross-slope (Se):									
Q_s (first guess: **Qt - 0.001**, after iteration should be same as next line)		0.005			0.013	0.024	0.000	0.005	0.000
Q_s over shoulder (excluding flow over the depression) (cfs):									
Q=Q_w+Q_s (cfs) (after iterations must match **Q_t** value):									
HYDRAULIC RESULTS:									
Flooded Width T for Q_t, upstream of inlet (ft):		**6.89**	**7.62**	**7.92**	**6.55**	**6.30**	**6.91**	**4.30**	**4.34**
Flooded Width T at depression (if any) (ft):		**6.89**	**7.62**	**7.92**	**6.55**	**6.30**	**6.91**	**4.30**	**4.34**
Flooded Width T for BYPASS Q downstream of inlet (ft):	0.00	**2.30**	**2.61**	**3.44**	**2.16**	**0.00**	**0.00**	**1.10**	**1.16**
Water depth at curb (with or without depression) (in):		2.48	2.74	2.09	1.18	0.76	0.50	0.26	0.26
Water cross-area at shoulder (without depression) (sq.ft.):		0.71	0.87	0.69	0.32	0.20	0.14	0.05	0.05
Water velocity immediately u/s from inlet (w/o depression) (fps):		1.09	0.83	1.38	0.94	0.70	0.53	0.34	0.34
Average water velocity for the segment to this inlet (fps):		0.41	0.33	0.55	0.40	0.28	0.20	0.13	0.13
Flowtime from the previous inlet to this one (min):		5.22	5.47	4.57	2.10	1.50	2.12	0.66	0.63
GRATE INLETS ON-GRADE:									
Splash-over V for effective length of grate (type P-1 3/8) (fps):		6.81	6.81	6.81	6.81				
Effective length of grate considering clogging factor (ft):		2.01	2.01	2.01	2.01				
Ratio of grate frontal flow to total flow:		0.90	0.862	0.847	0.919				
Fraction of frontal flow intercepted (Rf):		100.0%	100.0%	100.0%	100.0%				
Fraction of side flow interception (Rs):		45.8%	58.3%	29.0%	35.6%				
Total flow intercepted (cfs):		0.74	0.680	0.848	0.288				
Grate Efficiency (E):		94.7%	94.3%	89.1%	94.8%				
Grate flow-through flow (cfs):		**0.04**	**0.041**	**0.103**	**0.016**				
SLOTTED DRAINS & SIDE-OPENING INLETS ON-GRADE:									
Length required for total interception (ft):						9.48	9.99	5.77	5.83
Length of inlet provided L (ft):		12.00	12.00	12.00	12.00	15.00	25.00	5.00	5.00
Efficiency for length L:						100.0%	100.0%	97.4%	97.0%
Interception for length L (cfs):						0.139	0.076	0.015	0.016
Side opening flow-through flow (cfs):						**0.000**	**0.000**	**0.000**	**0.000**
INTERCEPTION CAPACITY OF INLETS IN SAG LOCATION:									
Maximum allowable flooded width (including the depression) (ft):									
Max. head at sag w/o exceeding allowable flooded width (ft):									
Capacity of grate in a sag (3-sided weir) (cfs):									
Length provided of curb-opening inlet at sag (ft):									
Capacity of curb-opening inlet in a sag (weir) (cfs):									

ONDRAIN_English Version 7.5d, developed by Fernando Manzanera, Caltrans District 1, Hydraulics Capital Support (December 2010).

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HYDRAULIC CALCULATOR FOR ONSITE DRAINAGE (English Units)

Date: 08/03/21

RCTC I-15 ELPSE

Note: "Subarea discharge Qsa (cfs)" was obtained from "Design Discharge" column of Hydrological Tables found within the hydrology maps in Appendix B.2, and inputted as "Additional discharge (cfs)" below.

	Starting Point	SLOTTED	SLOTTED	N-1459					
Location station (ft):	**1459+10.0**	**1459+15.0**	**1459+20.0**	**1459+25.0**					
Longitudinal profile ("on-grade" or "sag"):		on-grade	on-grade	on-grade					
Calculation Type ("grate", "side opening", or "shoulder hydraulics only"):		side opening	side opening	grate					
Longitudinal slope, S:		0.40%	0.40%	0.40%					
Shoulder cross-slope, Sx:		0.30%	0.25%	0.20%					
Average watershed paved width (ft):		43.56	43.56	34.85					
Shoulder Manning's n:		0.016	0.016	0.016					
Inlet description (optional):									
Clogging factor for on-grade grates:				33%					
Grate width (ft):				2.00					
Grate length (ft):				3.00					
Precipitation intensity (in/hr):		3.29	3.29	3.29					
Runoff Coefficient for paved areas, "C_p":		0.99	0.99	0.99					
Runoff Coefficient for unpaved areas, "C_u":		0.63	0.63	0.63					
Unpaved area contributing to this inlet (acres):		0.000	0.000	0.000					
Watershed paved length (ft):		5.0	5.0	5.0					
Paved area contributing to this inlet (acres):		0.005	0.005	0.004					
Subarea discharge Q_{sa} (cfs):		0.02	0.016	0.013					
Additional discharge (cfs):									
Total discharge Q_t, including any upstream by-pass (cfs):		**0.016**	**0.019**	**0.018**					
By-pass Q *Describe here source of bypass:*	**0.000**	**0.00**	**0.00**	**0.01**					
DEPRESSION CALCULATION:									
Width of depression "w" (ft):									
Depression depth "a" (from flowline w/o depression) (in):									
Depression cross-slope (Sw=Sx+a/12w):									
Fraction of flow over the depression (Eo):									
Discharge-weighted equivalent cross-slope (Se):									
Q_s (first guess: **Qt - 0.001**, after iteration should be same as next line)		0.005							
Q_s over shoulder (excluding flow over the depression) (cfs):									
Q=Q_w+Q_s (cfs) (after iterations must match **Q_t** value):									
HYDRAULIC RESULTS:									
Flooded Width T for Q_t, upstream of inlet (ft):		**5.98**	**7.10**	**7.99**					
Flooded Width T at depression (if any) (ft):		**5.98**	**7.10**	**7.99**					
Flooded Width T for BYPASS Q downstream of inlet (ft):	**0.00**	**3.05**	**4.26**	**4.96**					
Water depth at curb (with or without depression) (in):		0.22	0.21	0.19					
Water cross-area at shoulder (without depression) (sq.ft.):		0.05	0.06	0.06					
Water velocity immediately u/s from inlet (w/o depression) (fps):		0.30	0.30	0.28					
Average water velocity for the segment to this inlet (fps):		0.11	0.12	0.12					
Flowtime from the previous inlet to this one (min):		0.74	0.68	0.71					
GRATE INLETS ON-GRADE:									
Splash-over V for effective length of grate (type P-1 3/8) (fps):				6.81					
Effective length of grate considering clogging factor (ft):				2.01					
Ratio of grate frontal flow to total flow:				0.536					
Fraction of frontal flow intercepted (Rf):				100.0%					
Fraction of side flow interception (Rs):				39.5%					
Total flow intercepted (cfs):				0.013					
Grate Efficiency (E):				72.0%					
Grate flow-through flow (cfs):				**0.005**					
SLOTTED DRAINS & SIDE-OPENING INLETS ON-GRADE:									
Length required for total interception (ft):		7.92	9.43						
Length of inlet provided L (ft):		5.00	5.00	5.00					
Efficiency for length L:		83.4%	74.3%						
Interception for length L (cfs):		0.01	0.014						
Side opening flow-through flow (cfs):		**0.00**	**0.005**						
INTERCEPTION CAPACITY OF INLETS IN SAG LOCATION:									
Maximum allowable flooded width (including the depression) (ft):									
Max. head at sag w/o exceeding allowable flooded width (ft):									
Capacity of grate in a sag (3-sided weir) (cfs):									
Length provided of curb-opening inlet at sag (ft):									
Capacity of curb-opening inlet in a sag (weir) (cfs):									

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Separate Run

HYDRAULIC CALCULATOR FOR ONSITE DRAINAGE (English Units)

Date: 08/04/21

RCTC I-15 ELPSE

Note: "Subarea discharge Qsa (cfs)" was obtained from "Design Discharge" column of Hydrological Tables found within the hydrology maps in Appendix B.2, and inputted as "Additional discharge (cfs)" below.

	Starting Point	N-1519	N-1518B	N-1518A	N-1517B	N-1517A	N-1516B	N-1516A	SLOTTED
Location station (ft):	**1519+90.0**	**1519+10.0**	**1518+53.3**	**1518+00.0**	**1517+50.0**	**1517+00.0**	**1516+50.0**	**1516+00.0**	**1515+70.0**
Longitudinal profile ("on-grade" or "sag"):		on-grade	on-grade	on-grade	on-grade	on-grade	on-grade	on-grade	on-grade
Calculation Type ("grate", "side opening", or "shoulder hydraulics only"):		grate	grate	grate	grate	grate	grate	grate	side opening
Longitudinal slope, S:		0.20%	0.30%	0.30%	0.30%	0.30%	0.30%	0.50%	0.50%
Shoulder cross-slope, Sx:		1.90%	1.80%	1.70%	1.70%	1.70%	1.70%	1.60%	1.00%
Average watershed paved width (ft):		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Shoulder Manning's n:		0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016
Inlet description (optional):									
Clogging factor for on-grade grates:		33%	33%	33%	33%	33%	33%	33%	
Grate width (ft):		2.00	2.00	2.00	2.00	2.00	4.00	4.00	
Grate length (ft):		3.00	3.00	3.00	3.00	3.00	3.00	3.00	
Precipitation intensity (in/hr):		3.29	3.29	3.29	3.29	3.29	3.29	3.29	3.29
Runoff Coefficient for paved areas, "C_p":		0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Runoff Coefficient for unpaved areas, "C_u":		0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63
Unpaved area contributing to this inlet (acres):		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Watershed paved length (ft):		80.0	56.7	53.3	50.0	50.0	50.0	50.0	30.0
Paved area contributing to this inlet (acres):		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Subarea discharge Q_{sa} (cfs):		0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Additional discharge (cfs):		0.500	0.360	0.300	0.300	0.300	0.270	0.340	0.160
Total discharge Q_t, including any upstream by-pass (cfs):		**0.500**	**0.485**	**0.430**	**0.413**	**0.406**	**0.374**	**0.362**	**0.179**
By-pass Q (cfs): *Describe here source of bypass:*	**0.000**	**0.13**	**0.13**	**0.11**	**0.11**	**0.10**	**0.02**	**0.02**	**0.00**
DEPRESSION CALCULATION:									
Width of depression "w" (ft):									
Depression depth "a" (from flowline w/o depression) (in):									
Depression cross-slope (Sw=Sx+a/12w):									
Fraction of flow over the depression (Eo):									
Discharge-weighted equivalent cross-slope (Se):									
Q_s (first guess: **Qt - 0.001**, after iteration should be same as next line)		0.005			0.013	0.024	0.000	0.005	0.000
Q_s over shoulder (excluding flow over the depression) (cfs):									
Q=Q_w+Q_s (cfs) (after iterations must match **Q_t** value):									
HYDRAULIC RESULTS:									
Flooded Width T for Q_t, upstream of inlet (ft):		**7.76**	**7.36**	**7.29**	**7.18**	**7.13**	**6.91**	**6.45**	**6.64**
Flooded Width T at depression (if any) (ft):		**7.76**	**7.36**	**7.29**	**7.18**	**7.13**	**6.91**	**6.45**	**6.64**
Flooded Width T for BYPASS Q downstream of inlet (ft):	**0.00**	**4.62**	**4.49**	**4.42**	**4.31**	**4.27**	**2.41**	**2.13**	**0.00**
Water depth at curb (with or without depression) (in):		1.77	1.59	1.49	1.46	1.46	1.41	1.24	0.80
Water cross-area at shoulder (without depression) (sq.ft.):		0.57	0.49	0.45	0.44	0.43	0.41	0.33	0.22
Water velocity immediately u/s from inlet (w/o depression) (fps):		0.87	1.00	0.95	0.94	0.94	0.92	1.09	0.81
Average water velocity for the segment to this inlet (fps):		0.33	0.44	0.41	0.41	0.41	0.40	0.44	0.32
Flowtime from the previous inlet to this one (min):		4.10	2.17	2.14	2.03	2.05	2.08	1.91	1.56
GRATE INLETS ON-GRADE:									
Splash-over V for effective length of grate (type P-1 3/8) (fps):		6.81	6.81	6.81	6.81	6.81	6.81	6.81	
Effective length of grate considering clogging factor (ft):		2.01	2.01	2.01	2.01	2.01	2.01	2.01	
Ratio of grate frontal flow to total flow:		0.55	0.571	0.575	0.581	0.584	0.900	0.924	
Fraction of frontal flow intercepted (Rf):		100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	
Fraction of side flow interception (Rs):		44.6%	37.6%	38.1%	38.5%	38.7%	39.6%	31.3%	
Total flow intercepted (cfs):		0.37	0.355	0.317	0.307	0.303	0.351	0.344	
Grate Efficiency (E):		75.0%	73.2%	73.7%	74.3%	74.5%	94.0%	94.8%	
Grate flow-through flow (cfs):		**0.13**	**0.130**	**0.113**	**0.106**	**0.104**	**0.022**	**0.019**	
SLOTTED DRAINS & SIDE-OPENING INLETS ON-GRADE:									
Length required for total interception (ft):									11.26
Length of inlet provided L (ft):		12.00	18.00	24.00	12.00	12.00	12.00	12.00	17.00
Efficiency for length L:									100.0%
Interception for length L (cfs):									0.179
Side opening flow-through flow (cfs):									**0.000**
INTERCEPTION CAPACITY OF INLETS IN SAG LOCATION:									
Maximum allowable flooded width (including the depression) (ft):									
Max. head at sag w/o exceeding allowable flooded width (ft):									
Capacity of grate in a sag (3-sided weir) (cfs):									
Length provided of curb-opening inlet at sag (ft):									
Capacity of curb-opening inlet in a sag (weir) (cfs):									

ONDRAIN_English Version 7.5d, developed by Fernando Manzanera, Caltrans District 1, Hydraulics Capital Support (December 2010).

Notes: -This program utilizes the equations presented in the FHA Hydraulic Engineering Circular 22 (HEC-22), FHWA-NHI-10-009.

- Underlined values are calculated by the program, the others are input by the user.

HYDRAULIC CALCULATOR FOR ONSITE DRAINAGE (English Units)

Date: 08/11/21

RCTC I-15 ELPSE

	Starting Point								
Location station (ft):	**1515+70.0**	**1515+40.0**	**1515+00.0**	**1514+75.0**	**1514+50.0**	**1514+25.0**	**1514+00.0**	**1513+85.0**	**1513+70.0**
Longitudinal profile ("on-grade" or "sag"):		on-grade	on-grade	on-grade	on-grade	on-grade	on-grade	on-grade	on-grade
Calculation Type ("grate", "side opening", or "shoulder hydraulics only"):		side opening	grate	side opening	side opening	side opening	grate	side opening	side opening
Longitudinal slope, S:		0.50%	0.50%	0.90%	0.90%	0.90%	0.90%	0.90%	0.90%
Shoulder cross-slope, Sx:		1.00%	0.90%	0.83%	0.77%	0.70%	0.63%	0.60%	5.50%
Average watershed paved width (ft):		106.00	47.92	139.39	90.60	81.89	87.12	40.66	84.22
Shoulder Manning's n:		0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016
Inlet description (optional):									
Clogging factor for on-grade grates:		33%	33%				33%		
Grate width (ft):		2.00	2.00				4.00		
Grate length (ft):		3.00	3.00				3.00		
Precipitation intensity (in/hr):		3.29	3.29	3.60	3.60	3.60	3.60	3.60	3.60
Runoff Coefficient for paved areas, "C_p":		0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Runoff Coefficient for unpaved areas, "C_u":		0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63
Unpaved area contributing to this inlet (acres):		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Watershed paved length (ft):		30.0	40.0	25.0	25.0	25.0	25.0	15.0	15.0
Paved area contributing to this inlet (acres):		0.073	0.044	0.080	0.052	0.047	0.050	0.014	0.029
Subarea discharge Q_{sa} (cfs):		0.24	0.143	0.285	0.185	0.168	0.178	0.050	0.103
Additional discharge (cfs):									
Total discharge Q_t, including any upstream by-pass (cfs):		**0.238**	**0.143**	**0.321**	**0.185**	**0.168**	**0.178**	**0.072**	**0.103**
By-pass Q (cfs): *Describe here source of bypass:*	**0.000**	**0.00**	**0.04**	**0.00**	**0.00**	**0.00**	**0.02**	**0.00**	**0.00**
DEPRESSION CALCULATION:									
Width of depression "w" (ft):									
Depression depth "a" (from flowline w/o depression) (in):									
Depression cross-slope (Sw=Sx+a/12w):									
Fraction of flow over the depression (Eo):									
Discharge-weighted equivalent cross-slope (Se):									
Q_s (first guess: **Qt - 0.001**, after iteration should be same as next line)		0.005			0.013	0.024	0.000	0.005	0.000
Q_s over shoulder (excluding flow over the depression) (cfs):									
Q=Q_w+Q_s (cfs) (after iterations must match **Q_t** value):									
HYDRAULIC RESULTS:									
Flooded Width T for Q_t, upstream of inlet (ft):		**7.39**	**6.53**	**8.32**	**7.10**	**7.25**	**7.93**	**5.81**	**1.67**
Flooded Width T at depression (if any) (ft):		**7.39**	**6.53**	**8.32**	**7.10**	**7.25**	**7.93**	**5.81**	**1.67**
Flooded Width T for BYPASS Q downstream of inlet (ft):	**0.00**	**0.00**	**3.88**	**0.00**	**0.00**	**0.00**	**3.61**	**0.00**	**0.00**
Water depth at curb (with or without depression) (in):		0.89	0.70	0.83	0.66	0.61	0.60	0.42	1.10
Water cross-area at shoulder (without depression) (sq.ft.):		0.27	0.19	0.29	0.19	0.18	0.20	0.10	0.08
Water velocity immediately u/s from inlet (w/o depression) (fps):		0.87	0.75	1.12	0.96	0.91	0.90	0.71	1.35
Average water velocity for the segment to this inlet (fps):		0.32	0.28	0.46	0.36	0.34	0.33	0.31	0.50
Flowtime from the previous inlet to this one (min):		1.54	2.40	0.90	1.17	1.23	1.25	0.81	0.50
GRATE INLETS ON-GRADE:									
Splash-over V for effective length of grate (type P-1 3/8) (fps):			6.81				6.81		
Effective length of grate considering clogging factor (ft):			2.01				2.01		
Ratio of grate frontal flow to total flow:			0.623				0.846		
Fraction of frontal flow intercepted (Rf):			100.0%				100.0%		
Fraction of side flow interception (Rs):			33.5%				20.2%		
Total flow intercepted (cfs):			0.107				0.156		
Grate Efficiency (E):			74.9%				87.7%		
Grate flow-through flow (cfs):			**0.036**				**0.022**		
SLOTTED DRAINS & SIDE-OPENING INLETS ON-GRADE:									
Length required for total interception (ft):		12.69		19.20	15.94	16.18		12.43	3.83
Length of inlet provided L (ft):		40.00	40.00	25.00	25.00	25.00	25.00	15.00	15.00
Efficiency for length L:		100.0%		100.0%	100.0%	100.0%		100.0%	100.0%
Interception for length L (cfs):		0.24		0.321	0.185	0.168		0.072	0.103
Side opening flow-through flow (cfs):		**0.00**		**0.000**	**0.000**	**0.000**		**0.000**	**0.000**
INTERCEPTION CAPACITY OF INLETS IN SAG LOCATION:									
Maximum allowable flooded width (including the depression) (ft):									
Max. head at sag w/o exceeding allowable flooded width (ft):									
Capacity of grate in a sag (3-sided weir) (cfs):									
Length provided of curb-opening inlet at sag (ft):									
Capacity of curb-opening inlet in a sag (weir) (cfs):									

ONDRAIN_English Version 7.5d, developed by Fernando Manzanera, Caltrans District 1, Hydraulics Capital Support (December 2010).

Notes: -This program utilizes the equations presented in the FHA Hydraulic Engineering Circular 22 (HEC-22), FHWA-NHI-10-009.

- Underlined values are calculated by the program, the others are input by the user.

North 1500's

HYDRAULIC CALCULATOR FOR ONSITE DRAINAGE (English Units)

Date: 08/04/21

RCTC I-15 ELPSE

Note: "Subarea discharge Qsa (cfs)" was obtained from "Design Discharge" column of Hydrological Tables found within the hydrology maps in Appendix B.2, and inputted as "Additional discharge (cfs)" below.

	Starting Point								
		SLOTTED	SLOTTED	SLOTTED	SLOTTED	N-1513A	SLOTTED	SLOTTED	SLOTTED
Location station (ft):	1513+70.0	1513+55.0	1513+40.0	1513+25.0	1513+10.0	1513+00.0	1512+90.0	1512+80.0	1512+70.0
Longitudinal profile ("on-grade" or "sag"):		on-grade	on-grade	on-grade	on-grade	on-grade	on-grade	on-grade	on-grade
Calculation Type ("grate", "side opening", or "shoulder hydraulics only"):		side opening	side opening	side opening	side opening	grate	side opening	side opening	side opening
Longitudinal slope, S:		0.90%	0.90%	0.90%	0.90%	0.90%	0.90%	0.90%	0.90%
Shoulder cross-slope, Sx:		0.50%	0.50%	0.44%	0.40%	0.40%	0.30%	0.30%	0.30%
Average watershed paved width (ft):		69.70	52.27	55.18	23.23	82.76	30.49	87.12	87.12
Shoulder Manning's n:		0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016
Inlet description (optional):									
Clogging factor for on-grade grates:						33%			
Grate width (ft):						4.00			
Grate length (ft):						3.00			
Precipitation intensity (in/hr):		3.60	3.60	3.60	3.60	3.60	3.60	3.60	3.60
Runoff Coefficient for paved areas, "C_p":		0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Runoff Coefficient for unpaved areas, "C_u":		0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63
Unpaved area contributing to this inlet (acres):		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Watershed paved length (ft):		15.0	15.0	15.0	15.0	10.0	10.0	10.0	10.0
Paved area contributing to this inlet (acres):		0.024	0.018	0.019	0.008	0.019	0.007	0.020	0.020
Subarea discharge Q_{sa} (cfs):		0.09	0.064	0.068	0.029	0.068	0.025	0.071	0.071
Additional discharge (cfs):									
Total discharge Q_t, including any upstream by-pass (cfs):		0.086	0.064	0.068	0.029	0.068	0.031	0.074	0.091
By-pass Q (cfs): *Describe here source of bypass:*	0.000	**0.00**	**0.00**	**0.00**	**0.00**	**0.01**	**0.00**	**0.02**	**0.03**
DEPRESSION CALCULATION:									
Width of depression "w" (ft):									
Depression depth "a" (from flowline w/o depression) (in):									
Depression cross-slope (Sw=Sx+a/12w):									
Fraction of flow over the depression (Eo):									
Discharge-weighted equivalent cross-slope (Se):									
Q_s (first guess: **Qt - 0.001**, after iteration should be same as next line)		0.005			0.013	0.024	0.000	0.005	0.000
Q_s over shoulder (excluding flow over the depression) (cfs):									
Q=Q_w+Q_s (cfs) (after iterations must match **Q_t** value):									
HYDRAULIC RESULTS:									
Flooded Width T for Q_t, upstream of inlet (ft):		**6.95**	**6.24**	**6.90**	**5.30**	**7.32**	**6.56**	**9.06**	**9.78**
Flooded Width T at depression (if any) (ft):		**6.95**	**6.24**	**6.90**	**5.30**	**7.32**	**6.56**	**9.06**	**9.78**
Flooded Width T for BYPASS Q downstream of inlet (ft):	0.00	**0.00**	**0.00**	**0.00**	**0.00**	**3.01**	**2.56**	**5.48**	**6.28**
Water depth at curb (with or without depression) (in):		0.42	0.37	0.36	0.25	0.35	0.24	0.33	0.35
Water cross-area at shoulder (without depression) (sq.ft.):		0.12	0.10	0.10	0.06	0.11	0.06	0.12	0.14
Water velocity immediately u/s from inlet (w/o depression) (fps):		0.71	0.66	0.65	0.51	0.63	0.48	0.60	0.63
Average water velocity for the segment to this inlet (fps):		0.26	0.24	0.24	0.19	0.23	0.20	0.23	0.27
Flowtime from the previous inlet to this one (min):		0.95	1.02	1.04	1.33	0.71	0.84	0.71	0.62
GRATE INLETS ON-GRADE:									
Splash-over V for effective length of grate (type P-1 3/8) (fps):						6.81			
Effective length of grate considering clogging factor (ft):						2.01			
Ratio of grate frontal flow to total flow:						0.878			
Fraction of frontal flow intercepted (Rf):						100.0%			
Fraction of side flow interception (Rs):						23.3%			
Total flow intercepted (cfs):						0.061			
Grate Efficiency (E):						90.7%			
Grate flow-through flow (cfs):						**0.006**			
SLOTTED DRAINS & SIDE-OPENING INLETS ON-GRADE:									
Length required for total interception (ft):		14.93	13.23	14.61	10.76		13.29	19.07	20.79
Length of inlet provided L (ft):		15.00	15.00	15.00	15.00	10.00	10.00	10.00	10.00
Efficiency for length L:		100.0%	100.0%	100.0%	100.0%		91.9%	73.8%	69.3%
Interception for length L (cfs):		0.09	0.064	0.068	0.029		0.029	0.054	0.063
Side opening flow-through flow (cfs):		**0.00**	**0.000**	**0.000**	**0.000**		**0.003**	**0.019**	**0.028**
INTERCEPTION CAPACITY OF INLETS IN SAG LOCATION:									
Maximum allowable flooded width (including the depression) (ft):									
Max. head at sag w/o exceeding allowable flooded width (ft):									
Capacity of grate in a sag (3-sided weir) (cfs):									
Length provided of curb-opening inlet at sag (ft):									
Capacity of curb-opening inlet in a sag (weir) (cfs):									

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Notes: -This program utilizes the equations presented in the FHA Hydraulic Engineering Circular 22 (HEC-22), FHWA-NHI-10-009.

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HYDRAULIC CALCULATOR FOR ONSITE DRAINAGE (English Units)

Date: 08/04/21

RCTC I-15 ELPSE

Note: "Subarea discharge Qsa (cfs)" was obtained from "Design Discharge" column of Hydrological Tables found within the hydrology maps in Appendix B.2, and inputted as "Additional discharge (cfs)" below.

	Starting Point								
		SLOTTED	SLOTTED	SLOTTED	SLOTTED	SLOTTED	N-1512		
Location station (ft):	1512+70.0	1512+60.0	1512+50.0	1512+40.0	1512+30.0	1512+25.0	1512+14.0		
Longitudinal profile ("on-grade" or "sag"):		on-grade	on-grade	on-grade	on-grade	on-grade	on-grade		
Calculation Type ("grate", "side opening", or "shoulder hydraulics only"):		side opening	side opening	side opening	side opening	side opening	grate		
Longitudinal slope, S:		0.90%	0.90%	0.90%	0.90%	0.90%	0.90%		
Shoulder cross-slope, Sx:		0.30%	0.30%	0.30%	0.25%	0.25%	0.25%		
Average watershed paved width (ft):		87.12	95.83	87.12	87.12	100.19	113.25		
Shoulder Manning's n:		0.016	0.016	0.016	0.016	0.016	0.016		
Inlet description (optional):									
Clogging factor for on-grade grates:							33%		
Grate width (ft):							4.00		
Grate length (ft):							3.00		
Precipitation intensity (in/hr):		3.60	3.60	3.60	3.60	3.60	3.60		
Runoff Coefficient for paved areas, "C_p":		0.99	0.99	0.99	0.99	0.99	0.99		
Runoff Coefficient for unpaved areas, "C_u":		0.63	0.63	0.63	0.63	0.63	0.63		
Unpaved area contributing to this inlet (acres):		0.000	0.000	0.000	0.000	0.000	0.000		
Watershed paved length (ft):		10.0	10.0	10.0	10.0	5.0	11.0		
Paved area contributing to this inlet (acres):		0.020	0.022	0.020	0.020	0.012	0.029		
Subarea discharge Q_{sa} (cfs):		0.07	0.078	0.071	0.071	0.041	0.102		
Additional discharge (cfs):									
Total discharge Q_t, including any upstream by-pass (cfs):		0.071	0.097	0.102	0.105	0.082	0.154		
By-pass Q (cfs): *Describe here source of bypass:*	0.000	**0.02**	**0.03**	**0.03**	**0.04**	**0.05**	**0.05**		
DEPRESSION CALCULATION:									
Width of depression "w" (ft):									
Depression depth "a" (from flowline w/o depression) (in):									
Depression cross-slope (Sw=Sx+a/12w):									
Fraction of flow over the depression (Eo):									
Discharge-weighted equivalent cross-slope (Se):									
Q_s (first guess: **Qt - 0.001**, after iteration should be same as next line)		0.005			0.013	0.024			
Q_s over shoulder (excluding flow over the depression) (cfs):									
Q=Q_w+Q_s (cfs) (after iterations must match **Q_t** value):									
HYDRAULIC RESULTS:									
Flooded Width T for Q_t, upstream of inlet (ft):		**8.94**	**10.02**	**10.23**	**11.59**	**10.57**	**13.37**		
Flooded Width T at depression (if any) (ft):		**8.94**	**10.02**	**10.23**	**11.59**	**10.57**	**13.37**		
Flooded Width T for BYPASS Q downstream of inlet (ft):	0.00	**5.35**	**6.54**	**6.77**	**8.17**	**8.91**	**8.86**		
Water depth at curb (with or without depression) (in):		0.32	0.36	0.37	0.35	0.32	0.40		
Water cross-area at shoulder (without depression) (sq.ft.):		0.12	0.15	0.16	0.17	0.14	0.22		
Water velocity immediately u/s from inlet (w/o depression) (fps):		0.59	0.64	0.65	0.63	0.59	0.69		
Average water velocity for the segment to this inlet (fps):		0.22	0.27	0.28	0.27	0.27	0.30		
Flowtime from the previous inlet to this one (min):		0.76	0.62	0.59	0.62	0.31	0.60		
GRATE INLETS ON-GRADE:									
Splash-over V for effective length of grate (type P-1 3/8) (fps):							6.81		
Effective length of grate considering clogging factor (ft):							2.01		
Ratio of grate frontal flow to total flow:							0.612		
Fraction of frontal flow intercepted (Rf):							100.0%		
Fraction of side flow interception (Rs):							14.0%		
Total flow intercepted (cfs):							0.103		
Grate Efficiency (E):							66.7%		
Grate flow-through flow (cfs):							**0.051**		
SLOTTED DRAINS & SIDE-OPENING INLETS ON-GRADE:									
Length required for total interception (ft):		18.79	21.35	21.86	24.69	22.27			
Length of inlet provided L (ft):		10.00	10.00	10.00	10.00	5.00	11.00		
Efficiency for length L:		74.5%	67.9%	66.7%	60.7%	36.7%			
Interception for length L (cfs):		0.05	0.066	0.068	0.064	0.030			
Side opening flow-through flow (cfs):		**0.02**	**0.031**	**0.034**	**0.041**	**0.052**			
INTERCEPTION CAPACITY OF INLETS IN SAG LOCATION:									
Maximum allowable flooded width (including the depression) (ft):									
Max. head at sag w/o exceeding allowable flooded width (ft):									
Capacity of grate in a sag (3-sided weir) (cfs):									
Length provided of curb-opening inlet at sag (ft):									
Capacity of curb-opening inlet in a sag (weir) (cfs):									

ONDRAIN_English Version 7.5d, developed by Fernando Manzanera, Caltrans District 1, Hydraulics Capital Support (December 2010).

Notes: -This program utilizes the equations presented in the FHA Hydraulic Engineering Circular 22 (HEC-22), FHWA-NHI-10-009.

- Underlined values are calculated by the program, the others are input by the user.

North 1500's

Separate Run

HYDRAULIC CALCULATOR FOR ONSITE DRAINAGE (English Units)

Date: 08/04/21

RCTC I-15 ELPSE

Note: "Subarea discharge Qsa (cfs)" was obtained from "Design Discharge" column of Hydrological Tables found within the hydrology maps in Appendix B.2, and inputted as "Additional discharge (cfs)" below.

	Starting Point	N-1520	N-1521A	N-1522	N-1525	N-1526A	N-1527	N-1529	N-1530
Location station (ft):	**1519+90.0**	**1520+50.0**	**1521+10.0**	**1522+91.0**	**1525+00.0**	**1526+00.0**	**1527+23.0**	**1529+00.0**	**1530+00.0**
Longitudinal profile ("on-grade" or "sag"):		on-grade	on-grade	on-grade	on-grade	on-grade	on-grade	on-grade	on-grade
Calculation Type ("grate", "side opening", or "shoulder hydraulics only"):		grate	grate	side opening	grate	grate	grate	grate	grate
Longitudinal slope, S:		0.30%	0.30%	0.30%	0.30%	0.90%	1.20%	1.20%	1.40%
Shoulder cross-slope, Sx:		2.00%	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%
Average watershed paved width (ft):		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Shoulder Manning's n:		0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016
Inlet description (optional):									
Clogging factor for on-grade grates:		33%	33%	33%	33%	33%	33%	33%	33%
Grate width (ft):		2.00	4.00	2.00	2.00	2.00	4.00	2.00	4.00
Grate length (ft):		3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00
Precipitation intensity (in/hr):		3.29	3.29	3.29	3.29	3.29	3.29	3.29	3.29
Runoff Coefficient for paved areas, "C_p":		0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Runoff Coefficient for unpaved areas, "C_u":		0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63
Unpaved area contributing to this inlet (acres):		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Watershed paved length (ft):		60.0	60.0	181.0	209.0	100.0	123.0	177.0	100.0
Paved area contributing to this inlet (acres):		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Subarea discharge Q_{sa} (cfs):		0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Additional discharge (cfs):		0.350	0.410	0.660	1.500	0.500	0.660	1.080	0.730
Total discharge Q_t, including any upstream by-pass (cfs):		**0.350**	**0.480**	**0.688**	**1.500**	**1.118**	**1.073**	**1.183**	**1.168**
By-pass Q (cfs): *Describe here source of bypass:*	**0.000**	**0.07**	**0.03**	**0.00**	**0.62**	**0.41**	**0.10**	**0.44**	**0.12**

DEPRESSION CALCULATION:

Width of depression "w" (ft):									
Depression depth "a" (from flowline w/o depression) (in):									
Depression cross-slope (Sw=Sx+a/12w):									
Fraction of flow over the depression (Eo):									
Discharge-weighted equivalent cross-slope (Se):									
Q_s (first guess: **Qt - 0.001**, after iteration should be same as next line)		0.005			0.013	0.024	0.000	0.005	0.000
Q_s over shoulder (excluding flow over the depression) (cfs):									
Q=Q_w+Q_s (cfs) (after iterations must match **Q_t** value):									

HYDRAULIC RESULTS:

Flooded Width T for Q_t, upstream of inlet (ft):		**6.09**	**6.86**	**7.85**	**10.52**	**7.67**	**7.15**	**7.42**	**7.17**
Flooded Width T at depression (if any) (ft):		**6.09**	**6.86**	**7.85**	**10.52**	**7.67**	**7.15**	**7.42**	**7.17**
Flooded Width T for BYPASS Q downstream of inlet (ft):	**0.00**	**3.33**	**2.37**	**0.00**	**7.54**	**5.28**	**2.97**	**5.11**	**3.01**
Water depth at curb (with or without depression) (in):		1.46	1.65	1.88	2.52	1.84	1.72	1.78	1.72
Water cross-area at shoulder (without depression) (sq.ft.):		0.37	0.47	0.62	1.11	0.59	0.51	0.55	0.51
Water velocity immediately u/s from inlet (w/o depression) (fps):		0.94	1.02	1.12	1.36	1.90	2.10	2.15	2.27
Average water velocity for the segment to this inlet (fps):		0.35	0.42	0.44	0.51	0.94	0.95	0.87	1.02
Flowtime from the previous inlet to this one (min):		2.85	2.35	6.87	6.89	1.77	2.15	3.39	1.63

GRATE INLETS ON-GRADE:

Splash-over V for effective length of grate (type P-1 3/8) (fps):		6.81	6.81		6.81	6.81	6.81	6.81	6.81
Effective length of grate considering clogging factor (ft):		2.01	2.01		2.01	2.01	2.01	2.01	2.01
Ratio of grate frontal flow to total flow:		0.65	0.903		0.430	0.553	0.888	0.567	0.886
Fraction of frontal flow intercepted (Rf):		100.0%	100.0%		100.0%	100.0%	100.0%	100.0%	100.0%
Fraction of side flow interception (Rs):		42.5%	39.1%		27.7%	17.3%	14.9%	14.4%	13.2%
Total flow intercepted (cfs):		0.28	0.451		0.882	0.705	0.970	0.744	1.053
Grate Efficiency (E):		80.1%	94.1%		58.8%	63.1%	90.4%	62.9%	90.1%
Grate flow-through flow (cfs):		**0.07**	**0.028**		**0.618**	**0.413**	**0.103**	**0.438**	**0.115**

SLOTTED DRAINS & SIDE-OPENING INLETS ON-GRADE:

Length required for total interception (ft):				11.22					
Length of inlet provided L (ft):				17.00					
Efficiency for length L:				100.0%					
Interception for length L (cfs):				0.688					
Side opening flow-through flow (cfs):				**0.000**					

INTERCEPTION CAPACITY OF INLETS IN SAG LOCATION:

Maximum allowable flooded width (including the depression) (ft):									
Max. head at sag w/o exceeding allowable flooded width (ft):									
Capacity of grate in a sag (3-sided weir) (cfs):									
Length provided of curb-opening inlet at sag (ft):									
Capacity of curb-opening inlet in a sag (weir) (cfs):									

ONDRAIN_English Version 7.5d, developed by Fernando Manzanera, Caltrans District 1, Hydraulics Capital Support (December 2010).

Notes: -This program utilizes the equations presented in the FHA Hydraulic Engineering Circular 22 (HEC-22), FHWA-NHI-10-009.

- Underlined values are calculated by the program, the others are input by the user.

North 1500's

HYDRAULIC CALCULATOR FOR ONSITE DRAINAGE (English Units)

Date: 08/04/21

RCTC I-15 ELPSE

Note: "Subarea discharge Qsa (cfs)" was obtained from "Design Discharge" column of Hydrological Tables found within the hydrology maps in Appendix B.2, and inputted as "Additional discharge (cfs)" below.

	Starting Point	N-1532	N-1533	N-1534	N-1535	N-1536A	N-1536B	N-1539	N-1540
Location station (ft):	1528+51.0	1532+00.0	1533+00.0	1534+25.0	1535+00.0	1536+00.0	1536+78.3	1539+50.0	1540+00.0
Longitudinal profile ("on-grade" or "sag"):		on-grade	on-grade	on-grade	on-grade	on-grade	on-grade	on-grade	on-grade
Calculation Type ("grate", "side opening", or "shoulder hydraulics only"):		grate	grate	grate	grate	grate	side opening	grate	grate
Longitudinal slope, S:		1.40%	1.40%	1.70%	1.70%	1.70%	1.70%	1.70%	1.70%
Shoulder cross-slope, Sx:		2.00%	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%
Average watershed paved width (ft):		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Shoulder Manning's n:		0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016
Inlet description (optional):									
Clogging factor for on-grade grates:		33%	33%	33%	33%	33%	33%	33%	33%
Grate width (ft):		2.00	2.00	2.00	2.00	2.00	2.00	4.00	4.00
Grate length (ft):		3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00
Precipitation intensity (in/hr):		3.29	3.29	3.29	3.29	3.29	3.29	3.29	3.29
Runoff Coefficient for paved areas, "C_p":		0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Runoff Coefficient for unpaved areas, "C_u":		0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63
Unpaved area contributing to this inlet (acres):		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Watershed paved length (ft):		349.0	100.0	125.0	75.0	100.0	78.3	271.7	50.0
Paved area contributing to this inlet (acres):		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Subarea discharge Q_{sa} (cfs):		0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Additional discharge (cfs):		1.230	0.620	0.770	0.310	0.610	0.480	1.670	0.560
Total discharge Q_t, including any upstream by-pass (cfs):		**1.380**	**1.158**	**1.189**	**0.736**	**0.815**	**0.722**	**1.670**	**0.789**
By-pass Q (cfs): *Describe here source of bypass:*	0.150	**0.54**	**0.42**	**0.43**	**0.21**	**0.24**	**0.00**	**0.23**	**0.04**
DEPRESSION CALCULATION:									
Width of depression "w" (ft):									
Depression depth "a" (from flowline w/o depression) (in):									
Depression cross-slope (Sw=Sx+a/12w):									
Fraction of flow over the depression (Eo):									
Discharge-weighted equivalent cross-slope (Se):									
Q_s (first guess: **Qt - 0.001**, after iteration should be same as next line)		0.005			0.013	0.024	0.000	0.005	0.000
Q_s over shoulder (excluding flow over the depression) (cfs):									
Q=Q_w+Q_s (cfs) (after iterations must match **Q_t** value):									
HYDRAULIC RESULTS:									
Flooded Width T for Q_t, upstream of inlet (ft):		**7.64**	**7.15**	**6.96**	**5.82**	**6.05**	**5.77**	**7.91**	**5.97**
Flooded Width T at depression (if any) (ft):		**7.64**	**7.15**	**6.96**	**5.82**	**6.05**	**5.77**	**7.91**	**5.97**
Flooded Width T for BYPASS Q downstream of inlet (ft):	0.00	**5.36**	**4.88**	**4.74**	**3.60**	**3.83**	**0.00**	**3.75**	**1.86**
Water depth at curb (with or without depression) (in):		1.83	1.72	1.67	1.40	1.45	1.39	1.90	1.43
Water cross-area at shoulder (without depression) (sq.ft.):		0.58	0.51	0.48	0.34	0.37	0.33	0.63	0.36
Water velocity immediately u/s from inlet (w/o depression) (fps):		2.37	2.27	2.45	2.17	2.23	2.16	2.67	2.21
Average water velocity for the segment to this inlet (fps):		0.88	1.03	1.10	1.01	0.97	0.96	0.99	0.97
Flowtime from the previous inlet to this one (min):		6.60	1.61	1.89	1.23	1.73	1.36	4.55	0.86
GRATE INLETS ON-GRADE:									
Splash-over V for effective length of grate (type P-1 3/8) (fps):		6.81	6.81	6.81	6.81	6.81		6.81	6.81
Effective length of grate considering clogging factor (ft):		2.01	2.01	2.01	2.01	2.01		2.01	2.01
Ratio of grate frontal flow to total flow:		0.56	0.583	0.595	0.675	0.657		0.847	0.948
Fraction of frontal flow intercepted (Rf):		100.0%	100.0%	100.0%	100.0%	100.0%		100.0%	100.0%
Fraction of side flow interception (Rs):		12.3%	13.2%	11.7%	14.1%	13.5%		10.2%	13.7%
Total flow intercepted (cfs):		0.84	0.739	0.763	0.530	0.574		1.441	0.754
Grate Efficiency (E):		61.0%	63.8%	64.2%	72.1%	70.4%		86.3%	95.5%
Grate flow-through flow (cfs):		**0.54**	**0.419**	**0.426**	**0.205**	**0.242**		**0.229**	**0.035**
SLOTTED DRAINS & SIDE-OPENING INLETS ON-GRADE:									
Length required for total interception (ft):							19.26		
Length of inlet provided L (ft):							30.00		
Efficiency for length L:							100.0%		
Interception for length L (cfs):							0.722		
Side opening flow-through flow (cfs):							**0.000**		
INTERCEPTION CAPACITY OF INLETS IN SAG LOCATION:									
Maximum allowable flooded width (including the depression) (ft):									
Max. head at sag w/o exceeding allowable flooded width (ft):									
Capacity of grate in a sag (3-sided weir) (cfs):									
Length provided of curb-opening inlet at sag (ft):									
Capacity of curb-opening inlet in a sag (weir) (cfs):									

ONDRAIN_English Version 7.5d, developed by Fernando Manzanera, Caltrans District 1, Hydraulics Capital Support (December 2010).

Notes: -This program utilizes the equations presented in the FHA Hydraulic Engineering Circular 22 (HEC-22), FHWA-NHI-10-009.

- Underlined values are calculated by the program, the others are input by the user.

HYDRAULIC CALCULATOR FOR ONSITE DRAINAGE (English Units)

Date: 08/04/21

RCTC I-15 ELPSE

Note: "Subarea discharge Qsa (cfs)" was obtained from "Design Discharge" column of Hydrological Tables found within the hydrology maps in Appendix B.2, and inputted as "Additional discharge (cfs)" below.

	Starting Point	N-1542	N-1544	N-1545	N-1546	N-1547A	SLOTTED	SLOTTED	N-1547B
Location station (ft):	1540+00.0	1542+00.0	1544+00.0	1545+00.0	1546+09.7	1547+00.0	1547+20.0	1547+40.0	1547+59.8
Longitudinal profile ("on-grade" or "sag"):		on-grade	on-grade	on-grade	on-grade	on-grade	on-grade	on-grade	on-grade
Calculation Type ("grate", "side opening", or "shoulder hydraulics only"):		grate	grate	grate	grate	grate	side opening	side opening	grate
Longitudinal slope, S:		1.70%	1.70%	1.70%	1.30%	1.30%	1.30%	1.30%	1.30%
Shoulder cross-slope, Sx:		2.00%	2.00%	2.00%	1.60%	1.30%	0.90%	0.60%	0.50%
Average watershed paved width (ft):		0.00	0.00	0.00	0.00	0.00	115.43	82.76	82.76
Shoulder Manning's n:		0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016
Inlet description (optional):									
Clogging factor for on-grade grates:		33%	33%	33%	33%	33%			33%
Grate width (ft):		2.00	2.00	4.00	4.00	2.00			4.00
Grate length (ft):		3.00	3.00	3.00	3.00	3.00			3.00
Precipitation intensity (in/hr):		3.29	3.29	3.29	3.29	3.29	3.20	3.20	3.20
Runoff Coefficient for paved areas, "C_p":		0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Runoff Coefficient for unpaved areas, "C_u":		0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63
Unpaved area contributing to this inlet (acres):		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Watershed paved length (ft):		200.0	200.0	100.0	109.7	90.3	20.0	20.0	19.8
Paved area contributing to this inlet (acres):		0.000	0.000	0.000	0.000	0.000	0.053	0.038	0.038
Subarea discharge Q_{sa} (cfs):		0.00	0.000	0.000	0.000	0.000	0.168	0.120	0.119
Additional discharge (cfs):		1.050	1.210	0.900	0.640	0.460			
Total discharge Q_t, including any upstream by-pass (cfs):		**1.090**	**1.585**	**1.541**	**0.833**	**0.549**	**0.363**	**0.123**	**0.119**
By-pass Q (cfs): *Describe here source of bypass:*	0.040	**0.37**	**0.64**	**0.19**	**0.09**	**0.19**	**0.00**	**0.00**	**0.01**
DEPRESSION CALCULATION:									
Width of depression "w" (ft):									
Depression depth "a" (from flowline w/o depression) (in):									
Depression cross-slope (Sw=Sx+a/12w):									
Fraction of flow over the depression (Eo):									
Discharge-weighted equivalent cross-slope (Se):									
Q_s (first guess: **Qt - 0.001**, after iteration should be same as next line)		0.005			0.013	0.024	0.000	0.005	0.000
Q_s over shoulder (excluding flow over the depression) (cfs):									
Q=Q_w+Q_s (cfs) (after iterations must match **Q_t** value):									
HYDRAULIC RESULTS:									
Flooded Width T for Q_t, upstream of inlet (ft):		**6.74**	**7.76**	**7.67**	**7.37**	**7.17**	**7.73**	**6.64**	**7.35**
Flooded Width T at depression (if any) (ft):		**6.74**	**7.76**	**7.67**	**7.37**	**7.17**	**7.73**	**6.64**	**7.35**
Flooded Width T for BYPASS Q downstream of inlet (ft):	0.00	**4.52**	**5.52**	**3.52**	**3.18**	**4.87**	**1.28**	**0.00**	**3.12**
Water depth at curb (with or without depression) (in):		1.62	1.86	1.84	1.41	1.12	0.83	0.48	0.44
Water cross-area at shoulder (without depression) (sq.ft.):		0.45	0.60	0.59	0.43	0.33	0.27	0.13	0.14
Water velocity immediately u/s from inlet (w/o depression) (fps):		2.40	2.63	2.62	1.92	1.64	1.35	0.93	0.88
Average water velocity for the segment to this inlet (fps):		0.89	1.14	1.18	0.80	0.67	0.59	0.35	0.33
Flowtime from the previous inlet to this one (min):		3.73	2.94	1.41	2.29	2.23	0.57	0.94	1.01
GRATE INLETS ON-GRADE:									
Splash-over V for effective length of grate (type P-1 3/8) (fps):		6.81	6.81	6.81	6.81	6.81			6.81
Effective length of grate considering clogging factor (ft):		2.01	2.01	2.01	2.01	2.01			2.01
Ratio of grate frontal flow to total flow:		0.61	0.549	0.860	0.876	0.582			0.877
Fraction of frontal flow intercepted (Rf):		100.0%	100.0%	100.0%	100.0%	100.0%			100.0%
Fraction of side flow interception (Rs):		12.1%	10.4%	10.5%	14.1%	15.0%			17.2%
Total flow intercepted (cfs):		0.72	0.944	1.348	0.745	0.354			0.107
Grate Efficiency (E):		65.6%	59.6%	87.4%	89.4%	64.5%			89.8%
Grate flow-through flow (cfs):		**0.37**	**0.641**	**0.193**	**0.089**	**0.195**			**0.012**
SLOTTED DRAINS & SIDE-OPENING INLETS ON-GRADE:									
Length required for total interception (ft):							21.50	17.43	
Length of inlet provided L (ft):							20.00	20.00	
Efficiency for length L:							99.2%	100.0%	
Interception for length L (cfs):							0.360	0.123	
Side opening flow-through flow (cfs):							**0.003**	**0.000**	
INTERCEPTION CAPACITY OF INLETS IN SAG LOCATION:									
Maximum allowable flooded width (including the depression) (ft):									
Max. head at sag w/o exceeding allowable flooded width (ft):									
Capacity of grate in a sag (3-sided weir) (cfs):									
Length provided of curb-opening inlet at sag (ft):									
Capacity of curb-opening inlet in a sag (weir) (cfs):									

ONDRAIN_English Version 7.5d, developed by Fernando Manzanera, Caltrans District 1, Hydraulics Capital Support (December 2010).

Notes: -This program utilizes the equations presented in the FHA Hydraulic Engineering Circular 22 (HEC-22), FHWA-NHI-10-009.

- Underlined values are calculated by the program, the others are input by the user.

Separate Run

HYDRAULIC CALCULATOR FOR ONSITE DRAINAGE (English Units)

Date: 08/03/21

RCTC I-15 ELPSE

Note: "Subarea discharge Qsa (cfs)" was obtained from "Design Discharge" column of Hydrological Tables found within the hydrology maps in Appendix B.2, and inputted as "Additional discharge (cfs)" below.

	Starting Point	N-1621	N-1623	N-1624	N-1625	N-1627	N-1630	N-1632	N-1636
Location station (ft):	1619+54.0	1621+50.0	1623+00.0	1624+00.0	1625+29.0	1627+75.0	1630+00.0	1632+00.0	1636+30.0
Longitudinal profile ("on-grade" or "sag"):		on-grade	on-grade	on-grade	on-grade	on-grade	on-grade	on-grade	on-grade
Calculation Type ("grate", "side opening", or "shoulder hydraulics only"):		side opening	grate	grate	grate	grate	grate	grate	grate
Longitudinal slope, S:		2.40%	2.40%	2.40%	2.40%	2.40%	2.40%	2.40%	2.20%
Shoulder cross-slope, Sx:		1.40%	2.50%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%
Average watershed paved width (ft):		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Shoulder Manning's n:		0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016
Inlet description (optional):									
Clogging factor for on-grade grates:		33%	33%	33%	33%	33%	33%	33%	33%
Grate width (ft):		4.00	2.00	2.00	2.00	2.00	4.00	4.00	4.00
Grate length (ft):		3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00
Precipitation intensity (in/hr):		3.47	3.47	3.47	3.47	3.47	3.47	3.47	3.47
Runoff Coefficient for paved areas, "C_p":		0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Runoff Coefficient for unpaved areas, "C_u":		0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63
Unpaved area contributing to this inlet (acres):		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Watershed paved length (ft):		196.0	150.0	100.0	129.0	246.0	225.0	200.0	430.0
Paved area contributing to this inlet (acres):		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Subarea discharge Q_{sa} (cfs):		0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Additional discharge (cfs):		1.030	2.920	0.810	0.800	1.680	1.680	1.140	2.400
Total discharge Q_t, including any upstream by-pass (cfs):		**1.030**	**2.920**	**2.060**	**1.465**	**2.070**	**2.350**	**1.312**	**2.426**
By-pass Q (cfs): *Describe here source of bypass:*	0.000	**0.00**	**1.25**	**0.66**	**0.39**	**0.67**	**0.17**	**0.03**	**0.20**
DEPRESSION CALCULATION:									
Width of depression "w" (ft):									
Depression depth "a" (from flowline w/o depression) (in):									
Depression cross-slope (Sw=Sx+a/12w):									
Fraction of flow over the depression (Eo):									
Discharge-weighted equivalent cross-slope (Se):									
Q_s (first guess: **Qt - 0.001**, after iteration should be same as next line)		0.005			0.013	0.024	0.000	0.005	0.000
Q_s over shoulder (excluding flow over the depression) (cfs):									
Q=Q_w+Q_s (cfs) (after iterations must match **Q_t** value):									
HYDRAULIC RESULTS:									
Flooded Width T for Q_t, upstream of inlet (ft):		**7.73**	**7.95**	**6.23**	**5.48**	**6.24**	**6.54**	**5.26**	**6.73**
Flooded Width T at depression (if any) (ft):		**7.73**	**7.95**	**6.23**	**5.48**	**6.24**	**6.54**	**5.26**	**6.73**
Flooded Width T for BYPASS Q downstream of inlet (ft):	0.00	**0.00**	**5.78**	**4.07**	**3.33**	**4.09**	**2.45**	**1.20**	**2.63**
Water depth at curb (with or without depression) (in):		1.30	2.39	2.24	1.97	2.25	2.35	1.89	2.42
Water cross-area at shoulder (without depression) (sq.ft.):		0.42	0.79	0.58	0.45	0.58	0.64	0.41	0.68
Water velocity immediately u/s from inlet (w/o depression) (fps):		2.46	3.69	3.54	3.25	3.55	3.66	3.17	3.57
Average water velocity for the segment to this inlet (fps):		0.92	1.38	1.72	1.48	1.50	1.60	1.31	1.36
Flowtime from the previous inlet to this one (min):		3.56	1.81	0.97	1.45	2.73	2.34	2.54	5.26
GRATE INLETS ON-GRADE:									
Splash-over V for effective length of grate (type P-1 3/8) (fps):			6.81	6.81	6.81	6.81	6.81	6.81	6.81
Effective length of grate considering clogging factor (ft):			2.01	2.01	2.01	2.01	2.01	2.01	2.01
Ratio of grate frontal flow to total flow:			0.538	0.644	0.702	0.643	0.920	0.978	0.910
Fraction of frontal flow intercepted (Rf):			100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Fraction of side flow interception (Rs):			7.3%	9.3%	10.6%	9.3%	8.8%	11.1%	9.1%
Total flow intercepted (cfs):			1.670	1.395	1.075	1.400	2.178	1.286	2.227
Grate Efficiency (E):			57.2%	67.7%	73.4%	67.6%	92.7%	98.0%	91.8%
Grate flow-through flow (cfs):			**1.250**	**0.665**	**0.390**	**0.670**	**0.172**	**0.026**	**0.198**
SLOTTED DRAINS & SIDE-OPENING INLETS ON-GRADE:									
Length required for total interception (ft):		30.72							
Length of inlet provided L (ft):		45.00							
Efficiency for length L:		100.0%							
Interception for length L (cfs):		1.03							
Side opening flow-through flow (cfs):		**0.00**							
INTERCEPTION CAPACITY OF INLETS IN SAG LOCATION:									
Maximum allowable flooded width (including the depression) (ft):									
Max. head at sag w/o exceeding allowable flooded width (ft):									
Capacity of grate in a sag (3-sided weir) (cfs):									
Length provided of curb-opening inlet at sag (ft):									
Capacity of curb-opening inlet in a sag (weir) (cfs):									

ONDRAIN_English Version 7.5d, developed by Fernando Manzanera, Caltrans District 1, Hydraulics Capital Support (December 2010).

Notes: -This program utilizes the equations presented in the FHA Hydraulic Engineering Circular 22 (HEC-22), FHWA-NHI-10-009.

- Underlined values are calculated by the program, the others are input by the user.

HYDRAULIC CALCULATOR FOR ONSITE DRAINAGE (English Units)

Date: 08/03/21

RCTC I-15 ELPSE

Note: "Subarea discharge Qsa (cfs)" was obtained from "Design Discharge" column of Hydrological Tables found within the hydrology maps in Appendix B.2, and inputted as "Additional discharge (cfs)" below.

	Starting Point	N-1637A	N-1637B	SLOTTED	SLOTTED	SLOTTED	SLOTTED	N-1638	
Location station (ft):	1636+30.0	1637+00.0	1637+60.0	1638+00.0	1638+25.0	1638+50.0	1638+55.0	1638+60.0	
Longitudinal profile ("on-grade" or "sag"):		on-grade	on-grade	on-grade	on-grade	on-grade	on-grade	on-grade	
Calculation Type ("grate", "side opening", or "shoulder hydraulics only"):		grate	grate	side opening	side opening	side opening	side opening	grate	
Longitudinal slope, S:		1.80%	1.80%	1.60%	1.60%	1.60%	1.60%	1.60%	
Shoulder cross-slope, Sx:		3.00%	2.00%	1.30%	0.50%	0.50%	0.32%	0.32%	
Average watershed paved width (ft):		0.00	0.00	64.25	43.56	43.56	121.97	121.97	
Shoulder Manning's n:		0.016	0.016	0.016	0.016	0.016	0.016	0.016	
Inlet description (optional):									
Clogging factor for on-grade grates:		33%	33%					33%	
Grate width (ft):		4.00	4.00					2.00	
Grate length (ft):		3.00	3.00					3.00	
Precipitation intensity (in/hr):		3.47	3.47	3.47	3.47	3.47	3.47	3.47	
Runoff Coefficient for paved areas, "C_p":		0.99	0.99	0.99	0.99	0.99	0.99	0.99	
Runoff Coefficient for unpaved areas, "C_u":		0.63	0.63	0.63	0.63	0.63	0.63	0.63	
Unpaved area contributing to this inlet (acres):		0.000	0.000	0.000	0.000	0.000	0.000	0.000	
Watershed paved length (ft):		70.0	60.0	40.0	25.0	25.0	5.0	5.0	
Paved area contributing to this inlet (acres):		0.000	0.000	0.059	0.025	0.025	0.014	0.014	
Subarea discharge Q_{sa} (cfs):		0.00	0.000	0.203	0.086	0.086	0.048	0.048	
Additional discharge (cfs):		1.690	0.460						
Total discharge Q_t, including any upstream by-pass (cfs):		**1.890**	**0.579**	**0.214**	**0.086**	**0.086**	**0.048**	**0.075**	
By-pass Q (cfs): *Describe here source of bypass:*	**0.200**	**0.12**	**0.01**	**0.00**	**0.00**	**0.00**	**0.03**	**0.03**	
DEPRESSION CALCULATION:									
Width of depression "w" (ft):									
Depression depth "a" (from flowline w/o depression) (in):									
Depression cross-slope (Sw=Sx+a/12w):									
Fraction of flow over the depression (Eo):									
Discharge-weighted equivalent cross-slope (Se):									
Q_s (first guess: **Qt - 0.001**, after iteration should be same as next line)		0.005			0.013	0.024	0.000	0.005	
Q_s over shoulder (excluding flow over the depression) (cfs):									
Q=Q_w+Q_s (cfs) (after iterations must match **Q_t** value):									
HYDRAULIC RESULTS:									
Flooded Width T for Q_t, upstream of inlet (ft):		**6.36**	**5.26**	**4.84**	**6.25**	**6.25**	**6.65**	**7.86**	
Flooded Width T at depression (if any) (ft):		**6.36**	**5.26**	**4.84**	**6.25**	**6.25**	**6.65**	**7.86**	
Flooded Width T for BYPASS Q downstream of inlet (ft):	**0.00**	**2.26**	**1.19**	**0.00**	**0.00**	**0.00**	**5.35**	**5.52**	
Water depth at curb (with or without depression) (in):		2.29	1.26	0.76	0.38	0.38	0.26	0.30	
Water cross-area at shoulder (without depression) (sq.ft.):		0.61	0.28	0.15	0.10	0.10	0.07	0.10	
Water velocity immediately u/s from inlet (w/o depression) (fps):		3.11	2.09	1.40	0.88	0.88	0.68	0.76	
Average water velocity for the segment to this inlet (fps):		1.16	0.86	0.54	0.33	0.33	0.25	0.34	
Flowtime from the previous inlet to this one (min):		1.00	1.17	1.23	1.28	1.28	0.33	0.25	
GRATE INLETS ON-GRADE:									
Splash-over V for effective length of grate (type P-1 3/8) (fps):		6.81	6.81					6.81	
Effective length of grate considering clogging factor (ft):		2.01	2.01					2.01	
Ratio of grate frontal flow to total flow:		0.93	0.978					0.543	
Fraction of frontal flow intercepted (Rf):		100.0%	100.0%					100.0%	
Fraction of side flow interception (Rs):		11.4%	14.9%					14.8%	
Total flow intercepted (cfs):		1.77	0.568					0.046	
Grate Efficiency (E):		93.7%	98.1%					61.1%	
Grate flow-through flow (cfs):		**0.12**	**0.011**					**0.029**	
SLOTTED DRAINS & SIDE-OPENING INLETS ON-GRADE:									
Length required for total interception (ft):				14.69	17.77	17.77	18.21		
Length of inlet provided L (ft):		12.00	34.00	22.00	25.00	25.00	5.00	5.00	
Efficiency for length L:				100.0%	100.0%	100.0%	43.9%		
Interception for length L (cfs):				0.214	0.086	0.086	0.021		
Side opening flow-through flow (cfs):				**0.000**	**0.000**	**0.000**	**0.027**		
INTERCEPTION CAPACITY OF INLETS IN SAG LOCATION:									
Maximum allowable flooded width (including the depression) (ft):									
Max. head at sag w/o exceeding allowable flooded width (ft):									
Capacity of grate in a sag (3-sided weir) (cfs):									
Length provided of curb-opening inlet at sag (ft):									
Capacity of curb-opening inlet in a sag (weir) (cfs):									

ONDRAIN_English Version 7.5d, developed by Fernando Manzanera, Caltrans District 1, Hydraulics Capital Support (December 2010).

Notes: -This program utilizes the equations presented in the FHA Hydraulic Engineering Circular 22 (HEC-22), FHWA-NHI-10-009.

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Separate Run

HYDRAULIC CALCULATOR FOR ONSITE DRAINAGE (English Units)

Date: 08/03/21

RCTC I-15 ELPSE

Note: "Subarea discharge Qsa (cfs)" was obtained from "Design Discharge" column of Hydrological Tables found within the hydrology maps in Appendix B.2, and inputted as "Additional discharge (cfs)" below.

	Starting Point	N-1657	N-1660	N-1662	N-1663	N-1664	N-1666	N-1667	N-1668
Location station (ft):	1654+60.0	1657+75.0	1660+16.6	1662+00.0	1663+00.0	1664+00.0	1666+00.0	1667+00.0	1668+00.0
Longitudinal profile ("on-grade" or "sag"):		on-grade	on-grade	on-grade	on-grade	on-grade	on-grade	on-grade	on-grade
Calculation Type ("grate", "side opening", or "shoulder hydraulics only"):		grate	grate	grate	grate	grate	grate	grate	grate
Longitudinal slope, S:		0.70%	0.70%	0.70%	0.70%	0.70%	0.70%	0.70%	0.70%
Shoulder cross-slope, Sx:		3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%
Average watershed paved width (ft):		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Shoulder Manning's n:		0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016
Inlet description (optional):									
Clogging factor for on-grade grates:		33%	33%	33%	33%	33%	33%	33%	33%
Grate width (ft):		4.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Grate length (ft):		3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00
Precipitation intensity (in/hr):		3.47	3.47	3.47	3.47	3.47	3.47	3.47	3.47
Runoff Coefficient for paved areas, "C_p":		0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Runoff Coefficient for unpaved areas, "C_u":		0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63
Unpaved area contributing to this inlet (acres):		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Watershed paved length (ft):		315.0	241.6	183.4	100.0	100.0	200.0	100.0	100.0
Paved area contributing to this inlet (acres):		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Subarea discharge Q_{sa} (cfs):		0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Additional discharge (cfs):		2.160	1.550	1.250	0.630	0.650	1.330	0.650	0.620
Total discharge Q_t, including any upstream by-pass (cfs):		**2.160**	**1.825**	**1.889**	**1.302**	**1.036**	**1.600**	**1.177**	**0.950**
By-pass Q (cfs): *Describe here source of bypass:*	0.000	**0.28**	**0.64**	**0.67**	**0.39**	**0.27**	**0.53**	**0.33**	**0.23**
DEPRESSION CALCULATION:									
Width of depression "w" (ft):									
Depression depth "a" (from flowline w/o depression) (in):									
Depression cross-slope (Sw=Sx+a/12w):									
Fraction of flow over the depression (Eo):									
Discharge-weighted equivalent cross-slope (Se):									
Q_s (first guess: **Qt - 0.001**, after iteration should be same as next line)		0.005			0.013	0.024	0.000	0.005	0.000
Q_s over shoulder (excluding flow over the depression) (cfs):									
Q=Q_w+Q_s (cfs) (after iterations must match **Q_t** value):									
HYDRAULIC RESULTS:									
Flooded Width T for Q_t, upstream of inlet (ft):		**7.98**	**7.50**	**7.59**	**6.60**	**6.06**	**7.13**	**6.36**	**5.87**
Flooded Width T at depression (if any) (ft):		**7.98**	**7.50**	**7.59**	**6.60**	**6.06**	**7.13**	**6.36**	**5.87**
Flooded Width T for BYPASS Q downstream of inlet (ft):	0.00	**3.69**	**5.06**	**5.15**	**4.19**	**3.66**	**4.70**	**3.95**	**3.47**
Water depth at curb (with or without depression) (in):		2.87	2.70	2.73	2.38	2.18	2.57	2.29	2.11
Water cross-area at shoulder (without depression) (sq.ft.):		0.96	0.84	0.86	0.65	0.55	0.76	0.61	0.52
Water velocity immediately u/s from inlet (w/o depression) (fps):		2.26	2.17	2.18	1.99	1.88	2.10	1.94	1.84
Average water velocity for the segment to this inlet (fps):		0.84	0.91	0.97	0.92	0.84	0.88	0.88	0.82
Flowtime from the previous inlet to this one (min):		6.23	4.45	3.15	1.81	1.98	3.78	1.89	2.04
GRATE INLETS ON-GRADE:									
Splash-over V for effective length of grate (type P-1 3/8) (fps):		6.81	6.81	6.81	6.81	6.81	6.81	6.81	6.81
Effective length of grate considering clogging factor (ft):		2.01	2.01	2.01	2.01	2.01	2.01	2.01	2.01
Ratio of grate frontal flow to total flow:		0.84	0.563	0.557	0.618	0.656	0.584	0.635	0.671
Fraction of frontal flow intercepted (Rf):		100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Fraction of side flow interception (Rs):		18.7%	19.9%	19.6%	22.4%	24.2%	20.8%	23.2%	25.0%
Total flow intercepted (cfs):		1.88	1.186	1.217	0.916	0.766	1.073	0.847	0.715
Grate Efficiency (E):		87.3%	65.0%	64.4%	70.3%	74.0%	67.1%	71.9%	75.3%
Grate flow-through flow (cfs):		**0.28**	**0.639**	**0.672**	**0.386**	**0.270**	**0.527**	**0.330**	**0.235**
SLOTTED DRAINS & SIDE-OPENING INLETS ON-GRADE:									
Length required for total interception (ft):									
Length of inlet provided L (ft):		12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
Efficiency for length L:									
Interception for length L (cfs):									
Side opening flow-through flow (cfs):									
INTERCEPTION CAPACITY OF INLETS IN SAG LOCATION:									
Maximum allowable flooded width (including the depression) (ft):									
Max. head at sag w/o exceeding allowable flooded width (ft):									
Capacity of grate in a sag (3-sided weir) (cfs):									
Length provided of curb-opening inlet at sag (ft):									
Capacity of curb-opening inlet in a sag (weir) (cfs):									

ONDRAIN_English Version 7.5d, developed by Fernando Manzanera, Caltrans District 1, Hydraulics Capital Support (December 2010).

Notes: -This program utilizes the equations presented in the FHA Hydraulic Engineering Circular 22 (HEC-22), FHWA-NHI-10-009.

- Underlined values are calculated by the program, the others are input by the user.

North 1600's

HYDRAULIC CALCULATOR FOR ONSITE DRAINAGE (English Units)

Date: 08/03/21

RCTC I-15 ELPSE

Note: "Subarea discharge Qsa (cfs)" was obtained from "Design Discharge" column of Hydrological Tables found within the hydrology maps in Appendix B.2, and inputted as "Additional discharge (cfs)" below.

	Starting Point	N-1669A	N-1669B	N-1670A	SLOTTED	SLOTTED	N-1670B		
Location station (ft):	**1668+00.0**	**1669+00.0**	**1669+60.0**	**1670+25.0**	**1670+50.0**	**1670+75.0**	**1670+90.0**		
Longitudinal profile ("on-grade" or "sag"):		on-grade	on-grade	on-grade	on-grade	on-grade	on-grade		
Calculation Type ("grate", "side opening", or "shoulder hydraulics only"):		grate	grate	grate	side opening	side opening	grate		
Longitudinal slope, S:		0.70%	0.70%	0.70%	0.70%	0.70%	0.70%		
Shoulder cross-slope, Sx:		2.30%	1.80%	1.20%	0.90%	0.70%	0.50%		
Average watershed paved width (ft):		0.00%	0.00%	0.00%	76.67	80.15	84.22		
Shoulder Manning's n:		0.016	0.016	0.016	0.016	0.016	0.016		
Inlet description (optional):									
Clogging factor for on-grade grates:		33%	33%	33%			33%		
Grate width (ft):		2.00	4.00	2.00			4.00		
Grate length (ft):		3.00	3.00	3.00			3.00		
Precipitation intensity (in/hr):		3.47	3.47	3.47	3.47	3.47	3.47		
Runoff Coefficient for paved areas, "C_p":		0.99	0.99	0.99	0.99	0.99	0.99		
Runoff Coefficient for unpaved areas, "C_u":		0.63	0.63	0.63	0.63	0.63	0.63		
Unpaved area contributing to this inlet (acres):		0.000	0.000	0.000	0.000	0.000	0.000		
Watershed paved length (ft):		100.0	60.0	65.0	25.0	25.0	15.0		
Paved area contributing to this inlet (acres):		0.000	0.000	0.000	0.044	0.046	0.029		
Subarea discharge Q_{sa} (cfs):		0.00	0.000	0.000	0.151	0.158	0.100		
Additional discharge (cfs):		0.630	0.420	0.260					
Total discharge Q_t, including any upstream by-pass (cfs):		**0.870**	**0.680**	**0.318**	**0.247**	**0.158**	**0.100**		
By-pass Q (cfs): *Describe here source of bypass:*	**0.240**	**0.26**	**0.06**	**0.10**	**0.00**	**0.00**	**0.01**		
DEPRESSION CALCULATION:									
Width of depression "w" (ft):									
Depression depth "a" (from flowline w/o depression) (in):									
Depression cross-slope (Sw=Sx+a/12w):									
Fraction of flow over the depression (Eo):									
Discharge-weighted equivalent cross-slope (Se):									
Q_s (first guess: **Qt - 0.001**, after iteration should be same as next line)		0.005			0.013	0.024	0.000		
Q_s over shoulder (excluding flow over the depression) (cfs):									
Q=Q_w+Q_s (cfs) (after iterations must match **Q_t** value):									
HYDRAULIC RESULTS:									
Flooded Width T for Q_t, upstream of inlet (ft):		**6.70**	**7.12**	**6.91**	**7.52**	**7.44**	**7.72**		
Flooded Width T at depression (if any) (ft):		**6.70**	**7.12**	**6.91**	**7.52**	**7.44**	**7.72**		
Flooded Width T for BYPASS Q downstream of inlet (ft):	**0.00**	**4.26**	**2.84**	**4.41**	**0.00**	**0.00**	**3.33**		
Water depth at curb (with or without depression) (in):		1.85	1.54	0.99	0.81	0.62	0.46		
Water cross-area at shoulder (without depression) (sq.ft.):		0.52	0.46	0.29	0.25	0.19	0.15		
Water velocity immediately u/s from inlet (w/o depression) (fps):		1.68	1.49	1.11	0.97	0.82	0.67		
Average water velocity for the segment to this inlet (fps):		0.63	0.64	0.45	0.42	0.30	0.25		
Flowtime from the previous inlet to this one (min):		2.66	1.55	2.40	1.00	1.37	1.01		
GRATE INLETS ON-GRADE:									
Splash-over V for effective length of grate (type P-1 3/8) (fps):		6.81	6.81	6.81			6.81		
Effective length of grate considering clogging factor (ft):		2.01	2.01	2.01			2.01		
Ratio of grate frontal flow to total flow:		0.61	0.889	0.598			0.857		
Fraction of frontal flow intercepted (Rf):		100.0%	100.0%	100.0%			100.0%		
Fraction of side flow interception (Rs):		23.0%	22.6%	24.7%			25.5%		
Total flow intercepted (cfs):		0.61	0.622	0.222			0.089		
Grate Efficiency (E):		70.1%	91.4%	69.8%			89.4%		
Grate flow-through flow (cfs):		**0.26**	**0.058**	**0.096**			**0.011**		
SLOTTED DRAINS & SIDE-OPENING INLETS ON-GRADE:									
Length required for total interception (ft):					15.20	14.64			
Length of inlet provided L (ft):		12.00	12.00	12.00	22.00	15.00	15.00		
Efficiency for length L:					100.0%	100.0%			
Interception for length L (cfs):					0.247	0.158			
Side opening flow-through flow (cfs):					**0.000**	**0.000**			
INTERCEPTION CAPACITY OF INLETS IN SAG LOCATION:									
Maximum allowable flooded width (including the depression) (ft):									
Max. head at sag w/o exceeding allowable flooded width (ft):									
Capacity of grate in a sag (3-sided weir) (cfs):									
Length provided of curb-opening inlet at sag (ft):									
Capacity of curb-opening inlet in a sag (weir) (cfs):									

ONDRAIN_English Version 7.5d, developed by Fernando Manzanera, Caltrans District 1, Hydraulics Capital Support (December 2010).

Notes: -This program utilizes the equations presented in the FHA Hydraulic Engineering Circular 22 (HEC-22), FHWA-NHI-10-009.

- Underlined values are calculated by the program, the others are input by the user.

Separate Run

HYDRAULIC CALCULATOR FOR ONSITE DRAINAGE (English Units)

Date: 08/03/21

RCTC I-15 ELPSE

Note: "Subarea discharge Qsa (cfs)" was obtained from "Design Discharge" column of Hydrological Tables found within the hydrology maps in Appendix B.2, and inputted as "Additional discharge (cfs)" below.

	Starting Point	N-1711	N-1709	N-1705B	N-1705A	N-1704	N-1703	SLOTTED	N-1702B
Location station (ft):	1712+17.0	1711+00.0	1709+00.0	1705+86.0	1705+26.0	1704+00.0	1703+40.0	1703+15.0	1702+50.0
Longitudinal profile ("on-grade" or "sag"):		on-grade	on-grade	on-grade	on-grade	on-grade	on-grade	on-grade	on-grade
Calculation Type ("grate", "side opening", or "shoulder hydraulics only"):		grate	grate	grate	grate	grate	grate	side opening	grate
Longitudinal slope, S:		0.20%	0.50%	0.90%	0.60%	1.40%	1.60%	1.60%	1.60%
Shoulder cross-slope, Sx:		3.00%	3.00%	3.00%	2.70%	1.80%	1.20%	1.00%	0.60%
Average watershed paved width (ft):		0.00	0.00	0.00	0.00	0.00	0.00	121.97	34.85
Shoulder Manning's n:		0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016
Inlet description (optional):									
Clogging factor for on-grade grates:		33%	33%	33%	33%	33%	33%		33%
Grate width (ft):		2.00	2.00	2.00	2.00	2.00	2.00		6.00
Grate length (ft):		3.00	3.00	3.00	3.00	3.00	3.00		3.00
Precipitation intensity (in/hr):		3.47	3.47	3.47	3.47	3.47	3.47	3.47	3.47
Runoff Coefficient for paved areas, "C_p":		0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Runoff Coefficient for unpaved areas, "C_u":		0.33	0.33	0.33	0.33	0.33	0.33	0.60	0.60
Unpaved area contributing to this inlet (acres):		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Watershed paved length (ft):		117.0	200.0	314.0	60.0	126.0	60.0	25.0	65.0
Paved area contributing to this inlet (acres):		0.000	0.000	0.000	0.000	0.000	0.000	0.070	0.052
Subarea discharge Q_{sa} (cfs):		0.00	0.000	0.000	0.000	0.000	0.000	0.240	0.179
Additional discharge (cfs):		0.930	1.310	1.900	0.340	0.350	0.450		
Total discharge Q_t, including any upstream by-pass (cfs):		**0.930**	**1.534**	**2.401**	**1.273**	**0.759**	**0.693**	**0.522**	**0.179**
By-pass Q *Describe here source of bypass:*	**0.000**	**0.22**	**0.50**	**0.93**	**0.41**	**0.24**	**0.28**	**0.00**	**0.00**
DEPRESSION CALCULATION:									
Width of depression "w" (ft):									
Depression depth "a" (from flowline w/o depression) (in):									
Depression cross-slope (Sw=Sx+a/12w):									
Fraction of flow over the depression (Eo):									
Discharge-weighted equivalent cross-slope (Se):									
Q_s (first guess: **Qt - 0.001**, after iteration should be same as next line)		0.005			0.013	0.024	0.000	0.005	0.000
Q_s over shoulder (excluding flow over the depression) (cfs):									
Q=Q_w+Q_s (cfs) (after iterations must match **Q_t** value):									
HYDRAULIC RESULTS:									
Flooded Width T for Q_t, upstream of inlet (ft):		**7.36**	**7.48**	**7.92**	**7.20**	**6.52**	**7.92**	**7.98**	**7.34**
Flooded Width T at depression (if any) (ft):		**7.36**	**7.48**	**7.92**	**7.20**	**6.52**	**7.92**	**7.98**	**7.34**
Flooded Width T for BYPASS Q downstream of inlet (ft):	**0.00**	**4.32**	**4.92**	**5.56**	**4.70**	**4.26**	**5.65**	**0.08**	**1.27**
Water depth at curb (with or without depression) (in):		2.65	2.69	2.85	2.33	1.41	1.14	0.96	0.53
Water cross-area at shoulder (without depression) (sq.ft.):		0.81	0.84	0.94	0.70	0.38	0.38	0.32	0.16
Water velocity immediately u/s from inlet (w/o depression) (fps):		1.14	1.83	2.55	1.82	1.99	1.84	1.64	1.10
Average water velocity for the segment to this inlet (fps):		0.43	0.79	1.11	0.84	0.90	0.78	0.74	0.41
Flowtime from the previous inlet to this one (min):		4.57	4.24	4.70	1.19	2.34	1.28	0.57	2.64
GRATE INLETS ON-GRADE:									
Splash-over V for effective length of grate (type P-1 3/8) (fps):		6.81	6.81	6.81	6.81	6.81	6.81		6.81
Effective length of grate considering clogging factor (ft):		2.01	2.01	2.01	2.01	2.01	2.01		2.01
Ratio of grate frontal flow to total flow:		0.57	0.564	0.540	0.580	0.624	0.540		0.989
Fraction of frontal flow intercepted (Rf):		100.0%	100.0%	100.0%	100.0%	100.0%	100.0%		100.0%
Fraction of side flow interception (Rs):		43.9%	25.2%	15.6%	23.4%	14.8%	11.7%		14.3%
Total flow intercepted (cfs):		0.71	1.033	1.468	0.863	0.516	0.412		0.177
Grate Efficiency (E):		75.9%	67.4%	61.1%	67.8%	67.9%	59.4%		99.1%
Grate flow-through flow (cfs):		**0.22**	**0.501**	**0.933**	**0.409**	**0.243**	**0.282**		**0.002**
SLOTTED DRAINS & SIDE-OPENING INLETS ON-GRADE:									
Length required for total interception (ft):								25.03	
Length of inlet provided L (ft):								25.00	65.00
Efficiency for length L:								100.0%	
Interception for length L (cfs):								0.522	
Side opening flow-through flow (cfs):								**0.000**	
INTERCEPTION CAPACITY OF INLETS IN SAG LOCATION:									
Maximum allowable flooded width (including the depression) (ft):									
Max. head at sag w/o exceeding allowable flooded width (ft):									
Capacity of grate in a sag (3-sided weir) (cfs):									
Length provided of curb-opening inlet at sag (ft):									
Capacity of curb-opening inlet in a sag (weir) (cfs):									

ONDRAIN_English Version 7.5d, developed by Fernando Manzanera, Caltrans District 1, Hydraulics Capital Support (December 2010).

Notes: -This program utilizes the equations presented in the FHA Hydraulic Engineering Circular 22 (HEC-22), FHWA-NHI-10-009.

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North 1700's

HYDRAULIC CALCULATOR FOR ONSITE DRAINAGE (English Units)

Date: 08/03/21

RCTC I-15 ELPSE

Note: "Subarea discharge Qsa (cfs)" was obtained from "Design Discharge" column of Hydrological Tables found within the hydrology maps in Appendix B.2, and inputted as "Additional discharge (cfs)" below.

	Starting Point	SLOTTED	SLOTTED	SLOTTED	N-1702A				
Location station (ft):	1702+50.0	1702+30.0	1702+20.0	1702+10.0	1702+00.0				
Longitudinal profile ("on-grade" or "sag"):		on-grade	on-grade	on-grade	on-grade				
Calculation Type ("grate", "side opening", or "shoulder hydraulics only"):		side opening	side opening	side opening	grate				
Longitudinal slope, S:		1.60%	1.60%	1.60%	1.60%				
Shoulder cross-slope, Sx:		0.40%	0.40%	0.40%	0.40%				
Average watershed paved width (ft):		56.63	56.63	121.97	47.92				
Shoulder Manning's n:		0.016	0.016	0.016	0.016				
Inlet description (optional):									
Clogging factor for on-grade grates:					33%				
Grate width (ft):					2.00				
Grate length (ft):					3.00				
Precipitation intensity (in/hr):		3.47	3.47	3.47	3.47				
Runoff Coefficient for paved areas, "C_p":		0.99	0.99	0.99	0.99				
Runoff Coefficient for unpaved areas, "C_u":		0.60	0.60	0.60	0.60				
Unpaved area contributing to this inlet (acres):		0.000	0.000	0.000	0.000				
Watershed paved length (ft):		20.0	10.0	10.0	10.0				
Paved area contributing to this inlet (acres):		0.026	0.013	0.028	0.011				
Subarea discharge Q_{sa} (cfs):		0.09	0.045	0.096	0.038				
Additional discharge (cfs):									
Total discharge Q_t, including any upstream by-pass (cfs):		0.089	0.045	0.103	0.072				
By-pass Q *Describe here source of bypass:*	0.000	**0.00**	**0.01**	**0.03**	**0.02**				
DEPRESSION CALCULATION:									
Width of depression "w" (ft):									
Depression depth "a" (from flowline w/o depression) (in):									
Depression cross-slope (Sw=Sx+a/12w):									
Fraction of flow over the depression (Eo):									
Discharge-weighted equivalent cross-slope (Se):									
Q_s (first guess: **Qt - 0.001**, after iteration should be same as next line)		0.005			0.013				
Q_s over shoulder (excluding flow over the depression) (cfs):									
Q=Q_w+Q_s (cfs) (after iterations must match **Q_t** value):									
HYDRAULIC RESULTS:									
Flooded Width T for Q_t, upstream of inlet (ft):		**7.29**	**5.63**	**7.70**	**6.74**				
Flooded Width T at depression (if any) (ft):		**7.29**	**5.63**	**7.70**	**6.74**				
Flooded Width T for BYPASS Q downstream of inlet (ft):	0.00	**0.71**	**2.79**	**5.11**	**4.42**				
Water depth at curb (with or without depression) (in):		0.35	0.27	0.37	0.32				
Water cross-area at shoulder (without depression) (sq.ft.):		0.11	0.06	0.12	0.09				
Water velocity immediately u/s from inlet (w/o depression) (fps):		0.84	0.71	0.87	0.80				
Average water velocity for the segment to this inlet (fps):		0.31	0.26	0.35	0.36				
Flowtime from the previous inlet to this one (min):		1.07	0.63	0.48	0.46				
GRATE INLETS ON-GRADE:									
Splash-over V for effective length of grate (type P-1 3/8) (fps):					6.81				
Effective length of grate considering clogging factor (ft):					2.01				
Ratio of grate frontal flow to total flow:					0.609				
Fraction of frontal flow intercepted (Rf):					100.0%				
Fraction of side flow interception (Rs):					16.7%				
Total flow intercepted (cfs):					0.049				
Grate Efficiency (E):					67.4%				
Grate flow-through flow (cfs):					**0.024**				
SLOTTED DRAINS & SIDE-OPENING INLETS ON-GRADE:									
Length required for total interception (ft):		20.66	15.47	21.94					
Length of inlet provided L (ft):		20.00	10.00	10.00	10.00				
Efficiency for length L:		99.8%	84.6%	66.6%					
Interception for length L (cfs):		0.09	0.038	0.069					
Side opening flow-through flow (cfs):		**0.00**	**0.007**	**0.034**					
INTERCEPTION CAPACITY OF INLETS IN SAG LOCATION:									
Maximum allowable flooded width (including the depression) (ft):									
Max. head at sag w/o exceeding allowable flooded width (ft):									
Capacity of grate in a sag (3-sided weir) (cfs):									
Length provided of curb-opening inlet at sag (ft):									
Capacity of curb-opening inlet in a sag (weir) (cfs):									

ONDRAIN_English Version 7.5d, developed by Fernando Manzanera, Caltrans District 1, Hydraulics Capital Support (December 2010).

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North 1700's

Separate Run

HYDRAULIC CALCULATOR FOR ONSITE DRAINAGE (English Units)

Date: 08/11/21

RCTC I-15 ELPSE

	Starting Point	N-1714	N-1715	N-1717A	N-1718A	N-1718B	SLOTTED	N-1719	SLOTTED
Location station (ft):	1712+17.0	1714+00.0	1715+00.0	1717+00.0	1718+00.0	1718+65.0	1719+00.0	1719+22.0	1719+44.3
Longitudinal profile ("on-grade" or "sag"):		on-grade	on-grade	on-grade	on-grade	on-grade	on-grade	on-grade	on-grade
Calculation Type ("grate", "side opening", or "shoulder hydraulics only"):		grate	grate	grate	grate	grate	side opening	grate	side opening
Longitudinal slope, S:		0.80%	0.50%	0.60%	0.50%	1.40%	1.00%	1.00%	1.00%
Shoulder cross-slope, Sx:		3.00%	3.00%	3.00%	2.20%	1.60%	1.20%	0.70%	0.60%
Average watershed paved width (ft):		0.00	0.00	0.00	0.00	0.00	47.29	81.18	74.23
Shoulder Manning's n:		0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016
Inlet description (optional):									
Clogging factor for on-grade grates:		33%	33%	33%	33%	33%		33%	
Grate width (ft):		2.00	2.00	4.00	2.00	4.00		4.00	
Grate length (ft):		3.00	3.00	3.00	3.00	3.00		3.00	
Precipitation intensity (in/hr):		3.47	3.47	3.47	3.47	3.47	3.47	3.47	3.47
Runoff Coefficient for paved areas, "C_p":		0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Runoff Coefficient for unpaved areas, "C_u":		0.63	0.63	0.63	0.63	0.63	0.60	0.60	0.60
Unpaved area contributing to this inlet (acres):		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Watershed paved length (ft):		183.0	100.0	200.0	100.0	65.0	35.0	22.0	22.3
Paved area contributing to this inlet (acres):		0.000	0.000	0.000	0.000	0.000	0.038	0.041	0.038
Subarea discharge Q_{sa} (cfs):		0.00	0.000	0.000	0.000	0.000	0.131	0.141	0.131
Additional discharge (cfs):		0.990	0.690	1.210	0.660	0.350			
Total discharge Q_t, including any upstream by-pass (cfs):		**0.990**	**0.938**	**1.445**	**0.780**	**0.581**	**0.165**	**0.141**	**0.140**
By-pass *Describe here source of bypass:*	**0.000**	**0.25**	**0.23**	**0.12**	**0.23**	**0.03**	**0.00**	**0.01**	**0.00**
DEPRESSION CALCULATION:									
Width of depression "w" (ft):									
Depression depth "a" (from flowline w/o depression) (in):									
Depression cross-slope (Sw=Sx+a/12w):									
Fraction of flow over the depression (Eo):									
Discharge-weighted equivalent cross-slope (Se):									
Q_s (first guess: **Qt - 0.001**, after iteration should be same as next line)		0.005			0.013	0.024	0.000	0.005	0.000
Q_s over shoulder (excluding flow over the depression) (cfs):									
Q=Q_w+Q_s (cfs) (after iterations must match **Q_t** value):									
HYDRAULIC RESULTS:									
Flooded Width T for Q_t, upstream of inlet (ft):		**5.81**	**6.22**	**7.07**	**7.04**	**6.35**	**5.05**	**6.66**	**7.32**
Flooded Width T at depression (if any) (ft):		**5.81**	**6.22**	**7.07**	**7.04**	**6.35**	**5.05**	**6.66**	**7.32**
Flooded Width T for BYPASS Q downstream of inlet (ft):	**0.00**	**3.46**	**3.70**	**2.78**	**4.46**	**2.20**	**0.00**	**2.43**	**0.00**
Water depth at curb (with or without depression) (in):		2.09	2.24	2.54	1.86	1.22	0.73	0.56	0.53
Water cross-area at shoulder (without depression) (sq.ft.):		0.51	0.58	0.75	0.55	0.32	0.15	0.16	0.16
Water velocity immediately u/s from inlet (w/o depression) (fps):		1.95	1.62	1.93	1.43	1.80	1.08	0.91	0.87
Average water velocity for the segment to this inlet (fps):		0.73	0.69	0.81	0.58	0.81	0.44	0.34	0.34
Flowtime from the previous inlet to this one (min):		4.19	2.41	4.09	2.89	1.34	1.32	1.09	1.08
GRATE INLETS ON-GRADE:									
Splash-over V for effective length of grate (type P-1 3/8) (fps):		6.81	6.81	6.81	6.81	6.81		6.81	
Effective length of grate considering clogging factor (ft):		2.01	2.01	2.01	2.01	2.01		2.01	
Ratio of grate frontal flow to total flow:		0.68	0.645	0.892	0.590	0.930		0.913	
Fraction of frontal flow intercepted (Rf):		100.0%	100.0%	100.0%	100.0%	100.0%		100.0%	
Fraction of side flow interception (Rs):		23.0%	29.6%	23.4%	27.8%	15.5%		21.7%	
Total flow intercepted (cfs):		0.74	0.703	1.325	0.548	0.546		0.131	
Grate Efficiency (E):		75.0%	75.0%	91.7%	70.4%	94.0%		93.2%	
Grate flow-through flow (cfs):		**0.25**	**0.235**	**0.120**	**0.231**	**0.035**		**0.010**	
SLOTTED DRAINS & SIDE-OPENING INLETS ON-GRADE:									
Length required for total interception (ft):							12.01		16.99
Length of inlet provided L (ft):							18.00	22.00	22.00
Efficiency for length L:							100.0%		100.0%
Interception for length L (cfs):							0.165		0.140
Side opening flow-through flow (cfs):							**0.000**		**0.000**
INTERCEPTION CAPACITY OF INLETS IN SAG LOCATION:									
Maximum allowable flooded width (including the depression) (ft):									
Max. head at sag w/o exceeding allowable flooded width (ft):									
Capacity of grate in a sag (3-sided weir) (cfs):									
Length provided of curb-opening inlet at sag (ft):									
Capacity of curb-opening inlet in a sag (weir) (cfs):									

ONDRAIN_English Version 7.5d, developed by Fernando Manzanera, Caltrans District 1, Hydraulics Capital Support (December 2010).

Notes: -This program utilizes the equations presented in the FHA Hydraulic Engineering Circular 22 (HEC-22), FHWA-NHI-10-009.

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North 1700's

HYDRAULIC CALCULATOR FOR ONSITE DRAINAGE (English Units)

Date: 08/03/21

RCTC I-15 ELPSE

Note: "Subarea discharge Qsa (cfs)" was obtained from "Design Discharge" column of Hydrological Tables found within the hydrology maps in Appendix B.2, and inputted as "Additional discharge (cfs)" below.

	Starting Point	SLOTTED	N-1719B	SLOTTED	SLOTEED	SLOTTED	N-1720		
Location station (ft):	1719+44.3	1719+66.3	1719+76.3	1719+84.3	1719+96.3	1720+04.0	1720+28.0		
Longitudinal profile ("on-grade" or "sag"):		on-grade	on-grade	on-grade	on-grade	on-grade	on-grade		
Calculation Type ("grate", "side opening", or "shoulder hydraulics only"):		side opening	grate	side opening	side opening	side opening	grate		
Longitudinal slope, S:		1.00%	1.00%	1.00%	1.00%	1.00%	1.00%		
Shoulder cross-slope, Sx:		0.50%	0.50%	0.40%	0.40%	0.40%	0.40%		
Average watershed paved width (ft):		19.80	95.83	87.12	54.45	96.17	29.04		
Shoulder Manning's n:		0.016	0.016	0.016	0.016	0.016	0.016		
Inlet description (optional):									
Clogging factor for on-grade grates:			33%				33%		
Grate width (ft):			2.00				2.00		
Grate length (ft):			3.00				3.00		
Precipitation intensity (in/hr):		3.47	3.47	3.47	3.47	3.47	3.47		
Runoff Coefficient for paved areas, "C_p":		0.99	0.99	0.99	0.99	0.99	0.99		
Runoff Coefficient for unpaved areas, "C_u":		0.60	0.60	0.63	0.63	0.63	0.63		
Unpaved area contributing to this inlet (acres):		0.000	0.000	0.000	0.000	0.000	0.000		
Watershed paved length (ft):		22.0	10.0	8.0	12.0	7.7	24.0		
Paved area contributing to this inlet (acres):		0.010	0.022	0.016	0.015	0.017	0.016		
Subarea discharge Q_{sa} (cfs):		0.03	0.076	0.055	0.052	0.058	0.055		
Additional discharge (cfs):									
Total discharge Q_t, including any upstream by-pass (cfs):		0.034	0.076	0.077	0.076	0.066	0.075		
By-pass Q *Describe here source of bypass:*	0.000	**0.00**	**0.02**	**0.02**	**0.01**	**0.02**	**0.03**		
DEPRESSION CALCULATION:									
Width of depression "w" (ft):									
Depression depth "a" (from flowline w/o depression) (in):									
Depression cross-slope (Sw=Sx+a/12w):									
Fraction of flow over the depression (Eo):									
Discharge-weighted equivalent cross-slope (Se):									
Q_s (first guess: **Qt - 0.001**, after iteration should be same as next line)									
Q_s over shoulder (excluding flow over the depression) (cfs):									
Q=Q_w+Q_s (cfs) (after iterations must match **Q_t** value):									
HYDRAULIC RESULTS:									
Flooded Width T for Q_t, upstream of inlet (ft):		**4.84**	**6.51**	**7.53**	**7.48**	**7.12**	**7.45**		
Flooded Width T at depression (if any) (ft):		**4.84**	**6.51**	**7.53**	**7.48**	**7.12**	**7.45**		
Flooded Width T for BYPASS Q downstream of inlet (ft):	0.00	**0.00**	**4.08**	**4.87**	**3.19**	**4.54**	**4.98**		
Water depth at curb (with or without depression) (in):		0.29	0.39	0.36	0.36	0.34	0.36		
Water cross-area at shoulder (without depression) (sq.ft.):		0.06	0.11	0.11	0.11	0.10	0.11		
Water velocity immediately u/s from inlet (w/o depression) (fps):		0.59	0.71	0.68	0.67	0.65	0.67		
Average water velocity for the segment to this inlet (fps):		0.22	0.26	0.29	0.30	0.27	0.29		
Flowtime from the previous inlet to this one (min):		1.69	0.63	0.47	0.68	0.48	1.37		
GRATE INLETS ON-GRADE:									
Splash-over V for effective length of grate (type P-1 3/8) (fps):			6.81				6.81		
Effective length of grate considering clogging factor (ft):			2.01				2.01		
Ratio of grate frontal flow to total flow:			0.624				0.565		
Fraction of frontal flow intercepted (Rf):			100.0%				100.0%		
Fraction of side flow interception (Rs):			23.4%				21.3%		
Total flow intercepted (cfs):			0.054				0.049		
Grate Efficiency (E):			71.2%				65.8%		
Grate flow-through flow (cfs):			**0.022**				**0.026**		
SLOTTED DRAINS & SIDE-OPENING INLETS ON-GRADE:									
Length required for total interception (ft):		10.51		16.83	16.72	15.82			
Length of inlet provided L (ft):		22.00	10.00	8.00	12.00	7.70	24.00		
Efficiency for length L:		100.0%		68.7%	89.7%	69.9%			
Interception for length L (cfs):		0.03		0.053	0.068	0.046			
Side opening flow-through flow (cfs):		**0.00**		**0.024**	**0.008**	**0.020**			
INTERCEPTION CAPACITY OF INLETS IN SAG LOCATION:									
Maximum allowable flooded width (including the depression) (ft):									
Max. head at sag w/o exceeding allowable flooded width (ft):									
Capacity of grate in a sag (3-sided weir) (cfs):									
Length provided of curb-opening inlet at sag (ft):									
Capacity of curb-opening inlet in a sag (weir) (cfs):									

ONDRAIN_English Version 7.5d, developed by Fernando Manzanera, Caltrans District 1, Hydraulics Capital Support (December 2010).

Notes: -This program utilizes the equations presented in the FHA Hydraulic Engineering Circular 22 (HEC-22), FHWA-NHI-10-009.

- Underlined values are calculated by the program, the others are input by the user.

North 1700's

Separate Run

HYDRAULIC CALCULATOR FOR ONSITE DRAINAGE (English Units)

Date: 08/03/21

RCTC I-15 ELPSE

Note: "Subarea discharge Qsa (cfs)" was obtained from "Design Discharge" column of Hydrological Tables found within the hydrology maps in Appendix B.2, and inputted as "Additional discharge (cfs)" below.

	Starting Point	N-1779A	N-1780	N-1781A	N-1782	N-1784	N-1785A	N-1786	DELETED
Location station (ft):	1777+59.0	1779+10.0	1780+33.3	1781+10.0	1782+81.0	1784+59.7	1785+50.0	1786+30.0	1786+61.0
Longitudinal profile ("on-grade" or "sag"):		on-grade	on-grade	on-grade	on-grade	on-grade	on-grade	on-grade	on-grade
Calculation Type ("grate", "side opening", or "shoulder hydraulics only"):		grate	grate	grate	side opening	grate	grate	grate	side opening
Longitudinal slope, S:		1.20%	1.20%	1.20%	1.20%	1.20%	1.20%	1.20%	1.20%
Shoulder cross-slope, Sx:		1.70%	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%
Average watershed paved width (ft):		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Shoulder Manning's n:		0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016
Inlet description (optional):									
Clogging factor for on-grade grates:		33%	33%	33%	33%	33%	33%	33%	
Grate width (ft):		2.00	2.00	2.00	2.00	2.00	2.00	4.00	
Grate length (ft):		3.00	3.00	3.00	3.00	3.00	3.00	3.00	
Precipitation intensity (in/hr):		3.61	3.61	3.61	3.61	3.61	3.61	3.61	3.61
Runoff Coefficient for paved areas, "C_p":		0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Runoff Coefficient for unpaved areas, "C_u":		0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.60
Unpaved area contributing to this inlet (acres):		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Watershed paved length (ft):		151.0	123.3	76.8	171.0	178.7	90.3	80.0	31.0
Paved area contributing to this inlet (acres):		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Subarea discharge Q_{sa} (cfs):		0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Additional discharge (cfs):		0.490	0.470	0.320	1.260	1.000	0.570	0.410	0.000
Total discharge Q_t, including any upstream by-pass (cfs):		**0.490**	**0.602**	**0.477**	**1.367**	**1.000**	**0.913**	**0.710**	**0.035**
By-pass Q *Describe here source of bypass:*	**0.000**	**0.13**	**0.16**	**0.11**	**0.00**	**0.34**	**0.30**	**0.03**	**0.03**
DEPRESSION CALCULATION:									
Width of depression "w" (ft):									
Depression depth "a" (from flowline w/o depression) (in):									
Depression cross-slope (Sw=Sx+a/12w):									
Fraction of flow over the depression (Eo):									
Discharge-weighted equivalent cross-slope (Se):									
Q_s (first guess: **Qt - 0.001**, after iteration should be same as next line)		0.005			0.013	0.024	0.000	0.005	0.000
Q_s over shoulder (excluding flow over the depression) (cfs):									
Q=Q_w+Q_s (cfs) (after iterations must match **Q_t** value):									
HYDRAULIC RESULTS:									
Flooded Width T for Q_t, upstream of inlet (ft):		**5.90**	**5.76**	**5.28**	**7.83**	**6.97**	**6.73**	**6.13**	**1.98**
Flooded Width T at depression (if any) (ft):		**5.90**	**5.76**	**5.28**	**7.83**	**6.97**	**6.73**	**6.13**	**1.98**
Flooded Width T for BYPASS Q downstream of inlet (ft):	**0.00**	**3.61**	**3.48**	**3.01**	**0.00**	**4.67**	**4.44**	**1.98**	**1.98**
Water depth at curb (with or without depression) (in):		1.20	1.38	1.27	1.88	1.67	1.62	1.47	0.48
Water cross-area at shoulder (without depression) (sq.ft.):		0.30	0.33	0.28	0.61	0.49	0.45	0.38	0.04
Water velocity immediately u/s from inlet (w/o depression) (fps):		1.66	1.82	1.71	2.23	2.06	2.01	1.89	0.89
Average water velocity for the segment to this inlet (fps):		0.62	0.79	0.76	0.90	0.77	0.90	0.86	#DIV/0!
Flowtime from the previous inlet to this one (min):		4.08	2.59	1.69	3.17	3.88	1.67	1.56	#DIV/0!
GRATE INLETS ON-GRADE:									
Splash-over V for effective length of grate (type P-1 3/8) (fps):		6.81	6.81	6.81		6.81	6.81	6.81	
Effective length of grate considering clogging factor (ft):		2.01	2.01	2.01		2.01	2.01	2.01	
Ratio of grate frontal flow to total flow:		0.67	0.679	0.719		0.594	0.609	0.940	
Fraction of frontal flow intercepted (Rf):		100.0%	100.0%	100.0%		100.0%	100.0%	100.0%	
Fraction of side flow interception (Rs):		18.6%	18.5%	20.1%		15.3%	15.8%	17.4%	
Total flow intercepted (cfs):		0.36	0.445	0.370		0.657	0.613	0.675	
Grate Efficiency (E):		73.0%	73.9%	77.6%		65.7%	67.1%	95.1%	
Grate flow-through flow (cfs):		**0.13**	**0.157**	**0.107**		**0.343**	**0.300**	**0.035**	
SLOTTED DRAINS & SIDE-OPENING INLETS ON-GRADE:									
Length required for total interception (ft):					22.69				4.86
Length of inlet provided L (ft):					33.00				0.00
Efficiency for length L:					100.0%				0.0%
Interception for length L (cfs):					1.367				0.000
Side opening flow-through flow (cfs):					**0.000**				**0.035**
INTERCEPTION CAPACITY OF INLETS IN SAG LOCATION:									
Maximum allowable flooded width (including the depression) (ft):									
Max. head at sag w/o exceeding allowable flooded width (ft):									
Capacity of grate in a sag (3-sided weir) (cfs):									
Length provided of curb-opening inlet at sag (ft):									
Capacity of curb-opening inlet in a sag (weir) (cfs):									

ONDRAIN_English Version 7.5d, developed by Fernando Manzanera, Caltrans District 1, Hydraulics Capital Support (December 2010).

Notes: -This program utilizes the equations presented in the FHA Hydraulic Engineering Circular 22 (HEC-22), FHWA-NHI-10-009.

- Underlined values are calculated by the program, the others are input by the user.

North 1700's

HYDRAULIC CALCULATOR FOR ONSITE DRAINAGE (English Units)

Date: 08/03/21

RCTC I-15 ELPSE

Note: "Subarea discharge Qsa (cfs)" was obtained from "Design Discharge" column of Hydrological Tables found within the hydrology maps in Appendix B.2, and inputted as "Additional discharge (cfs)" below.

	Starting Point	DELETED	DELETED	N-1787A	N-1787B	N-1788	Slotted	Slotted	N-1790
Location station (ft):	1786+61.0	1786+74.0	1786+87.0	1787+10.0	1787+99.3	1788+83.0	1789+50.0	1789+75.0	1790+00.0
Longitudinal profile ("on-grade" or "sag"):		on-grade	on-grade	on-grade	on-grade	on-grade	on-grade	on-grade	on-grade
Calculation Type ("grate", "side opening", or "shoulder hydraulics only"):		side opening	side opening	grate	grate	grate	side opening	side opening	grate
Longitudinal slope, S:		1.20%	1.20%	1.20%	1.20%	1.20%	1.20%	1.20%	1.20%
Shoulder cross-slope, Sx:		2.00%	2.00%	2.00%	1.80%	1.80%	1.80%	0.50%	0.50%
Average watershed paved width (ft):		0.00	0.00	0.00	0.00	0.00	85.17	47.04	47.04
Shoulder Manning's n:		0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016
Inlet description (optional):									
Clogging factor for on-grade grates:				33%	33%	33%			33%
Grate width (ft):				4.00	2.00	2.00			2.00
Grate length (ft):				3.00	3.00	3.00			3.00
Precipitation intensity (in/hr):		3.61	3.61	3.61	3.61	3.61	3.61	3.61	3.61
Runoff Coefficient for paved areas, "C_p":		0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Runoff Coefficient for unpaved areas, "C_u":		0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63
Unpaved area contributing to this inlet (acres):		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Watershed paved length (ft):		13.0	13.0	23.0	89.3	83.8	67.0	25.0	25.0
Paved area contributing to this inlet (acres):		0.000	0.000	0.000	0.000	0.000	0.131	0.027	0.027
Subarea discharge Q_{sa} (cfs):		0.00	0.000	0.000	0.000	0.000	0.468	0.096	0.096
Additional discharge (cfs):		0.000	0.000	0.790	0.740	0.380			
Total discharge Q_t, including any upstream by-pass (cfs):		**0.030**	**0.030**	**0.820**	**0.792**	**0.644**	**0.661**	**0.096**	**0.096**
By-pass Q *Describe here source of bypass:*	**0.030**	**0.03**	**0.03**	**0.05**	**0.26**	**0.19**	**0.00**	**0.00**	**0.03**
DEPRESSION CALCULATION:									
Width of depression "w" (ft):									
Depression depth "a" (from flowline w/o depression) (in):									
Depression cross-slope (Sw=Sx+a/12w):									
Fraction of flow over the depression (Eo):									
Discharge-weighted equivalent cross-slope (Se):									
Q_s (first guess: **Qt - 0.001**, after iteration should be same as next line)		0.005			0.013	0.024	0.000	0.005	0.000
Q_s over shoulder (excluding flow over the depression) (cfs):									
Q=Q_w+Q_s (cfs) (after iterations must match **Q_t** value):									
HYDRAULIC RESULTS:									
Flooded Width T for Q_t, upstream of inlet (ft):		**1.87**	**1.87**	**6.47**	**6.82**	**6.31**	**6.37**	**6.89**	**6.89**
Flooded Width T at depression (if any) (ft):		**1.87**	**1.87**	**6.47**	**6.82**	**6.31**	**6.37**	**6.89**	**6.89**
Flooded Width T for BYPASS Q downstream of inlet (ft):	**0.00**	**1.87**	**1.87**	**2.31**	**4.52**	**4.01**	**0.00**	**0.00**	**4.51**
Water depth at curb (with or without depression) (in):		0.45	0.45	1.55	1.47	1.36	1.38	0.41	0.41
Water cross-area at shoulder (without depression) (sq.ft.):		0.03	0.03	0.42	0.42	0.36	0.37	0.12	0.12
Water velocity immediately u/s from inlet (w/o depression) (fps):		0.86	0.86	1.96	1.89	1.80	1.81	0.81	0.81
Average water velocity for the segment to this inlet (fps):		0.32	#DIV/0!	0.77	0.75	0.81	0.79	0.30	0.30
Flowtime from the previous inlet to this one (min):		0.68	#DIV/0!	0.50	1.98	1.72	1.41	1.38	1.38
GRATE INLETS ON-GRADE:									
Splash-over V for effective length of grate (type P-1 3/8) (fps):				6.81	6.81	6.81			6.81
Effective length of grate considering clogging factor (ft):				2.01	2.01	2.01			2.01
Ratio of grate frontal flow to total flow:				0.923	0.604	0.638			0.599
Fraction of frontal flow intercepted (Rf):				100.0%	100.0%	100.0%			100.0%
Fraction of side flow interception (Rs):				16.5%	15.9%	17.2%			19.5%
Total flow intercepted (cfs):				0.768	0.528	0.451			0.065
Grate Efficiency (E):				93.6%	66.7%	70.1%			67.7%
Grate flow-through flow (cfs):				**0.052**	**0.264**	**0.193**			**0.031**
SLOTTED DRAINS & SIDE-OPENING INLETS ON-GRADE:									
Length required for total interception (ft):		4.56	4.56				17.81	17.12	
Length of inlet provided L (ft):		0.00	0.00				27.00	25.00	25.00
Efficiency for length L:		0.0%	0.0%				100.0%	100.0%	
Interception for length L (cfs):		0.00	0.000				0.661	0.096	
Side opening flow-through flow (cfs):		**0.03**	**0.030**				**0.000**	**0.000**	
INTERCEPTION CAPACITY OF INLETS IN SAG LOCATION:									
Maximum allowable flooded width (including the depression) (ft):									
Max. head at sag w/o exceeding allowable flooded width (ft):									
Capacity of grate in a sag (3-sided weir) (cfs):									
Length provided of curb-opening inlet at sag (ft):									
Capacity of curb-opening inlet in a sag (weir) (cfs):									

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Notes: -This program utilizes the equations presented in the FHA Hydraulic Engineering Circular 22 (HEC-22), FHWA-NHI-10-009.

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Separate Run

HYDRAULIC CALCULATOR FOR ONSITE DRAINAGE (English Units)

Date: 08/03/21

RCTC I-15 ELPSE

Note: "Subarea discharge Qsa (cfs)" was obtained from "Design Discharge" column of Hydrological Tables found within the hydrology maps in Appendix B.2, and inputted as "Additional discharge (cfs)" below.

	Starting Point	Delete	N-1906	N-1907	N-1908A	N-1908B	N-1910	N-1911	N-1912
Location station (ft):	1904+32.0	1904+32.0	1906+00.0	1907+00.0	1908+00.0	1908+73.0	1910+00.0	1911+00.0	1912+00.0
Longitudinal profile ("on-grade" or "sag"):		on-grade	on-grade	on-grade	on-grade	on-grade	on-grade	on-grade	on-grade
Calculation Type ("grate", "side opening", or "shoulder hydraulics only"):		grate	grate	grate	grate	grate	grate	grate	grate
Longitudinal slope, S:		0.70%	0.70%	0.70%	0.70%	0.70%	0.70%	0.70%	0.70%
Shoulder cross-slope, Sx:		2.00%	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%
Average watershed paved width (ft):		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Shoulder Manning's n:		0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016
Inlet description (optional):									
Clogging factor for on-grade grates:		33%	33%	33%	33%	33%	33%	33%	33%
Grate width (ft):		4.00	2.00	2.00	2.00	4.00	4.00	4.00	4.00
Grate length (ft):		3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00
Precipitation intensity (in/hr):		3.61	3.61	3.61	3.61	3.61	3.61	3.61	3.61
Runoff Coefficient for paved areas, "C_p":		0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Runoff Coefficient for unpaved areas, "C_u":		0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63
Unpaved area contributing to this inlet (acres):		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Watershed paved length (ft):		0.0	168.0	100.0	100.0	73.0	127.0	100.0	100.0
Paved area contributing to this inlet (acres):		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Subarea discharge Q_{sa} (cfs):		0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Additional discharge (cfs):		0.000	0.620	0.510	0.480	0.390	0.710	0.710	0.710
Total discharge Q_t, including any upstream by-pass (cfs):		0.000	0.620	0.684	0.683	0.592	0.741	0.766	0.771
By-pass Q *Describe here source of bypass:*	0.000	0.00	0.17	0.20	0.20	0.03	0.06	0.06	0.06
DEPRESSION CALCULATION:									
Width of depression "w" (ft):									
Depression depth "a" (from flowline w/o depression) (in):									
Depression cross-slope (Sw=Sx+a/12w):									
Fraction of flow over the depression (Eo):									
Discharge-weighted equivalent cross-slope (Se):									
Q_s (first guess: **Qt - 0.001**, after iteration should be same as next line)		0.005			0.013	0.024	0.000	0.005	0.000
Q_s over shoulder (excluding flow over the depression) (cfs):									
Q=Q_w+Q_s (cfs) (after iterations must match **Q_t** value):									
HYDRAULIC RESULTS:									
Flooded Width T for Q_t, upstream of inlet (ft):		0.00	6.44	6.68	6.68	6.33	6.89	6.97	6.99
Flooded Width T at depression (if any) (ft):		0.00	6.44	6.68	6.68	6.33	6.89	6.97	6.99
Flooded Width T for BYPASS Q downstream of inlet (ft):	0.00	0.00	4.00	4.23	4.23	2.09	2.62	2.70	2.72
Water depth at curb (with or without depression) (in):		0.00	1.55	1.60	1.60	1.52	1.65	1.67	1.68
Water cross-area at shoulder (without depression) (sq.ft.):		0.00	0.41	0.45	0.45	0.40	0.47	0.49	0.49
Water velocity immediately u/s from inlet (w/o depression) (fps):		0.00	1.49	1.53	1.53	1.48	1.56	1.58	1.58
Average water velocity for the segment to this inlet (fps):		#DIV/0!	0.56	0.66	0.67	0.65	0.61	0.63	0.64
Flowtime from the previous inlet to this one (min):		#DIV/0!	5.03	2.51	2.48	1.86	3.44	2.63	2.62
GRATE INLETS ON-GRADE:									
Splash-over V for effective length of grate (type P-1 3/8) (fps):		6.81	6.81	6.81	6.81	6.81	6.81	6.81	6.81
Effective length of grate considering clogging factor (ft):		2.01	2.01	2.01	2.01	2.01	2.01	2.01	2.01
Ratio of grate frontal flow to total flow:		1.00	0.629	0.613	0.613	0.930	0.902	0.897	0.896
Fraction of frontal flow intercepted (Rf):		100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Fraction of side flow interception (Rs):		0.0%	24.4%	23.6%	23.6%	24.8%	22.9%	22.7%	22.6%
Total flow intercepted (cfs):		0.00	0.446	0.481	0.481	0.561	0.685	0.705	0.709
Grate Efficiency (E):		100.0%	71.9%	70.4%	70.4%	94.8%	92.4%	92.0%	92.0%
Grate flow-through flow (cfs):		0.00	0.174	0.203	0.202	0.031	0.056	0.061	0.062
SLOTTED DRAINS & SIDE-OPENING INLETS ON-GRADE:									
Length required for total interception (ft):									
Length of inlet provided L (ft):		12.00	12.00	12.00	12.00	12.00		10.00	
Efficiency for length L:									
Interception for length L (cfs):									
Side opening flow-through flow (cfs):									
INTERCEPTION CAPACITY OF INLETS IN SAG LOCATION:									
Maximum allowable flooded width (including the depression) (ft):									
Max. head at sag w/o exceeding allowable flooded width (ft):									
Capacity of grate in a sag (3-sided weir) (cfs):									
Length provided of curb-opening inlet at sag (ft):									
Capacity of curb-opening inlet in a sag (weir) (cfs):									

ONDRAIN_English Version 7.5d, developed by Fernando Manzanera, Caltrans District 1, Hydraulics Capital Support (December 2010).

Notes: -This program utilizes the equations presented in the FHA Hydraulic Engineering Circular 22 (HEC-22), FHWA-NHI-10-009.

- Underlined values are calculated by the program, the others are input by the user.

North 1900's

HYDRAULIC CALCULATOR FOR ONSITE DRAINAGE (English Units)

Date: 08/03/21

RCTC I-15 ELPSE

Note: "Subarea discharge Qsa (cfs)" was obtained from "Design Discharge" column of Hydrological Tables found within the hydrology maps in Appendix B.2, and inputted as "Additional discharge (cfs)" below.

	Starting Point	N-1913	N-1914	N-1915	N-1915B	N-1917	N-1918	N-1919	N-1920
Location station (ft):	1912+00.0	1913+00.0	1914+25.0	1915+25.0	1915+95.0	1917+00.0	1918+00.0	1919+00.0	1920+25.0
Longitudinal profile ("on-grade" or "sag"):		on-grade	on-grade	on-grade	on-grade	on-grade	on-grade	on-grade	on-grade
Calculation Type ("grate", "side opening", or "shoulder hydraulics only"):		grate	grate	side opening	side opening	side opening	grate	side opening	grate
Longitudinal slope, S:		0.60%	1.00%	0.70%	0.70%	0.70%	0.70%	0.70%	1.20%
Shoulder cross-slope, Sx:		2.00%	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%
Average watershed paved width (ft):		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Shoulder Manning's n:		0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016
Inlet description (optional):									
Clogging factor for on-grade grates:		33%	33%				33%		33%
Grate width (ft):		4.00	4.00				4.00		4.00
Grate length (ft):		3.00	3.00				3.00		3.00
Precipitation intensity (in/hr):		3.61	3.61	3.61	3.61	3.61	3.61	3.61	3.61
Runoff Coefficient for paved areas, "C_p":		0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Runoff Coefficient for unpaved areas, "C_u":		0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63
Unpaved area contributing to this inlet (acres):		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Watershed paved length (ft):		100.0	125.0	100.0	70.0	105.0	100.0	100.0	125.0
Paved area contributing to this inlet (acres):		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Subarea discharge Q_{sa} (cfs):		0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Additional discharge (cfs):		0.550	0.700	0.690	0.740	0.750	0.740	0.680	0.990
Total discharge Q_t, including any upstream by-pass (cfs):		**0.610**	**0.737**	**0.735**	**0.740**	**0.750**	**0.740**	**0.736**	**0.990**
By-pass Q *Describe here source of bypass:*	**0.060**	**0.04**	**0.04**	**0.00**	**0.00**	**0.00**	**0.06**	**0.00**	**0.08**
DEPRESSION CALCULATION:									
Width of depression "w" (ft):									
Depression depth "a" (from flowline w/o depression) (in):									
Depression cross-slope (Sw=Sx+a/12w):									
Fraction of flow over the depression (Eo):									
Discharge-weighted equivalent cross-slope (Se):									
Q_s (first guess: **Qt - 0.001**, after iteration should be same as next line)		0.005			0.013	0.024	0.000	0.005	0.000
Q_s over shoulder (excluding flow over the depression) (cfs):									
Q=Q_w+Q_s (cfs) (after iterations must match **Q_t** value):									
HYDRAULIC RESULTS:									
Flooded Width T for Q_t, upstream of inlet (ft):		**6.59**	**6.43**	**6.86**	**6.88**	**6.92**	**6.88**	**6.87**	**6.94**
Flooded Width T at depression (if any) (ft):		**6.59**	**6.43**	**6.86**	**6.88**	**6.92**	**6.88**	**6.87**	**6.94**
Flooded Width T for BYPASS Q downstream of inlet (ft):	**0.00**	**2.31**	**2.24**	**0.00**	**0.00**	**0.00**	**2.62**	**0.00**	**2.76**
Water depth at curb (with or without depression) (in):		1.58	1.54	1.65	1.65	1.66	1.65	1.65	1.67
Water cross-area at shoulder (without depression) (sq.ft.):		0.43	0.41	0.47	0.47	0.48	0.47	0.47	0.48
Water velocity immediately u/s from inlet (w/o depression) (fps):		1.40	1.78	1.56	1.56	1.57	1.56	1.56	2.06
Average water velocity for the segment to this inlet (fps):		0.52	0.71	0.62	0.58	0.58	0.58	0.63	0.77
Flowtime from the previous inlet to this one (min):		3.19	2.92	2.70	2.01	3.00	2.87	2.65	2.72
GRATE INLETS ON-GRADE:									
Splash-over V for effective length of grate (type P-1 3/8) (fps):		6.81	6.81				6.81		6.81
Effective length of grate considering clogging factor (ft):		2.01	2.01				2.01		2.01
Ratio of grate frontal flow to total flow:		0.92	0.925				0.902		0.899
Fraction of frontal flow intercepted (Rf):		100.0%	100.0%				100.0%		100.0%
Fraction of side flow interception (Rs):		26.5%	19.0%				22.9%		15.4%
Total flow intercepted (cfs):		0.57	0.693				0.684		0.905
Grate Efficiency (E):		93.9%	94.0%				92.4%		91.4%
Grate flow-through flow (cfs):		**0.04**	**0.045**				**0.056**		**0.085**
SLOTTED DRAINS & SIDE-OPENING INLETS ON-GRADE:									
Length required for total interception (ft):				14.87	14.92	15.00		14.88	
Length of inlet provided L (ft):				23.00	23.00	23.00		23.00	
Efficiency for length L:				100.0%	100.0%	100.0%		100.0%	
Interception for length L (cfs):				0.735	0.740	0.750		0.736	
Side opening flow-through flow (cfs):				**0.000**	**0.000**	**0.000**		**0.000**	
INTERCEPTION CAPACITY OF INLETS IN SAG LOCATION:									
Maximum allowable flooded width (including the depression) (ft):									
Max. head at sag w/o exceeding allowable flooded width (ft):									
Capacity of grate in a sag (3-sided weir) (cfs):									
Length provided of curb-opening inlet at sag (ft):									
Capacity of curb-opening inlet in a sag (weir) (cfs):									

ONDRAIN_English Version 7.5d, developed by Fernando Manzanera, Caltrans District 1, Hydraulics Capital Support (December 2010).

Notes: -This program utilizes the equations presented in the FHA Hydraulic Engineering Circular 22 (HEC-22), FHWA-NHI-10-009.

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HYDRAULIC CALCULATOR FOR ONSITE DRAINAGE (English Units)

Date: 08/03/21

RCTC I-15 ELPSE

Note: "Subarea discharge Qsa (cfs)" was obtained from "Design Discharge" column of Hydrological Tables found within the hydrology maps in Appendix B.2, and inputted as "Additional discharge (cfs)" below.

	Starting Point	N-1921	N-1922	N-1923	N-1925	N-1926	N-1928A	N-1928B	N-1929A
Location station (ft):	1920+25.0	1921+50.0	1922+50.0	1923+90.0	1925+00.0	1926+10.0	1928+00.0	1928+75.0	1929+23.0
Longitudinal profile ("on-grade" or "sag"):		on-grade	on-grade	on-grade	on-grade	on-grade	on-grade	on-grade	on-grade
Calculation Type ("grate", "side opening", or "shoulder hydraulics only"):		grate	grate	grate	grate	grate	grate	grate	grate
Longitudinal slope, S:		1.20%	1.20%	1.20%	1.20%	1.20%	1.20%	1.20%	1.20%
Shoulder cross-slope, Sx:		2.00%	2.00%	2.00%	2.00%	2.00%	2.00%	1.80%	1.20%
Average watershed paved width (ft):		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Shoulder Manning's n:		0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016
Inlet description (optional):									
Clogging factor for on-grade grates:		33%	33%	33%	33%	33%	33%	33%	33%
Grate width (ft):		4.00	4.00	2.00	2.00	4.00	2.00	2.00	4.00
Grate length (ft):		3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00
Precipitation intensity (in/hr):		3.61	3.61	3.61	3.61	3.61	3.61	3.61	3.61
Runoff Coefficient for paved areas, "C_p":		0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Runoff Coefficient for unpaved areas, "C_u":		0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63
Unpaved area contributing to this inlet (acres):		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Watershed paved length (ft):		125.0	100.0	140.0	110.0	110.0	190.0	75.0	48.0
Paved area contributing to this inlet (acres):		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Subarea discharge Q_{sa} (cfs):		0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Additional discharge (cfs):		0.910	0.920	0.910	0.550	0.560	0.950	0.350	0.160
Total discharge Q_t, including any upstream by-pass (cfs):		**1.010**	**1.009**	**0.999**	**0.893**	**0.850**	**1.008**	**0.697**	**0.378**
By-pass Q *Describe here source of bypass:*	**0.100**	**0.09**	**0.09**	**0.34**	**0.29**	**0.06**	**0.35**	**0.22**	**0.03**
DEPRESSION CALCULATION:									
Width of depression "w" (ft):									
Depression depth "a" (from flowline w/o depression) (in):									
Depression cross-slope (Sw=Sx+a/12w):									
Fraction of flow over the depression (Eo):									
Discharge-weighted equivalent cross-slope (Se):									
Q_s (first guess: **Qt - 0.001**, after iteration should be same as next line)		0.005			0.013	0.024	0.000	0.005	0.000
Q_s over shoulder (excluding flow over the depression) (cfs):									
Q=Q_w+Q_s (cfs) (after iterations must match **Q_t** value):									
HYDRAULIC RESULTS:									
Flooded Width T for Q_t, upstream of inlet (ft):		**6.99**	**6.99**	**6.96**	**6.68**	**6.55**	**6.99**	**6.50**	**6.65**
Flooded Width T at depression (if any) (ft):		**6.99**	**6.99**	**6.96**	**6.68**	**6.55**	**6.99**	**6.50**	**6.65**
Flooded Width T for BYPASS Q downstream of inlet (ft):	**0.00**	**2.81**	**2.81**	**4.66**	**4.38**	**2.39**	**4.69**	**4.20**	**2.47**
Water depth at curb (with or without depression) (in):		1.68	1.68	1.67	1.60	1.57	1.68	1.40	0.96
Water cross-area at shoulder (without depression) (sq.ft.):		0.49	0.49	0.48	0.45	0.43	0.49	0.38	0.27
Water velocity immediately u/s from inlet (w/o depression) (fps):		2.07	2.07	2.06	2.00	1.98	2.06	1.83	1.42
Average water velocity for the segment to this inlet (fps):		0.77	0.84	0.84	0.90	0.88	0.82	0.83	0.62
Flowtime from the previous inlet to this one (min):		2.71	1.99	2.79	2.04	2.09	3.85	1.51	1.29
GRATE INLETS ON-GRADE:									
Splash-over V for effective length of grate (type P-1 3/8) (fps):		6.81	6.81	6.81	6.81	6.81	6.81	6.81	6.81
Effective length of grate considering clogging factor (ft):		2.01	2.01	2.01	2.01	2.01	2.01	2.01	2.01
Ratio of grate frontal flow to total flow:		0.90	0.896	0.595	0.613	0.919	0.593	0.625	0.914
Fraction of frontal flow intercepted (Rf):		100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Fraction of side flow interception (Rs):		15.2%	15.3%	15.3%	16.0%	16.3%	15.3%	16.7%	17.5%
Total flow intercepted (cfs):		0.92	0.920	0.656	0.603	0.793	0.660	0.480	0.351
Grate Efficiency (E):		91.2%	91.2%	65.7%	67.5%	93.2%	65.5%	68.8%	92.9%
Grate flow-through flow (cfs):		**0.09**	**0.089**	**0.343**	**0.290**	**0.058**	**0.347**	**0.218**	**0.027**
SLOTTED DRAINS & SIDE-OPENING INLETS ON-GRADE:									
Length required for total interception (ft):									
Length of inlet provided L (ft):									
Efficiency for length L:									
Interception for length L (cfs):									
Side opening flow-through flow (cfs):									
INTERCEPTION CAPACITY OF INLETS IN SAG LOCATION:									
Maximum allowable flooded width (including the depression) (ft):									
Max. head at sag w/o exceeding allowable flooded width (ft):									
Capacity of grate in a sag (3-sided weir) (cfs):									
Length provided of curb-opening inlet at sag (ft):									
Capacity of curb-opening inlet in a sag (weir) (cfs):									

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HYDRAULIC CALCULATOR FOR ONSITE DRAINAGE (English Units)

Date: 08/03/21

RCTC I-15 ELPSE

Note: "Subarea discharge Qsa (cfs)" was obtained from "Design Discharge" column of Hydrological Tables found within the hydrology maps in Appendix B.2, and inputted as "Additional discharge (cfs)" below.

	Starting Point								
Location station (ft):	**1929+23.0**	**1929+57.0**	**1929+72.0**	**1929+82.0**	**1929+92.0**				
Longitudinal profile ("on-grade" or "sag"):		on-grade	on-grade	on-grade	on-grade				
Calculation Type ("grate", "side opening", or "shoulder hydraulics only"):		side opening	side opening	side opening	grate				
Longitudinal slope, S:		1.20%	1.20%	1.20%	1.20%				
Shoulder cross-slope, Sx:		0.80%	0.50%	0.40%	0.30%				
Average watershed paved width (ft):		25.62	63.89	60.98	60.98				
Shoulder Manning's n:		0.016	0.016	0.016	0.016				
Inlet description (optional):									
Clogging factor for on-grade grates:					33%				
Grate width (ft):					4.00				
Grate length (ft):					3.00				
Precipitation intensity (in/hr):		3.61	3.61	3.61	3.61				
Runoff Coefficient for paved areas, "C_p":		0.99	0.99	0.99	0.99				
Runoff Coefficient for unpaved areas, "C_u":		0.63	0.63	0.63	0.63				
Unpaved area contributing to this inlet (acres):		0.000	0.000	0.000	0.000				
Watershed paved length (ft):		34.0	15.0	10.0	10.0				
Paved area contributing to this inlet (acres):		0.020	0.022	0.014	0.014				
Subarea discharge Q_{sa} (cfs):		0.07	0.079	0.050	0.050				
Additional discharge (cfs):									
Total discharge Q_t, including any upstream by-pass (cfs):		**0.091**	**0.079**	**0.050**	**0.057**				
By-pass Q *Describe here source of bypass:*	**0.020**	**0.00**	**0.00**	**0.01**	**0.01**				
DEPRESSION CALCULATION:									
Width of depression "w" (ft):									
Depression depth "a" (from flowline w/o depression) (in):									
Depression cross-slope (Sw=Sx+a/12w):									
Fraction of flow over the depression (Eo):									
Discharge-weighted equivalent cross-slope (Se):									
Q_s (first guess: **Qt - 0.001**, after iteration should be same as next line)		0.005			0.013				
Q_s over shoulder (excluding flow over the depression) (cfs):									
Q=Q_w+Q_s (cfs) (after iterations must match **Q_t** value):									
HYDRAULIC RESULTS:									
Flooded Width T for Q_t, upstream of inlet (ft):		**5.04**	**6.38**	**6.21**	**7.78**				
Flooded Width T at depression (if any) (ft):		**5.04**	**6.38**	**6.21**	**7.78**				
Flooded Width T for BYPASS Q downstream of inlet (ft):	**0.00**	**0.00**	**0.79**	**2.93**	**3.49**				
Water depth at curb (with or without depression) (in):		0.48	0.38	0.30	0.28				
Water cross-area at shoulder (without depression) (sq.ft.):		0.10	0.10	0.08	0.09				
Water velocity immediately u/s from inlet (w/o depression) (fps):		0.90	0.77	0.65	0.63				
Average water velocity for the segment to this inlet (fps):		0.33	0.29	0.24	0.25				
Flowtime from the previous inlet to this one (min):		1.69	0.87	0.68	0.67				
GRATE INLETS ON-GRADE:									
Splash-over V for effective length of grate (type P-1 3/8) (fps):					6.81				
Effective length of grate considering clogging factor (ft):					2.01				
Ratio of grate frontal flow to total flow:					0.854				
Fraction of frontal flow intercepted (Rf):					100.0%				
Fraction of side flow interception (Rs):					18.8%				
Total flow intercepted (cfs):					0.050				
Grate Efficiency (E):					88.2%				
Grate flow-through flow (cfs):					**0.007**				
SLOTTED DRAINS & SIDE-OPENING INLETS ON-GRADE:									
Length required for total interception (ft):		12.63	15.71	14.89					
Length of inlet provided L (ft):		20.00	15.00	10.00	10.00				
Efficiency for length L:		100.0%	99.6%	86.5%					
Interception for length L (cfs):		0.09	0.078	0.044					
Side opening flow-through flow (cfs):		**0.00**	**0.000**	**0.007**					
INTERCEPTION CAPACITY OF INLETS IN SAG LOCATION:									
Maximum allowable flooded width (including the depression) (ft):									
Max. head at sag w/o exceeding allowable flooded width (ft):									
Capacity of grate in a sag (3-sided weir) (cfs):									
Length provided of curb-opening inlet at sag (ft):									
Capacity of curb-opening inlet in a sag (weir) (cfs):									

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- Underlined values are calculated by the program, the others are input by the user.

North 1900's

Southbound Runs

HYDRAULIC CALCULATOR FOR ONSITE DRAINAGE (English Units)

Date: 08/03/21

RCTC I-15 ELPSE

Note: "Subarea discharge Qsa (cfs)" was obtained from "Design Discharge" column of Hydrological Tables found within the hydrology maps in Appendix B.2, and inputted as "Additional discharge (cfs)" below.

	Starting Point	S-1276	S-1277	SLOTTED	S-1278	SLOTTED	S-1279		
Location station (ft):	1274+00.0	1276+00.0	1277+55.0	1278+68.0	1278+68.0	1279+30.0	1279+30.0		
Longitudinal profile ("on-grade" or "sag"):		on-grade	on-grade	on-grade	on-grade	on-grade	on-grade		
Calculation Type ("grate", "side opening", or "shoulder hydraulics only"):		grate	grate	side opening	grate	side opening	grate		
Longitudinal slope, S:		0.40%	0.40%	0.70%	0.70%	0.50%	0.50%		
Shoulder cross-slope, Sx:		1.50%	0.80%	0.70%	0.70%	0.30%	0.30%		
Average watershed paved width (ft):		0.00	0.00	0.00	0.00	0.00	0.00		
Shoulder Manning's n:		0.016	0.016	0.016	0.016	0.016	0.016		
Inlet description (optional):									
Clogging factor for on-grade grates:		33%	33%	33%	33%	33%	33%		
Grate width (ft):		4.00	2.00	2.00	4.00	2.00	4.00		
Grate length (ft):		3.00	3.00	3.00	3.00	3.00	3.00		
Precipitation intensity (in/hr):		3.20	3.20	3.20	3.20	3.20	3.20		
Runoff Coefficient for paved areas, "C_p":		0.99	0.99	0.99	0.99	0.99	0.99		
Runoff Coefficient for unpaved areas, "C_u":		0.63	0.63	0.63	0.63	0.63	0.63		
Unpaved area contributing to this inlet (acres):		0.000	0.000	0.000	0.000	0.000	0.000		
Watershed paved length (ft):		200.0	155.0	113.0	0.0	62.0	0.0		
Paved area contributing to this inlet (acres):		0.000	0.000	0.000	0.000	0.000	0.000		
Subarea discharge Q_{sa} (cfs):		0.00	0.000	0.000	0.000	0.000	0.000		
Additional discharge (cfs):		1.550	0.910	0.540	0.450	0.220	0.180		
Total discharge Q_t, including any upstream by-pass (cfs):		**1.550**	**1.329**	**1.330**	**0.450**	**0.332**	**0.180**		
By-pass Q *Describe here source of bypass:*	**0.000**	**0.42**	**0.79**	**0.00**	**0.11**	**0.00**	**0.06**		
DEPRESSION CALCULATION:									
Width of depression "w" (ft):									
Depression depth "a" (from flowline w/o depression) (in):									
Depression cross-slope (Sw=Sx+a/12w):									
Fraction of flow over the depression (Eo):									
Discharge-weighted equivalent cross-slope (Se):									
Q_s (first guess: **Qt - 0.001**, after iteration should be same as next line)		0.005			0.013	0.024	0.000		
Q_s over shoulder (excluding flow over the depression) (cfs):									
Q=Q_w+Q_s (cfs) (after iterations must match **Q_t** value):									
HYDRAULIC RESULTS:									
Flooded Width T for Q_t, upstream of inlet (ft):		**12.08**	**16.88**	**16.53**	**11.01**	**17.76**	**14.12**		
Flooded Width T at depression (if any) (ft):		**12.08**	**16.88**	**16.53**	**11.01**	**17.76**	**14.12**		
Flooded Width T for BYPASS Q downstream of inlet (ft):	**0.00**	**7.39**	**13.89**	**0.00**	**6.53**	**0.00**	**9.31**		
Water depth at curb (with or without depression) (in):		2.17	1.62	1.39	0.92	0.64	0.51		
Water cross-area at shoulder (without depression) (sq.ft.):		1.09	1.14	0.96	0.42	0.47	0.30		
Water velocity immediately u/s from inlet (w/o depression) (fps):		1.42	1.17	1.39	1.06	0.70	0.60		
Average water velocity for the segment to this inlet (fps):		0.53	0.48	0.65	0.39	0.28	0.22		
Flowtime from the previous inlet to this one (min):		6.31	5.41	2.88	0.00	3.69	0.00		
GRATE INLETS ON-GRADE:									
Splash-over V for effective length of grate (type P-1 3/8) (fps):		6.81	6.81		6.81		6.81		
Effective length of grate considering clogging factor (ft):		2.01	2.01		2.01		2.01		
Ratio of grate frontal flow to total flow:		0.66	0.286		0.700		0.588		
Fraction of frontal flow intercepted (Rf):		100.0%	100.0%		100.0%		100.0%		
Fraction of side flow interception (Rs):		21.0%	16.8%		17.3%		19.9%		
Total flow intercepted (cfs):		1.13	0.539		0.338		0.121		
Grate Efficiency (E):		73.0%	40.5%		75.2%		67.0%		
Grate flow-through flow (cfs):		**0.42**	**0.790**		**0.112**		**0.059**		
SLOTTED DRAINS & SIDE-OPENING INLETS ON-GRADE:									
Length required for total interception (ft):				35.82		30.05			
Length of inlet provided L (ft):				54.00		45.00			
Efficiency for length L:				100.0%		100.0%			
Interception for length L (cfs):				1.330		0.332			
Side opening flow-through flow (cfs):				**0.000**		**0.000**			
INTERCEPTION CAPACITY OF INLETS IN SAG LOCATION:									
Maximum allowable flooded width (including the depression) (ft):						**12.00**			
Max. head at sag w/o exceeding allowable flooded width (ft):									
Capacity of grate in a sag (3-sided weir) (cfs):									
Length provided of curb-opening inlet at sag (ft):									
Capacity of curb-opening inlet in a sag (weir) (cfs):									

ONDRAIN_English Version 7.5d, developed by Fernando Manzanera, Caltrans District 1, Hydraulics Capital Support (December 2010).

Notes: -This program utilizes the equations presented in the FHA Hydraulic Engineering Circular 22 (HEC-22), FHWA-NHI-10-009.

- Underlined values are calculated by the program, the others are input by the user.

South 1200's

Separate Run

HYDRAULIC CALCULATOR FOR ONSITE DRAINAGE (English Units)

Date: 08/03/21

RCTC I-15 ELPSE

Note: "Subarea discharge Qsa (cfs)" was obtained from "Design Discharge" column of Hydrological Tables found within the hydrology maps in Appendix B.2, and inputted as "Additional discharge (cfs)" below.

	Starting Point	S-1267	S-1263	S-1258	S-1255	S-1253			
Location station (ft):	1272+00.0	1267+40.0	1263+56.0	1258+62.0	1255+00.0	1253+50.0			
Longitudinal profile ("on-grade" or "sag"):		on-grade	on-grade	on-grade	on-grade	sag			
Calculation Type ("grate", "side opening", or "shoulder hydraulics only"):		grate	grate	grate	side opening	grate			
Longitudinal slope, S:		0.40%	1.00%	1.00%	1.00%				
Shoulder cross-slope, Sx:		2.00%	2.00%	2.00%	2.00%	2.00%			
Average watershed paved width (ft):		0.00	0.00	0.00	0.00	0.00			
Shoulder Manning's n:		0.016	0.016	0.016	0.016	0.016			
Inlet description (optional):									
Clogging factor for on-grade grates:		33%	33%	33%	33%	33%			
Grate width (ft):		2.00	2.00	2.00	2.00	2.00			
Grate length (ft):		3.00	3.00	3.00	3.00	3.00			
Precipitation intensity (in/hr):		3.20	3.20	3.20	3.20	3.20			
Runoff Coefficient for paved areas, "C_p":		0.99	0.99	0.99	0.99	0.99			
Runoff Coefficient for unpaved areas, "C_u":		0.63	0.63	0.63	0.63	0.63			
Unpaved area contributing to this inlet (acres):		0.000	0.000	0.210	0.000	0.000			
Watershed paved length (ft):		460.0	384.0	494.0	362.0	150.0			
Paved area contributing to this inlet (acres):		0.000	0.000	0.000	0.000	0.000			
Subarea discharge Q_{sa} (cfs):		0.00	0.000	0.423	0.000	0.000			
Additional discharge (cfs):		5.180	2.180	3.170	2.000	1.880			
Total discharge Q_t, including any upstream by-pass (cfs):		5.190	5.249	6.705	6.179	1.880			
By-pass Q *Describe here source of bypass:*	0.010	3.07	3.11	4.18	0.00	SAG			
DEPRESSION CALCULATION:									
Width of depression "w" (ft):									
Depression depth "a" (from flowline w/o depression) (in):									
Depression cross-slope (Sw=Sx+a/12w):									
Fraction of flow over the depression (Eo):									
Discharge-weighted equivalent cross-slope (Se):									
Q_s (first guess: **Qt - 0.001**, after iteration should be same as next line)		0.005			0.013	0.024	0.000	0.005	0.000
Q_s over shoulder (excluding flow over the depression) (cfs):									
Q=Q_w+Q_s (cfs) (after iterations must match **Q_t** value):									
HYDRAULIC RESULTS:									
Flooded Width T for Q_t, upstream of inlet (ft):		15.87	13.42	14.71	14.27	SAG			
Flooded Width T at depression (if any) (ft):		15.87	13.42	14.71	14.27	SAG			
Flooded Width T for BYPASS Q downstream of inlet (ft):	0.00	13.03	11.03	12.32	0.00	SAG			
Water depth at curb (with or without depression) (in):		3.81	3.22	3.53	3.42				
Water cross-area at shoulder (without depression) (sq.ft.):		2.52	1.80	2.17	2.04				
Water velocity immediately u/s from inlet (w/o depression) (fps):		2.06	2.91	3.10	3.03				
Average water velocity for the segment to this inlet (fps):		0.77	1.44	1.42	1.44				
Flowtime from the previous inlet to this one (min):		9.96	4.45	5.81	4.18				
GRATE INLETS ON-GRADE:									
Splash-over V for effective length of grate (type P-1 3/8) (fps):		6.81	6.81	6.81					
Effective length of grate considering clogging factor (ft):		2.01	2.01	2.01					
Ratio of grate frontal flow to total flow:		0.30	0.350	0.323					
Fraction of frontal flow intercepted (Rf):		100.0%	100.0%	100.0%					
Fraction of side flow interception (Rs):		15.3%	8.8%	8.0%					
Total flow intercepted (cfs):		2.12	2.137	2.526					
Grate Efficiency (E):		40.9%	40.7%	37.7%					
Grate flow-through flow (cfs):		3.07	3.112	4.179					
SLOTTED DRAINS & SIDE-OPENING INLETS ON-GRADE:									
Length required for total interception (ft):					40.48				
Length of inlet provided L (ft):		42.00	12.00	38.00	65.00	22.00		10.00	
Efficiency for length L:					100.0%				
Interception for length L (cfs):					6.179				
Side opening flow-through flow (cfs):					0.000				
INTERCEPTION CAPACITY OF INLETS IN SAG LOCATION:									
Maximum allowable flooded width (including the depression) (ft):						18.00	8.00		
Max. head at sag w/o exceeding allowable flooded width (ft):						0.36			
Capacity of grate in a sag (3-sided weir) (cfs):						3.875			
Length provided of curb-opening inlet at sag (ft):									
Capacity of curb-opening inlet in a sag (weir) (cfs):									

ONDRAIN_English Version 7.5d, developed by Fernando Manzanera, Caltrans District 1, Hydraulics Capital Support (December 2010).

Notes: -This program utilizes the equations presented in the FHA Hydraulic Engineering Circular 22 (HEC-22), FHWA-NHI-10-009.

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South 1200's

Separate Run

HYDRAULIC CALCULATOR FOR ONSITE DRAINAGE (English Units)

Date: 08/03/21

RCTC I-15 ELPSE

Note: "Subarea discharge Qsa (cfs)" was obtained from "Design Discharge" column of Hydrological Tables found within the hydrology maps in Appendix B.2, and inputted as "Additional discharge (cfs)" below.

	Starting Point	S-1245	S-1250	S-1251	S-1253				
Location station (ft):	1240+20.0	1245+00.0	1250+00.0	1252+00.0	1253+50.0				
Longitudinal profile ("on-grade" or "sag"):		on-grade	on-grade	on-grade	sag				
Calculation Type ("grate", "side opening", or "shoulder hydraulics only"):		grate	grate	side opening	grate				
Longitudinal slope, S:		1.00%	1.00%	1.00%					
Shoulder cross-slope, Sx:		2.00%	2.00%	2.00%	2.00%				
Average watershed paved width (ft):		0.00	0.00	0.00	0.00				
Shoulder Manning's n:		0.016	0.016	0.016	0.016				
Inlet description (optional):									
Clogging factor for on-grade grates:		33%	33%	33%	33%				
Grate width (ft):		2.00	2.00	2.00	2.00				
Grate length (ft):		3.00	3.00	3.00	3.00				
Precipitation intensity (in/hr):		3.20	3.20	3.20	3.20				
Runoff Coefficient for paved areas, "C_p":		0.99	0.99	0.99	0.99				
Runoff Coefficient for unpaved areas, "C_u":		0.63	0.63	0.63	0.63				
Unpaved area contributing to this inlet (acres):		0.010	0.030	0.020	0.000				
Watershed paved length (ft):		480.0	500.0	200.0	150.0				
Paved area contributing to this inlet (acres):		0.000	0.000	0.000	0.000				
Subarea discharge Q_{sa} (cfs):		0.02	0.060	0.040	0.000				
Additional discharge (cfs):		3.300	4.360	1.320	1.880				
Total discharge Q_t, including any upstream by-pass (cfs):		3.320	6.186	5.155	1.880				
By-pass Q *Describe here source of bypass:*	0.000	1.77	3.79	0.00	SAG				

DEPRESSION CALCULATION:

Width of depression "w" (ft):									
Depression depth "a" (from flowline w/o depression) (in):									
Depression cross-slope (Sw=Sx+a/12w):									
Fraction of flow over the depression (Eo):									
Discharge-weighted equivalent cross-slope (Se):									
Q_s (first guess: **Qt - 0.001**, after iteration should be same as next line)		0.005			0.013				
Q_s over shoulder (excluding flow over the depression) (cfs):									
Q=Q_w+Q_s (cfs) (after iterations must match **Q_t** value):									

HYDRAULIC RESULTS:

Flooded Width T for Q_t, upstream of inlet (ft):		11.30	14.28	13.33	SAG				
Flooded Width T at depression (if any) (ft):		11.30	14.28	13.33	SAG				
Flooded Width T for BYPASS Q downstream of inlet (ft):	0.00	8.92	11.89	0.00	SAG				
Water depth at curb (with or without depression) (in):		2.71	3.43	3.20					
Water cross-area at shoulder (without depression) (sq.ft.):		1.28	2.04	1.78					
Water velocity immediately u/s from inlet (w/o depression) (fps):		2.60	3.04	2.90					
Average water velocity for the segment to this inlet (fps):		0.97	1.33	1.39					
Flowtime from the previous inlet to this one (min):		8.25	6.27	2.39					

GRATE INLETS ON-GRADE:

Splash-over V for effective length of grate (type P-1 3/8) (fps):	6.81	6.81						
Effective length of grate considering clogging factor (ft):	2.01	2.01						
Ratio of grate frontal flow to total flow:	0.40	0.331						
Fraction of frontal flow intercepted (Rf):	100.0%	100.0%						
Fraction of side flow interception (Rs):	10.6%	8.3%						
Total flow intercepted (cfs):	1.55	2.391						
Grate Efficiency (E):	46.8%	38.7%						
Grate flow-through flow (cfs):	1.77	3.794						

SLOTTED DRAINS & SIDE-OPENING INLETS ON-GRADE:

Length required for total interception (ft):			37.51					
Length of inlet provided L (ft):			60.00					
Efficiency for length L:			100.0%					
Interception for length L (cfs):			5.155					
Side opening flow-through flow (cfs):			0.000					

INTERCEPTION CAPACITY OF INLETS IN SAG LOCATION:

Maximum allowable flooded width (including the depression) (ft):				18.00				
Max. head at sag w/o exceeding allowable flooded width (ft):				0.36				
Capacity of grate in a sag (3-sided weir) (cfs):				3.875				
Length provided of curb-opening inlet at sag (ft):								
Capacity of curb-opening inlet in a sag (weir) (cfs):								

ONDRAIN_English Version 7.5d, developed by Fernando Manzanera, Caltrans District 1, Hydraulics Capital Support (December 2010).

Notes: -This program utilizes the equations presented in the FHA Hydraulic Engineering Circular 22 (HEC-22), FHWA-NHI-10-009.

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South 1200's

Separate Run

HYDRAULIC CALCULATOR FOR ONSITE DRAINAGE (English Units)

Date: 05/25/21

RCTC I-15 ELPSE

Note: "Subarea discharge Qsa (cfs)" was obtained from "Design Discharge" column of Hydrological Tables found within the hydrology maps in Appendix B.2, and inputted as "Additional discharge (cfs)" below.

	Starting Point	S-1413	S-1412						
Location station (ft):	**1416+00.0**	**1413+47.0**	**1412+80.0**						
Longitudinal profile ("on-grade" or "sag"):		on-grade	sag						
Calculation Type ("grate", "side opening", or "shoulder hydraulics only"):		grate	grate						
Longitudinal slope, S:		0.80%							
Shoulder cross-slope, Sx:		3.00%	3.00%						
Average watershed paved width (ft):		0.00	0.00						
Shoulder Manning's n:		0.016	0.016						
Inlet description (optional):									
Clogging factor for on-grade grates:		33%	33%						
Grate width (ft):		2.00	2.00						
Grate length (ft):		3.00	3.00						
Precipitation intensity (in/hr):		3.29	3.29						
Runoff Coefficient for paved areas, "C_p":		0.99	0.99						
Runoff Coefficient for unpaved areas, "C_u":		0.63	0.63						
Unpaved area contributing to this inlet (acres):		0.000	0.000						
Watershed paved length (ft):		253.0	67.0						
Paved area contributing to this inlet (acres):		0.000	0.000						
Subarea discharge Q_{sa} (cfs):		0.00	0.000						
Additional discharge (cfs):		1.530	0.810						
Total discharge Q_t, including any upstream by-pass (cfs):		**1.530**	**1.299**						
By-pass Q *Describe here source of bypass:*	**0.000**	**0.49**	**SAG**						
DEPRESSION CALCULATION:									
Width of depression "w" (ft):									
Depression depth "a" (from flowline w/o depression) (in):									
Depression cross-slope (Sw=Sx+a/12w):									
Fraction of flow over the depression (Eo):									
Discharge-weighted equivalent cross-slope (Se):									
Q_s (first guess: **Qt - 0.001**, after iteration should be same as next line)		0.005							
Q_s over shoulder (excluding flow over the depression) (cfs):									
Q=Q_w+Q_s (cfs) (after iterations must match **Q_t** value):									
HYDRAULIC RESULTS:									
Flooded Width T for Q_t, upstream of inlet (ft):		**6.84**	**SAG**						
Flooded Width T at depression (if any) (ft):		**6.84**	**SAG**						
Flooded Width T for BYPASS Q downstream of inlet (ft):	**0.00**	**4.46**	**SAG**						
Water depth at curb (with or without depression) (in):		2.46							
Water cross-area at shoulder (without depression) (sq.ft.):		0.70							
Water velocity immediately u/s from inlet (w/o depression) (fps):		2.18							
Average water velocity for the segment to this inlet (fps):		0.81							
Flowtime from the previous inlet to this one (min):		5.19							
GRATE INLETS ON-GRADE:									
Splash-over V for effective length of grate (type P-1 3/8) (fps):		6.81							
Effective length of grate considering clogging factor (ft):		2.01							
Ratio of grate frontal flow to total flow:		0.60							
Fraction of frontal flow intercepted (Rf):		100.0%							
Fraction of side flow interception (Rs):		19.7%							
Total flow intercepted (cfs):		1.04							
Grate Efficiency (E):		68.1%							
Grate flow-through flow (cfs):		**0.49**							
SLOTTED DRAINS & SIDE-OPENING INLETS ON-GRADE:									
Length required for total interception (ft):									
Length of inlet provided L (ft):									
Efficiency for length L:									
Interception for length L (cfs):									
Side opening flow-through flow (cfs):									
INTERCEPTION CAPACITY OF INLETS IN SAG LOCATION:									
Maximum allowable flooded width (including the depression) (ft):			**8.00**						
Max. head at sag w/o exceeding allowable flooded width (ft):			0.24						
Capacity of grate in a sag (3-sided weir) (cfs):			***2.109***						
Length provided of curb-opening inlet at sag (ft):									
Capacity of curb-opening inlet in a sag (weir) (cfs):									

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Notes: -This program utilizes the equations presented in the FHA Hydraulic Engineering Circular 22 (HEC-22), FHWA-NHI-10-009.

- Underlined values are calculated by the program, the others are input by the user.

South 1400's

Separate Run

HYDRAULIC CALCULATOR FOR ONSITE DRAINAGE (English Units)

Date: 05/25/21

RCTC I-15 ELPSE

Note: "Subarea discharge Qsa (cfs)" was obtained from "Design Discharge" column of Hydrological Tables found within the hydrology maps in Appendix B.2, and inputted as "Additional discharge (cfs)" below.

	Starting Point	S-1411	S-1410B	S-1410A	S-1409				
Location station (ft):	1412+17.0	1411+53.0	1410+88.0	1410+40.0	1409+83.0				
Longitudinal profile ("on-grade" or "sag"):		on-grade	on-grade	on-grade	on-grade				
Calculation Type ("grate", "side opening", or "shoulder hydraulics only"):		grate	grate	grate	grate				
Longitudinal slope, S:		0.30%	0.30%	0.30%	0.30%				
Shoulder cross-slope, Sx:		3.00%	3.00%	3.00%	1.20%				
Average watershed paved width (ft):		0.00	0.00	0.00	0.00				
Shoulder Manning's n:		0.016	0.016	0.016	0.016				
Inlet description (optional):									
Clogging factor for on-grade grates:		33%	33%	33%	33%				
Grate width (ft):		2.00	2.00	4.00	4.00				
Grate length (ft):		3.00	3.00	3.00	3.00				
Precipitation intensity (in/hr):		3.29	3.29	3.29	3.29				
Runoff Coefficient for paved areas, "C_p":		0.99	0.99	0.99	0.99				
Runoff Coefficient for unpaved areas, "C_u":		0.63	0.63	0.63	0.63				
Unpaved area contributing to this inlet (acres):		0.000	0.000	0.000	0.000				
Watershed paved length (ft):		64.0	65.0	48.0	57.0				
Paved area contributing to this inlet (acres):		0.000	0.000	0.000	0.000				
Subarea discharge Q_{sa} (cfs):		0.00	0.000	0.000	0.000				
Additional discharge (cfs):		0.390	0.390	0.360	0.200				
Total discharge Q_t, including any upstream by-pass (cfs):		0.390	0.442	0.425	0.204				
By-pass Q *Describe here source of bypass:*	0.000	0.05	0.07	0.00	0.01				
DEPRESSION CALCULATION:									
Width of depression "w" (ft):									
Depression depth "a" (from flowline w/o depression) (in):									
Depression cross-slope (Sw=Sx+a/12w):									
Fraction of flow over the depression (Eo):									
Discharge-weighted equivalent cross-slope (Se):									
Q_s (first guess: **Qt - 0.001**, after iteration should be same as next line)		0.005			0.013				
Q_s over shoulder (excluding flow over the depression) (cfs):									
Q=Q_w+Q_s (cfs) (after iterations must match **Q_t** value):									
HYDRAULIC RESULTS:									
Flooded Width T for Q_t, upstream of inlet (ft):		4.93	5.16	5.09	6.85				
Flooded Width T at depression (if any) (ft):		4.93	5.16	5.09	6.85				
Flooded Width T for BYPASS Q downstream of inlet (ft):	0.00	2.31	2.52	0.86	2.33				
Water depth at curb (with or without depression) (in):		1.77	1.86	1.83	0.99				
Water cross-area at shoulder (without depression) (sq.ft.):		0.36	0.40	0.39	0.28				
Water velocity immediately u/s from inlet (w/o depression) (fps):		1.07	1.11	1.10	0.72				
Average water velocity for the segment to this inlet (fps):		0.40	0.45	0.46	0.27				
Flowtime from the previous inlet to this one (min):		2.67	2.38	1.75	3.48				
GRATE INLETS ON-GRADE:									
Splash-over V for effective length of grate (type P-1 3/8) (fps):		6.81	6.81	6.81	6.81				
Effective length of grate considering clogging factor (ft):		2.01	2.01	2.01	2.01				
Ratio of grate frontal flow to total flow:		0.75	0.729	0.984	0.904				
Fraction of frontal flow intercepted (Rf):		100.0%	100.0%	100.0%	100.0%				
Fraction of side flow interception (Rs):		46.8%	45.4%	45.8%	41.6%				
Total flow intercepted (cfs):		0.34	0.376	0.421	0.192				
Grate Efficiency (E):		86.7%	85.2%	99.1%	94.4%				
Grate flow-through flow (cfs):		0.05	0.065	0.004	0.011				
SLOTTED DRAINS & SIDE-OPENING INLETS ON-GRADE:									
Length required for total interception (ft):									
Length of inlet provided L (ft):									
Efficiency for length L:									
Interception for length L (cfs):									
Side opening flow-through flow (cfs):									
INTERCEPTION CAPACITY OF INLETS IN SAG LOCATION:									
Maximum allowable flooded width (including the depression) (ft):									
Max. head at sag w/o exceeding allowable flooded width (ft):									
Capacity of grate in a sag (3-sided weir) (cfs):									
Length provided of curb-opening inlet at sag (ft):									
Capacity of curb-opening inlet in a sag (weir) (cfs):									

ONDRAIN_English Version 7.5d, developed by Fernando Manzanera, Caltrans District 1, Hydraulics Capital Support (December 2010).

Notes: -This program utilizes the equations presented in the FHA Hydraulic Engineering Circular 22 (HEC-22), FHWA-NHI-10-009.

- Underlined values are calculated by the program, the others are input by the user.

South 1400's

Separate Run

HYDRAULIC CALCULATOR FOR ONSITE DRAINAGE (English Units)

Date: 05/25/21

RCTC I-15 ELPSE

Note: "Subarea discharge Qsa (cfs)" was obtained from "Design Discharge" column of Hydrological Tables found within the hydrology maps in Appendix B.2, and inputted as "Additional discharge (cfs)" below.

	Starting Point	S-1417	S-1418	S-1419	S-1420	S-1421	S-1422	S-1425	S-1426
Location station (ft):	1416+00.0	1417+11.0	1418+20.0	1419+30.0	1420+39.0	1421+40.0	1422+74.0	1425+23.0	1426+49.0
Longitudinal profile ("on-grade" or "sag"):		on-grade	on-grade	on-grade	on-grade	on-grade	on-grade	on-grade	on-grade
Calculation Type ("grate", "side opening", or "shoulder hydraulics only"):		grate	grate	grate	grate	grate	grate	grate	grate
Longitudinal slope, S:		1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%
Shoulder cross-slope, Sx:		3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%
Average watershed paved width (ft):		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Shoulder Manning's n:		0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016
Inlet description (optional):									
Clogging factor for on-grade grates:		33%	33%	33%	33%	33%	33%	33%	33%
Grate width (ft):		2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Grate length (ft):		3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00
Precipitation intensity (in/hr):		3.29	3.29	3.29	3.29	3.29	3.29	3.29	3.29
Runoff Coefficient for paved areas, "C_p":		0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Runoff Coefficient for unpaved areas, "C_u":		0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63
Unpaved area contributing to this inlet (acres):		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Watershed paved length (ft):		111.0	109.0	110.0	109.0	101.0	134.0	249.0	126.0
Paved area contributing to this inlet (acres):		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Subarea discharge Q_{sa} (cfs):		0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Additional discharge (cfs):		0.750	0.620	0.680	0.570	1.040	1.050	1.860	0.880
Total discharge Q_t, including any upstream by-pass (cfs):		**0.750**	**0.770**	**0.837**	**0.752**	**1.191**	**1.375**	**2.267**	**1.734**
By-pass Q *Describe here source of bypass:*	**0.000**	**0.15**	**0.16**	**0.18**	**0.15**	**0.32**	**0.41**	**0.85**	**0.58**
DEPRESSION CALCULATION:									
Width of depression "w" (ft):									
Depression depth "a" (from flowline w/o depression) (in):									
Depression cross-slope (Sw=Sx+a/12w):									
Fraction of flow over the depression (Eo):									
Discharge-weighted equivalent cross-slope (Se):									
Q_s (first guess: **Qt - 0.001**, after iteration should be same as next line)		0.005			0.013	0.024	0.000	0.005	0.000
Q_s over shoulder (excluding flow over the depression) (cfs):									
Q=Q_w+Q_s (cfs) (after iterations must match **Q_t** value):									
HYDRAULIC RESULTS:									
Flooded Width T for Q_t, upstream of inlet (ft):		**5.02**	**5.07**	**5.23**	**5.03**	**5.97**	**6.30**	**7.60**	**6.88**
Flooded Width T at depression (if any) (ft):		**5.02**	**5.07**	**5.23**	**5.03**	**5.97**	**6.30**	**7.60**	**6.88**
Flooded Width T for BYPASS Q downstream of inlet (ft):	**0.00**	**2.75**	**2.79**	**2.95**	**2.75**	**3.67**	**3.99**	**5.27**	**4.56**
Water depth at curb (with or without depression) (in):		1.81	1.83	1.88	1.81	2.15	2.27	2.74	2.48
Water cross-area at shoulder (without depression) (sq.ft.):		0.38	0.39	0.41	0.38	0.54	0.60	0.87	0.71
Water velocity immediately u/s from inlet (w/o depression) (fps):		1.98	2.00	2.04	1.98	2.22	2.31	2.61	2.44
Average water velocity for the segment to this inlet (fps):		0.74	0.85	0.86	0.86	0.92	0.99	1.11	1.12
Flowtime from the previous inlet to this one (min):		2.50	2.14	2.12	2.12	1.83	2.25	3.75	1.87
GRATE INLETS ON-GRADE:									
Splash-over V for effective length of grate (type P-1 3/8) (fps):		6.81	6.81	6.81	6.81	6.81	6.81	6.81	6.81
Effective length of grate considering clogging factor (ft):		2.01	2.01	2.01	2.01	2.01	2.01	2.01	2.01
Ratio of grate frontal flow to total flow:		0.74	0.737	0.723	0.741	0.663	0.639	0.557	0.600
Fraction of frontal flow intercepted (Rf):		100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Fraction of side flow interception (Rs):		22.5%	22.3%	21.7%	22.5%	19.1%	18.1%	15.0%	16.6%
Total flow intercepted (cfs):		0.60	0.613	0.656	0.601	0.866	0.968	1.413	1.156
Grate Efficiency (E):		80.0%	79.6%	78.3%	80.0%	72.7%	70.4%	62.3%	66.7%
Grate flow-through flow (cfs):		**0.15**	**0.157**	**0.182**	**0.151**	**0.325**	**0.407**	**0.854**	**0.578**
SLOTTED DRAINS & SIDE-OPENING INLETS ON-GRADE:									
Length required for total interception (ft):									
Length of inlet provided L (ft):									
Efficiency for length L:									
Interception for length L (cfs):									
Side opening flow-through flow (cfs):									
INTERCEPTION CAPACITY OF INLETS IN SAG LOCATION:									
Maximum allowable flooded width (including the depression) (ft):									
Max. head at sag w/o exceeding allowable flooded width (ft):									
Capacity of grate in a sag (3-sided weir) (cfs):									
Length provided of curb-opening inlet at sag (ft):									
Capacity of curb-opening inlet in a sag (weir) (cfs):									

ONDRAIN_English Version 7.5d, developed by Fernando Manzanera, Caltrans District 1, Hydraulics Capital Support (December 2010).

Notes: -This program utilizes the equations presented in the FHA Hydraulic Engineering Circular 22 (HEC-22), FHWA-NHI-10-009.

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South 1400's

HYDRAULIC CALCULATOR FOR ONSITE DRAINAGE (English Units)

Date: 05/25/21

RCTC I-15 ELPSE

Note: "Subarea discharge Qsa (cfs)" was obtained from "Design Discharge" column of Hydrological Tables found within the hydrology maps in Appendix B.2, and inputted as "Additional discharge (cfs)" below.

	Starting Point	S-1427	S-1428	S-1430	S-1431	S-1432	SLOTTED	SLOTTED	S-1433
Location station (ft):	1426+49.0	1427+69.0	1428+69.0	1430+22.0	1431+32.0	1432+05.0	1432+45.0	1432+86.0	1433+20.0
Longitudinal profile ("on-grade" or "sag"):		on-grade	on-grade	on-grade	on-grade	on-grade	on-grade	on-grade	on-grade
Calculation Type ("grate", "side opening", or "shoulder hydraulics only"):		grate	grate	grate	grate	grate	side opening	side opening	grate
Longitudinal slope, S:		1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%
Shoulder cross-slope, Sx:		3.00%	3.00%	3.00%	3.00%	2.80%	2.50%	2.20%	0.70%
Average watershed paved width (ft):		0.00	0.00	0.00	0.00	0.00	60.98	101.99	85.84
Shoulder Manning's n:		0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016
Inlet description (optional):									
Clogging factor for on-grade grates:		33%	33%	33%	33%	33%			33%
Grate width (ft):		2.00	2.00	2.00	2.00	2.00			4.00
Grate length (ft):		3.00	3.00	3.00	3.00	3.00			3.00
Precipitation intensity (in/hr):		3.29	3.29	3.29	3.29	3.29	3.29	3.29	3.29
Runoff Coefficient for paved areas, "C_p":		0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Runoff Coefficient for unpaved areas, "C_u":		0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63
Unpaved area contributing to this inlet (acres):		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Watershed paved length (ft):		120.0	100.0	153.0	110.0	73.0	40.0	41.0	34.0
Paved area contributing to this inlet (acres):		0.000	0.000	0.000	0.000	0.000	0.056	0.096	0.067
Subarea discharge Q_{sa} (cfs):		0.00	0.000	0.000	0.000	0.000	0.182	0.313	0.218
Additional discharge (cfs):		0.930	0.990	1.120	0.870	0.390			
Total discharge Q_t, including any upstream by-pass (cfs):		1.470	1.441	1.557	1.362	0.791	0.361	0.313	0.218
By-pass Q *Describe here source of bypass:*	0.540	0.45	0.44	0.49	0.40	0.18	0.00	0.00	0.03
DEPRESSION CALCULATION:									
Width of depression "w" (ft):									
Depression depth "a" (from flowline w/o depression) (in):									
Depression cross-slope (Sw=Sx+a/12w):									
Fraction of flow over the depression (Eo):									
Discharge-weighted equivalent cross-slope (Se):									
Q_s (first guess: **Qt - 0.001**, after iteration should be same as next line)		0.005			0.013	0.024	0.000	0.005	0.000
Q_s over shoulder (excluding flow over the depression) (cfs):									
Q=Q_w+Q_s (cfs) (after iterations must match **Q_t** value):									
HYDRAULIC RESULTS:									
Flooded Width T for Q_t, upstream of inlet (ft):		6.46	6.42	6.61	6.28	5.35	4.28	4.39	7.85
Flooded Width T at depression (if any) (ft):		6.46	6.42	6.61	6.28	5.35	4.28	4.39	7.85
Flooded Width T for BYPASS Q downstream of inlet (ft):	0.00	4.15	4.10	4.29	3.97	3.06	0.00	0.00	3.57
Water depth at curb (with or without depression) (in):		2.33	2.31	2.38	2.26	1.80	1.28	1.16	0.66
Water cross-area at shoulder (without depression) (sq.ft.):		0.63	0.62	0.65	0.59	0.40	0.23	0.21	0.22
Water velocity immediately u/s from inlet (w/o depression) (fps):		2.35	2.33	2.38	2.30	1.97	1.58	1.47	1.01
Average water velocity for the segment to this inlet (fps):		0.87	1.03	1.04	1.03	0.90	0.71	0.55	0.38
Flowtime from the previous inlet to this one (min):		2.29	1.62	2.45	1.78	1.35	0.94	1.25	1.51
GRATE INLETS ON-GRADE:									
Splash-over V for effective length of grate (type P-1 3/8) (fps):		6.81	6.81	6.81	6.81	6.81			6.81
Effective length of grate considering clogging factor (ft):		2.01	2.01	2.01	2.01	2.01			2.01
Ratio of grate frontal flow to total flow:		0.63	0.631	0.618	0.640	0.713			0.850
Fraction of frontal flow intercepted (Rf):		100.0%	100.0%	100.0%	100.0%	100.0%			100.0%
Fraction of side flow interception (Rs):		17.7%	17.8%	17.3%	18.2%	21.5%			18.5%
Total flow intercepted (cfs):		1.02	1.004	1.065	0.961	0.613			0.192
Grate Efficiency (E):		69.3%	69.6%	68.4%	70.6%	77.5%			87.8%
Grate flow-through flow (cfs):		0.45	0.437	0.492	0.401	0.178			0.027
SLOTTED DRAINS & SIDE-OPENING INLETS ON-GRADE:									
Length required for total interception (ft):							10.74	10.92	
Length of inlet provided L (ft):							15.00	41.00	
Efficiency for length L:							100.0%	100.0%	
Interception for length L (cfs):							0.361	0.313	
Side opening flow-through flow (cfs):							0.000	0.000	
INTERCEPTION CAPACITY OF INLETS IN SAG LOCATION:									
Maximum allowable flooded width (including the depression) (ft):									
Max. head at sag w/o exceeding allowable flooded width (ft):									
Capacity of grate in a sag (3-sided weir) (cfs):									
Length provided of curb-opening inlet at sag (ft):									
Capacity of curb-opening inlet in a sag (weir) (cfs):									

ONDRAIN_English Version 7.5d, developed by Fernando Manzanera, Caltrans District 1, Hydraulics Capital Support (December 2010).

Notes: -This program utilizes the equations presented in the FHA Hydraulic Engineering Circular 22 (HEC-22), FHWA-NHI-10-009.

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South 1400's

Separate Run

HYDRAULIC CALCULATOR FOR ONSITE DRAINAGE (English Units)

Date: 08/03/21

RCTC I-15 ELPSE

Note: "Subarea discharge Qsa (cfs)" was obtained from "Design Discharge" column of Hydrological Tables found within the hydrology maps in Appendix B.2, and inputted as "Additional discharge (cfs)" below.

	Starting Point	S-1473	S-1475	S-1476	S-1478	S-1479			
Location station (ft):	1472+00.0	1473+00.0	1475+47.0	1476+82.0	1478+18.0	1479+77.0			
Longitudinal profile ("on-grade" or "sag"):		on-grade	on-grade	on-grade	on-grade	on-grade			
Calculation Type ("grate", "side opening", or "shoulder hydraulics only"):		grate	grate	grate	grate	side opening			
Longitudinal slope, S:		1.00%	1.00%	1.00%	1.00%	1.00%			
Shoulder cross-slope, Sx:		1.30%	3.00%	3.00%	3.00%	3.00%			
Average watershed paved width (ft):		0.00	0.00	0.00	0.00	0.00			
Shoulder Manning's n:		0.016	0.016	0.016	0.016	0.016			
Inlet description (optional):									
Clogging factor for on-grade grates:		33%	33%	33%	33%	33%			
Grate width (ft):		2.00	2.00	2.00	2.00	2.00			
Grate length (ft):		3.00	3.00	3.00	3.00	3.00			
Precipitation intensity (in/hr):		3.29	3.29	3.29	3.29	3.29			
Runoff Coefficient for paved areas, "C_p":		0.99	0.99	0.99	0.99	0.99			
Runoff Coefficient for unpaved areas, "C_u":		0.63	0.63	0.63	0.63	0.63			
Unpaved area contributing to this inlet (acres):		0.000	0.000	0.000	0.000	0.000			
Watershed paved length (ft):		100.0	247.0	135.0	136.0	159.0			
Paved area contributing to this inlet (acres):		0.000	0.000	0.000	0.000	0.000			
Subarea discharge Q_{sa} (cfs):		0.00	0.000	0.000	0.000	0.000			
Additional discharge (cfs):		0.330	1.600	0.850	0.880	0.650			
Total discharge Q_t, including any upstream by-pass (cfs):		0.330	1.693	1.408	1.302	1.024			
By-pass Q *Describe here source of bypass:*	0.000	0.09	0.56	0.42	0.37	0.00			
DEPRESSION CALCULATION:									
Width of depression "w" (ft):									
Depression depth "a" (from flowline w/o depression) (in):									
Depression cross-slope (Sw=Sx+a/12w):									
Fraction of flow over the depression (Eo):									
Discharge-weighted equivalent cross-slope (Se):									
Q_s (first guess: **Qt - 0.001**, after iteration should be same as next line)		0.005			0.013	0.024	0.000	0.005	0.000
Q_s over shoulder (excluding flow over the depression) (cfs):									
Q=Q_w+Q_s (cfs) (after iterations must match **Q_t** value):									
HYDRAULIC RESULTS:									
Flooded Width T for Q_t, upstream of inlet (ft):		6.23	6.82	6.36	6.18	5.64			
Flooded Width T at depression (if any) (ft):		6.23	6.82	6.36	6.18	5.64			
Flooded Width T for BYPASS Q downstream of inlet (ft):	0.00	3.87	4.50	4.05	3.87	0.00			
Water depth at curb (with or without depression) (in):		0.97	2.45	2.29	2.22	2.03			
Water cross-area at shoulder (without depression) (sq.ft.):		0.25	0.70	0.61	0.57	0.48			
Water velocity immediately u/s from inlet (w/o depression) (fps):		1.31	2.43	2.32	2.28	2.14			
Average water velocity for the segment to this inlet (fps):		0.49	1.04	1.04	1.01	0.96			
Flowtime from the previous inlet to this one (min):		3.42	3.95	2.15	2.25	2.77			
GRATE INLETS ON-GRADE:									
Splash-over V for effective length of grate (type P-1 3/8) (fps):		6.81	6.81	6.81	6.81				
Effective length of grate considering clogging factor (ft):		2.01	2.01	2.01	2.01				
Ratio of grate frontal flow to total flow:		0.64	0.604	0.635	0.648				
Fraction of frontal flow intercepted (Rf):		100.0%	100.0%	100.0%	100.0%				
Fraction of side flow interception (Rs):		21.0%	16.8%	18.0%	18.5%				
Total flow intercepted (cfs):		0.24	1.135	0.986	0.928				
Grate Efficiency (E):		71.9%	67.0%	70.0%	71.3%				
Grate flow-through flow (cfs):		0.09	0.558	0.422	0.374				
SLOTTED DRAINS & SIDE-OPENING INLETS ON-GRADE:									
Length required for total interception (ft):						14.92			
Length of inlet provided L (ft):						24.00			
Efficiency for length L:						100.0%			
Interception for length L (cfs):						1.024			
Side opening flow-through flow (cfs):						0.000			
INTERCEPTION CAPACITY OF INLETS IN SAG LOCATION:									
Maximum allowable flooded width (including the depression) (ft):									
Max. head at sag w/o exceeding allowable flooded width (ft):									
Capacity of grate in a sag (3-sided weir) (cfs):									
Length provided of curb-opening inlet at sag (ft):									
Capacity of curb-opening inlet in a sag (weir) (cfs):									

ONDRAIN_English Version 7.5d, developed by Fernando Manzanera, Caltrans District 1, Hydraulics Capital Support (December 2010).

Notes: -This program utilizes the equations presented in the FHA Hydraulic Engineering Circular 22 (HEC-22), FHWA-NHI-10-009.

- Underlined values are calculated by the program, the others are input by the user.

South 1400's

Separate Run

HYDRAULIC CALCULATOR FOR ONSITE DRAINAGE (English Units)

Date: 05/25/21

RCTC I-15 ELPSE

Note: "Subarea discharge Qsa (cfs)" was obtained from "Design Discharge" column of Hydrological Tables found within the hydrology maps in Appendix B.2, and inputted as "Additional discharge (cfs)" below.

	Starting Point	S-1499	S-1498A	S-1496	S-1495	S-1493	S-1491	S-1488	S-1486A
Location station (ft):	1501+89.0	1499+25.0	1498+29.1	1496+66.5	1495+17.3	1493+65.1	1491+00.0	1488+63.0	1486+94.0
Longitudinal profile ("on-grade" or "sag"):		on-grade	on-grade	on-grade	on-grade	on-grade	on-grade	on-grade	on-grade
Calculation Type ("grate", "side opening", or "shoulder hydraulics only"):		grate	grate	grate	grate	grate	grate	grate	grate
Longitudinal slope, S:		1.40%	1.40%	1.40%	1.40%	1.40%	1.40%	1.40%	1.40%
Shoulder cross-slope, Sx:		3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%
Average watershed paved width (ft):		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Shoulder Manning's n:		0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016
Inlet description (optional):									
Clogging factor for on-grade grates:		33%	33%	33%	33%	33%	33%	33%	33%
Grate width (ft):		2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Grate length (ft):		3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00
Precipitation intensity (in/hr):		3.29	3.29	3.29	3.29	3.29	3.29	3.29	3.29
Runoff Coefficient for paved areas, "C_p":		0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Runoff Coefficient for unpaved areas, "C_u":		0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63
Unpaved area contributing to this inlet (acres):		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Watershed paved length (ft):		264.0	95.9	162.6	149.1	152.2	265.1	237.0	169.0
Paved area contributing to this inlet (acres):		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Subarea discharge Q_{sa} (cfs):		0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Additional discharge (cfs):		1.630	0.740	0.880	1.100	0.890	1.650	1.600	1.090
Total discharge Q_t, including any upstream by-pass (cfs):		**1.630**	**1.247**	**1.213**	**1.419**	**1.299**	**2.006**	**2.292**	**1.930**
By-pass Q (cfs): *Describe here source of bypass:*	0.000	**0.51**	**0.33**	**0.32**	**0.41**	**0.36**	**0.69**	**0.84**	**0.65**
DEPRESSION CALCULATION:									
Width of depression "w" (ft):									
Depression depth "a" (from flowline w/o depression) (in):									
Depression cross-slope (Sw=Sx+a/12w):									
Fraction of flow over the depression (Eo):									
Discharge-weighted equivalent cross-slope (Se):									
Q_s (first guess: **Qt - 0.001**, after iteration should be same as next line)		0.005			0.013	0.024	0.000	0.005	0.000
Q_s over shoulder (excluding flow over the depression) (cfs):									
Q=Q_w+Q_s (cfs) (after iterations must match **Q_t** value):									
HYDRAULIC RESULTS:									
Flooded Width T for Q_t, upstream of inlet (ft):		**6.31**	**5.71**	**5.65**	**5.99**	**5.79**	**6.82**	**7.17**	**6.72**
Flooded Width T at depression (if any) (ft):		**6.31**	**5.71**	**5.65**	**5.99**	**5.79**	**6.82**	**7.17**	**6.72**
Flooded Width T for BYPASS Q downstream of inlet (ft):	0.00	**4.07**	**3.48**	**3.42**	**3.76**	**3.56**	**4.57**	**4.92**	**4.48**
Water depth at curb (with or without depression) (in):		2.27	2.05	2.03	2.16	2.09	2.45	2.58	2.42
Water cross-area at shoulder (without depression) (sq.ft.):		0.60	0.49	0.48	0.54	0.50	0.70	0.77	0.68
Water velocity immediately u/s from inlet (w/o depression) (fps):		2.73	2.55	2.54	2.64	2.58	2.88	2.97	2.85
Average water velocity for the segment to this inlet (fps):		1.02	1.15	1.11	1.13	1.14	1.21	1.31	1.29
Flowtime from the previous inlet to this one (min):		4.32	1.39	2.45	2.20	2.23	3.64	3.02	2.18
GRATE INLETS ON-GRADE:									
Splash-over V for effective length of grate (type P-1 3/8) (fps):		6.81	6.81	6.81	6.81	6.81	6.81	6.81	6.81
Effective length of grate considering clogging factor (ft):		2.01	2.01	2.01	2.01	2.01	2.01	2.01	2.01
Ratio of grate frontal flow to total flow:		0.64	0.684	0.688	0.662	0.677	0.604	0.582	0.610
Fraction of frontal flow intercepted (Rf):		100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Fraction of side flow interception (Rs):		14.0%	15.6%	15.7%	14.8%	15.3%	13.0%	12.3%	13.2%
Total flow intercepted (cfs):		1.12	0.914	0.894	1.010	0.943	1.314	1.452	1.277
Grate Efficiency (E):		68.9%	73.3%	73.7%	71.2%	72.6%	65.5%	63.3%	66.1%
Grate flow-through flow (cfs):		**0.51**	**0.333**	**0.319**	**0.409**	**0.356**	**0.692**	**0.840**	**0.654**
SLOTTED DRAINS & SIDE-OPENING INLETS ON-GRADE:									
Length required for total interception (ft):									
Length of inlet provided L (ft):									
Efficiency for length L:									
Interception for length L (cfs):									
Side opening flow-through flow (cfs):									
INTERCEPTION CAPACITY OF INLETS IN SAG LOCATION:									
Maximum allowable flooded width (including the depression) (ft):									
Max. head at sag w/o exceeding allowable flooded width (ft):									
Capacity of grate in a sag (3-sided weir) (cfs):									
Length provided of curb-opening inlet at sag (ft):									
Capacity of curb-opening inlet in a sag (weir) (cfs):									

ONDRAIN_English Version 7.5d, developed by Fernando Manzanera, Caltrans District 1, Hydraulics Capital Support (December 2010).

Notes: -This program utilizes the equations presented in the FHA Hydraulic Engineering Circular 22 (HEC-22), FHWA-NHI-10-009.

- Underlined values are calculated by the program, the others are input by the user.

South 1500's

HYDRAULIC CALCULATOR FOR ONSITE DRAINAGE (English Units)

Date: 08/05/21

RCTC I-15 ELPSE

Note: "Subarea discharge Qsa (cfs)" was obtained from "Design Discharge" column of Hydrological Tables found within the hydrology maps in Appendix B.2, and inputted as "Additional discharge (cfs)" below.

	Starting Point	S-1485	S-1484						
Location station (ft):	**1485+16.0**	**1485+16.0**	**1484+25.0**						
Longitudinal profile ("on-grade" or "sag"):		on-grade	on-grade						
Calculation Type ("grate", "side opening", or "shoulder hydraulics only"):		grate	side opening						
Longitudinal slope, S:		1.40%	1.40%						
Shoulder cross-slope, Sx:		3.00%	3.00%						
Average watershed paved width (ft):		0.00	0.00						
Shoulder Manning's n:		0.016	0.016						
Inlet description (optional):									
Clogging factor for on-grade grates:		33%							
Grate width (ft):		2.00							
Grate length (ft):		3.00							
Precipitation intensity (in/hr):		3.29	3.29						
Runoff Coefficient for paved areas, "C_p":		0.99	0.99						
Runoff Coefficient for unpaved areas, "C_u":		0.63	0.63						
Unpaved area contributing to this inlet (acres):		0.000	0.000						
Watershed paved length (ft):		0.0	91.0						
Paved area contributing to this inlet (acres):		0.000	0.000						
Subarea discharge Q_{sa} (cfs):		0.00	0.000						
Additional discharge (cfs):		1.150	0.530						
Total discharge Q_t, including any upstream by-pass (cfs):		**1.810**	**1.124**						
By-pass Q (cfs): *Describe here source of bypass:*	**0.660**	**0.59**	**0.00**						
DEPRESSION CALCULATION:									
Width of depression "w" (ft):									
Depression depth "a" (from flowline w/o depression) (in):									
Depression cross-slope (Sw=Sx+a/12w):									
Fraction of flow over the depression (Eo):									
Discharge-weighted equivalent cross-slope (Se):									
Q_s (first guess: **Qt - 0.001**, after iteration should be same as next line)		0.005							
Q_s over shoulder (excluding flow over the depression) (cfs):									
Q=Q_w+Q_s (cfs) (after iterations must match **Q_t** value):									
HYDRAULIC RESULTS:									
Flooded Width T for Q_t, upstream of inlet (ft):		**6.56**	**5.49**						
Flooded Width T at depression (if any) (ft):		**6.56**	**5.49**						
Flooded Width T for BYPASS Q downstream of inlet (ft):	**0.00**	**4.32**	**0.00**						
Water depth at curb (with or without depression) (in):		2.36	1.98						
Water cross-area at shoulder (without depression) (sq.ft.):		0.65	0.45						
Water velocity immediately u/s from inlet (w/o depression) (fps):		2.80	2.49						
Average water velocity for the segment to this inlet (fps):		1.05	1.15						
Flowtime from the previous inlet to this one (min):		0.00	1.32						
GRATE INLETS ON-GRADE:									
Splash-over V for effective length of grate (type P-1 3/8) (fps):		6.81							
Effective length of grate considering clogging factor (ft):		2.01							
Ratio of grate frontal flow to total flow:		0.62							
Fraction of frontal flow intercepted (Rf):		100.0%							
Fraction of side flow interception (Rs):		13.5%							
Total flow intercepted (cfs):		1.22							
Grate Efficiency (E):		67.2%							
Grate flow-through flow (cfs):		**0.59**							
SLOTTED DRAINS & SIDE-OPENING INLETS ON-GRADE:									
Length required for total interception (ft):			17.16						
Length of inlet provided L (ft):			27.00						
Efficiency for length L:			100.0%						
Interception for length L (cfs):			1.124						
Side opening flow-through flow (cfs):			**0.000**						
INTERCEPTION CAPACITY OF INLETS IN SAG LOCATION:									
Maximum allowable flooded width (including the depression) (ft):									
Max. head at sag w/o exceeding allowable flooded width (ft):									
Capacity of grate in a sag (3-sided weir) (cfs):									
Length provided of curb-opening inlet at sag (ft):									
Capacity of curb-opening inlet in a sag (weir) (cfs):									

ONDRAIN_English Version 7.5d, developed by Fernando Manzanera, Caltrans District 1, Hydraulics Capital Support (December 2010).

Notes: -This program utilizes the equations presented in the FHA Hydraulic Engineering Circular 22 (HEC-22), FHWA-NHI-10-009.

- Underlined values are calculated by the program, the others are input by the user.

Separate Run

HYDRAULIC CALCULATOR FOR ONSITE DRAINAGE (English Units)

Date: 05/25/21

RCTC I-15 ELPSE

Note: "Subarea discharge Qsa (cfs)" was obtained from "Design Discharge" column of Hydrological Tables found within the hydrology maps in Appendix B.2, and inputted as "Additional discharge (cfs)" below.

	Starting Point	S-1553	S-1554A	S-1555	S-1556	S-1558	S-1559	S-1560	S-1561
Location station (ft):	1552+57.0	1553+70.0	1554+00.0	1555+00.0	1556+00.0	1558+00.0	1559+00.0	1560+22.0	1561+22.0
Longitudinal profile ("on-grade" or "sag"):		on-grade	on-grade	on-grade	on-grade	on-grade	on-grade	on-grade	on-grade
Calculation Type ("grate", "side opening", or "shoulder hydraulics only"):		grate	grate	grate	grate	grate	grate	grate	grate
Longitudinal slope, S:		1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	0.50%	0.50%
Shoulder cross-slope, Sx:		2.00%	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%
Average watershed paved width (ft):		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Shoulder Manning's n:		0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016
Inlet description (optional):									
Clogging factor for on-grade grates:		33%	33%	33%	33%	33%	33%	33%	33%
Grate width (ft):		2.00	2.00	2.00	4.00	2.00	4.00	2.00	4.00
Grate length (ft):		3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00
Precipitation intensity (in/hr):		3.29	3.29	3.29	3.29	3.29	7.29	3.29	3.29
Runoff Coefficient for paved areas, "C_p":		0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Runoff Coefficient for unpaved areas, "C_u":		0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63
Unpaved area contributing to this inlet (acres):		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Watershed paved length (ft):		113.0	30.0	100.0	100.0	200.0	100.0	122.0	100.0
Paved area contributing to this inlet (acres):		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Subarea discharge Q_{sa} (cfs):		0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Additional discharge (cfs):		0.360	0.230	0.580	0.680	1.240	0.610	0.740	0.550
Total discharge Q_t, including any upstream by-pass (cfs):		**0.360**	**0.298**	**0.627**	**0.852**	**1.305**	**1.121**	**0.864**	**0.840**
By-pass Q (cfs): *Describe here source of bypass:*	**0.000**	**0.07**	**0.05**	**0.17**	**0.07**	**0.51**	**0.12**	**0.29**	**0.09**
DEPRESSION CALCULATION:									
Width of depression "w" (ft):									
Depression depth "a" (from flowline w/o depression) (in):									
Depression cross-slope (Sw=Sx+a/12w):									
Fraction of flow over the depression (Eo):									
Discharge-weighted equivalent cross-slope (Se):									
Q_s (first guess: **Qt - 0.001**, after iteration should be same as next line)		0.005			0.013	0.024	0.000	0.005	0.000
Q_s over shoulder (excluding flow over the depression) (cfs):									
Q=Q_w+Q_s (cfs) (after iterations must match **Q_t** value):									
HYDRAULIC RESULTS:									
Flooded Width T for Q_t, upstream of inlet (ft):		**4.91**	**4.58**	**6.05**	**6.79**	**7.97**	**7.52**	**7.77**	**7.69**
Flooded Width T at depression (if any) (ft):		**4.91**	**4.58**	**6.05**	**6.79**	**7.97**	**7.52**	**7.77**	**7.69**
Flooded Width T for BYPASS Q downstream of inlet (ft):	**0.00**	**2.62**	**2.30**	**3.72**	**2.59**	**5.60**	**3.30**	**5.16**	**3.29**
Water depth at curb (with or without depression) (in):		1.18	1.10	1.45	1.63	1.91	1.81	1.87	1.85
Water cross-area at shoulder (without depression) (sq.ft.):		0.24	0.21	0.37	0.46	0.63	0.57	0.60	0.59
Water velocity immediately u/s from inlet (w/o depression) (fps):		1.49	1.42	1.71	1.85	2.06	1.98	1.43	1.42
Average water velocity for the segment to this inlet (fps):		0.55	0.61	0.69	0.79	0.81	0.90	0.58	0.63
Flowtime from the previous inlet to this one (min):		3.40	0.82	2.42	2.12	4.09	1.85	3.48	2.64
GRATE INLETS ON-GRADE:									
Splash-over V for effective length of grate (type P-1 3/8) (fps):		6.81	6.81	6.81	6.81	6.81	6.81	6.81	6.81
Effective length of grate considering clogging factor (ft):		2.01	2.01	2.01	2.01	2.01	2.01	2.01	2.01
Ratio of grate frontal flow to total flow:		0.75	0.784	0.657	0.907	0.537	0.868	0.548	0.859
Fraction of frontal flow intercepted (Rf):		100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Fraction of side flow interception (Rs):		24.5%	26.1%	20.1%	18.0%	15.3%	16.3%	25.8%	26.1%
Total flow intercepted (cfs):		0.29	0.250	0.456	0.787	0.794	0.997	0.574	0.752
Grate Efficiency (E):		81.2%	84.0%	72.6%	92.4%	60.8%	88.9%	66.5%	89.6%
Grate flow-through flow (cfs):		**0.07**	**0.047**	**0.172**	**0.065**	**0.511**	**0.124**	**0.290**	**0.088**
SLOTTED DRAINS & SIDE-OPENING INLETS ON-GRADE:									
Length required for total interception (ft):									
Length of inlet provided L (ft):									
Efficiency for length L:									
Interception for length L (cfs):									
Side opening flow-through flow (cfs):									
INTERCEPTION CAPACITY OF INLETS IN SAG LOCATION:									
Maximum allowable flooded width (including the depression) (ft):									
Max. head at sag w/o exceeding allowable flooded width (ft):									
Capacity of grate in a sag (3-sided weir) (cfs):									
Length provided of curb-opening inlet at sag (ft):									
Capacity of curb-opening inlet in a sag (weir) (cfs):									

ONDRAIN_English Version 7.5d, developed by Fernando Manzanera, Caltrans District 1, Hydraulics Capital Support (December 2010).

Notes: -This program utilizes the equations presented in the FHA Hydraulic Engineering Circular 22 (HEC-22), FHWA-NHI-10-009.

- Underlined values are calculated by the program, the others are input by the user.

South 1500's

HYDRAULIC CALCULATOR FOR ONSITE DRAINAGE (English Units)

Date: 05/25/21

RCTC I-15 ELPSE

Note: "Subarea discharge Qsa (cfs)" was obtained from "Design Discharge" column of Hydrological Tables found within the hydrology maps in Appendix B.2, and inputted as "Additional discharge (cfs)" below.

	Starting Point	S-1562A	S-1563A	S-1564A	S-1564B	S-1566A	S-1566B	S-1568	S-1569
Location station (ft):	1561+22.0	1562+22.0	1563+23.0	1564+08.0	1564+66.0	1566+00.0	1566+90.0	1568+12.0	1569+02.0
Longitudinal profile ("on-grade" or "sag"):		on-grade	on-grade	on-grade	on-grade	on-grade	on-grade	on-grade	on-grade
Calculation Type ("grate", "side opening", or "shoulder hydraulics only"):		grate	grate	grate	grate	grate	grate	grate	grate
Longitudinal slope, S:		0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%
Shoulder cross-slope, Sx:		2.00%	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%
Average watershed paved width (ft):		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Shoulder Manning's n:		0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016
Inlet description (optional):									
Clogging factor for on-grade grates:		33%	33%	33%	33%	33%	33%	33%	33%
Grate width (ft):		2.00	2.00	2.00	4.00	2.00	4.00	4.00	4.00
Grate length (ft):		3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00
Precipitation intensity (in/hr):		3.29	3.29	3.29	3.29	3.29	3.29	3.29	3.29
Runoff Coefficient for paved areas, "C_p":		0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Runoff Coefficient for unpaved areas, "C_u":		0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63
Unpaved area contributing to this inlet (acres):		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Watershed paved length (ft):		100.0	101.0	85.0	58.0	134.0	90.0	122.0	90.0
Paved area contributing to this inlet (acres):		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Subarea discharge Q_{sa} (cfs):		0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Additional discharge (cfs):		0.670	0.560	0.610	0.360	0.820	0.490	0.660	0.490
Total discharge Q_t, including any upstream by-pass (cfs):		**0.760**	**0.800**	**0.869**	**0.652**	**0.869**	**0.782**	**0.735**	**0.555**
By-pass Q (cfs): *Describe here source of bypass:*	0.090	**0.24**	**0.26**	**0.29**	**0.05**	**0.29**	**0.07**	**0.06**	**0.03**
DEPRESSION CALCULATION:									
Width of depression "w" (ft):									
Depression depth "a" (from flowline w/o depression) (in):									
Depression cross-slope (Sw=Sx+a/12w):									
Fraction of flow over the depression (Eo):									
Discharge-weighted equivalent cross-slope (Se):									
Q_s (first guess: **Qt - 0.001**, after iteration should be same as next line)		0.005			0.013	0.024	0.000	0.005	0.000
Q_s over shoulder (excluding flow over the depression) (cfs):									
Q=Q_w+Q_s (cfs) (after iterations must match **Q_t** value):									
HYDRAULIC RESULTS:									
Flooded Width T for Q_t, upstream of inlet (ft):		**7.41**	**7.55**	**7.79**	**6.99**	**7.79**	**7.49**	**7.31**	**6.58**
Flooded Width T at depression (if any) (ft):		**7.41**	**7.55**	**7.79**	**6.99**	**7.79**	**7.49**	**7.31**	**6.58**
Flooded Width T for BYPASS Q downstream of inlet (ft):	0.00	**4.80**	**4.94**	**5.17**	**2.64**	**5.17**	**3.10**	**2.94**	**2.26**
Water depth at curb (with or without depression) (in):		1.78	1.81	1.87	1.68	1.87	1.80	1.75	1.58
Water cross-area at shoulder (without depression) (sq.ft.):		0.55	0.57	0.61	0.49	0.61	0.56	0.53	0.43
Water velocity immediately u/s from inlet (w/o depression) (fps):		1.39	1.40	1.43	1.33	1.43	1.40	1.37	1.28
Average water velocity for the segment to this inlet (fps):		0.52	0.62	0.63	0.61	0.57	0.62	0.56	0.53
Flowtime from the previous inlet to this one (min):		3.23	2.73	2.25	1.59	3.92	2.40	3.62	2.85
GRATE INLETS ON-GRADE:									
Splash-over V for effective length of grate (type P-1 3/8) (fps):		6.81	6.81	6.81	6.81	6.81	6.81	6.81	6.81
Effective length of grate considering clogging factor (ft):		2.01	2.01	2.01	2.01	2.01	2.01	2.01	2.01
Ratio of grate frontal flow to total flow:		0.57	0.560	0.547	0.896	0.547	0.870	0.879	0.918
Fraction of frontal flow intercepted (Rf):		100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Fraction of side flow interception (Rs):		27.0%	26.5%	25.8%	28.3%	25.8%	26.7%	27.3%	29.8%
Total flow intercepted (cfs):		0.52	0.541	0.577	0.603	0.577	0.707	0.670	0.523
Grate Efficiency (E):		68.5%	67.7%	66.4%	92.5%	66.4%	90.5%	91.2%	94.2%
Grate flow-through flow (cfs):		**0.24**	**0.259**	**0.292**	**0.049**	**0.292**	**0.075**	**0.065**	**0.032**
SLOTTED DRAINS & SIDE-OPENING INLETS ON-GRADE:									
Length required for total interception (ft):									
Length of inlet provided L (ft):		12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
Efficiency for length L:									
Interception for length L (cfs):									
Side opening flow-through flow (cfs):									
INTERCEPTION CAPACITY OF INLETS IN SAG LOCATION:									
Maximum allowable flooded width (including the depression) (ft):									
Max. head at sag w/o exceeding allowable flooded width (ft):									
Capacity of grate in a sag (3-sided weir) (cfs):									
Length provided of curb-opening inlet at sag (ft):									
Capacity of curb-opening inlet in a sag (weir) (cfs):									

ONDRAIN_English Version 7.5d, developed by Fernando Manzanera, Caltrans District 1, Hydraulics Capital Support (December 2010).

Notes: -This program utilizes the equations presented in the FHA Hydraulic Engineering Circular 22 (HEC-22), FHWA-NHI-10-009.

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South 1500's

HYDRAULIC CALCULATOR FOR ONSITE DRAINAGE (English Units)

Date: 08/03/21

RCTC I-15 ELPSE

Note: "Subarea discharge Qsa (cfs)" was obtained from "Design Discharge" column of Hydrological Tables found within the hydrology maps in Appendix B.2, and inputted as "Additional discharge (cfs)" below.

	Starting Point	S-1570A	SLOTTED	SLOTTED	SLOTTED	S-1570B			
Location station (ft):	**1569+02.0**	**1570+00.0**	**1570+10.0**	**1570+20.0**	**1570+30.0**	**1570+48.0**			
Longitudinal profile ("on-grade" or "sag"):		on-grade	on-grade	on-grade	on-grade	on-grade			
Calculation Type ("grate", "side opening", or "shoulder hydraulics only"):		grate	side opening	side opening	side opening	grate			
Longitudinal slope, S:		0.60%	0.50%	0.50%	0.50%	0.50%			
Shoulder cross-slope, Sx:		1.40%	1.40%	1.40%	0.90%	0.40%			
Average watershed paved width (ft):		0.00	78.41	74.05	56.63	19.36			
Shoulder Manning's n:		0.016	0.016	0.016	0.016	0.016			
Inlet description (optional):									
Clogging factor for on-grade grates:		33%				33%			
Grate width (ft):		2.00				4.00			
Grate length (ft):		3.00				3.00			
Precipitation intensity (in/hr):		3.29	3.29	3.29	3.29	3.29			
Runoff Coefficient for paved areas, "C_p":		0.99	0.99	0.99	0.99	0.99			
Runoff Coefficient for unpaved areas, "C_u":		0.63	0.63	0.63	0.63	0.63			
Unpaved area contributing to this inlet (acres):		0.000	0.000	0.000	0.000	0.000			
Watershed paved length (ft):		98.0	10.0	10.0	10.0	18.0			
Paved area contributing to this inlet (acres):		0.000	0.018	0.017	0.013	0.008			
Subarea discharge Q_{sa} (cfs):		0.00	0.059	0.055	0.042	0.026			
Additional discharge (cfs):		0.520							
Total discharge Q_t, including any upstream by-pass (cfs):		**0.550**	**0.252**	**0.057**	**0.042**	**0.026**			
By-pass Q (cfs): *Describe here source of bypass:*	**0.030**	**0.19**	**0.00**	**0.00**	**0.00**	**0.00**			
DEPRESSION CALCULATION:									
Width of depression "w" (ft):									
Depression depth "a" (from flowline w/o depression) (in):									
Depression cross-slope (Sw=Sx+a/12w):									
Fraction of flow over the depression (Eo):									
Discharge-weighted equivalent cross-slope (Se):									
Q_s (first guess: **Qt - 0.001**, after iteration should be same as next line)		0.005			0.013	0.024			
Q_s over shoulder (excluding flow over the depression) (cfs):									
Q=Q_w+Q_s (cfs) (after iterations must match **Q_t** value):									
HYDRAULIC RESULTS:									
Flooded Width T for Q_t, upstream of inlet (ft):		**7.92**	**6.12**	**3.50**	**4.13**	**5.72**			
Flooded Width T at depression (if any) (ft):		**7.92**	**6.12**	**3.50**	**4.13**	**5.72**			
Flooded Width T for BYPASS Q downstream of inlet (ft):	**0.00**	**5.35**	**0.90**	**0.00**	**0.00**	**1.41**			
Water depth at curb (with or without depression) (in):		1.33	1.03	0.59	0.45	0.27			
Water cross-area at shoulder (without depression) (sq.ft.):		0.44	0.26	0.09	0.08	0.07			
Water velocity immediately u/s from inlet (w/o depression) (fps):		1.25	0.96	0.66	0.55	0.40			
Average water velocity for the segment to this inlet (fps):		0.47	0.46	0.26	0.20	0.15			
Flowtime from the previous inlet to this one (min):		3.51	0.36	0.65	0.81	2.03			
GRATE INLETS ON-GRADE:									
Splash-over V for effective length of grate (type P-1 3/8) (fps):		6.81				6.81			
Effective length of grate considering clogging factor (ft):		2.01				2.01			
Ratio of grate frontal flow to total flow:		0.54				0.960			
Fraction of frontal flow intercepted (Rf):		100.0%				100.0%			
Fraction of side flow interception (Rs):		23.7%				41.0%			
Total flow intercepted (cfs):		0.36				0.025			
Grate Efficiency (E):		64.9%				97.6%			
Grate flow-through flow (cfs):		**0.19**				**0.001**			
SLOTTED DRAINS & SIDE-OPENING INLETS ON-GRADE:									
Length required for total interception (ft):			10.62	5.69	6.55				
Length of inlet provided L (ft):		12.00	10.00	10.00	10.00	18.00			
Efficiency for length L:			99.4%	100.0%	100.0%				
Interception for length L (cfs):			0.250	0.057	0.042				
Side opening flow-through flow (cfs):			**0.002**	**0.000**	**0.000**				
INTERCEPTION CAPACITY OF INLETS IN SAG LOCATION:									
Maximum allowable flooded width (including the depression) (ft):									
Max. head at sag w/o exceeding allowable flooded width (ft):									
Capacity of grate in a sag (3-sided weir) (cfs):									
Length provided of curb-opening inlet at sag (ft):									
Capacity of curb-opening inlet in a sag (weir) (cfs):									

ONDRAIN_English Version 7.5d, developed by Fernando Manzanera, Caltrans District 1, Hydraulics Capital Support (December 2010).

Notes: -This program utilizes the equations presented in the FHA Hydraulic Engineering Circular 22 (HEC-22), FHWA-NHI-10-009.

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Separate Run

HYDRAULIC CALCULATOR FOR ONSITE DRAINAGE (English Units)

Date: 08/03/21

RCTC I-15 ELPSE

Note: "Subarea discharge Qsa (cfs)" was obtained from "Design Discharge" column of Hydrological Tables found within the hydrology maps in Appendix B.2, and inputted as "Additional discharge (cfs)" below.

	Starting Point	S-1596A	S-1598	S-1600	S-1601	S-1602	S-1603A	S-1604	S-1606
Location station (ft):	1593+10.0	1596+00.0	1598+00.0	1600+00.0	1601+00.0	1602+00.0	1603+00.0	1603+87.0	1606+15.0
Longitudinal profile ("on-grade" or "sag"):		on-grade	on-grade	on-grade	on-grade	on-grade	on-grade	on-grade	on-grade
Calculation Type ("grate", "side opening", or "shoulder hydraulics only"):		grate	grate	grate	grate	grate	grate	side opening	grate
Longitudinal slope, S:		0.80%	0.80%	0.80%	0.80%	0.80%	0.80%	0.80%	0.80%
Shoulder cross-slope, Sx:		3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%
Average watershed paved width (ft):		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Shoulder Manning's n:		0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016
Inlet description (optional):									
Clogging factor for on-grade grates:		33%	33%	33%	33%	33%	33%		33%
Grate width (ft):		2.00	2.00	2.00	2.00	2.00	2.00		2.00
Grate length (ft):		3.00	3.00	3.00	3.00	3.00	3.00		3.00
Precipitation intensity (in/hr):		3.47	3.47	3.47	3.47	3.47	3.47	3.47	3.47
Runoff Coefficient for paved areas, "C_p":		0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Runoff Coefficient for unpaved areas, "C_u":		0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63
Unpaved area contributing to this inlet (acres):		0.020	0.020	0.020	0.020	0.020	0.060	0.070	0.000
Watershed paved length (ft):		290.0	200.0	200.0	100.0	100.0	100.0	87.0	228.0
Paved area contributing to this inlet (acres):		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Subarea discharge Q_{sa} (cfs):		0.04	0.044	0.044	0.044	0.044	0.131	0.153	0.000
Additional discharge (cfs):		1.640	1.710	1.350	0.680	0.690	0.620	0.550	1.770
Total discharge Q_t, including any upstream by-pass (cfs):		**1.684**	**2.317**	**2.287**	**1.601**	**1.257**	**1.113**	**1.002**	**1.770**
By-pass Q (cfs): *Describe here source of bypass:*	**0.000**	**0.56**	**0.89**	**0.88**	**0.52**	**0.36**	**0.30**	**0.00**	**0.61**
DEPRESSION CALCULATION:									
Width of depression "w" (ft):									
Depression depth "a" (from flowline w/o depression) (in):									
Depression cross-slope (Sw=Sx+a/12w):									
Fraction of flow over the depression (Eo):									
Discharge-weighted equivalent cross-slope (Se):									
Q_s (first guess: **Qt - 0.001**, after iteration should be same as next line)		0.005			0.013	0.024	0.000	0.005	0.000
Q_s over shoulder (excluding flow over the depression) (cfs):									
Q=Q_w+Q_s (cfs) (after iterations must match **Q_t** value):									
HYDRAULIC RESULTS:									
Flooded Width T for Q_t, upstream of inlet (ft):		**7.09**	**7.99**	**7.96**	**6.96**	**6.36**	**6.07**	**5.84**	**7.23**
Flooded Width T at depression (if any) (ft):		**7.09**	**7.99**	**7.96**	**6.96**	**6.36**	**6.07**	**5.84**	**7.23**
Flooded Width T for BYPASS Q downstream of inlet (ft):	**0.00**	**4.71**	**5.59**	**5.55**	**4.57**	**3.98**	**3.71**	**0.00**	**4.84**
Water depth at curb (with or without depression) (in):		2.55	2.88	2.86	2.51	2.29	2.19	2.10	2.60
Water cross-area at shoulder (without depression) (sq.ft.):		0.75	0.96	0.95	0.73	0.61	0.55	0.51	0.78
Water velocity immediately u/s from inlet (w/o depression) (fps):		2.23	2.42	2.41	2.20	2.07	2.01	1.96	2.26
Average water velocity for the segment to this inlet (fps):		0.83	1.04	1.08	1.02	0.94	0.89	0.86	0.84
Flowtime from the previous inlet to this one (min):		5.81	3.19	3.08	1.63	1.78	1.87	1.69	4.51
GRATE INLETS ON-GRADE:									
Splash-over V for effective length of grate (type P-1 3/8) (fps):		6.81	6.81	6.81	6.81	6.81	6.81		6.81
Effective length of grate considering clogging factor (ft):		2.01	2.01	2.01	2.01	2.01	2.01		2.01
Ratio of grate frontal flow to total flow:		0.59	0.536	0.538	0.595	0.635	0.655		0.579
Fraction of frontal flow intercepted (Rf):		100.0%	100.0%	100.0%	100.0%	100.0%	100.0%		100.0%
Fraction of side flow interception (Rs):		19.0%	16.9%	17.0%	19.4%	21.1%	22.1%		18.7%
Total flow intercepted (cfs):		1.12	1.424	1.410	1.078	0.895	0.814		1.163
Grate Efficiency (E):		66.5%	61.4%	61.6%	67.3%	71.2%	73.1%		65.7%
Grate flow-through flow (cfs):		**0.56**	**0.894**	**0.877**	**0.523**	**0.362**	**0.299**		**0.607**
SLOTTED DRAINS & SIDE-OPENING INLETS ON-GRADE:									
Length required for total interception (ft):								13.83	
Length of inlet provided L (ft):		12.00	12.00	12.00	12.00	12.00	12.00	21.00	
Efficiency for length L:								100.0%	
Interception for length L (cfs):								1.002	
Side opening flow-through flow (cfs):								**0.000**	
INTERCEPTION CAPACITY OF INLETS IN SAG LOCATION:									
Maximum allowable flooded width (including the depression) (ft):									
Max. head at sag w/o exceeding allowable flooded width (ft):									
Capacity of grate in a sag (3-sided weir) (cfs):									
Length provided of curb-opening inlet at sag (ft):									
Capacity of curb-opening inlet in a sag (weir) (cfs):									

ONDRAIN_English Version 7.5d, developed by Fernando Manzanera, Caltrans District 1, Hydraulics Capital Support (December 2010).

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HYDRAULIC CALCULATOR FOR ONSITE DRAINAGE (English Units)

Date: 08/03/21

RCTC I-15 ELPSE

Note: "Subarea discharge Qsa (cfs)" was obtained from "Design Discharge" column of Hydrological Tables found within the hydrology maps in Appendix B.2, and inputted as "Additional discharge (cfs)" below.

	Starting Point	S-1607	S-1609	S-1612	S-1614	S-1616A	S-1616B	SLOTTED	SLOTTED
Location station (ft):	1606+15.0	1607+00.0	1609+00.0	1612+50.0	1615+00.0	1616+00.0	1616+50.0	1616+75.0	1617+00.0
Longitudinal profile ("on-grade" or "sag"):		on-grade	on-grade	on-grade	on-grade	on-grade	on-grade	on-grade	on-grade
Calculation Type ("grate", "side opening", or "shoulder hydraulics only"):		grate	grate	grate	grate	grate	grate	side opening	side opening
Longitudinal slope, S:		0.80%	0.80%	0.80%	0.80%	0.80%	0.80%	0.80%	0.80%
Shoulder cross-slope, Sx:		3.00%	3.00%	3.00%	3.00%	2.80%	2.00%	1.60%	1.10%
Average watershed paved width (ft):		0.00	0.00	0.00	0.00	0.00	71.00	63.89	63.89
Shoulder Manning's n:		0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016
Inlet description (optional):									
Clogging factor for on-grade grates:		33%	33%	33%	33%	33%	33%		
Grate width (ft):		2.00	2.00	4.00	2.00	4.00	4.00		
Grate length (ft):		3.00	3.00	3.00	3.00	3.00	3.00		
Precipitation intensity (in/hr):		3.47	3.47	3.47	3.47	3.47	3.47	3.47	3.47
Runoff Coefficient for paved areas, "C_p":		0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Runoff Coefficient for unpaved areas, "C_u":		0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63
Unpaved area contributing to this inlet (acres):		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Watershed paved length (ft):		85.0	200.0	350.0	250.0	100.0	50.0	25.0	25.0
Paved area contributing to this inlet (acres):		0.000	0.000	0.000	0.000	0.000	0.081	0.037	0.037
Subarea discharge Q_{sa} (cfs):		0.00	0.000	0.000	0.000	0.000	0.280	0.126	0.126
Additional discharge (cfs):		0.470	1.360	1.700	1.680	0.630			
Total discharge Q_t, including any upstream by-pass (cfs):		**1.070**	**1.641**	**2.242**	**1.963**	**1.335**	**0.379**	**0.132**	**0.126**
By-pass Q (cfs): *Describe here source of bypass:*	**0.600**	**0.28**	**0.54**	**0.28**	**0.71**	**0.10**	**0.01**	**0.00**	**0.00**
DEPRESSION CALCULATION:									
Width of depression "w" (ft):									
Depression depth "a" (from flowline w/o depression) (in):									
Depression cross-slope (Sw=Sx+a/12w):									
Fraction of flow over the depression (Eo):									
Discharge-weighted equivalent cross-slope (Se):									
Q_s (first guess: **Qt - 0.001**, after iteration should be same as next line)		0.005			0.013	0.024	0.000	0.005	0.000
Q_s over shoulder (excluding flow over the depression) (cfs):									
Q=Q_w+Q_s (cfs) (after iterations must match **Q_t** value):									
HYDRAULIC RESULTS:									
Flooded Width T for Q_t, upstream of inlet (ft):		**5.98**	**7.02**	**7.90**	**7.51**	**6.79**	**5.23**	**4.04**	**5.02**
Flooded Width T at depression (if any) (ft):		**5.98**	**7.02**	**7.90**	**7.51**	**6.79**	**5.23**	**4.04**	**5.02**
Flooded Width T for BYPASS Q downstream of inlet (ft):	**0.00**	**3.62**	**4.64**	**3.63**	**5.12**	**2.56**	**1.09**	**0.00**	**0.00**
Water depth at curb (with or without depression) (in):		2.15	2.53	2.84	2.70	2.28	1.25	0.78	0.66
Water cross-area at shoulder (without depression) (sq.ft.):		0.54	0.74	0.94	0.85	0.65	0.27	0.13	0.14
Water velocity immediately u/s from inlet (w/o depression) (fps):		1.99	2.22	2.40	2.32	2.07	1.39	1.01	0.91
Average water velocity for the segment to this inlet (fps):		0.74	0.93	1.04	0.97	0.95	0.58	0.39	0.34
Flowtime from the previous inlet to this one (min):		1.91	3.57	5.63	4.31	1.76	1.44	1.06	1.24
GRATE INLETS ON-GRADE:									
Splash-over V for effective length of grate (type P-1 3/8) (fps):		6.81	6.81	6.81	6.81	6.81	6.81		
Effective length of grate considering clogging factor (ft):		2.01	2.01	2.01	2.01	2.01	2.01		
Ratio of grate frontal flow to total flow:		0.66	0.591	0.848	0.562	0.907	0.979		
Fraction of frontal flow intercepted (Rf):		100.0%	100.0%	100.0%	100.0%	100.0%	100.0%		
Fraction of side flow interception (Rs):		22.4%	19.2%	17.1%	18.0%	20.1%	26.9%		
Total flow intercepted (cfs):		0.79	1.098	1.960	1.258	1.236	0.374		
Grate Efficiency (E):		73.8%	66.9%	87.4%	64.1%	92.5%	98.5%		
Grate flow-through flow (cfs):		**0.28**	**0.542**	**0.283**	**0.705**	**0.099**	**0.006**		
SLOTTED DRAINS & SIDE-OPENING INLETS ON-GRADE:									
Length required for total interception (ft):								8.60	10.57
Length of inlet provided L (ft):								13.00	25.00
Efficiency for length L:								100.0%	100.0%
Interception for length L (cfs):								0.132	0.126
Side opening flow-through flow (cfs):								**0.000**	**0.000**
INTERCEPTION CAPACITY OF INLETS IN SAG LOCATION:									
Maximum allowable flooded width (including the depression) (ft):									
Max. head at sag w/o exceeding allowable flooded width (ft):									
Capacity of grate in a sag (3-sided weir) (cfs):									
Length provided of curb-opening inlet at sag (ft):									
Capacity of curb-opening inlet in a sag (weir) (cfs):									

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South 1500's

HYDRAULIC CALCULATOR FOR ONSITE DRAINAGE (English Units)

Date: 08/03/21

RCTC I-15 ELPSE

Note: "Subarea discharge Qsa (cfs)" was obtained from "Design Discharge" column of Hydrological Tables found within the hydrology maps in Appendix B.2, and inputted as "Additional discharge (cfs)" below.

	Starting Point							
		SLOTTED	SLOTTED	SLOTTED	SLOTTED	SLOTTED	SLOTTED	S-1617
Location station (ft):	1617+00.0	1617+10.0	1617+20.0	1617+30.0	1617+35.0	1617+40.0	1617+45.0	1617+50.0
Longitudinal profile ("on-grade" or "sag"):		on-grade	on-grade	on-grade	on-grade	on-grade	on-grade	on-grade
Calculation Type ("grate", "side opening", or "shoulder hydraulics only"):		side opening	side opening	side opening	side opening	side opening	side opening	grate
Longitudinal slope, S:		0.80%	0.80%	0.80%	0.80%	0.80%	0.80%	0.80%
Shoulder cross-slope, Sx:		0.70%	0.70%	0.35%	0.30%	0.30%	0.30%	0.30%
Average watershed paved width (ft):		63.89	63.89	63.89	63.89	63.89	63.89	63.89
Shoulder Manning's n:		0.016	0.016	0.016	0.016	0.016	0.016	0.016
Inlet description (optional):								
Clogging factor for on-grade grates:		33%						33%
Grate width (ft):		2.00						4.00
Grate length (ft):		3.00						3.00
Precipitation intensity (in/hr):		3.47	3.47	3.47	3.47	3.47	3.47	3.47
Runoff Coefficient for paved areas, "C_p":		0.99	0.99	0.99	0.99	0.99	0.99	0.99
Runoff Coefficient for unpaved areas, "C_u":		0.63	0.63	0.63	0.63	0.63	0.63	0.63
Unpaved area contributing to this inlet (acres):		0.000	0.000	0.000	0.000	0.000	0.000	0.000
Watershed paved length (ft):		10.0	10.0	10.0	5.0	5.0	5.0	5.0
Paved area contributing to this inlet (acres):		0.015	0.015	0.015	0.007	0.007	0.007	0.007
Subarea discharge Q_{sa} (cfs):		0.05	0.050	0.050	0.025	0.025	0.025	0.025
Additional discharge (cfs):								
Total discharge Q_t, including any upstream by-pass (cfs):		0.050	0.050	0.050	0.031	0.038	0.042	0.045
By-pass Q (cfs): *Describe here source of bypass:*	0.000	0.00	0.00	0.01	0.01	0.02	0.02	0.00
DEPRESSION CALCULATION:								
Width of depression "w" (ft):								
Depression depth "a" (from flowline w/o depression) (in):								
Depression cross-slope (Sw=Sx+a/12w):								
Fraction of flow over the depression (Eo):								
Discharge-weighted equivalent cross-slope (Se):								
Q_s (first guess: **Qt - 0.001**, after iteration should be same as next line)		0.005			0.013	0.024	0.000	
Q_s over shoulder (excluding flow over the depression) (cfs):								
Q=Q_w+Q_s (cfs) (after iterations must match **Q_t** value):								
HYDRAULIC RESULTS:								
Flooded Width T for Q_t, upstream of inlet (ft):		4.72	4.72	7.29	6.68	7.21	7.50	7.69
Flooded Width T at depression (if any) (ft):		4.72	4.72	7.29	6.68	7.21	7.50	7.69
Flooded Width T for BYPASS Q downstream of inlet (ft):	0.00	0.00	0.00	3.24	4.78	5.34	5.65	3.31
Water depth at curb (with or without depression) (in):		0.40	0.40	0.31	0.24	0.26	0.27	0.28
Water cross-area at shoulder (without depression) (sq.ft.):		0.08	0.08	0.09	0.07	0.08	0.08	0.09
Water velocity immediately u/s from inlet (w/o depression) (fps):		0.65	0.65	0.54	0.46	0.49	0.50	0.51
Average water velocity for the segment to this inlet (fps):		0.24	0.24	0.20	0.19	0.21	0.22	0.23
Flowtime from the previous inlet to this one (min):		0.70	0.70	0.83	0.44	0.39	0.37	0.36
GRATE INLETS ON-GRADE:								
Splash-over V for effective length of grate (type P-1 3/8) (fps):								6.81
Effective length of grate considering clogging factor (ft):								2.01
Ratio of grate frontal flow to total flow:								0.859
Fraction of frontal flow intercepted (Rf):								100.0%
Fraction of side flow interception (Rs):								25.3%
Total flow intercepted (cfs):								0.040
Grate Efficiency (E):								89.5%
Grate flow-through flow (cfs):								0.005
SLOTTED DRAINS & SIDE-OPENING INLETS ON-GRADE:								
Length required for total interception (ft):		9.43	9.43	14.29	12.78	13.91	14.55	
Length of inlet provided L (ft):		10.00	10.00	10.00	5.00	5.00	5.00	5.00
Efficiency for length L:		100.0%	100.0%	88.5%	59.1%	55.2%	53.1%	
Interception for length L (cfs):		0.05	0.050	0.045	0.018	0.021	0.022	
Side opening flow-through flow (cfs):		0.00	0.000	0.006	0.013	0.017	0.020	
INTERCEPTION CAPACITY OF INLETS IN SAG LOCATION:								
Maximum allowable flooded width (including the depression) (ft):								
Max. head at sag w/o exceeding allowable flooded width (ft):								
Capacity of grate in a sag (3-sided weir) (cfs):								
Length provided of curb-opening inlet at sag (ft):								
Capacity of curb-opening inlet in a sag (weir) (cfs):								

ONDRAIN_English Version 7.5d, developed by Fernando Manzanera, Caltrans District 1, Hydraulics Capital Support (December 2010).

Notes: -This program utilizes the equations presented in the FHA Hydraulic Engineering Circular 22 (HEC-22), FHWA-NHI-10-009.

- Underlined values are calculated by the program, the others are input by the user.

South 1500's

Separate Run

HYDRAULIC CALCULATOR FOR ONSITE DRAINAGE (English Units)

Date: 08/03/21

RCTC I-15 ELPSE

Note: "Subarea discharge Qsa (cfs)" was obtained from "Design Discharge" column of Hydrological Tables found within the hydrology maps in Appendix B.2, and inputted as "Additional discharge (cfs)" below.

	Starting Point	S-1674A	S-1675	S-1677A	S-1678A	S-1680	S-1681	S-1682	S-1683
Location station (ft):	1672+47.0	1674+90.0	1675+96.0	1677+00.0	1678+00.0	1680+00.0	1681+00.0	1682+00.0	1683+00.0
Longitudinal profile ("on-grade" or "sag"):		on-grade	on-grade	on-grade	on-grade	on-grade	on-grade	on-grade	on-grade
Calculation Type ("grate", "side opening", or "shoulder hydraulics only"):		grate	grate	grate	grate	grate	grate	grate	side opening
Longitudinal slope, S:		0.70%	0.70%	0.70%	0.70%	0.70%	0.70%	0.70%	0.70%
Shoulder cross-slope, Sx:		3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%
Average watershed paved width (ft):		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Shoulder Manning's n:		0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016
Inlet description (optional):									
Clogging factor for on-grade grates:		33%	33%	33%	33%	33%	33%	33%	
Grate width (ft):		2.00	2.00	2.00	2.00	2.00	2.00	2.00	
Grate length (ft):		3.00	3.00	3.00	3.00	3.00	3.00	3.00	
Precipitation intensity (in/hr):		3.47	3.47	3.47	3.47	3.47	3.47	3.47	3.47
Runoff Coefficient for paved areas, "C_p":		0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Runoff Coefficient for unpaved areas, "C_u":		0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63
Unpaved area contributing to this inlet (acres):		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Watershed paved length (ft):		243.0	106.0	104.0	100.0	200.0	100.0	100.0	100.0
Paved area contributing to this inlet (acres):		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Subarea discharge Q_{sa} (cfs):		0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Additional discharge (cfs):		1.410	0.710	0.680	0.670	1.480	0.800	0.730	0.880
Total discharge Q_t, including any upstream by-pass (cfs):		**1.410**	**1.146**	**0.997**	**0.924**	**1.704**	**1.378**	**1.151**	**1.199**
By-pass Q (cfs): *Describe here source of bypass:*	0.000	**0.44**	**0.32**	**0.25**	**0.22**	**0.58**	**0.42**	**0.32**	**0.00**
DEPRESSION CALCULATION:									
Width of depression "w" (ft):									
Depression depth "a" (from flowline w/o depression) (in):									
Depression cross-slope (Sw=Sx+a/12w):									
Fraction of flow over the depression (Eo):									
Discharge-weighted equivalent cross-slope (Se):									
Q_s (first guess: **Qt - 0.001**, after iteration should be same as next line)		0.005			0.013	0.024	0.000	0.005	0.000
Q_s over shoulder (excluding flow over the depression) (cfs):									
Q=Q_w+Q_s (cfs) (after iterations must match **Q_t** value):									
HYDRAULIC RESULTS:									
Flooded Width T for Q_t, upstream of inlet (ft):		**6.80**	**6.30**	**5.97**	**5.81**	**7.31**	**6.75**	**6.31**	**6.40**
Flooded Width T at depression (if any) (ft):		**6.80**	**6.30**	**5.97**	**5.81**	**7.31**	**6.75**	**6.31**	**6.40**
Flooded Width T for BYPASS Q downstream of inlet (ft):	0.00	**4.38**	**3.89**	**3.58**	**3.41**	**4.87**	**4.32**	**3.90**	**0.00**
Water depth at curb (with or without depression) (in):		2.45	2.27	2.15	2.09	2.63	2.43	2.27	2.30
Water cross-area at shoulder (without depression) (sq.ft.):		0.69	0.59	0.54	0.51	0.80	0.68	0.60	0.61
Water velocity immediately u/s from inlet (w/o depression) (fps):		2.03	1.93	1.86	1.83	2.13	2.02	1.93	1.95
Average water velocity for the segment to this inlet (fps):		0.76	0.86	0.82	0.80	0.88	0.91	0.86	0.85
Flowtime from the previous inlet to this one (min):		5.35	2.04	2.11	2.09	3.78	1.82	1.93	1.96
GRATE INLETS ON-GRADE:									
Splash-over V for effective length of grate (type P-1 3/8) (fps):		6.81	6.81	6.81	6.81	6.81	6.81	6.81	
Effective length of grate considering clogging factor (ft):		2.01	2.01	2.01	2.01	2.01	2.01	2.01	
Ratio of grate frontal flow to total flow:		0.60	0.639	0.663	0.676	0.574	0.608	0.638	
Fraction of frontal flow intercepted (Rf):		100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	
Fraction of side flow interception (Rs):		21.8%	23.4%	24.6%	25.2%	20.4%	22.0%	23.4%	
Total flow intercepted (cfs):		0.97	0.829	0.743	0.700	1.126	0.957	0.832	
Grate Efficiency (E):		69.1%	72.4%	74.6%	75.7%	66.1%	69.4%	72.3%	
Grate flow-through flow (cfs):		**0.44**	**0.317**	**0.254**	**0.224**	**0.578**	**0.421**	**0.319**	
SLOTTED DRAINS & SIDE-OPENING INLETS ON-GRADE:									
Length required for total interception (ft):									14.32
Length of inlet provided L (ft):									25.00
Efficiency for length L:									100.0%
Interception for length L (cfs):									1.199
Side opening flow-through flow (cfs):									**0.000**
INTERCEPTION CAPACITY OF INLETS IN SAG LOCATION:									
Maximum allowable flooded width (including the depression) (ft):									
Max. head at sag w/o exceeding allowable flooded width (ft):									
Capacity of grate in a sag (3-sided weir) (cfs):									
Length provided of curb-opening inlet at sag (ft):									
Capacity of curb-opening inlet in a sag (weir) (cfs):									

ONDRAIN_English Version 7.5d, developed by Fernando Manzanera, Caltrans District 1, Hydraulics Capital Support (December 2010).

Notes: -This program utilizes the equations presented in the FHA Hydraulic Engineering Circular 22 (HEC-22), FHWA-NHI-10-009.

- Underlined values are calculated by the program, the others are input by the user.

South 1600's

HYDRAULIC CALCULATOR FOR ONSITE DRAINAGE (English Units)

Date: 08/03/21

RCTC I-15 ELPSE

Note: "Subarea discharge Qsa (cfs)" was obtained from "Design Discharge" column of Hydrological Tables found within the hydrology maps in Appendix B.2, and inputted as "Additional discharge (cfs)" below.

	Starting Point	S-1685	S-1686						
Location station (ft):	**1683+00.0**	**1685+64.0**	**1686+62.0**						
Longitudinal profile ("on-grade" or "sag"):		on-grade	on-grade						
Calculation Type ("grate", "side opening", or "shoulder hydraulics only"):		grate	side opening						
Longitudinal slope, S:		0.70%	0.70%						
Shoulder cross-slope, Sx:		3.00%	3.00%						
Average watershed paved width (ft):		0.00	0.00						
Shoulder Manning's n:		0.016	0.016						
Inlet description (optional):									
Clogging factor for on-grade grates:		33%							
Grate width (ft):		4.00							
Grate length (ft):		3.00							
Precipitation intensity (in/hr):		3.47	3.47						
Runoff Coefficient for paved areas, "C_p":		0.99	0.99						
Runoff Coefficient for unpaved areas, "C_u":		0.63	0.63						
Unpaved area contributing to this inlet (acres):		0.060	0.120						
Watershed paved length (ft):		264.0	98.0						
Paved area contributing to this inlet (acres):		0.000	0.000						
Subarea discharge Q_{sa} (cfs):		0.13	0.262						
Additional discharge (cfs):		1.990	0.770						
Total discharge Q_t, including any upstream by-pass (cfs):		2.121	1.297						
By-pass Q (cfs): *Describe here source of bypass:*	**0.000**	**0.26**	**0.00**						
DEPRESSION CALCULATION:									
Width of depression "w" (ft):									
Depression depth "a" (from flowline w/o depression) (in):									
Depression cross-slope (Sw=Sx+a/12w):									
Fraction of flow over the depression (Eo):									
Discharge-weighted equivalent cross-slope (Se):									
Q_s (first guess: **Qt - 0.001**, after iteration should be same as next line)		0.005							
Q_s over shoulder (excluding flow over the depression) (cfs):									
Q=Q_w+Q_s (cfs) (after iterations must match **Q_t** value):									
HYDRAULIC RESULTS:									
Flooded Width T for Q_t, upstream of inlet (ft):		**7.93**	**6.59**						
Flooded Width T at depression (if any) (ft):		**7.93**	**6.59**						
Flooded Width T for BYPASS Q downstream of inlet (ft):	**0.00**	**3.63**	**0.00**						
Water depth at curb (with or without depression) (in):		2.85	2.37						
Water cross-area at shoulder (without depression) (sq.ft.):		0.94	0.65						
Water velocity immediately u/s from inlet (w/o depression) (fps):		2.25	1.99						
Average water velocity for the segment to this inlet (fps):		0.84	0.85						
Flowtime from the previous inlet to this one (min):		5.24	1.93						
GRATE INLETS ON-GRADE:									
Splash-over V for effective length of grate (type P-1 3/8) (fps):		6.81							
Effective length of grate considering clogging factor (ft):		2.01							
Ratio of grate frontal flow to total flow:		0.85							
Fraction of frontal flow intercepted (Rf):		100.0%							
Fraction of side flow interception (Rs):		18.8%							
Total flow intercepted (cfs):		1.86							
Grate Efficiency (E):		87.5%							
Grate flow-through flow (cfs):		**0.26**							
SLOTTED DRAINS & SIDE-OPENING INLETS ON-GRADE:									
Length required for total interception (ft):			14.80						
Length of inlet provided L (ft):			22.00						
Efficiency for length L:			100.0%						
Interception for length L (cfs):			1.297						
Side opening flow-through flow (cfs):			**0.000**						
INTERCEPTION CAPACITY OF INLETS IN SAG LOCATION:									
Maximum allowable flooded width (including the depression) (ft):									
Max. head at sag w/o exceeding allowable flooded width (ft):									
Capacity of grate in a sag (3-sided weir) (cfs):									
Length provided of curb-opening inlet at sag (ft):									
Capacity of curb-opening inlet in a sag (weir) (cfs):									

ONDRAIN_English Version 7.5d, developed by Fernando Manzanera, Caltrans District 1, Hydraulics Capital Support (December 2010).

Notes: -This program utilizes the equations presented in the FHA Hydraulic Engineering Circular 22 (HEC-22), FHWA-NHI-10-009.

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South 1600's

Separate Run

HYDRAULIC CALCULATOR FOR ONSITE DRAINAGE (English Units)

Date: 08/03/21

RCTC I-15 ELPSE

Note: "Subarea discharge Qsa (cfs)" was obtained from "Design Discharge" column of Hydrological Tables found within the hydrology maps in Appendix B.2, and inputted as "Additional discharge (cfs)" below.

	Starting Point	S-1700	S-1698	S-1696B	S-1695B	S-1695A	S-1694	S-1693	S-1692
Location station (ft):	1704+00.0	1700+08.0	1698+00.0	1696+46.0	1695+77.0	1695+00.0	1694+00.0	1693+00.0	1692+00.0
Longitudinal profile ("on-grade" or "sag"):		on-grade	on-grade	on-grade	on-grade	on-grade	on-grade	on-grade	on-grade
Calculation Type ("grate", "side opening", or "shoulder hydraulics only"):		grate	grate	grate	grate	grate	grate	grate	grate
Longitudinal slope, S:		1.70%	1.70%	1.70%	1.70%	1.70%	1.70%	1.00%	1.00%
Shoulder cross-slope, Sx:		1.90%	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%
Average watershed paved width (ft):		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Shoulder Manning's n:		0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016
Inlet description (optional):									
Clogging factor for on-grade grates:		33%	33%	33%	33%	33%	33%	33%	33%
Grate width (ft):		4.00	4.00	2.00	2.00	2.00	2.00	2.00	2.00
Grate length (ft):		3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00
Precipitation intensity (in/hr):		3.47	3.47	3.47	3.47	3.47	3.47	3.47	3.47
Runoff Coefficient for paved areas, "C_p":		0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Runoff Coefficient for unpaved areas, "C_u":		0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63
Unpaved area contributing to this inlet (acres):		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Watershed paved length (ft):		392.0	208.0	154.0	69.0	77.0	100.0	100.0	100.0
Paved area contributing to this inlet (acres):		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Subarea discharge Q_{sa} (cfs):		0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Additional discharge (cfs):		1.580	1.430	1.060	0.430	0.530	0.650	0.770	0.640
Total discharge Q_t, including any upstream by-pass (cfs):		1.580	1.653	1.284	0.906	0.814	0.891	1.047	1.013
By-pass Q (cfs): *Describe here source of bypass:*	0.000	0.22	0.22	0.48	0.28	0.24	0.28	0.37	0.36
DEPRESSION CALCULATION:									
Width of depression "w" (ft):									
Depression depth "a" (from flowline w/o depression) (in):									
Depression cross-slope (Sw=Sx+a/12w):									
Fraction of flow over the depression (Eo):									
Discharge-weighted equivalent cross-slope (Se):									
Q_s (first guess: **Qt - 0.001**, after iteration should be same as next line)		0.005			0.013	0.024	0.000	0.005	0.000
Q_s over shoulder (excluding flow over the depression) (cfs):									
Q=Q_w+Q_s (cfs) (after iterations must match **Q_t** value):									
HYDRAULIC RESULTS:									
Flooded Width T for Q_t, upstream of inlet (ft):		8.00	7.88	7.17	6.29	6.04	6.25	7.33	7.24
Flooded Width T at depression (if any) (ft):		8.00	7.88	7.17	6.29	6.04	6.25	7.33	7.24
Flooded Width T for BYPASS Q downstream of inlet (ft):	0.00	3.84	3.73	4.94	4.07	3.83	4.03	4.98	4.89
Water depth at curb (with or without depression) (in):		1.82	1.89	1.72	1.51	1.45	1.50	1.76	1.74
Water cross-area at shoulder (without depression) (sq.ft.):		0.61	0.62	0.51	0.40	0.36	0.39	0.54	0.52
Water velocity immediately u/s from inlet (w/o depression) (fps):		2.60	2.66	2.50	2.29	2.23	2.28	1.95	1.93
Average water velocity for the segment to this inlet (fps):		0.97	1.11	1.05	1.06	0.99	0.99	0.83	0.86
Flowtime from the previous inlet to this one (min):		6.74	3.12	2.44	1.09	1.29	1.68	2.01	1.93
GRATE INLETS ON-GRADE:									
Splash-over V for effective length of grate (type P-1 3/8) (fps):		6.81	6.81	6.81	6.81	6.81	6.81	6.81	6.81
Effective length of grate considering clogging factor (ft):		2.01	2.01	2.01	2.01	2.01	2.01	2.01	2.01
Ratio of grate frontal flow to total flow:		0.84	0.849	0.582	0.640	0.658	0.643	0.572	0.578
Fraction of frontal flow intercepted (Rf):		100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Fraction of side flow interception (Rs):		10.2%	10.2%	11.3%	13.0%	13.5%	13.1%	16.7%	16.9%
Total flow intercepted (cfs):		1.36	1.429	0.808	0.622	0.573	0.614	0.674	0.657
Grate Efficiency (E):		85.9%	86.4%	62.9%	68.6%	70.4%	68.9%	64.4%	64.9%
Grate flow-through flow (cfs):		0.22	0.224	0.476	0.284	0.241	0.277	0.373	0.356
SLOTTED DRAINS & SIDE-OPENING INLETS ON-GRADE:									
Length required for total interception (ft):									
Length of inlet provided L (ft):		12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
Efficiency for length L:									
Interception for length L (cfs):									
Side opening flow-through flow (cfs):									
INTERCEPTION CAPACITY OF INLETS IN SAG LOCATION:									
Maximum allowable flooded width (including the depression) (ft):									
Max. head at sag w/o exceeding allowable flooded width (ft):									
Capacity of grate in a sag (3-sided weir) (cfs):									
Length provided of curb-opening inlet at sag (ft):									
Capacity of curb-opening inlet in a sag (weir) (cfs):									

ONDRAIN_English Version 7.5d, developed by Fernando Manzanera, Caltrans District 1, Hydraulics Capital Support (December 2010).

Notes: -This program utilizes the equations presented in the FHA Hydraulic Engineering Circular 22 (HEC-22), FHWA-NHI-10-009.

- Underlined values are calculated by the program, the others are input by the user.

South 1700's

HYDRAULIC CALCULATOR FOR ONSITE DRAINAGE (English Units)

Date: 08/03/21

RCTC I-15 ELPSE

Note: "Subarea discharge Qsa (cfs)" was obtained from "Design Discharge" column of Hydrological Tables found within the hydrology maps in Appendix B.2, and inputted as "Additional discharge (cfs)" below.

	Starting Point	S-1691	S-1690	S-1689A					
Location station (ft):	1692+00.0	1691+00.0	1690+50.0	1689+10.0					
Longitudinal profile ("on-grade" or "sag"):		on-grade	on-grade	on-grade					
Calculation Type ("grate", "side opening", or "shoulder hydraulics only"):		grate	grate	side opening					
Longitudinal slope, S:		1.00%	1.00%	1.00%					
Shoulder cross-slope, Sx:		2.00%	2.00%	2.00%					
Average watershed paved width (ft):		0.00	0.00	0.00					
Shoulder Manning's n:		0.016	0.016	0.016					
Inlet description (optional):									
Clogging factor for on-grade grates:		33%	33%						
Grate width (ft):		2.00	2.00						
Grate length (ft):		3.00	3.00						
Precipitation intensity (in/hr):		3.47	3.47	3.47					
Runoff Coefficient for paved areas, "C_p":		0.99	0.99	0.99					
Runoff Coefficient for unpaved areas, "C_u":		0.63	0.63	0.63					
Unpaved area contributing to this inlet (acres):		0.000	0.000	0.000					
Watershed paved length (ft):		100.0	50.0	140.0					
Paved area contributing to this inlet (acres):		0.000	0.000	0.000					
Subarea discharge Q_{sa} (cfs):		0.00	0.000	0.000					
Additional discharge (cfs):		0.660	0.320	1.000					
Total discharge Q_t, including any upstream by-pass (cfs):		1.040	0.690	1.199					
By-pass Q (cfs): *Describe here source of bypass:*	0.380	0.37	0.20	0.00					
DEPRESSION CALCULATION:									
Width of depression "w" (ft):									
Depression depth "a" (from flowline w/o depression) (in):									
Depression cross-slope (Sw=Sx+a/12w):									
Fraction of flow over the depression (Eo):									
Discharge-weighted equivalent cross-slope (Se):									
Q_s (first guess: **Qt - 0.001**, after iteration should be same as next line)		0.005							
Q_s over shoulder (excluding flow over the depression) (cfs):									
Q=Q_w+Q_s (cfs) (after iterations must match **Q_t** value):									
HYDRAULIC RESULTS:									
Flooded Width T for Q_t, upstream of inlet (ft):		7.32	6.27	7.72					
Flooded Width T at depression (if any) (ft):		7.32	6.27	7.72					
Flooded Width T for BYPASS Q downstream of inlet (ft):	0.00	4.96	3.94	0.00					
Water depth at curb (with or without depression) (in):		1.76	1.50	1.85					
Water cross-area at shoulder (without depression) (sq.ft.):		0.54	0.39	0.60					
Water velocity immediately u/s from inlet (w/o depression) (fps):		1.94	1.75	2.01					
Average water velocity for the segment to this inlet (fps):		0.72	0.81	0.85					
Flowtime from the previous inlet to this one (min):		2.30	1.03	2.76					
GRATE INLETS ON-GRADE:									
Splash-over V for effective length of grate (type P-1 3/8) (fps):		6.81	6.81						
Effective length of grate considering clogging factor (ft):		2.01	2.01						
Ratio of grate frontal flow to total flow:		0.57	0.641						
Fraction of frontal flow intercepted (Rf):		100.0%	100.0%						
Fraction of side flow interception (Rs):		16.7%	19.5%						
Total flow intercepted (cfs):		0.67	0.490						
Grate Efficiency (E):		64.5%	71.1%						
Grate flow-through flow (cfs):		0.37	0.199						
SLOTTED DRAINS & SIDE-OPENING INLETS ON-GRADE:									
Length required for total interception (ft):				20.33					
Length of inlet provided L (ft):		12.00	12.00	33.00	12.00	12.00	12.00	12.00	24.00
Efficiency for length L:				100.0%					
Interception for length L (cfs):				1.199					
Side opening flow-through flow (cfs):				0.000					
INTERCEPTION CAPACITY OF INLETS IN SAG LOCATION:									
Maximum allowable flooded width (including the depression) (ft):									
Max. head at sag w/o exceeding allowable flooded width (ft):									
Capacity of grate in a sag (3-sided weir) (cfs):									
Length provided of curb-opening inlet at sag (ft):									
Capacity of curb-opening inlet in a sag (weir) (cfs):									

ONDRAIN_English Version 7.5d, developed by Fernando Manzanera, Caltrans District 1, Hydraulics Capital Support (December 2010).

Notes: -This program utilizes the equations presented in the FHA Hydraulic Engineering Circular 22 (HEC-22), FHWA-NHI-10-009.

- Underlined values are calculated by the program, the others are input by the user.

Separate Run

HYDRAULIC CALCULATOR FOR ONSITE DRAINAGE (English Units)

Date: 08/03/21

RCTC I-15 ELPSE

Note: "Subarea discharge Qsa (cfs)" was obtained from "Design Discharge" column of Hydrological Tables found within the hydrology maps in Appendix B.2, and inputted as "Additional discharge (cfs)" below.

	Starting Point	S-1722	S-1724	S-1725	S-1727	S-1728	S-1729	S-1730	S-1732
Location station (ft):	1719+44.0	1722+00.0	1724+00.0	1725+00.0	1727+00.0	1728+00.0	1729+00.0	1730+00.0	1732+00.0
Longitudinal profile ("on-grade" or "sag"):		on-grade	on-grade	on-grade	on-grade	on-grade	on-grade	on-grade	on-grade
Calculation Type ("grate", "side opening", or "shoulder hydraulics only"):		grate	grate	grate	grate	grate	grate	grate	grate
Longitudinal slope, S:		1.80%	2.20%	1.40%	2.00%	2.30%	2.00%	2.20%	2.40%
Shoulder cross-slope, Sx:		2.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%
Average watershed paved width (ft):		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Shoulder Manning's n:		0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016
Inlet description (optional):									
Clogging factor for on-grade grates:		33%	33%	33%	33%	33%	33%	33%	33%
Grate width (ft):		2.00	2.00	2.00	2.00	4.00	6.00	6.00	6.00
Grate length (ft):		3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00
Precipitation intensity (in/hr):		3.47	3.47	3.47	3.47	3.47	3.47	3.47	3.47
Runoff Coefficient for paved areas, "C_p":		0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Runoff Coefficient for unpaved areas, "C_u":		0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63
Unpaved area contributing to this inlet (acres):		0.130	0.110	0.100	0.130	0.210	0.380	0.290	0.260
Watershed paved length (ft):		256.0	200.0	100.0	200.0	100.0	100.0	100.0	200.0
Paved area contributing to this inlet (acres):		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Subarea discharge Q_{sa} (cfs):		0.28	0.240	0.219	0.284	0.459	0.831	0.634	0.568
Additional discharge (cfs):		1.110	2.110	1.090	2.210	1.160	1.530	1.870	2.170
Total discharge Q_t, including any upstream by-pass (cfs):		1.394	2.882	2.412	3.398	3.027	2.688	2.521	2.747
By-pass Q (cfs): *Describe here source of bypass:*	0.000	0.53	1.10	0.90	1.41	0.33	0.02	0.01	0.01
DEPRESSION CALCULATION:									
Width of depression "w" (ft):									
Depression depth "a" (from flowline w/o depression) (in):									
Depression cross-slope (Sw=Sx+a/12w):									
Fraction of flow over the depression (Eo):									
Discharge-weighted equivalent cross-slope (Se):									
Q_s (first guess: **Qt - 0.001**, after iteration should be same as next line)		0.005			0.013	0.024	0.000	0.005	0.000
Q_s over shoulder (excluding flow over the depression) (cfs):									
Q=Q_w+Q_s (cfs) (after iterations must match **Q_t** value):									
HYDRAULIC RESULTS:									
Flooded Width T for Q_t, upstream of inlet (ft):		7.31	7.18	7.31	7.77	7.25	7.12	6.83	6.93
Flooded Width T at depression (if any) (ft):		7.31	7.18	7.31	7.77	7.25	7.12	6.83	6.93
Flooded Width T for BYPASS Q downstream of inlet (ft):	0.00	5.09	5.01	5.06	5.58	3.15	1.08	0.80	0.91
Water depth at curb (with or without depression) (in):		1.76	2.58	2.63	2.80	2.61	2.56	2.46	2.50
Water cross-area at shoulder (without depression) (sq.ft.):		0.53	0.77	0.80	0.91	0.79	0.76	0.70	0.72
Water velocity immediately u/s from inlet (w/o depression) (fps):		2.61	3.73	3.01	3.75	3.84	3.54	3.61	3.81
Average water velocity for the segment to this inlet (fps):		0.97	1.68	1.35	1.66	1.77	1.45	1.37	1.43
Flowtime from the previous inlet to this one (min):		4.39	1.98	1.24	2.01	0.94	1.15	1.22	2.32
GRATE INLETS ON-GRADE:									
Splash-over V for effective length of grate (type P-1 3/8) (fps):		6.81	6.81	6.81	6.81	6.81	6.81	6.81	6.81
Effective length of grate considering clogging factor (ft):		2.01	2.01	2.01	2.01	2.01	2.01	2.01	2.01
Ratio of grate frontal flow to total flow:		0.57	0.581	0.574	0.548	0.882	0.993	0.996	0.995
Fraction of frontal flow intercepted (Rf):		100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Fraction of side flow interception (Rs):		10.6%	8.5%	12.0%	8.4%	8.1%	9.3%	9.0%	8.2%
Total flow intercepted (cfs):		0.86	1.779	1.508	1.991	2.699	2.670	2.513	2.735
Grate Efficiency (E):		61.9%	61.7%	62.5%	58.6%	89.2%	99.3%	99.7%	99.6%
Grate flow-through flow (cfs):		0.53	1.103	0.904	1.407	0.327	0.018	0.008	0.012
SLOTTED DRAINS & SIDE-OPENING INLETS ON-GRADE:									
Length required for total interception (ft):									
Length of inlet provided L (ft):									
Efficiency for length L:									
Interception for length L (cfs):									
Side opening flow-through flow (cfs):									
INTERCEPTION CAPACITY OF INLETS IN SAG LOCATION:									
Maximum allowable flooded width (including the depression) (ft):									
Max. head at sag w/o exceeding allowable flooded width (ft):									
Capacity of grate in a sag (3-sided weir) (cfs):									
Length provided of curb-opening inlet at sag (ft):									
Capacity of curb-opening inlet in a sag (weir) (cfs):									

ONDRAIN_English Version 7.5d, developed by Fernando Manzanera, Caltrans District 1, Hydraulics Capital Support (December 2010).

Notes: -This program utilizes the equations presented in the FHA Hydraulic Engineering Circular 22 (HEC-22), FHWA-NHI-10-009.

- Underlined values are calculated by the program, the others are input by the user.

HYDRAULIC CALCULATOR FOR ONSITE DRAINAGE (English Units)

Date: 08/03/21

RCTC I-15 ELPSE

Note: "Subarea discharge Qsa (cfs)" was obtained from "Design Discharge" column of Hydrological Tables found within the hydrology maps in Appendix B.2, and inputted as "Additional discharge (cfs)" below.

	Starting Point	S-1733	S-1735	S-1738A	S-1738B	S-1742	SLOTTED	SLOTTED	SLOTTED
Location station (ft):	1732+00.0	1733+00.0	1735+00.0	1738+00.0	1738+77.0	1742+16.0	1742+80.0	1743+40.0	1743+60.0
Longitudinal profile ("on-grade" or "sag"):		on-grade	on-grade	on-grade	on-grade	on-grade	on-grade	on-grade	on-grade
Calculation Type ("grate", "side opening", or "shoulder hydraulics only"):		grate	side opening	grate	side opening	grate	side opening	side opening	side opening
Longitudinal slope, S:		1.60%	2.40%	1.90%	2.70%	2.00%	2.20%	2.20%	2.20%
Shoulder cross-slope, Sx:		3.00%	3.00%	3.00%	3.00%	2.50%	1.50%	1.50%	1.50%
Average watershed paved width (ft):		0.00	0.00	0.00	0.00	0.00	117.75	55.18	50.09
Shoulder Manning's n:		0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016
Inlet description (optional):									
Clogging factor for on-grade grates:		33%	33%	33%	33%	33%			
Grate width (ft):		2.00	4.00	2.00	2.00	4.00			
Grate length (ft):		3.00	3.00	3.00	3.00	3.00			
Precipitation intensity (in/hr):		3.47	3.47	3.47	3.47	3.47	3.47	3.47	3.47
Runoff Coefficient for paved areas, "C_p":		0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Runoff Coefficient for unpaved areas, "C_u":		0.33	0.33	0.33	0.33	0.33	0.60	0.60	0.60
Unpaved area contributing to this inlet (acres):		0.300	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Watershed paved length (ft):		100.0	200.0	300.0	77.0	339.0	64.0	60.0	20.0
Paved area contributing to this inlet (acres):		0.000	0.000	0.000	0.000	0.000	0.173	0.076	0.023
Subarea discharge Q_{sa} (cfs):		0.34	0.000	0.000	0.000	0.000	0.594	0.261	0.079
Additional discharge (cfs):		0.730	1.710	2.420	0.700	2.700			
Total discharge Q_t, including any upstream by-pass (cfs):		1.084	1.968	2.420	1.575	2.700	0.982	0.261	0.079
By-pass Q (cfs): *Describe here source of bypass:*	0.010	0.26	0.00	0.88	0.00	0.39	0.00	0.00	0.00
DEPRESSION CALCULATION:									
Width of depression "w" (ft):									
Depression depth "a" (from flowline w/o depression) (in):									
Depression cross-slope (Sw=Sx+a/12w):									
Fraction of flow over the depression (Eo):									
Discharge-weighted equivalent cross-slope (Se):									
Q_s (first guess: **Qt - 0.001**, after iteration should be same as next line)		0.005			0.013	0.024	0.000	0.005	0.000
Q_s over shoulder (excluding flow over the depression) (cfs):									
Q=Q_w+Q_s (cfs) (after iterations must match **Q_t** value):									
HYDRAULIC RESULTS:									
Flooded Width T for Q_t, upstream of inlet (ft):		5.28	6.12	6.91	5.51	7.99	7.39	4.50	2.87
Flooded Width T at depression (if any) (ft):		5.28	6.12	6.91	5.51	7.99	7.39	4.50	2.87
Flooded Width T for BYPASS Q downstream of inlet (ft):	0.00	3.08	0.00	4.72	0.00	3.86	0.00	0.00	0.00
Water depth at curb (with or without depression) (in):		1.90	2.20	2.49	1.98	2.40	1.33	0.81	0.52
Water cross-area at shoulder (without depression) (sq.ft.):		0.42	0.56	0.72	0.45	0.80	0.41	0.15	0.06
Water velocity immediately u/s from inlet (w/o depression) (fps):		2.59	3.50	3.38	3.46	3.38	2.40	1.72	1.28
Average water velocity for the segment to this inlet (fps):		0.97	1.47	1.26	1.64	1.26	1.01	0.64	0.47
Flowtime from the previous inlet to this one (min):		1.73	2.27	3.97	0.78	4.48	1.06	1.56	0.70
GRATE INLETS ON-GRADE:									
Splash-over V for effective length of grate (type P-1 3/8) (fps):		6.81		6.81		6.81			
Effective length of grate considering clogging factor (ft):		2.01		2.01		2.01			
Ratio of grate frontal flow to total flow:		0.72		0.598		0.843			
Fraction of frontal flow intercepted (Rf):		100.0%		100.0%		100.0%			
Fraction of side flow interception (Rs):		15.2%		10.0%		8.5%			
Total flow intercepted (cfs):		0.83		1.545		2.312			
Grate Efficiency (E):		76.2%		63.8%		85.6%			
Grate flow-through flow (cfs):		0.26		0.875		0.388			
SLOTTED DRAINS & SIDE-OPENING INLETS ON-GRADE:									
Length required for total interception (ft):			25.52		24.08		28.15	16.14	9.77
Length of inlet provided L (ft):		12.00	38.00		38.00		40.00	20.00	20.00
Efficiency for length L:			100.0%		100.0%		100.0%	100.0%	100.0%
Interception for length L (cfs):			1.968		1.575		0.982	0.261	0.079
Side opening flow-through flow (cfs):			0.000		0.000		0.000	0.000	0.000
INTERCEPTION CAPACITY OF INLETS IN SAG LOCATION:									
Maximum allowable flooded width (including the depression) (ft):									
Max. head at sag w/o exceeding allowable flooded width (ft):									
Capacity of grate in a sag (3-sided weir) (cfs):									
Length provided of curb-opening inlet at sag (ft):									
Capacity of curb-opening inlet in a sag (weir) (cfs):									

ONDRAIN_English Version 7.5d, developed by Fernando Manzanera, Caltrans District 1, Hydraulics Capital Support (December 2010).

Notes: -This program utilizes the equations presented in the FHA Hydraulic Engineering Circular 22 (HEC-22), FHWA-NHI-10-009.

- Underlined values are calculated by the program, the others are input by the user.

HYDRAULIC CALCULATOR FOR ONSITE DRAINAGE (English Units)

Date: 08/03/21

RCTC I-15 ELPSE

Note: "Subarea discharge Qsa (cfs)" was obtained from "Design Discharge" column of Hydrological Tables found within the hydrology maps in Appendix B.2, and inputted as "Additional discharge (cfs)" below.

	Starting Point	S-1743	SLOTTED	SLOTTED	SLOTTED	S-1744A	S-1744B		
Location station (ft):	1743+60.0	1743+80.0	1743+90.0	1744+00.0	1744+20.0	1744+29.0	1744+38.0		
Longitudinal profile ("on-grade" or "sag"):		on-grade	on-grade	on-grade	on-grade	on-grade	on-grade		
Calculation Type ("grate", "side opening", or "shoulder hydraulics only"):		grate	side opening	side opening	side opening	grate	grate		
Longitudinal slope, S:		2.20%	2.20%	2.20%	2.20%	2.20%	2.20%		
Shoulder cross-slope, Sx:		1.50%	1.50%	1.50%	0.40%	0.40%	0.40%		
Average watershed paved width (ft):		108.90	213.44	143.75	78.41	101.64	101.64		
Shoulder Manning's n:		0.016	0.016	0.016	0.016	0.016	0.016		
Inlet description (optional):									
Clogging factor for on-grade grates:		33%			33%	33%	33%		
Grate width (ft):		2.00			4.00	4.00	4.00		
Grate length (ft):		3.00			3.00	3.00	3.00		
Precipitation intensity (in/hr):		3.47	3.47	3.47	3.47	3.47	3.47		
Runoff Coefficient for paved areas, "C_p":		0.99	0.99	0.99	0.99	0.99	0.99		
Runoff Coefficient for unpaved areas, "C_u":		0.60	0.60	0.60	0.60	0.60	0.60		
Unpaved area contributing to this inlet (acres):		0.000	0.000	0.000	0.000	0.000	0.000		
Watershed paved length (ft):		20.0	10.0	10.0	20.0	9.0	9.0		
Paved area contributing to this inlet (acres):		0.050	0.049	0.033	0.036	0.021	0.021		
Subarea discharge Q_{sa} (cfs):		0.17	0.168	0.113	0.124	0.072	0.072		
Additional discharge (cfs):									
Total discharge Q_t, including any upstream by-pass (cfs):		0.172	0.188	0.133	0.130	0.083	0.078		
By-pass Q (cfs): *Describe here source of bypass:*	0.000	0.02	0.02	0.01	0.01	0.01	0.01		
DEPRESSION CALCULATION:									
Width of depression "w" (ft):									
Depression depth "a" (from flowline w/o depression) (in):									
Depression cross-slope (Sw=Sx+a/12w):									
Fraction of flow over the depression (Eo):									
Discharge-weighted equivalent cross-slope (Se):									
Q_s (first guess: **Qt - 0.001**, after iteration should be same as next line)		0.005			0.013	0.024			
Q_s over shoulder (excluding flow over the depression) (cfs):									
Q=Q_w+Q_s (cfs) (after iterations must match **Q_t** value):									
HYDRAULIC RESULTS:									
Flooded Width T for Q_t, upstream of inlet (ft):		3.84	3.98	3.50	7.90	6.64	6.51		
Flooded Width T at depression (if any) (ft):		3.84	3.98	3.50	7.90	6.64	6.51		
Flooded Width T for BYPASS Q downstream of inlet (ft):	0.00	1.71	1.72	1.09	3.08	2.51	2.38		
Water depth at curb (with or without depression) (in):		0.69	0.72	0.63	0.38	0.32	0.31		
Water cross-area at shoulder (without depression) (sq.ft.):		0.11	0.12	0.09	0.12	0.09	0.09		
Water velocity immediately u/s from inlet (w/o depression) (fps):		1.55	1.59	1.45	1.04	0.93	0.92		
Average water velocity for the segment to this inlet (fps):		0.58	0.65	0.61	0.39	0.38	0.37		
Flowtime from the previous inlet to this one (min):		0.58	0.26	0.28	0.85	0.39	0.41		
GRATE INLETS ON-GRADE:									
Splash-over V for effective length of grate (type P-1 3/8) (fps):		6.81				6.81	6.81		
Effective length of grate considering clogging factor (ft):		2.01				2.01	2.01		
Ratio of grate frontal flow to total flow:		0.86				0.914	0.921		
Fraction of frontal flow intercepted (Rf):		100.0%				100.0%	100.0%		
Fraction of side flow interception (Rs):		18.5%				13.2%	13.5%		
Total flow intercepted (cfs):		0.15				0.077	0.073		
Grate Efficiency (E):		88.5%				92.6%	93.2%		
Grate flow-through flow (cfs):		0.02				0.006	0.005		
SLOTTED DRAINS & SIDE-OPENING INLETS ON-GRADE:									
Length required for total interception (ft):			14.06	12.17	26.58				
Length of inlet provided L (ft):		20.00	10.00	10.00	20.00	9.00			
Efficiency for length L:			89.3%	95.5%	91.9%				
Interception for length L (cfs):			0.168	0.127	0.119				
Side opening flow-through flow (cfs):			0.020	0.006	0.011				
INTERCEPTION CAPACITY OF INLETS IN SAG LOCATION:									
Maximum allowable flooded width (including the depression) (ft):									
Max. head at sag w/o exceeding allowable flooded width (ft):									
Capacity of grate in a sag (3-sided weir) (cfs):									
Length provided of curb-opening inlet at sag (ft):									
Capacity of curb-opening inlet in a sag (weir) (cfs):									

ONDRAIN_English Version 7.5d, developed by Fernando Manzanera, Caltrans District 1, Hydraulics Capital Support (December 2010).

Notes: -This program utilizes the equations presented in the FHA Hydraulic Engineering Circular 22 (HEC-22), FHWA-NHI-10-009.

- Underlined values are calculated by the program, the others are input by the user.

Separate Run

HYDRAULIC CALCULATOR FOR ONSITE DRAINAGE (English Units)

Date: 08/03/21

RCTC I-15 ELPSE

Note: "Subarea discharge Qsa (cfs)" was obtained from "Design Discharge" column of Hydrological Tables found within the hydrology maps in Appendix B.2, and inputted as "Additional discharge (cfs)" below.

	Starting Point	SLOTTED	SLOTTED	S-1832					
Location station (ft):	1830+61.0	1831+25.0	1831+75.0	1832+15.0					
Longitudinal profile ("on-grade" or "sag"):		on-grade	on-grade	on-grade					
Calculation Type ("grate", "side opening", or "shoulder hydraulics only"):		side opening	side opening	side opening					
Longitudinal slope, S:		0.40%	0.40%	0.40%					
Shoulder cross-slope, Sx:		1.90%	1.20%	0.90%					
Average watershed paved width (ft):		45.60	30.49	45.79					
Shoulder Manning's n:		0.016	0.016	0.016					
Inlet description (optional):									
Clogging factor for on-grade grates:		33%	33%	33%					
Grate width (ft):		2.00	2.00	2.00					
Grate length (ft):		3.00	3.00	3.00					
Precipitation intensity (in/hr):		3.61	3.61	3.61					
Runoff Coefficient for paved areas, "C_p":		0.99	0.99	0.99					
Runoff Coefficient for unpaved areas, "C_u":		0.33	0.33	0.33					
Unpaved area contributing to this inlet (acres):		0.000	0.000	0.000					
Watershed paved length (ft):		64.0	50.0	40.0					
Paved area contributing to this inlet (acres):		0.067	0.035	0.042					
Subarea discharge Q_{sa} (cfs):		0.24	0.125	0.150					
Additional discharge (cfs):									
Total discharge Q_t, including any upstream by-pass (cfs):		**0.239**	**0.125**	**0.150**					
y-pass *Describe here source of bypass:*	**0.000**	**0.00**	**0.00**	**0.00**					

DEPRESSION CALCULATION:

Width of depression "w" (ft):									
Depression depth "a" (from flowline w/o depression) (in):									
Depression cross-slope (Sw=Sx+a/12w):									
Fraction of flow over the depression (Eo):									
Discharge-weighted equivalent cross-slope (Se):									
Q_s (first guess: **Qt - 0.001**, after iteration should be same as next line)		0.005							
Q_s over shoulder (excluding flow over the depression) (cfs):									
Q=Q_w+Q_s (cfs) (after iterations must match **Q_t** value):									

HYDRAULIC RESULTS:

Flooded Width T for Q_t, upstream of inlet (ft):		**5.17**	**5.40**	**6.93**					
Flooded Width T at depression (if any) (ft):		**5.17**	**5.40**	**6.93**					
Flooded Width T for BYPASS Q downstream of inlet (ft):	**0.00**	**0.26**	**0.00**	**0.00**					
Water depth at curb (with or without depression) (in):		1.18	0.78	0.75					
Water cross-area at shoulder (without depression) (sq.ft.):		0.25	0.18	0.22					
Water velocity immediately u/s from inlet (w/o depression) (fps):		0.94	0.71	0.70					
Average water velocity for the segment to this inlet (fps):		0.35	0.27	0.26					
Flowtime from the previous inlet to this one (min):		3.04	3.13	2.58					

GRATE INLETS ON-GRADE:

Splash-over V for effective length of grate (type P-1 3/8) (fps):									
Effective length of grate considering clogging factor (ft):									
Ratio of grate frontal flow to total flow:									
Fraction of frontal flow intercepted (Rf):									
Fraction of side flow interception (Rs):									
Total flow intercepted (cfs):									
Grate Efficiency (E):									
Grate flow-through flow (cfs):									

SLOTTED DRAINS & SIDE-OPENING INLETS ON-GRADE:

Length required for total interception (ft):		8.10	8.12	10.42					
Length of inlet provided L (ft):		8.00	50.00	40.00					
Efficiency for length L:		100.0%	100.0%	100.0%					
Interception for length L (cfs):		0.24	0.125	0.150					
Side opening flow-through flow (cfs):		**0.00**	**0.000**	**0.000**					

INTERCEPTION CAPACITY OF INLETS IN SAG LOCATION:

Maximum allowable flooded width (including the depression) (ft):		**8.00**	**8.00**	**8.00**					
Max. head at sag w/o exceeding allowable flooded width (ft):									
Capacity of grate in a sag (3-sided weir) (cfs):									
Length provided of curb-opening inlet at sag (ft):									
Capacity of curb-opening inlet in a sag (weir) (cfs):									

ONDRAIN_English Version 7.5d, developed by Fernando Manzanera, Caltrans District 1, Hydraulics Capital Support (December 2010).

Notes: -This program utilizes the equations presented in the FHA Hydraulic Engineering Circular 22 (HEC-22), FHWA-NHI-10-009.

- Underlined values are calculated by the program, the others are input by the user.

South 1800's

Separate Run

HYDRAULIC CALCULATOR FOR ONSITE DRAINAGE (English Units)

Date: 08/03/21

RCTC I-15 ELPSE

Note: "Subarea discharge Qsa (cfs)" was obtained from "Design Discharge" column of Hydrological Tables found within the hydrology maps in Appendix B.2, and inputted as "Additional discharge (cfs)" below.

	Starting Point	S-1829	S-1828	S-1827	S-1826	SLOTTED	SLOTTED	SLOTTED	S-1825B
Location station (ft):	**1830+75.3**	**1829+00.0**	**1828+00.0**	**1827+00.0**	**1826+30.0**	**1826+10.0**	**1825+90.0**	**1825+80.0**	**1825+70.0**
Longitudinal profile ("on-grade" or "sag"):		on-grade	on-grade	on-grade	on-grade	on-grade	on-grade	on-grade	on-grade
Calculation Type ("grate", "side opening", or "shoulder hydraulics only"):		grate	grate	grate	grate	side opening	side opening	side opening	grate
Longitudinal slope, S:		0.40%	0.40%	0.40%	0.40%	0.40%	0.40%	0.40%	0.40%
Shoulder cross-slope, Sx:		2.00%	2.00%	2.00%	1.30%	0.40%	0.40%	0.40%	0.40%
Average watershed paved width (ft):		0.00	0.00	0.00	0.00	19.60	28.31	39.20	39.20
Shoulder Manning's n:		0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016
Inlet description (optional):									
Clogging factor for on-grade grates:		33%	33%	33%	33%				33%
Grate width (ft):		2.00	2.00	4.00	6.00				2.00
Grate length (ft):		3.00	3.00	3.00	3.00				3.00
Precipitation intensity (in/hr):		3.61	3.61	3.61	3.61	3.47	3.47	3.47	3.47
Runoff Coefficient for paved areas, "C_p":		0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Runoff Coefficient for unpaved areas, "C_u":		0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63
Unpaved area contributing to this inlet (acres):		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Watershed paved length (ft):		175.3	100.0	100.0	70.0	20.0	20.0	10.0	10.0
Paved area contributing to this inlet (acres):		0.000	0.000	0.000	0.000	0.009	0.013	0.009	0.009
Subarea discharge Q_{sa} (cfs):		0.00	0.000	0.000	0.000	0.031	0.045	0.031	0.031
Additional discharge (cfs):		0.740	0.530	0.520	0.310				
Total discharge Q_t, including any upstream by-pass (cfs):		**0.740**	**0.760**	**0.759**	**0.386**	**0.036**	**0.045**	**0.031**	**0.031**
by-pass *Describe here source of bypass:*	**0.000**	**0.23**	**0.24**	**0.08**	**0.01**	**0.00**	**0.00**	**0.00**	**0.01**
DEPRESSION CALCULATION:									
Width of depression "w" (ft):									
Depression depth "a" (from flowline w/o depression) (in):									
Depression cross-slope (Sw=Sx+a/12w):									
Fraction of flow over the depression (Eo):									
Discharge-weighted equivalent cross-slope (Se):									
Q_s (first guess: **Qt - 0.001**, after iteration should be same as next line)		0.005							
Q_s over shoulder (excluding flow over the depression) (cfs):									
Q=Q_w+Q_s (cfs) (after iterations must match **Q_t** value):									
HYDRAULIC RESULTS:									
Flooded Width T for Q_t, upstream of inlet (ft):		**7.65**	**7.72**	**7.72**	**7.84**	**6.76**	**7.29**	**6.35**	**6.35**
Flooded Width T at depression (if any) (ft):		**7.65**	**7.72**	**7.72**	**7.84**	**6.76**	**7.29**	**6.35**	**6.35**
Flooded Width T for BYPASS Q downstream of inlet (ft):	**0.00**	**4.93**	**5.00**	**3.25**	**1.60**	**0.00**	**0.00**	**0.00**	**3.53**
Water depth at curb (with or without depression) (in):		1.83	1.85	1.85	1.22	0.32	0.35	0.31	0.31
Water cross-area at shoulder (without depression) (sq.ft.):		0.58	0.60	0.60	0.40	0.09	0.11	0.08	0.08
Water velocity immediately u/s from inlet (w/o depression) (fps):		1.27	1.27	1.27	0.97	0.40	0.42	0.38	0.38
Average water velocity for the segment to this inlet (fps):		0.47	0.56	0.56	0.39	0.15	0.16	0.14	0.14
Flowtime from the previous inlet to this one (min):		6.19	2.98	2.97	2.97	2.18	2.14	1.18	1.18
GRATE INLETS ON-GRADE:									
Splash-over V for effective length of grate (type P-1 3/8) (fps):		6.81	6.81	6.81	6.81				6.81
Effective length of grate considering clogging factor (ft):		2.01	2.01	2.01	2.01				2.01
Ratio of grate frontal flow to total flow:		0.55	0.550	0.857	0.979				0.635
Fraction of frontal flow intercepted (Rf):		100.0%	100.0%	100.0%	100.0%				100.0%
Fraction of side flow interception (Rs):		30.3%	30.0%	30.0%	31.5%				42.8%
Total flow intercepted (cfs):		0.51	0.521	0.683	0.380				0.024
Grate Efficiency (E):		68.9%	68.5%	90.0%	98.6%				79.1%
Grate flow-through flow (cfs):		**0.23**	**0.239**	**0.076**	**0.006**				**0.006**
SLOTTED DRAINS & SIDE-OPENING INLETS ON-GRADE:									
Length required for total interception (ft):						9.35	10.19	8.73	
Length of inlet provided L (ft):						15.00	20.00	10.00	10.00
Efficiency for length L:						100.0%	100.0%	100.0%	
Interception for length L (cfs):						0.036	0.045	0.031	
Side opening flow-through flow (cfs):						**0.000**	**0.000**	**0.000**	
INTERCEPTION CAPACITY OF INLETS IN SAG LOCATION:									
Maximum allowable flooded width (including the depression) (ft):		**8.00**							
Max. head at sag w/o exceeding allowable flooded width (ft):									
Capacity of grate in a sag (3-sided weir) (cfs):									
Length provided of curb-opening inlet at sag (ft):									
Capacity of curb-opening inlet in a sag (weir) (cfs):									

ONDRAIN_English Version 7.5d, developed by Fernando Manzanera, Caltrans District 1, Hydraulics Capital Support (December 2010).

Notes: -This program utilizes the equations presented in the FHA Hydraulic Engineering Circular 22 (HEC-22), FHWA-NHI-10-009.

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South 1800's

HYDRAULIC CALCULATOR FOR ONSITE DRAINAGE (English Units)

Date: 08/03/21

RCTC I-15 ELPSE

Note: "Subarea discharge Qsa (cfs)" was obtained from "Design Discharge" column of Hydrological Tables found within the hydrology maps in Appendix B.2, and inputted as "Additional discharge (cfs)" below.

	Starting Point								
		SLOTTED	SLOTTED	SLOTTED	SLOTTED	SLOTTED	S-1825		
Location station (ft):	**1825+70.0**	**1825+60.0**	**1825+50.0**	**1825+40.0**	**1825+30.0**	**1825+20.0**	**1825+10.0**		
Longitudinal profile ("on-grade" or "sag"):		on-grade	on-grade	on-grade	on-grade	on-grade	on-grade		
Calculation Type ("grate", "side opening", or "shoulder hydraulics only"):		side opening	side opening	side opening	side opening	side opening	grate		
Longitudinal slope, S:		0.40%	0.40%	0.40%	0.40%	0.40%	0.40%		
Shoulder cross-slope, Sx:		0.40%	0.40%	0.40%	0.40%	0.40%	0.40%		
Average watershed paved width (ft):		47.92	47.92	56.63	60.98	60.98	60.98		
Shoulder Manning's n:		0.016	0.016	0.016	0.016	0.016	0.016		
Inlet description (optional):									
Clogging factor for on-grade grates:							33%		
Grate width (ft):							2.00		
Grate length (ft):							3.00		
Precipitation intensity (in/hr):		3.47	3.47	3.47	3.47	3.47	3.47		
Runoff Coefficient for paved areas, "C_p":		0.99	0.99	0.99	0.99	0.99	0.99		
Runoff Coefficient for unpaved areas, "C_u":		0.63	0.63	0.63	0.63	0.63	0.63		
Unpaved area contributing to this inlet (acres):		0.000	0.000	0.000	0.000	0.000	0.000		
Watershed paved length (ft):		10.0	10.0	10.0	10.0	10.0	10.0		
Paved area contributing to this inlet (acres):		0.011	0.011	0.013	0.014	0.014	0.014		
Subarea discharge Q_{sa} (cfs):		0.04	0.038	0.045	0.048	0.048	0.048		
Additional discharge (cfs):									
Total discharge Q_t, including any upstream by-pass (cfs):		**0.048**	**0.038**	**0.045**	**0.048**	**0.048**	**0.048**		
by-pass *Describe here source of bypass:*	**0.010**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.01**		
DEPRESSION CALCULATION:									
Width of depression "w" (ft):									
Depression depth "a" (from flowline w/o depression) (in):									
Depression cross-slope (Sw=Sx+a/12w):									
Fraction of flow over the depression (Eo):									
Discharge-weighted equivalent cross-slope (Se):									
Q_s (first guess: **Qt - 0.001**, after iteration should be same as next line)		0.005							
Q_s over shoulder (excluding flow over the depression) (cfs):									
Q=Q_w+Q_s (cfs) (after iterations must match **Q_t** value):									
HYDRAULIC RESULTS:									
Flooded Width T for Q_t, upstream of inlet (ft):		**7.48**	**6.86**	**7.29**	**7.50**	**7.51**	**7.51**		
Flooded Width T at depression (if any) (ft):		**7.48**	**6.86**	**7.29**	**7.50**	**7.51**	**7.51**		
Flooded Width T for BYPASS Q downstream of inlet (ft):	**0.00**	**0.93**	**0.00**	**0.49**	**0.97**	**1.00**	**4.61**		
Water depth at curb (with or without depression) (in):		0.36	0.33	0.35	0.36	0.36	0.36		
Water cross-area at shoulder (without depression) (sq.ft.):		0.11	0.09	0.11	0.11	0.11	0.11		
Water velocity immediately u/s from inlet (w/o depression) (fps):		0.43	0.40	0.42	0.43	0.43	0.43		
Average water velocity for the segment to this inlet (fps):		0.16	0.15	0.16	0.16	0.16	0.16		
Flowtime from the previous inlet to this one (min):		1.05	1.10	1.07	1.05	1.04	1.04		
GRATE INLETS ON-GRADE:									
Splash-over V for effective length of grate (type P-1 3/8) (fps):							6.81		
Effective length of grate considering clogging factor (ft):							2.01		
Ratio of grate frontal flow to total flow:							0.562		
Fraction of frontal flow intercepted (Rf):							100.0%		
Fraction of side flow interception (Rs):							38.0%		
Total flow intercepted (cfs):							0.035		
Grate Efficiency (E):							72.8%		
Grate flow-through flow (cfs):							**0.013**		
SLOTTED DRAINS & SIDE-OPENING INLETS ON-GRADE:									
Length required for total interception (ft):		10.48	9.52	10.19	10.51	10.53			
Length of inlet provided L (ft):		10.00	10.00	10.00	10.00	10.00	10.00		
Efficiency for length L:		99.6%	100.0%	99.9%	99.6%	99.5%			
Interception for length L (cfs):		0.05	0.038	0.045	0.048	0.048			
Side opening flow-through flow (cfs):		**0.00**	**0.000**	**0.000**	**0.000**	**0.000**			
INTERCEPTION CAPACITY OF INLETS IN SAG LOCATION:									
Maximum allowable flooded width (including the depression) (ft):	**8.00**								
Max. head at sag w/o exceeding allowable flooded width (ft):									
Capacity of grate in a sag (3-sided weir) (cfs):									
Length provided of curb-opening inlet at sag (ft):									
Capacity of curb-opening inlet in a sag (weir) (cfs):									

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Notes: -This program utilizes the equations presented in the FHA Hydraulic Engineering Circular 22 (HEC-22), FHWA-NHI-10-009.

- Underlined values are calculated by the program, the others are input by the user.

South 1800's

Separate Run

HYDRAULIC CALCULATOR FOR ONSITE DRAINAGE (English Units)

Date: 08/03/21

RCTC I-15 ELPSE

Note: "Subarea discharge Qsa (cfs)" was obtained from "Design Discharge" column of Hydrological Tables found within the hydrology maps in Appendix B.2, and inputted as "Additional discharge (cfs)" below.

	Starting Point	S-1866	S-1864	S-1863	S-1861	S-1860	S-1859	SLOTTED	SLOTTED
Location station (ft):	1868+18.0	1866+20.0	1864+50.0	1863+00.0	1861+00.0	1860+00.0	1859+00.0	1858+70.0	1858+40.0
Longitudinal profile ("on-grade" or "sag"):		on-grade	on-grade	on-grade	on-grade	on-grade	on-grade	on-grade	on-grade
Calculation Type ("grate", "side opening", or "shoulder hydraulics only"):		side opening	grate	grate	grate	grate	grate	side opening	side opening
Longitudinal slope, S:		0.40%	0.40%	0.40%	0.40%	0.40%	0.40%	0.40%	0.40%
Shoulder cross-slope, Sx:		2.00%	2.00%	2.00%	2.00%	2.00%	2.00%	1.00%	0.90%
Average watershed paved width (ft):		0.00	0.00	0.00	0.00	0.00	0.00	46.46	46.46
Shoulder Manning's n:		0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016
Inlet description (optional):									
Clogging factor for on-grade grates:		33%	33%	33%	33%	33%	33%		
Grate width (ft):		2.00	4.00	4.00	4.00	2.00	4.00		
Grate length (ft):		3.00	3.00	3.00	3.00	3.00	3.00		
Precipitation intensity (in/hr):		3.61	3.61	3.61	3.61	3.61	3.61	3.47	3.47
Runoff Coefficient for paved areas, "C_p":		0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Runoff Coefficient for unpaved areas, "C_u":		0.63	0.63	0.63	0.63	0.63	0.63	0.60	0.63
Unpaved area contributing to this inlet (acres):		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Watershed paved length (ft):		198.0	170.0	150.0	200.0	100.0	100.0	30.0	30.0
Paved area contributing to this inlet (acres):		0.000	0.000	0.000	0.000	0.000	0.000	0.032	0.032
Subarea discharge Q_{sa} (cfs):		0.00	0.000	0.000	0.000	0.000	0.000	0.110	0.110
Additional discharge (cfs):		0.830	0.810	0.710	0.700	0.630	0.380		
Total discharge Q_t, including any upstream by-pass (cfs):		**0.830**	**0.810**	**0.797**	**0.784**	**0.711**	**0.597**	**0.153**	**0.110**
by-pass *Describe here source of bypass:*	0.000	**0.00**	**0.09**	**0.08**	**0.08**	**0.22**	**0.04**	**0.00**	**0.00**
DEPRESSION CALCULATION:									
Width of depression "w" (ft):									
Depression depth "a" (from flowline w/o depression) (in):									
Depression cross-slope (Sw=Sx+a/12w):									
Fraction of flow over the depression (Eo):									
Discharge-weighted equivalent cross-slope (Se):									
Q_s (first guess: **Qt - 0.001**, after iteration should be same as next line)		0.005							
Q_s over shoulder (excluding flow over the depression) (cfs):									
Q=Q_w+Q_s (cfs) (after iterations must match **Q_t** value):									
HYDRAULIC RESULTS:									
Flooded Width T for Q_t, upstream of inlet (ft):		**7.98**	**7.91**	**7.86**	**7.81**	**7.53**	**7.05**	**6.53**	**6.16**
Flooded Width T at depression (if any) (ft):		**7.98**	**7.91**	**7.86**	**7.81**	**7.53**	**7.05**	**6.53**	**6.16**
Flooded Width T for BYPASS Q downstream of inlet (ft):	0.00	**0.00**	**3.43**	**3.39**	**3.34**	**4.82**	**2.64**	**0.00**	**0.00**
Water depth at curb (with or without depression) (in):		1.92	1.90	1.89	1.88	1.81	1.69	0.78	0.67
Water cross-area at shoulder (without depression) (sq.ft.):		0.64	0.63	0.62	0.61	0.57	0.50	0.21	0.17
Water velocity immediately u/s from inlet (w/o depression) (fps):		1.30	1.29	1.29	1.28	1.25	1.20	0.72	0.64
Average water velocity for the segment to this inlet (fps):		0.49	0.48	0.53	0.53	0.52	0.54	0.29	0.24
Flowtime from the previous inlet to this one (min):		6.80	5.87	4.73	6.33	3.24	3.11	1.72	2.09
GRATE INLETS ON-GRADE:									
Splash-over V for effective length of grate (type P-1 3/8) (fps):			6.81	6.81	6.81	6.81	6.81		
Effective length of grate considering clogging factor (ft):			2.01	2.01	2.01	2.01	2.01		
Ratio of grate frontal flow to total flow:			0.847	0.850	0.852	0.561	0.893		
Fraction of frontal flow intercepted (Rf):			100.0%	100.0%	100.0%	100.0%	100.0%		
Fraction of side flow interception (Rs):			29.4%	29.6%	29.7%	30.7%	32.4%		
Total flow intercepted (cfs):			0.723	0.713	0.703	0.495	0.553		
Grate Efficiency (E):			89.2%	89.4%	89.6%	69.5%	92.8%		
Grate flow-through flow (cfs):			**0.087**	**0.084**	**0.081**	**0.217**	**0.043**		
SLOTTED DRAINS & SIDE-OPENING INLETS ON-GRADE:									
Length required for total interception (ft):		13.23						9.86	9.14
Length of inlet provided L (ft):		15.00						10.00	30.00
Efficiency for length L:		100.0%						100.0%	100.0%
Interception for length L (cfs):		0.83						0.153	0.110
Side opening flow-through flow (cfs):		**0.00**						**0.000**	**0.000**
INTERCEPTION CAPACITY OF INLETS IN SAG LOCATION:									
Maximum allowable flooded width (including the depression) (ft):									
Max. head at sag w/o exceeding allowable flooded width (ft):									
Capacity of grate in a sag (3-sided weir) (cfs):									
Length provided of curb-opening inlet at sag (ft):									
Capacity of curb-opening inlet in a sag (weir) (cfs):									

ONDRAIN_English Version 7.5d, developed by Fernando Manzanera, Caltrans District 1, Hydraulics Capital Support (December 2010).

Notes: -This program utilizes the equations presented in the FHA Hydraulic Engineering Circular 22 (HEC-22), FHWA-NHI-10-009.

- Underlined values are calculated by the program, the others are input by the user.

South 1800's

HYDRAULIC CALCULATOR FOR ONSITE DRAINAGE (English Units)

Date: 08/03/21

RCTC I-15 ELPSE

Note: "Subarea discharge Qsa (cfs)" was obtained from "Design Discharge" column of Hydrological Tables found within the hydrology maps in Appendix B.2, and inputted as "Additional discharge (cfs)" below.

	Starting Point	SLOTTED	SLOTTED	SLOTTED	S-1857				
Location station (ft):	**1858+40.0**	**1858+25.0**	**1858+10.0**	**1857+95.0**	**1857+80.0**				
Longitudinal profile ("on-grade" or "sag"):		on-grade	on-grade	on-grade	on-grade				
Calculation Type ("grate", "side opening", or "shoulder hydraulics only"):		side opening	side opening	side opening	grate				
Longitudinal slope, S:		0.40%	0.40%	0.40%	0.40%				
Shoulder cross-slope, Sx:		0.60%	0.30%	0.30%	0.30%				
Average watershed paved width (ft):		40.66	29.04	17.42	5.81				
Shoulder Manning's n:		0.016	0.016	0.016	0.016				
Inlet description (optional):									
Clogging factor for on-grade grates:					33%				
Grate width (ft):					2.00				
Grate length (ft):					3.00				
Precipitation intensity (in/hr):		3.47	3.47	3.47	3.47				
Runoff Coefficient for paved areas, "C_p":		0.99	0.99	0.99	0.99				
Runoff Coefficient for unpaved areas, "C_u":		0.63	0.63	0.63	0.63				
Unpaved area contributing to this inlet (acres):		0.000	0.000	0.000	0.000				
Watershed paved length (ft):		15.0	15.0	15.0	15.0				
Paved area contributing to this inlet (acres):		0.014	0.010	0.006	0.002				
Subarea discharge Q_{sa} (cfs):		0.05	0.034	0.021	0.007				
Additional discharge (cfs):									
Total discharge Q_t, including any upstream by-pass (cfs):		**0.048**	**0.034**	**0.021**	**0.007**				
by-pass *Describe here source of bypass:*	**0.000**	**0.00**	**0.00**	**0.00**	**0.00**				

DEPRESSION CALCULATION:

Width of depression "w" (ft):									
Depression depth "a" (from flowline w/o depression) (in):									
Depression cross-slope (Sw=Sx+a/12w):									
Fraction of flow over the depression (Eo):									
Discharge-weighted equivalent cross-slope (Se):									
Q_s (first guess: **Qt - 0.001**, after iteration should be same as next line)		0.005							
Q_s over shoulder (excluding flow over the depression) (cfs):									
Q=Q_w+Q_s (cfs) (after iterations must match **Q_t** value):									

HYDRAULIC RESULTS:

Flooded Width T for Q_t, upstream of inlet (ft):		**5.82**	**7.91**	**6.53**	**4.33**				
Flooded Width T at depression (if any) (ft):		**5.82**	**7.91**	**6.53**	**4.33**				
Flooded Width T for BYPASS Q downstream of inlet (ft):	**0.00**	**0.00**	**0.00**	**0.00**	**1.72**				
Water depth at curb (with or without depression) (in):		0.42	0.28	0.24	0.16				
Water cross-area at shoulder (without depression) (sq.ft.):		0.10	0.09	0.06	0.03				
Water velocity immediately u/s from inlet (w/o depression) (fps):		0.47	0.37	0.32	0.24				
Average water velocity for the segment to this inlet (fps):		0.18	0.14	0.12	0.09				
Flowtime from the previous inlet to this one (min):		1.43	1.85	2.10	2.77				

GRATE INLETS ON-GRADE:

Splash-over V for effective length of grate (type P-1 3/8) (fps):					6.81				
Effective length of grate considering clogging factor (ft):					2.01				
Ratio of grate frontal flow to total flow:					0.809				
Fraction of frontal flow intercepted (Rf):					100.0%				
Fraction of side flow interception (Rs):					55.7%				
Total flow intercepted (cfs):					0.006				
Grate Efficiency (E):					91.5%				
Grate flow-through flow (cfs):					**0.001**				

SLOTTED DRAINS & SIDE-OPENING INLETS ON-GRADE:

Length required for total interception (ft):		8.24	10.84	8.75					
Length of inlet provided L (ft):		15.00	15.00	15.00					
Efficiency for length L:		100.0%	100.0%	100.0%					
Interception for length L (cfs):		0.05	0.034	0.021					
Side opening flow-through flow (cfs):		**0.00**	**0.000**	**0.000**					

INTERCEPTION CAPACITY OF INLETS IN SAG LOCATION:

Maximum allowable flooded width (including the depression) (ft):		**8.00**		**8.00**					
Max. head at sag w/o exceeding allowable flooded width (ft):									
Capacity of grate in a sag (3-sided weir) (cfs):									
Length provided of curb-opening inlet at sag (ft):									
Capacity of curb-opening inlet in a sag (weir) (cfs):									

ONDRAIN_English Version 7.5d, developed by Fernando Manzanera, Caltrans District 1, Hydraulics Capital Support (December 2010).

Notes: -This program utilizes the equations presented in the FHA Hydraulic Engineering Circular 22 (HEC-22), FHWA-NHI-10-009.

- Underlined values are calculated by the program, the others are input by the user.

South 1800's

Appendix D.3

Outer Shoulder Dikes Spread Analysis Results Summary

Northbound Runs

Outter Shoulder Dikes (Northbound)

Inlet		Dike Discharge							
ID	Type	Total Q (cfs)	Spread (ft)	Depth (ft)	Bypass Q (cfs)	Sag Inlet Capacity (cfs)	Shoulder Width (ft)	Dike Type	Remarks
N-OFF-1247	Grate	5.71	SAG	6.73	SAG	6.34	**10**	E	Off-Ramp
N-1267	Grate	5.68	SAG	6.52	SAG	6.34	**10**	E	On-Ramp
N-1594	Grate	5.36	7.07	4.24	1.97	-	**10**		Off-ramp
N-1603	2-Grate	12.08	7.65	4.59	4.24	-	**8**		Off-Ramp
N-1771	Grate	6.55	7.22	4.33	2.53	-	**17**	E	
N-1779B	GDO	1.12	11.60	1.39	0.32	-	**20**	E	Proposed Inlet
N-1781B	GDO	0.83	10.37	1.24	0.20	-	**20**	E	Proposed Inlet
N-1783	GDO	0.49	8.48	1.02	0.07	-	**20**	E	Proposed Inlet
N-1785B	GDO	0.41	7.99	0.96	0.05	-	**20**	E	Proposed Inlet
N-1796	Grate-Slotted	5.06	7.34	4.40	0.34	-	**10**	A	
N-1806B	Grate-Slotted	11.51	9.98	5.99	0.38	-	**10**	A	

Run Continues

Outter Shoulder Dikes (Northbound)

Inlet		Dike Discharge							
ID	Type	Total Q (cfs)	Spread (ft)	Depth (ft)	Bypass Q (cfs)	Sag Inlet Capacity (cfs)	Shoulder Width (ft)	Dike Type	Remarks
N-1814	Spillway	14.12	6.6	4.00	SAG	6.34	**10**	E	SAG - Due to type E dike standards water in these area will reach a maximum elevation of 4" before overflowing to the cutslope away from the roadway. Resulting in maximum spread of 6.60'
N-1830	OSD	1.25	5.98	3.59	0.22	-	10	E	
N-1826	OSD	3.24	7.50	4.89	1.04	-	10	E	Bypass flow to N-1814
N-1839	Spillway	4.59	6.67	4.00	1.57	-	**10**	E	
N-1846	Spillway	6.20	7.47	4.48	2.43	-	**10**	E	
N-1851	Spillway	9.23	6.6	4.00	SAG	6.34	**10**	E	SAG - Due to type E dike standards water in these area will reach a maximum elevation of 4" before overflowing to the cutslope away from the roadway. Resulting in maximum spread of 6.60'
N-1862	OSD	3.44	8.10	4.86	1.12		**10**	E	
N-1856	OSD	4.85	9.21	5.53	1.84		**10**	E	Bypass flow to N-1851
N-1882	OSD	1.75	6.28	3.32	0.39		**10**	E	**Run Continues**

Outter Shoulder Dikes (Northbound)

Inlet		Dike Discharge							
ID	Type	Total Q (cfs)	Spread (ft)	Depth (ft)	Bypass Q (cfs)	Sag Inlet Capacity (cfs)	Shoulder Width (ft)	Dike Type	Remarks
N-1874	OSD	4.86	9.22	5.53	1.84		**10**	E	
N-1871	Grate-Slotted	5.10	9.39	5.63	0.08		**10**	E	
N-1892	Grate-Slotted	4.79	8.33	5.00	0.14		**10**	E	
N-1896	Spillway	3.47	7.13	4.28	1.13		**10**	E	
N-1904A	Grate-Slotted	8.21	10.20	6.12	0.76		**10**	A	

Southbound Runs

Outter Shoulder Dikes (Southbound)

Inlet		Dike Discharge							
ID	Type	Total Q (cfs)	Spread (ft)	Depth (in)	Bypass Q (cfs)	Sag Inlet Capacity (cfs)	Shoulder Width (ft)	Dike Type	Remarks
S-1797	Grate-Slotted	9.42	9.11	5.47	0.01	-	**10**	A	
S-1806	Grate-Slotted	11.29	10.09	6.05	0.30	-	**10**	A	
S-1813	Spillway	5.16	10.17	6.10	1.94	-	**10**	E	
S-1815	Spillway	8.03	6.6	4	SAG	6.34	**10**	E	SAG - Due to type E dike standards water in these area will reach a maximum elevation of 4" before overflowing to the cutslope away from the roadway. Resulting in maximum spread of 6.60'
S-1823	Spillway	1.75	5.23	3.14	0.37		**10**	E	
S-1855	No Inlet	4.15	7.41	4.45	4.15		**10**	Barrier	This area considers the concentrated flow againts an existing barrier before scuppers intercept flow. Note that scuppers are existing and NO barriers with scuppers will be proposed for this project
S-1869	Grate-Slotted	2.06	5.56	3.34	0.00		**10**	Barrier	
S-1867	Grate	2.30	5.99	3.6	SAG	8.34	**10**	Barrier	

Outter Shoulder Dikes (Southbound)

Inlet		Dike Discharge							
ID	Type	Total Q (cfs)	Spread (ft)	Depth (in)	Bypass Q (cfs)	Sag Inlet Capacity (cfs)	Shoulder Width (ft)	Dike Type	Remarks
S-1880	OSD	3.51	8.80	5.28	1.12	-	**10**	E	
S-1874	Grate-Slotted	4.29	9.50	5.70	0.00	-	**10**	E	
S-1873	Grate	0.73	4.90	2.94	0.08	-	**10**	E	
S-1891	Grate-Slotted	4.15	8.23	4.94	0.05	-	**10**	E	
S-1892	Grate	0.93	4.69	2.82	0.13	-	**10**	E	
S-1899	Grate-Slotted	8.47	9.45	5.67	1.06	-	**23**	Barrier	
S-1902	Grate-Slotted	5.76	8.18	4.91	0.40	-	**23**	Barrier	
S-1904	Grate-Slotted	4.97	7.73	4.64	0.26	-	**23**	Barrier	
S-1907	Grate-Slotted	2.32	6.04	3.63	0.01	-	**23**	Barrier	
S-1913	Spillway	4.92	7.90	4.74	0.62	-	**10**	A	
S-1930	Grate-Slotted	14.17	10.46	6.28	0.00	-	**15**	Retaining Wall	
S-1935	Spillway	4.22	6.39	3.83	0.10	-	**10**	E	

Appendix D.4

Outer Shoulder Dikes Spread Calculations (On-drain)

Northbound Runs

HYDRAULIC CALCULATOR FOR ONSITE DRAINAGE (English Units)

Date: 05/25/21

RCTC I-15 ELPSE - OUTTER SHOULDER DIKES

Note: "Subarea discharge Qsa (cfs)" was obtained from "Design Discharge" column of Hydrological Tables found within the hydrology maps in Appendix B.2, and inputted as "Additional discharge (cfs)" below.

	Starting Point	N-OFF-1247							
Location station (ft):	**1239+00.0**	**1247+62.0**							
Longitudinal profile ("on-grade" or "sag"):		sag							
Calculation Type ("grate", "side opening", or "shoulder hydraulics only"):		grate							
Longitudinal slope, S:		2.00%							
Shoulder cross-slope, Sx:		5.00%							
Average watershed paved width (ft):		0.00							
Shoulder Manning's n:		0.016							
Inlet description (optional):		10' SHLDR							
Clogging factor for on-grade grates:		33%							
Grate width (ft):		2.00							
Grate length (ft):		3.00							
Precipitation intensity (in/hr):		3.61							
Runoff Coefficient for paved areas, "C_p":		0.99							
Runoff Coefficient for unpaved areas, "C_u":		0.63							
Unpaved area contributing to this inlet (acres):		0.000							
Watershed paved length (ft):		862.0							
Paved area contributing to this inlet (acres):		0.000							
Subarea discharge Q_{sa} (cfs):		0.00							
Additional discharge (cfs):		5.710							
Total discharge Q_t, including any upstream by-pass (cfs):		**5.710**							
By-pass Q *Describe here source of bypass:*	**0.000**	**SAG**							
DEPRESSION CALCULATION:									
Width of depression "w" (ft):									
Depression depth "a" (from flowline w/o depression) (in):									
Depression cross-slope (Sw=Sx+a/12w):									
Fraction of flow over the depression (Eo):									
Discharge-weighted equivalent cross-slope (Se):									
Q_s (first guess: **Qt - 0.001**, after iteration should be same as next line)		0.005							
Q_s over shoulder (excluding flow over the depression) (cfs):									
Q=Q_w+Q_s (cfs) (after iterations must match **Q_t** value):									
HYDRAULIC RESULTS:									
Flooded Width T for Q_t, upstream of inlet (ft):		**SAG**							
Flooded Width T at depression (if any) (ft):		**SAG**							
Flooded Width T for BYPASS Q downstream of inlet (ft):	**0.00**	**SAG**							
Water depth at curb (with or without depression) (in):									
Water cross-area at shoulder (without depression) (sq.ft.):									
Water velocity immediately u/s from inlet (w/o depression) (fps):									
Average water velocity for the segment to this inlet (fps):									
Flowtime from the previous inlet to this one (min):									
GRATE INLETS ON-GRADE:									
Splash-over V for effective length of grate (type P-1 3/8) (fps):									
Effective length of grate considering clogging factor (ft):									
Ratio of grate frontal flow to total flow:									
Fraction of frontal flow intercepted (Rf):									
Fraction of side flow interception (Rs):									
Total flow intercepted (cfs):									
Grate Efficiency (E):									
Grate flow-through flow (cfs):									
SLOTTED DRAINS & SIDE-OPENING INLETS ON-GRADE:									
Length required for total interception (ft):									
Length of inlet provided L (ft):									
Efficiency for length L:									
Interception for length L (cfs):									
Side opening flow-through flow (cfs):									
INTERCEPTION CAPACITY OF INLETS IN SAG LOCATION:									
Maximum allowable flooded width (including the depression) (ft):		**10.00**							
Max. head at sag w/o exceeding allowable flooded width (ft):		0.50							
Capacity of grate in a sag (3-sided weir) (cfs):		***6.34***							
Length provided of curb-opening inlet at sag (ft):									
Capacity of curb-opening inlet in a sag (weir) (cfs):									

ONDRAIN_English Version 7.5d, developed by Fernando Manzanera, Caltrans District 1, Hydraulics Capital Support (December 2010).

Notes: -This program utilizes the equations presented in the FHA Hydraulic Engineering Circular 22 (HEC-22), FHWA-NHI-10-009.

- Underlined values are calculated by the program, the others are input by the user.

Separate Run

HYDRAULIC CALCULATOR FOR ONSITE DRAINAGE (English Units)

Date: 05/25/21

RCTC I-15 ELPSE - OUTTER SHOULDER DIKES

Note: "Subarea discharge Qsa (cfs)" was obtained from "Design Discharge" column of Hydrological Tables found within the hydrology maps in Appendix B.2, and inputted as "Additional discharge (cfs)" below.

	Starting Point	N-1267							
Location station (ft):	**1258+00.0**	**1267+50.0**							
Longitudinal profile ("on-grade" or "sag"):		sag							
Calculation Type ("grate", "side opening", or "shoulder hydraulics only"):		grate							
Longitudinal slope, S:		2.00%							
Shoulder cross-slope, Sx:		5.00%							
Average watershed paved width (ft):		0.00							
Shoulder Manning's n:		0.016							
Inlet description (optional):		10' SHLDR							
Clogging factor for on-grade grates:		33%							
Grate width (ft):		2.00							
Grate length (ft):		3.00							
Precipitation intensity (in/hr):		3.61							
Runoff Coefficient for paved areas, "C_p":		0.99							
Runoff Coefficient for unpaved areas, "C_u":		0.63							
Unpaved area contributing to this inlet (acres):		0.000							
Watershed paved length (ft):		950.0							
Paved area contributing to this inlet (acres):		0.000							
Subarea discharge Q_{sa} (cfs):		0.00							
Additional discharge (cfs):		5.680							
Total discharge Q_t, including any upstream by-pass (cfs):		**5.680**							
By-pass Q *Describe here source of bypass:*	**0.000**	**SAG**							
DEPRESSION CALCULATION:									
Width of depression "w" (ft):									
Depression depth "a" (from flowline w/o depression) (in):									
Depression cross-slope (Sw=Sx+a/12w):									
Fraction of flow over the depression (Eo):									
Discharge-weighted equivalent cross-slope (Se):									
Q_s (first guess: **Qt - 0.001**, after iteration should be same as next line)		0.005							
Q_s over shoulder (excluding flow over the depression) (cfs):									
Q=Q_w+Q_s (cfs) (after iterations must match **Q_t** value):									
HYDRAULIC RESULTS:									
Flooded Width T for Q_t, upstream of inlet (ft):		**SAG**							
Flooded Width T at depression (if any) (ft):		**SAG**							
Flooded Width T for BYPASS Q downstream of inlet (ft):	**0.00**	**SAG**							
Water depth at curb (with or without depression) (in):									
Water cross-area at shoulder (without depression) (sq.ft.):									
Water velocity immediately u/s from inlet (w/o depression) (fps):									
Average water velocity for the segment to this inlet (fps):									
Flowtime from the previous inlet to this one (min):									
GRATE INLETS ON-GRADE:									
Splash-over V for effective length of grate (type P-1 3/8) (fps):									
Effective length of grate considering clogging factor (ft):									
Ratio of grate frontal flow to total flow:									
Fraction of frontal flow intercepted (Rf):									
Fraction of side flow interception (Rs):									
Total flow intercepted (cfs):									
Grate Efficiency (E):									
Grate flow-through flow (cfs):									
SLOTTED DRAINS & SIDE-OPENING INLETS ON-GRADE:									
Length required for total interception (ft):									
Length of inlet provided L (ft):									
Efficiency for length L:									
Interception for length L (cfs):									
Side opening flow-through flow (cfs):									
INTERCEPTION CAPACITY OF INLETS IN SAG LOCATION:									
Maximum allowable flooded width (including the depression) (ft):		**10.00**							
Max. head at sag w/o exceeding allowable flooded width (ft):		0.50							
Capacity of grate in a sag (3-sided weir) (cfs):		***6.34***							
Length provided of curb-opening inlet at sag (ft):									
Capacity of curb-opening inlet in a sag (weir) (cfs):									

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Notes: -This program utilizes the equations presented in the FHA Hydraulic Engineering Circular 22 (HEC-22), FHWA-NHI-10-009.

- Underlined values are calculated by the program, the others are input by the user.

Separate Run

HYDRAULIC CALCULATOR FOR ONSITE DRAINAGE (English Units)

Date: 05/25/21

RCTC I-15 ELPSE - OUTTER SHOULDER DIKES

Note: "Subarea discharge Qsa (cfs)" was obtained from "Design Discharge" column of Hydrological Tables found within the hydrology maps in Appendix B.2, and inputted as "Additional discharge (cfs)" below.

	Starting Point	N-1594	N-1603						
Location station (ft):	**1587+30.0**	**1594+48.0**	**1602+70.0**	**1602+70.0**					
Longitudinal profile ("on-grade" or "sag"):		on-grade	on-grade	on-grade					
Calculation Type ("grate", "side opening", or "shoulder hydraulics only"):		grate	grate	grate					
Longitudinal slope, S:		1.50%	5.00%	5.00%					
Shoulder cross-slope, Sx:		5.00%	5.00%	5.00%					
Average watershed paved width (ft):		0.00	0.00	0.00					
Shoulder Manning's n:		0.016	0.016	0.016					
Inlet description (optional):									
Clogging factor for on-grade grates:		33%	33%	33%					
Grate width (ft):		2.00	3.00	3.00					
Grate length (ft):		3.00	3.00	3.00					
Precipitation intensity (in/hr):		3.61	3.61	3.61					
Runoff Coefficient for paved areas, "C_p":		0.99	0.99	0.99					
Runoff Coefficient for unpaved areas, "C_u":		0.63	0.63	0.63					
Unpaved area contributing to this inlet (acres):		0.000	0.000	0.000					
Watershed paved length (ft):		718.0	822.0	0.0					
Paved area contributing to this inlet (acres):		0.000	0.000	0.000					
Subarea discharge Q_{sa} (cfs):		0.00	0.000	0.000					
Additional discharge (cfs):		5.360	10.110						
Total discharge Q_t, including any upstream by-pass (cfs):		**5.360**	**12.081**	**4.241**					
By-pass Q *Describe here source of bypass:*	**0.000**	**1.97**	**4.24**	**0.39**					
DEPRESSION CALCULATION:									
Width of depression "w" (ft):									
Depression depth "a" (from flowline w/o depression) (in):									
Depression cross-slope (Sw=Sx+a/12w):									
Fraction of flow over the depression (Eo):									
Discharge-weighted equivalent cross-slope (Se):									
Q_s (first guess: **Qt - 0.001**, after iteration should be same as next line)		0.005							
Q_s over shoulder (excluding flow over the depression) (cfs):									
Q=Q_w+Q_s (cfs) (after iterations must match **Q_t** value):									
HYDRAULIC RESULTS:									
Flooded Width T for Q_t, upstream of inlet (ft):		**7.07**	**7.65**	**5.17**					
Flooded Width T at depression (if any) (ft):		**7.07**	**7.65**	**5.17**					
Flooded Width T for BYPASS Q downstream of inlet (ft):	**0.00**	**4.86**	**5.17**	**2.12**					
Water depth at curb (with or without depression) (in):		4.24	4.59	3.10					
Water cross-area at shoulder (without depression) (sq.ft.):		1.25	1.46	0.67					
Water velocity immediately u/s from inlet (w/o depression) (fps):		4.29	8.25	6.35					
Average water velocity for the segment to this inlet (fps):		1.60	3.63	#DIV/0!					
Flowtime from the previous inlet to this one (min):		7.47	3.77	#DIV/0!					
GRATE INLETS ON-GRADE:									
Splash-over V for effective length of grate (type P-1 3/8) (fps):		6.81	6.81	6.81					
Effective length of grate considering clogging factor (ft):		2.01	2.01	2.01					
Ratio of grate frontal flow to total flow:		0.59	0.735	0.901					
Fraction of frontal flow intercepted (Rf):		100.0%	87.0%	100.0%					
Fraction of side flow interception (Rs):		10.8%	3.6%	5.6%					
Total flow intercepted (cfs):		3.39	7.840	3.846					
Grate Efficiency (E):		63.2%	64.9%	90.7%					
Grate flow-through flow (cfs):		**1.97**	**4.241**	**0.395**					
SLOTTED DRAINS & SIDE-OPENING INLETS ON-GRADE:									
Length required for total interception (ft):									
Length of inlet provided L (ft):		10.00	20.00	10.00					
Efficiency for length L:									
Interception for length L (cfs):									
Side opening flow-through flow (cfs):									
INTERCEPTION CAPACITY OF INLETS IN SAG LOCATION:									
Maximum allowable flooded width (including the depression) (ft):									
Max. head at sag w/o exceeding allowable flooded width (ft):									
Capacity of grate in a sag (3-sided weir) (cfs):									
Length provided of curb-opening inlet at sag (ft):									
Capacity of curb-opening inlet in a sag (weir) (cfs):									

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Separate Run

HYDRAULIC CALCULATOR FOR ONSITE DRAINAGE (English Units)

Date: 05/25/21

RCTC I-15 ELPSE - OUTTER SHOULDER DIKES

Note: "Subarea discharge Qsa (cfs)" was obtained from "Design Discharge" column of Hydrological Tables found within the hydrology maps in Appendix B.2, and inputted as "Additional discharge (cfs)" below.

	Starting Point	N-Off-1754
Location station (ft):	**1587+30.0**	**1744+54.0**
Longitudinal profile ("on-grade" or "sag"):		on-grade
Calculation Type ("grate", "side opening", or "shoulder hydraulics only"):		grate
Longitudinal slope, S:		1.50%
Shoulder cross-slope, Sx:		8.00%
Average watershed paved width (ft):		0.00
Shoulder Manning's n:		0.016
Inlet description (optional):		
Clogging factor for on-grade grates:		33%
Grate width (ft):		2.00
Grate length (ft):		3.00
Precipitation intensity (in/hr):		3.61
Runoff Coefficient for paved areas, "C_p":		0.99
Runoff Coefficient for unpaved areas, "C_u":		0.63
Unpaved area contributing to this inlet (acres):		0.000
Watershed paved length (ft):		15724.0
Paved area contributing to this inlet (acres):		0.000
Subarea discharge Q_{sa} (cfs):		0.00
Additional discharge (cfs):		5.200
Total discharge Q_t, including any upstream by-pass (cfs):		**5.200**
By-pass Q *Describe here source of bypass:*	**0.000**	**1.23**

DEPRESSION CALCULATION:

Width of depression "w" (ft):	
Depression depth "a" (from flowline w/o depression) (in):	
Depression cross-slope (Sw=Sx+a/12w):	
Fraction of flow over the depression (Eo):	
Discharge-weighted equivalent cross-slope (Se):	
Q_s (first guess: **Qt - 0.001**, after iteration should be same as next line)	0.005
Q_s over shoulder (excluding flow over the depression) (cfs):	
Q=Q_w+Q_s (cfs) (after iterations must match **Q_t** value):	

HYDRAULIC RESULTS:

Flooded Width T for Q_t, upstream of inlet (ft):		**5.21**
Flooded Width T at depression (if any) (ft):		**5.21**
Flooded Width T for BYPASS Q downstream of inlet (ft):	**0.00**	**3.04**
Water depth at curb (with or without depression) (in):		5.00
Water cross-area at shoulder (without depression) (sq.ft.):		1.09
Water velocity immediately u/s from inlet (w/o depression) (fps):		4.79
Average water velocity for the segment to this inlet (fps):		1.79
Flowtime from the previous inlet to this one (min):		146.47

GRATE INLETS ON-GRADE:

Splash-over V for effective length of grate (type P-1 3/8) (fps):	6.81
Effective length of grate considering clogging factor (ft):	2.01
Ratio of grate frontal flow to total flow:	0.72
Fraction of frontal flow intercepted (Rf):	100.0%
Fraction of side flow interception (Rs):	13.7%
Total flow intercepted (cfs):	3.97
Grate Efficiency (E):	76.3%
Grate flow-through flow (cfs):	**1.23**

SLOTTED DRAINS & SIDE-OPENING INLETS ON-GRADE:

Length required for total interception (ft):	
Length of inlet provided L (ft):	
Efficiency for length L:	
Interception for length L (cfs):	
Side opening flow-through flow (cfs):	

INTERCEPTION CAPACITY OF INLETS IN SAG LOCATION:

Maximum allowable flooded width (including the depression) (ft):	
Max. head at sag w/o exceeding allowable flooded width (ft):	
Capacity of grate in a sag (3-sided weir) (cfs):	
Length provided of curb-opening inlet at sag (ft):	
Capacity of curb-opening inlet in a sag (weir) (cfs):	

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Separate Run

HYDRAULIC CALCULATOR FOR ONSITE DRAINAGE (English Units)

Date: 05/25/21

RCTC I-15 ELPSE - OUTTER SHOULDER DIKES

Note: "Subarea discharge Qsa (cfs)" was obtained from "Design Discharge" column of Hydrological Tables found within the hydrology maps in Appendix B.2, and inputted as "Additional discharge (cfs)" below.

	Starting Point	N-1771							
Location station (ft):	**1763+00.0**	**1771+20.0**							
Longitudinal profile ("on-grade" or "sag"):		on-grade							
Calculation Type ("grate", "side opening", or "shoulder hydraulics only"):		grate							
Longitudinal slope, S:		2.00%							
Shoulder cross-slope, Sx:		5.00%							
Average watershed paved width (ft):		0.00							
Shoulder Manning's n:		0.016							
Inlet description (optional):		17' SHLDR							
Clogging factor for on-grade grates:		33%							
Grate width (ft):		2.00							
Grate length (ft):		3.00							
Precipitation intensity (in/hr):		3.61							
Runoff Coefficient for paved areas, "C_p":		0.99							
Runoff Coefficient for unpaved areas, "C_u":		0.63							
Unpaved area contributing to this inlet (acres):		0.000							
Watershed paved length (ft):		820.0							
Paved area contributing to this inlet (acres):		0.000							
Subarea discharge Q_{sa} (cfs):		0.00							
Additional discharge (cfs):		6.550							
Total discharge Q_t, including any upstream by-pass (cfs):		**6.550**							
By-pass Q *Describe here source of bypass:*	**0.000**	**2.53**							
DEPRESSION CALCULATION:									
Width of depression "w" (ft):									
Depression depth "a" (from flowline w/o depression) (in):									
Depression cross-slope (Sw=Sx+a/12w):									
Fraction of flow over the depression (Eo):									
Discharge-weighted equivalent cross-slope (Se):									
Q_s (first guess: **Qt - 0.001**, after iteration should be same as next line)		0.005							
Q_s over shoulder (excluding flow over the depression) (cfs):									
Q=Q_w+Q_s (cfs) (after iterations must match **Q_t** value):									
HYDRAULIC RESULTS:									
Flooded Width T for Q_t, upstream of inlet (ft):		**7.22**							
Flooded Width T at depression (if any) (ft):		**7.22**							
Flooded Width T for BYPASS Q downstream of inlet (ft):	**0.00**	**5.06**							
Water depth at curb (with or without depression) (in):		4.33							
Water cross-area at shoulder (without depression) (sq.ft.):		1.30							
Water velocity immediately u/s from inlet (w/o depression) (fps):		5.02							
Average water velocity for the segment to this inlet (fps):		1.88							
Flowtime from the previous inlet to this one (min):		7.28							
GRATE INLETS ON-GRADE:									
Splash-over V for effective length of grate (type P-1 3/8) (fps):		6.81							
Effective length of grate considering clogging factor (ft):		2.01							
Ratio of grate frontal flow to total flow:		0.58							
Fraction of frontal flow intercepted (Rf):		100.0%							
Fraction of side flow interception (Rs):		8.3%							
Total flow intercepted (cfs):		4.02							
Grate Efficiency (E):		61.4%							
Grate flow-through flow (cfs):		**2.53**							
SLOTTED DRAINS & SIDE-OPENING INLETS ON-GRADE:									
Length required for total interception (ft):									
Length of inlet provided L (ft):									
Efficiency for length L:									
Interception for length L (cfs):									
Side opening flow-through flow (cfs):									
INTERCEPTION CAPACITY OF INLETS IN SAG LOCATION:									
Maximum allowable flooded width (including the depression) (ft):									
Max. head at sag w/o exceeding allowable flooded width (ft):									
Capacity of grate in a sag (3-sided weir) (cfs):									
Length provided of curb-opening inlet at sag (ft):									
Capacity of curb-opening inlet in a sag (weir) (cfs):									

ONDRAIN_English Version 7.5d, developed by Fernando Manzanera, Caltrans District 1, Hydraulics Capital Support (December 2010).

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Separate Run

HYDRAULIC CALCULATOR FOR ONSITE DRAINAGE (English Units)

Date: 05/25/21

RCTC I-15 ELPSE - OUTTER SHOULDER DIKES

Note: "Subarea discharge Qsa (cfs)" was obtained from "Design Discharge" column of Hydrological Tables found within the hydrology maps in Appendix B.2, and inputted as "Additional discharge (cfs)" below.

	Starting Point	N-1779B	N-1781B	N-1783	N-1785B				
Location station (ft):	1776+57.0	1779+14.0	1781+35.0	1783+00.0	1785+20.0				
Longitudinal profile ("on-grade" or "sag"):		on-grade	on-grade	on-grade	on-grade				
Calculation Type ("grate", "side opening", or "shoulder hydraulics only"):		grate	grate	grate	grate				
Longitudinal slope, S:		1.00%	1.00%	1.00%	1.00%				
Shoulder cross-slope, Sx:		1.00%	1.00%	1.00%	1.00%				
Average watershed paved width (ft):		0.00	0.00	0.00	0.00				
Shoulder Manning's n:		0.016	0.016	0.016	0.016				
Inlet description (optional):		20' SHLDR	20' SHLDR	20' SHLDR	20' SHLDR				
Clogging factor for on-grade grates:		33%	33%	33%	33%				
Grate width (ft):		4.00	4.00	4.00	4.00				
Grate length (ft):		3.00	3.00	3.00	3.00				
Precipitation intensity (in/hr):		3.61	3.61	3.61	3.61				
Runoff Coefficient for paved areas, "C_p":		0.99	0.99	0.99	0.99				
Runoff Coefficient for unpaved areas, "C_u":		0.63	0.63	0.63	0.63				
Unpaved area contributing to this inlet (acres):		0.000	0.000	0.000	0.000				
Watershed paved length (ft):		257.0	221.0	165.0	220.0				
Paved area contributing to this inlet (acres):		0.000	0.000	0.000	0.000				
Subarea discharge Q_{sa} (cfs):		0.00	0.000	0.000	0.000				
Additional discharge (cfs):		1.120	0.510	0.290	0.340				
Total discharge Q_t, including any upstream by-pass (cfs):		1.120	0.830	0.486	0.414				
By-pass Q — *Describe here source of bypass:*	0.000	0.32	0.20	0.07	0.05				
DEPRESSION CALCULATION:									
Width of depression "w" (ft):									
Depression depth "a" (from flowline w/o depression) (in):									
Depression cross-slope (Sw=Sx+a/12w):									
Fraction of flow over the depression (Eo):									
Discharge-weighted equivalent cross-slope (Se):									
Q_s (first guess: **Qt - 0.001**, after iteration should be same as next line)		0.005							
Q_s over shoulder (excluding flow over the depression) (cfs):									
Q=Q_w+Q_s (cfs) (after iterations must match **Q_t** value):									
HYDRAULIC RESULTS:									
Flooded Width T for Q_t, upstream of inlet (ft):		11.60	10.37	8.48	7.99				
Flooded Width T at depression (if any) (ft):		11.60	10.37	8.48	7.99				
Flooded Width T for BYPASS Q downstream of inlet (ft):	0.00	7.25	6.04	4.20	3.72				
Water depth at curb (with or without depression) (in):		1.39	1.24	1.02	0.96				
Water cross-area at shoulder (without depression) (sq.ft.):		0.67	0.54	0.36	0.32				
Water velocity immediately u/s from inlet (w/o depression) (fps):		1.66	1.54	1.35	1.30				
Average water velocity for the segment to this inlet (fps):		0.62	0.69	0.61	0.55				
Flowtime from the previous inlet to this one (min):		6.91	5.32	4.52	6.70				
GRATE INLETS ON-GRADE:									
Splash-over V for effective length of grate (type P-1 3/8) (fps):		6.81	6.81	6.81	6.81				
Effective length of grate considering clogging factor (ft):		2.01	2.01	2.01	2.01				
Ratio of grate frontal flow to total flow:		0.68	0.727	0.817	0.843				
Fraction of frontal flow intercepted (Rf):		100.0%	100.0%	100.0%	100.0%				
Fraction of side flow interception (Rs):		11.7%	13.2%	16.2%	17.2%				
Total flow intercepted (cfs):		0.80	0.634	0.412	0.361				
Grate Efficiency (E):		71.4%	76.3%	84.7%	87.0%				
Grate flow-through flow (cfs):		0.32	0.196	0.074	0.054				
SLOTTED DRAINS & SIDE-OPENING INLETS ON-GRADE:									
Length required for total interception (ft):									
Length of inlet provided L (ft):		10.00	20.00	10.00					
Efficiency for length L:									
Interception for length L (cfs):									
Side opening flow-through flow (cfs):									
INTERCEPTION CAPACITY OF INLETS IN SAG LOCATION:									
Maximum allowable flooded width (including the depression) (ft):									
Max. head at sag w/o exceeding allowable flooded width (ft):									
Capacity of grate in a sag (3-sided weir) (cfs):									
Length provided of curb-opening inlet at sag (ft):									
Capacity of curb-opening inlet in a sag (weir) (cfs):									

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Separate Run

HYDRAULIC CALCULATOR FOR ONSITE DRAINAGE (English Units)

Date: 05/25/21

RCTC I-15 ELPSE - OUTTER SHOULDER DIKES

Note: "Subarea discharge Qsa (cfs)" was obtained from "Design Discharge" column of Hydrological Tables found within the hydrology maps in Appendix B.2, and inputted as "Additional discharge (cfs)" below.

	Starting Point		N-1796		N-1806B	N-1814			
Location station (ft):	**1790+00.0**	**1796+72.0**	**1796+72.0**	**1806+77.0**	**1806+77.0**	**1814+00.0**			
Longitudinal profile ("on-grade" or "sag"):		on-grade	on-grade	on-grade	on-grade	sag			
Calculation Type ("grate", "side opening", or "shoulder hydraulics only"):		side opening	grate	side opening	grate	grate			
Longitudinal slope, S:		1.10%	1.10%	1.10%	1.10%	1.10%			
Shoulder cross-slope, Sx:		5.00%	5.00%	5.00%	5.00%	5.00%			
Average watershed paved width (ft):		0.00	0.00	0.00	0.00	0.00			
Shoulder Manning's n:		0.016	0.016	0.016	0.016	0.016			
Inlet description (optional):		TYP A 10'	TYP A 10'	TYP A 10'	TYP A 10'	TYP E 10'			
Clogging factor for on-grade grates:			33%		33%	33%			
Grate width (ft):			2.00		2.00	2.00			
Grate length (ft):			3.00		3.00	3.00			
Precipitation intensity (in/hr):		3.61	3.61	3.61	3.61	3.61			
Runoff Coefficient for paved areas, "C_p":		0.99	0.99	0.99	0.99	0.99			
Runoff Coefficient for unpaved areas, "C_u":		0.63	0.63	0.63	0.63	0.63			
Unpaved area contributing to this inlet (acres):		0.000	0.000	0.000	0.000	0.000			
Watershed paved length (ft):		672.0	0.0	1005.0	0.0	723.0			
Paved area contributing to this inlet (acres):		0.000	0.000	0.000	0.000	0.000			
Subarea discharge Q_{sa} (cfs):		0.00	0.000	0.000	0.000	0.000			
Additional discharge (cfs):		5.060		11.170		13.080			
Total discharge Q_t, including any upstream by-pass (cfs):		**5.060**	**1.711**	**11.506**	**1.822**	**13.456**			
By-pass Q *Describe here source of bypass:*	**0.000**	**1.71**	**0.34**	**1.82**	**0.38**	**SAG**			
DEPRESSION CALCULATION:									
Width of depression "w" (ft):									
Depression depth "a" (from flowline w/o depression) (in):									
Depression cross-slope (Sw=Sx+a/12w):									
Fraction of flow over the depression (Eo):									
Discharge-weighted equivalent cross-slope (Se):									
Q_s (first guess: **Qt - 0.001**, after iteration should be same as next line)		0.005							
Q_s over shoulder (excluding flow over the depression) (cfs):									
Q=Q_w+Q_s (cfs) (after iterations must match **Q_t** value):									
HYDRAULIC RESULTS:									
Flooded Width T for Q_t, upstream of inlet (ft):		**7.34**	**4.89**	**9.98**	**5.00**	**SAG**			
Flooded Width T at depression (if any) (ft):		**7.34**	**4.89**	**9.98**	**5.00**	**SAG**			
Flooded Width T for BYPASS Q downstream of inlet (ft):	**0.00**	**4.89**	**2.65**	**5.00**	**2.77**	**SAG**			
Water depth at curb (with or without depression) (in):		4.40	2.93	5.99	3.00				
Water cross-area at shoulder (without depression) (sq.ft.):		1.35	0.60	2.49	0.63				
Water velocity immediately u/s from inlet (w/o depression) (fps):		3.76	2.87	4.62	2.91				
Average water velocity for the segment to this inlet (fps):		1.41	#DIV/0!	1.81	#DIV/0!				
Flowtime from the previous inlet to this one (min):		7.97	#DIV/0!	9.28	#DIV/0!				
GRATE INLETS ON-GRADE:									
Splash-over V for effective length of grate (type P-1 3/8) (fps):			6.81		6.81				
Effective length of grate considering clogging factor (ft):			2.01		2.01				
Ratio of grate frontal flow to total flow:			0.754		0.744				
Fraction of frontal flow intercepted (Rf):			100.0%		100.0%				
Fraction of side flow interception (Rs):			19.9%		19.5%				
Total flow intercepted (cfs):			1.375		1.446				
Grate Efficiency (E):			80.3%		79.4%				
Grate flow-through flow (cfs):			**0.336**		**0.376**				
SLOTTED DRAINS & SIDE-OPENING INLETS ON-GRADE:									
Length required for total interception (ft):		22.10		31.21					
Length of inlet provided L (ft):		10.00		20.00					
Efficiency for length L:		66.2%		84.2%					
Interception for length L (cfs):		3.35		9.684					
Side opening flow-through flow (cfs):		**1.71**		**1.822**					
INTERCEPTION CAPACITY OF INLETS IN SAG LOCATION:									
Maximum allowable flooded width (including the depression) (ft):						**10.00**			
Max. head at sag w/o exceeding allowable flooded width (ft):						0.50			
Capacity of grate in a sag (3-sided weir) (cfs):						***6.343***			
Length provided of curb-opening inlet at sag (ft):									
Capacity of curb-opening inlet in a sag (weir) (cfs):									

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Separate Run

HYDRAULIC CALCULATOR FOR ONSITE DRAINAGE (English Units)

Date: 05/25/21

RCTC I-15 ELPSE - OUTTER SHOULDER DIKES

Note: "Subarea discharge Qsa (cfs)" was obtained from "Design Discharge" column of Hydrological Tables found within the hydrology maps in Appendix B.2, and inputted as "Additional discharge (cfs)" below.

	Starting Point	N-1830	N-1826	N-1814					
Location station (ft):	**1832+50.0**	**1830+58.0**	**1826+07.0**	**1814+00.0**					
Longitudinal profile ("on-grade" or "sag"):		on-grade	on-grade	sag					
Calculation Type ("grate", "side opening", or "shoulder hydraulics only"):		grate	grate	grate					
Longitudinal slope, S:		0.20%	0.40%	0.40%					
Shoulder cross-slope, Sx:		5.00%	5.00%	5.00%					
Average watershed paved width (ft):		0.00	0.00	0.00					
Shoulder Manning's n:		0.016	0.016	0.016					
Inlet description (optional):		TYP E 10'	TYP E 10'	TYP E 10'					
Clogging factor for on-grade grates:		33%	33%	33%					
Grate width (ft):		2.00	2.00	2.00					
Grate length (ft):		3.00	3.00	3.00					
Precipitation intensity (in/hr):		3.61	3.61	3.61					
Runoff Coefficient for paved areas, "C_p":		0.99	0.99	0.99					
Runoff Coefficient for unpaved areas, "C_u":		0.63	0.63	0.63					
Unpaved area contributing to this inlet (acres):		0.000	0.000	0.000					
Watershed paved length (ft):		192.0	451.0	1207.0					
Paved area contributing to this inlet (acres):		0.000	0.000	0.000					
Subarea discharge Q_{sa} (cfs):		0.00	0.000	0.000					
Additional discharge (cfs):		1.250	3.020	13.080					
Total discharge Q_t, including any upstream by-pass (cfs):		**1.250**	**3.241**	**14.115**					
By-pass Q *Describe here source of bypass:*	**0.000**	**0.22**	**1.04**	**SAG**					
DEPRESSION CALCULATION:									
Width of depression "w" (ft):									
Depression depth "a" (from flowline w/o depression) (in):									
Depression cross-slope (Sw=Sx+a/12w):									
Fraction of flow over the depression (Eo):									
Discharge-weighted equivalent cross-slope (Se):									
Q_s (first guess: **Qt - 0.001**, after iteration should be same as next line)		0.005							
Q_s over shoulder (excluding flow over the depression) (cfs):									
Q=Q_w+Q_s (cfs) (after iterations must match **Q_t** value):									
HYDRAULIC RESULTS:									
Flooded Width T for Q_t, upstream of inlet (ft):		**5.98**	**7.50**	**SAG**					
Flooded Width T at depression (if any) (ft):		**5.98**	**7.50**	**SAG**					
Flooded Width T for BYPASS Q downstream of inlet (ft):	**0.00**	**3.12**	**4.89**	**SAG**					
Water depth at curb (with or without depression) (in):		3.59	4.50						
Water cross-area at shoulder (without depression) (sq.ft.):		0.89	1.41						
Water velocity immediately u/s from inlet (w/o depression) (fps):		1.40	2.30						
Average water velocity for the segment to this inlet (fps):		0.52	0.94						
Flowtime from the previous inlet to this one (min):		6.12	7.99						
GRATE INLETS ON-GRADE:									
Splash-over V for effective length of grate (type P-1 3/8) (fps):		6.81	6.81						
Effective length of grate considering clogging factor (ft):		2.01	2.01						
Ratio of grate frontal flow to total flow:		0.66	0.562						
Fraction of frontal flow intercepted (Rf):		100.0%	100.0%						
Fraction of side flow interception (Rs):		47.6%	27.0%						
Total flow intercepted (cfs):		1.03	2.206						
Grate Efficiency (E):		82.3%	68.1%						
Grate flow-through flow (cfs):		**0.22**	**1.035**						
SLOTTED DRAINS & SIDE-OPENING INLETS ON-GRADE:									
Length required for total interception (ft):									
Length of inlet provided L (ft):									
Efficiency for length L:									
Interception for length L (cfs):									
Side opening flow-through flow (cfs):									
INTERCEPTION CAPACITY OF INLETS IN SAG LOCATION:									
Maximum allowable flooded width (including the depression) (ft):				**10.00**					
Max. head at sag w/o exceeding allowable flooded width (ft):				0.50					
Capacity of grate in a sag (3-sided weir) (cfs):				***6.343***					
Length provided of curb-opening inlet at sag (ft):									
Capacity of curb-opening inlet in a sag (weir) (cfs):									

ONDRAIN_English Version 7.5d, developed by Fernando Manzanera, Caltrans District 1, Hydraulics Capital Support (December 2010).

Notes: -This program utilizes the equations presented in the FHA Hydraulic Engineering Circular 22 (HEC-22), FHWA-NHI-10-009.

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Separate Run

HYDRAULIC CALCULATOR FOR ONSITE DRAINAGE (English Units)

Date: 05/25/21

RCTC I-15 ELPSE - OUTTER SHOULDER DIKES

Note: "Subarea discharge Qsa (cfs)" was obtained from "Design Discharge" column of Hydrological Tables found within the hydrology maps in Appendix B.2, and inputted as "Additional discharge (cfs)" below.

	Starting Point	N-1839	N-1846	N-1851					
Location station (ft):	**1832+50.0**	**1839+56.0**	**1846+45.0**	**1851+50.0**					
Longitudinal profile ("on-grade" or "sag"):		on-grade	on-grade	sag					
Calculation Type ("grate", "side opening", or "shoulder hydraulics only"):		grate	grate	grate					
Longitudinal slope, S:		1.50%	1.50%	1.50%					
Shoulder cross-slope, Sx:		5.00%	5.00%	5.00%					
Average watershed paved width (ft):		0.00	0.00	0.00					
Shoulder Manning's n:		0.016	0.016	0.016					
Inlet description (optional):		TYP E 10'	TYP E 10'	TYP E 10'					
Clogging factor for on-grade grates:		33%	33%	33%					
Grate width (ft):		2.00	2.00	2.00					
Grate length (ft):		3.00	3.00	3.00					
Precipitation intensity (in/hr):		3.61	3.61	3.61					
Runoff Coefficient for paved areas, "C_p":		0.99	0.99	0.99					
Runoff Coefficient for unpaved areas, "C_u":		0.63	0.63	0.63					
Unpaved area contributing to this inlet (acres):		0.000	0.000	0.000					
Watershed paved length (ft):		706.0	689.0	505.0					
Paved area contributing to this inlet (acres):		0.000	0.000	0.000					
Subarea discharge Q_{sa} (cfs):		0.00	0.000	0.000					
Additional discharge (cfs):		4.590	4.630	6.800					
Total discharge Q_t, including any upstream by-pass (cfs):		**4.590**	**6.201**	**9.226**					
By-pass Q *Describe here source of bypass:*	**0.000**	**1.57**	**2.43**	**SAG**					
DEPRESSION CALCULATION:									
Width of depression "w" (ft):									
Depression depth "a" (from flowline w/o depression) (in):									
Depression cross-slope (Sw=Sx+a/12w):									
Fraction of flow over the depression (Eo):									
Discharge-weighted equivalent cross-slope (Se):									
Q_s (first guess: **Qt - 0.001**, after iteration should be same as next line)		0.005							
Q_s over shoulder (excluding flow over the depression) (cfs):									
Q=Q_w+Q_s (cfs) (after iterations must match **Q_t** value):									
HYDRAULIC RESULTS:									
Flooded Width T for Q_t, upstream of inlet (ft):		**6.67**	**7.47**	**SAG**					
Flooded Width T at depression (if any) (ft):		**6.67**	**7.47**	**SAG**					
Flooded Width T for BYPASS Q downstream of inlet (ft):	**0.00**	**4.46**	**5.25**	**SAG**					
Water depth at curb (with or without depression) (in):		4.00	4.48						
Water cross-area at shoulder (without depression) (sq.ft.):		1.11	1.39						
Water velocity immediately u/s from inlet (w/o depression) (fps):		4.12	4.45						
Average water velocity for the segment to this inlet (fps):		1.54	1.93						
Flowtime from the previous inlet to this one (min):		7.64	5.95						
GRATE INLETS ON-GRADE:									
Splash-over V for effective length of grate (type P-1 3/8) (fps):		6.81	6.81						
Effective length of grate considering clogging factor (ft):		2.01	2.01						
Ratio of grate frontal flow to total flow:		0.61	0.564						
Fraction of frontal flow intercepted (Rf):		100.0%	100.0%						
Fraction of side flow interception (Rs):		11.5%	10.2%						
Total flow intercepted (cfs):		3.02	3.775						
Grate Efficiency (E):		65.8%	60.9%						
Grate flow-through flow (cfs):		**1.57**	**2.426**						
SLOTTED DRAINS & SIDE-OPENING INLETS ON-GRADE:									
Length required for total interception (ft):									
Length of inlet provided L (ft):		10.00	20.00	20.00					
Efficiency for length L:									
Interception for length L (cfs):									
Side opening flow-through flow (cfs):									
INTERCEPTION CAPACITY OF INLETS IN SAG LOCATION:									
Maximum allowable flooded width (including the depression) (ft):				**10.00**					
Max. head at sag w/o exceeding allowable flooded width (ft):				0.50					
Capacity of grate in a sag (3-sided weir) (cfs):				***6.343***					
Length provided of curb-opening inlet at sag (ft):									
Capacity of curb-opening inlet in a sag (weir) (cfs):									

ONDRAIN_English Version 7.5d, developed by Fernando Manzanera, Caltrans District 1, Hydraulics Capital Support (December 2010).

Notes: -This program utilizes the equations presented in the FHA Hydraulic Engineering Circular 22 (HEC-22), FHWA-NHI-10-009.

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Separate Run

HYDRAULIC CALCULATOR FOR ONSITE DRAINAGE (English Units)

Date: 05/25/21

RCTC I-15 ELPSE - OUTTER SHOULDER DIKES

Note: "Subarea discharge Qsa (cfs)" was obtained from "Design Discharge" column of Hydrological Tables found within the hydrology maps in Appendix B.2, and inputted as "Additional discharge (cfs)" below.

	Starting Point	N-1862	N-1856	N-1851					
Location station (ft):	**1867+00.0**	**1862+12.0**	**1856+43.0**	**1851+50.0**					
Longitudinal profile ("on-grade" or "sag"):		on-grade	on-grade	sag					
Calculation Type ("grate", "side opening", or "shoulder hydraulics only"):		grate	grate	grate					
Longitudinal slope, S:		0.30%	0.30%						
Shoulder cross-slope, Sx:		5.00%	5.00%	5.00%					
Average watershed paved width (ft):		0.00	0.00	0.00					
Shoulder Manning's n:		0.016	0.016	0.016					
Inlet description (optional):		TYP E 10'	TYP E 10'	TYP E 10'					
Clogging factor for on-grade grates:		33%	33%	33%					
Grate width (ft):		2.00	2.00	2.00					
Grate length (ft):		3.00	3.00	3.00					
Precipitation intensity (in/hr):		3.61	3.61	3.61					
Runoff Coefficient for paved areas, "C_p":		0.99	0.99	0.99					
Runoff Coefficient for unpaved areas, "C_u":		0.63	0.63	0.63					
Unpaved area contributing to this inlet (acres):		0.000	0.000	0.000					
Watershed paved length (ft):		488.0	569.0	493.0					
Paved area contributing to this inlet (acres):		0.000	0.000	0.000					
Subarea discharge Q_{sa} (cfs):		0.00	0.000	0.000					
Additional discharge (cfs):		3.440	3.730	6.800					
Total discharge Q_t, including any upstream by-pass (cfs):		**3.440**	**4.853**	**8.638**					
By-pass Q *Describe here source of bypass:*	**0.000**	**1.12**	**1.84**	**SAG**					
DEPRESSION CALCULATION:									
Width of depression "w" (ft):									
Depression depth "a" (from flowline w/o depression) (in):									
Depression cross-slope (Sw=Sx+a/12w):									
Fraction of flow over the depression (Eo):									
Discharge-weighted equivalent cross-slope (Se):									
Q_s (first guess: **Qt - 0.001**, after iteration should be same as next line)		0.005							
Q_s over shoulder (excluding flow over the depression) (cfs):									
Q=Q_w+Q_s (cfs) (after iterations must match **Q_t** value):									
HYDRAULIC RESULTS:									
Flooded Width T for Q_t, upstream of inlet (ft):		**8.10**	**9.21**	**SAG**					
Flooded Width T at depression (if any) (ft):		**8.10**	**9.21**	**SAG**					
Flooded Width T for BYPASS Q downstream of inlet (ft):	**0.00**	**5.32**	**6.40**	**SAG**					
Water depth at curb (with or without depression) (in):		4.86	5.53						
Water cross-area at shoulder (without depression) (sq.ft.):		1.64	2.12						
Water velocity immediately u/s from inlet (w/o depression) (fps):		2.10	2.29						
Average water velocity for the segment to this inlet (fps):		0.78	0.99						
Flowtime from the previous inlet to this one (min):		10.37	9.61						
GRATE INLETS ON-GRADE:									
Splash-over V for effective length of grate (type P-1 3/8) (fps):		6.81	6.81						
Effective length of grate considering clogging factor (ft):		2.01	2.01						
Ratio of grate frontal flow to total flow:		0.53	0.479						
Fraction of frontal flow intercepted (Rf):		100.0%	100.0%						
Fraction of side flow interception (Rs):		30.4%	27.3%						
Total flow intercepted (cfs):		2.32	3.015						
Grate Efficiency (E):		67.3%	62.1%						
Grate flow-through flow (cfs):		**1.12**	**1.838**						
SLOTTED DRAINS & SIDE-OPENING INLETS ON-GRADE:									
Length required for total interception (ft):									
Length of inlet provided L (ft):									
Efficiency for length L:									
Interception for length L (cfs):									
Side opening flow-through flow (cfs):									
INTERCEPTION CAPACITY OF INLETS IN SAG LOCATION:									
Maximum allowable flooded width (including the depression) (ft):				**10.00**					
Max. head at sag w/o exceeding allowable flooded width (ft):				0.50					
Capacity of grate in a sag (3-sided weir) (cfs):				***6.343***					
Length provided of curb-opening inlet at sag (ft):									
Capacity of curb-opening inlet in a sag (weir) (cfs):									

ONDRAIN_English Version 7.5d, developed by Fernando Manzanera, Caltrans District 1, Hydraulics Capital Support (December 2010).

Notes: -This program utilizes the equations presented in the FHA Hydraulic Engineering Circular 22 (HEC-22), FHWA-NHI-10-009.

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Separate Run

HYDRAULIC CALCULATOR FOR ONSITE DRAINAGE (English Units)

Date: 05/25/21

RCTC I-15 ELPSE - OUTTER SHOULDER DIKES

Note: "Subarea discharge Qsa (cfs)" was obtained from "Design Discharge" column of Hydrological Tables found within the hydrology maps in Appendix B.2, and inputted as "Additional discharge (cfs)" below.

	Starting Point	N-1882	N-1875		N-1871				
Location station (ft):	**1885+34.0**	**1882+35.0**	**1875+94.0**	**1870+94.0**	**1870+94.0**				
Longitudinal profile ("on-grade" or "sag"):		on-grade	on-grade	on-grade	on-grade				
Calculation Type ("grate", "side opening", or "shoulder hydraulics only"):		grate	grate	side opening	grate				
Longitudinal slope, S:		0.30%	0.30%	0.30%	0.30%				
Shoulder cross-slope, Sx:		5.00%	5.00%	5.00%	5.00%				
Average watershed paved width (ft):		0.00	0.00	0.00	0.00				
Shoulder Manning's n:		0.016	0.016	0.016	0.016				
Inlet description (optional):		TYP E 10'	TYP E 10'	TYP E 10'	TYP E 10'				
Clogging factor for on-grade grates:		33%	33%	33%	33%				
Grate width (ft):		2.00	2.00	2.00	2.00				
Grate length (ft):		3.00	3.00	3.00	3.00				
Precipitation intensity (in/hr):		3.61	3.61	3.61	3.61				
Runoff Coefficient for paved areas, "C_p":		0.99	0.99	0.99	0.99				
Runoff Coefficient for unpaved areas, "C_u":		0.63	0.63	0.63	0.63				
Unpaved area contributing to this inlet (acres):		0.000	0.000	0.000	0.000				
Watershed paved length (ft):		299.0	641.0	500.0	0.0				
Paved area contributing to this inlet (acres):		0.000	0.000	0.000	0.000				
Subarea discharge Q_{sa} (cfs):		0.00	0.000	0.000	0.000				
Additional discharge (cfs):		1.750	4.460	3.260					
Total discharge Q_t, including any upstream by-pass (cfs):		**1.750**	**4.856**	**5.100**	**0.709**				
By-pass Q *Describe here source of bypass:*	**0.000**	**0.40**	**1.84**	**0.71**	**0.08**				
DEPRESSION CALCULATION:									
Width of depression "w" (ft):									
Depression depth "a" (from flowline w/o depression) (in):									
Depression cross-slope (Sw=Sx+a/12w):									
Fraction of flow over the depression (Eo):									
Discharge-weighted equivalent cross-slope (Se):									
Q_s (first guess: **Qt - 0.001**, after iteration should be same as next line)		0.005							
Q_s over shoulder (excluding flow over the depression) (cfs):									
Q=Q_w+Q_s (cfs) (after iterations must match **Q_t** value):									
HYDRAULIC RESULTS:									
Flooded Width T for Q_t, upstream of inlet (ft):		**6.28**	**9.22**	**9.39**	**4.48**				
Flooded Width T at depression (if any) (ft):		**6.28**	**9.22**	**9.39**	**4.48**				
Flooded Width T for BYPASS Q downstream of inlet (ft):	**0.00**	**3.60**	**6.40**	**4.48**	**1.95**				
Water depth at curb (with or without depression) (in):		3.77	5.53	5.63	2.69				
Water cross-area at shoulder (without depression) (sq.ft.):		0.99	2.12	2.20	0.50				
Water velocity immediately u/s from inlet (w/o depression) (fps):		1.77	2.29	2.32	1.41				
Average water velocity for the segment to this inlet (fps):		0.66	0.93	1.04	#DIV/0!				
Flowtime from the previous inlet to this one (min):		7.53	11.52	8.04	#DIV/0!				
GRATE INLETS ON-GRADE:									
Splash-over V for effective length of grate (type P-1 3/8) (fps):		6.81	6.81		6.81				
Effective length of grate considering clogging factor (ft):		2.01	2.01		2.01				
Ratio of grate frontal flow to total flow:		0.64	0.479		0.794				
Fraction of frontal flow intercepted (Rf):		100.0%	100.0%		100.0%				
Fraction of side flow interception (Rs):		37.2%	27.2%		47.1%				
Total flow intercepted (cfs):		1.35	3.016		0.631				
Grate Efficiency (E):		77.4%	62.1%		89.1%				
Grate flow-through flow (cfs):		**0.40**	**1.840**		**0.077**				
SLOTTED DRAINS & SIDE-OPENING INLETS ON-GRADE:									
Length required for total interception (ft):				15.02					
Length of inlet provided L (ft):		10.00	20.00	10.00					
Efficiency for length L:				86.1%					
Interception for length L (cfs):				4.391					
Side opening flow-through flow (cfs):				**0.709**					
INTERCEPTION CAPACITY OF INLETS IN SAG LOCATION:									
Maximum allowable flooded width (including the depression) (ft):									
Max. head at sag w/o exceeding allowable flooded width (ft):									
Capacity of grate in a sag (3-sided weir) (cfs):									
Length provided of curb-opening inlet at sag (ft):									
Capacity of curb-opening inlet in a sag (weir) (cfs):									

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Notes: -This program utilizes the equations presented in the FHA Hydraulic Engineering Circular 22 (HEC-22), FHWA-NHI-10-009.

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Separate Run

HYDRAULIC CALCULATOR FOR ONSITE DRAINAGE (English Units)

Date: 05/25/21

RCTC I-15 ELPSE - OUTTER SHOULDER DIKES

Note: "Subarea discharge Qsa (cfs)" was obtained from "Design Discharge" column of Hydrological Tables found within the hydrology maps in Appendix B.2, and inputted as "Additional discharge (cfs)" below.

	Starting Point		N-1892	N-1896		N-1904A			
Location station (ft):	**1885+34.0**	**1892+32.0**	**1892+32.0**	**1896+45.0**	**1904+52.0**	**1904+52.0**			
Longitudinal profile ("on-grade" or "sag"):		on-grade	on-grade	on-grade	on-grade	on-grade			
Calculation Type ("grate", "side opening", or "shoulder hydraulics only"):		side opening	grate	grate	side opening	grate			
Longitudinal slope, S:		0.50%	0.50%	0.60%	0.50%	0.50%			
Shoulder cross-slope, Sx:		5.00%	5.00%	5.00%	5.00%	5.00%			
Average watershed paved width (ft):		0.00	0.00	0.00	0.00	0.00			
Shoulder Manning's n:		0.016	0.016	0.016	0.016	0.016			
Inlet description (optional):									
Clogging factor for on-grade grates:		33%	33%	33%	33%	33%			
Grate width (ft):		2.00	2.00	2.00	2.00	2.00			
Grate length (ft):		3.00	3.00	3.00	3.00	3.00			
Precipitation intensity (in/hr):		3.61	3.61	3.61	3.61	3.61			
Runoff Coefficient for paved areas, "C_p":		0.99	0.99	0.99	0.99	0.99			
Runoff Coefficient for unpaved areas, "C_u":		0.63	0.63	0.63	0.63	0.63			
Unpaved area contributing to this inlet (acres):		0.000	0.000	0.000	0.000	0.000			
Watershed paved length (ft):		698.0	0.0	413.0	807.0	0.0			
Paved area contributing to this inlet (acres):		0.000	0.000	0.000	0.000	0.000			
Subarea discharge Q_{sa} (cfs):		0.00	0.000	0.000	0.000	0.000			
Additional discharge (cfs):		4.790		3.330	7.080				
Total discharge Q_t, including any upstream by-pass (cfs):		**4.790**	**0.977**	**3.467**	**8.213**	**2.640**			
By-pass Q *Describe here source of bypass:*	**0.000**	**0.98**	**0.14**	**1.13**	**2.64**	**0.76**			
DEPRESSION CALCULATION:									
Width of depression "w" (ft):									
Depression depth "a" (from flowline w/o depression) (in):									
Depression cross-slope (Sw=Sx+a/12w):									
Fraction of flow over the depression (Eo):									
Discharge-weighted equivalent cross-slope (Se):									
Q_s (first guess: **Qt - 0.001**, after iteration should be same as next line)		0.005							
Q_s over shoulder (excluding flow over the depression) (cfs):									
Q=Q_w+Q_s (cfs) (after iterations must match **Q_t** value):									
HYDRAULIC RESULTS:									
Flooded Width T for Q_t, upstream of inlet (ft):		**8.33**	**4.59**	**7.13**	**10.20**	**6.66**			
Flooded Width T at depression (if any) (ft):		**8.33**	**4.59**	**7.13**	**10.20**	**6.66**			
Flooded Width T for BYPASS Q downstream of inlet (ft):	**0.00**	**4.59**	**2.20**	**4.69**	**6.66**	**4.17**			
Water depth at curb (with or without depression) (in):		5.00	2.75	4.28	6.12	4.00			
Water cross-area at shoulder (without depression) (sq.ft.):		1.74	0.53	1.27	2.60	1.11			
Water velocity immediately u/s from inlet (w/o depression) (fps):		2.76	1.86	2.73	3.16	2.38			
Average water velocity for the segment to this inlet (fps):		1.03	#DIV/0!	1.08	1.31	#DIV/0!			
Flowtime from the previous inlet to this one (min):		11.27	#DIV/0!	6.39	10.26	#DIV/0!			
GRATE INLETS ON-GRADE:									
Splash-over V for effective length of grate (type P-1 3/8) (fps):			6.81	6.81		6.81			
Effective length of grate considering clogging factor (ft):			2.01	2.01		2.01			
Ratio of grate frontal flow to total flow:			0.783	0.584		0.614			
Fraction of frontal flow intercepted (Rf):			100.0%	100.0%		100.0%			
Fraction of side flow interception (Rs):			35.3%	21.4%		25.9%			
Total flow intercepted (cfs):			0.840	2.335		1.885			
Grate Efficiency (E):			85.9%	67.3%		71.4%			
Grate flow-through flow (cfs):			**0.137**	**1.133**		**0.756**			
SLOTTED DRAINS & SIDE-OPENING INLETS ON-GRADE:									
Length required for total interception (ft):		17.05			21.38				
Length of inlet provided L (ft):		10.00	20.00	10.00	10.00	10.00			
Efficiency for length L:		79.6%			67.9%				
Interception for length L (cfs):		3.81			5.572				
Side opening flow-through flow (cfs):		**0.98**			**2.640**				
INTERCEPTION CAPACITY OF INLETS IN SAG LOCATION:									
Maximum allowable flooded width (including the depression) (ft):				**10.00**		**10.00**			
Max. head at sag w/o exceeding allowable flooded width (ft):									
Capacity of grate in a sag (3-sided weir) (cfs):									
Length provided of curb-opening inlet at sag (ft):									
Capacity of curb-opening inlet in a sag (weir) (cfs):									

ONDRAIN_English Version 7.5d, developed by Fernando Manzanera, Caltrans District 1, Hydraulics Capital Support (December 2010).

Notes: -This program utilizes the equations presented in the FHA Hydraulic Engineering Circular 22 (HEC-22), FHWA-NHI-10-009.

- Underlined values are calculated by the program, the others are input by the user.

Southbound Runs

HYDRAULIC CALCULATOR FOR ONSITE DRAINAGE (English Units)

Date: 05/25/21

RCTC I-15 ELPSE - OUTTER SHOULDER DIKES

Note: "Subarea discharge Qsa (cfs)" was obtained from "Design Discharge" column of Hydrological Tables found within the hydrology maps in Appendix B.2, and inputted as "Additional discharge (cfs)" below.

	Starting Point	N-OFF-1247							
Location station (ft):	**1239+00.0**	**1247+62.0**							
Longitudinal profile ("on-grade" or "sag"):		sag							
Calculation Type ("grate", "side opening", or "shoulder hydraulics only"):		grate							
Longitudinal slope, S:		2.00%							
Shoulder cross-slope, Sx:		5.00%							
Average watershed paved width (ft):		0.00							
Shoulder Manning's n:		0.016							
Inlet description (optional):		10' SHLDR							
Clogging factor for on-grade grates:		33%							
Grate width (ft):		2.00							
Grate length (ft):		3.00							
Precipitation intensity (in/hr):		3.61							
Runoff Coefficient for paved areas, "C_p":		0.99							
Runoff Coefficient for unpaved areas, "C_u":		0.63							
Unpaved area contributing to this inlet (acres):		0.000							
Watershed paved length (ft):		862.0							
Paved area contributing to this inlet (acres):		0.000							
Subarea discharge Q_{sa} (cfs):		0.00							
Additional discharge (cfs):		5.710							
Total discharge Q_t, including any upstream by-pass (cfs):		**5.710**							
By-pass Q *Describe here source of bypass:*	**0.000**	**SAG**							
DEPRESSION CALCULATION:									
Width of depression "w" (ft):									
Depression depth "a" (from flowline w/o depression) (in):									
Depression cross-slope (Sw=Sx+a/12w):									
Fraction of flow over the depression (Eo):									
Discharge-weighted equivalent cross-slope (Se):									
Q_s (first guess: **Qt - 0.001**, after iteration should be same as next line)		0.005							
Q_s over shoulder (excluding flow over the depression) (cfs):									
Q=Q_w+Q_s (cfs) (after iterations must match **Q_t** value):									
HYDRAULIC RESULTS:									
Flooded Width T for Q_t, upstream of inlet (ft):		**SAG**							
Flooded Width T at depression (if any) (ft):		**SAG**							
Flooded Width T for BYPASS Q downstream of inlet (ft):	**0.00**	**SAG**							
Water depth at curb (with or without depression) (in):									
Water cross-area at shoulder (without depression) (sq.ft.):									
Water velocity immediately u/s from inlet (w/o depression) (fps):									
Average water velocity for the segment to this inlet (fps):									
Flowtime from the previous inlet to this one (min):									
GRATE INLETS ON-GRADE:									
Splash-over V for effective length of grate (type P-1 3/8) (fps):									
Effective length of grate considering clogging factor (ft):									
Ratio of grate frontal flow to total flow:									
Fraction of frontal flow intercepted (Rf):									
Fraction of side flow interception (Rs):									
Total flow intercepted (cfs):									
Grate Efficiency (E):									
Grate flow-through flow (cfs):									
SLOTTED DRAINS & SIDE-OPENING INLETS ON-GRADE:									
Length required for total interception (ft):									
Length of inlet provided L (ft):									
Efficiency for length L:									
Interception for length L (cfs):									
Side opening flow-through flow (cfs):									
INTERCEPTION CAPACITY OF INLETS IN SAG LOCATION:									
Maximum allowable flooded width (including the depression) (ft):		**10.00**							
Max. head at sag w/o exceeding allowable flooded width (ft):		0.50							
Capacity of grate in a sag (3-sided weir) (cfs):		***6.34***							
Length provided of curb-opening inlet at sag (ft):									
Capacity of curb-opening inlet in a sag (weir) (cfs):									

ONDRAIN_English Version 7.5d, developed by Fernando Manzanera, Caltrans District 1, Hydraulics Capital Support (December 2010).

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Separate Run

HYDRAULIC CALCULATOR FOR ONSITE DRAINAGE (English Units)

Date: 05/25/21

RCTC I-15 ELPSE - OUTTER SHOULDER DIKES	Note: "Subarea discharge Qsa (cfs)" was obtained from "Design Discharge" column of Hydrological Tables found within the hydrology maps in Appendix B.2, and inputted as "Additional discharge (cfs)" below.	

	Starting Point	N-1267								
Location station (ft):	**1258+00.0**	**1267+50.0**								
Longitudinal profile ("on-grade" or "sag"):		sag								
Calculation Type ("grate", "side opening", or "shoulder hydraulics only"):		grate								
Longitudinal slope, S:		2.00%								
Shoulder cross-slope, Sx:		5.00%								
Average watershed paved width (ft):		0.00								
Shoulder Manning's n:		0.016								
Inlet description (optional):		10' SHLDR								
Clogging factor for on-grade grates:		33%								
Grate width (ft):		2.00								
Grate length (ft):		3.00								
Precipitation intensity (in/hr):		3.61								
Runoff Coefficient for paved areas, "C_p":		0.99								
Runoff Coefficient for unpaved areas, "C_u":		0.63								
Unpaved area contributing to this inlet (acres):		0.000								
Watershed paved length (ft):		950.0								
Paved area contributing to this inlet (acres):		0.000								
Subarea discharge Q_{sa} (cfs):		0.00								
Additional discharge (cfs):		5.680								
Total discharge Q_t, including any upstream by-pass (cfs):		**5.680**								
By-pass Q *Describe here source of bypass:*	**0.000**	**SAG**								
DEPRESSION CALCULATION:										
Width of depression "w" (ft):										
Depression depth "a" (from flowline w/o depression) (in):										
Depression cross-slope (Sw=Sx+a/12w):										
Fraction of flow over the depression (Eo):										
Discharge-weighted equivalent cross-slope (Se):										
Q_s (first guess: **Qt - 0.001**, after iteration should be same as next line)		0.005								
Q_s over shoulder (excluding flow over the depression) (cfs):										
Q=Q_w+Q_s (cfs) (after iterations must match **Q_t** value):										
HYDRAULIC RESULTS:										
Flooded Width T for Q_t, upstream of inlet (ft):		**SAG**								
Flooded Width T at depression (if any) (ft):		**SAG**								
Flooded Width T for BYPASS Q downstream of inlet (ft):	**0.00**	**SAG**								
Water depth at curb (with or without depression) (in):										
Water cross-area at shoulder (without depression) (sq.ft.):										
Water velocity immediately u/s from inlet (w/o depression) (fps):										
Average water velocity for the segment to this inlet (fps):										
Flowtime from the previous inlet to this one (min):										
GRATE INLETS ON-GRADE:										
Splash-over V for effective length of grate (type P-1 3/8) (fps):										
Effective length of grate considering clogging factor (ft):										
Ratio of grate frontal flow to total flow:										
Fraction of frontal flow intercepted (Rf):										
Fraction of side flow interception (Rs):										
Total flow intercepted (cfs):										
Grate Efficiency (E):										
Grate flow-through flow (cfs):										
SLOTTED DRAINS & SIDE-OPENING INLETS ON-GRADE:										
Length required for total interception (ft):										
Length of inlet provided L (ft):										
Efficiency for length L:										
Interception for length L (cfs):										
Side opening flow-through flow (cfs):										
INTERCEPTION CAPACITY OF INLETS IN SAG LOCATION:										
Maximum allowable flooded width (including the depression) (ft):		**10.00**								
Max. head at sag w/o exceeding allowable flooded width (ft):		0.50								
Capacity of grate in a sag (3-sided weir) (cfs):		***6.34***								
Length provided of curb-opening inlet at sag (ft):										
Capacity of curb-opening inlet in a sag (weir) (cfs):										

ONDRAIN_English Version 7.5d, developed by Fernando Manzanera, Caltrans District 1, Hydraulics Capital Support (December 2010).

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Separate Run

HYDRAULIC CALCULATOR FOR ONSITE DRAINAGE (English Units)

Date: 05/25/21

RCTC I-15 ELPSE - OUTTER SHOULDER DIKES

Note: "Subarea discharge Qsa (cfs)" was obtained from "Design Discharge" column of Hydrological Tables found within the hydrology maps in Appendix B.2, and inputted as "Additional discharge (cfs)" below.

	Starting Point	N-1594	N-1603						
Location station (ft):	**1587+30.0**	**1594+48.0**	**1602+70.0**	**1602+70.0**					
Longitudinal profile ("on-grade" or "sag"):		on-grade	on-grade	on-grade					
Calculation Type ("grate", "side opening", or "shoulder hydraulics only"):		grate	grate	grate					
Longitudinal slope, S:		1.50%	5.00%	5.00%					
Shoulder cross-slope, Sx:		5.00%	5.00%	5.00%					
Average watershed paved width (ft):		0.00	0.00	0.00					
Shoulder Manning's n:		0.016	0.016	0.016					
Inlet description (optional):									
Clogging factor for on-grade grates:		33%	33%	33%					
Grate width (ft):		2.00	3.00	3.00					
Grate length (ft):		3.00	3.00	3.00					
Precipitation intensity (in/hr):		3.61	3.61	3.61					
Runoff Coefficient for paved areas, "C_p":		0.99	0.99	0.99					
Runoff Coefficient for unpaved areas, "C_u":		0.63	0.63	0.63					
Unpaved area contributing to this inlet (acres):		0.000	0.000	0.000					
Watershed paved length (ft):		718.0	822.0	0.0					
Paved area contributing to this inlet (acres):		0.000	0.000	0.000					
Subarea discharge Q_{sa} (cfs):		0.00	0.000	0.000					
Additional discharge (cfs):		5.360	10.110						
Total discharge Q_t, including any upstream by-pass (cfs):		**5.360**	**12.081**	**4.241**					
By-pass Q *Describe here source of bypass:*	**0.000**	**1.97**	**4.24**	**0.39**					
DEPRESSION CALCULATION:									
Width of depression "w" (ft):									
Depression depth "a" (from flowline w/o depression) (in):									
Depression cross-slope (Sw=Sx+a/12w):									
Fraction of flow over the depression (Eo):									
Discharge-weighted equivalent cross-slope (Se):									
Q_s (first guess: **Qt - 0.001**, after iteration should be same as next line)		0.005							
Q_s over shoulder (excluding flow over the depression) (cfs):									
Q=Q_w+Q_s (cfs) (after iterations must match **Q_t** value):									
HYDRAULIC RESULTS:									
Flooded Width T for Q_t, upstream of inlet (ft):		**7.07**	**7.65**	**5.17**					
Flooded Width T at depression (if any) (ft):		**7.07**	**7.65**	**5.17**					
Flooded Width T for BYPASS Q downstream of inlet (ft):	**0.00**	**4.86**	**5.17**	**2.12**					
Water depth at curb (with or without depression) (in):		4.24	4.59	3.10					
Water cross-area at shoulder (without depression) (sq.ft.):		1.25	1.46	0.67					
Water velocity immediately u/s from inlet (w/o depression) (fps):		4.29	8.25	6.35					
Average water velocity for the segment to this inlet (fps):		1.60	3.63	#DIV/0!					
Flowtime from the previous inlet to this one (min):		7.47	3.77	#DIV/0!					
GRATE INLETS ON-GRADE:									
Splash-over V for effective length of grate (type P-1 3/8) (fps):		6.81	6.81	6.81					
Effective length of grate considering clogging factor (ft):		2.01	2.01	2.01					
Ratio of grate frontal flow to total flow:		0.59	0.735	0.901					
Fraction of frontal flow intercepted (Rf):		100.0%	87.0%	100.0%					
Fraction of side flow interception (Rs):		10.8%	3.6%	5.6%					
Total flow intercepted (cfs):		3.39	7.840	3.846					
Grate Efficiency (E):		63.2%	64.9%	90.7%					
Grate flow-through flow (cfs):		**1.97**	**4.241**	**0.395**					
SLOTTED DRAINS & SIDE-OPENING INLETS ON-GRADE:									
Length required for total interception (ft):									
Length of inlet provided L (ft):		10.00	20.00	10.00					
Efficiency for length L:									
Interception for length L (cfs):									
Side opening flow-through flow (cfs):									
INTERCEPTION CAPACITY OF INLETS IN SAG LOCATION:									
Maximum allowable flooded width (including the depression) (ft):									
Max. head at sag w/o exceeding allowable flooded width (ft):									
Capacity of grate in a sag (3-sided weir) (cfs):									
Length provided of curb-opening inlet at sag (ft):									
Capacity of curb-opening inlet in a sag (weir) (cfs):									

ONDRAIN_English Version 7.5d, developed by Fernando Manzanera, Caltrans District 1, Hydraulics Capital Support (December 2010).

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Separate Run

HYDRAULIC CALCULATOR FOR ONSITE DRAINAGE (English Units)

Date: 05/25/21

RCTC I-15 ELPSE - OUTTER SHOULDER DIKES

Note: "Subarea discharge Qsa (cfs)" was obtained from "Design Discharge" column of Hydrological Tables found within the hydrology maps in Appendix B.2, and inputted as "Additional discharge (cfs)" below.

	Starting Point	N-Off-1754							
Location station (ft):	**1587+30.0**	**1744+54.0**							
Longitudinal profile ("on-grade" or "sag"):		on-grade							
Calculation Type ("grate", "side opening", or "shoulder hydraulics only"):		grate							
Longitudinal slope, S:		1.50%							
Shoulder cross-slope, Sx:		8.00%							
Average watershed paved width (ft):		0.00							
Shoulder Manning's n:		0.016							
Inlet description (optional):									
Clogging factor for on-grade grates:		33%							
Grate width (ft):		2.00							
Grate length (ft):		3.00							
Precipitation intensity (in/hr):		3.61							
Runoff Coefficient for paved areas, "C_p":		0.99							
Runoff Coefficient for unpaved areas, "C_u":		0.63							
Unpaved area contributing to this inlet (acres):		0.000							
Watershed paved length (ft):		15724.0							
Paved area contributing to this inlet (acres):		0.000							
Subarea discharge Q_{sa} (cfs):		0.00							
Additional discharge (cfs):		5.200							
Total discharge Q_t, including any upstream by-pass (cfs):		**5.200**							
By-pass Q *Describe here source of bypass:*	**0.000**	**1.23**							
DEPRESSION CALCULATION:									
Width of depression "w" (ft):									
Depression depth "a" (from flowline w/o depression) (in):									
Depression cross-slope (Sw=Sx+a/12w):									
Fraction of flow over the depression (Eo):									
Discharge-weighted equivalent cross-slope (Se):									
Q_s (first guess: **Qt - 0.001**, after iteration should be same as next line)		0.005							
Q_s over shoulder (excluding flow over the depression) (cfs):									
Q=Q_w+Q_s (cfs) (after iterations must match **Q_t** value):									
HYDRAULIC RESULTS:									
Flooded Width T for Q_t, upstream of inlet (ft):		**5.21**							
Flooded Width T at depression (if any) (ft):		**5.21**							
Flooded Width T for BYPASS Q downstream of inlet (ft):	**0.00**	**3.04**							
Water depth at curb (with or without depression) (in):		5.00							
Water cross-area at shoulder (without depression) (sq.ft.):		1.09							
Water velocity immediately u/s from inlet (w/o depression) (fps):		4.79							
Average water velocity for the segment to this inlet (fps):		1.79							
Flowtime from the previous inlet to this one (min):		146.47							
GRATE INLETS ON-GRADE:									
Splash-over V for effective length of grate (type P-1 3/8) (fps):		6.81							
Effective length of grate considering clogging factor (ft):		2.01							
Ratio of grate frontal flow to total flow:		0.72							
Fraction of frontal flow intercepted (Rf):		100.0%							
Fraction of side flow interception (Rs):		13.7%							
Total flow intercepted (cfs):		3.97							
Grate Efficiency (E):		76.3%							
Grate flow-through flow (cfs):		**1.23**							
SLOTTED DRAINS & SIDE-OPENING INLETS ON-GRADE:									
Length required for total interception (ft):									
Length of inlet provided L (ft):									
Efficiency for length L:									
Interception for length L (cfs):									
Side opening flow-through flow (cfs):									
INTERCEPTION CAPACITY OF INLETS IN SAG LOCATION:									
Maximum allowable flooded width (including the depression) (ft):									
Max. head at sag w/o exceeding allowable flooded width (ft):									
Capacity of grate in a sag (3-sided weir) (cfs):									
Length provided of curb-opening inlet at sag (ft):									
Capacity of curb-opening inlet in a sag (weir) (cfs):									

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Separate Run

HYDRAULIC CALCULATOR FOR ONSITE DRAINAGE (English Units)

Date: 05/25/21

RCTC I-15 ELPSE - OUTTER SHOULDER DIKES

Note: "Subarea discharge Qsa (cfs)" was obtained from "Design Discharge" column of Hydrological Tables found within the hydrology maps in Appendix B.2, and inputted as "Additional discharge (cfs)" below.

	Starting Point	N-1771							
Location station (ft):	**1763+00.0**	**1771+20.0**							
Longitudinal profile ("on-grade" or "sag"):		on-grade							
Calculation Type ("grate", "side opening", or "shoulder hydraulics only"):		grate							
Longitudinal slope, S:		2.00%							
Shoulder cross-slope, Sx:		5.00%							
Average watershed paved width (ft):		0.00							
Shoulder Manning's n:		0.016							
Inlet description (optional):		17' SHLDR							
Clogging factor for on-grade grates:		33%							
Grate width (ft):		2.00							
Grate length (ft):		3.00							
Precipitation intensity (in/hr):		3.61							
Runoff Coefficient for paved areas, "C_p":		0.99							
Runoff Coefficient for unpaved areas, "C_u":		0.63							
Unpaved area contributing to this inlet (acres):		0.000							
Watershed paved length (ft):		820.0							
Paved area contributing to this inlet (acres):		0.000							
Subarea discharge Q_{sa} (cfs):		0.00							
Additional discharge (cfs):		6.550							
Total discharge Q_t, including any upstream by-pass (cfs):		**6.550**							
By-pass Q — *Describe here source of bypass:*	**0.000**	**2.53**							
DEPRESSION CALCULATION:									
Width of depression "w" (ft):									
Depression depth "a" (from flowline w/o depression) (in):									
Depression cross-slope (Sw=Sx+a/12w):									
Fraction of flow over the depression (Eo):									
Discharge-weighted equivalent cross-slope (Se):									
Q_s (first guess: **Qt - 0.001**, after iteration should be same as next line)		0.005							
Q_s over shoulder (excluding flow over the depression) (cfs):									
Q=Q_w+Q_s (cfs) (after iterations must match **Q_t** value):									
HYDRAULIC RESULTS:									
Flooded Width T for Q_t, upstream of inlet (ft):		**7.22**							
Flooded Width T at depression (if any) (ft):		**7.22**							
Flooded Width T for BYPASS Q downstream of inlet (ft):	**0.00**	**5.06**							
Water depth at curb (with or without depression) (in):		4.33							
Water cross-area at shoulder (without depression) (sq.ft.):		1.30							
Water velocity immediately u/s from inlet (w/o depression) (fps):		5.02							
Average water velocity for the segment to this inlet (fps):		1.88							
Flowtime from the previous inlet to this one (min):		7.28							
GRATE INLETS ON-GRADE:									
Splash-over V for effective length of grate (type P-1 3/8) (fps):		6.81							
Effective length of grate considering clogging factor (ft):		2.01							
Ratio of grate frontal flow to total flow:		0.58							
Fraction of frontal flow intercepted (Rf):		100.0%							
Fraction of side flow interception (Rs):		8.3%							
Total flow intercepted (cfs):		4.02							
Grate Efficiency (E):		61.4%							
Grate flow-through flow (cfs):		**2.53**							
SLOTTED DRAINS & SIDE-OPENING INLETS ON-GRADE:									
Length required for total interception (ft):									
Length of inlet provided L (ft):									
Efficiency for length L:									
Interception for length L (cfs):									
Side opening flow-through flow (cfs):									
INTERCEPTION CAPACITY OF INLETS IN SAG LOCATION:									
Maximum allowable flooded width (including the depression) (ft):									
Max. head at sag w/o exceeding allowable flooded width (ft):									
Capacity of grate in a sag (3-sided weir) (cfs):									
Length provided of curb-opening inlet at sag (ft):									
Capacity of curb-opening inlet in a sag (weir) (cfs):									

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Separate Run

HYDRAULIC CALCULATOR FOR ONSITE DRAINAGE (English Units)

Date: 05/25/21

RCTC I-15 ELPSE - OUTTER SHOULDER DIKES

Note: "Subarea discharge Qsa (cfs)" was obtained from "Design Discharge" column of Hydrological Tables found within the hydrology maps in Appendix B.2, and inputted as "Additional discharge (cfs)" below.

	Starting Point	N-1779B	N-1781B	N-1783	N-1785B				
Location station (ft):	1776+57.0	1779+14.0	1781+35.0	1783+00.0	1785+20.0				
Longitudinal profile ("on-grade" or "sag"):		on-grade	on-grade	on-grade	on-grade				
Calculation Type ("grate", "side opening", or "shoulder hydraulics only"):		grate	grate	grate	grate				
Longitudinal slope, S:		1.00%	1.00%	1.00%	1.00%				
Shoulder cross-slope, Sx:		1.00%	1.00%	1.00%	1.00%				
Average watershed paved width (ft):		0.00	0.00	0.00	0.00				
Shoulder Manning's n:		0.016	0.016	0.016	0.016				
Inlet description (optional):		20' SHLDR	20' SHLDR	20' SHLDR	20' SHLDR				
Clogging factor for on-grade grates:		33%	33%	33%	33%				
Grate width (ft):		4.00	4.00	4.00	4.00				
Grate length (ft):		3.00	3.00	3.00	3.00				
Precipitation intensity (in/hr):		3.61	3.61	3.61	3.61				
Runoff Coefficient for paved areas, "C_p":		0.99	0.99	0.99	0.99				
Runoff Coefficient for unpaved areas, "C_u":		0.63	0.63	0.63	0.63				
Unpaved area contributing to this inlet (acres):		0.000	0.000	0.000	0.000				
Watershed paved length (ft):		257.0	221.0	165.0	220.0				
Paved area contributing to this inlet (acres):		0.000	0.000	0.000	0.000				
Subarea discharge Q_{sa} (cfs):		0.00	0.000	0.000	0.000				
Additional discharge (cfs):		1.120	0.510	0.290	0.340				
Total discharge Q_t, including any upstream by-pass (cfs):		1.120	0.830	0.486	0.414				
By-pass Q — *Describe here source of bypass:*	0.000	0.32	0.20	0.07	0.05				
DEPRESSION CALCULATION:									
Width of depression "w" (ft):									
Depression depth "a" (from flowline w/o depression) (in):									
Depression cross-slope (Sw=Sx+a/12w):									
Fraction of flow over the depression (Eo):									
Discharge-weighted equivalent cross-slope (Se):									
Q_s (first guess: **Qt - 0.001**, after iteration should be same as next line)		0.005							
Q_s over shoulder (excluding flow over the depression) (cfs):									
Q=Q_w+Q_s (cfs) (after iterations must match **Q_t** value):									
HYDRAULIC RESULTS:									
Flooded Width T for Q_t, upstream of inlet (ft):		11.60	10.37	8.48	7.99				
Flooded Width T at depression (if any) (ft):		11.60	10.37	8.48	7.99				
Flooded Width T for BYPASS Q downstream of inlet (ft):	0.00	7.25	6.04	4.20	3.72				
Water depth at curb (with or without depression) (in):		1.39	1.24	1.02	0.96				
Water cross-area at shoulder (without depression) (sq.ft.):		0.67	0.54	0.36	0.32				
Water velocity immediately u/s from inlet (w/o depression) (fps):		1.66	1.54	1.35	1.30				
Average water velocity for the segment to this inlet (fps):		0.62	0.69	0.61	0.55				
Flowtime from the previous inlet to this one (min):		6.91	5.32	4.52	6.70				
GRATE INLETS ON-GRADE:									
Splash-over V for effective length of grate (type P-1 3/8) (fps):		6.81	6.81	6.81	6.81				
Effective length of grate considering clogging factor (ft):		2.01	2.01	2.01	2.01				
Ratio of grate frontal flow to total flow:		0.68	0.727	0.817	0.843				
Fraction of frontal flow intercepted (Rf):		100.0%	100.0%	100.0%	100.0%				
Fraction of side flow interception (Rs):		11.7%	13.2%	16.2%	17.2%				
Total flow intercepted (cfs):		0.80	0.634	0.412	0.361				
Grate Efficiency (E):		71.4%	76.3%	84.7%	87.0%				
Grate flow-through flow (cfs):		0.32	0.196	0.074	0.054				
SLOTTED DRAINS & SIDE-OPENING INLETS ON-GRADE:									
Length required for total interception (ft):									
Length of inlet provided L (ft):		10.00	20.00	10.00					
Efficiency for length L:									
Interception for length L (cfs):									
Side opening flow-through flow (cfs):									
INTERCEPTION CAPACITY OF INLETS IN SAG LOCATION:									
Maximum allowable flooded width (including the depression) (ft):									
Max. head at sag w/o exceeding allowable flooded width (ft):									
Capacity of grate in a sag (3-sided weir) (cfs):									
Length provided of curb-opening inlet at sag (ft):									
Capacity of curb-opening inlet in a sag (weir) (cfs):									

ONDRAIN_English Version 7.5d, developed by Fernando Manzanera, Caltrans District 1, Hydraulics Capital Support (December 2010).

Notes: -This program utilizes the equations presented in the FHA Hydraulic Engineering Circular 22 (HEC-22), FHWA-NHI-10-009.

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Separate Run

HYDRAULIC CALCULATOR FOR ONSITE DRAINAGE (English Units)

Date: 05/25/21

RCTC I-15 ELPSE - OUTTER SHOULDER DIKES

Note: "Subarea discharge Qsa (cfs)" was obtained from "Design Discharge" column of Hydrological Tables found within the hydrology maps in Appendix B.2, and inputted as "Additional discharge (cfs)" below.

	Starting Point	N-1796		N-1806B	N-1814			
Location station (ft):	**1790+00.0**	**1796+72.0**	**1796+72.0**	**1806+77.0**	**1806+77.0**	**1814+00.0**		
Longitudinal profile ("on-grade" or "sag"):		on-grade	on-grade	on-grade	on-grade	sag		
Calculation Type ("grate", "side opening", or "shoulder hydraulics only"):		side opening	grate	side opening	grate	grate		
Longitudinal slope, S:		1.10%	1.10%	1.10%	1.10%	1.10%		
Shoulder cross-slope, Sx:		5.00%	5.00%	5.00%	5.00%	5.00%		
Average watershed paved width (ft):		0.00	0.00	0.00	0.00	0.00		
Shoulder Manning's n:		0.016	0.016	0.016	0.016	0.016		
Inlet description (optional):		TYP A 10'	TYP A 10'	TYP A 10'	TYP A 10'	TYP E 10'		
Clogging factor for on-grade grates:			33%		33%	33%		
Grate width (ft):			2.00		2.00	2.00		
Grate length (ft):			3.00		3.00	3.00		
Precipitation intensity (in/hr):		3.61	3.61	3.61	3.61	3.61		
Runoff Coefficient for paved areas, "C_p":		0.99	0.99	0.99	0.99	0.99		
Runoff Coefficient for unpaved areas, "C_u":		0.63	0.63	0.63	0.63	0.63		
Unpaved area contributing to this inlet (acres):		0.000	0.000	0.000	0.000	0.000		
Watershed paved length (ft):		672.0	0.0	1005.0	0.0	723.0		
Paved area contributing to this inlet (acres):		0.000	0.000	0.000	0.000	0.000		
Subarea discharge Q_{sa} (cfs):		0.00	0.000	0.000	0.000	0.000		
Additional discharge (cfs):		5.060		11.170		13.080		
Total discharge Q_t, including any upstream by-pass (cfs):		**5.060**	**1.711**	**11.506**	**1.822**	**13.456**		
By-pass Q *Describe here source of bypass:*	**0.000**	**1.71**	**0.34**	**1.82**	**0.38**	**SAG**		
DEPRESSION CALCULATION:								
Width of depression "w" (ft):								
Depression depth "a" (from flowline w/o depression) (in):								
Depression cross-slope (Sw=Sx+a/12w):								
Fraction of flow over the depression (Eo):								
Discharge-weighted equivalent cross-slope (Se):								
Q_s (first guess: **Qt - 0.001**, after iteration should be same as next line)		0.005						
Q_s over shoulder (excluding flow over the depression) (cfs):								
Q=Q_w+Q_s (cfs) (after iterations must match **Q_t** value):								
HYDRAULIC RESULTS:								
Flooded Width T for Q_t, upstream of inlet (ft):		**7.34**	**4.89**	**9.98**	**5.00**	**SAG**		
Flooded Width T at depression (if any) (ft):		**7.34**	**4.89**	**9.98**	**5.00**	**SAG**		
Flooded Width T for BYPASS Q downstream of inlet (ft):	**0.00**	**4.89**	**2.65**	**5.00**	**2.77**	**SAG**		
Water depth at curb (with or without depression) (in):		4.40	2.93	5.99	3.00			
Water cross-area at shoulder (without depression) (sq.ft.):		1.35	0.60	2.49	0.63			
Water velocity immediately u/s from inlet (w/o depression) (fps):		3.76	2.87	4.62	2.91			
Average water velocity for the segment to this inlet (fps):		1.41	#DIV/0!	1.81	#DIV/0!			
Flowtime from the previous inlet to this one (min):		7.97	#DIV/0!	9.28	#DIV/0!			
GRATE INLETS ON-GRADE:								
Splash-over V for effective length of grate (type P-1 3/8) (fps):			6.81		6.81			
Effective length of grate considering clogging factor (ft):			2.01		2.01			
Ratio of grate frontal flow to total flow:			0.754		0.744			
Fraction of frontal flow intercepted (Rf):			100.0%		100.0%			
Fraction of side flow interception (Rs):			19.9%		19.5%			
Total flow intercepted (cfs):			1.375		1.446			
Grate Efficiency (E):			80.3%		79.4%			
Grate flow-through flow (cfs):			**0.336**		**0.376**			
SLOTTED DRAINS & SIDE-OPENING INLETS ON-GRADE:								
Length required for total interception (ft):		22.10		31.21				
Length of inlet provided L (ft):		10.00		20.00				
Efficiency for length L:		66.2%		84.2%				
Interception for length L (cfs):		3.35		9.684				
Side opening flow-through flow (cfs):		**1.71**		**1.822**				
INTERCEPTION CAPACITY OF INLETS IN SAG LOCATION:								
Maximum allowable flooded width (including the depression) (ft):						**10.00**		
Max. head at sag w/o exceeding allowable flooded width (ft):						0.50		
Capacity of grate in a sag (3-sided weir) (cfs):						***6.343***		
Length provided of curb-opening inlet at sag (ft):								
Capacity of curb-opening inlet in a sag (weir) (cfs):								

ONDRAIN_English Version 7.5d, developed by Fernando Manzanera, Caltrans District 1, Hydraulics Capital Support (December 2010).

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Separate Run

HYDRAULIC CALCULATOR FOR ONSITE DRAINAGE (English Units)

Date: 05/25/21

RCTC I-15 ELPSE - OUTTER SHOULDER DIKES

Note: "Subarea discharge Qsa (cfs)" was obtained from "Design Discharge" column of Hydrological Tables found within the hydrology maps in Appendix B.2, and inputted as "Additional discharge (cfs)" below.

	Starting Point	N-1830	N-1826	N-1814					
Location station (ft):	**1832+50.0**	**1830+58.0**	**1826+07.0**	**1814+00.0**					
Longitudinal profile ("on-grade" or "sag"):		on-grade	on-grade	sag					
Calculation Type ("grate", "side opening", or "shoulder hydraulics only"):		grate	grate	grate					
Longitudinal slope, S:		0.20%	0.40%	0.40%					
Shoulder cross-slope, Sx:		5.00%	5.00%	5.00%					
Average watershed paved width (ft):		0.00	0.00	0.00					
Shoulder Manning's n:		0.016	0.016	0.016					
Inlet description (optional):		TYP E 10'	TYP E 10'	TYP E 10'					
Clogging factor for on-grade grates:		33%	33%	33%					
Grate width (ft):		2.00	2.00	2.00					
Grate length (ft):		3.00	3.00	3.00					
Precipitation intensity (in/hr):		3.61	3.61	3.61					
Runoff Coefficient for paved areas, "C_p":		0.99	0.99	0.99					
Runoff Coefficient for unpaved areas, "C_u":		0.63	0.63	0.63					
Unpaved area contributing to this inlet (acres):		0.000	0.000	0.000					
Watershed paved length (ft):		192.0	451.0	1207.0					
Paved area contributing to this inlet (acres):		0.000	0.000	0.000					
Subarea discharge Q_{sa} (cfs):		0.00	0.000	0.000					
Additional discharge (cfs):		1.250	3.020	13.080					
Total discharge Q_t, including any upstream by-pass (cfs):		**1.250**	**3.241**	**14.115**					
By-pass Q *Describe here source of bypass:*	**0.000**	**0.22**	**1.04**	**SAG**					
DEPRESSION CALCULATION:									
Width of depression "w" (ft):									
Depression depth "a" (from flowline w/o depression) (in):									
Depression cross-slope (Sw=Sx+a/12w):									
Fraction of flow over the depression (Eo):									
Discharge-weighted equivalent cross-slope (Se):									
Q_s (first guess: **Qt - 0.001**, after iteration should be same as next line)		0.005							
Q_s over shoulder (excluding flow over the depression) (cfs):									
Q=Q_w+Q_s (cfs) (after iterations must match **Q_t** value):									
HYDRAULIC RESULTS:									
Flooded Width T for Q_t, upstream of inlet (ft):		**5.98**	**7.50**	**SAG**					
Flooded Width T at depression (if any) (ft):		**5.98**	**7.50**	**SAG**					
Flooded Width T for BYPASS Q downstream of inlet (ft):	**0.00**	**3.12**	**4.89**	**SAG**					
Water depth at curb (with or without depression) (in):		3.59	4.50						
Water cross-area at shoulder (without depression) (sq.ft.):		0.89	1.41						
Water velocity immediately u/s from inlet (w/o depression) (fps):		1.40	2.30						
Average water velocity for the segment to this inlet (fps):		0.52	0.94						
Flowtime from the previous inlet to this one (min):		6.12	7.99						
GRATE INLETS ON-GRADE:									
Splash-over V for effective length of grate (type P-1 3/8) (fps):		6.81	6.81						
Effective length of grate considering clogging factor (ft):		2.01	2.01						
Ratio of grate frontal flow to total flow:		0.66	0.562						
Fraction of frontal flow intercepted (Rf):		100.0%	100.0%						
Fraction of side flow interception (Rs):		47.6%	27.0%						
Total flow intercepted (cfs):		1.03	2.206						
Grate Efficiency (E):		82.3%	68.1%						
Grate flow-through flow (cfs):		**0.22**	**1.035**						
SLOTTED DRAINS & SIDE-OPENING INLETS ON-GRADE:									
Length required for total interception (ft):									
Length of inlet provided L (ft):									
Efficiency for length L:									
Interception for length L (cfs):									
Side opening flow-through flow (cfs):									
INTERCEPTION CAPACITY OF INLETS IN SAG LOCATION:									
Maximum allowable flooded width (including the depression) (ft):				**10.00**					
Max. head at sag w/o exceeding allowable flooded width (ft):				0.50					
Capacity of grate in a sag (3-sided weir) (cfs):				***6.343***					
Length provided of curb-opening inlet at sag (ft):									
Capacity of curb-opening inlet in a sag (weir) (cfs):									

ONDRAIN_English Version 7.5d, developed by Fernando Manzanera, Caltrans District 1, Hydraulics Capital Support (December 2010).

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Separate Run

HYDRAULIC CALCULATOR FOR ONSITE DRAINAGE (English Units)

Date: 05/25/21

RCTC I-15 ELPSE - OUTTER SHOULDER DIKES

Note: "Subarea discharge Qsa (cfs)" was obtained from "Design Discharge" column of Hydrological Tables found within the hydrology maps in Appendix B.2, and inputted as "Additional discharge (cfs)" below.

	Starting Point	N-1839	N-1846	N-1851					
Location station (ft):	**1832+50.0**	**1839+56.0**	**1846+45.0**	**1851+50.0**					
Longitudinal profile ("on-grade" or "sag"):		on-grade	on-grade	sag					
Calculation Type ("grate", "side opening", or "shoulder hydraulics only"):		grate	grate	grate					
Longitudinal slope, S:		1.50%	1.50%	1.50%					
Shoulder cross-slope, Sx:		5.00%	5.00%	5.00%					
Average watershed paved width (ft):		0.00	0.00	0.00					
Shoulder Manning's n:		0.016	0.016	0.016					
Inlet description (optional):		TYP E 10'	TYP E 10'	TYP E 10'					
Clogging factor for on-grade grates:		33%	33%	33%					
Grate width (ft):		2.00	2.00	2.00					
Grate length (ft):		3.00	3.00	3.00					
Precipitation intensity (in/hr):		3.61	3.61	3.61					
Runoff Coefficient for paved areas, "C_p":		0.99	0.99	0.99					
Runoff Coefficient for unpaved areas, "C_u":		0.63	0.63	0.63					
Unpaved area contributing to this inlet (acres):		0.000	0.000	0.000					
Watershed paved length (ft):		706.0	689.0	505.0					
Paved area contributing to this inlet (acres):		0.000	0.000	0.000					
Subarea discharge Q_{sa} (cfs):		0.00	0.000	0.000					
Additional discharge (cfs):		4.590	4.630	6.800					
Total discharge Q_t, including any upstream by-pass (cfs):		**4.590**	**6.201**	**9.226**					
By-pass Q *Describe here source of bypass:*	**0.000**	**1.57**	**2.43**	**SAG**					
DEPRESSION CALCULATION:									
Width of depression "w" (ft):									
Depression depth "a" (from flowline w/o depression) (in):									
Depression cross-slope (Sw=Sx+a/12w):									
Fraction of flow over the depression (Eo):									
Discharge-weighted equivalent cross-slope (Se):									
Q_s (first guess: **Qt - 0.001**, after iteration should be same as next line)		0.005							
Q_s over shoulder (excluding flow over the depression) (cfs):									
Q=Q_w+Q_s (cfs) (after iterations must match **Q_t** value):									
HYDRAULIC RESULTS:									
Flooded Width T for Q_t, upstream of inlet (ft):		**6.67**	**7.47**	**SAG**					
Flooded Width T at depression (if any) (ft):		**6.67**	**7.47**	**SAG**					
Flooded Width T for BYPASS Q downstream of inlet (ft):	**0.00**	**4.46**	**5.25**	**SAG**					
Water depth at curb (with or without depression) (in):		4.00	4.48						
Water cross-area at shoulder (without depression) (sq.ft.):		1.11	1.39						
Water velocity immediately u/s from inlet (w/o depression) (fps):		4.12	4.45						
Average water velocity for the segment to this inlet (fps):		1.54	1.93						
Flowtime from the previous inlet to this one (min):		7.64	5.95						
GRATE INLETS ON-GRADE:									
Splash-over V for effective length of grate (type P-1 3/8) (fps):		6.81	6.81						
Effective length of grate considering clogging factor (ft):		2.01	2.01						
Ratio of grate frontal flow to total flow:		0.61	0.564						
Fraction of frontal flow intercepted (Rf):		100.0%	100.0%						
Fraction of side flow interception (Rs):		11.5%	10.2%						
Total flow intercepted (cfs):		3.02	3.775						
Grate Efficiency (E):		65.8%	60.9%						
Grate flow-through flow (cfs):		**1.57**	**2.426**						
SLOTTED DRAINS & SIDE-OPENING INLETS ON-GRADE:									
Length required for total interception (ft):									
Length of inlet provided L (ft):		10.00	20.00	20.00					
Efficiency for length L:									
Interception for length L (cfs):									
Side opening flow-through flow (cfs):									
INTERCEPTION CAPACITY OF INLETS IN SAG LOCATION:									
Maximum allowable flooded width (including the depression) (ft):				**10.00**					
Max. head at sag w/o exceeding allowable flooded width (ft):				0.50					
Capacity of grate in a sag (3-sided weir) (cfs):				***6.343***					
Length provided of curb-opening inlet at sag (ft):									
Capacity of curb-opening inlet in a sag (weir) (cfs):									

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Separate Run

HYDRAULIC CALCULATOR FOR ONSITE DRAINAGE (English Units)

Date: 05/25/21

RCTC I-15 ELPSE - OUTTER SHOULDER DIKES

Note: "Subarea discharge Qsa (cfs)" was obtained from "Design Discharge" column of Hydrological Tables found within the hydrology maps in Appendix B.2, and inputted as "Additional discharge (cfs)" below.

	Starting Point	N-1862	N-1856	N-1851					
Location station (ft):	**1867+00.0**	**1862+12.0**	**1856+43.0**	**1851+50.0**					
Longitudinal profile ("on-grade" or "sag"):		on-grade	on-grade	sag					
Calculation Type ("grate", "side opening", or "shoulder hydraulics only"):		grate	grate	grate					
Longitudinal slope, S:		0.30%	0.30%						
Shoulder cross-slope, Sx:		5.00%	5.00%	5.00%					
Average watershed paved width (ft):		0.00	0.00	0.00					
Shoulder Manning's n:		0.016	0.016	0.016					
Inlet description (optional):		TYP E 10'	TYP E 10'	TYP E 10'					
Clogging factor for on-grade grates:		33%	33%	33%					
Grate width (ft):		2.00	2.00	2.00					
Grate length (ft):		3.00	3.00	3.00					
Precipitation intensity (in/hr):		3.61	3.61	3.61					
Runoff Coefficient for paved areas, "C_p":		0.99	0.99	0.99					
Runoff Coefficient for unpaved areas, "C_u":		0.63	0.63	0.63					
Unpaved area contributing to this inlet (acres):		0.000	0.000	0.000					
Watershed paved length (ft):		488.0	569.0	493.0					
Paved area contributing to this inlet (acres):		0.000	0.000	0.000					
Subarea discharge Q_{sa} (cfs):		0.00	0.000	0.000					
Additional discharge (cfs):		3.440	3.730	6.800					
Total discharge Q_t, including any upstream by-pass (cfs):		**3.440**	**4.853**	**8.638**					
By-pass Q — *Describe here source of bypass:*	**0.000**	**1.12**	**1.84**	**SAG**					
DEPRESSION CALCULATION:									
Width of depression "w" (ft):									
Depression depth "a" (from flowline w/o depression) (in):									
Depression cross-slope (Sw=Sx+a/12w):									
Fraction of flow over the depression (Eo):									
Discharge-weighted equivalent cross-slope (Se):									
Q_s (first guess: **Qt - 0.001**, after iteration should be same as next line)		0.005							
Q_s over shoulder (excluding flow over the depression) (cfs):									
Q=Q_w+Q_s (cfs) (after iterations must match **Q_t** value):									
HYDRAULIC RESULTS:									
Flooded Width T for Q_t, upstream of inlet (ft):		**8.10**	**9.21**	**SAG**					
Flooded Width T at depression (if any) (ft):		**8.10**	**9.21**	**SAG**					
Flooded Width T for BYPASS Q downstream of inlet (ft):	**0.00**	**5.32**	**6.40**	**SAG**					
Water depth at curb (with or without depression) (in):		4.86	5.53						
Water cross-area at shoulder (without depression) (sq.ft.):		1.64	2.12						
Water velocity immediately u/s from inlet (w/o depression) (fps):		2.10	2.29						
Average water velocity for the segment to this inlet (fps):		0.78	0.99						
Flowtime from the previous inlet to this one (min):		10.37	9.61						
GRATE INLETS ON-GRADE:									
Splash-over V for effective length of grate (type P-1 3/8) (fps):		6.81	6.81						
Effective length of grate considering clogging factor (ft):		2.01	2.01						
Ratio of grate frontal flow to total flow:		0.53	0.479						
Fraction of frontal flow intercepted (Rf):		100.0%	100.0%						
Fraction of side flow interception (Rs):		30.4%	27.3%						
Total flow intercepted (cfs):		2.32	3.015						
Grate Efficiency (E):		67.3%	62.1%						
Grate flow-through flow (cfs):		**1.12**	**1.838**						
SLOTTED DRAINS & SIDE-OPENING INLETS ON-GRADE:									
Length required for total interception (ft):									
Length of inlet provided L (ft):									
Efficiency for length L:									
Interception for length L (cfs):									
Side opening flow-through flow (cfs):									
INTERCEPTION CAPACITY OF INLETS IN SAG LOCATION:									
Maximum allowable flooded width (including the depression) (ft):				**10.00**					
Max. head at sag w/o exceeding allowable flooded width (ft):				0.50					
Capacity of grate in a sag (3-sided weir) (cfs):				***6.343***					
Length provided of curb-opening inlet at sag (ft):									
Capacity of curb-opening inlet in a sag (weir) (cfs):									

ONDRAIN_English Version 7.5d, developed by Fernando Manzanera, Caltrans District 1, Hydraulics Capital Support (December 2010).

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Separate Run

HYDRAULIC CALCULATOR FOR ONSITE DRAINAGE (English Units)

Date: 05/25/21

RCTC I-15 ELPSE - OUTTER SHOULDER DIKES

Note: "Subarea discharge Qsa (cfs)" was obtained from "Design Discharge" column of Hydrological Tables found within the hydrology maps in Appendix B.2, and inputted as "Additional discharge (cfs)" below.

	Starting Point	N-1882	N-1875		N-1871				
Location station (ft):	**1885+34.0**	**1882+35.0**	**1875+94.0**	**1870+94.0**	**1870+94.0**				
Longitudinal profile ("on-grade" or "sag"):		on-grade	on-grade	on-grade	on-grade				
Calculation Type ("grate", "side opening", or "shoulder hydraulics only"):		grate	grate	side opening	grate				
Longitudinal slope, S:		0.30%	0.30%	0.30%	0.30%				
Shoulder cross-slope, Sx:		5.00%	5.00%	5.00%	5.00%				
Average watershed paved width (ft):		0.00	0.00	0.00	0.00				
Shoulder Manning's n:		0.016	0.016	0.016	0.016				
Inlet description (optional):		TYP E 10'	TYP E 10'	TYP E 10'	TYP E 10'				
Clogging factor for on-grade grates:		33%	33%	33%	33%				
Grate width (ft):		2.00	2.00	2.00	2.00				
Grate length (ft):		3.00	3.00	3.00	3.00				
Precipitation intensity (in/hr):		3.61	3.61	3.61	3.61				
Runoff Coefficient for paved areas, "C_p":		0.99	0.99	0.99	0.99				
Runoff Coefficient for unpaved areas, "C_u":		0.63	0.63	0.63	0.63				
Unpaved area contributing to this inlet (acres):		0.000	0.000	0.000	0.000				
Watershed paved length (ft):		299.0	641.0	500.0	0.0				
Paved area contributing to this inlet (acres):		0.000	0.000	0.000	0.000				
Subarea discharge Q_{sa} (cfs):		0.00	0.000	0.000	0.000				
Additional discharge (cfs):		1.750	4.460	3.260					
Total discharge Q_t, including any upstream by-pass (cfs):		**1.750**	**4.856**	**5.100**	**0.709**				
By-pass Q — *Describe here source of bypass:*	**0.000**	**0.40**	**1.84**	**0.71**	**0.08**				
DEPRESSION CALCULATION:									
Width of depression "w" (ft):									
Depression depth "a" (from flowline w/o depression) (in):									
Depression cross-slope (Sw=Sx+a/12w):									
Fraction of flow over the depression (Eo):									
Discharge-weighted equivalent cross-slope (Se):									
Q_s (first guess: **Qt - 0.001**, after iteration should be same as next line)		0.005							
Q_s over shoulder (excluding flow over the depression) (cfs):									
Q=Q_w+Q_s (cfs) (after iterations must match **Q_t** value):									
HYDRAULIC RESULTS:									
Flooded Width T for Q_t, upstream of inlet (ft):		**6.28**	**9.22**	**9.39**	**4.48**				
Flooded Width T at depression (if any) (ft):		**6.28**	**9.22**	**9.39**	**4.48**				
Flooded Width T for BYPASS Q downstream of inlet (ft):	**0.00**	**3.60**	**6.40**	**4.48**	**1.95**				
Water depth at curb (with or without depression) (in):		3.77	5.53	5.63	2.69				
Water cross-area at shoulder (without depression) (sq.ft.):		0.99	2.12	2.20	0.50				
Water velocity immediately u/s from inlet (w/o depression) (fps):		1.77	2.29	2.32	1.41				
Average water velocity for the segment to this inlet (fps):		0.66	0.93	1.04	#DIV/0!				
Flowtime from the previous inlet to this one (min):		7.53	11.52	8.04	#DIV/0!				
GRATE INLETS ON-GRADE:									
Splash-over V for effective length of grate (type P-1 3/8) (fps):		6.81	6.81		6.81				
Effective length of grate considering clogging factor (ft):		2.01	2.01		2.01				
Ratio of grate frontal flow to total flow:		0.64	0.479		0.794				
Fraction of frontal flow intercepted (Rf):		100.0%	100.0%		100.0%				
Fraction of side flow interception (Rs):		37.2%	27.2%		47.1%				
Total flow intercepted (cfs):		1.35	3.016		0.631				
Grate Efficiency (E):		77.4%	62.1%		89.1%				
Grate flow-through flow (cfs):		**0.40**	**1.840**		**0.077**				
SLOTTED DRAINS & SIDE-OPENING INLETS ON-GRADE:									
Length required for total interception (ft):				15.02					
Length of inlet provided L (ft):		10.00	20.00	10.00					
Efficiency for length L:				86.1%					
Interception for length L (cfs):				4.391					
Side opening flow-through flow (cfs):				**0.709**					
INTERCEPTION CAPACITY OF INLETS IN SAG LOCATION:									
Maximum allowable flooded width (including the depression) (ft):									
Max. head at sag w/o exceeding allowable flooded width (ft):									
Capacity of grate in a sag (3-sided weir) (cfs):									
Length provided of curb-opening inlet at sag (ft):									
Capacity of curb-opening inlet in a sag (weir) (cfs):									

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Notes: -This program utilizes the equations presented in the FHA Hydraulic Engineering Circular 22 (HEC-22), FHWA-NHI-10-009.

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Separate Run

HYDRAULIC CALCULATOR FOR ONSITE DRAINAGE (English Units)

Date: 05/25/21

RCTC I-15 ELPSE - OUTTER SHOULDER DIKES

Note: "Subarea discharge Qsa (cfs)" was obtained from "Design Discharge" column of Hydrological Tables found within the hydrology maps in Appendix B.2, and inputted as "Additional discharge (cfs)" below.

	Starting Point		N-1892	N-1896		N-1904A			
Location station (ft):	**1885+34.0**	**1892+32.0**	**1892+32.0**	**1896+45.0**	**1904+52.0**	**1904+52.0**			
Longitudinal profile ("on-grade" or "sag"):		on-grade	on-grade	on-grade	on-grade	on-grade			
Calculation Type ("grate", "side opening", or "shoulder hydraulics only"):		side opening	grate	grate	side opening	grate			
Longitudinal slope, S:		0.50%	0.50%	0.60%	0.50%	0.50%			
Shoulder cross-slope, Sx:		5.00%	5.00%	5.00%	5.00%	5.00%			
Average watershed paved width (ft):		0.00	0.00	0.00	0.00	0.00			
Shoulder Manning's n:		0.016	0.016	0.016	0.016	0.016			
Inlet description (optional):									
Clogging factor for on-grade grates:		33%	33%	33%	33%	33%			
Grate width (ft):		2.00	2.00	2.00	2.00	2.00			
Grate length (ft):		3.00	3.00	3.00	3.00	3.00			
Precipitation intensity (in/hr):		3.61	3.61	3.61	3.61	3.61			
Runoff Coefficient for paved areas, "C_p":		0.99	0.99	0.99	0.99	0.99			
Runoff Coefficient for unpaved areas, "C_u":		0.63	0.63	0.63	0.63	0.63			
Unpaved area contributing to this inlet (acres):		0.000	0.000	0.000	0.000	0.000			
Watershed paved length (ft):		698.0	0.0	413.0	807.0	0.0			
Paved area contributing to this inlet (acres):		0.000	0.000	0.000	0.000	0.000			
Subarea discharge Q_{sa} (cfs):		0.00	0.000	0.000	0.000	0.000			
Additional discharge (cfs):		4.790		3.330	7.080				
Total discharge Q_t, including any upstream by-pass (cfs):		**4.790**	**0.977**	**3.467**	**8.213**	**2.640**			
By-pass Q *Describe here source of bypass:*	**0.000**	**0.98**	**0.14**	**1.13**	**2.64**	**0.76**			
DEPRESSION CALCULATION:									
Width of depression "w" (ft):									
Depression depth "a" (from flowline w/o depression) (in):									
Depression cross-slope (Sw=Sx+a/12w):									
Fraction of flow over the depression (Eo):									
Discharge-weighted equivalent cross-slope (Se):									
Q_s (first guess: **Qt - 0.001**, after iteration should be same as next line)		0.005							
Q_s over shoulder (excluding flow over the depression) (cfs):									
Q=Q_w+Q_s (cfs) (after iterations must match **Q_t** value):									
HYDRAULIC RESULTS:									
Flooded Width T for Q_t, upstream of inlet (ft):		**8.33**	**4.59**	**7.13**	**10.20**	**6.66**			
Flooded Width T at depression (if any) (ft):		**8.33**	**4.59**	**7.13**	**10.20**	**6.66**			
Flooded Width T for BYPASS Q downstream of inlet (ft):	**0.00**	**4.59**	**2.20**	**4.69**	**6.66**	**4.17**			
Water depth at curb (with or without depression) (in):		5.00	2.75	4.28	6.12	4.00			
Water cross-area at shoulder (without depression) (sq.ft.):		1.74	0.53	1.27	2.60	1.11			
Water velocity immediately u/s from inlet (w/o depression) (fps):		2.76	1.86	2.73	3.16	2.38			
Average water velocity for the segment to this inlet (fps):		1.03	#DIV/0!	1.08	1.31	#DIV/0!			
Flowtime from the previous inlet to this one (min):		11.27	#DIV/0!	6.39	10.26	#DIV/0!			
GRATE INLETS ON-GRADE:									
Splash-over V for effective length of grate (type P-1 3/8) (fps):			6.81	6.81		6.81			
Effective length of grate considering clogging factor (ft):			2.01	2.01		2.01			
Ratio of grate frontal flow to total flow:			0.783	0.584		0.614			
Fraction of frontal flow intercepted (Rf):			100.0%	100.0%		100.0%			
Fraction of side flow interception (Rs):			35.3%	21.4%		25.9%			
Total flow intercepted (cfs):			0.840	2.335		1.885			
Grate Efficiency (E):			85.9%	67.3%		71.4%			
Grate flow-through flow (cfs):			**0.137**	**1.133**		**0.756**			
SLOTTED DRAINS & SIDE-OPENING INLETS ON-GRADE:									
Length required for total interception (ft):		17.05			21.38				
Length of inlet provided L (ft):		10.00	20.00	10.00	10.00	10.00			
Efficiency for length L:		79.6%			67.9%				
Interception for length L (cfs):		3.81			5.572				
Side opening flow-through flow (cfs):		**0.98**			**2.640**				
INTERCEPTION CAPACITY OF INLETS IN SAG LOCATION:									
Maximum allowable flooded width (including the depression) (ft):				**10.00**		**10.00**			
Max. head at sag w/o exceeding allowable flooded width (ft):									
Capacity of grate in a sag (3-sided weir) (cfs):									
Length provided of curb-opening inlet at sag (ft):									
Capacity of curb-opening inlet in a sag (weir) (cfs):									

ONDRAIN_English Version 7.5d, developed by Fernando Manzanera, Caltrans District 1, Hydraulics Capital Support (December 2010).

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Appendix D.5

50-yr Analysis

Northbound Runs

HYDRAULIC CALCULATOR FOR ONSITE DRAINAGE (English Units)

Date: 08/05/21

RCTC I-15 ELPSE - 50yr Storm Analysis for Inlets in Sump Condition

Note: "Subarea discharge Qsa (cfs)" was obtained from "Design Discharge" column of Hydrological Tables found within the hydrology maps in Appendix B.2, and inputted as "Additional discharge (cfs)" below.

	Starting Point	N-1285A	N-1288	N-1291	N-1294	N-1295	N-1296		
Location station (ft):	**1279+07.0**	**1285+98.0**	**1288+59.0**	**1291+26.0**	**1294+00.0**	**1295+00.0**	**1296+50.0**		
Longitudinal profile ("on-grade" or "sag"):		on-grade	on-grade	on-grade	on-grade	on-grade	sag		
Calculation Type ("grate", "side opening", or "shoulder hydraulics only"):		grate	grate	grate	grate	side opening	grate		
Longitudinal slope, S:		1.20%	1.50%	1.20%	0.70%	0.60%			
Shoulder cross-slope, Sx:		2.00%	2.00%	2.00%	2.00%	2.00%	2.00%		
Average watershed paved width (ft):		0.00	0.00	0.00	0.00	0.00	0.00		
Shoulder Manning's n:		0.016	0.016	0.016	0.016	0.016	0.016		
Inlet description (optional):									
Clogging factor for on-grade grates:		33%	33%	33%	33%		33%		
Grate width (ft):		2.00	2.00	2.00	2.00		2.00		
Grate length (ft):		3.00	3.00	3.00	3.00		3.00		
Precipitation intensity (in/hr):		3.73	3.73	3.73	3.73	3.73	3.73		
Runoff Coefficient for paved areas, "C_p":		0.99	0.99	0.99	0.99	0.99	0.99		
Runoff Coefficient for unpaved areas, "C_u":		0.63	0.63	0.63	0.63	0.63	0.63		
Unpaved area contributing to this inlet (acres):		0.000	0.000	0.470	0.000	0.000	0.000		
Watershed paved length (ft):		691.0	261.0	267.0	274.0	100.0	150.0		
Paved area contributing to this inlet (acres):		0.000	0.000	0.000	0.000	0.000	0.000		
Subarea discharge Q_{sa} (cfs):		0.00	0.000	1.104	0.000	0.000	0.000		
Additional discharge (cfs):		4.330	1.810	2.340	1.950	0.610	1.840		
Total discharge Q_t, including any upstream by-pass (cfs):		**4.330**	**4.253**	**5.807**	**5.447**	**3.885**	**1.840**		
By-pass Q (cfs): *Describe here source of bypass:*	**0.000**	**2.44**	**2.36**	**3.50**	**3.28**	**0.00**	**SAG**		
DEPRESSION CALCULATION:									
Width of depression "w" (ft):									
Depression depth "a" (from flowline w/o depression) (in):									
Depression cross-slope (Sw=Sx+a/12w):									
Fraction of flow over the depression (Eo):									
Discharge-weighted equivalent cross-slope (Se):									
Q_s (first guess: **Qt - 0.001**, after iteration should be same as next line)		0.005			0.013	0.024	0.000		
Q_s over shoulder (excluding flow over the depression) (cfs):									
Q=Q_w+Q_s (cfs) (after iterations must match **Q_t** value):									
HYDRAULIC RESULTS:									
Flooded Width T for Q_t, upstream of inlet (ft):		**12.07**	**11.50**	**13.47**	**14.55**	**13.20**	**SAG**		
Flooded Width T at depression (if any) (ft):		**12.07**	**11.50**	**13.47**	**14.55**	**13.20**	**SAG**		
Flooded Width T for BYPASS Q downstream of inlet (ft):	**0.00**	**9.74**	**9.22**	**11.14**	**12.03**	**0.00**	**SAG**		
Water depth at curb (with or without depression) (in):		2.90	2.76	3.23	3.49	3.17			
Water cross-area at shoulder (without depression) (sq.ft.):		1.46	1.32	1.82	2.12	1.74			
Water velocity immediately u/s from inlet (w/o depression) (fps):		2.97	3.22	3.20	2.57	2.23			
Average water velocity for the segment to this inlet (fps):		1.11	1.52	1.43	1.18	1.08			
Flowtime from the previous inlet to this one (min):		10.38	2.86	3.11	3.86	1.54			
GRATE INLETS ON-GRADE:									
Splash-over V for effective length of grate (type P-1 3/8) (fps):		6.81	6.81	6.81	6.81				
Effective length of grate considering clogging factor (ft):		2.01	2.01	2.01	2.01				
Ratio of grate frontal flow to total flow:		0.38	0.399	0.349	0.326				
Fraction of frontal flow intercepted (Rf):		100.0%	100.0%	100.0%	100.0%				
Fraction of side flow interception (Rs):		8.5%	7.5%	7.6%	10.8%				
Total flow intercepted (cfs):		1.89	1.890	2.310	2.172				
Grate Efficiency (E):		43.6%	44.4%	39.8%	39.9%				
Grate flow-through flow (cfs):		**2.44**	**2.363**	**3.497**	**3.275**				
SLOTTED DRAINS & SIDE-OPENING INLETS ON-GRADE:									
Length required for total interception (ft):						28.58			
Length of inlet provided L (ft):						39.00			
Efficiency for length L:						100.0%			
Interception for length L (cfs):						3.885			
Side opening flow-through flow (cfs):						**0.000**			
INTERCEPTION CAPACITY OF INLETS IN SAG LOCATION:									
Maximum allowable flooded width (including the depression) (ft):							**11.62**		
Max. head at sag w/o exceeding allowable flooded width (ft):							0.23		
Capacity of grate in a sag (3-sided weir) (cfs):							***2.010***		
Length provided of curb-opening inlet at sag (ft):									
Capacity of curb-opening inlet in a sag (weir) (cfs):									

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Separate Run

HYDRAULIC CALCULATOR FOR ONSITE DRAINAGE (English Units)

Date: 08/03/21

RCTC I-15 ELPSE - 50yr Storm Analysis for Inlets in Sump Condition

Note: "Subarea discharge Qsa (cfs)" was obtained from "Design Discharge" column of Hydrological Tables found within the hydrology maps in Appendix B.2, and inputted as "Additional discharge (cfs)" below.

	Starting Point	N-1299A	N-1298	N-1296					
Location station (ft):	**1299+80.0**	**1299+10.0**	**1298+00.0**	**1296+50.0**					
Longitudinal profile ("on-grade" or "sag"):		on-grade	on-grade	sag					
Calculation Type ("grate", "side opening", or "shoulder hydraulics only"):		grate	side opening	grate					
Longitudinal slope, S:		0.50%	0.50%	0.50%					
Shoulder cross-slope, Sx:		2.00%	2.00%	2.00%					
Average watershed paved width (ft):		0.00	0.00	0.00					
Shoulder Manning's n:		0.013	0.013	0.013					
Inlet description (optional):									
Clogging factor for on-grade grates:		33%	33%	33%					
Grate width (ft):		2.00	4.00	2.00					
Grate length (ft):		3.00	3.00	3.00					
Precipitation intensity (in/hr):		3.73	3.73	3.73					
Runoff Coefficient for paved areas, "C_p":		0.99	0.99	0.99					
Runoff Coefficient for unpaved areas, "C_u":		0.63	0.63	0.63					
Unpaved area contributing to this inlet (acres):		0.000	0.000	0.000					
Watershed paved length (ft):		70.0	110.0	150.0					
Paved area contributing to this inlet (acres):		0.000	0.000	0.000					
Subarea discharge Q_{sa} (cfs):		0.00	0.000	0.000					
Additional discharge (cfs):		0.380	0.690	1.840					
Total discharge Q_t, including any upstream by-pass (cfs):		**0.460**	**0.797**	**1.840**					
By-pass Q *Describe here source of bypass:*	**0.080**	**0.11**	**0.00**	**SAG**					
DEPRESSION CALCULATION:									
Width of depression "w" (ft):									
Depression depth "a" (from flowline w/o depression) (in):									
Depression cross-slope (Sw=Sx+a/12w):									
Fraction of flow over the depression (Eo):									
Discharge-weighted equivalent cross-slope (Se):									
Q_s (first guess: **Qt - 0.001**, after iteration should be same as next line)		0.005							
Q_s over shoulder (excluding flow over the depression) (cfs):									
Q=Q_w+Q_s (cfs) (after iterations must match **Q_t** value):									
HYDRAULIC RESULTS:									
Flooded Width T for Q_t, upstream of inlet (ft):		**5.68**	**6.97**	**SAG**					
Flooded Width T at depression (if any) (ft):		**5.68**	**6.97**	**SAG**					
Flooded Width T for BYPASS Q downstream of inlet (ft):	**0.00**	**3.28**	**0.00**	**SAG**					
Water depth at curb (with or without depression) (in):		1.36	1.67						
Water cross-area at shoulder (without depression) (sq.ft.):		0.32	0.49						
Water velocity immediately u/s from inlet (w/o depression) (fps):		1.43	1.64						
Average water velocity for the segment to this inlet (fps):		0.53	0.68						
Flowtime from the previous inlet to this one (min):		2.19	2.70						
GRATE INLETS ON-GRADE:									
Splash-over V for effective length of grate (type P-1 3/8) (fps):		6.81							
Effective length of grate considering clogging factor (ft):		2.01							
Ratio of grate frontal flow to total flow:		0.69							
Fraction of frontal flow intercepted (Rf):		100.0%							
Fraction of side flow interception (Rs):		25.9%							
Total flow intercepted (cfs):		0.35							
Grate Efficiency (E):		76.7%							
Grate flow-through flow (cfs):		**0.11**							
SLOTTED DRAINS & SIDE-OPENING INLETS ON-GRADE:									
Length required for total interception (ft):			15.76						
Length of inlet provided L (ft):		15.00	23.00						
Efficiency for length L:			100.0%						
Interception for length L (cfs):			0.797						
Side opening flow-through flow (cfs):			**0.000**						
INTERCEPTION CAPACITY OF INLETS IN SAG LOCATION:									
Maximum allowable flooded width (including the depression) (ft):				**11.62**					
Max. head at sag w/o exceeding allowable flooded width (ft):				0.23					
Capacity of grate in a sag (3-sided weir) (cfs):				***2.010***					
Length provided of curb-opening inlet at sag (ft):									
Capacity of curb-opening inlet in a sag (weir) (cfs):									

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Notes: -This program utilizes the equations presented in the FHA Hydraulic Engineering Circular 22 (HEC-22), FHWA-NHI-10-009.

- Underlined values are calculated by the program, the others are input by the user.

Separate Run

HYDRAULIC CALCULATOR FOR ONSITE DRAINAGE (English Units)

Date: 08/05/21

RCTC I-15 ELPSE - 50yr Storm Analysis for Inlets in Sump Condition

Note: "Subarea discharge Qsa (cfs)" was obtained from "Design Discharge" column of Hydrological Tables found within the hydrology maps in Appendix B.2, and inputted as "Additional discharge (cfs)" below.

	Starting Point	N-1452	N-1450	N-1449	N-1447	N-1444	N-1442	N-1441B	N-1441A
Location station (ft):	1454+15.0	1452+92.0	1450+26.0	1449+33.0	1447+20.0	1444+76.0	1442+42.0	1441+72.0	1441+13.0
Longitudinal profile ("on-grade" or "sag"):		on-grade	on-grade	on-grade	on-grade	on-grade	on-grade	on-grade	on-grade
Calculation Type ("grate", "side opening", or "shoulder hydraulics only"):		side opening	grate	grate	grate	grate	grate	grate	side opening
Longitudinal slope, S:		0.20%	0.40%	0.40%	1.00%	1.00%	0.50%	0.30%	0.10%
Shoulder cross-slope, Sx:		3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%
Average watershed paved width (ft):		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Shoulder Manning's n:		0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016
Inlet description (optional):									
Clogging factor for on-grade grates:		33%	33%	33%	33%	33%	33%	33%	33%
Grate width (ft):		2.00	2.00	2.00	2.00	4.00	2.00	2.00	4.00
Grate length (ft):		3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00
Precipitation intensity (in/hr):		3.80	3.80	3.80	3.80	3.80	3.80	3.80	3.80
Runoff Coefficient for paved areas, "C_p":		0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Runoff Coefficient for unpaved areas, "C_u":		0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63
Unpaved area contributing to this inlet (acres):		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Watershed paved length (ft):		123.0	266.0	93.0	213.0	244.0	234.0	70.0	59.0
Paved area contributing to this inlet (acres):		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Subarea discharge Q_{sa} (cfs):		0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Additional discharge (cfs):		0.840	1.860	0.690	1.570	1.740	1.620	0.620	0.510
Total discharge Q_t, including any upstream by-pass (cfs):		**0.840**	**1.860**	**1.352**	**1.985**	**2.445**	**1.929**	**1.319**	**0.906**
By-pass Q (cfs): *Describe here source of bypass:*	**0.000**	**0.00**	**0.66**	**0.41**	**0.71**	**0.31**	**0.70**	**0.40**	**0.00**
DEPRESSION CALCULATION:									
Width of depression "w" (ft):									
Depression depth "a" (from flowline w/o depression) (in):									
Depression cross-slope (Sw=Sx+a/12w):									
Fraction of flow over the depression (Eo):									
Discharge-weighted equivalent cross-slope (Se):									
Q_s (first guess: **Qt - 0.001**, after iteration should be same as next line)		0.005			0.013	0.024	0.000	0.005	0.000
Q_s over shoulder (excluding flow over the depression) (cfs):									
Q=Q_w+Q_s (cfs) (after iterations must match **Q_t** value):									
HYDRAULIC RESULTS:									
Flooded Width T for Q_t, upstream of inlet (ft):		**7.09**	**8.38**	**7.44**	**7.23**	**7.82**	**8.15**	**7.78**	**8.30**
Flooded Width T at depression (if any) (ft):		**7.09**	**8.38**	**7.44**	**7.23**	**7.82**	**8.15**	**7.78**	**8.30**
Flooded Width T for BYPASS Q downstream of inlet (ft):	**0.00**	**0.00**	**5.69**	**4.78**	**4.91**	**3.60**	**5.57**	**4.95**	**0.00**
Water depth at curb (with or without depression) (in):		2.55	3.02	2.68	2.60	2.82	2.93	2.80	2.99
Water cross-area at shoulder (without depression) (sq.ft.):		0.75	1.05	0.83	0.79	0.92	1.00	0.91	1.03
Water velocity immediately u/s from inlet (w/o depression) (fps):		1.12	1.76	1.63	2.53	2.66	1.94	1.45	0.88
Average water velocity for the segment to this inlet (fps):		0.42	0.66	0.75	1.12	1.17	0.80	0.66	0.38
Flowtime from the previous inlet to this one (min):		4.93	6.73	2.07	3.17	3.48	4.90	1.78	2.59
GRATE INLETS ON-GRADE:									
Splash-over V for effective length of grate (type P-1 3/8) (fps):			6.81	6.81	6.81	6.81	6.81	6.81	
Effective length of grate considering clogging factor (ft):			2.01	2.01	2.01	2.01	2.01	2.01	
Ratio of grate frontal flow to total flow:			0.517	0.566	0.578	0.852	0.528	0.547	
Fraction of frontal flow intercepted (Rf):			100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	
Fraction of side flow interception (Rs):			26.4%	29.3%	15.8%	14.6%	23.3%	33.7%	
Total flow intercepted (cfs):			1.198	0.937	1.280	2.136	1.231	0.923	
Grate Efficiency (E):			64.4%	69.3%	64.5%	87.3%	63.8%	70.0%	
Grate flow-through flow (cfs):			**0.662**	**0.415**	**0.705**	**0.309**	**0.699**	**0.396**	
SLOTTED DRAINS & SIDE-OPENING INLETS ON-GRADE:									
Length required for total interception (ft):		8.47							7.10
Length of inlet provided L (ft):		12.00							11.00
Efficiency for length L:		100.0%							100.0%
Interception for length L (cfs):		0.84							0.906
Side opening flow-through flow (cfs):		**0.00**							**0.000**
INTERCEPTION CAPACITY OF INLETS IN SAG LOCATION:									
Maximum allowable flooded width (including the depression) (ft):									
Max. head at sag w/o exceeding allowable flooded width (ft):									
Capacity of grate in a sag (3-sided weir) (cfs):									
Length provided of curb-opening inlet at sag (ft):									
Capacity of curb-opening inlet in a sag (weir) (cfs):									

ONDRAIN_English Version 7.5d, developed by Fernando Manzanera, Caltrans District 1, Hydraulics Capital Support (December 2010).

Notes: -This program utilizes the equations presented in the FHA Hydraulic Engineering Circular 22 (HEC-22), FHWA-NHI-10-009.

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HYDRAULIC CALCULATOR FOR ONSITE DRAINAGE (English Units)

Date: 08/05/21

RCTC I-15 ELPSE - 50yr Storm Analysis for Inlets in Sump Condition

Note: "Subarea discharge Qsa (cfs)" was obtained from "Design Discharge" column of Hydrological Tables found within the hydrology maps in Appendix B.2, and inputted as "Additional discharge (cfs)" below.

	Starting Point	N-1440							
Location station (ft):	**1441+72.0**	**1440+00.0**							
Longitudinal profile ("on-grade" or "sag"):		sag							
Calculation Type ("grate", "side opening", or "shoulder hydraulics only"):		grate							
Longitudinal slope, S:									
Shoulder cross-slope, Sx:		3.00%							
Average watershed paved width (ft):		0.00							
Shoulder Manning's n:		0.013							
Inlet description (optional):									
Clogging factor for on-grade grates:									
Grate width (ft):		2.00							
Grate length (ft):		3.00							
Precipitation intensity (in/hr):		3.80							
Runoff Coefficient for paved areas, "C_p":		0.99							
Runoff Coefficient for unpaved areas, "C_u":		0.63							
Unpaved area contributing to this inlet (acres):		0.000							
Watershed paved length (ft):		172.0							
Paved area contributing to this inlet (acres):		0.000							
Subarea discharge Q_{sa} (cfs):		0.00							
Additional discharge (cfs):		1.780							
Total discharge Q_t, including any upstream by-pass (cfs):		1.850							
By-pass Q (cfs): *Describe here source of bypass:*	**0.070**	**SAG**							

DEPRESSION CALCULATION:

Width of depression "w" (ft):									
Depression depth "a" (from flowline w/o depression) (in):									
Depression cross-slope (Sw=Sx+a/12w):									
Fraction of flow over the depression (Eo):									
Discharge-weighted equivalent cross-slope (Se):									
Q_s (first guess: **Qt - 0.001**, after iteration should be same as next line)		0.005							
Q_s over shoulder (excluding flow over the depression) (cfs):									
Q=Q_w+Q_s (cfs) (after iterations must match **Q_t** value):									

HYDRAULIC RESULTS:

Flooded Width T for Q_t, upstream of inlet (ft):		SAG							
Flooded Width T at depression (if any) (ft):		SAG							
Flooded Width T for BYPASS Q downstream of inlet (ft):	**0.00**	SAG							
Water depth at curb (with or without depression) (in):									
Water cross-area at shoulder (without depression) (sq.ft.):									
Water velocity immediately u/s from inlet (w/o depression) (fps):									
Average water velocity for the segment to this inlet (fps):									
Flowtime from the previous inlet to this one (min):									

GRATE INLETS ON-GRADE:

Splash-over V for effective length of grate (type P-1 3/8) (fps):									
Effective length of grate considering clogging factor (ft):									
Ratio of grate frontal flow to total flow:									
Fraction of frontal flow intercepted (Rf):									
Fraction of side flow interception (Rs):									
Total flow intercepted (cfs):									
Grate Efficiency (E):									
Grate flow-through flow (cfs):									

SLOTTED DRAINS & SIDE-OPENING INLETS ON-GRADE:

Length required for total interception (ft):									
Length of inlet provided L (ft):									
Efficiency for length L:									
Interception for length L (cfs):									
Side opening flow-through flow (cfs):									

INTERCEPTION CAPACITY OF INLETS IN SAG LOCATION:

Maximum allowable flooded width (including the depression) (ft):		**8.00**							
Max. head at sag w/o exceeding allowable flooded width (ft):		0.24							
Capacity of grate in a sag (3-sided weir) (cfs):		***2.11***							
Length provided of curb-opening inlet at sag (ft):									
Capacity of curb-opening inlet in a sag (weir) (cfs):									

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North 1400's

Separate Run

HYDRAULIC CALCULATOR FOR ONSITE DRAINAGE (English Units)

Date: 08/03/21

RCTC I-15 ELPSE - 50yr Storm Analysis for Inlets in Sump Condition

Note: "Subarea discharge Qsa (cfs)" was obtained from "Design Discharge" column of Hydrological Tables found within the hydrology maps in Appendix B.2, and inputted as "Additional discharge (cfs)" below.

	Starting Point	N-1436A	N-1436B	N-1437	N-1439	N-1440			
Location station (ft):	1431+58.0	1436+00.0	1436+63.0	1437+83.0	1439+00.0	1440+00.0			
Longitudinal profile ("on-grade" or "sag"):		on-grade	on-grade	on-grade	on-grade	sag			
Calculation Type ("grate", "side opening", or "shoulder hydraulics only"):		grate	grate	grate	side opening	grate			
Longitudinal slope, S:		1.40%	1.40%	0.50%	0.50%				
Shoulder cross-slope, Sx:		1.81%	2.30%	3.00%	3.00%	3.00%			
Average watershed paved width (ft):		0.00	0.00	0.00	0.00	0.00			
Shoulder Manning's n:		0.016	0.016	0.016	0.016	0.016			
Inlet description (optional):									
Clogging factor for on-grade grates:		33%	33%	33%	33%	0%			
Grate width (ft):		4.00	2.00	2.00	4.00	2.00			
Grate length (ft):		3.00	3.00	3.00	3.00	3.00			
Precipitation intensity (in/hr):		3.80	3.80	3.80	3.80	3.80			
Runoff Coefficient for paved areas, "C_p":		0.99	0.99	0.99	0.99	0.99			
Runoff Coefficient for unpaved areas, "C_u":		0.63	0.63	0.63	0.63	0.63			
Unpaved area contributing to this inlet (acres):		0.000	0.000	0.000	0.000	0.000			
Watershed paved length (ft):		442.0	63.0	120.0	117.0	100.0			
Paved area contributing to this inlet (acres):		0.000	0.000	0.000	0.000	0.000			
Subarea discharge Q_{sa} (cfs):		0.00	0.000	0.000	0.000	0.000			
Additional discharge (cfs):		1.520	1.910	1.070	0.930	1.780			
Total discharge Q_t, including any upstream by-pass (cfs):		1.520	2.152	1.984	1.657	1.780			
By-pass Q (cfs): *Describe here source of bypass:*	0.000	0.24	0.91	0.73	0.00	SAG			
DEPRESSION CALCULATION:									
Width of depression "w" (ft):									
Depression depth "a" (from flowline w/o depression) (in):									
Depression cross-slope (Sw=Sx+a/12w):									
Fraction of flow over the depression (Eo):									
Discharge-weighted equivalent cross-slope (Se):									
Q_s (first guess: **Qt - 0.001**, after iteration should be same as next line)		0.005			0.013	0.024	0.000	0.005	0.000
Q_s over shoulder (excluding flow over the depression) (cfs):									
Q=Q_w+Q_s (cfs) (after iterations must match **Q_t** value):									
HYDRAULIC RESULTS:									
Flooded Width T for Q_t, upstream of inlet (ft):		8.43	8.27	8.24	7.70	SAG			
Flooded Width T at depression (if any) (ft):		8.43	8.27	8.24	7.70	SAG			
Flooded Width T for BYPASS Q downstream of inlet (ft):	0.00	4.23	6.00	5.65	0.00	SAG			
Water depth at curb (with or without depression) (in):		1.83	2.28	2.97	2.77				
Water cross-area at shoulder (without depression) (sq.ft.):		0.64	0.79	1.02	0.89				
Water velocity immediately u/s from inlet (w/o depression) (fps):		2.36	2.74	1.95	1.86				
Average water velocity for the segment to this inlet (fps):		0.88	1.15	0.88	0.85				
Flowtime from the previous inlet to this one (min):		8.36	0.91	2.26	2.30				
GRATE INLETS ON-GRADE:									
Splash-over V for effective length of grate (type P-1 3/8) (fps):		6.81	6.81	6.81					
Effective length of grate considering clogging factor (ft):		2.01	2.01	2.01					
Ratio of grate frontal flow to total flow:		0.82	0.522	0.524					
Fraction of frontal flow intercepted (Rf):		100.0%	100.0%	100.0%					
Fraction of side flow interception (Rs):		11.3%	11.1%	23.1%					
Total flow intercepted (cfs):		1.28	1.238	1.257					
Grate Efficiency (E):		84.1%	57.5%	63.3%					
Grate flow-through flow (cfs):		0.24	0.914	0.727					
SLOTTED DRAINS & SIDE-OPENING INLETS ON-GRADE:									
Length required for total interception (ft):					14.83				
Length of inlet provided L (ft):					21.00				
Efficiency for length L:					100.0%				
Interception for length L (cfs):					1.657				
Side opening flow-through flow (cfs):					0.000				
INTERCEPTION CAPACITY OF INLETS IN SAG LOCATION:									
Maximum allowable flooded width (including the depression) (ft):						8.00			
Max. head at sag w/o exceeding allowable flooded width (ft):						0.24			
Capacity of grate in a sag (3-sided weir) (cfs):						2.109			
Length provided of curb-opening inlet at sag (ft):									
Capacity of curb-opening inlet in a sag (weir) (cfs):									

ONDRAIN_English Version 7.5d, developed by Fernando Manzanera, Caltrans District 1, Hydraulics Capital Support (December 2010).

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Separate Run

Southbound Runs

HYDRAULIC CALCULATOR FOR ONSITE DRAINAGE (English Units)

Date: 08/03/21

RCTC I-15 ELPSE - 50yr Storm Analysis for Inlets in Sump Condition

Note: "Subarea discharge Qsa (cfs)" was obtained from "Design Discharge" column of Hydrological Tables found within the hydrology maps in Appendix B.2, and inputted as "Additional discharge (cfs)" below.

	Starting Point	S-1245	S-1250	S-1251	S-1253				
Location station (ft):	1240+20.0	1245+00.0	1250+00.0	1252+00.0	1253+50.0				
Longitudinal profile ("on-grade" or "sag"):		on-grade	on-grade	on-grade	sag				
Calculation Type ("grate", "side opening", or "shoulder hydraulics only"):		grate	grate	side opening	grate				
Longitudinal slope, S:		1.00%	1.00%	1.00%					
Shoulder cross-slope, Sx:		2.00%	2.00%	2.00%	2.00%				
Average watershed paved width (ft):		0.00	0.00	0.00	0.00				
Shoulder Manning's n:		0.016	0.016	0.016	0.016				
Inlet description (optional):									
Clogging factor for on-grade grates:		33%	33%	33%	33%				
Grate width (ft):		2.00	2.00	2.00	2.00				
Grate length (ft):		3.00	3.00	3.00	3.00				
Precipitation intensity (in/hr):		3.20	3.20	3.20	3.20				
Runoff Coefficient for paved areas, "C_p":		0.99	0.99	0.99	0.99				
Runoff Coefficient for unpaved areas, "C_u":		0.63	0.63	0.63	0.63				
Unpaved area contributing to this inlet (acres):		0.010	0.030	0.020	0.000				
Watershed paved length (ft):		480.0	500.0	200.0	150.0				
Paved area contributing to this inlet (acres):		0.000	0.000	0.000	0.000				
Subarea discharge Q_{sa} (cfs):		0.02	0.060	0.040	0.000				
Additional discharge (cfs):		3.850	5.080	1.540	2.190				
Total discharge Q_t, including any upstream by-pass (cfs):		3.870	7.280	6.189	2.190				
By-pass Q — *Describe here source of bypass:*	0.000	2.14	4.61	0.00	SAG				
DEPRESSION CALCULATION:									
Width of depression "w" (ft):									
Depression depth "a" (from flowline w/o depression) (in):									
Depression cross-slope (Sw=Sx+a/12w):									
Fraction of flow over the depression (Eo):									
Discharge-weighted equivalent cross-slope (Se):									
Q_s (first guess: **Qt - 0.001**, after iteration should be same as next line)		0.005			0.013				
Q_s over shoulder (excluding flow over the depression) (cfs):									
Q=Q_w+Q_s (cfs) (after iterations must match Q_t value):									
HYDRAULIC RESULTS:									
Flooded Width T for Q_t, upstream of inlet (ft):		11.97	15.17	14.28	SAG				
Flooded Width T at depression (if any) (ft):		11.97	15.17	14.28	SAG				
Flooded Width T for BYPASS Q downstream of inlet (ft):	0.00	9.59	12.78	0.00	SAG				
Water depth at curb (with or without depression) (in):		2.87	3.64	3.43					
Water cross-area at shoulder (without depression) (sq.ft.):		1.43	2.30	2.04					
Water velocity immediately u/s from inlet (w/o depression) (fps):		2.70	3.16	3.04					
Average water velocity for the segment to this inlet (fps):		1.01	1.39	1.46					
Flowtime from the previous inlet to this one (min):		7.94	6.00	2.28					
GRATE INLETS ON-GRADE:									
Splash-over V for effective length of grate (type P-1 3/8) (fps):		6.81	6.81						
Effective length of grate considering clogging factor (ft):		2.01	2.01						
Ratio of grate frontal flow to total flow:		0.39	0.314						
Fraction of frontal flow intercepted (Rf):		100.0%	100.0%						
Fraction of side flow interception (Rs):		10.0%	7.7%						
Total flow intercepted (cfs):		1.73	2.671						
Grate Efficiency (E):		44.7%	36.7%						
Grate flow-through flow (cfs):		2.14	4.608						
SLOTTED DRAINS & SIDE-OPENING INLETS ON-GRADE:									
Length required for total interception (ft):				40.51					
Length of inlet provided L (ft):				60.00					
Efficiency for length L:				100.0%					
Interception for length L (cfs):				6.189					
Side opening flow-through flow (cfs):				0.000					
INTERCEPTION CAPACITY OF INLETS IN SAG LOCATION:									
Maximum allowable flooded width (including the depression) (ft):					18.00				
Max. head at sag w/o exceeding allowable flooded width (ft):					0.36				
Capacity of grate in a sag (3-sided weir) (cfs):					3.875				
Length provided of curb-opening inlet at sag (ft):									
Capacity of curb-opening inlet in a sag (weir) (cfs):									

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Separate Run

HYDRAULIC CALCULATOR FOR ONSITE DRAINAGE (English Units)

Date: 08/03/21

RCTC I-15 ELPSE - 50yr Storm Analysis for Inlets in Sump Condition

Note: "Subarea discharge Qsa (cfs)" was obtained from "Design Discharge" column of Hydrological Tables found within the hydrology maps in Appendix B.2, and inputted as "Additional discharge (cfs)" below.

	Starting Point	S-1267	S-1263	S-1258	S-1255	S-1253			
Location station (ft):	1272+00.0	1267+40.0	1263+56.0	1258+62.0	1255+00.0	1253+50.0			
Longitudinal profile ("on-grade" or "sag"):		on-grade	on-grade	on-grade	on-grade	sag			
Calculation Type ("grate", "side opening", or "shoulder hydraulics only"):		grate	grate	grate	side opening	grate			
Longitudinal slope, S:		0.40%	1.00%	1.00%	1.00%				
Shoulder cross-slope, Sx:		2.00%	2.00%	2.00%	2.00%	2.00%			
Average watershed paved width (ft):		0.00	0.00	0.00	0.00	0.00			
Shoulder Manning's n:		0.016	0.016	0.016	0.016	0.016			
Inlet description (optional):									
Clogging factor for on-grade grates:		33%	33%	33%	33%	33%			
Grate width (ft):		2.00	2.00	2.00	2.00	2.00			
Grate length (ft):		3.00	3.00	3.00	3.00	3.00			
Precipitation intensity (in/hr):		3.73	3.73	3.73	3.73	3.73			
Runoff Coefficient for paved areas, "C_p":		0.99	0.99	0.99	0.99	0.99			
Runoff Coefficient for unpaved areas, "C_u":		0.63	0.63	0.63	0.63	0.63			
Unpaved area contributing to this inlet (acres):		0.000	0.000	0.210	0.000	0.000			
Watershed paved length (ft):		460.0	384.0	494.0	362.0	150.0			
Paved area contributing to this inlet (acres):		0.000	0.000	0.000	0.000	0.000			
Subarea discharge Q_{sa} (cfs):		0.00	0.000	0.493	0.000	0.000			
Additional discharge (cfs):		6.040	2.540	3.700	2.330	2.190			
Total discharge Q_t, including any upstream by-pass (cfs):		6.050	6.233	8.023	7.500	2.190			
By-pass Q *Describe here source of bypass:*	0.010	3.69	3.83	5.17	0.00	SAG			
DEPRESSION CALCULATION:									
Width of depression "w" (ft):									
Depression depth "a" (from flowline w/o depression) (in):									
Depression cross-slope (Sw=Sx+a/12w):									
Fraction of flow over the depression (Eo):									
Discharge-weighted equivalent cross-slope (Se):									
Q_s (first guess: **Qt - 0.001**, after iteration should be same as next line)		0.005			0.013	0.024	0.000	0.005	0.000
Q_s over shoulder (excluding flow over the depression) (cfs):									
Q=Q_w+Q_s (cfs) (after iterations must match **Q_t** value):									
HYDRAULIC RESULTS:									
Flooded Width T for Q_t, upstream of inlet (ft):		16.81	14.32	15.74	15.35	SAG			
Flooded Width T at depression (if any) (ft):		16.81	14.32	15.74	15.35	SAG			
Flooded Width T for BYPASS Q downstream of inlet (ft):	0.00	13.97	11.93	13.35	0.00	SAG			
Water depth at curb (with or without depression) (in):		4.03	3.44	3.78	3.68				
Water cross-area at shoulder (without depression) (sq.ft.):		2.83	2.05	2.48	2.35				
Water velocity immediately u/s from inlet (w/o depression) (fps):		2.14	3.04	3.24	3.18				
Average water velocity for the segment to this inlet (fps):		0.80	1.50	1.49	1.52				
Flowtime from the previous inlet to this one (min):		9.59	4.26	5.54	3.97				
GRATE INLETS ON-GRADE:									
Splash-over V for effective length of grate (type P-1 3/8) (fps):		6.81	6.81	6.81					
Effective length of grate considering clogging factor (ft):		2.01	2.01	2.01					
Ratio of grate frontal flow to total flow:		0.29	0.331	0.304					
Fraction of frontal flow intercepted (Rf):		100.0%	100.0%	100.0%					
Fraction of side flow interception (Rs):		14.4%	8.2%	7.4%					
Total flow intercepted (cfs):		2.36	2.404	2.853					
Grate Efficiency (E):		39.0%	38.6%	35.6%					
Grate flow-through flow (cfs):		3.69	3.829	5.170					
SLOTTED DRAINS & SIDE-OPENING INLETS ON-GRADE:									
Length required for total interception (ft):					43.91				
Length of inlet provided L (ft):					65.00				
Efficiency for length L:					100.0%				
Interception for length L (cfs):					7.500				
Side opening flow-through flow (cfs):					0.000				
INTERCEPTION CAPACITY OF INLETS IN SAG LOCATION:									
Maximum allowable flooded width (including the depression) (ft):						18.00			
Max. head at sag w/o exceeding allowable flooded width (ft):						0.36			
Capacity of grate in a sag (3-sided weir) (cfs):						3.875			
Length provided of curb-opening inlet at sag (ft):									
Capacity of curb-opening inlet in a sag (weir) (cfs):									

ONDRAIN_English Version 7.5d, developed by Fernando Manzanera, Caltrans District 1, Hydraulics Capital Support (December 2010).

Notes: -This program utilizes the equations presented in the FHA Hydraulic Engineering Circular 22 (HEC-22), FHWA-NHI-10-009.

- Underlined values are calculated by the program, the others are input by the user.

Separate Run

HYDRAULIC CALCULATOR FOR ONSITE DRAINAGE (English Units)

Date: 08/03/21

RCTC I-15 ELPSE - 50yr Storm Analysis for Inlets in Sump Condition

Note: "Subarea discharge Qsa (cfs)" was obtained from "Design Discharge" column of Hydrological Tables found within the hydrology maps in Appendix B.2, and inputted as "Additional discharge (cfs)" below.

	Starting Point	S-1473	S-1475	S-1476	S-1478	S-1479	S-1482		
Location station (ft):	1472+00.0	1473+00.0	1475+47.0	1476+82.0	1478+18.0	1479+77.0	1482+00.0		
Longitudinal profile ("on-grade" or "sag"):		on-grade	on-grade	on-grade	on-grade	on-grade	sag		
Calculation Type ("grate", "side opening", or "shoulder hydraulics only"):		grate	grate	grate	grate	side opening	hydraulics only		
Longitudinal slope, S:		1.00%	1.00%	1.00%	1.00%	1.00%			
Shoulder cross-slope, Sx:		1.30%	3.00%	3.00%	3.00%	3.00%	3.00%		
Average watershed paved width (ft):		0.00	0.00	0.00	0.00	0.00	0.00		
Shoulder Manning's n:		0.016	0.016	0.016	0.016	0.016	0.016		
Inlet description (optional):									
Clogging factor for on-grade grates:		33%	33%	33%	33%				
Grate width (ft):		2.00	2.00	2.00	2.00				
Grate length (ft):		3.00	3.00	3.00	3.00				
Precipitation intensity (in/hr):		3.73	3.73	3.73	3.73	3.73	3.73		
Runoff Coefficient for paved areas, "C_p":		0.99	0.99	0.99	0.99	0.99	0.99		
Runoff Coefficient for unpaved areas, "C_u":		0.63	0.63	0.63	0.63	0.63	0.63		
Unpaved area contributing to this inlet (acres):		0.000	0.000	0.000	0.000	0.000	0.000		
Watershed paved length (ft):		100.0	247.0	135.0	136.0	159.0	223.0		
Paved area contributing to this inlet (acres):		0.000	0.000	0.000	0.000	0.000	0.000		
Subarea discharge Q_{sa} (cfs):		0.00	0.000	0.000	0.000	0.000	0.000		
Additional discharge (cfs):		0.350	1.810	0.950	1.000	0.730	4.120		
Total discharge Q_t, including any upstream by-pass (cfs):		**0.350**	**1.912**	**1.618**	**1.521**	**1.205**	**4.120**		
By-pass Q *Describe here source of bypass:*	**0.000**	**0.10**	**0.67**	**0.52**	**0.48**	**0.00**	**4.12**		
DEPRESSION CALCULATION:									
Width of depression "w" (ft):									
Depression depth "a" (from flowline w/o depression) (in):									
Depression cross-slope (Sw=Sx+a/12w):									
Fraction of flow over the depression (Eo):									
Discharge-weighted equivalent cross-slope (Se):									
Q_s (first guess: **Qt - 0.001**, after iteration should be same as next line)		0.005			0.013	0.024			
Q_s over shoulder (excluding flow over the depression) (cfs):									
Q=Q_w+Q_s (cfs) (after iterations must match **Q_t** value):									
HYDRAULIC RESULTS:									
Flooded Width T for Q_t, upstream of inlet (ft):		**6.36**	**7.13**	**6.70**	**6.55**	**6.00**	**SAG**		
Flooded Width T at depression (if any) (ft):		**6.36**	**7.13**	**6.70**	**6.55**	**6.00**	**SAG**		
Flooded Width T for BYPASS Q downstream of inlet (ft):	**0.00**	**4.00**	**4.81**	**4.38**	**4.23**	**0.00**	**SAG**		
Water depth at curb (with or without depression) (in):		0.99	2.57	2.41	2.36	2.16			
Water cross-area at shoulder (without depression) (sq.ft.):		0.26	0.76	0.67	0.64	0.54			
Water velocity immediately u/s from inlet (w/o depression) (fps):		1.33	2.50	2.40	2.37	2.23			
Average water velocity for the segment to this inlet (fps):		0.49	1.07	1.09	1.05	1.00			
Flowtime from the previous inlet to this one (min):		3.37	3.84	2.07	2.16	2.64			
GRATE INLETS ON-GRADE:									
Splash-over V for effective length of grate (type P-1 3/8) (fps):		6.81	6.81	6.81	6.81				
Effective length of grate considering clogging factor (ft):		2.01	2.01	2.01	2.01				
Ratio of grate frontal flow to total flow:		0.63	0.584	0.611	0.622				
Fraction of frontal flow intercepted (Rf):		100.0%	100.0%	100.0%	100.0%				
Fraction of side flow interception (Rs):		20.6%	16.0%	17.1%	17.5%				
Total flow intercepted (cfs):		0.25	1.244	1.096	1.046				
Grate Efficiency (E):		70.9%	65.1%	67.8%	68.8%				
Grate flow-through flow (cfs):		**0.10**	**0.668**	**0.521**	**0.475**				
SLOTTED DRAINS & SIDE-OPENING INLETS ON-GRADE:									
Length required for total interception (ft):						15.97			
Length of inlet provided L (ft):		12.00	12.00	12.00	12.00	23.00			
Efficiency for length L:						100.0%			
Interception for length L (cfs):						1.205			
Side opening flow-through flow (cfs):						**0.000**			
INTERCEPTION CAPACITY OF INLETS IN SAG LOCATION:									
Maximum allowable flooded width (including the depression) (ft):									
Max. head at sag w/o exceeding allowable flooded width (ft):							0.00		
Capacity of grate in a sag (3-sided weir) (cfs):									
Length provided of curb-opening inlet at sag (ft):									
Capacity of curb-opening inlet in a sag (weir) (cfs):									

ONDRAIN_English Version 7.5d, developed by Fernando Manzanera, Caltrans District 1, Hydraulics Capital Support (December 2010).

Notes: -This program utilizes the equations presented in the FHA Hydraulic Engineering Circular 22 (HEC-22), FHWA-NHI-10-009.

- Underlined values are calculated by the program, the others are input by the user.

South 1400's

Separate Run

HYDRAULIC CALCULATOR FOR ONSITE DRAINAGE (English Units)

Date: 05/26/21

RCTC I-15 ELPSE - 50yr Storm Analysis for Inlets in Sump Condition

Note: "Subarea discharge Qsa (cfs)" was obtained from "Design Discharge" column of Hydrological Tables for Sump Condition found within the hydrology maps in Appendix B.2, and inputted as "Additional discharge (cfs)" below.

	Starting Point	S-1499	S-1498A	S-1496	S-1495	S-1493	S-1491	S-1488	S-1486A
Location station (ft):	1501+89.0	1499+34.0	1498+36.0	1496+77.0	1495+27.0	1493+74.0	1491+00.0	1488+63.0	1486+94.0
Longitudinal profile ("on-grade" or "sag"):		on-grade	on-grade	on-grade	on-grade	on-grade	on-grade	on-grade	on-grade
Calculation Type ("grate", "side opening", or "shoulder hydraulics only"):		grate	grate	grate	grate	grate	grate	grate	grate
Longitudinal slope, S:		1.40%	1.40%	1.40%	1.40%	1.40%	1.40%	1.40%	1.40%
Shoulder cross-slope, Sx:		3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%
Average watershed paved width (ft):		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Shoulder Manning's n:		0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016
Inlet description (optional):									
Clogging factor for on-grade grates:		33%	33%	33%	33%	33%	33%	33%	33%
Grate width (ft):		2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Grate length (ft):		3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00
Precipitation intensity (in/hr):		3.73	3.73	3.73	3.73	3.73	3.73	3.73	3.73
Runoff Coefficient for paved areas, "C_p":		0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Runoff Coefficient for unpaved areas, "C_u":		0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63
Unpaved area contributing to this inlet (acres):		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Watershed paved length (ft):		255.0	98.0	159.0	150.0	153.0	274.0	237.0	169.0
Paved area contributing to this inlet (acres):		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Subarea discharge Q_{sa} (cfs):		0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Additional discharge (cfs):		1.840	0.840	1.000	1.240	1.000	1.870	1.810	1.240
Total discharge Q_t, including any upstream by-pass (cfs):		**1.840**	**1.449**	**1.422**	**1.651**	**1.517**	**2.324**	**2.667**	**2.283**
By-pass Q (cfs): *Describe here source of bypass:*	0.000	**0.61**	**0.42**	**0.41**	**0.52**	**0.45**	**0.86**	**1.04**	**0.84**
DEPRESSION CALCULATION:									
Width of depression "w" (ft):									
Depression depth "a" (from flowline w/o depression) (in):									
Depression cross-slope (Sw=Sx+a/12w):									
Fraction of flow over the depression (Eo):									
Discharge-weighted equivalent cross-slope (Se):									
Q_s (first guess: **Qt - 0.001**, after iteration should be same as next line)		0.005			0.013	0.024	0.000	0.005	0.000
Q_s over shoulder (excluding flow over the depression) (cfs):									
Q=Q_w+Q_s (cfs) (after iterations must match **Q_t** value):									
HYDRAULIC RESULTS:									
Flooded Width T for Q_t, upstream of inlet (ft):		**6.60**	**6.04**	**5.99**	**6.34**	**6.14**	**7.21**	**7.59**	**7.16**
Flooded Width T at depression (if any) (ft):		**6.60**	**6.04**	**5.99**	**6.34**	**6.14**	**7.21**	**7.59**	**7.16**
Flooded Width T for BYPASS Q downstream of inlet (ft):	0.00	**4.36**	**3.80**	**3.76**	**4.10**	**3.91**	**4.96**	**5.34**	**4.91**
Water depth at curb (with or without depression) (in):		2.38	2.17	2.16	2.28	2.21	2.59	2.73	2.58
Water cross-area at shoulder (without depression) (sq.ft.):		0.65	0.55	0.54	0.60	0.57	0.78	0.86	0.77
Water velocity immediately u/s from inlet (w/o depression) (fps):		2.81	2.65	2.64	2.74	2.68	2.98	3.09	2.97
Average water velocity for the segment to this inlet (fps):		1.05	1.20	1.16	1.19	1.19	1.27	1.37	1.36
Flowtime from the previous inlet to this one (min):		4.05	1.36	2.29	2.11	2.14	3.60	2.89	2.08
GRATE INLETS ON-GRADE:									
Splash-over V for effective length of grate (type P-1 3/8) (fps):		6.81	6.81	6.81	6.81	6.81	6.81	6.81	6.81
Effective length of grate considering clogging factor (ft):		2.01	2.01	2.01	2.01	2.01	2.01	2.01	2.01
Ratio of grate frontal flow to total flow:		0.62	0.658	0.661	0.636	0.650	0.580	0.558	0.583
Fraction of frontal flow intercepted (Rf):		100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Fraction of side flow interception (Rs):		13.4%	14.7%	14.8%	14.0%	14.4%	12.2%	11.6%	12.3%
Total flow intercepted (cfs):		1.23	1.026	1.012	1.134	1.063	1.467	1.624	1.447
Grate Efficiency (E):		66.9%	70.8%	71.1%	68.7%	70.1%	63.1%	60.9%	63.4%
Grate flow-through flow (cfs):		**0.61**	**0.422**	**0.411**	**0.517**	**0.454**	**0.857**	**1.043**	**0.836**
SLOTTED DRAINS & SIDE-OPENING INLETS ON-GRADE:									
Length required for total interception (ft):									
Length of inlet provided L (ft):									
Efficiency for length L:									
Interception for length L (cfs):									
Side opening flow-through flow (cfs):									
INTERCEPTION CAPACITY OF INLETS IN SAG LOCATION:									
Maximum allowable flooded width (including the depression) (ft):									
Max. head at sag w/o exceeding allowable flooded width (ft):									
Capacity of grate in a sag (3-sided weir) (cfs):									
Length provided of curb-opening inlet at sag (ft):									
Capacity of curb-opening inlet in a sag (weir) (cfs):									

ONDRAIN_English Version 7.5d, developed by Fernando Manzanera, Caltrans District 1, Hydraulics Capital Support (December 2010).

Notes: -This program utilizes the equations presented in the FHA Hydraulic Engineering Circular 22 (HEC-22), FHWA-NHI-10-009.

- Underlined values are calculated by the program, the others are input by the user.

South 1500's

HYDRAULIC CALCULATOR FOR ONSITE DRAINAGE (English Units)

Date: 08/03/21

RCTC I-15 ELPSE - 50yr Storm Analysis for Inlets in Sump Condition

Note: "Subarea discharge Qsa (cfs)" was obtained from "Design Discharge" column of Hydrological Tables found within the hydrology maps in Appendix B.2, and inputted as "Additional discharge (cfs)" below.

	Starting Point	S-1485	S-1484	S-1482					
Location station (ft):	**1485+16.0**	**1485+16.0**	**1484+25.0**	**1482+00.0**					
Longitudinal profile ("on-grade" or "sag"):		on-grade	on-grade	sag					
Calculation Type ("grate", "side opening", or "shoulder hydraulics only"):		grate	side opening	hydraulics only					
Longitudinal slope, S:		1.40%	1.40%						
Shoulder cross-slope, Sx:		3.00%	3.00%	3.00%					
Average watershed paved width (ft):		0.00	0.00	0.00					
Shoulder Manning's n:		0.016	0.016	0.016					
Inlet description (optional):									
Clogging factor for on-grade grates:		33%							
Grate width (ft):		2.00							
Grate length (ft):		3.00							
Precipitation intensity (in/hr):		3.73	3.73	3.73					
Runoff Coefficient for paved areas, "C_p":		0.99	0.99	0.99					
Runoff Coefficient for unpaved areas, "C_u":		0.63	0.63	0.63					
Unpaved area contributing to this inlet (acres):		0.000	0.000	0.000					
Watershed paved length (ft):		0.0	91.0	225.0					
Paved area contributing to this inlet (acres):		0.000	0.000	0.000					
Subarea discharge Q_{sa} (cfs):		0.00	0.000	0.000					
Additional discharge (cfs):		1.300	0.610	4.120					
Total discharge Q_t, including any upstream by-pass (cfs):		**2.140**	**1.371**	**4.120**					
By-pass Q (cfs): *Describe here source of bypass:*	**0.840**	**0.76**	**0.00**	**4.12**					
DEPRESSION CALCULATION:									
Width of depression "w" (ft):									
Depression depth "a" (from flowline w/o depression) (in):									
Depression cross-slope (Sw=Sx+a/12w):									
Fraction of flow over the depression (Eo):									
Discharge-weighted equivalent cross-slope (Se):									
Q_s (first guess: **Qt - 0.001**, after iteration should be same as next line)		0.005							
Q_s over shoulder (excluding flow over the depression) (cfs):									
Q=Q_w+Q_s (cfs) (after iterations must match **Q_t** value):									
HYDRAULIC RESULTS:									
Flooded Width T for Q_t, upstream of inlet (ft):		**6.99**	**5.91**	**SAG**					
Flooded Width T at depression (if any) (ft):		**6.99**	**5.91**	**SAG**					
Flooded Width T for BYPASS Q downstream of inlet (ft):	**0.00**	**4.74**	**0.00**	**SAG**					
Water depth at curb (with or without depression) (in):		2.52	2.13						
Water cross-area at shoulder (without depression) (sq.ft.):		0.73	0.52						
Water velocity immediately u/s from inlet (w/o depression) (fps):		2.92	2.61						
Average water velocity for the segment to this inlet (fps):		1.09	1.22						
Flowtime from the previous inlet to this one (min):		0.00	1.25						
GRATE INLETS ON-GRADE:									
Splash-over V for effective length of grate (type P-1 3/8) (fps):		6.81							
Effective length of grate considering clogging factor (ft):		2.01							
Ratio of grate frontal flow to total flow:		0.59							
Fraction of frontal flow intercepted (Rf):		100.0%							
Fraction of side flow interception (Rs):		12.6%							
Total flow intercepted (cfs):		1.38							
Grate Efficiency (E):		64.5%							
Grate flow-through flow (cfs):		**0.76**							
SLOTTED DRAINS & SIDE-OPENING INLETS ON-GRADE:									
Length required for total interception (ft):			18.65						
Length of inlet provided L (ft):			27.00						
Efficiency for length L:			100.0%						
Interception for length L (cfs):			1.371						
Side opening flow-through flow (cfs):			**0.000**						
INTERCEPTION CAPACITY OF INLETS IN SAG LOCATION:									
Maximum allowable flooded width (including the depression) (ft):									
Max. head at sag w/o exceeding allowable flooded width (ft):				0.00					
Capacity of grate in a sag (3-sided weir) (cfs):									
Length provided of curb-opening inlet at sag (ft):									
Capacity of curb-opening inlet in a sag (weir) (cfs):									

ONDRAIN_English Version 7.5d, developed by Fernando Manzanera, Caltrans District 1, Hydraulics Capital Support (December 2010).

Notes: -This program utilizes the equations presented in the FHA Hydraulic Engineering Circular 22 (HEC-22), FHWA-NHI-10-009.

- Underlined values are calculated by the program, the others are input by the user.

South 1500's

Separate Run

HYDRAULIC CALCULATOR FOR ONSITE DRAINAGE (English Units)

Date: 05/26/21

RCTC I-15 ELPSE - 50yr Storm Analysis for Inlets in Sump Condition

Note: "Subarea discharge Qsa (cfs)" was obtained from "Design Discharge" column of Hydrological Tables for Sump Condition found within the hydrology maps in Appendix B.2, and inputted as "Additional discharge (cfs)" below.

	Starting Point	S-1674A	S-1675	S-1677A	S-1678A	S-1680	S-1681	S-1682	S-1683
Location station (ft):	1672+47.0	1674+90.0	1675+96.0	1677+00.0	1678+00.0	1680+00.0	1681+00.0	1682+00.0	1683+00.0
Longitudinal profile ("on-grade" or "sag"):		on-grade	on-grade	on-grade	on-grade	on-grade	on-grade	on-grade	on-grade
Calculation Type ("grate", "side opening", or "shoulder hydraulics only"):		grate	grate	grate	grate	grate	grate	grate	side opening
Longitudinal slope, S:		0.70%	0.70%	0.70%	0.70%	0.70%	0.70%	0.70%	0.70%
Shoulder cross-slope, Sx:		3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%
Average watershed paved width (ft):		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Shoulder Manning's n:		0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016
Inlet description (optional):									
Clogging factor for on-grade grates:		33%	33%	33%	33%	33%	33%	33%	
Grate width (ft):		2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Grate length (ft):		3.00	3.00	3.00	3.00	3.00	3.00	3.00	
Precipitation intensity (in/hr):		3.47	3.47	3.47	3.47	3.47	3.47	3.47	3.47
Runoff Coefficient for paved areas, "C_p":		0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Runoff Coefficient for unpaved areas, "C_u":		0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63
Unpaved area contributing to this inlet (acres):		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Watershed paved length (ft):		243.0	106.0	104.0	100.0	200.0	100.0	100.0	100.0
Paved area contributing to this inlet (acres):		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Subarea discharge Q_{sa} (cfs):		0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Additional discharge (cfs):		1.640	0.830	0.780	0.780	1.720	0.930	0.850	1.020
Total discharge Q_t, including any upstream by-pass (cfs):		**1.640**	**1.377**	**1.200**	**1.120**	**2.026**	**1.673**	**1.413**	**1.457**
By-pass Q (cfs): *Describe here source of bypass:*	**0.000**	**0.55**	**0.42**	**0.34**	**0.31**	**0.74**	**0.56**	**0.44**	**0.00**
DEPRESSION CALCULATION:									
Width of depression "w" (ft):									
Depression depth "a" (from flowline w/o depression) (in):									
Depression cross-slope (Sw=Sx+a/12w):									
Fraction of flow over the depression (Eo):									
Discharge-weighted equivalent cross-slope (Se):									
Q_s (first guess: **Qt - 0.001**, after iteration should be same as next line)		0.005			0.013	0.024	0.000	0.005	0.000
Q_s over shoulder (excluding flow over the depression) (cfs):									
Q=Q_w+Q_s (cfs) (after iterations must match **Q_t** value):									
HYDRAULIC RESULTS:									
Flooded Width T for Q_t, upstream of inlet (ft):		**7.20**	**6.74**	**6.41**	**6.24**	**7.79**	**7.25**	**6.81**	**6.89**
Flooded Width T at depression (if any) (ft):		**7.20**	**6.74**	**6.41**	**6.24**	**7.79**	**7.25**	**6.81**	**6.89**
Flooded Width T for BYPASS Q downstream of inlet (ft):	**0.00**	**4.77**	**4.32**	**3.99**	**3.84**	**5.35**	**4.82**	**4.39**	**0.00**
Water depth at curb (with or without depression) (in):		2.59	2.43	2.31	2.25	2.81	2.61	2.45	2.48
Water cross-area at shoulder (without depression) (sq.ft.):		0.78	0.68	0.62	0.58	0.91	0.79	0.70	0.71
Water velocity immediately u/s from inlet (w/o depression) (fps):		2.11	2.02	1.95	1.92	2.22	2.12	2.03	2.05
Average water velocity for the segment to this inlet (fps):		0.79	0.91	0.87	0.84	0.93	0.96	0.92	0.90
Flowtime from the previous inlet to this one (min):		5.15	1.94	2.00	1.98	3.59	1.73	1.82	1.85
GRATE INLETS ON-GRADE:									
Splash-over V for effective length of grate (type P-1 3/8) (fps):		6.81	6.81	6.81	6.81	6.81	6.81	6.81	
Effective length of grate considering clogging factor (ft):		2.01	2.01	2.01	2.01	2.01	2.01	2.01	
Ratio of grate frontal flow to total flow:		0.58	0.609	0.631	0.643	0.546	0.577	0.604	
Fraction of frontal flow intercepted (Rf):		100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	
Fraction of side flow interception (Rs):		20.6%	22.0%	23.0%	23.6%	19.1%	20.5%	21.8%	
Total flow intercepted (cfs):		1.09	0.956	0.860	0.815	1.283	1.110	0.976	
Grate Efficiency (E):		66.7%	69.5%	71.6%	72.7%	63.3%	66.4%	69.0%	
Grate flow-through flow (cfs):		**0.55**	**0.420**	**0.340**	**0.306**	**0.743**	**0.563**	**0.437**	
SLOTTED DRAINS & SIDE-OPENING INLETS ON-GRADE:									
Length required for total interception (ft):									15.55
Length of inlet provided L (ft):									25.00
Efficiency for length L:									100.0%
Interception for length L (cfs):									1.457
Side opening flow-through flow (cfs):									**0.000**
INTERCEPTION CAPACITY OF INLETS IN SAG LOCATION:									
Maximum allowable flooded width (including the depression) (ft):									
Max. head at sag w/o exceeding allowable flooded width (ft):									
Capacity of grate in a sag (3-sided weir) (cfs):									
Length provided of curb-opening inlet at sag (ft):									
Capacity of curb-opening inlet in a sag (weir) (cfs):									

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Notes: -This program utilizes the equations presented in the FHA Hydraulic Engineering Circular 22 (HEC-22), FHWA-NHI-10-009.

- Underlined values are calculated by the program, the others are input by the user.

HYDRAULIC CALCULATOR FOR ONSITE DRAINAGE (English Units)

Date: 08/03/21

RCTC I-15 ELPSE - 50yr Storm Analysis for Inlets in Sump Condition

Note: "Subarea discharge Qsa (cfs)" was obtained from "Design Discharge" column of Hydrological Tables found within the hydrology maps in Appendix B.2, and inputted as "Additional discharge (cfs)" below.

	Starting Point	S-1685	S-1686	S-1688					
Location station (ft):	**1683+00.0**	**1685+64.0**	**1686+62.0**	**1688+00.0**					
Longitudinal profile ("on-grade" or "sag"):		on-grade	on-grade	sag					
Calculation Type ("grate", "side opening", or "shoulder hydraulics only"):		grate	side opening	hydraulics only					
Longitudinal slope, S:		0.70%	0.70%						
Shoulder cross-slope, Sx:		3.00%	3.00%	3.00%					
Average watershed paved width (ft):		0.00	0.00	0.00					
Shoulder Manning's n:		0.016	0.016	0.016					
Inlet description (optional):									
Clogging factor for on-grade grates:		33%							
Grate width (ft):		4.00							
Grate length (ft):		3.00							
Precipitation intensity (in/hr):		3.47	3.47	3.47					
Runoff Coefficient for paved areas, "C_p":		0.99	0.99	0.99					
Runoff Coefficient for unpaved areas, "C_u":		0.63	0.63	0.63					
Unpaved area contributing to this inlet (acres):		0.060	0.120	0.120					
Watershed paved length (ft):		264.0	98.0	138.0					
Paved area contributing to this inlet (acres):		0.000	0.000	0.000					
Subarea discharge Q_{sa} (cfs):		0.13	0.262	0.262					
Additional discharge (cfs):		2.310	0.890	2.150					
Total discharge Q_t, including any upstream by-pass (cfs):		**2.441**	**1.506**	**2.412**					
By-pass Q (cfs): *Describe here source of bypass:*	**0.000**	**0.35**	**0.00**	**2.41**					
DEPRESSION CALCULATION:									
Width of depression "w" (ft):									
Depression depth "a" (from flowline w/o depression) (in):									
Depression cross-slope (Sw=Sx+a/12w):									
Fraction of flow over the depression (Eo):									
Discharge-weighted equivalent cross-slope (Se):									
Q_s (first guess: **Qt - 0.001**, after iteration should be same as next line)		0.005							
Q_s over shoulder (excluding flow over the depression) (cfs):									
Q=Q_w+Q_s (cfs) (after iterations must match **Q_t** value):									
HYDRAULIC RESULTS:									
Flooded Width T for Q_t, upstream of inlet (ft):		**8.36**	**6.97**	**SAG**					
Flooded Width T at depression (if any) (ft):		**8.36**	**6.97**	**SAG**					
Flooded Width T for BYPASS Q downstream of inlet (ft):	**0.00**	**4.05**	**0.00**	**SAG**					
Water depth at curb (with or without depression) (in):		3.01	2.51						
Water cross-area at shoulder (without depression) (sq.ft.):		1.05	0.73						
Water velocity immediately u/s from inlet (w/o depression) (fps):		2.33	2.06						
Average water velocity for the segment to this inlet (fps):		0.87	0.89						
Flowtime from the previous inlet to this one (min):		5.06	1.84						
GRATE INLETS ON-GRADE:									
Splash-over V for effective length of grate (type P-1 3/8) (fps):		6.81							
Effective length of grate considering clogging factor (ft):		2.01							
Ratio of grate frontal flow to total flow:		0.82							
Fraction of frontal flow intercepted (Rf):		100.0%							
Fraction of side flow interception (Rs):		17.9%							
Total flow intercepted (cfs):		2.09							
Grate Efficiency (E):		85.5%							
Grate flow-through flow (cfs):		**0.35**							
SLOTTED DRAINS & SIDE-OPENING INLETS ON-GRADE:									
Length required for total interception (ft):			15.76						
Length of inlet provided L (ft):			23.00						
Efficiency for length L:			100.0%						
Interception for length L (cfs):			1.506						
Side opening flow-through flow (cfs):			**0.000**						
INTERCEPTION CAPACITY OF INLETS IN SAG LOCATION:									
Maximum allowable flooded width (including the depression) (ft):									
Max. head at sag w/o exceeding allowable flooded width (ft):				0.00					
Capacity of grate in a sag (3-sided weir) (cfs):									
Length provided of curb-opening inlet at sag (ft):									
Capacity of curb-opening inlet in a sag (weir) (cfs):									

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South 1600's

Separate Run

HYDRAULIC CALCULATOR FOR ONSITE DRAINAGE (English Units)

Date: 08/05/21

RCTC I-15 ELPSE - 50yr Storm Analysis for Inlets in Sump Condition

Note: "Subarea discharge Qsa (cfs)" was obtained from "Design Discharge" column of Hydrological Tables found within the hydrology maps in Appendix B.2, and inputted as "Additional discharge (cfs)" below.

	Starting Point	S-1700	S-1698	S-1696B	S-1695B	S-1695A	S-1694	S-1693	S-1692
Location station (ft):	1704+00.0	1700+08.0	1698+00.0	1696+46.0	1695+77.0	1695+00.0	1694+00.0	1693+00.0	1692+00.0
Longitudinal profile ("on-grade" or "sag"):		on-grade	on-grade	on-grade	on-grade	on-grade	on-grade	on-grade	on-grade
Calculation Type ("grate", "side opening", or "shoulder hydraulics only"):		grate	grate	grate	grate	grate	grate	grate	grate
Longitudinal slope, S:		1.70%	1.70%	1.70%	1.70%	1.70%	1.70%	1.00%	1.00%
Shoulder cross-slope, Sx:		1.90%	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%
Average watershed paved width (ft):		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Shoulder Manning's n:		0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016
Inlet description (optional):									
Clogging factor for on-grade grates:		33%	33%	33%	33%	33%	33%	33%	33%
Grate width (ft):		4.00	4.00	2.00	2.00	2.00	2.00	2.00	2.00
Grate length (ft):		3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00
Precipitation intensity (in/hr):		4.03	4.03	4.03	4.03	4.03	4.03	4.03	4.03
Runoff Coefficient for paved areas, "C_p":		0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Runoff Coefficient for unpaved areas, "C_u":		0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63
Unpaved area contributing to this inlet (acres):		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Watershed paved length (ft):		392.0	208.0	154.0	69.0	77.0	100.0	100.0	100.0
Paved area contributing to this inlet (acres):		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Subarea discharge Q_{sa} (cfs):		0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Additional discharge (cfs):		1.840	1.660	1.230	0.510	0.620	0.760	0.890	0.740
Total discharge Q_t, including any upstream by-pass (cfs):		1.840	1.963	1.547	1.130	1.015	1.097	1.268	1.231
By-pass Q (cfs): *Describe here source of bypass:*	0.000	0.30	0.32	0.62	0.40	0.34	0.38	0.49	0.47
DEPRESSION CALCULATION:									
Width of depression "w" (ft):									
Depression depth "a" (from flowline w/o depression) (in):									
Depression cross-slope (Sw=Sx+a/12w):									
Fraction of flow over the depression (Eo):									
Discharge-weighted equivalent cross-slope (Se):									
Q_s (first guess: **Qt - 0.001**, after iteration should be same as next line)		0.005			0.013	0.024	0.000	0.005	0.000
Q_s over shoulder (excluding flow over the depression) (cfs):									
Q=Q_w+Q_s (cfs) (after iterations must match **Q_t** value):									
HYDRAULIC RESULTS:									
Flooded Width T for Q_t, upstream of inlet (ft):		8.47	8.40	7.69	6.83	6.56	6.76	7.88	7.79
Flooded Width T at depression (if any) (ft):		8.47	8.40	7.69	6.83	6.56	6.76	7.88	7.79
Flooded Width T for BYPASS Q downstream of inlet (ft):	0.00	4.30	4.24	5.45	4.61	4.34	4.53	5.52	5.43
Water depth at curb (with or without depression) (in):		1.93	2.02	1.84	1.64	1.57	1.62	1.89	1.87
Water cross-area at shoulder (without depression) (sq.ft.):		0.68	0.71	0.59	0.47	0.43	0.46	0.62	0.61
Water velocity immediately u/s from inlet (w/o depression) (fps):		2.70	2.78	2.62	2.42	2.36	2.40	2.04	2.03
Average water velocity for the segment to this inlet (fps):		1.01	1.17	1.12	1.12	1.06	1.06	0.88	0.91
Flowtime from the previous inlet to this one (min):		6.49	2.96	2.30	1.02	1.21	1.58	1.90	1.83
GRATE INLETS ON-GRADE:									
Splash-over V for effective length of grate (type P-1 3/8) (fps):		6.81	6.81	6.81	6.81	6.81	6.81	6.81	6.81
Effective length of grate considering clogging factor (ft):		2.01	2.01	2.01	2.01	2.01	2.01	2.01	2.01
Ratio of grate frontal flow to total flow:		0.82	0.822	0.552	0.603	0.621	0.608	0.542	0.547
Fraction of frontal flow intercepted (Rf):		100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Fraction of side flow interception (Rs):		9.5%	9.5%	10.5%	11.9%	12.4%	12.1%	15.5%	15.7%
Total flow intercepted (cfs):		1.54	1.646	0.927	0.735	0.678	0.719	0.778	0.760
Grate Efficiency (E):		83.6%	83.9%	59.9%	65.0%	66.8%	65.5%	61.3%	61.8%
Grate flow-through flow (cfs):		0.30	0.317	0.620	0.395	0.337	0.378	0.491	0.471
SLOTTED DRAINS & SIDE-OPENING INLETS ON-GRADE:									
Length required for total interception (ft):									
Length of inlet provided L (ft):									
Efficiency for length L:									
Interception for length L (cfs):									
Side opening flow-through flow (cfs):									
INTERCEPTION CAPACITY OF INLETS IN SAG LOCATION:									
Maximum allowable flooded width (including the depression) (ft):									
Max. head at sag w/o exceeding allowable flooded width (ft):									
Capacity of grate in a sag (3-sided weir) (cfs):									
Length provided of curb-opening inlet at sag (ft):									
Capacity of curb-opening inlet in a sag (weir) (cfs):									

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South 1700's

HYDRAULIC CALCULATOR FOR ONSITE DRAINAGE (English Units)

Date: 08/05/21

RCTC I-15 ELPSE - 50yr Storm Analysis for Inlets in Sump Condition

Note: "Subarea discharge Qsa (cfs)" was obtained from "Design Discharge" column of Hydrological Tables found within the hydrology maps in Appendix B.2, and inputted as "Additional discharge (cfs)" below.

	Starting Point	S-1691	S-1690	S-1689A	S-1688				
Location station (ft):	**1692+00.0**	**1691+00.0**	**1690+50.0**	**1689+10.0**	**1688+00.0**				
Longitudinal profile ("on-grade" or "sag"):		on-grade	on-grade	on-grade	sag				
Calculation Type ("grate", "side opening", or "shoulder hydraulics only"):		grate	grate	side opening	hydraulics only				
Longitudinal slope, S:		1.00%	1.00%	1.00%					
Shoulder cross-slope, Sx:		2.00%	2.00%	2.00%	3.00%				
Average watershed paved width (ft):		0.00	0.00	0.00	0.00				
Shoulder Manning's n:		0.016	0.016	0.016	0.016				
Inlet description (optional):									
Clogging factor for on-grade grates:		33%	33%						
Grate width (ft):		2.00	2.00						
Grate length (ft):		3.00	3.00						
Precipitation intensity (in/hr):		4.03	4.03	4.03	4.03				
Runoff Coefficient for paved areas, "C_p":		0.99	0.99	0.99	0.99				
Runoff Coefficient for unpaved areas, "C_u":		0.63	0.63	0.63	0.63				
Unpaved area contributing to this inlet (acres):		0.000	0.000	0.000	0.000				
Watershed paved length (ft):		100.0	50.0	140.0	110.0				
Paved area contributing to this inlet (acres):		0.000	0.000	0.000	0.000				
Subarea discharge Q_{sa} (cfs):		0.00	0.000	0.000	0.000				
Additional discharge (cfs):		0.770	0.370	1.160	2.150				
Total discharge Q_t, including any upstream by-pass (cfs):		**1.240**	**0.845**	**1.432**	**2.150**				
By-pass Q (cfs): *Describe here source of bypass:*	**0.470**	**0.48**	**0.27**	**0.00**	**2.15**				
DEPRESSION CALCULATION:									
Width of depression "w" (ft):									
Depression depth "a" (from flowline w/o depression) (in):									
Depression cross-slope (Sw=Sx+a/12w):									
Fraction of flow over the depression (Eo):									
Discharge-weighted equivalent cross-slope (Se):									
Q_s (first guess: **Qt - 0.001**, after iteration should be same as next line)		0.005							
Q_s over shoulder (excluding flow over the depression) (cfs):									
Q=Q_w+Q_s (cfs) (after iterations must match **Q_t** value):									
HYDRAULIC RESULTS:									
Flooded Width T for Q_t, upstream of inlet (ft):		**7.81**	**6.77**	**8.25**	**SAG**				
Flooded Width T at depression (if any) (ft):		**7.81**	**6.77**	**8.25**	**SAG**				
Flooded Width T for BYPASS Q downstream of inlet (ft):	**0.00**	**5.45**	**4.43**	**0.00**	**SAG**				
Water depth at curb (with or without depression) (in):		1.88	1.62	1.98					
Water cross-area at shoulder (without depression) (sq.ft.):		0.61	0.46	0.68					
Water velocity immediately u/s from inlet (w/o depression) (fps):		2.03	1.85	2.11					
Average water velocity for the segment to this inlet (fps):		0.76	0.86	0.89					
Flowtime from the previous inlet to this one (min):		2.20	0.97	2.61					
GRATE INLETS ON-GRADE:									
Splash-over V for effective length of grate (type P-1 3/8) (fps):		6.81	6.81						
Effective length of grate considering clogging factor (ft):		2.01	2.01						
Ratio of grate frontal flow to total flow:		0.55	0.607						
Fraction of frontal flow intercepted (Rf):		100.0%	100.0%						
Fraction of side flow interception (Rs):		15.7%	18.1%						
Total flow intercepted (cfs):		0.76	0.573						
Grate Efficiency (E):		61.7%	67.8%						
Grate flow-through flow (cfs):		**0.48**	**0.272**						
SLOTTED DRAINS & SIDE-OPENING INLETS ON-GRADE:									
Length required for total interception (ft):				21.91					
Length of inlet provided L (ft):				33.00					
Efficiency for length L:				100.0%					
Interception for length L (cfs):				1.432					
Side opening flow-through flow (cfs):				**0.000**					
INTERCEPTION CAPACITY OF INLETS IN SAG LOCATION:									
Maximum allowable flooded width (including the depression) (ft):									
Max. head at sag w/o exceeding allowable flooded width (ft):					0.00				
Capacity of grate in a sag (3-sided weir) (cfs):									
Length provided of curb-opening inlet at sag (ft):									
Capacity of curb-opening inlet in a sag (weir) (cfs):									

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Appendix E

Miscellaneous Calculations

Figure 819.2A

Runoff Coefficients for Undeveloped Areas Watershed Types

	Extreme	High	Normal	Low
Relief	.28 -.35 Steep, rugged terrain with average slopes above 30%	.20 -.28 Hilly, with average slopes of 10 to 30%	.14 -.20 Rolling, with average slopes of 5 to 10%	.08 -.14 Relatively flat land, with average slopes of 0 to 5%
Soil Infiltration	.12 -.16 No effective soil cover, either rock or thin soil mantle of negligible infiltration capacity	.08 -.12 Slow to take up water, clay or shallow loam soils of low infiltration capacity, imperfectly or poorly drained	.06 -.08 Normal; well drained light or medium textured soils, sandy loams, silt and silt loams	.04 -.06 High; deep sand or other soil that takes up water readily, very light well drained soils
Vegetal Cover	.12 -.16 No effective plant cover, bare or very sparse cover	.08 -.12 Poor to fair; clean cultivation crops, or poor natural cover, less than 20% of drainage area over good cover	.06 -.08 Fair to good; about 50% of area in good grassland or woodland, not more than 50% of area in cultivated crops	.04 -.06 Good to excellent; about 90% of drainage area in good grassland, woodland or equivalent cover
Surface Storage	.10 -.12 Negligible surface depression few and shallow; drainageways steep and small, no marshes	.08 -.10 Low; well defined system of small drainageways; no ponds or marshes	.06 -.08 Normal; considerable surface depression storage; lakes and pond marshes	.04 -.06 High; surface storage, high; drainage system not sharply defined; large floodplain storage or large number of ponds or marshes
Given	C HIGH RANGE = 0.67 C LOW RANGE = 0.48 C AVERAGE = .57		C_{25} = C AVERAGE(1.1) C_{25} = 0.63	
Find				

Appendix F

Existing Drainage Facilities Inventory

I-15 ELPSE Existing Drainage Matrix

THE ALLIANCE GROUP ENTERPRISE INC.

No.	Owner	Size (in)	Material	Start Station	End Station	Direction	Disposition	Invert In Elev.	Invert Out Elev.	S_o (ft/ft)	Existing Flow Capacity $Q = (K_Q/n)D^{2.67}So^{0.5}$ (ft^3/s)
1	Caltrans	300 mm	PVC	1135+50	1140+46	Longitudinal	136ft right				
2	Caltrans	24	CMP	1146+00		Transverse					
3	Caltrans	24	CMP	1149+71		Transverse					
4	Caltrans	8ft x 6ft	RCB	1159+90		Transverse		1274.00	1270.00	0.011	
5	Caltrans	8in	CSP	1162+00		Transverse	35ft Left				
6	Caltrans	8in	CSP	1162+00		Transverse	25ft Right				
7	Caltrans	54	APC	1164+20		Transverse		1280.44	1274.84	0.016	293.43
8	Caltrans	36	RCP	1168+00		Transverse		1276.50	1273.00	0.008	68.95
9	Caltrans	30	RCP	1171+05		Transverse		1282.00	1271.50	0.019	66.39
10	Caltrans	8	CSP	1172+00		Transverse	173ft Right				
11	Caltrans	12	CSP (Downdrain)	1172+64		Transverse	200ft Right	1307.40	1281.60		0.00
12	Caltrans	8	CSP	1173+00		Transverse					0.00
13	Caltrans	24	APC	1174+35		Transverse				0.026	42.50
14	Caltrans	18	APC	1174+35	1174+58	Longitudinal	207ft Left	1282.92	1280.60	0.064	31.33
15	Caltrans	8	CSP	1174+67	1175+66	Longitudinal	178ft Left	1283.82	1283.48	0.102	4.52
16	Caltrans	18	APC	1174+94		Transverse	195ft Right	1288.10	1286.00	0.022	18.44
17	Caltrans	8	CSP	1175+00	1176+14	Longitudinal	143ft Right				
18	Caltrans	3ft x 2ft	RCB	1175+90		Transverse		1298.16	1280.60		
19	Caltrans	8	CSP	1180+00		Transverse					
20	Caltrans	8	CSP	1180+45		Transverse	167ft Left				
21	Caltrans	18	APC	1181+45		Transverse		1304.80	1303.75	0.010	12.35
22	Caltrans	24	RCP	1186+87		Transverse		1287.00	1285.60	0.023	40.36
23	Caltrans	24	RCP	1188+76		Transverse		1286.40	1285.50	0.009	25.67
24	Caltrans	24	RCP	1188+78		Transverse		1286.40	1285.50	0.009	25.67
25	Caltrans	24	RCP	1188+76	1198+37	Longitudinal	189ft Left	1286.40	1285.50		
26	Caltrans	30	RCP	1190+76		Transverse		1286.70	1285.60	0.004	31.67
27	Caltrans	30	RCP	1191+74		Transverse		1286.70	1285.50	0.004	32.03
28	Caltrans	36	RCP	1192+74		Transverse		1283.89	1281,13	0.014	92.64
29	Caltrans	36	RCP	1192+93		Transverse		1283.79	1281.xx	0.014	93.96
30	Caltrans	36	RCP	1193+10		Transverse		1283.71	1281.18	0.015	94.94
31	Caltrans	36	RCP	1193+29		Transverse		1283.98	1281.11	0.013	89.93
32	Caltrans	36	RCP	1193+45		Transverse		1283.98	1281.11	0.130	283.30

I-15 ELPSE Existing Drainage Matrix

THE ALLIANCE GROUP ENTERPRISE INC.

No.	Owner	Size (in)	Material	Start Station	End Station	Direction	Disposition	Invert In Elev.	Invert Out Elev.	S_o (ft/ft)	Existing Flow Capacity $Q = (K_Q/n)D^{2.67}So^{0.5}$ (ft^3/s)
33	Caltrans	36	RCP	1193+64		Transverse		1283.88	1281.11	0.013	90.62
34	Caltrans	36	RCP	1193+82		Transverse		1283.90	1281.18	0.013	89.93
35	Caltrans	36	RCP	1194+00		Transverse		1283.97	1281.32	0.013	88.20
36	Caltrans	36	RCP	1194+19		Transverse		1284.15	1281.12	0.012	84.63
37	Caltrans	36	RCP	1194+36		Transverse		1283.74	1281.19	0.014	91.63
38	Caltrans	48	RCP	1195+34		Transverse		1281.57	1279.91	0.015	204.66
39	Caltrans	48	RCP	1195+50		Transverse		1281.34	1279.98	0.016	214.25
40	Caltrans	48	RCP	1195+66		Transverse		1281.32	1280.00	0.016	214.92
41	Caltrans	48	RCP	1195+83		Transverse		1281.44	1280.00	0.015	209.51
42	Caltrans	48	RCP	1196+00		Transverse		1281.66	1280.02	0.014	199.70
43	Caltrans	8	CSP	1199+00		Transverse					
44	Caltrans	30	APC	1202+19		Transverse		1282.00	1280.96	0.011	50.65
45	Caltrans	12	APC	1204+74	1205+16	Longitudinal	7ft Left				
46	Caltrans	12	APC	1204+74	1205+16	Longitudinal	7ft Left				
47	Caltrans	18	APC	1204+96	1205+20	Longitudinal	101ft Right				
48	Caltrans	18	APC	1205+00		Transverse		1285.20	1281.60	0.034	22.77
49	Caltrans	24	APC	1205+00		Transverse	7ft Left	1281.60	1280.80	0.008	23.05
50	Caltrans	12	APC	1205+12	1205+30	Longitudinal	100ft Left				
51	Caltrans	12	APC	1205+20	1205+46	Longitudinal	101ft Right				
52	Caltrans	8	CSP	1209+01		Transverse					
53	Caltrans	54	RCP	1209+47		Transverse		1276.84	1274.12	0.020	330.51
54	Caltrans	54	RCP	1209+52		Transverse		1276.84	1274.12	0.020	330.51
55	Caltrans	36	CSP	1211+16		Transverse		1277.75	1275.42	0.017	103.35
56	Caltrans	24	APC	1216+12		Transverse		1289.50	1273.50	0.056	62.87
57	Caltrans	24	APC	1217+20		Transverse		1287.00	1273.50	0.047	57.70
58	Caltrans	30	APC	1221+65		Transverse		1283.40	1273.00	0.038	93.89
59	Caltrans	30	APC	1223+92		Transverse		1282.70	1271.20	0.039	95.85
60	Caltrans	8	CSP	1229+00		Transverse					
61	Caltrans	24	APC	1229+40		Transverse		1286.80	1276.80	0.037	51.06
62	Caltrans	24	APC	1232+47		Transverse		1286.00	1274.70	0.040	53.23
63	Caltrans	8	CSP	1239+00		Transverse	12ft Left				
64	Caltrans	8	CSP	1239+00		Transverse	12ft Right				

I-15 ELPSE Existing Drainage Matrix

THE ALLIANCE GROUP ENTERPRISE INC.

No.	Owner	Size (in)	Material	Start Station	End Station	Direction	Disposition	Invert In Elev.	Invert Out Elev.	S_o (ft/ft)	Existing Flow Capacity $Q = (K_Q/n)D^{2.67}So^{0.5}$ (ft^3/s)
65	Caltrans	18	APC	1239+26		Transverse	90ft Right				
66	Caltrans	18	APC	1239+58		Transverse					
67	Caltrans	14ft x 6ft	RCB	1239+59		Transverse		1284.00	1276.00		
68	Caltrans	18	APC	1239+95		Transverse	110ft Left	1282.50	1276.00	0.310	68.74
69	Caltrans	12	APC	1240+95	1241+44	Longitudinal	110ft Left	1283.24	1282.60	0.014	4.88
70	Caltrans	18	APC	1247+02	1247+81	Longitudinal	141ft Right				
71	Caltrans	8	CSP	1247+03		Transverse					
72	Caltrans	30	APC	1247+61		Transverse		1273.10	1264.70	0.028	81.24
73	Caltrans	24	APC	1252+61		Transverse		1271.16	1265.42	0.011	28.42
74	Caltrans	24	APC	1252+64	1253+60	Longitudinal	7ft Left				
75	Caltrans	30	APC	1252+87		Transverse	115ft Left	1265.32	1260.20	0.021	69.48
76	Caltrans	18	APC	1253+61	1254+44	Longitudinal	7ft Left				
77	Caltrans	8	CSP	1254+85		Transverse					
78	Caltrans	18	APC	1258+90		Transverse	229ft Left	1296.83	1295.19	0.050	27.72
79	Caltrans	24	RCP	1260+00		Transverse		1275.17	1272.97	0.007	22.89
80	Caltrans	24	APC	1260+54	1264+15	Longitudinal	85ft Left				
81	Caltrans	8	CSP	1261+96		Transverse					
82	Caltrans	54	APC	1263+58		Transverse		1277.90	1269.40	0.016	293.43
83	Caltrans	54	APC	1263+58		Transverse		1277.90	1269.40	0.016	293.43
84	Caltrans	12	CSP	1263+62		Transverse	217ft Right				
85	Caltrans	12	CSP	1265+90		Transverse	177ft Left				
86	Caltrans	18	APC	1266+77		Longitudinal	148ft Right				
87	Caltrans	48	RCP	1267+46		Transverse		1279.00	1268.50	0.031	295.81
88	Caltrans	24	APC	1270+34		Transverse		1278.50	1266.50	0.040	53.23
89	Caltrans	8	CSP	1271+97		Transverse					
90	Caltrans	18	APC	1279+95		Transverse		1284.10	1278.17	0.055	29.06
91	Caltrans	24	APC	1279+95		Transverse	11ft Left	1278.00	1264.00	0.099	83.57
92	Caltrans	8	CSP	1282+09		Transverse					
93	LLWD	24	CSP	1284+98		Transverse	185ft Right				
94	Caltrans	54	CSP	1285+94		Transverse		1254.75	1246.95	0.050	518.71
95	Caltrans	24	APC	1291+06		Transverse		1253.00	1246.53	0.044	55.83
96	Caltrans	12	APC	1296+56	1297+06	Longitudinal	103ft Left				

I-15 ELPSE Existing Drainage Matrix

THE ALLIANCE GROUP ENTERPRISE INC.

No.	Owner	Size (in)	Material	Start Station	End Station	Direction	Disposition	Invert In Elev.	Invert Out Elev.	S_o (ft/ft)	Existing Flow Capacity $Q = (K_Q/n)D^{2.67}So^{0.5}$ (ft^3/s)
97	Caltrans	12	APC	1296+56	1297+06	Longitudinal	7ft Left				
98	Caltrans	12	APC	1296+57	1297+07	Longitudinal	92ft Right				
99	Caltrans	18	APC	1296+81		Transverse		1268.48	1262.28	0.059	
100	Caltrans	18	APC	1296+81		Transverse	7ft Left	1262.18	1259.70	0.026	20.06
101	Caltrans	54	APC	1299+14		Transverse		1266.00	1247.20	0.065	591.42
102	Caltrans	42	APC	1306+45		Transverse		1268.00	1253.00	0.056	280.62
103	Caltrans	24	APC	1306+45	1309+06	Longitudinal	102ft Right				
104	Caltrans	18	APC	1309+08		Transverse	102ft Right	1286.50	1274.00	0.284	65.79
105	Caltrans	30	CSP	1316+47		Transverse		1271.16	1254.50	0.061	119.07
106	Caltrans	84	CSP	1324+29		Transverse		1264.00	1254.00	0.033	1373.06
107	Caltrans	18	CSP	1327+60		Transverse	104ft Right				
108	Caltrans	24	CSP	1327+82		Transverse		1261.60	1255.20	0.048	58.31
109	Caltrans	18	APC	1330+21		Transverse	8ft Left	1266.48	1265.04	0.014	14.76
110	Caltrans	7ft x 5ft	RCB	1335+52		Transverse		1257.64	1249.00		
111	Caltrans	66	APC	1338+43		Transverse		1254.70	1246.50	0.028	664.49
112	Caltrans	30	RCP	1343+92		Transverse		1261.80	1251.90	0.071	128.22
113	Caltrans	18	APC	1346+97	1347+80	Longitudinal	103ft Right	1267.76	1263.60	0.040	24.69
114	Caltrans	12	APC	1347+00		Transverse	104ft Left	1261.20	1248.00	0.400	26.45
115	Caltrans	12	APC	1347+93	1348+36	Longitudinal	6ft Left	1262.00	1257.00	0.167	17.09
116	Caltrans	7ft x 5ft	RCB	1353+56		Transverse		1259.41	1250.29	0.023	
117	Caltrans	42	APC	1364+11		Transverse		1236.23	1230.00	0.023	178.67
118	Caltrans	42	APC	1373+22		Transverse		1231.58	1229.94	0.012	127.72
119	Caltrans	42	RCP	1377+42		Transverse		1230.40	1227.50	0.004	75.00
120	Caltrans	48	APC	1377+42		Transverse	102ft Right				
121	Caltrans	18	APC	1382+52	1384+46	Longitudinal	102ft Left				
122	Caltrans	18	APC	1382+53	1384+48	Longitudinal	1ft Left				
123	Caltrans	18	APC	1382+54	1384+47	Longitudinal	102ft Right				
124	Caltrans	36	APC	1383+44		Transverse				0.018	105.42
125	Caltrans	30	CSP	1383+44		Transverse	105ft Right				
126	Caltrans	42	RCP	1393+25		Transverse		1219.00	1217.00	0.005	83.85
127	Caltrans	36	APC	1399+20		Transverse	332ft Right				
128	Caltrans	24	APC	1400+70		Transverse		AsBuilt Too blurry			

I-15 ELPSE Existing Drainage Matrix

THE ALLIANCE GROUP ENTERPRISE INC.

No.	Owner	Size (in)	Material	Start Station	End Station	Direction	Disposition	Invert In Elev.	Invert Out Elev.	S_o (ft/ft)	Existing Flow Capacity $Q = (K_Q/n)D^{2.67}So^{0.5}$ (ft^3/s)
129	Caltrans	8	CSP	1404+52		Transverse	23ft Right	As Built Remove and dispose			
130	Caltrans	8	CSP	1404+54		Transverse	22ft Left				
131	Caltrans	8	CSP	1408+40	1408+97	Longitudinal	143ft Left				
132	Caltrans	36	RCP	1408+54		Transverse		1216.00	1213.90	0.040	157.15
133	Caltrans	12ft x 9ft	RCB	1408+78		Transverse		1218.57	1213.90	0.005	
134	Caltrans	12	APC	1408+90	1409+76	Longitudinal	12ft Right	AsBuilt Too blurry			
135	Caltrans	42	APC	1409+09		Transverse	183ft Right			0.017	154.61
136	Caltrans	8	CSP	1412+48		Transverse	23ft Left				
137	Caltrans	8	CSP	1412+49		Transverse	23ft Right				
138	Caltrans	8	CSP	1417+35		Transverse	138ft Right				
139	Caltrans	8	CSP	1417+70		Transverse	142ft Left				
140	Caltrans	24	APC	1421+07		Transverse				0.050	59.51
141	Caltrans	30	CSP	1428+05		Transverse		1231.80	1229.20	0.010	48.29
142	Caltrans	10ft x 6ft	RCB	1432+76		Transverse		1213.72	1210.36		
143	Caltrans	Dbl 8ft x 6ft	RCB	1432+76		Transverse					
144	Caltrans	18	APC	1439+11	1441+07	Longitudinal	97ft Left	1218.90	1217.40	0.004	7.81
145	Caltrans	18	APC	1439+17	1441+04	Longitudinal	104ft Right	1222.60	1221.00	0.010	12.35
146	Caltrans	18	APC	1439+29	1441+05	Longitudinal	1ft Left	1219.50	1217.10	0.019	17.02
147	Caltrans	42	CSP	1440+01		Transverse		1220.40	1204.00	0.058	285.59
148	Caltrans	36	CSP	1440+01		Transverse	105ft Right	1230.60			
149	Caltrans	18	APC	1448+37		Transverse	3ft Left			0.009	11.71
150	Caltrans	18	APC	1448+86	1449+36	Longitudinal	222ft Right	1231.50	1229.00		
151	Caltrans	10ft x 6ft	RCB	1451+17		Transverse			1215.30	0.007	
152	Caltrans	10ft x 6ft	RCB	1451+27		Transverse					
153	Caltrans	10ft x 6ft	RCB	1451+37		Transverse		1224.50		0.011	
154	Caltrans	30	APC	1460+94	1461+42	Longitudinal	262ft Right	1197.00	1195.50	0.033	87.19
155	Caltrans	24	RCP	1466+13		Transverse				0.008	23.80
156	Caltrans	24	CSP	1467+76		Transverse	102ft Right				
157	LLWD	18	APC	1478+92		Transverse	103ft Left	1212.30	1183.00		
158	LLWD	18	APC	1479+33		Transverse	2ft Left	1209.30	1182.00		
159	LLWD	18	APC	1480+11	1480+74	Longitudinal	101ft Right				
160	LLWD	18	APC	1483+90		Transverse		1210.80	1181.00		

I-15 ELPSE Existing Drainage Matrix

THE ALLIANCE GROUP ENTERPRISE INC.

No.	Owner	Size (in)	Material	Start Station	End Station	Direction	Disposition	Invert In Elev.	Invert Out Elev.	S_o (ft/ft)	Existing Flow Capacity $Q = (K_Q/n)D^{2.67}So^{0.5}$ (ft^3/s)
161	LLWD	18	APC	1484+50		Transverse	105ft Right	1209.40	1180.00		
162	Caltrans	42	CSP	1486+90		Transverse				0.034	218.66
163	Caltrans	30	CSP	1493+69		Transverse				0.032	86.39
164	Caltrans	48	CSP	1498+36		Transverse				0.032	303.00
165	Caltrans	72	CSP	1502+33		Transverse		1230.50	1218.00	0.013	570.17
166	Caltrans	36	CSP	1507+86		Transverse		1217.50	1198.65	0.012	86.07
167	Caltrans	30	CSP	1512+40		Transverse					
168	Caltrans	42	CSP	1514+30		Transverse					
169	Caltrans	18	APC	1522+83		Transverse				0.005	8.73
170	Caltrans	12	APC	1524+52	1524+74	Longitudinal	27ft Right	1247.00	1246.60		
171	Caltrans	18	APC	1524+65		Transverse					
172	LLWD	78	CSP	1527+69		Transverse		1234.78	1217.90	0.014	732.67
173	Caltrans	18	APC	1536+32	1536+85	Longitudinal	104ft Left	1230.80	1222.00		
174	Caltrans	18	APC	1536+70	1537+35	Longitudinal		1230.20	1218.00		
175	Caltrans	18	APC	1537+21	1537+76	Longitudinal	99ft Right	1231.10	1213.00		
176	Caltrans	36	Culvert Pipe	1543+43		Transverse		1213.40	1199.10	0.015	96.23
177	Caltrans	18	APC	1544+11		Transverse	127ft Left	1216.80	1216.60	0.006	9.56
178	LLWD	66	CSP	1554+64		Transverse		1188.00	1145.50	0.014	469.03
179	LLWD	72	CSP	1562+72		Transverse		1192.90	1161.40	0.015	612.46
180	Caltrans	54	CSP	1571+33		Transverse		1193.50	1182.30	0.014	274.48
181	Caltrans	24	APC	1579+48		Transverse		1185.70	1185.00	0.003	14.58
182	Caltrans	18	APC	1587+08		Transverse	104ft Left	1184.90	1184.50		
183	Caltrans	18	APC	1587+53		Transverse	1ft Left	1184.90	1171.00		
184	Caltrans	18	APC	1587+99	1588+67	Longitudinal	104ft Right	1184.20	1166.00		
185	Caltrans	60	CSP	1595+20		Transverse		1172.70	1136.50	0.016	388.75
186	Caltrans	36	CSP	1602+95		Transverse				0.025	
187	Caltrans	18	CSP	1603+37		Transverse	224ft Right				
188	Caltrans	18	CSP	1604+87		Transverse	179ft Right				
189	Caltrans	24	CSP	1605+12		Transverse	265ft Left				
190	Caltrans	18	CSP	1605+39		Transverse	91ft Right				
191	Caltrans	18	CSP	1605+79		Transverse	30ft Left				
192	Caltrans	18	CSP	1605+80	1605+96	Longitudinal	29ft Left				

I-15 ELPSE Existing Drainage Matrix

THE ALLIANCE GROUP ENTERPRISE INC.

No.	Owner	Size (in)	Material	Start Station	End Station	Direction	Disposition	Invert In Elev.	Invert Out Elev.	S_o (ft/ft)	Existing Flow Capacity $Q = (K_Q/n)D^{2.67}So^{0.5}$ (ft^3/s)
193	Caltrans	8ft x 6ft	RCB	1606+61		Transverse					
194	Caltrans	24	CSP	1606+76	1608+52	Longitudinal	408ft Left				
195	Caltrans	24	CSP	1606+84		Transverse	25ft Left				
196	Caltrans	30	CSP	1613+11		Transverse					
197	Caltrans	24	CSP	1615+95		Transverse					
198	Caltrans	18	CSP	1621+85		Transverse					
199	Caltrans	18	CSP	1627+78		Transverse					
200	Caltrans	48	CSP	1630+49		Transverse					
201	Caltrans	36	CSP	1636+55		Transverse					
202	Caltrans	18	CSP	1642+17		Transverse	2ft Left				
203	Caltrans	48	CSP	1643+00		Transverse					
204	Caltrans	24	CSP	1643+00		Transverse					
205	Caltrans	12	CSP	1646+06		Transverse	112ft Left				
206	Caltrans	12	CSP	1647+54		Transverse	116ft Left				
207	Caltrans	18	CSP	1650+00		Transverse					
208	Caltrans	36	CSP	1650+13		Transverse					
209	Caltrans	36	CSP	1656+22		Transverse					
210	Caltrans	18	CSP	1660+14		Transverse					
211	Caltrans	36	CSP	1660+57		Transverse					
212	Caltrans	24	CSP	1668+36		Transverse					
213	Caltrans	12	CSP	1669+10		Transverse	113ft Left				
214	Caltrans	24	CSP	1671+37		Transverse					
215	Caltrans	36	CSP	1674+94		Transverse					
216	Caltrans	36	CSP	1678+74		Transverse					
217	Caltrans	18	CSP	1682+32		Transverse	113ft Right				
218	Caltrans	18	CSP	1683+01		Transverse	2ft Right				
219	Caltrans	12	CSP	1683+90		Transverse	103ft Left				
220	LLWD	24	CSP	1684+42		Transverse					
221	Caltrans	12	CSP	1684+72		Transverse	92ft Right				
222	Caltrans	12	CSP	1685+96		Transverse	93ft Left				
223	Caltrans	12	CSP	1686+40		Transverse	91ft Right				
224	Caltrans	12	CSP	1687+82	1688+50	Longitudinal	102ft Right				

I-15 ELPSE Existing Drainage Matrix

THE ALLIANCE GROUP ENTERPRISE INC.

No.	Owner	Size (in)	Material	Start Station	End Station	Direction	Disposition	Invert In Elev.	Invert Out Elev.	S_o (ft/ft)	Existing Flow Capacity $Q = (K_Q/n)D^{2.67}So^{0.5}$ (ft^3/s)
225	Caltrans	12	CSP	1688+03	1688+84	Longitudinal					
226	Caltrans	12	CSP	1688+50	1689+09	Longitudinal	131ft Left				
227	Caltrans	42	CSP	1696+52		Transverse					
228	Caltrans	24	CSP	1706+36		Transverse					
229	Caltrans	36	CSP	1708+35		Transverse					
230	Caltrans	36	APC	1720+59		Transverse					
231	Caltrans	30	APC	1721+60		Transverse					
232	Caltrans	18	CSP	1727+06		Transverse	3ft Right				
233	Caltrans	24	CSP	1727+10	1734+93	Longitudinal					
234	Caltrans	18	CSP	1731+09		Transverse	4ft Right				
235	Caltrans	18	CSP	1734+95		Transverse	3ft Right				
236	Caltrans	30	CSP	1734+98	1740+19	Longitudinal					
237	Caltrans	12	CSP	1737+93		Transverse	104ft Right				
238	Caltrans	48	CSP	1749+74		Transverse					
239	Caltrans	48	CMP	1753+25		Transverse		1006.20	1002.40	0.020	239.54
240	Caltrans	18	CSP	1754+17		Transverse	190ft Left	914.00	913.30	0.010	12.35
241	Caltrans	18	CSP	1754+47	1755+19	Longitudinal					
242	LLWD	24	CSP	1755+22		Transverse					
243	LLWD	24	CSP	1754+50	1755+21	Longitudinal	147ft Left				
244	LLWD	24	CSP	1755+22		Transverse					
245	Caltrans	54	CSP	1756+01	1759+25	Longitudinal	222ft Right				
246	Caltrans	54	CSP	1759+71		Transverse		985.70	973.40	0.038	449.82
247	Caltrans	24	CSP	1759+66	1764+41	Longitudinal	120ft Left				
248	Caltrans	36	CSP	1770+25		Transverse		981.50	959.70		
249	Caltrans	12	CSP	1775+00		Transverse	105ft Left				
250	Caltrans	36	CSP	1775+14		Transverse		953.70	943.00		
251	Caltrans	5ft x 4ft	RCB	1778+42		Transverse		941.70	936.40	0.004	
252	Caltrans	12	CSP	1781+95		Transverse	114ft Left				
253	Caltrans	12	CSP	1784+99		Transverse	105ft Left				
254	Caltrans	DBL 8in	CMP	1787+06		Transverse		947.20	937.70	0.017	
255	Caltrans	7ft x 6ft	RCB	1788+13		Transverse		947.10	943.50	0.009	
256	Caltrans	42	CSP	1790+01		Transverse		940.80	938.30	0.010	118.58

I-15 ELPSE Existing Drainage Matrix

THE ALLIANCE GROUP ENTERPRISE INC.

No.	Owner	Size (in)	Material	Start Station	End Station	Direction	Disposition	Invert In Elev.	Invert Out Elev.	S_o (ft/ft)	Existing Flow Capacity $Q = (K_Q/n)D^{2.67}So^{0.5}$ (ft^3/s)
257	Caltrans	30	CSP	1796+95		Transverse		982.80	942.20	0.018	64.79
258	Caltrans	12ft x 12ft	RCB	1807+20		Transverse		926.60	920.00	0.04	
259	Caltrans	24	CMP	1813+86		Transverse		934.20	930.80	0.003	14.58
260	Caltrans	30	CSP	1826+38		Transverse		935.00	931.00	0.014	57.14
261	LLWD	20ft x 11ft	Culvert	1833+00		Transverse					
262	RCFC	6		1832+83	1837+17	Longitudinal	164ft Left				
263	Caltrans	36	CSP	1846+47		Transverse		917.70	916.20	0.006	60.86
264	Caltrans	8ft x 5ft	RCB	1850+03		Transverse		911.40	909.60	0.005	
265	Caltrans	8ft x 5ft	RCB	1856+36		Transverse		916.00	910.30	0.005	
266	Caltrans	8	CMP	1856+51		Transverse	83ft Right				
267	Caltrans	24	CSP	1859+19		Transverse		923.20	909.00	0.012	29.15
268	Caltrans	54	CSP	1865+81		Transverse		905.80	900.40	0.015	284.11
269	Caltrans	24	CSP	1870+18		Transverse		939.50		0.007	22.27
270	Caltrans	18	RCP	1873+32		Transverse					
271	Caltrans	18	CSP	1874+91	1876+74	Longitudinal	121ft Right				
272	Caltrans	54	CSP	1877+20		Transverse		897.80	883.00	0.015	284.11
273	Caltrans	24	CSP	1879+46	1883+26	Longitudinal	146ft Left				
274	Caltrans	18	ALTP	1880+71	1882+17	Longitudinal	178ft Right				
275	Caltrans	24	CSP	1881+10	1883+45	Longitudinal	264ft Left				
276	Caltrans	36	CSP	1883+00		Transverse		910.10	895.80	0.014	92.97
277	Caltrans	24	CSP	1887+57		Transverse	172ft Left				
278	Caltrans	54	CSP	1888+08		Transverse		902.80	892.40	0.0264	376.92
279	Caltrans	24	ALTP	1891+26	1892+39	Longitudinal	75ft left				
280	Caltrans	25	ALTP	1891+70	1892+26	Longitudinal	75ft Right				
281	Caltrans	24	CSP	1891+78		Transverse		924.00	921.80	0.01	26.61
282	Caltrans	12	CSP	1899+16		Transverse	82ft Left	963.70	924.50	0.41	26.78
283	RCFC	24	ALTP	1899+16	1902+00	Longitudinal	82ft Left				
284	Caltrans	30	ALTP	1902+00	1907+51	Longitudinal	79ft Right				
285	Caltrans	24	CSP	1904+44	1908+53	Longitudinal	79ft Right				
286	Caltrans	54	CSP	1908+57		Transverse		905.00	899.00	0.014	274.48
287	Caltrans	48	CSP	1913+58		Transverse		905.30	894.70	0.012	185.55
288	Caltrans	24	CSP	1915+36		Transverse		908.00	907.20	0.01	26.61

I-15 ELPSE Existing Drainage Matrix

THE ALLIANCE GROUP ENTERPRISE INC.

No.	Owner	Size (in)	Material	Start Station	End Station	Direction	Disposition	Invert In Elev.	Invert Out Elev.	S_o (ft/ft)	Existing Flow Capacity $Q = (K_Q/n)D^{2.67}So^{0.5}$ (ft^3/s)
289	Caltrans	24	CSP	1916+02		Transverse					
290	Caltrans	24	CMP	1929+00	1930+87	Longitudinal					
291	Caltrans	12	CMP	1930+07	1930+54	Longitudinal	133ft Right				
292	Caltrans	12	CMP	1930+40	1930+75	Longitudinal	100ft Left				
293	Caltrans	24	CSP	1939+00		Transverse		883.40	876.00	0.014	31.49
294	Caltrans	24	APC	1948+39	1949+03	Longitudinal	138ft Left				
295	Caltrans	24	CMP	1948+51		Transverse					
296	Caltrans	18	APC	1949+11		Transverse	88ft Left				
297	Caltrans	24	APC	1951+48	1953+23	Longitudinal	225ft Left				
298	Caltrans	8	CSP	1955+89		Transverse	144ft Left				
299	Caltrans	12	CMP	1959+26	1959+90	Longitudinal	183ft Left				
300	Caltrans	25	CMP	1959+93		Transverse		898.60	895.20	0.014	35.12
301	Caltrans	24	CMP	1963+50	1963+80	Longitudinal	130ft Left				
302	RCFC	12ft x 10ft	RCB	1963+80		Transverse		896.00	891.00	0.005	