H. Hydrology and Water Quality Studies

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THE HIVE LIVE

PRELIMINARY WATER QUALITY MANAGEMENT PLAN (WQMP)

Prepared for:
Legacy Partners
5141 California Ave, Suite 100
Irvine, CA 92618
949.930.6600

Prepared By
Fuscoe Engineering, Inc.
600 Wilshire Blvd, Suite 1470
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Project Manager
Shelby Shirlock, PE C75912

Date Prepared: 4/4/2024

WQ XX-XXXX

County of Orange/Santa Ana Region Priority Project Water Quality Management Plan (WQMP)

Project Name:

The Hive Live

GRADING PERMIT NO: TBD

BUILDING PERMIT NO: TBD

PROJECT ADDRESS: 3333 SUSAN ST, COSTA MESA, CA 92626

TRACT / LOT NUMBERS: PM 94-120, LOT 3

APN: 140-042-12

Prepared for:

Legacy Partners

5141 California Ave, Suite 100

Irvine, CA 92617

949.930.6600

Prepared by:

Shelby Shirlock, Fuscoe Engineering

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Los Angeles, CA 90017

213.988.8802 / sshirlock@fuscoe.com

Date Prepared: April 4, 2024

Project Owner's Certification			
Planning Application No. (If applicable)	Pending	Grading Permit No.	Pending
Tract/Parcel Map and Lot(s) No.	PM 94-120, Lot 3	Building Permit No.	Pending
Address of Project Site and APN (If no address, specify Tract/Parcel Map and Lot Numbers)			3333 Susan St, Costa Mesa, CA 92626 140-042-12

This Water Quality Management Plan (WQMP) has been prepared for Legacy Partners by Fuscoe Engineering. The WQMP is intended to comply with the requirements of the County of Orange NPDES Stormwater Program requiring the preparation of the plan.

The undersigned, while it owns the subject property, is responsible for the implementation of the provisions of this plan , including the ongoing operation and maintenance of all best management practices (BMPs), and will ensure that this plan is amended as appropriate to reflect up-to-date conditions on the site consistent with the current Orange County Drainage Area Management Plan (DAMP) and the intent of the non-point source NPDES Permit for Waste Discharge Requirements for the County of Orange, Orange County Flood Control District and the incorporated Cities of Orange County within the Santa Ana Region. Once the undersigned transfers its interest in the property, its successors-in-interest shall bear the aforementioned responsibility to implement and amend the WQMP. An appropriate number of approved and signed copies of this document shall be available on the subject site in perpetuity.

Owner: Tim O'Brien			
Title	Senior Managing Director | Southern California, Arizona, Nevada		
Company	Legacy Partners		
Address	5141 California Ave, Suite 100 Irvine, CA 92617		
Email	tobrien@legacypartners.com		
Telephone #	949.930.6600		
I understand my responsibility to implement the provisions of this WQMP including the ongoing operation and maintenance of the best management practices (BMPs) described herein.			
Owner Signature		Date	

Preparer (Engineer): Shelby Shirlock			
Title	Senior Project Manager	PE Registration #	C75912
Company	Fuscoe Engineering		
Address	600 Wilshire Blvd, #1470, Los Angeles CA 90017		
Email	sshirlock@fuscoe.com		
Telephone #	213.988.8802		

I hereby certify that this Water Quality Management Plan is in compliance with, and meets the requirements set forth in, Order No. R8-2009-0030/NPDES No. CAS618030, of the Santa Ana Regional Water Quality Control Board.

Preparer Signature		Date	*04/04/2024*
Place Stamp Here	REGISTERED PROFESSIONAL ENGINEER SHELBY L. SHIRLOCK NO. C75912 CIVIL STATE OF CALIFORNIA		

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Attachments

Section I Permit(s) and Water Quality Conditions of Approval or Issuance

Provide discretionary or grading/building permit information and water quality conditions of approval, or permit issuance, applied to the project. If conditions are unknown, please request applicable conditions from staff. *Refer to Section 2.1 in the Technical Guidance Document (TGD) available on the OC Planning website (ocplanning.net).*

Project Infomation			
Permit/Application No. (If applicable)	Pending	Grading or Building Permit No. (If applicable)	Pending
Address of Project Site (or Tract Map and Lot Number if no address) and APN	3333 Susan St, Costa Mesa, CA 92626 140-042-12		
Water Quality Conditions of Approval or Issuance			
Water Quality Conditions of Approval or Issuance applied to this project. (Please list verbatim.)	Pending – to be provided in Final WQMP		
Conceptual WQMP			
Was a Conceptual Water Quality Management Plan previously approved for this project?	This serves at the Conceptual WQMP.		
Watershed-Based Plan Conditions			
Provide applicable conditions from watershed - based plans including WIHMPs and TMDLS.	N/A		

Section II Project Description

II.1 Project Description

The proposed Hive Live project site encompasses approximately 14.30 acres in the City of Costa Mesa. The project site is located north of the 405 freeway, east of Harbor Boulevard, west of Fairview Road, and south of MacArthur Boulevard. The project site is bounded by private industrial properties to the west, Sunflower Avenue to the north, Susan Street to the east, and South Coast Drive to the south.

Under existing conditions, the project site consists of commercial structure, football field, and parking lot. Susan Street, Sunflower Avenue, and South Coast Drive are the traditional street consisting of roadway and parkway with sidewalks and landscape.

The proposed project consists of 3 apartment buildings, drive aisles, pathways, amenities, and landscaping. The table below summarizes the proposed project.

Description of Proposed Project				
Development Category (From Model WQMP, Table 7.11-2; or -3):	**Category 8:** All significant redevelopment projects, where significant redevelopment is defined as the addition or replacement of 5,000 or more square feet of impervious surface on an already developed site. Redevelopment does not include routine maintenance activities that are conducted to maintain original line and grade, hydraulic capacity, original purpose of the facility, or emergency redevelopment activity required to protect public health and safety.			
Project Area (ft^2): 623,275 (14.30 ac)	Number of Dwelling Units: 1,050		SIC Code: N/A	
Project Area	Pervious		Impervious	
	Area (acres or sq ft)	Percentage	Area (acres or sq ft)	Percentage
Pre-Project Conditions	62,327	10%	560,947	90%
Post-Project Conditions	124,655	20%	498,620	80%
Drainage Patterns/Connections	**Existing Conditions** The existing site is currently divided into 5 drainage areas (A-E), see the existing conditions drainage map in Attachment G for details. Drainage area A is conveyed through existing curb and gutters, which are captured by on-site storm drain inlets. These inlets are connected to the existing storm drain system at Susan Street, ultimately directing the water to the Greenville Banning Channel. Drainage area B is either conveyed through existing curb and gutters or surfaces. These runoffs			

are captured by on-site storm drain inlets, connected to the existing storm drain system. Drainage area C drains from northwest to southeast and it captured by storm drain inlets connected to existing catch basin at Susan Street. Drainage area D drains towards to the Sunflower Avenue and it captured by existing catch basin located next to existing driveway. Drainage area E flows towards to the adjacent property. Area E will not be disturbed due to proposed project. All flows ultimately directing the water to the Greenville Banning Channel.

Proposed Conditions

The proposed project area is divided into 5 drainage areas (A-E), see the proposed conditions drainage map in Attachment G for details. The proposed development will maintain the historic discharge point. Generally, onsite stormwater runoff will be captured by localized catch basins and area drain inlets, and flows will be diverted into high and low flows. The low flows will be routed first to treatment points with Modular Wetlands Systems (MWS) to treat the proposed runoff. High flows will be diverted via internal bypass within the MWS units. Flows will discharge and connect to South Coast Drive, Susan Street, and Sunflower Avenue. All flows will tie into Greenville Banning Channel which flow into the Santa Ana River and eventually the Pacific Ocean.

Drainage area A consists of east half of proposed building B and C, drive aisles, pathway, and landscaping. The drainage in this area will connect to a catch basin on Susan Street. Drainage area B consists of 60% of building A, west half of building B and C, drive aisles, pathway, amenities, and landscaping. The drainage in this area will connect a catch basin on South Coast Drive. Drainage area C consists of south and east part of building A, drive aisles, pathway, and landscaping. The drainage in this area will connect to a catch basin on Susan Street. Drainage area D consists of landscaping, drive aisles, and walkway. The drainage in this area will be conveyed via surface and collected via area drains and catch basin inlets into private storm drain system. There will be a diversion structure downstream of the private storm system in which the required storm water quality flows will be routed to a proposed MWS unit before discharging to existing catch basin at Sunflower Avenue. Drainage area E consists of a recently paved pathway and landscaping. Runoff form this area flow towards to the

adjacent property. Area E will not be disturbed due to proposed project. An existing vegetated swale treats the runoff.

All low flows will be routed to Modular Wetland Units for biofiltration treatment. Before discharging from the site, runoff will be routed through CPS installed in catch basin to meet state trash requirements. All flows ultimately directing the water to the Greenville Banning then to the Santa Ana River and eventually the Pacific Ocean.

Narrative Project Description:

(Use as much space as necessary.)

The proposed project consists of 3 apartment buildings, drive aisles, pathways, amenities, and landscaping. The property will be developed as multi-story residential development, proposed to consist of three (3) 5-story, apartment residential buildings of Type III-A Wrap construction along with related improvements. Building A is planned for 315 units, Building B is planned for 346 units, and Building C is 389 units. Each of the buildings will have a Type I-A parking structure with six-seven levels of parking, Building A parking with 521 parking stalls, Building B parking with 572 parking stalls and Building C with 643 parking stalls. Amenities include courtyards, paved entrance ways and drive areas, an artwork space and exhibit, a pool, and retail space along Susan Street. Proposed landscaped areas will be situated along S Coast Dr, Susan St, and Sunflower Ave, along building setbacks, along the project entryways, within residential courtyards and throughout parking areas. Trees, shrubs, and groundcover are included within proposed landscaped areas.

Residential Unit Count Summary

	Studio Units	J 1 Bed	1 Bed	J 2 Bed	2 Bed	Total Units
Building A	41	26	128	21	99	315
Building B	57	51	135	0	103	346
Building C	43	38	184	0	124	389
Total						**1,050**

Commercial Square Footage Summary

Building A	3,692 SF
Total	3,692 SF

	The site will not have any outdoor storage areas, vehicle/ community car wash racks, vehicle/equipment wash areas. For the commercial/retail areas, outdoor activities are anticipated with passive uses in the common landscaped areas surrounding the buildings. Outdoor lounge furniture and seating is proposed. All vehicular parking will be located within parking garage areas and outdoor parking spaces. No outdoor storage of materials is anticipated. For the residential areas, outdoor areas throughout the site will be used for recreational and open space purposes. Each building will have an at-grade courtyard areas that will include fireplace/BBQ areas, various lounge/dining furnishings, and open areas (courtyards or roof decks). All other outdoor areas will be used for walkways, common areas and landscaping, and other recreational purposes. Materials anticipated to be stored on-site include those associated with retail buildings (i.e. cleaning products, storage, etc.); however, no hazardous wastes will be stored on-site. No outdoor storage of materials is anticipated (materials will be stored indoors).

II.2 Potential Stormwater Pollutants

Determine and list expected stormwater pollutants based on land uses and site activities. *Refer to Section 2.2.2 and Table 2.1 in the Technical Guidance Document (TGD) for guidance.*

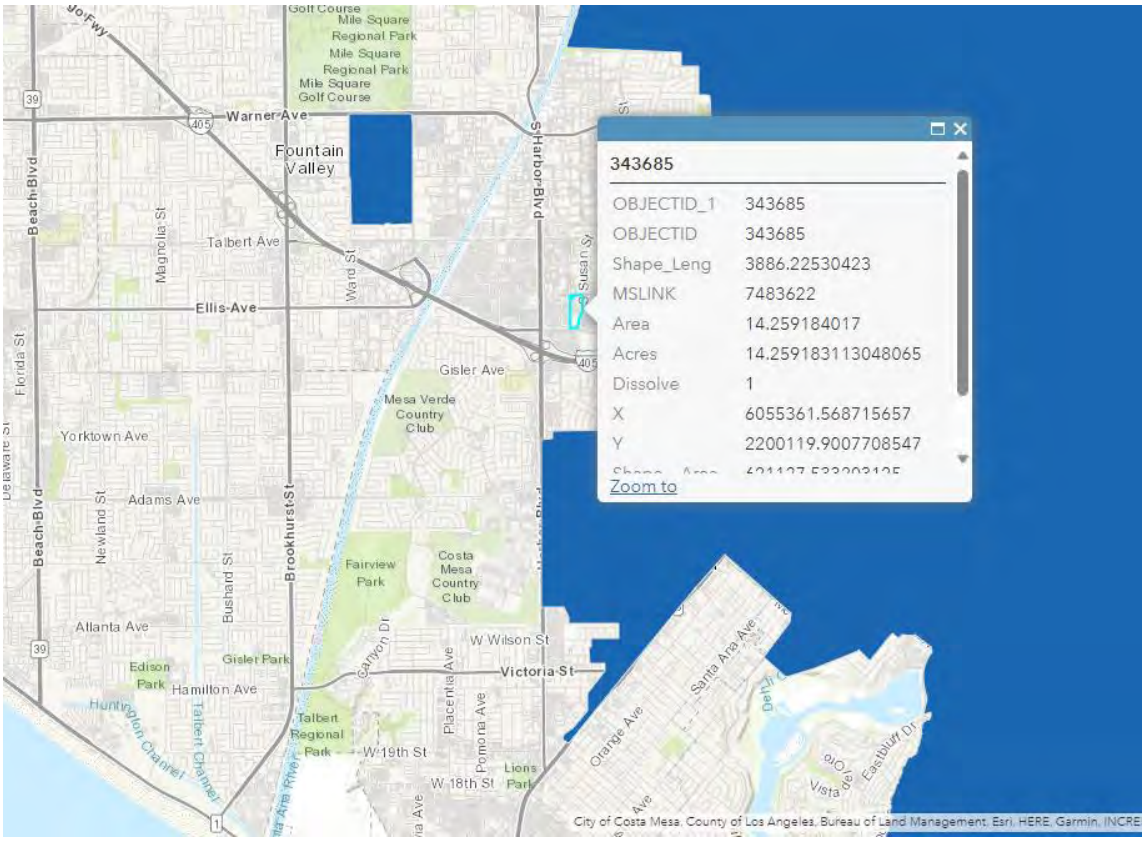
Pollutants of Concern			
Pollutant	Check One for each: E=Expected to be of concern N=Not Expected to be of concern		Additional Information and Comments
Suspended-Solid/ Sediment	E ☒	N ☐	Potential Source of Pollutants: Landscape area
Nutrients	E ☒	N ☐	Potential Source of Pollutants: Landscape area, commercial areas
Heavy Metals	E ☒	N ☐	Potential Source of Pollutants: Landscape area, parking areas
Pathogens (Bacteria/Virus)	E ☒	N ☐	Potential Source of Pollutants: Commercial areas
Pesticides	E ☒	N ☐	Potential Source of Pollutants: Landscape area
Oil and Grease	E ☒	N ☐	Potential Source of Pollutants: Parking areas
Toxic Organic Compounds	E ☒	N ☐	Potential Source of Pollutants: Landscape area, parking areas, commercial areas
Trash and Debris	E ☒	N ☐	Potential Source of Pollutants: Commercial areas

II.3 Hydrologic Conditions of Concern

Determine if streams located downstream from the project area are potentially susceptible to hydromodification impacts. *Refer to Section 2.2.3.1 in the Technical Guidance Document (TGD) for North Orange County or Section 2.2.3.2 for South Orange County.*

☒ No – Show map

☐ Yes – Describe applicable hydrologic conditions of concern below. *Refer to Section 2.2.3 in the Technical Guidance Document (TGD).*



Downstream water bodies from the project area are not susceptible to hydromodification impacts.

II.4 Post Development Drainage Characteristics

Describe post development drainage characteristics. *Refer to Section 2.2.4 in the Technical Guidance Document (TGD).*

The proposed project area is divided into 5 drainage areas (A, B, C, D, and E). The proposed development will maintain the historic discharge point. Generally, onsite stormwater runoff will be captured by localized catch basins and area drain inlets, and flows will be diverted into high and low flows. The low flows will be routed first to treatment points with Modular Wetlands Systems (MWS) to treat the proposed runoff. High flows will be diverted via internal bypass within the MWS units. Flows will discharge and connect to South Coast Drive, Susan Street, and Sunflower Avenue. All flows will tie into Greenville Banning Channel, located southeast of the project, which flow into the Santa Ana River and eventually the Pacific Ocean.

II.5 Property Ownership/Management

Describe property ownership/management. *Refer to Section 2.2.5 in the Technical Guidance Document (TGD).*

No infrastructure will be transferred to a public agency. The private streets, parking lot, landscaped areas, open spaces, buildings, and structural BMPs within the project boundary are owned and managed by Legacy Partners. Inspection and maintenance responsibilities are outlined in Section V of this report.

Section III Site Description

III.1 Physical Setting

Fill out table with relevant information. *Refer to Section 2.3.1 in the Technical Guidance Document (TGD).*

Name of Planned Community/Planning Area (if applicable)	N/A
Location/Address	3333 Susan St, Costa Mesa, CA 92626
	140-042-12
General Plan Land Use Designation	Existing: Industrial Park (per the North Costa Mesa Specific Plan) Proposed: Urban Central Commercial
Zoning	Existing: PDI – Planned Development Industrial Proposed: Planned Development Commercial
Acreage of Project Site	14.30 acres
Predominant Soil Type	HSG Type C (see Attachment B)

III.2 Site Characteristics

Fill out table with relevant information and include information regarding BMP sizing, suitability, and feasibility, as applicable. *Refer to Section 2.3.2 in the Technical Guidance Document (TGD).*

Site Characteristics	
Precipitation Zone	0.75" (See Attachment B)
Topography	The project site is relatively flat (approx. 0.1% grade towards the north and 1% towards the south), and generally drains to an existing low point at the north and south edges of the project site. The high point is in the middle of the site.
Drainage Patterns/Connections	The proposed project area is divided into 5 drainage areas (A-E). The proposed development will maintain the historic discharge point. Generally, onsite stormwater runoff will be captured by localized catch basins and area drain inlets, and flows will be diverted into high and low flows. The low flows will be routed first to treatment points with Modular Wetlands Systems (MWS) to treat the proposed runoff. High flows will be diverted via internal bypass

	within the MWS units. Flows will discharge and connect to South Coast Drive, Susan Street, and Sunflower Avenue. All flows will tie into Greenville Banning Channel, located southeast of the project, which flow into the Santa Ana River and eventually the Pacific Ocean.
Soil Type, Geology, and Infiltration Properties	A geotechnical study was performed for the site in 2024 by NOVA Services. Soils within the vicinity of the Project Site generally are cohesive soils consisting of clay. Shallow groundwater of about 23 feet bgs are present at the Project Site and historic high levels of about 10 feet bgs.
Hydrogeologic (Groundwater) Conditions	According to OC Stormwater Program Land Development Tool, the project site is located in an area with historic high groundwater of 10 feet bgs. During the 2024 geotechnical study groundwater was encountered in the boring holes at 23 ft. See Attachment B for geotechnical engineer email confirmation.
Geotechnical Conditions (relevant to infiltration)	According to OC Stormwater Program Land Development Tool and Geotracker, the project site is soil susceptibility to rill and sheet erosion as well as predominately soil type C. The site is also approximately 3 miles west of a selenium containment area. The site is also located within 500 ft of an open Cleanup Program Site with diesel as the potential contaminants of concern. In addition, there are existing vegetated swales surrounding the western edge of the property which concludes biofiltration was used as a treatment choice for an existing project. See Attachment B for more details. Based on NOVA's infiltration feasibility memo prepared on February 15,2024 "surface soils are comprised of cohesive soils that would result in a very low infiltration rate, less than the required minimum measured rate of 0.3 inches per hour by the local jurisdictional agency. Infiltration into the cohesive soils is likely to result in clogging and mounding. Additionally, the historic high groundwater depth is shallow (approximately 10 feet below grade). As a result, treatment of stormwater will require the use of other options such as bio-filtration." Refer to Attachment F for details.
Off-Site Drainage	The project site does not receive any off-site storm water flows onto the property.
Utility and Infrastructure Information	Dry and wet utilities will be incorporated into the proposed project and will tie into existing facilities associated with the existing development.

III.3 Watershed Description

Fill out table with relevant information and include information regarding BMP sizing, suitability, and feasibility, as applicable. *Refer to Section 2.3.3 in the Technical Guidance Document (TGD).*

Receiving Waters	Greenville-Banning Channel, Santa Ana River Channel, Pacific Ocean
303(d) Listed Impairments	N/A
Applicable TMDLs	N/A
Pollutants of Concern for the Project	Suspended Solid/ Sediment, Nutrients, Heavy Metals, Pathogens (Bacteria/Virus), Pesticides, Oil & Grease, Toxic Organic Compounds, Trash & Debris
Environmentally Sensitive and Special Biological Significant Areas	There are no Environmentally Sensitive Areas (ESAs) or Areas of Special Biological Significance (ASBS) within the project site or within the project's vicinity. The nearest selenium containment area is approximately 3 miles west of the Project Site.

Section IV Best Management Practices (BMPs)

IV. 1 Project Performance Criteria

Describe project performance criteria. Several steps must be followed in order to determine what performance criteria will apply to a project. These steps include:

- If the project has an approved WIHMP or equivalent, then any watershed specific criteria must be used and the project can evaluate participation in the approved regional or sub-regional opportunities. (Please ask your assigned planner or plan checker regarding whether your project is part of an approved WIHMP or equivalent.)
- Determine applicable hydromodification control performance criteria. *Refer to Section 7.II-2.4.2.2 of the Model WQMP.*
- Determine applicable LID performance criteria. *Refer to Section 7.II-2.4.3 of the Model WQMP.*
- Determine applicable treatment control BMP performance criteria. *Refer to Section 7.II-*3.2.2 *of the Model WQMP.*
- Calculate the LID design storm capture volume for the project. *Refer to Section 7.II-2.4.3 of the Model WQMP.*

(NOC Permit Area only) Is there an approved WIHMP or equivalent for the project area that includes more stringent LID feasibility criteria or if there are opportunities identified for implementing LID on regional or sub-regional basis?	YES ☐	NO ☒
If yes, describe WIHMP feasibility criteria or regional/sub-regional LID opportunities.	Not Applicable	

Project Performance Criteria	
If HCOC exists, list applicable hydromodification control performance criteria (Section 7.II-2.4.2.2 in MWQMP)	If a hydrologic condition of concern (HCOC) exists, priority projects shall implement onsite or regional hydromodification controls such that: • Post-development runoff volume for the two-year frequency storm does not exceed that of the predevelopment condition by more than five percent, and • Time of concentration of post-development runoff for the two-year storm event is not less than that for the predevelopment condition by more than five percent. Where the Project WQMP documents that excess runoff volume from the two-year runoff event cannot feasibly be retained and where in-stream controls cannot be used to otherwise mitigate HCOCs, the project shall implement on-site or regional hydromodification controls to: • Retain the excess volume from the two-year runoff event to the MEP, and Implement on-site or regional hydromodification controls such that the post-development runoff two-year peak flow rate is no greater than 110 percent of the predevelopment runoff two-year peak flow rate.
List applicable LID performance criteria (Section 7.II-2.4.3 from MWQMP)	Infiltrate, harvest and use, evapotranspire, or biotreat/biofilter, the 85th percentile, 24-hour storm event (Design Capture Volume). LID BMPs must be designed to retain, on-site, (infiltrate, harvest and use, or evapotranspire) storm water runoff up to 80 percent average annual capture efficiency.
List applicable treatment control BMP performance criteria (Section 7.II-3.2.2 from MWQMP)	If it is not feasible to meet LID performance criteria through retention and/or biotreatment provided on-site or at a sub-regional/regional scale, then treatment control BMPs shall be provided on-site or offsite prior to discharge to waters of the US. Sizing of treatment control BMP(s) shall be based on either the unmet volume after claiming applicable water quality credits, if appropriate.

Calculate LID design storm capture volume for Project.	DCV = C × d × A × 43560 sf/ac × 1/12 in/ft Where: DCV = design storm capture volume, cu-ft C = runoff coefficient = (0.75 × imp + 0.15) Imp = impervious fraction of drainage area (ranges from 0 to 1) d = storm depth (inches) A = tributary area (acres) Imp = 80 % d = 0.75 inches A = 14.30 acres DCV = (0.75 x 0.80 +0.15) x 0.75 inches x 14.30 ac x 43560 sf/ac x 1/12 in/ft = **29,199 cu-ft** *Refer to Section IV.2 for specific Drainage Manage Area (DMA) breakdown and Attachment B for detailed calculations (Worksheet B).*

IV.2. Site Design and Drainage

Describe site design and drainage including

- A narrative of site design practices utilized or rationale for not using practices;
- A narrative of how site is designed to allow BMPs to be incorporated to the MEP
- A table of DMA characteristics and list of LID BMPs proposed in each DMA.
- Reference to the WQMP "BMP Exhibit."
- Calculation of Design Capture Volume (DCV) for each drainage area.
- A listing of GIS coordinates for LID and Treatment Control BMPs.

Refer to Section 2.4.2 in the Technical Guidance Document (TGD).

Minimize Impervious Area

The project will increase impervious surfaces as compared to existing conditions. However, landscaping will be provided throughout the site within the common areas and court yards as well as around the perimeter of the building.

Maximize Natural Infiltration Capacity

Infiltration is not recommended for the project site due to proximity to groundwater and high historic groundwater levels as well as proximity to selenium containment area. Refer to Section IV.3.2 for details.

Preserve Existing Drainage Patterns and Time of Concentration

Runoff from the site will continue to flow similar to existing conditions. Low-flows will be routed to seven (7) Modular Wetland Unit systems for water quality treatment via biofiltration. High flows will be bypass the system via internal weir bypass within the MWS units.

Disconnect Impervious Areas

Landscaping will be provided adjacent to sidewalks and between the proposed buildings.

Protect Existing Vegetation and Sensitive Areas, and Revegetate Disturbed Areas

There are no existing vegetated or sensitive areas to preserve on the project site. All disturbed areas will either be paved or landscaped.

Xeriscape Landscaping

Xeriscape landscaping is not proposed for the project. Native and/or tolerant landscaping will be incorporated into the site design consistent with City guidelines.

Drainage Management Area (DMA) Summary

See table below for DMA summary as well as Worksheet B in Attachment B.

DMA[1]	Drainage Area (sf)	Drainage Area (ac)	% Imp	Runoff Coeff.	Storm Depth (in)[2]	Tc (min)	Rainfall Intensity (in/hr)[3]	Simple Method DCV (cf)[4]	Q_{Design} (cfs)[5]
DMA A1	72,671	1.67	80%	0.75	0.75	5	0.26	3,410	0.326
DMA A2	117,107	2.69	80%	0.75	0.75	5	0.26	5,493	0.525
DMA A3	8,000	0.18	80%	0.75	0.75	5	0.26	368	0.035
DMA B1	96,711	2.22	80%	0.75	0.75	5	0.26	4,533	0.433
DMA B2	94,001	2.16	80%	0.75	0.75	5	0.26	4,410	0.421
DMA B3	91,594	2.10	80%	0.75	0.75	5	0.26	4,288	0.410
DMA C1	102,400	2.35	80%	0.75	0.75	5	0.26	4,798	0.458
DMA C2	1,681	0.04	80%	0.75	0.75	5	0.26	82	0.008
DMA C3	5,362	0.12	80%	0.75	0.75	5	0.26	245	0.023
DMA D1	10,658	0.24	80%	0.75	0.75	5	0.26	490	0.047
DMA D2	2,471	0.06	80%	0.75	0.75	5	0.26	123	0.012
DMA E1	20,618	0.47	80%	0.75	0.75	5	0.26	960	0.092
TOTAL	**623,275**	**14.30**	**80%**	**0.75**	**0.75**	**5**	**0.26**	**29,199**	**2.789**

Notes

1. Refer to exhibits in Section VI for locations of each DMA.
2. Per Figure XVI-1 of the Technical Guidance Document, dated May 19, 2011. See also Appendix A.
3. Per Figure III.4 of the Technical Guidance Document, dated May 19, 2011. See also Appendix A.
4. Per Section III.1.1 of the Technical Guidance Document.
5. Per Section III.3.3 and Worksheet D of the Technical Guidance Document.

IV.3 LID BMP Selection and Project Conformance Analysis

Each sub-section below documents that the proposed design features conform to the applicable project performance criteria via check boxes, tables, calculations, narratives, and/or references to worksheets. *Refer to Section 2.4.2.3 in the Technical Guidance Document (TGD) for selecting LID BMPs and Section 2.4.3 in the Technical Guidance Document (TGD) for conducting conformance analysis with project performance criteria.*

IV.3.1 Hydrologic Source Controls (HSCs)

If required HSCs are included, fill out applicable check box forms. If the retention criteria are otherwise met with other LID BMPs, include a statement indicating HSCs not required.

Name	Included?
Localized on-lot infiltration	☐
Impervious area dispersion (e.g. roof top disconnection)	☐
Street trees (canopy interception)	☐
Residential rain barrels (not actively managed)	☐
Green roofs/Brown roofs	☐
Blue roofs	☐
Impervious area reduction (e.g. permeable pavers, site design)	☐
Other:	☐
Other:	☐
Other:	☐
Other:	☐
Other:	☐
Other:	☐
Other:	☐
Other:	☐

HSCs were not incorporated into the project's design as this stage.

IV.3.2 Infiltration BMPs

Identify infiltration BMPs to be used in project. If design volume cannot be met, state why.

Name	Included?
Bioretention without underdrains	☐
Rain gardens	☐
Porous landscaping	☐
Infiltration planters	☐
Retention swales	☐
Infiltration trenches	☐
Infiltration basins	☐
Drywells	☐
Subsurface infiltration galleries	☐
French drains	☐
Permeable asphalt	☐
Permeable concrete	☐
Permeable concrete pavers	☐
Other:	☐
Other:	☐

Show calculations below to demonstrate if the LID Design Strom Capture Volume can be met with infiltration BMPs. If not, document how much can be met with infiltration and document why it is not feasible to meet the full volume with infiltration BMPs.

No infiltration BMPs are proposed within the new development project. As discussed in Section III.2, the project site has cohesive clay soils near the surface and groundwater occurring at a depth of 23 feet and historic groundwater levels of 10 feet bgs. The project site is very close to a selenium containment area. Due to these constraints, the geotechnical engineer is recommending against infiltration. See also Attachment B for further details.

IV.3.3 Evapotranspiration, Rainwater Harvesting BMPs

If the full Design Storm Capture Volume cannot be met with infiltration BMPs, describe any evapotranspiration and/or rainwater harvesting BMPs included.

Name	Included?
All HSCs; *See Section IV.3.1*	☐
Surface-based infiltration BMPs	☐
Biotreatment BMPs	☐
Above-ground cisterns and basins	☐
Underground detention	☐
Other:	☐
Other:	☐
Other:	☐

Show calculations below to demonstrate if the LID Design Storm Capture Volume can be met with evapotranspiration and/or rainwater harvesting BMPs in combination with infiltration BMPs. If not, document below how much can be met with either infiltration BMPs, evapotranspiration, rainwater harvesting BMPs, or a combination, and document why it is not feasible to meet the full volume with these BMP categories.

For a system to be considered "feasible", the system must be designed with a storage volume equal to the DCV from the tributary area and achieve more than 40% capture. The system must also be able to drawdown in 30 days to meet the 40% capture value. This is determined by calculating the Estimated Applied Water Use (EAWU) equation from Appendix X of the TGD. The EAWU can then be divided by the water quality volume for the project site or DMA to determine drawdown time. If the drawdown time is less than 30 days, harvest and reuse is considered partially feasible and the Effective Irrigated Area to Tributary Area (EIATA) ratio may be utilized to determine the capture efficiency of the system. If drawdown is greater than 30 days, harvest and reuse may be concluded to be infeasible.

As shown by Worksheet J included in Attachment B, harvest and reuse is considered infeasible due insufficient water demand during the wet season to drawdown the water quality volume.

IV.3.4 Biotreatment BMPs

If the full Design Storm Capture Volume cannot be met with infiltration BMPs, and/or evapotranspiration and rainwater harvesting BMPs, describe biotreatment BMPs included. Include sections for selection, suitability, sizing, and infeasibility, as applicable.

Name	Included?
Bioretention with underdrains	☐
Stormwater planter boxes with underdrains	☐
Rain gardens with underdrains	☐
Constructed wetlands	☐
Vegetated swales	☐
Vegetated filter strips	☐
Proprietary vegetated biotreatment systems	☒
Wet extended detention basin	☐
Dry extended detention basins	☐
Other:	☐
Other:	☐

Show calculations below to demonstrate if the LID Design Storm Capture Volume can be met with infiltration, evapotranspiration, rainwater harvesting and/or biotreatment BMPs. If not, document how much can be met with either infiltration BMPs, evapotranspiration, rainwater harvesting BMPs, or a combination, and document why it is not feasible to meet the full volume with these BMP categories.

Modular Wetlands Linear by Contech. are proprietary biotreatment systems that utilize multi-stage treatment processes including screening media filtration, settling, and biofiltration. The pre-treatment chamber contains the first three stages of treatment and includes a catch basin inlet filter to capture trash, debris, gross solids and sediments, a settling chamber for separating out larger solids, and a media filter cartridge for capturing fine TSS, metals, nutrients, and bacteria. Runoff then flows through the wetland chamber where treatment is achieved through a variety of physical, chemical, and biological processes. As storm water passes down through the planting soil, pollutants are filtered, adsorbed, biodegraded, and sequestered by the soil and plants, functioning similar to bioretention systems. The discharge chamber at the end of the unit collects treated flows and discharges back into the storm drain system.

As shown below, seven MWS units are proposed. Low flows will be diverted to a MWS for treatment and any flows exceeding this will bypass within the MWS units via internal weir diversions. All MWS units are sized based on the flowrate of the 85th percentile storm event. See Attachment B for additional calculations.

DMA A2 MWS unit is sized to treat the design flowrate of A2 and A3. DMA A3 is draining away from the property.

DMA C1 MWS unit is sized to treat the design flowrate from C1, C2, and C3. DMA C2 and DMA C3 are draining away from the property.

DMA D1 MWS unit is sized to treat the design flowrate of D1 and D3. DMA D3 is draining away from the property.

DMA E1 is part of the property but will be undisturbed from any construction activities. Existing vegetated swales line the western edge of the property to which the runoff drains to. Therefore no MWS unit is proposed for this area.

MODULAR WETLAND DESIGN SUMMARY

DMA ID	Total Drainage Area (ac)	% Imp	QDesign (cfs)	Sizes / Models	Total Treatment Capacity (cfs)
DMA A1	1.67	80%	0.326	MWS-L-8-20	0.577
DMA A2	2.69	80%	0.525	MWS-L-8-20	0.577
DMA A3	0.18	80%	0.035		
DMA B1	2.22	80%	0.433	MWS-L-8-20	0.577
DMA B2	2.16	80%	0.421	MWS-L-8-16	0.462
DMA B3	2.10	80%	0.410	MWS-L-8-16	0.462
DMA C1	2.35	80%	0.458	MWS-L-8-20	0.577
DMA C2	0.04	80%	0.008		
DMA C3	0.12	80%	0.023		
DMA D1	0.24	80%	0.047	MWS-L-4-8	0.115
DMA D2	0.06	80%	0.012		

IV.3.5 Hydromodification Control BMPs

Describe hydromodification control BMPs. *See Section 5 of the Technical Guidance Document (TGD).* Include sections for selection, suitability, sizing, and infeasibility, as applicable. Detail compliance with Prior Conditions of Approval (if applicable).

Hydromodification Control BMPs
Not applicable. See Section II.3 Hydrologic Conditions of Concern.

IV.3.6 Regional/Sub-Regional LID BMPs

Describe regional/sub-regional LID BMPs in which the project will participate. *Refer to Section 7.II-2.4.3.2 of the Model WQMP*.

Regional/Sub-Regional LID BMPs
Not applicable. LID BMPs (proprietary biofiltration) will be utilized for water quality treatment on-site in accordance with the MS4 Permit hierarchy identified at the beginning of this Section.

IV.3.7 Treatment Control BMPs

Treatment control BMPs can only be considered if the project conformance analysis indicates that it is not feasible to retain the full design capture volume with LID BMPs. Describe treatment control BMPs including sections for selection, sizing, and infeasibility, as applicable.

Treatment Control BMPs	
BMP Name	BMP Description
Connector Pipe Screen (CPS) – Ferguson Waterworks (Fabco Industries Inc)	Stormwater Connector Pipe Screens (CPS) are used to prevent trash and debris from entering the stormwater system during dry weather and moderate storm flows by keeping the trash inside the catch basin. The CPS is a screen placed in a catch basin at the location of the outlet pipe. The screen separates trash and debris from stormwater treatment flows. Flows that exceed the treatment flow rate bypass over the top of the screen. When the outlet pipe is located below a curb opening the CPS features a lid to prevent debris from passing behind the screen and flowing directly to the outlet pipe. The CPS shall be

	designed to retain all trash larger than 5 mm (0.197 inches) in the catch basin.

To provide compliance with the CA Trash Provisions, the outlet of each of the MWS units connecting to the back of the catch basin will be equipped with a connector pipe screen (CPS) before discharging into the public storm drain system.

The sizing of the CPS will match the outlet pipe sizing to fully proect any trash from entering the storm drain system. There are 4 catch basin connections outlting to the storm drain system proposed for the project. See table below for proposed CPS models.

Connections	Pipe size (ft)	Pipe size (in)	CPS Size (in)	CPS Model
Susan Street 1 (South)	2.0	24.0	24.0	OCS-24-1L
Susan Street 2 (North)	2.5	30.0	36.0	OCS-36-1L
S Coast Drive	1.5	18.0	18.0	OCS-18-1L
Sunflower Ave	1.5	18.0	18.0	OCS-18-1L

IV.3.8 Non-structural Source Control BMPs

Fill out non-structural source control check box forms or provide a brief narrative explaining if non-structural source controls were not used.

Non-Structural Source Control BMPs				
Identifier	Name	Check One		If not applicable, state brief reason
		Included	Not Applicable	
N1	Education for Property Owners, Tenants and Occupants	☒	☐	
N2	Activity Restrictions	☒	☐	
N3	Common Area Landscape Management	☒	☐	
N4	BMP Maintenance	☒	☐	
N5	Title 22 CCR Compliance (How development will comply)	☐	☒	No hazardous materials proposed.
N6	Local Industrial Permit Compliance	☐	☒	The City of Costa Mesa does not issue water quality permits.
N7	Spill Contingency Plan	☐	☒	No hazardous materials proposed.
N8	Underground Storage Tank Compliance	☐	☒	No underground storage tanks proposed.
N9	Hazardous Materials Disclosure Compliance	☐	☒	No hazardous materials stored onsite.
N10	Uniform Fire Code Implementation	☐	☒	No hazardous materials proposed.
N11	Common Area Litter Control	☒	☐	
N12	Employee Training	☒	☐	
N13	Housekeeping of Loading Docks	☐	☒	No loading docks are proposed.
N14	Common Area Catch Basin Inspection	☒	☐	
N15	Street Sweeping Private Streets and Parking Lots	☒	☐	
N16	Retail Gasoline Outlets	☐	☒	No gasoline facilities proposed.

N1, Education for Property Owners, Tenants and Occupants

Educational materials will be provided to tenants, including brochures and restrictions to reduce pollutants from reaching the storm drain system. Examples include tips for pet care, household tips, and proper household hazardous waste disposal. Tenants will be provided with these materials by the property management prior to occupancy, and periodically thereafter. Refer to Section VII for a list of materials available and attached to this WQMP. Additional materials are available through the County of Orange Stormwater Program website (http://ocwatersheds.com/PublicEd/) and the California Stormwater Quality Association's (CASQA) BMP Handbooks (http://www.cabmphandbooks.com/).

N2, Activity Restrictions

The Owner shall develop ongoing activity restrictions that include those that have the potential to create adverse impacts on water quality. Activities include but are not limited to: handling and disposal of contaminants, fertilizer and pesticide application restrictions, litter control and pick-up, and vehicle or equipment repair and maintenance in non-designated areas, as well as any other activities that may potentially contribute to water pollution.

N3, Common Area Landscape Management

Management programs will be designed and implemented by the Developer to maintain all the common areas within the project site. These programs will cover how to reduce the potential pollutant sources of fertilizer and pesticide uses, utilization of water-efficient landscaping practices and proper disposal of landscape wastes by the owner/developer and/or contractors.

N4, BMP Maintenance

The Developer will be responsible for the implementation and maintenance of each applicable non-structural BMP, as well as scheduling inspections and maintenance of all applicable structural BMP facilities through its staff, landscape contractor, and/or any other necessary maintenance contractors. Details on BMP maintenance are provided in Section V of this WQMP, and the O&M Plan is included in Attachment D.

N11, Common Area Litter Control

The Owner will be responsible for performing trash pickup and sweeping of littered common areas on a weekly basis or whenever necessary. Responsibilities will also include noting improper disposal materials by the public and reporting such violations for investigation.

N12, Employee Training

All employees of the Owner and any contractors will require training to ensure that employees are aware of maintenance activities that may result in pollutants reaching the storm drain. Training will include, but not be limited to, spill cleanup procedures, proper waste disposal, housekeeping practices, etc.

N14, Common Area Catch Basin Inspection

All on-site catch basin inlets and drainage facilities shall be inspected and maintained by the Owner at least once a year, prior to the rainy season, no later than October 1st of each year.

N15, Street Sweeping Private Streets and Parking Lots

The Owner shall be responsible for sweeping all on-site streets and drive isles within the project on a quarterly basis.

IV.3.9 Structural Source Control BMPs

Fill out structural source control check box forms or provide a brief narrative explaining if structural source controls were not used.

Structural Source Control BMPs				
Identifier	Name	Check One		If not applicable, state brief reason
		Included	Not Applicable	
S1	Provide storm drain system stenciling and signage	☒	☐	
S2	Design and construct outdoor material storage areas to reduce pollution introduction	☐	☒	No outdoor material storage areas are proposed.
S3	Design and construct trash and waste storage areas to reduce pollution introduction	☒	☐	
S4	Use efficient irrigation systems & landscape design, water conservation, smart controllers, and source control	☒	☐	
S5	Protect slopes and channels and provide energy dissipation	☐	☒	There are no slopes or channels on the project site.
S6	Dock areas	☐	☒	No loading docks are proposed.
S7	Maintenance bays	☐	☒	No maintenance bays are proposed.
S8	Vehicle wash areas	☐	☒	No wash areas are proposed.
S9	Outdoor processing areas	☐	☒	No processing areas are proposed.
S10	Equipment wash areas	☐	☒	No wash areas are proposed.
S11	Fueling areas	☐	☒	No fueling areas are proposed.
S12	Hillside landscaping	☐	☒	No hillside development proposed.
S13	Wash water control for food preparation areas	☐	☒	No food prep areas proposed.
S14	Community car wash racks	☐	☒	No community car wash racks are proposed.

S1/SD-13, Provide storm drain system stenciling and signage

The phrase "NO DUMPING! DRAINS TO OCEAN", or an equally effective phrase approved by the City, will be stenciled on all major storm drain inlets within the project site to alert the public to the destination of pollutants discharged into

storm water. Stencils shall be in place prior to release of certificate of occupancy. Stencils shall be inspected for legibility on an annual basis and re-stenciled as necessary on catch basins located on Fourth Street.

S3/SD-32, Design and construct trash and waste storage areas to reduce pollution introduction

All trash and waste shall be stored in containers that have lids or tarps to minimize direct precipitation into the containers. The trash storage areas will be designed to City standards, and will be walled, roofed, have gates and proper drainage per City standards. Frequency of occurrence will be ongoing.

S4/SD-12, Use efficient irrigation systems & landscape design, water conservation, smart controllers, and source control

The Owner will be responsible for the installation and maintenance of all common landscape areas utilizing similar planting materials with similar water requirements to reduce excess irrigation runoff. The Owner will be responsible for implementing all efficient irrigation systems for common area landscaping including, but not limited to, provisions for water sensors and programmable irrigation cycles. This includes smart timers, rain sensors, and moisture shut-off valves. The irrigation systems shall be in conformance with water efficiency guidelines. Systems shall be tested twice per year, and water used during testing/flushing shall not be discharged to the storm drain system.

IV.4 Alternative Compliance Plan (If Applicable)

Describe an alternative compliance plan (if applicable). Include alternative compliance obligations (i.e., gallons, pounds) and describe proposed alternative compliance measures. *Refer to Section 7.II 3.0 in the WQMP.*

IV.4.1 Water Quality Credits

Determine if water quality credits are applicable for the project. *Refer to Section 3.1 of the Model WQMP for description of credits and Appendix VI of the Technical Guidance Document (TGD) for calculation methods for applying water quality credits.*

<table>
<tr><th colspan="5">Description of Proposed Project</th></tr>
<tr><td colspan="5">Project Types that Qualify for Water Quality Credits (Select all that apply):</td></tr>
<tr><td colspan="2">☐Redevelopment projects that reduce the overall impervious footprint of the project site.</td><td colspan="2">☐Brownfield redevelopment, meaning redevelopment, expansion, or reuse of real property which may be complicated by the presence or potential presence of hazardous substances, pollutants or contaminants, and which have the potential to contribute to adverse ground or surface WQ if not redeveloped.</td><td>☐ Higher density development projects which include two distinct categories (credits can only be taken for one category): those with more than seven units per acre of development (lower credit allowance); vertical density developments, for example, those with a Floor to Area Ratio (FAR) of 2 or those having more than 18 units per acre (greater credit allowance).</td></tr>
<tr><td colspan="2">☐ Mixed use development, such as a combination of residential, commercial, industrial, office, institutional, or other land uses which incorporate design principles that can demonstrate environmental benefits that would not be realized through single use projects (e.g. reduced vehicle trip traffic with the potential to reduce sources of water or air pollution).</td><td colspan="2">☐ Transit-oriented developments, such as a mixed use residential or commercial area designed to maximize access to public transportation; similar to above criterion, but where the development center is within one half mile of a mass transit center (e.g. bus, rail, light rail or commuter train station). Such projects would not be able to take credit for both categories, but may have greater credit assigned</td><td>☐ Redevelopment projects in an established historic district, historic preservation area, or similar significant city area including core City Center areas (to be defined through mapping).</td></tr>
<tr><td>☐Developments with dedication of undeveloped portions to parks, preservation areas and other pervious uses.</td><td>☐ Developments in a city center area.</td><td>☐ Developments in historic districts or historic preservation areas.</td><td>☐ Live-work developments, a variety of developments designed to support residential and vocational needs together – similar to criteria to mixed use development; would not be able to take credit for both categories.</td><td>☐In-fill projects, the conversion of empty lots and other underused spaces into more beneficially used spaces, such as residential or commercial areas.</td></tr>
</table>

Calculation of Water Quality Credits (if applicable)	Not applicable. Water quality credits will not be applied for the project. LID BMPs will be utilized for water quality treatment on-site in accordance with the MS4 Permit hierarchy identified.

IV.4.2 Alternative Compliance Plan Information

Describe an alternative compliance plan (if applicable). Include alternative compliance obligations (i.e., gallons, pounds) and describe proposed alternative compliance measures. *Refer to Section 7.II 3.0 in the Model WQMP.*

Not applicable. LID BMPs (Biofiltration) will be utilized for water quality treatment on-site in accordance with the MS4 Permit hierarchy identified.

Section V Inspection/Maintenance Responsibility for BMPs

Fill out information in table below. Prepare and attach an Operation and Maintenance Plan. Identify the funding mechanism through which BMPs will be maintained. Inspection and maintenance records must be kept for a minimum of five years for inspection by the regulatory agencies. *Refer to Section 7.II 4.0 in the Model WQMP.*

BMP Inspection/Maintenance			
BMP	Reponsible Party(s)	Inspection/ Maintenance Activities Required	Minimum Frequency of Activities
Proprietary Biotreatment – Modular Wetland System	Legacy Partners	Remove trash from screening device, remove sediment from separation chamber, replace cartridge filter media, replace drain down filter media, trim vegetation.	Annually and before October 1st of each year.
Connector Pipe Screen (CPS)	Legacy Partners	Remove trash on screen and support structure, inspect screen for breakage, inspect support structure and anchor bolts, tighten, if necessary, ensure no gaps between mounting hardware and vault wall.	Twice a year and before October 1st of each year.
N1: Education for Property Owners, Tenants and Occupants	Legacy Partners	Educational materials will be provided to tenants, including brochures and restrictions to reduce pollutants from reaching the storm drain system. Examples include tips for pet care, household tips, and proper household hazardous waste disposal. Tenants will be provided with these materials by the property management prior to occupancy, and periodically thereafter.	Annually
N2: Activity Restrictions	Legacy Partners	The Owner will prescribe activity restrictions to protect surface water quality, through lease terms or other equally effective measure, for the property. Restrictions include, but are	Ongoing

		not limited to, prohibiting vehicle maintenance or vehicle washing.	
N3: Common Area Landscape Management	Legacy Partners	Maintenance shall be consistent with City requirements. Fertilizer and/or pesticide usage shall be consistent with County Management Guidelines for Use of Fertilizers (OC DAMP Section 5.5). Maintenance includes mowing, weeding, and debris removal on a weekly basis. Trimming, replanting, and replacement of mulch shall be performed on an as-needed basis to prevent exposure of erodible surfaces. Trimmings, clippings, and other landscape wastes shall be properly disposed of in accordance with local regulations. Materials temporarily stockpiled during maintenance activities shall be placed away from water courses and storm drains inlets.	Weekly
N4: BMP Maintenance	Legacy Partners	Maintenance of structural BMPs implemented at the project site shall be performed at the frequency prescribed in this WQMP. Records of inspections and BMP maintenance shall be kept by the Owner and shall be available for review upon request.	Annually
N11: Common Area Litter Control	Legacy Partners	Litter patrol, violations investigations, reporting and other litter control activities shall be performed on a weekly basis and in conjunction with routine maintenance activities.	Weekly
Employee Training	Legacy Partners	The Owner shall educate all new employees/ managers on storm water pollution prevention, particularly good housekeeping practices, prior to the start of the rainy season (October 1). Refresher courses shall be conducted on an as needed basis.	Annually

		Materials that may be utilized on BMP maintenance are included in Appendix D.	
N12: Common Area Catch Basin Inspection	Legacy Partners	Remove trash and debris from catch basins and grates. Check for damage, clogging, and standing water. Repair or mitigate clogging/standing water, as needed.	2x per year and after large storm event
N13: Street Sweeping Private Streets and Parking Lots	Legacy Partners	On-site parking lots, drive aisles, and the parking structure basement level will be swept on a monthly basis, at minimum.	Monthly
S1: Provide storm drain system stenciling and signage	Legacy Partners	On-site storm drain stencils shall be inspected for legibility, at minimum, once prior to the storm season, no later than October 1st each year. Those determined to be illegible will be re-stenciled as soon as possible.	Annually
S3: Design and construct trash and waste storage areas to reduce pollution introduction	Legacy Partners	Trash receptacles will be monitored and emptied by the building management. Trash will be taken from the interior trash rooms to the exterior trash storage areas at the time trash collection is set to occur.	Ongoing
S4: Use efficient irrigation systems & landscape design, water conservation, smart controllers, and source control	Legacy Partners	In conjunction with routine maintenance, verify that landscape design continues to function properly by adjusting systems to eliminate overspray to hardscape areas and to verify that irrigation timing and cycle lengths are adjusted in accordance to water demands, given the time of year, weather, and day or nighttime temperatures. System testing shall occur twice per year. Water from testing/flushing shall be collected and properly disposed to the sewer system and shall not discharge to the storm drain system.	2x per year

Section VI BMP Exhibit (Site Plan)

VI.1 BMP Exhibit (Site Plan)

Include a BMP Exhibit (Site Plan), at a size no less than 24" by 36," which includes the following minimum information:

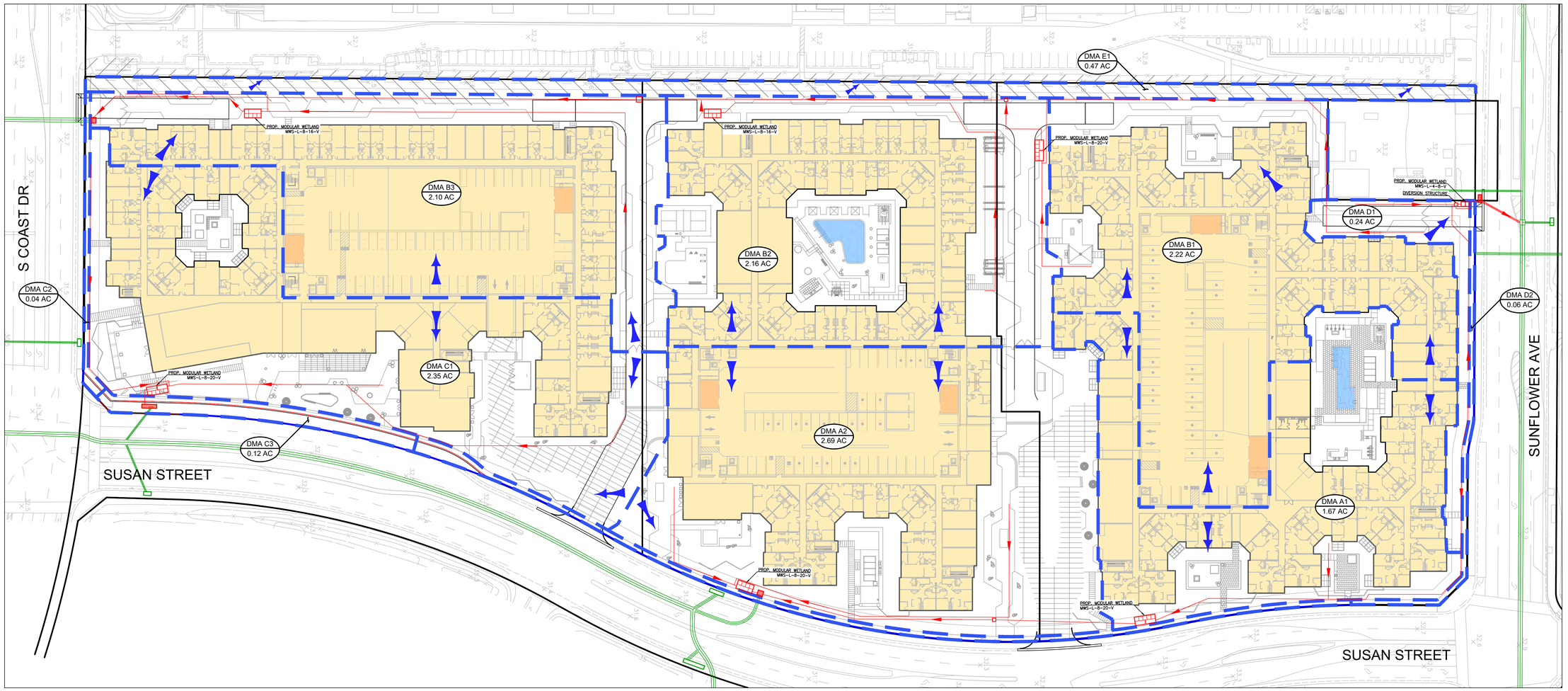
- Insert in the title block (lower right hand corner) of BMP Exhibit: the WQMP Number (assigned by staff) and the grading/building or Planning Application permit numbers
- Project location (address, tract/lot number(s), etc.)
- Site boundary
- Land uses and land covers, as applicable
- Suitability/feasibility constraints
- Structural BMP locations
- Drainage delineations and flow information
- Delineate the area being treated by each structural BMP
- GIS coordinates for LID and Treatment Control BMPs
- Drainage connections
- BMP details
- Preparer name and stamp

Please do not include any areas outside of the project area or any information not related to drainage or water quality. The approved BMP Exhibit (Site Plan) shall be submitted as a plan sheet on all grading and building plan sets submitted for plan check review and approval. The BMP Exhibit shall be at the same size as the rest of the plan sheets in the submittal and shall have an approval stamp and signature prior to plan check submittal.

VI.2 Submittal and Recordation of Water Quality Management Plan

Following approval of the Final Project-Specific WQMP, three copies of the approved WQMP (including BMP Exhibit, Operations and Maintenance (O&M) Plan, and Appendices) shall be submitted. In addition, these documents shall be submitted in a PDF format.

Each approved WQMP (including BMP Exhibit, Operations and Maintenance (O&M) Plan, and Appendices) shall be recorded in the Orange County Clerk-Recorder's Office, prior to close-out of grading and/or building permit. Educational Materials are not required to be included.



LEGEND

- PROPERTY LINE / RIGHT OF WAY
- EXISTING STORM DRAIN
- PROPOSED STORM DRAIN
- BMP DRAINAGE AREA BOUNDARY
- DMA 4 / 14.69 AC — DRAINAGE MANAGEMENT AREA
- DIRECTION OF PIPED FLOW
- DIRECTION OF SURFACE FLOW
- PROPOSED BUILDING
- PROPOSED POOL/SPA (DRAINS TO SEWER)
- PROPOSED TRASH ENCLOSURE (S3)
- CATCH BASIN WITH STENCILING AND CPS (N14, S1)
- PROPOSED MODULAR WETLANDS SYSTEM (N4)

NON-STRUCTURAL SOURCE CONTROL BMP'S

- N1 EDUCATION FOR PROPERTY OWNERS
- N2 ACTIVITY RESTRICTIONS
- N3 COMMON AREA LANDSCAPE MANAGEMENT
- N4 BMP MAINTENANCE
- N11 COMMON AREA LITTER CONTROL
- N12 EMPLOYEE TRAINING
- N14 COMMON AREA CATCH BASIN INSPECTION
- N15 STREET SWEEPING PRIVATE STREETS AND PARKING LOTS

STRUCTURAL SOURCE CONTROL BMP'S

- S1 PROVIDE STORM DRAIN SYSTEM STENCILING AND SIGNAGE
- S3 DESIGN AND CONSTRUCT TRASH AND WASTE STORAGE AREAS TO REDUCE POLLUTION INTRODUCTION
- S4 USE EFFICIENT IRRIGATION SYSTEMS & LANDSCAPE DESIGN, WATER CONSERVATION, SMART CONTROLLERS, AND SOURCE CONTROL

SITE AREA DETIALS

TOTAL AREA = 14.30 AC
IMPERVIOUS AREA = 11.44 AC (80%)
PERVIOUS AREA = 2.86 (20%)

SUITABILITY/FEASIBILITY CONSTRAINTS

GROUNDWATER ENCOUNTERED AT 23 FEET BGS WITH HISTORIC HIGH LEVELS AT 10 FEET BGS. NEAR SURFACE MATERIALS ARE COHESIVE SOILS CONSISTING OF CLAYS. APPROXIMATELY 3 MILES WEST OF SELENIUM CONTAINMENT AREA. 1 OPEN GEOTRACKER SITE WITHIN 500 FT.

NOTES

1. CONNECTOR PIPE SCREENS (CPS) FOR TRASH FULL CAPTURE SYSTEMS (FCS) ARE PROPOSED ON THE 4 CATCH BASINS CONNECTING TO THE EXISTING STORM DRAIN SYSTEM
2. SELF-CERTIFICATION FROM A STATE LICENSED PROFESSIONAL ENGINEER OR THIRD-PARTY CERTIFICATIONS ARE REQUIRED OF ALL BMPS CONSTRUCTED ON THIS PLAN OR FINAL CERTIFICATE OF OCCUPANCY WILL NOT BE GRATED FROM THE CITY.

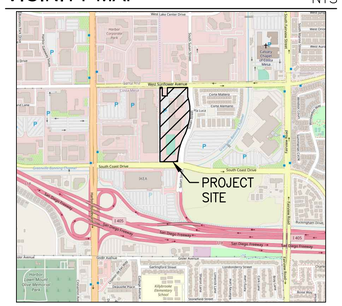
MODULAR WETLAND DESIGN SUMMARY

Drainage Area Name / DMA	BMP ID, Feature or Land Use Type	GIS Coordinates	Total Drainage Area (ft²)	Total Drainage Area (acres)	Assumed % impervious	Runoff Coefficient	Average or Estimated Tc (min)	Rainfall Intensity (in/hr)	Q_{Design} (cfs)
DMA A1	MWS	33.694563, -117.913654	72,671	1.67	80.0%	0.750	5	0.26	**0.326**
DMA A2	MWS	33.693548, -117.913814	117,107	2.69	80.0%	0.750	5	0.26	**0.525**
DMA A3	Offset by A2		8,000	0.18	80.0%	0.750	5	0.26	**0.035**
DMA B1	MWS	33.694578, -117.915303	96,711	2.22	80.0%	0.750	5	0.26	**0.433**
DMA B2	MWS	33.694238, -117.915370	94,001	2.16	80.0%	0.750	5	0.26	**0.421**
DMA B3	MWS	33.692267, -117.915276	91,594	2.10	80.0%	0.750	5	0.26	**0.410**
DMA C1	MWS	33.692040, -117.914444	102,400	2.35	80.0%	0.750	5	0.26	**0.458**
DMA C2	Offset by C1		1,681	0.04	80.0%	0.750	5	0.26	**0.008**
DMA C3	Offset by C1		5,362	0.12	80.0%	0.750	5	0.26	**0.023**
DMA D1	MWS	33.695484, -117.914987	10,658	0.24	80.0%	0.750	5	0.26	**0.047**
DMA D2	Offset by D1		2,471	0.06	80.0%	0.750	5	0.26	**0.012**
DMA E1	Existing Swale		20,618	0.47	80.0%	0.750	5	0.26	**0.092**

Proprietary Biotreatment			
Model / Size	Treatment Capacity per Unit (cfs)	# Units Needed	Total Q Treated (cfs)
MWS-L-8-20	0.577	1	0.577
MWS-L-8-20	0.577	1	0.577
MWS-L-8-20	0.577	1	0.577
MWS-L-8-16	0.462	1	0.462
MWS-L-8-16	0.462	1	0.462
MWS-L-8-20	0.577	1	0.577
MWS-L-4-8	0.115	1	0.115

VICINITY MAP

NTS



NO DUMPING · THIS DRAINS TO OCEAN

CATCH BASIN STENCILING SAMPLE S1
SCALE: NTS

50' 0' 25' 50'
SCALE: 1" = 50'

Exhibit Date: 4/4/24

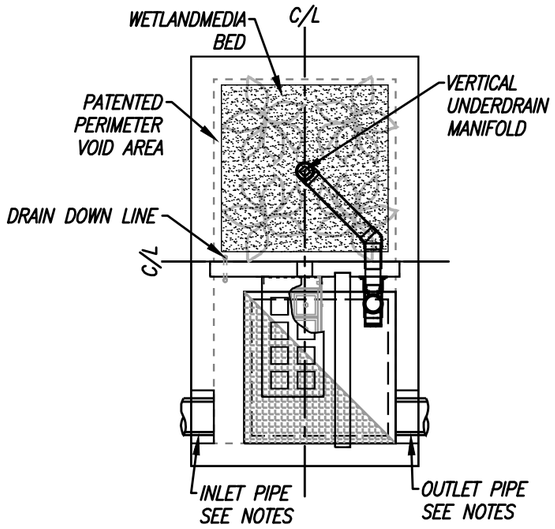
WQMP EXHIBIT
3333 SUSAN ST, COSTA MESA
CA 92626

THE HIVE LIVE
COSTA MESA, CA

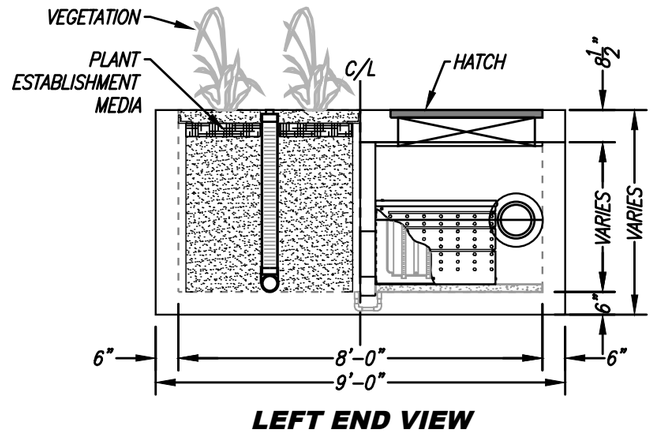
FUSCOE ENGINEERING
FULL CIRCLE THINKING
15535 Sand Canyon Ave 949.474.1960
Suite 100
Irvine, California 92618 fuscoe.com

SITE SPECIFIC DATA			
PROJECT NUMBER			
PROJECT NAME			
PROJECT LOCATION			
STRUCTURE ID			
TREATMENT REQUIRED			
FLOW BASED (CFS)			
0.115			
PEAK BYPASS REQUIRED (CFS) – IF APPLICABLE			OFFLINE
PIPE DATA	I.E.	MATERIAL	DIAMETER
INLET PIPE 1			
INLET PIPE 2	N/A	N/A	N/A
OUTLET PIPE			
	PRETREATMENT	BIOFILTRATION	DISCHARGE
RIM ELEVATION			
SURFACE LOAD	PEDESTRIAN		
NOTES:			

* PRELIMINARY NOT FOR CONSTRUCTION



PLAN VIEW



LEFT END VIEW

INSTALLATION NOTES

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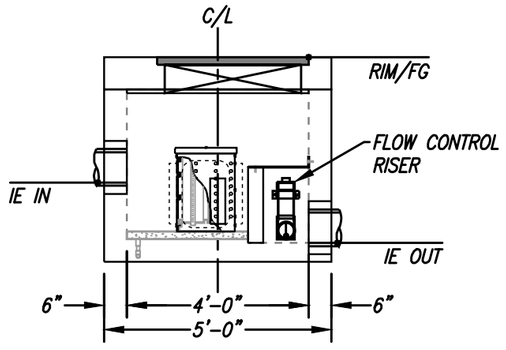
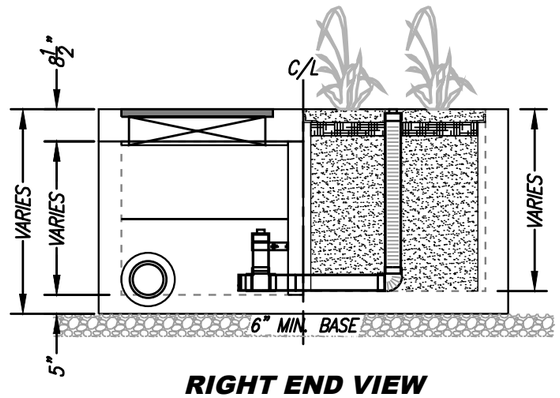
6. VEGETATION SUPPLIED AND INSTALLED BY OTHERS. ALL UNITS WITH VEGETATION MUST HAVE DRIP OR SPRAY IRRIGATION SUPPLIED AND INSTALLED BY OTHERS.
7. CONTRACTOR RESPONSIBLE FOR CONTACTING CONTECH FOR ACTIVATION OF UNIT. MANUFACTURER'S WARRANTY IS VOID WITHOUT PROPER ACTIVATION BY A CONTECH REPRESENTATIVE.

GENERAL NOTES

1. MANUFACTURER TO PROVIDE ALL MATERIALS UNLESS OTHERWISE NOTED.
2. ALL DIMENSIONS, ELEVATIONS, SPECIFICATIONS AND CAPACITIES ARE SUBJECT TO CHANGE. FOR PROJECT SPECIFIC DRAWINGS DETAILING EXACT DIMENSIONS, WEIGHTS AND ACCESSORIES PLEASE CONTACT CONTECH.



ELEVATION VIEW



RIGHT END VIEW

TREATMENT FLOW (CFS)	0.115
OPERATING HEAD (FT)	3.4
PRETREATMENT LOADING RATE (GPM/SF)	2.0
WETLAND MEDIA LOADING RATE (GPM/SF)	1.0

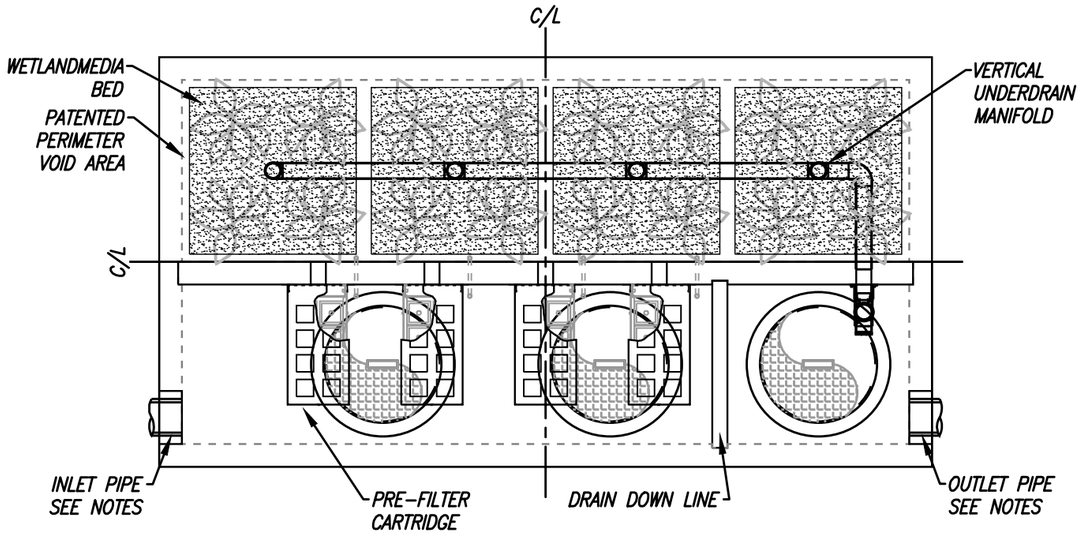
MODULAR WETLANDS
FOR PATENT INFORMATION, GO TO www.ContechES.com/IP

CONTECH ENGINEERED SOLUTIONS LLC
www.ContechES.com

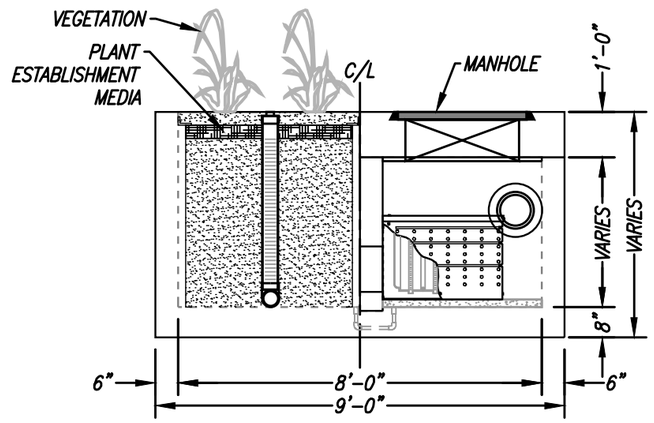
MWS-L-4-8-V
STORMWATER BIOFILTRATION SYSTEM
STANDARD DETAIL

SITE SPECIFIC DATA			
PROJECT NUMBER			
PROJECT NAME			
PROJECT LOCATION			
STRUCTURE ID			
TREATMENT REQUIRED			
FLOW BASED (CFS)			
0.462			
PEAK BYPASS REQUIRED (CFS) – IF APPLICABLE			OFFLINE
PIPE DATA	I.E.	MATERIAL	DIAMETER
INLET PIPE 1			
INLET PIPE 2	N/A	N/A	N/A
OUTLET PIPE			
	PRETREATMENT	BIOFILTRATION	DISCHARGE
RIM ELEVATION			
SURFACE LOAD	PEDESTRIAN		
NOTES:			

* PRELIMINARY NOT FOR CONSTRUCTION



PLAN VIEW



LEFT END VIEW

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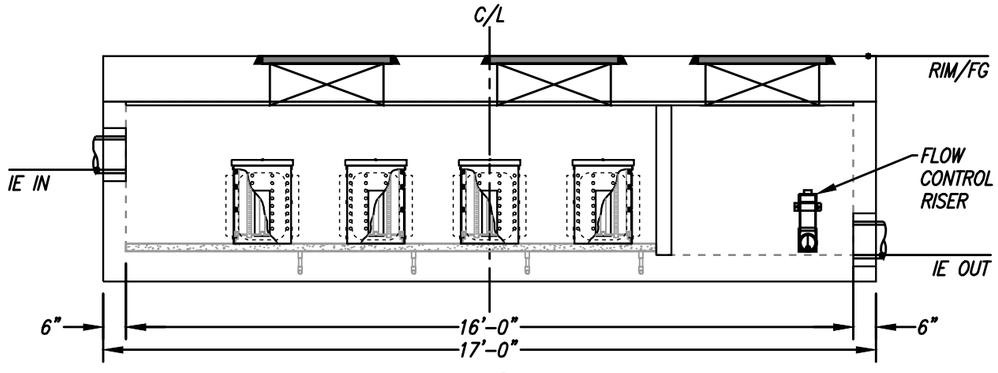
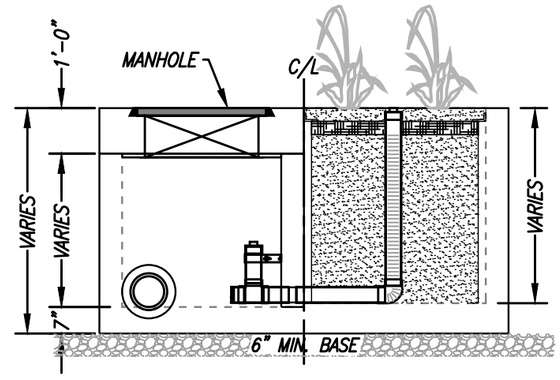


ELEVATION VIEW



RIGHT END VIEW

TREATMENT FLOW (CFS)	0.462
OPERATING HEAD (FT)	3.4
PRETREATMENT LOADING RATE (GPM/SF)	2.0
WETLAND MEDIA LOADING RATE (GPM/SF)	1.0

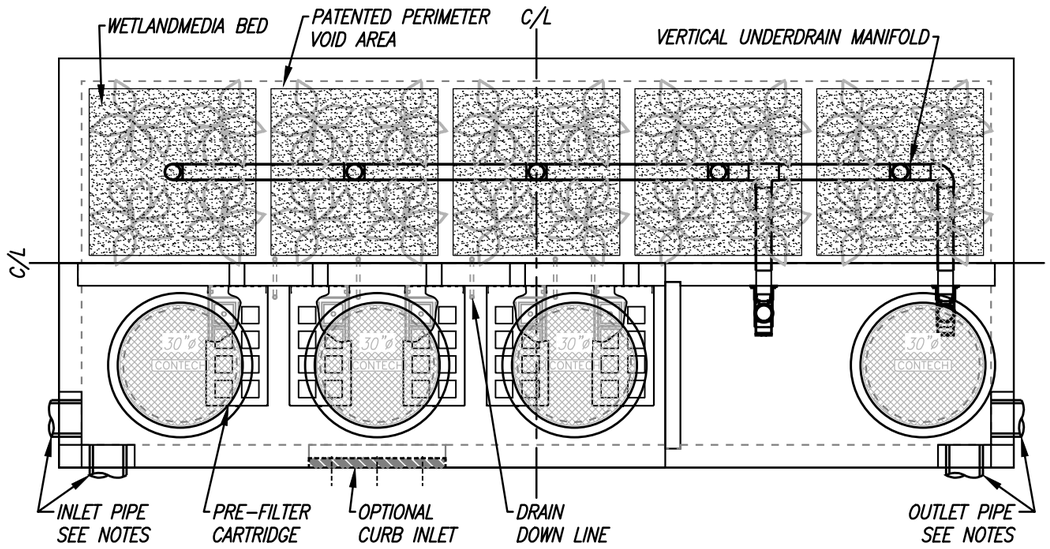
MODULAR WETLANDS
FOR PATENT INFORMATION, GO TO www.ContechES.com/IP

CONTECH ENGINEERED SOLUTIONS LLC
www.ContechES.com

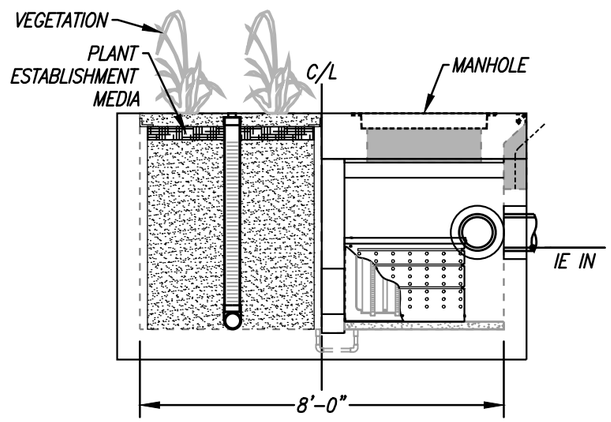
MWS-L-8-16-V
STORMWATER BIOFILTRATION SYSTEM
STANDARD DETAIL

SITE SPECIFIC DATA			
PROJECT NUMBER			
PROJECT NAME			
PROJECT LOCATION			
STRUCTURE ID			
TREATMENT REQUIRED			
TREATMENT FLOW (CFS)			
PRETREATMENT LOADING RATE (GPM/SF)			2.1 GPM/SF
WETLAND MEDIA LOADING RATE (GPM/SF)			1.0
PEAK BYPASS REQUIRED (CFS) – IF APPLICABLE			_____ (CFS)
PIPE DATA	I.E.	MATERIAL	DIAMETER
INLET PIPE 1			
INLET PIPE 2			
OUTLET PIPE			
	PRETREATMENT	BIOFILTRATION	DISCHARGE
RIM ELEVATION			
SURFACE LOAD	PEDESTRIAN		
NOTES:			

* PRELIMINARY ONLY - NOT FOR CONSTRUCTION



PLAN VIEW



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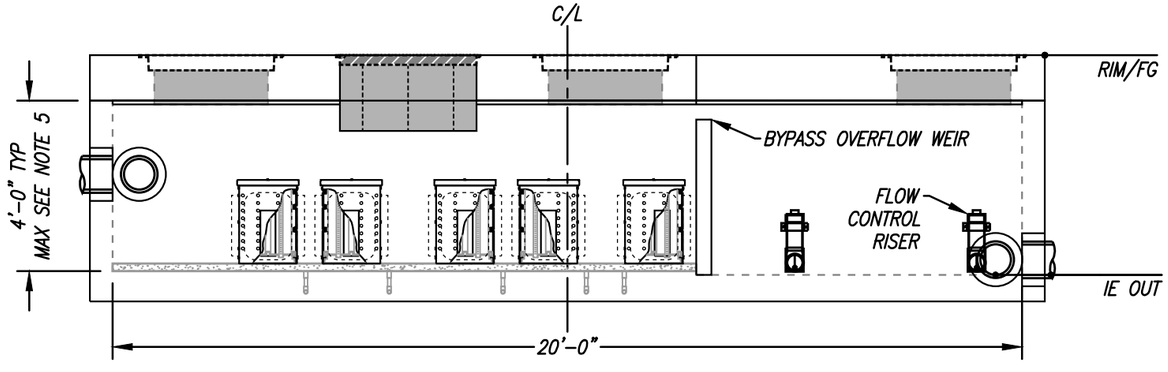
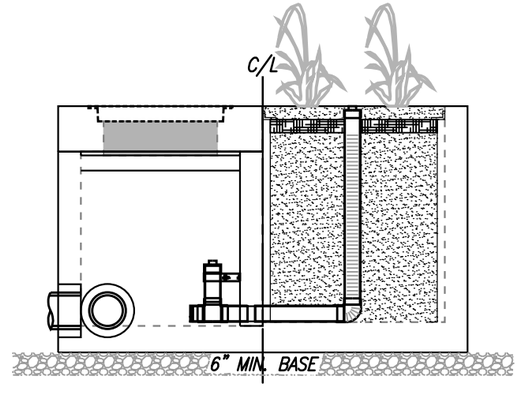
5. VERTICAL HEIGHT VARIES BASED ON SITE SPECIFIC REQUIREMENTS.



ELEVATION VIEW



RIGHT END VIEW

MWS-L-8-20-V
STORMWATER BIOFILTRATION SYSTEM
STANDARD DETAIL

8/14/23SCOTT.SERTICH

NOTES:

1. MATERIAL:
   A. STAINLESS STEEL FRAME & HARDWARE
   B. PERFORATED STAINLESS STEEL, 5mm HOLES
   C. PERFORATED SCREEN, 51% OPEN AREA
2. CUSTOM SIZES AVAILABLE, CONTACT FERGUSON WATERWORKS
3. WARRANTY: 10-YEARS ON MANUFACTURED COMPONENTS
   (REFER TO FABCO WEBSITE FOR FURTHER DETAILS)
4. TYPICAL INSTALLATION:
   A. PASS SCREENS THROUGH MANHOLE OPENING AND ASSEMBLE SCREEN ASSEMBLY USING PROVIDED HARDWARE.
   B. POSITION CPS BASE AGAINST CATCH BASIN WALL IN FRONT OF OUTLET PIPE.
   C. MOUNT USING PROVIDED CONCRETE STRIKE ANCHORS AND SEAL EDGES WITH SILICONE IF NECESSARY.
   D. MEASURE HEIGHT FOR BYPASS AND MOUNT COVER USING PROVIDED CONCRETE STRIKE ANCHORS

CERTIFIED FULL TRASH CAPTURE DEVICE BY CALIFORNIA STATE WATERBOARD

PART NUMBER	PIPE DIA.	WIDTH (A)	DEPTH (B)	HEIGHT (C)	MIN. BYPASS HEIGHT (D)	FILTERED FLOW RATE	BYPASS FLOW RATE
STANDARD							
OCS12-1U	12"	14.00"	14.00"	12.00"	4.00"	4 CFS	4 CFS
OCS18-1U	18"	20.00"	20.00"	18.00"	7.00"	9 CFS	10 CFS
OCS24-1U	24"	28.00"	14.00"	24.00"	15.00"	10 CFS	20 CFS
OCS36-1U	36"	40.00"	20.00"	36.00"	20.00"	24 CFS	39 CFS
CALIFORNIA WATERBOARD APPROVED							
OCS12-1WU	12"	14.00"	14.00"	12.00"	4.00"	4 CFS	4 CFS
OCS18-1WU	18"	20.00"	20.00"	18.00"	7.00"	9 CFS	10 CFS
OCS24-1WU	24"	28.00"	14.00"	24.00"	15.00"	10 CFS	20 CFS
OCS36-1WU	36"	40.00"	20.00"	36.00"	20.00"	24 CFS	39 CFS
CALIFORNIA WATERBOARD APPROVED WITH QUICK RELEASE							
OCS12-1WUQ	12"	14.00"	14.00"	12.00"	4.00"	4 CFS	4 CFS
OCS18-1WUQ	18"	20.00"	20.00"	18.00"	7.00"	9 CFS	10 CFS
OCS24-1WUQ	24"	28.00"	14.00"	24.00"	15.00"	10 CFS	20 CFS
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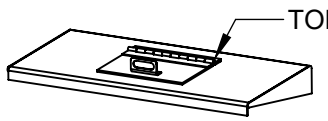
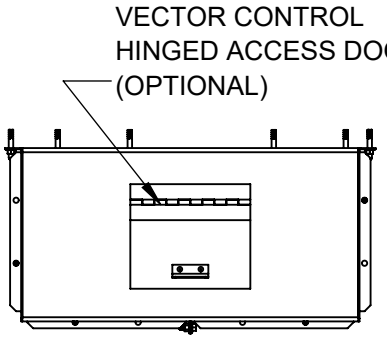
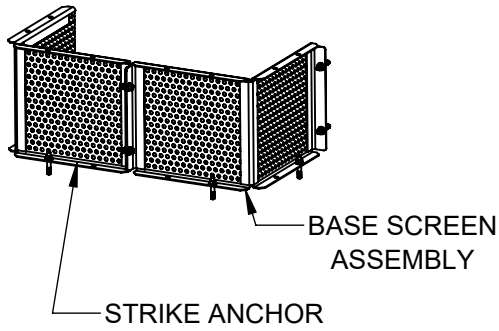
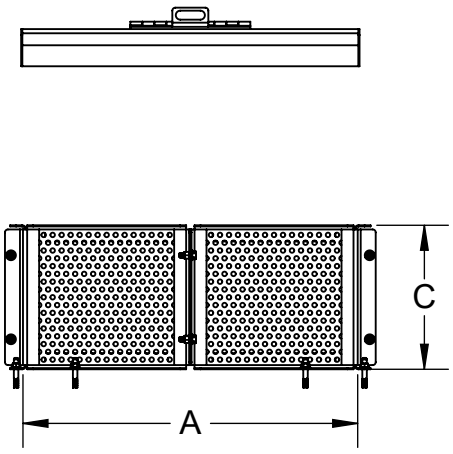


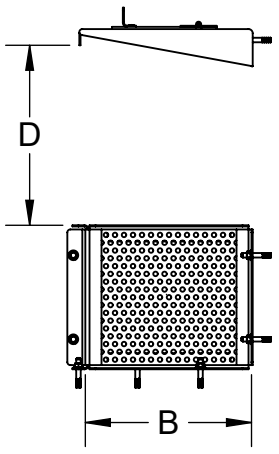


PLAN VIEW





FRONT VIEW



SIDE VIEW

FERGUSON WATERWORKS

fabco Industries Inc

NOT TO SCALE

7/18/2023

CPS, U-WALL-MOUNTED

Section VII Educational Materials

Refer to the Orange County Stormwater Program (ocwatersheds.com) for a library of materials available. Please only attach the educational materials specifically applicable to this project. Other materials specific to the project may be included as well and must be attached.

Education Materials			
Residential Material (http://www.ocwatersheds.com)	Check If Applicable	Business Material (http://www.ocwatersheds.com)	Check If Applicable
The Ocean Begins at Your Front Door	☒	Tips for the Automotive Industry	☐
Tips for Car Wash Fund-raisers	☐	Tips for Using Concrete and Mortar	☐
Tips for the Home Mechanic	☐	Tips for the Food Service Industry	☐
Homeowners Guide for Sustainable Water Use	☐	Proper Maintenance Practices for Your Business	☐
Household Tips	☒	Other Material	Check If Attached
Proper Disposal of Household Hazardous Waste	☒		
Recycle at Your Local Used Oil Collection Center (North County)	☐	DF-1 Drainage System Operation & Maintenance	☒
Recycle at Your Local Used Oil Collection Center (Central County)	☒	R-4 Home & Garden Care Activities	☒
Recycle at Your Local Used Oil Collection Center (South County)	☐	R-5 Disposal of Pet Waste	☒
Tips for Maintaining a Septic Tank System	☐	R-7 Household Hazardous Waste	☒
Responsible Pest Control	☒	R-8 Water Conservation	☒
Sewer Spill	☐	SD-12 Efficient Irrigation	☒
Tips for the Home Improvement Projects	☐	SD-13 Storm Drain Signage	☒
Tips for Horse Care	☐	SD-32 Trash Storage Areas	☒
Tips for Landscaping and Gardening	☐		
Tips for Pet Care	☒		
Tips for Pool Maintenance	☐		
Tips for Residential Pool, Landscape and Hardscape Drains	☒		
Tips for Projects Using Paint	☐		

ATTACHMENT A

EDUCATIONAL MATERIALS

The Ocean Begins at Your Front Door

Orange County Stormwater Program

Even if you live miles from the Pacific Ocean, you may be unknowingly polluting it.

Dumping one quart of motor oil into a storm drain can contaminate 250,000 gallons of water.

Did You Know?

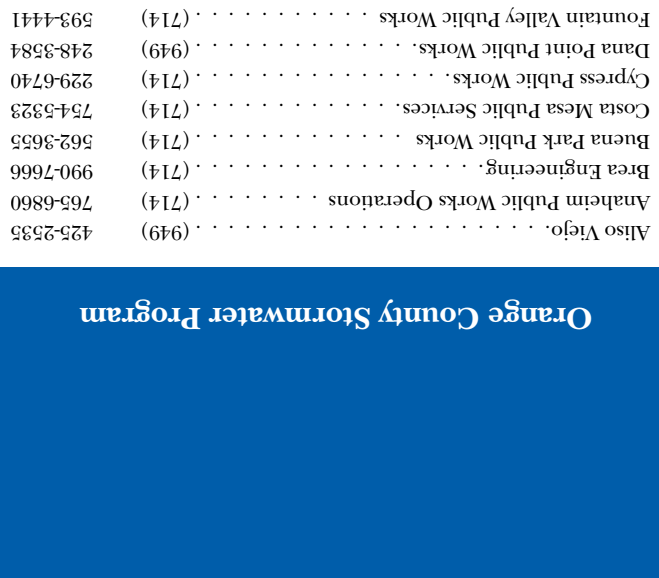
- Most people believe that the largest source of water pollution in urban areas comes from specific sources such as factories and sewage treatment plants. In fact, the largest source of water pollution comes from city streets, neighborhoods, construction sites and parking lots. This type of pollution is sometimes called “non-point source” pollution.
- There are two types of non-point source pollution: stormwater and urban runoff pollution.
- Stormwater runoff results from rainfall. When rainstorms cause large volumes of water to rinse the urban landscape, picking up pollutants along the way.
- Urban runoff can happen any time of the year when excessive water use from irrigation, vehicle washing and other sources carries trash, lawn clippings and other urban pollutants into storm drains.

Where Does It Go?

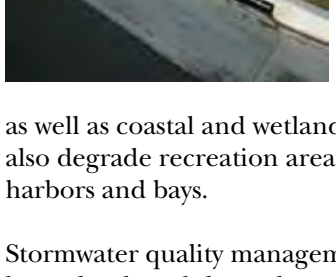
- Anything we use outside homes, vehicles and businesses – like motor oil, paint, pesticides, fertilizers and cleaners – can be blown or washed into storm drains.
- A little water from a garden hose or rain can also send materials into storm drains.
- Storm drains are separate from our sanitary sewer systems; unlike water in sanitary sewers (from sinks or toilets), water in storm drains is not treated before entering our waterways.

Sources of Non-Point Source Pollution

- Automotive leaks and spills.
- Improper disposal of used oil and other engine fluids.
- Metals found in vehicle exhaust, weathered paint, rust, metal plating and tires.
- Pesticides and fertilizers from lawns, gardens and farms.
- Improper disposal of cleaners, paint and paint removers.
- Soil erosion and dust debris from landscape and construction activities.
- Litter, lawn clippings, animal waste, and other organic matter.
- Oil stains on parking lots and paved surfaces.



The Effect on the Ocean



Non-point source pollution can have a serious impact on water quality in Orange County. Pollutants from the storm drain system can harm marine life as well as coastal and wetland habitats. They can also degrade recreation areas such as beaches, harbors and bays.

Stormwater quality management programs have been developed throughout Orange County to educate and encourage the public to protect water quality, monitor runoff in the storm drain system, investigate illegal dumping and maintain storm drains.

Support from Orange County residents and businesses is needed to improve water quality and reduce urban runoff pollution. Proper use and disposal of materials will help stop pollution before it reaches the storm drain and the ocean.

For More Information

California Environmental Protection Agency
www.calepa.ca.gov

- **Air Resources Board**
  www.arb.ca.gov
- **Department of Pesticide Regulation**
  www.cdpr.ca.gov
- **Department of Toxic Substances Control**
  www.dtsc.ca.gov
- **Integrated Waste Management Board**
  www.ciwmb.ca.gov
- **Office of Environmental Health Hazard Assessment**
  www.oehha.ca.gov
- **State Water Resources Control Board**
  www.waterboards.ca.gov

Earth 911 - Community-Specific Environmental Information 1-800-cleanup or visit www.1800cleanup.org

Health Care Agency’s Ocean and Bay Water Closure and Posting Hotline
(714) 433-6400 or visit www.ocbeachinfo.com

Integrated Waste Management Dept. of Orange County (714) 834-6752 or visit www.oclandfills.com for information on household hazardous waste collection centers, recycling centers and solid waste collection

O.C. Agriculture Commissioner
(714) 447-7100 or visit www.ocagcomm.com

Stormwater Best Management Practice Handbook
Visit www.cabmphandbooks.com

UC Master Gardener Hotline
(714) 708-1646 or visit www.uccemg.com

The Orange County Stormwater Program has created and moderates an electronic mailing list to facilitate communications, take questions and exchange ideas among its users about issues and topics related to stormwater and urban runoff and the implementation of program elements. To join the list, please send an email to ocstormwaterinfo-join@list.ocwatersheds.com

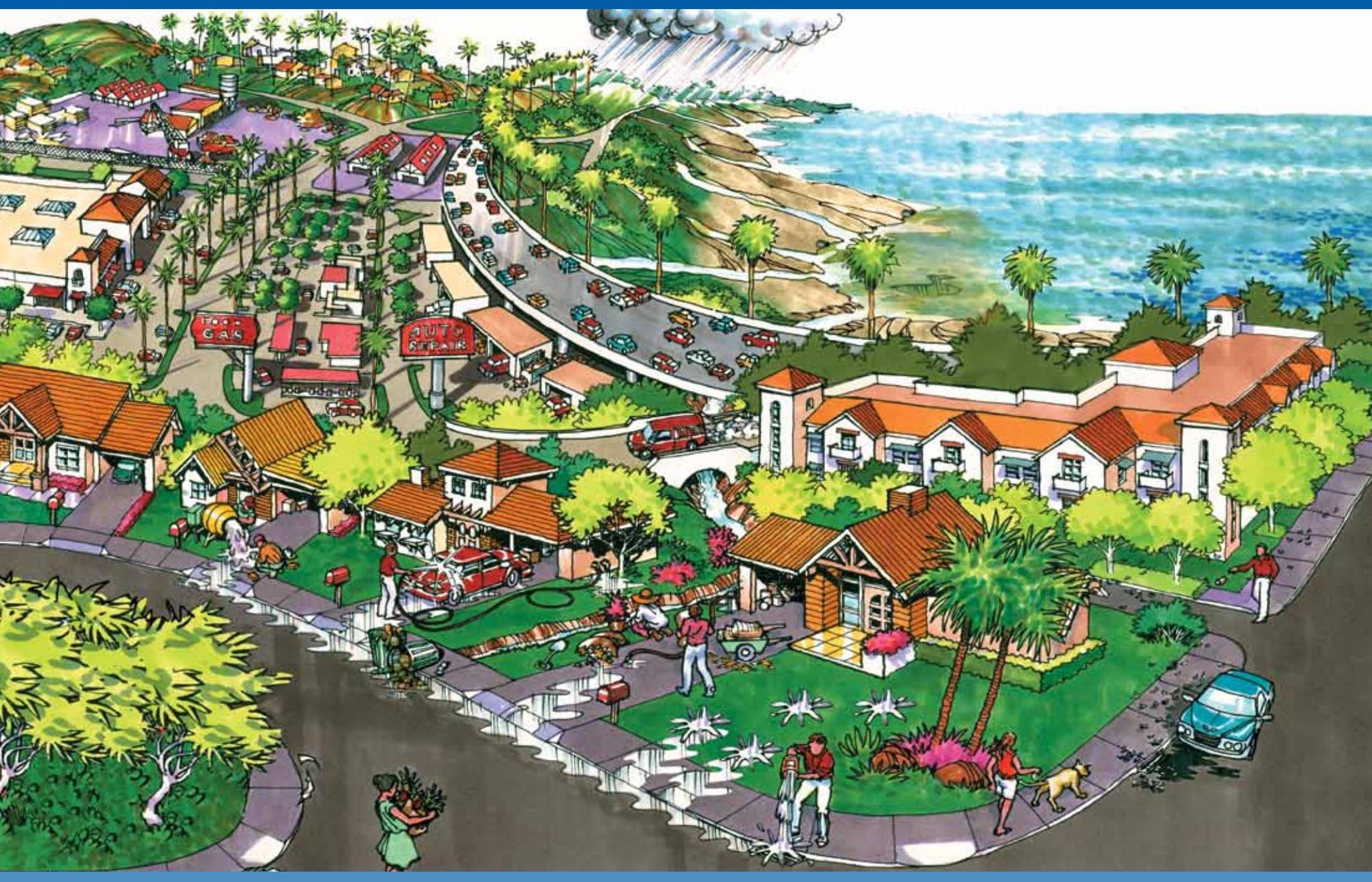
Aliso Viejo	(949)	425-2535
Anaheim Public Works Operations	(714)	765-6860
Brea Engineering	(714)	990-7666
Buena Park Public Works	(714)	562-3655
Costa Mesa Public Services	(714)	754-5323
Cypress Public Works	(714)	229-6740
Dana Point Public Works	(949)	248-3584
Fountain Valley Public Works	(714)	593-4441
Fullerton Engineering Dept.	(714)	738-6853
Garden Grove Public Works	(714)	741-5956
Huntington Beach Public Works	(714)	536-5431
Irvine Public Works	(949)	724-6315
La Habra Public Services	(562)	905-9792
La Palma Public Works	(714)	690-3310
Laguna Beach Water Quality	(949)	497-0378
Laguna Hills Public Services	(949)	707-2650
Laguna Niguel Public Works	(949)	362-4337
Laguna Woods Public Works	(949)	639-0500
Lake Forest Public Works	(949)	461-3480
Los Alamitos Community Dev.	(562)	431-3538
Mission Viejo Public Works	(949)	470-3056
Newport Beach, Code & Water Quality Enforcement	(949)	644-3215
Orange Public Works	(714)	532-6480
Placentia Public Works	(714)	993-8245
Rancho Santa Margarita	(949)	635-1800
San Clemente Environmental Programs	(949)	361-6143
San Juan Capistrano Engineering	(949)	234-4413
Santa Ana Public Works	(714)	647-3380
Seal Beach Engineering	(562)	431-2527 x317
Stanton Public Works	(714)	379-9222 x204
Tustin Public Works/Engineering	(714)	573-3150
Villa Park Engineering	(714)	998-1500
Westminster Public Works/Engineering	(714)	898-3311 x446
Yorba Linda Engineering	(714)	961-7138
Orange County Stormwater Program	(877)	897-7455

Orange County 24-Hour
Water Pollution Problem Reporting Hotline
1-877-89-SPILL (1-877-897-7455)

On-line Water Pollution Problem Reporting Form
www.ocwatersheds.com

Printed on Recycled Paper

The Ocean Begins at Your Front Door



Never allow pollutants to enter the street, gutter or storm drain!

Follow these simple steps to help reduce water pollution:

Household Activities

- Do not rinse spills with water. Use dry cleanup methods such as applying cat litter or another absorbent material, sweep and dispose of in the trash. Take items such as used or excess batteries, oven cleaners, automotive fluids, painting products and cathode ray tubes, like TVs and computer monitors, to a Household Hazardous Waste Collection Center (HHWCC).
- For a HHWCC near you call (714) 834-6752 or visit www.oclandfills.com.
- Do not hose down your driveway, sidewalk or patio to the street, gutter or storm drain. Sweep up debris and dispose of it in the trash.

Automotive

- Take your vehicle to a commercial car wash whenever possible. If you wash your vehicle at home, choose soaps, cleaners, or detergents labeled non-toxic, phosphate- free or biodegradable. Vegetable and citrus-based products are typically safest for the environment.
- Do not allow washwater from vehicle washing to drain into the street, gutter or storm drain. Excess washwater should be disposed of in the sanitary sewer (through a sink or toilet) or onto an absorbent surface like your lawn.
- Monitor your vehicles for leaks and place a pan under leaks. Keep your vehicles well maintained to stop and prevent leaks.
- Never pour oil or antifreeze in the street, gutter or storm drain. Recycle these substances at a service station, a waste oil collection center or used oil recycling center. For the nearest Used Oil Collection Center call 1-800-CLEANUP or visit www.1800cleanup.org.

Pool Maintenance

- Pool and spa water must be dechlorinated and free of excess acid, alkali or color to be allowed in the street, gutter or storm drain.
- When it is not raining, drain dechlorinated pool and spa water directly into the sanitary sewer.
- Some cities may have ordinances that do not allow pool water to be disposed of in the storm drain. Check with your city.

Landscape and Gardening

- Do not over-water. Water your lawn and garden by hand to control the amount of water you use or set irrigation systems to reflect seasonal water needs. If water flows off your yard onto your driveway or sidewalk, your system is over-watering. Periodically inspect and fix leaks and misdirected sprinklers.
- Do not rake or blow leaves, clippings or pruning waste into the street, gutter or storm drain. Instead, dispose of waste by composting, hauling it to a permitted landfill, or as green waste through your city's recycling program.
- Follow directions on pesticides and fertilizer, (measure, do not estimate amounts) and do not use if rain is predicted within 48 hours.
- Take unwanted pesticides to a HHWCC to be recycled. For locations and hours of HHWCC, call (714) 834-6752 or visit www.oclandfills.com.

Trash

- Place trash and litter that cannot be recycled in securely covered trash cans.
- Whenever possible, buy recycled products.
- Remember: Reduce, Reuse, Recycle.

Pet Care

- Always pick up after your pet. Flush waste down the toilet or dispose of it in the trash. Pet waste, if left outdoors, can wash into the street, gutter or storm drain.
- If possible, bathe your pets indoors. If you must bathe your pet outside, wash it on your lawn or another absorbent/permeable surface to keep the washwater from entering the street, gutter or storm drain.
- Follow directions for use of pet care products and dispose of any unused products at a HHWCC.

Common Pollutants

Home Maintenance
- Detergents, cleaners and solvents
- Oil and latex paint
- Swimming pool chemicals
- Outdoor trash and litter

Lawn and Garden
- Pet and animal waste
- Pesticides
- Clippings, leaves and soil
- Fertilizer

Automobile
- Oil and grease
- Radiator fluids and antifreeze
- Cleaning chemicals
- Brake pad dust

Do your part to prevent water pollution in our creeks, rivers, bays and ocean.

Clean beaches and healthy creeks, rivers, bays, and ocean are important to Orange County. However, many common household activities can lead to water pollution if you're not careful.

Remember the Water in Your Storm Drain is Not Treated BEFORE It Enters Our Waterways

Litter, oil, chemicals and other substances that are left on your yard or driveway can be blown or washed into storm drains that flow to the ocean. Over-watering your lawn and washing your car can also flush materials into the storm drains. Unlike water in sanitary sewers (from sinks and toilets), water in storm drains is not treated.

You would never pour soap, fertilizers or oil into the ocean, so don't let them enter streets, gutters or storm drains. Follow the easy tips in this brochure to help prevent water pollution.

For more information, please call the **Orange County Stormwater Program** at **1-877-89-SPILL** (1-877-897-7455) or visit **www.ocwatersheds.com**

To report a spill, call the **Orange County 24-Hour Water Pollution Problem Reporting Hotline 1-877-89-SPILL** (1-877-897-7455).

For emergencies, dial 911.

The tips contained in this brochure provide useful information to help prevent water pollution while performing everyday household activities. If you have other suggestions, please contact your city's stormwater representatives or call the Orange County Stormwater Program.

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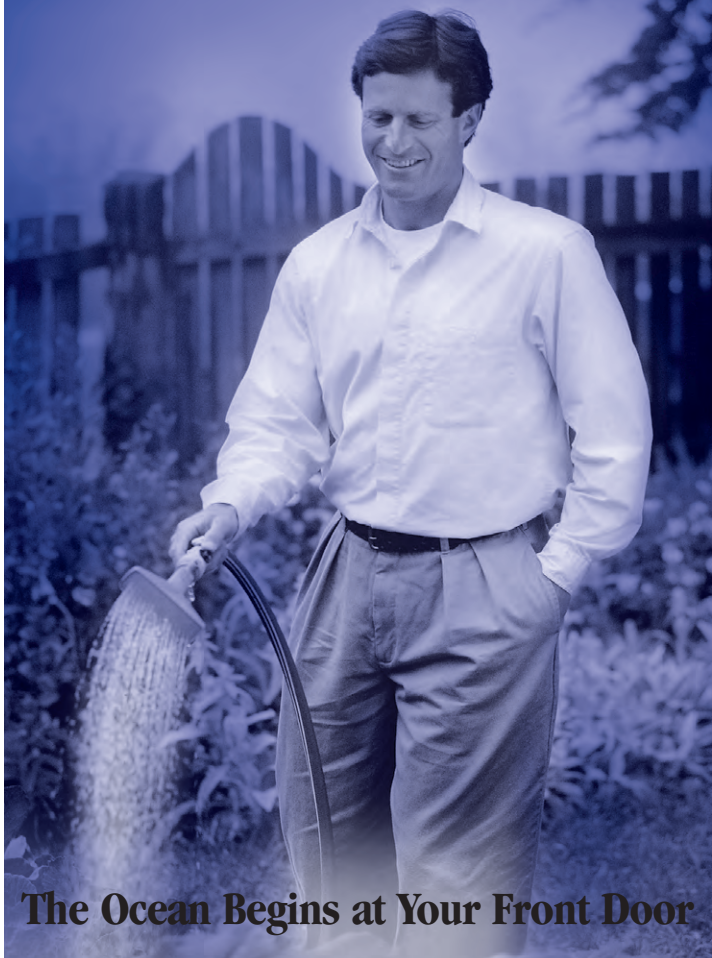
RECYCLE USED OIL

Help Prevent Ocean Pollution:

Household Tips



The Ocean Begins at Your Front Door

PROJECT Pollution PREVENTION

Pollution Prevention

Household Activities

- **Do not rinse spills with water!** Sweep outdoor spills and dispose of in the trash. For wet spills like oil, apply cat litter or another absorbent material, then sweep and bring to a household hazardous waste collection center (HHWCC).
- Securely cover trash cans.
- Take household hazardous waste to a household hazardous waste collection center.
- Store household hazardous waste in closed, labeled containers inside or under a cover.
- Do not hose down your driveway, sidewalk or patio. Sweep up debris and dispose of in trash.
- Always pick up after your pet. Flush waste down the toilet or dispose of in the trash.
- Bathe pets indoors or have them professionally groomed.

Household Hazardous Wastes include:

- ▲ **Batteries**
- ▲ **Paint thinners, paint strippers and removers**
- ▲ **Adhesives**
- ▲ **Drain openers**
- ▲ **Oven cleaners**
- ▲ **Wood and metal cleaners and polishes**
- ▲ **Herbicides and pesticides**
- ▲ **Fungicides/wood preservatives**
- ▲ **Automotive fluids and products**
- ▲ **Grease and rust solvents**
- ▲ **Thermometers and other products containing mercury**
- ▲ **Fluorescent lamps**
- ▲ **Cathode ray tubes, e.g. TVs, computer monitors**
- ▲ **Pool and spa chemicals**

Gardening Activities

- Follow directions on pesticides and fertilizers, (measure, do not estimate amounts) and do not use if rain is predicted within 48 hours.
- Water your lawn and garden by hand to control the amount of water you use. Set irrigation systems to reflect seasonal water needs. If water flows off your yard and onto your driveway or sidewalk, your system is over-watering.
- Mulch clippings or leave them on the lawn. If necessary, dispose in a green waste container.
- Cultivate your garden often to control weeds.

Washing and Maintaining Your Car

- Take your car to a commercial car wash whenever possible.
- Choose soaps, cleaners, or detergents labeled "non-toxic," "phosphate free" or "biodegradable." Vegetable and citrus-based products are typically safest for the environment, **but even these should not be allowed into the storm drain.**
- Shake floor mats into a trash can or vacuum to clean.
- Do not use acid-based wheel cleaners and "hose off" engine degreasers at home. They can be used at a commercial facility, which can properly process the washwater.
- **Do not dump washwater onto your driveway, sidewalk, street, gutter or storm drain.** Excess washwater should be disposed of in the sanitary sewers (through a sink, or toilet) or onto an absorbent surface like your lawn.
- Use a nozzle to turn off water when not actively washing down automobile.
- Monitor vehicles for leaks and place pans under leaks. Keep your car well maintained to stop and prevent leaks.
- Use cat litter or other absorbents and sweep to remove any materials deposited by vehicles. Contain sweepings and dispose of at a HHWCC.
- Perform automobile repair and maintenance under a covered area and use drip pans or plastic sheeting to keep spills and waste material from reaching storm drains.
- **Never pour oil or antifreeze in the street, gutter or storm drains.** Recycle these substances at a service station, HHWCC, or used oil recycling center. For the nearest Used Oil Collection Center call 1-800-CLEANUP or visit www.ciwmb.ca.gov/UsedOil.

For locations and hours of Household Hazardous Waste Collection Centers in Anaheim, Huntington Beach, Irvine and San Juan Capistrano, call (714)834-6752 or visit www.oclandfills.com.

Do your part to prevent water pollution in our creeks, rivers, bays and ocean.

Clean beaches and healthy creeks, rivers, bays and ocean are important to Orange County. However, not properly disposing of household hazardous waste can lead to water pollution. Batteries, electronics, paint, oil, gardening chemicals, cleaners and other hazardous materials cannot be thrown in the trash. They also must never be poured or thrown into yards, sidewalks, driveways, gutters or streets. Rain or other water could wash the materials into the storm drain and eventually into our waterways and the ocean. In addition, hazardous waste must not be poured in the sanitary sewers (sinks and toilets).

NEVER DISPOSE OF HOUSEHOLD HAZARDOUS WASTE IN THE TRASH, STREET, GUTTER, STORM DRAIN OR SEWER.

For more information,
please call the
Orange County Stormwater Program
at **1-877-89-SPILL** (1-877-897-7455)
or visit
www.ocwatersheds.com

To Report Illegal Dumping of Household Hazardous Waste call 1-800-69-TOXIC

To report a spill,
call the
Orange County 24-Hour Water Pollution Problem Reporting Hotline
1-877-89-SPILL (1-877-897-7455).

For emergencies, dial 911.

RECYCLE USED OIL

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Help Prevent Ocean Pollution:

Proper Disposal of Household Hazardous Waste

The Ocean Begins at Your Front Door

PROJECT Pollution PREVENTION

ORANGE COUNTY

Pollution Prevention

Leftover household products that contain corrosive, toxic, ignitable, or reactive ingredients are considered to be "household hazardous waste" or "HHW." HHW can be found throughout your home, including the bathroom, kitchen, laundry room and garage.

WHEN POSSIBLE, USE NON-HAZARDOUS OR LESS-HAZARDOUS PRODUCTS.

Disposal of HHW down the drain, on the ground, into storm drains, or in the trash is illegal and unsafe.

Proper disposal of HHW is actually easy. Simply drop them off at a Household Hazardous Waste Collection Center (HHWCC) for free disposal and recycling. Many materials including anti-freeze, latex-based paint, motor oil and batteries can be recycled. Some centers have a "Stop & Swap" program that lets you take partially used home, garden, and automobile products free of charge. There are four HHWCCs in Orange County:

Anaheim:.....1071 N. Blue Gum St
Huntington Beach:.....17121 Nichols St
Irvine:..... 6411 Oak Canyon
San Juan Capistrano:... 32250 La Pata Ave

Centers are open Tuesday-Saturday, 9 a.m.-3 p.m. Centers are closed on rainy days and major holidays. For more information, call **(714) 834-6752** or visit **www.oclandfills.com.**

Common household hazardous wastes

- Batteries
- Paint and paint products
- Adhesives
- Drain openers
- Household cleaning products
- Wood and metal cleaners and polishes
- Pesticides
- Fungicides/wood preservatives
- Automotive products (antifreeze, motor oil, fluids)
- Grease and rust solvents
- Fluorescent lamps
- Mercury (thermometers & thermostats)
- All forms of electronic waste including computers and microwaves
- Pool & spa chemicals
- Cleaners
- Medications
- Propane (camping & BBQ)
- Mercury-containing lamps
- Television & monitors (CRTs, flatscreens)

Tips for household hazardous waste

- Never dispose of HHW in the trash, street, gutter, storm drain or sewer.
- Keep these materials in closed, labeled containers and store materials indoors or under a cover.
- When possible, use non-hazardous products.
- Reuse products whenever possible or share with family and friends.
- Purchase only as much of a product as you'll need. Empty containers may be disposed of in the trash.
- HHW can be harmful to humans, pets and the environment. Report emergencies to 911.

Did you know that just one quart of oil can pollute 250,000 gallons of water?

A clean ocean and healthy creeks, rivers, bays and beaches are important to Orange County. However, not properly disposing of used oil can lead to water pollution. If you pour or drain oil onto driveways, sidewalks or streets, it can be washed into the storm drain. Unlike water in sanitary sewers (from sinks and toilets), water in storm drains is not treated before entering the ocean. Help prevent water pollution by taking your used oil to a used oil collection center.

Included in this brochure is a list of locations that will accept up to five gallons of used motor oil at no cost. Many also accept used oil filters. Please contact the facility before delivering your used oil. This listing of companies is for your reference and does not constitute a recommendation or endorsement of the company.

Please note that used oil filters may not be disposed of with regular household trash. They must be taken to a household hazardous waste collection or recycling center in Anaheim, Huntington Beach, Irvine or San Juan Capistrano. For information about these centers, visit www.oclandfills.com.

Please do not mix your oil with other substances!

For more information, please call the Orange County Stormwater Program at 1-877-89-SPILL (1-877-897-7455) or visit www.watersheds.com.

For information about the proper disposal of household hazardous waste, call the Household Waste Hotline at (714) 834-6752 or visit www.oclandfills.com.

RECYCLE USED OIL

For additional information about the nearest oil recycling center, call the Used Oil Program at 1-800-CLEANUP or visit www.cleanup.org.

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Help Prevent Ocean Pollution:

Recycle at Your Local Used Oil Collection Center

The Ocean Begins at Your Front Door

PROJECT Pollution PREVENTION

NORTH COUNTY

Used Oil Collection Centers

Anaheim

All Seasons Tire and Auto Center, Inc.
817 S Brookhurst St., Anaheim, CA 92804
(714)772-6090( )
CIWMB#: 30-C-03177

AutoZone #3317
423 N Anaheim Blvd., Anaheim, CA 92805
(714)776-0787( )
CIWMB#: 30-C-05263

AutoZone #5226
2145 W Lincoln Ave., Anaheim, CA 92801
(714)533-6599( )
CIWMB#: 30-C-04604

Bedard Automotive
3601 E Miraloma Ave., Anaheim, CA 92806
(714)528-1380( )
CIWMB#: 30-C-02205

Classic Chevrolet
1001 Weir Canyon Rd., Anaheim, CA 92807
(714)283-5400( )
CIWMB#: 30-C-05223

Econo Lube N' Tune #4
3201 W Lincoln Ave., Anaheim, CA 92801
(714)821-0128( )
CIWMB#: 30-C-01485

EZ Lube Inc - Savi Ranch #43
985 N Weir Canyon Rd., Anaheim, CA 92807
(714)556-1312( )
CIWMB#: 30-C-06011

Firestone Store #71C7
1200 S Magnolia Ave., Anaheim, CA 92804
(949)598-5520( )
CIWMB#: 30-C-05743

Great Western Lube Express
125 N Brookhurst St., Anaheim, CA 92801
(714)254-1300( )
CIWMB#: 30-C-05542

HR Pro Auto Service Center
3180 W Lincoln Ave., Anaheim, CA 92801
(714)761-4343( )
CIWMB#: 30-C-05927

Ira Newman Automotive Services
1507 N State College Blvd., Anaheim, CA 92806
(714)635-2392( )
CIWMB#: 30-C-01482

Jiffy Lube #1028
2400 W Ball Rd., Anaheim, CA 92804
(714)761-5211( )
CIWMB#: 30-C-00870

Jiffy Lube #1903
2505 E Lincoln Ave., Anaheim, CA 92806
(714)772-4000( )
CIWMB#: 30-C-05511

Jiffy Lube #2340
2181 W Lincoln Ave., Anaheim, CA 92801
(714)533-1000( )
CIWMB#: 30-C-04647

Kragen Auto Parts #1303
1088 N State College Blvd., Anaheim, CA 92806
(714)956-7351( )
CIWMB#: 30-C-03438

Kragen Auto Parts #1399
2245 W Ball Rd., Anaheim, CA 92804
(714)490-1274( )
CIWMB#: 30-C-04094

Kragen Auto Parts #1565
2072 Lincoln Ave., Anaheim, CA 92806
(714)502-6992( )
CIWMB#: 30-C-04078

Kragen Auto Parts #1582
3420 W Lincoln Ave., Anaheim, CA 92801
(714)828-7977( )
CIWMB#: 30-C-04103

Pep Boys #613
10912 Katella Ave., Anaheim, CA 92804
(714)638-0863( )
CIWMB#: 30-C-01756

Pep Boys #663
3030 W Lincoln Anaheim, CA 92801
(714)826-4810( )
CIWMB#: 30-C-03417

Pep Boys #809
8205 E Santa Ana Cyn Rd., Anaheim, CA 92808
(714)974-0105( )
CIWMB#: 30-C-03443

Pick Your Part
1235 S Beach Blvd., Anaheim, CA 92804
(714)527-1645( )
CIWMB#: 30-C-03744

PK Auto Performance
3106 W. Lincoln Ave., Anaheim, CA 92801
(714)826-2141( )
CIWMB#: 30-C-05628

Quick Change Lube and Oil
2731 W Lincoln Ave., Anaheim, CA 92801
(714)821-4464( )
CIWMB#: 30-C-04363

Saturn of Anaheim
1380 S Auto Center Dr., Anaheim, CA 92806
(714)648-2444( )
CIWMB#: 30-C-06332

Sun Tech Auto Service
105 S State College Blvd., Anaheim, CA 92806
(714)956-1389( )
CIWMB#: 30-C-06455

Vonic Truck Services
515 S Rose St., Anaheim, CA 92805
(714)533-3333( )
CIWMB#: 30-C-01142

Anaheim Hills

Anaheim Hills Car Wash & Lube
5810 E La Palma Ave., Anaheim Hills, CA 92807
(714)777-6605( )
CIWMB#: 30-C-01387

Brea

Firestone Store #27A9
891 E Imperial Hwy., Brea, CA 92821
(714)529-8404( )
CIWMB#: 30-C-01221

Oil Can Henry's
230 N Brea Blvd., Brea, CA 92821
(714)990-1900( )
CIWMB#: 30-C-04273

Buena Park

Firestone Store #71F7
6011 Orangethorpe Buena Park, CA 90620
(714)670-7912( )
CIWMB#: 30-C-01218

Firestone Store #71T8
8600 Beach Blvd., Buena Park, CA 90620
(714)827-5300( )
CIWMB#: 30-C-02121

Kragen Auto Parts #1204
5303 Beach Blvd., Buena Park, CA 90621
(714)994-1320( )
CIWMB#: 30-C-02623

Cypress

AutoZone #5521
5471 Lincoln Ave., Cypress, CA 90630
(714)995-4644( )
CIWMB#: 30-C-00836

Big O Tires
6052 Cerritos Ave., Cypress, CA 90630
(714)826-6334( )
CIWMB#: 30-C-04245

Econo Lube N' Tune #213
5497 Cerritos Ave., Cypress, CA 90630
(714)761-0456( )
CIWMB#: 30-C-06240

Jiffy Lube #851
4942 Lincoln Ave., Cypress, CA 90630
(626)965-9689( )
CIWMB#: 30-C-06182

M & N Coastline Auto & Tire Service
4005 Ball Rd., Cypress, CA 90630
(714)826-1001( )
CIWMB#: 30-C-04387

Masterlube #103
5904 Lincoln Cypress, CA 90630
(714)826-2323( )
CIWMB#: 30-C-01071

Masterlube #104
5971 Ball Rd., Cypress, CA 90630
(714)220-1555( )
CIWMB#: 30-C-04682

Metric Motors of Cypress
6042 Cerritos Ave., Cypress, CA 90630
(714)821-4702( )
CIWMB#: 30-C-05157

Fullerton

AutoZone #2898
146 N. Raymond Ave., Fullerton, CA 92831
(714)870-9772( )
CIWMB#: 30-C-04488

AutoZone #5522
1801 Orangethorpe W. Fullerton, CA 92833
(714)870-8286( )
CIWMB#: 30-C-06062

AutoZone #5523
102 N Euclid Fullerton, CA 92832
(714)870-8286( )
CIWMB#: 30-C-04755

EZ Lube #17
4002 N Harbor Blvd., Fullerton, CA 92835
(714)871-9980( )
CIWMB#: 30-C-03741

Firestone Store #27EH
1933 N Placentia Ave., Fullerton, CA 92831
(714)993-7100( )
CIWMB#: 30-C-02122

Fox Service Center
1018 W Orangethorpe Fullerton, CA 92833
(714)879-1430( )
CIWMB#: 30-C-02318

Fullerton College Automotive Technology
321 E Chapman Ave., Fullerton, CA 92832
(714)992-7275( )
CIWMB#: 30-C-03165

Kragen Auto Parts #0731
2978 Yorba Linda Fullerton, CA 92831
(714)996-4780( )
CIWMB#: 30-C-02628

Kragen Auto Parts #4133
904 W Orangethorpe Ave., Fullerton, CA 92832
(714)526-3570( )
CIWMB#: 30-C-06256

Pep Boys #642
1530 S Harbor Blvd., Fullerton, CA 92832
(714)870-0700( )
CIWMB#: 30-C-01755

Sunnyside 76 Car Care Center
2701 N Brea Blvd., Fullerton, CA 92835
(714)256-0773( )
CIWMB#: 30-C-01381

Garden Grove

76 Pro Lube Plus
9001 Trask Ave., Garden Grove, CA 92844
(714)393-0590( )
CIWMB#: 30-C-05276

AutoZone #5527
13190 Harbor Blvd., Garden Grove, CA 92843
(714)636-5665( )
CIWMB#: 30-C-04760

David Murray Shell
12571 Vly View St., Garden Grove, CA 92845
(714)898-0170( )
CIWMB#: 30-C-00547

Express Lube & Wash
8100 Lampson Ave., Garden Grove, CA 92841
(909)316-8261( )
CIWMB#: 30-C-06544

Firestone Store #7180
10081 Chapman Ave., Garden Grove, CA 92840
(714)530-4630( )
CIWMB#: 30-C-01224

Firestone Store #71W3
13961 Brookhurst St., Garden Grove, CA 92843
(714)590-2741( )
CIWMB#: 30-C-03690

Jiffy Lube #1991
13970 Harbor Blvd., Garden Grove, CA 92843
(714)554-0610( )
CIWMB#: 30-C-05400

Kragen Auto Parts #1251
13933 N Harbor Blvd., Garden Grove, CA 92843
(714)554-3780( )
CIWMB#: 30-C-02663

Kragen Auto Parts #1555
9851 Chapman Ave., Garden Grove, CA 92841
(714)741-8030( )
CIWMB#: 30-C-04079

Nissan of Grarden Grove
9670 Trask Ave., Garden Grove, CA 92884
(714)537-0900( )
CIWMB#: 30-C-06553

Toyota of Garden Grove
9444 Trask Ave., Garden Grove, CA 92844
(714)895-5595( )
CIWMB#: 30-C-06555

La Habra

AutoZone #5532
1200 W Imperial Hwy., La Habra, CA 90631
(562)694-5337( )
CIWMB#: 30-C-04784

Burch Ford
201 N Harbor Blvd., La Habra, CA 90631
(562)691-3225( )
CIWMB#: 30-C-05179

Firestone Store #2736
1071 S Beach Blvd., La Habra, CA 90631
(562)691-1731( )
CIWMB#: 30-C-01169

Kragen Auto Parts #1569
1621 W Whittier Blvd., La Habra, CA 90631
(562)905-2538( )
CIWMB#: 30-C-04076

Pep Boys #997
125 W Imperial Hwy., La Habra, CA 90631
(714)447-0601( )
CIWMB#: 30-C-04026

SpeeDee Oil Change & Tune-Up
1580 W Imperial Hwy., La Habra, CA 90631
(562)697-3513( )

Los Alamitos

Jiffy Lube #1740
3311 Katella Ave., Los Alamitos, CA 90720
(562)596-1827( )
CIWMB#: 30-C-03529

Midway City

Bolsa Transmission
8331 Bolsa Ave., Midway City, CA 92655
(714)799-6158( )
CIWMB#: 30-C-05768

Placentia

Advanced Auto & Diesel
144 S Bradford Placentia, CA 92870
(714)996-8222( )
CIWMB#: 30-C-06242

Castner's Auto Service
214 S. Bradford Ave., Placentia, CA 92870
(714)528-1311( )
CIWMB#: 30-C-06452

Econo Lube N' Tune
100 W Chapman Ave., Placentia, CA 92870
(714)524-0424( )
CIWMB#: 30-C-06454

Fairway Ford
1350 E Yorba Linda Blvd., Placentia, CA 92870
(714)524-1200( )
CIWMB#: 30-C-01863

Seal Beach

M & N Coastline Auto & Tire Service
12239 Seal Beach Blvd., Seal Beach, CA 90740
(714)826-1001( )
CIWMB#: 30-C-04433

Seal Beach Chevron
12541 Seal Beach Blvd., Seal Beach, CA 90740
(949)495-0774(14)
CIWMB#: 30-C-06425

Stanton

AutoZone #2806
11320 Beach Blvd., Stanton, CA 90680
(714)895-7665( )
CIWMB#: 30-C-04563

Joe's Auto Clinic
11763 Beach Blvd., Stanton, CA 90680
(714)891-7715( )
CIWMB#: 30-C-03253

Kragen Auto Parts #1742
11951 Beach Blvd., Stanton, CA 90680
(714)799-7574( )
CIWMB#: 30-C-05231

Scher Tire #20
7000 Katella Ave., Stanton, CA 90680
(714)892-9924( )
CIWMB#: 30-C-05907

USA 10 Minute Oil Change
8100 Lampson Ave., Stanton, CA 92841
(714)373-4432( )
CIWMB#: 30-C-05909

Westminster

AutoZone #5543
6611 Westminster Blvd., Westminster, CA 92683
(714)898-2898( )
CIWMB#: 30-C-04964

AutoZone #5544
8481 Westminster Blvd., Westminster, CA 92683
(714)891-3511( )
CIWMB#: 30-C-04966

City of Westminster Corporate Yard
14381 Olive St., Westminster, CA 92683
(714)895-2876(292)
CIWMB#: 30-C-02008

Honda World
13600 Beach Blvd., Westminster, CA 92683
(714)890-8900( )
CIWMB#: 30-C-03639

Jiffy Lube #1579
6011 Westminster Blvd., Westminster, CA 92683
(714)899-2727( )
CIWMB#: 30-C-02745

John's Brake & Auto Repair
13050 Hoover St., Westminster, CA 92683
(714)379-2088( )
CIWMB#: 30-C-05617

Kragen Auto Parts #0762
6562 Westminster Blvd., Westminster, CA 92683
(714)898-0810( )
CIWMB#: 30-C-02590

Midway City Sanitary District
14451 Cedarwood St., Westminster, CA 92683
(714)893-3553( )
CIWMB#: 30-C-01626

Pep Boys #653
15221 Beach Blvd., Westminster, CA 92683
(714)893-8544( )
CIWMB#: 30-C-03415

Yorba Linda

AutoZone #5545
18528 Yorba Linda Blvd., Yorba Linda, CA 92886
(714)970-8933( )
CIWMB#: 30-C-04971

Econo Lube N' Tune
22270 La Palma Ave., Yorba Linda, CA 92887
(714)692-8394( )
CIWMB#: 30-C-06513

EZ Lube Inc. #41
17511 Yorba Linda Blvd., Yorba Linda, CA 92886
(714)556-1312( )
CIWMB#: 30-C-05739

Firestone Store #27T3
18500 Yorba Linda Blvd., Yorba Linda, CA 92886
(714)779-1966( )
CIWMB#: 30-C-01222

Jiffy Lube #1532
16751 Yorba Linda Blvd., Yorba Linda, CA 92886
(714)528-2800( )
CIWMB#: 30-C-03777

Mike Schultz Import Service
4832 Eureka Ave., Yorba Linda, CA 92886
(714)528-4411( )
CIWMB#: 30-C-04313

This information was provided by the County of Orange Integrated Waste Management Department and the California Integrated Waste Management Board (CIWMB).

Clean beaches and healthy creeks, rivers, bays and ocean are important to Orange County. However, many common activities such as pest control can lead to water pollution if you're not careful. Pesticide treatments must be planned and applied properly to ensure that pesticides do not enter the street, gutter or storm drain. Unlike water in sanitary sewers (from sinks and toilets), water in storm drains is not treated before entering our waterways.

You would never dump pesticides into the ocean, so don't let it enter the storm drains. Pesticides can cause significant damage to our environment if used improperly. If you are thinking of using a pesticide to control a pest, there are some important things to consider.

For more information,
please call
University of California Cooperative
Extension Master Gardeners at
(714) 708-1646
or visit these Web sites:
www.uccemg.org
www.ipm.ucdavis.edu

For instructions on collecting a specimen sample visit the Orange County Agriculture Commissioner's website at:
http://www.ocagcomm.com/ser_lab.asp

To report a spill, call the
Orange County 24-Hour
Water Pollution Problem
Reporting Hotline
at 1-877-89-SPILL (1-877-897-7455).

For emergencies, dial 911.

Information From:
Cheryl Wilen, Area IPM Advisor; Darren Haver, Watershed Management Advisor; Mary Louise Flint, IPM Education and Publication Director; Pamela M. Geisel, Environmental Horticulture Advisor; Carolyn L. Unruh, University of California Cooperative Extension staff writer. Photos courtesy of the UC Statewide IPM Program and Darren Haver.

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Help Prevent Ocean Pollution:

Responsible Pest Control

Tips for Pest Control

Key Steps to Follow:

Step 1: **Correctly identify the pest (insect, weed, rodent, or disease) and verify that it is actually causing the problem.**

Three life stages of the common lady beetle, a beneficial insect.

This is important because beneficial insects are often mistaken for pests and sprayed with pesticides needlessly.

Consult with a Certified Nursery Professional at a local nursery or garden center or send a sample of the pest to the Orange County Agricultural Commissioner's Office.

Determine if the pest is still present – even though you see damage, the pest may have left.

Step 2: **Determine how many pests are present and causing damage.**

Small pest populations may be controlled more safely using non-pesticide techniques. These include removing food sources, washing off leaves with a strong stream of water, blocking entry into the home using caulking and replacing problem plants with ones less susceptible to pests.

Integrated Pest Management (IPM) usually combines several least toxic pest control methods for long-term prevention and management of pest problems without harming you, your family, or the environment.

UC CE University of California Cooperative Extension

Step 3: **If a pesticide must be used, choose the least toxic chemical.**

Obtain information on the least toxic pesticides that are effective at controlling the target pest from the UC Statewide Integrated Pest Management (IPM) Program's Web site at www.ipm.ucdavis.edu.

Seek out the assistance of a Certified Nursery Professional at a local nursery or garden center when selecting a pesticide. Purchase the smallest amount of pesticide available.

Apply the pesticide to the pest during its most vulnerable life stage. This information can be found on the pesticide label.

Step 4: **Wear appropriate protective clothing.**

Follow pesticide labels regarding specific types of protective equipment you should wear. Protective clothing should always be washed separately from other clothing.

Step 5: **Continuously monitor external conditions when applying pesticides such as weather, irrigation, and the presence of children and animals.**

Never apply pesticides when rain is predicted within the next 48 hours. Also, do not water after applying pesticides unless the directions say it is necessary.

Apply pesticides when the air is still; breezy conditions may cause the spray or dust to drift away from your targeted area.

In case of an emergency call 911 and/or the regional poison control number at (714) 634-5988 or (800) 544-4404 (CA only).

For general questions you may also visit www.calpoison.org.

Step 6: **In the event of accidental spills, sweep up or use an absorbent agent to remove any excess pesticides. Avoid the use of water.**

Be prepared. Have a broom, dust pan, or dry absorbent material, such as cat litter, newspapers or paper towels, ready to assist in cleaning up spills.

Contain and clean up the spill right away. Place contaminated materials in a doubled plastic bag. All materials used to clean up the spill should be properly disposed of according to your local Household Hazardous Waste Disposal site.

Step 7: **Properly store and dispose of unused pesticides.**

Purchase Ready-To-Use (RTU) products to avoid storing large concentrated quantities of pesticides.

Store unused chemicals in a locked cabinet.

Unused pesticide chemicals may be disposed of at a Household Hazardous Waste Collection Center.

Empty pesticide containers should be triple rinsed prior to disposing of them in the trash.

Household Hazardous Waste Collection Center
(714) 834-6752
www.oclandfills.com

PROJECT Pollution PREVENTION

Clean beaches and healthy creeks, rivers, bays and ocean are important to Orange County. However, many common activities can lead to water pollution if you're not careful. Pet waste and pet care products can be washed into the storm drains that flow to the ocean. Unlike water in sanitary sewers (from sinks and toilets), water in storm drains is not treated before entering our waterways.

You would never put pet waste or pet care products into the ocean, so don't let them enter the storm drains. Follow these easy tips to help prevent water pollution.

For more information,
please call the
Orange County Stormwater Program
at **1-877-89-SPILL** (1-877-897-7455)
or visit
www.ocwatersheds.com

To report a spill,
call the
Orange County 24-Hour Water Pollution Problem Reporting Hotline
1-877-89-SPILL (1-877-897-7455).

For emergencies, dial 911.

The tips contained in this brochure provide useful information to help prevent water pollution while caring for your pet. If you have other suggestions, please contact your city's stormwater representatives or call the Orange County Stormwater Program.

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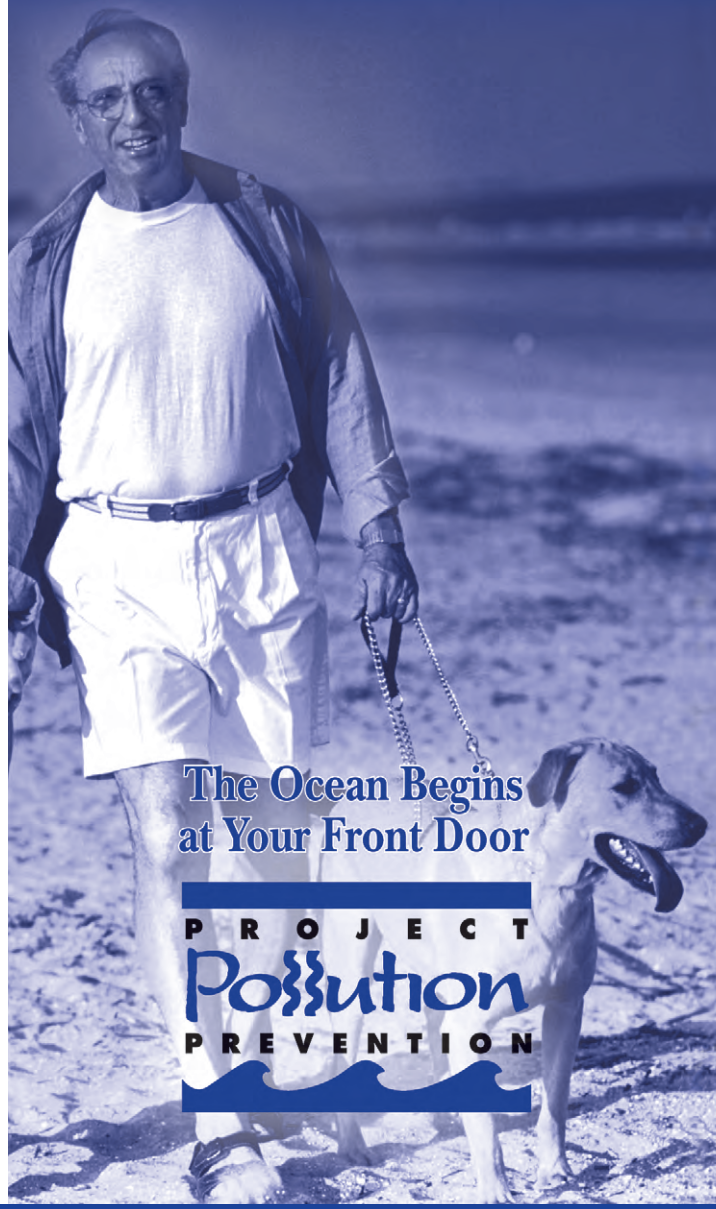
Help Prevent Ocean Pollution:

Tips for Pet Care



Tips for Pet Care

Never let any pet care products or washwater run off your yard and into the street, gutter or storm drain.

Washing Your Pets

Even biodegradable soaps and shampoos can be harmful to marine life and the environment.

- If possible, bathe your pets indoors using less-toxic shampoos or have your pet professionally groomed. Follow instructions on the products and clean up spills.

- If you bathe your pet outside, wash it on your lawn or another absorbent/ permeable surface to keep the washwater from running into the street, gutter or storm drain.

Flea Control

- Consider using oral or topical flea control products.

- If you use flea control products such as shampoos, sprays or collars, make sure to dispose of any unused products at a Household Hazardous Waste Collection Center. For location information, call **(714) 834-6752**.

Why You Should Pick Up After Your Pet

It's the law! Every city has an ordinance requiring you to pick up after your pet. Besides being a nuisance, pet waste can lead to water pollution, even if you live inland. During rainfall, pet waste left outdoors can wash into storm drains. This waste flows directly into our waterways and the ocean where it can harm human health, marine life and the environment.

As it decomposes, pet waste demands a high level of oxygen from water. This decomposition can contribute to killing marine life by reducing the amount of dissolved oxygen available to them.

Have fun with your pets, but please be a responsible pet owner by taking care of them and the environment.

- Take a bag with you on walks to pick up after your pet.

- Dispose of the waste in the trash or in a toilet.

PROJECT Pollution PREVENTION

For more information,
please call the
Orange County Stormwater Program
at **1-877-89-SPILL** (1-877-897-7455)
or visit
www.ocwatersheds.com

To report a spill,
call the
Orange County 24-Hour
Water Pollution Problem
Reporting Hotline
at **1-877-89-SPILL** (1-877-897-7455).

For emergencies, dial 911.

The tips contained in this brochure provide useful information to help prevent water pollution. If you have other suggestions, please contact your city's stormwater representatives or call the Orange County Stormwater Program.

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Help Prevent Ocean Pollution:

Tips for Residential Pool, Landscape and Hardscape Drains

The Ocean Begins at Your Front Door

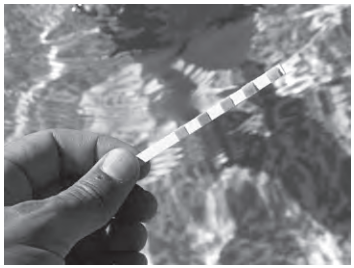
PROJECT Pollution PREVENTION

Tips for Residential Pool, Landscape and Hardscape Drains

Pool Maintenance

All pool water discharged to the curb, gutter or permitted pool drain from your property must meet the following water quality criteria:

- The residual chlorine does not exceed 0.1 mg/L (parts per million).
- The pH is between 6.5 and 8.5.
- The water is free of any unusual coloration.
- There is no discharge of filter media or acid cleaning wastes.



Some cities have ordinances that do not allow pool water to be discharged to the storm drain. Check with your city.

Landscape and Hardscape Drains

The following recommendations will help reduce or prevent pollutants from your landscape and hardscape drains from entering the street, gutter or storm drain. Unlike water that enters the sewer (from sinks and toilets), water that enters a landscape or hardscape drain is not treated before entering our creeks, rivers, bays and ocean.

Household Activities

- Do not rinse spills of materials or chemicals to any drain.
- Use dry cleanup methods such as applying cat litter or another absorbent material, then sweep it up and dispose of it in the trash. If the material is hazardous, dispose of it at a Household Hazardous Waste Collection Center (HHWCC). For locations, call **(714) 834-6752** or visit **www.oclandfills.com**.
- Do not hose down your driveways, sidewalks or patios to your landscape or hardscape drain. Sweep up debris and dispose of it in the trash.
- Always pick up after your pet. Flush waste down the toilet or dispose of it in the trash.
- Do not store items such as cleaners, batteries, automotive fluids, paint products, TVs, or computer monitors uncovered outdoors. Take them to a HHWCC for disposal.

Yard Maintenance

- Do not overwater. Water by hand or set automated irrigation systems to reflect seasonal water needs.
- Follow directions on pesticides and fertilizers (measure, do not estimate amounts) and do not use if rain is predicted within 48 hours.
- Cultivate your garden often to control weeds and reduce the need to use chemicals.

Vehicle Maintenance

- Never pour oil or antifreeze down your landscape or hardscape drain. Recycle these substances at a service station, a waste collection center or used oil recycling center. For locations, contact the Used Oil Program at **1-800-CLEANUP** or visit **www.CLEANUP.org**.
- Whenever possible, take your vehicle to a commercial car wash.
- If you do wash your vehicle at home, do not allow the washwater to go down your landscape or hardscape drain. Instead, dispose of it in the sanitary sewer (a sink or toilet) or onto an absorbent surface such as your lawn.
- Use a spray nozzle that will shut off the water when not in use.

DF-1
DRAINAGE FACILITY OPERATION AND MAINTENANCE

As a consequence of its function, the stormwater conveyance system collects and transports urban runoff and storm water that may contain certain pollutants. Consequently these pollutants may accumulate in the system and must be removed periodically. In addition, the systems must also be maintained to function properly hydraulically to avoid flooding. Maintaining the system may involve the following activities:

1. Inspection and Cleaning of Stormwater Conveyance Structures
2. Controlling Illicit Connections and Discharges
3. Controlling Illegal Dumping

This list of Model Maintenance Procedures can be utilized as an inspection checklist to determine where better compliance with Designated Minimum Best Management Practices (notated with checkmarks and capital letters) is needed, and to recommend Additional Best Management Practices (notated with bullet points and lower case letters) that may be applicable under certain circumstances, especially where there are certain Pollutant Constituents of Concern. BMPs applicable to certain constituents are notated as:

Bacteria (BACT) *Sediment (SED)* *Nutrients (NUT)* *Oil and Grease (O&G)* *Pesticides (PEST)*
OtherToxic Compounds (TOX) *Trash (TRASH)* *Hydrological Impacts (HYD)* *Any/All or General (ANY)*

Program/Facility Being Inspected: _____

Date: _____ Inspector Name: _____

When completed, the checklist should be attached to the General Inspection Form Cover Sheet and copies should be provided to the Supervisor of the Facility/Program being inspected.

MAINTENANCE PROCEDURES:

1. Inspection and Cleaning of Drainage Facilities

Unsatisfactory	OK
☐ _____	☐
☐ _____	☐
☐ _____	☐
☐ _____	☐
☐ _____	☐
☐ _____	☐
☐ _____	☐
☐ _____	☐

General Guidelines

- T 1A. Annually inspect and clean drainage structures as needed.
- T 1B. Maintain appropriate records of cleaning and inspections.
- T 1C. Properly dispose of removed materials at a landfill or recycling facility.
- T 1D. Conduct intermittent supplemental visual inspections during the wet season to determine if there are problem inlets where sediment/trash or other pollutants accumulate, and provide for additional cleanouts as appropriate.
- T 1E. Prevent or clean up any discharges that may occur during the course of maintenance and cleaning procedures.
- T 1F. Verify that appropriate employees or subcontractors are trained in proper conductance of maintenance activities, including record keeping and disposal.
- T 1G. Annually inspect and clean v-ditches as needed, prior to the wet season. On shrub-covered slopes, vegetative debris may be placed on the downhill side of the ditch. Trash should be bagged and disposed at a landfill.

Unsatisfactory	OK
☐	☐
☐	☐
☐	☐
☐	☐
☐	☐
☐	☐
☐	☐
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☐	☐
☐	☐

General Guidelines (cont.)

- 1a. Remove trash or debris as needed from open channels. It should be noted that major vegetative debris removal may require other regulatory permits prior to completing the work. (TRASH)
- 1b. Consider retrofitting energy dissipaters (e.g. riprap) below culvert outfalls to minimize potential for erosion. (SED)
- 1c. Repair any v-ditches that have cracked or displaced in a manner that accelerates erosion. (SED)
- 1d. If suspicious conditions appear to exist, test selected samples of the removed wastes for compliance with hazardous waste regulations prior to disposal. (TOX)
- 1e. Consider more frequent regular cleaning of selected drainage structures to help address ongoing specific impairments. (SED, BACT, NUT, TRASH)
- 1f. Consider structural retrofits to the MS4 to help address ongoing specific impairments (SED, BACT, NUT, TRASH, O&G)
- 1g. Consider cleaning out pipes at gradient breaks or other in-pipe debris accumulation points as identified/needed. (ANY, BACT, NUT, TRASH)

Storm Drain Flushing

- 1h. Flushing of storm drains or storm drain inlets should only be done when critically necessary and no other solution is practical. (SED, BACT, TRASH).
- 1i. If flushed, to the extent practical the material should be collected (vacuumed), treated with an appropriate filtering device to remove sand and debris and disposed of properly. (SED)

Waste Management

- 1H. Store wastes collected from cleaning activities of the drainage facilities in appropriate containers or temporary storage sites in a manner that prevents discharge to the storm drain.
- 1j. Dewater the wastes if necessary with outflow into the sanitary sewer if permitted. Water should be treated with an appropriate filtering device to remove the sand and debris prior to discharge to the sanitary sewer. If discharge to the sanitary sewer is not permitted, water should be pumped or vacuumed to a tank and properly disposed of. Do not dewater near a storm drain or stream. (SED, TRASH)
- 1k. Provide for laboratory analysis of at least one randomly collected sediment (less the debris) sample per year from the storm drain inlet leaning program to ensure that it does not meet the EPA criteria for hazardous waste. If the sample is determined to be hazardous, the sediment must be disposed of as hazardous waste and the source should be investigated. (TOX).

2. Controlling Illicit Connections and Discharges

Unsatisfactory	OK	
☐	☐	T 2A. Report prohibited discharges such as dumping, paint spills, abandoned oil containers, etc. observed during the course of normal daily activities so they can be investigated, contained, and cleaned up.
☐	☐	T 2B. Where field observations and/or monitoring data indicate significant problems, conduct field investigations to detect and eliminate existing illicit connections and improper disposal of pollutants into the storm drain (i.e. identify problem areas where discharges or illegal connections may occur and follow up stream to determine the source(s)). (Refer to Appendices A-10 and A-11.)
☐	☐	T 2C. Report all observed illicit connections and discharges to the 24-hour water pollution problem reporting hotline (714) 567-6363.
☐	☐	T 2D. Encourage public reporting of improper waste disposal by distributing public education materials and advertising the 24-hour water pollution problem reporting hotline.
		Storm Drain Stenciling ("No Dumping—Drains to Ocean")
☐	☐	T 2E. Implement and maintain a storm drain stenciling program.
☐	☐	• 2a. Consider adding the hotline number to the storm drain stencils (BACT, TOX, TRASH).

3. Controlling Illegal Dumping

		Field Investigation
☐	☐	T 3A. Report prohibited discharges such as dumpings observed during the course of normal daily activities so they can be investigated, contained and cleaned up.
☐	☐	T 3B. Conduct field investigations to detect and eliminate improper disposal of pollutants into the storm drain (i.e. identify problem areas where discharges or illegal connections may occur and follow up stream to determine the source(s)).
☐	☐	T 3C. Report all observed illegal dumping to the 24-hour water pollution problem reporting hotline (714) 567-6363.
☐	☐	T 3D. Encourage public reporting of improper waste disposal by distributing public education materials and advertising the 24-hour water pollution problem reporting hotline.
☐	☐	T 3E. If perpetrator can be identified, take appropriate enforcement action.
☐	☐	• 3a. Consider posting "No Dumping" signs in problem areas with a phone number for reporting dumping and disposal. Signs could also indicate fines and penalties for illegal dumping. (ANY)

Unsatisfactory	OK	Training/Education/Outreach
☐ _____	☐	T 3F. Verify that appropriate employees and subcontractors are trained to recognize and report illegal dumping.
☐ _____	☐	T 3G. Encourage public reporting of illegal dumping by advertising the 24-hour water pollution problem reporting hotline (714) 567-6363.
☐ _____	☐	• 3b. Take extra steps to educate the public in neighborhoods where illegal dumping has occurred to inform them why illegal dumping is a problem, and that illegal dumping carries a significant financial penalty. (ANY)

LIMITATIONS:

Clean-up activities may create a slight disturbance for local aquatic species. Access to items and material on private property may be limited. Trade-offs may exist between channel hydraulics and water quality/riparian habitat. If storm channels or basins are recognized as wetlands, many activities, including maintenance, may be subject to regulation and permitting.

R-4
HOME AND GARDEN CARE ACTIVITIES

The activities outlined in this fact sheet target the following pollutants:	
Sediment	x
Nutrients	
Bacteria	x
Foaming Agents	x
Metals	x
Hydrocarbons	x
Hazardous Materials	x
Pesticides and Herbicides	
Other	x

HOME CARE

Many hazardous materials may be used in and around residences during routine maintenance activities (such as: oils, paints, cleaners, bleaches, pesticides, glues, solvents, and other products). Improper or excessive use of these products can increase the potential for pollutants to be transported to the storm drain by runoff. The pollution prevention activities outlined in this fact sheets are used to prevent the discharge of pollutants to the storm drain system.

Think before conducting home care activities. Remember - The ocean starts at your front door.

Required Activities

- Clean out painting equipment in an area where the waste can be contained and properly disposed of (latex – sewer, oil based – household hazardous waste center).
- Rinse off cement mixers and cement laden tools in a contained washout area. Dispose of dried concrete waste in household trash.
- If safe, contain, clean up, and properly dispose all household hazardous waste spills. If an unsafe condition exists, call 911 to activate the proper response team.
- Household hazardous materials must be stored indoors or under cover, and in closed and labeled containers. Dispose of them at a household hazardous waste center.
- Household wash waters (e.g. washer machine effluent, mop water, etc.) must be disposed of in the sanitary sewer.
- Pool and spa water may be discharged to the storm drain if residual chlorine is less than 0.1 mg/L, the pH is between 6.5 and 8.5, and the water is free from any unusual coloration. (Call 714-834-6107 to obtain information on a pool drain permit). Pool filter media must be contained and disposed of properly.

Recommended Activities

- Only purchase the types and amounts of materials needed.
- Share unused portions of products with neighbors or community programs (latex paint)

For additional information contact:
County of Orange, OC Watershed
Main: (714) 955-0600/ 24hr Water Pollution Discharge Hotline 1-877-89-SPILL
or visit our website at: www.ocwatersheds.com

GARDEN CARE

Garden activities may contribute pollutants via soil erosion, green waste, fertilizer and pesticide use. Plant and garden care activities such as landscape maintenance, fertilization, and pesticide application have the potential to discharge significant quantities of pollutants to the storm drain system. Nonvegetated surfaces may allow for significant erosion leading to high sediment loads. Other pollutants such as pesticides may adsorb onto the soil particles and be transported off site. Excess fertilizer and pesticide pollutants from over application may be carried to the storm drain by dissolving in irrigation runoff or rainwater. Green wastes may also contain organic matter and may have adsorbed fertilizers and pesticides.

The activities outlined in this fact sheet target the following pollutants:	
Sediment	x
Nutrients	x
Bacteria	x
Foaming Agents	
Metals	
Hydrocarbons	
Hazardous Materials	
Pesticides and Herbicides	x
Other	x

Excessive irrigation is often the most significant factor in home and garden care activities. Pollutants may dissolve in irrigation water and then be transported to the storm drain, or particles and materials coated with fertilizers and pesticides may be suspended in the irrigation flow and carried to the storm drain. The pollution prevention activities outlined in this fact sheets are used to prevent the discharge of pollutants to the storm drain system.

Think before conducting garden care activities. Remember - The ocean starts at your front door.

Required Activities

- Irrigation systems must be properly adjusted to reflect seasonal water needs.
- Minimize the use of pesticides and fertilizers. Read the labels and follow directions to avoid improper use. Do not apply chemicals if it is windy or about to rain.
- Properly clean up and dispose of spills of gardening chemicals, fertilizes, or soils. If possible, return the spilled material to the container for future use.
- Lawn and garden care products must be stored in closed labeled containers, in covered areas, or off-ground and under protective tarps.
- Household hazardous waste must be properly disposed at a household hazardous waste center.
- Cover nonvegetated surfaces to prevent erosion.

Recommended Activities

- Utilize xeroscaping and use of drought and insect resistant landscaping.
- Cultivate garden often to control weeds
- Use integrated pest management (IPM). Planting pest repelling plants (e.g. Marigolds) or using pest eating insects (e.g. ladybugs) may reduce the need for pesticides.
- Do not leave food (human or pet) outside overnight
- Remove fruit and garden waste

For additional information contact:
County of Orange, OC Watershed
Main: (714) 955-0600/ 24hr Water Pollution Discharge Hotline 1-877-89-SPILL
or visit our website at: www.ocwatersheds.com

R-5
DISPOSAL OF PET WASTES

Pet wastes left in the environment may introduce solids, bacteria, and nutrients to the storm drain. The type and quantity of waste will dictate the proper disposal method. Small quantities of waste are best disposed with regular trash or flushed down a toilet. Large quantities of wastes from herbivore animals may be composted for subsequent use or disposal to landfill.

The activities outlined in this fact sheet target the following pollutants:	
Sediment	x
Nutrients	x
Bacteria	x
Foaming Agents	
Metals	
Hydrocarbons	
Hazardous Materials	
Pesticides and Herbicides	
Other	

Pick up after your pet! It's as easy as 1-2-3. 1) Bring a bag. 2) Clean it up. 3) Dispose of it properly (toilet or trash). The pollution prevention activities outlined in this fact sheets are used to prevent the discharge of pollutants to the storm drain system.

Think before you dispose of any pet wastes. Remember - The ocean starts at your front door.

Required Activities

- All pet wastes must be picked up and properly disposed of. Pet waste should be disposed of in the regular trash, flushed down a toilet, or composted as type and quantities dictate.
- Properly dispose of unused flea control products (shampoo, sprays, or collars).
- Manure produced by livestock in uncovered areas should be removed at least daily for composting, or storage in water-tight container prior to disposal. Never hose down to stream or storm drain. Composting or storage areas should be configured and maintained so as not to allow contact with runoff. Compost may be donated to greenhouses, nurseries, and botanical parks. Topsoil companies and composting centers may also accept composted manure.
- Line waste pits or trenches with an impermeable layer, such as thick plastic sheeting.
- When possible, allow wash water to infiltrate into the ground, or collect in an area that is routed to the sanitary sewer.
- Confine livestock in fenced in areas except during exercise and grazing times. Restrict animal access to creeks and streams, preferably by fencing.

For additional information contact:
County of Orange, OC Watershed
Main: (714) 955-0600/ 24hr Water Pollution Discharge Hotline 1-877-89-SPILL
or visit our website at: www.ocwatersheds.com

- Install gutters that will divert roof runoff away from livestock areas.

Recommended Activities

- In order to properly dispose of pet waste, carry bags, pooper-scooper, or equivalent to safely pick up pet wastes while walking with pets.

- Bathe pets indoors and use less toxic shampoos. When possible, have pets professionally groomed.

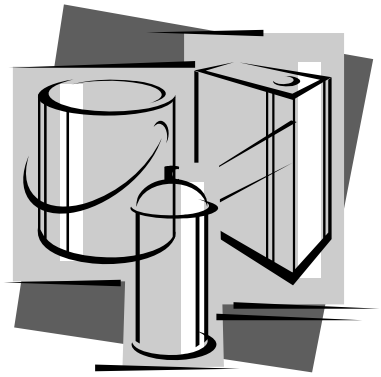
- Properly inoculate your pet in order to maintain their health and reduce the possibility of pathogens in pet wastes.

- Maintain healthy and vigorous pastures with at least three inches of leafy material.

- Consider indoor feeding of livestock during heavy rainfall, to minimize manure exposed to potential runoff.

- Locate barns, corrals, and other high use areas on portions of property that either drain away from or are located distant form nearby creeks or storm drains.

For additional information contact:
County of Orange, OC Watershed
Main: (714) 955-0600/ 24hr Water Pollution Discharge Hotline 1-877-89-SPILL
or visit our website at: www.ocwatersheds.com



R-7
HOUSEHOLD HAZARDOUS WASTE

Household hazardous wastes (HHW) are defined as waste materials which are typically found in homes or similar sources, which exhibit characteristics such as: corrosivity, ignitability, reactivity, and/or toxicity, or are listed as hazardous materials by EPA.

The activities outlined in this fact sheet target the following pollutants:	
Sediment	
Nutrients	
Bacteria	
Foaming Agents	x
Metals	x
Hydrocarbons	x
Hazardous Materials	x
Pesticides and Herbicides	x
Other	x

List of most common HHW products:

Drain openers
Oven cleaners
Wood and metal cleaners and polishes
Automotive oil and fuel additives
Grease and rust solvents
Carburetor and fuel injection cleaners
Starter fluids
Batteries
Paint Thinners
Paint strippers and removers
Adhesives
Herbicides
Pesticides
Fungicides/wood preservatives

Many types of waste can be recycled, however options for each waste type are limited. Recycling is always preferable to disposal of unwanted materials. All gasoline, antifreeze, waste oil, and lead-acid batteries can be recycled. Latex and oil-based paint can be reused, as well as recycled. Materials that cannot be reused or recycled should be disposed of at a properly permitted landfill.

Think before disposing of any household hazardous waste. Remember - The ocean starts at your front door.

RECYCLE USED OIL

Required Activities

- Dispose of HHW at a local collection facility. Call (714) 834-6752 for the household hazardous waste center closest to your area.
- Household hazardous materials must be stored indoors or under cover, and in closed and labeled containers.
- If safe, contain, clean up, and properly dispose all household hazardous waste spills. If an unsafe condition exists, call 911 to activate the proper response team.

Recommended Activities

- Use non-hazardous or less-hazardous products.
- Participate in HHW reuse and recycling. Call (714) 834-6752 for the participating household hazardous waste centers.

The California Integrated Waste Management Board has a Recycling Hotline (800) 553-2962, that provides information and recycling locations for used oil.

For additional information contact:
County of Orange, OC Watershed
Main: (714) 955-0600/ 24hr Water Pollution Discharge Hotline 1-877-89-SPILL
or visit our website at: www.ocwatersheds.com

R-8
WATER CONSERVATION

The activities outlined in this fact sheet target the following pollutants:	
Sediment	x
Nutrients	x
Bacteria	x
Foaming Agents	x
Metals	x
Hydrocarbons	x
Hazardous Materials	x
Pesticides and Herbicides	x
Other	x

Excessive irrigation and/or the overuse of water is often the most significant factor in transporting pollutants to the storm drain system. Pollutants from a wide variety of sources including automobile repair and maintenance, automobile washing, automobile parking, home and garden care activities and pet care may dissolve in the water and be transported to the storm drain. In addition, particles and materials coated with fertilizers and pesticides may be suspended in the flow and be transported to the storm drain.

Hosing off outside areas to wash them down not only consumes large quantities of water, but also transports any pollutants, sediments, and waste to the storm drain system. The pollution prevention activities outlined in this fact sheets are used to prevent the discharge of pollutants to the storm drain system.

Think before using water. Remember - The ocean starts at your front door.

Required Activities

- Irrigation systems must be properly adjusted to reflect seasonal water needs.
- Do not hose off outside surfaces to clean, sweep with a broom instead.

Recommended Activities

- Fix any leaking faucets and eliminate unnecessary water sources.
- Use xeroscaping and drought tolerant landscaping to reduce the watering needs.
- Do not over watering lawns or gardens. Over watering wastes water and promotes diseases.
- Use a bucket to re-soak sponges/rags while washing automobiles and other items outdoors. Use hose only for rinsing.
- Wash automobiles at a commercial car wash employing water recycling.

For additional information contact:
County of Orange, OC Watershed
Main: (714) 955-0600/ 24hr Water Pollution Discharge Hotline 1-877-89-SPILL
or visit our website at: www.ocwatersheds.com

Efficient Irrigation SD-12

Design Objectives

- ☑ Maximize Infiltration
- ☑ Provide Retention
- ☑ Slow Runoff
- Minimize Impervious Land Coverage
- Prohibit Dumping of Improper Materials
- Contain Pollutants
- Collect and Convey

Description

Irrigation water provided to landscaped areas may result in excess irrigation water being conveyed into stormwater drainage systems.

Approach

Project plan designs for development and redevelopment should include application methods of irrigation water that minimize runoff of excess irrigation water into the stormwater conveyance system.

Suitable Applications

Appropriate applications include residential, commercial and industrial areas planned for development or redevelopment. (Detached residential single-family homes are typically excluded from this requirement.)

Design Considerations

Designing New Installations

The following methods to reduce excessive irrigation runoff should be considered, and incorporated and implemented where determined applicable and feasible by the Permittee:

- Employ rain-triggered shutoff devices to prevent irrigation after precipitation.
- Design irrigation systems to each landscape area's specific water requirements.
- Include design featuring flow reducers or shutoff valves triggered by a pressure drop to control water loss in the event of broken sprinkler heads or lines.
- Implement landscape plans consistent with County or City water conservation resolutions, which may include provision of water sensors, programmable irrigation times (for short cycles), etc.

- Design timing and application methods of irrigation water to minimize the runoff of excess irrigation water into the storm water drainage system.
- Group plants with similar water requirements in order to reduce excess irrigation runoff and promote surface filtration. Choose plants with low irrigation requirements (for example, native or drought tolerant species). Consider design features such as:
  - Using mulches (such as wood chips or bar) in planter areas without ground cover to minimize sediment in runoff
  - Installing appropriate plant materials for the location, in accordance with amount of sunlight and climate, and use native plant materials where possible and/or as recommended by the landscape architect
  - Leaving a vegetative barrier along the property boundary and interior watercourses, to act as a pollutant filter, where appropriate and feasible
  - Choosing plants that minimize or eliminate the use of fertilizer or pesticides to sustain growth
- Employ other comparable, equally effective methods to reduce irrigation water runoff.

Redeveloping Existing Installations

Various jurisdictional stormwater management and mitigation plans (SUSMP, WQMP, etc.) define "redevelopment" in terms of amounts of additional impervious area, increases in gross floor area and/or exterior construction, and land disturbing activities with structural or impervious surfaces. The definition of " redevelopment" must be consulted to determine whether or not the requirements for new development apply to areas intended for redevelopment. If the definition applies, the steps outlined under "designing new installations" above should be followed.

Other Resources

A Manual for the Standard Urban Stormwater Mitigation Plan (SUSMP), Los Angeles County Department of Public Works, May 2002.

Model Standard Urban Storm Water Mitigation Plan (SUSMP) for San Diego County, Port of San Diego, and Cities in San Diego County, February 14, 2002.

Model Water Quality Management Plan (WQMP) for County of Orange, Orange County Flood Control District, and the Incorporated Cities of Orange County, Draft February 2003.

Ventura Countywide Technical Guidance Manual for Stormwater Quality Control Measures, July 2002.

Storm Drain Signage SD-13

Design Objectives

- Maximize Infiltration
- Provide Retention
- Slow Runoff
- Minimize Impervious Land Coverage
- ☑ Prohibit Dumping of Improper Materials
- Contain Pollutants
- Collect and Convey

Description

Waste materials dumped into storm drain inlets can have severe impacts on receiving and ground waters. Posting notices regarding discharge prohibitions at storm drain inlets can prevent waste dumping. Storm drain signs and stencils are highly visible source controls that are typically placed directly adjacent to storm drain inlets.

Approach

The stencil or affixed sign contains a brief statement that prohibits dumping of improper materials into the urban runoff conveyance system. Storm drain messages have become a popular method of alerting the public about the effects of and the prohibitions against waste disposal.

Suitable Applications

Stencils and signs alert the public to the destination of pollutants discharged to the storm drain. Signs are appropriate in residential, commercial, and industrial areas, as well as any other area where contributions or dumping to storm drains is likely.

Design Considerations

Storm drain message markers or placards are recommended at all storm drain inlets within the boundary of a development project. The marker should be placed in clear sight facing toward anyone approaching the inlet from either side. All storm drain inlet locations should be identified on the development site map.

Designing New Installations

The following methods should be considered for inclusion in the project design and show on project plans:

- Provide stenciling or labeling of all storm drain inlets and catch basins, constructed or modified, within the project area with prohibitive language. Examples include "NO DUMPING

– DRAINS TO OCEAN" and/or other graphical icons to discourage illegal dumping.

- Post signs with prohibitive language and/or graphical icons, which prohibit illegal dumping at public access points along channels and creeks within the project area.

Note - Some local agencies have approved specific signage and/or storm drain message placards for use. Consult local agency stormwater staff to determine specific requirements for placard types and methods of application.

Redeveloping Existing Installations

Various jurisdictional stormwater management and mitigation plans (SUSMP, WQMP, etc.) define "redevelopment" in terms of amounts of additional impervious area, increases in gross floor area and/or exterior construction, and land disturbing activities with structural or impervious surfaces. If the project meets the definition of "redevelopment", then the requirements stated under " designing new installations" above should be included in all project design plans.

Additional Information

Maintenance Considerations

- Legibility of markers and signs should be maintained. If required by the agency with jurisdiction over the project, the owner/operator or homeowner's association should enter into a maintenance agreement with the agency or record a deed restriction upon the property title to maintain the legibility of placards or signs.

Placement

- Signage on top of curbs tends to weather and fade.

- Signage on face of curbs tends to be worn by contact with vehicle tires and sweeper brooms.

Supplemental Information

Examples

- Most MS4 programs have storm drain signage programs. Some MS4 programs will provide stencils, or arrange for volunteers to stencil storm drains as part of their outreach program.

Other Resources

A Manual for the Standard Urban Stormwater Mitigation Plan (SUSMP), Los Angeles County Department of Public Works, May 2002.

Model Standard Urban Storm Water Mitigation Plan (SUSMP) for San Diego County, Port of San Diego, and Cities in San Diego County, February 14, 2002.

Model Water Quality Management Plan (WQMP) for County of Orange, Orange County Flood Control District, and the Incorporated Cities of Orange County, Draft February 2003.

Ventura Countywide Technical Guidance Manual for Stormwater Quality Control Measures, July 2002.

Trash Storage Areas SD-32

Design Objectives

- Maximize Infiltration
- Provide Retention
- Slow Runoff
- Minimize Impervious Land Coverage
- Prohibit Dumping of Improper Materials
- ☑ Contain Pollutants
- Collect and Convey

Description

Trash storage areas are areas where a trash receptacle (s) are located for use as a repository for solid wastes. Stormwater runoff from areas where trash is stored or disposed of can be polluted. In addition, loose trash and debris can be easily transported by water or wind into nearby storm drain inlets, channels, and/or creeks. Waste handling operations that may be sources of stormwater pollution include dumpsters, litter control, and waste piles.

Approach

This fact sheet contains details on the specific measures required to prevent or reduce pollutants in stormwater runoff associated with trash storage and handling. Preventative measures including enclosures, containment structures, and impervious pavements to mitigate spills, should be used to reduce the likelihood of contamination.

Suitable Applications

Appropriate applications include residential, commercial and industrial areas planned for development or redevelopment. (Detached residential single-family homes are typically excluded from this requirement.)

Design Considerations

Design requirements for waste handling areas are governed by Building and Fire Codes, and by current local agency ordinances and zoning requirements. The design criteria described in this fact sheet are meant to enhance and be consistent with these code and ordinance requirements. Hazardous waste should be handled in accordance with legal requirements established in Title 22, California Code of Regulation.

Wastes from commercial and industrial sites are typically hauled by either public or commercial carriers that may have design or access requirements for waste storage areas. The design criteria in this fact sheet are recommendations and are not intended to be in conflict with requirements established by the waste hauler. The waste hauler should be contacted prior to the design of your site trash collection areas. Conflicts or issues should be discussed with the local agency.

Designing New Installations

Trash storage areas should be designed to consider the following structural or treatment control BMPs:

- Design trash container areas so that drainage from adjoining roofs and pavement is diverted around the area(s) to avoid run-on. This might include berming or grading the waste handling area to prevent run-on of stormwater.
- Make sure trash container areas are screened or walled to prevent off-site transport of trash.

- Use lined bins or dumpsters to reduce leaking of liquid waste.
- Provide roofs, awnings, or attached lids on all trash containers to minimize direct precipitation and prevent rainfall from entering containers.
- Pave trash storage areas with an impervious surface to mitigate spills.
- Do not locate storm drains in immediate vicinity of the trash storage area.
- Post signs on all dumpsters informing users that hazardous materials are not to be disposed of therein.

Redeveloping Existing Installations

Various jurisdictional stormwater management and mitigation plans (SUSMP, WQMP, etc.) define "redevelopment" in terms of amounts of additional impervious area, increases in gross floor area and/or exterior construction, and land disturbing activities with structural or impervious surfaces. The definition of " redevelopment" must be consulted to determine whether or not the requirements for new development apply to areas intended for redevelopment. If the definition applies, the steps outlined under "designing new installations" above should be followed.

Additional Information

Maintenance Considerations

The integrity of structural elements that are subject to damage (i.e., screens, covers, and signs) must be maintained by the owner/operator. Maintenance agreements between the local agency and the owner/operator may be required. Some agencies will require maintenance deed restrictions to be recorded of the property title. If required by the local agency, maintenance agreements or deed restrictions must be executed by the owner/operator before improvement plans are approved.

Other Resources

A Manual for the Standard Urban Stormwater Mitigation Plan (SUSMP), Los Angeles County Department of Public Works, May 2002.

Model Standard Urban Storm Water Mitigation Plan (SUSMP) for San Diego County, Port of San Diego, and Cities in San Diego County, February 14, 2002.

Model Water Quality Management Plan (WQMP) for County of Orange, Orange County Flood Control District, and the Incorporated Cities of Orange County, Draft February 2003.

Ventura Countywide Technical Guidance Manual for Stormwater Quality Control Measures, July 2002.

ATTACHMENT B

SUPPORTING CALCULATIONS

Worksheet B: Simple Design Capture Volume Sizing Method

Project: The Hive Live

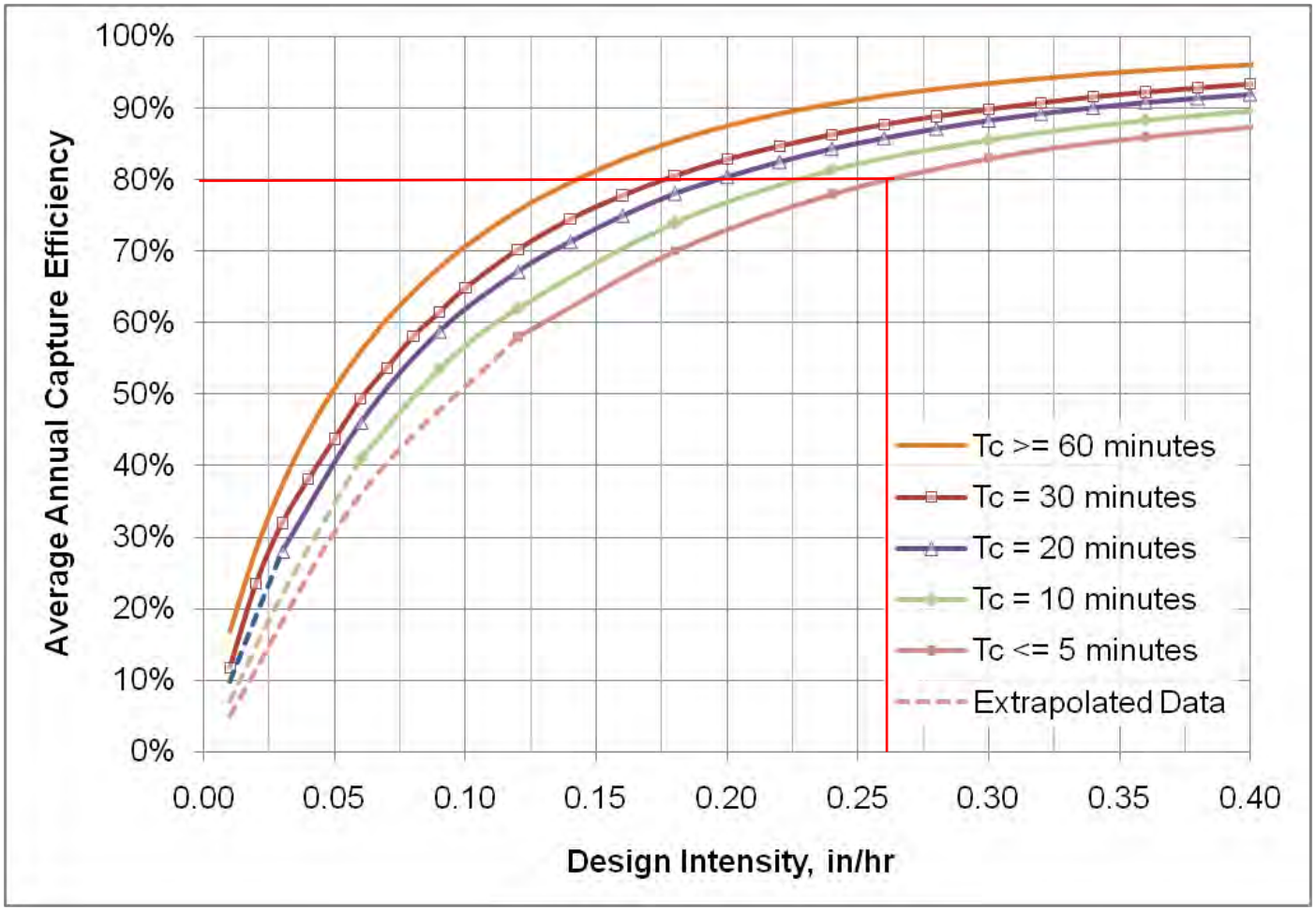
		DMA =	DMA A1	DMA A2	DMA A3	DMA B1	DMA B2	DMA B3	DMA C1	DMA C2	DMA C3	DMA D1	DMA D2	DMA E1	
Step 1: Determine the design capture storm depth used for calculating volume															
1	Enter design capture storm depth from Figure III.1, *d* (inches)	d=	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	inches
2	Enter the effect of provided HSCs, d_{HSC} (inches) (Worksheet A)	d_{HSC}=	0	0	0	0	0	0	0	0	0	0	0	0	inches
3	Calculate the remainder of the design capture storm depth, $d_{remainder}$ (inches) (Line 1 – Line 2)	$d_{remainder}$=	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	inches
Step 2: Calculate the DCV															
1	Enter Project area tributary to BMP(s), *A* (acres)	A=	1.67	2.69	0.18	2.22	2.16	2.10	2.35	0.04	0.12	0.24	0.06	0.47	acres
2	Enter Project Imperviousness, *imp* (unitless)	imp=	80%	80%	80%	80%	80%	80%	80%	80%	80%	80%	80%	80%	%
3	Calculate runoff coefficient, *C= (0.75 x imp) + 0.15*	C=	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	
4	Calculate runoff volume, V_{design} = (C x $d_{remainder}$ x A x 43560 x (1/12))	V_{design}=	3,410	5,493	368	4,533	4,410	4,288	4,798	82	245	490	123	960	cu-ft

Worksheet D: Capture Efficiency Method for Flow-Based BMPs

Project: The Hive Live

			DMA A1	DMA A2	DMA A3	DMA B1	DMA B2	DMA B3	DMA C1	DMA C2	DMA C3	DMA D1	DMA D2	
Step 1: Determine the design capture storm depth used for calculating volume														
1	Enter the time of concentration, T_c (min) (See Appendix IV.2)	T_c=	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	min
2	Using Figure III.4, determine the design intensity at which the estimated time of concentration (T_c) achieves 80% capture efficiency, I_1	I_1=	0.260	0.260	0.260	0.260	0.260	0.260	0.260	0.260	0.260	0.260	0.260	in/hr
3	Enter the effect depth of provided HSCs upstream, d_{HSC} (inches) (Worksheet A)	d_{HSC}=	0	0	0	0	0	0	0	0	0	0	0	inches
4	Enter capture efficiency corresponding to d_{HSC}, Y_2 (Worksheet A)	Y_2=	0%	0%	0%	0%	100%	100%	100%	100%	100%	100%	100%	%
5	Using Figure III.4, determine the design intensity at which the time of concentration (T_c) achieves the upstream capture efficiency (Y_2), I_2	I_2=	0	0	0	0	0	0	0	0	0	0	0	in/hr
6	Determine the design intensity that must be provided by BMP, $I_{design} = I_1 - I_2$	I_{design}=	0.260	0.260	0.260	0.260	0.260	0.260	0.260	0.260	0.260	0.260	0.260	in/hr
Step 2: Calculate the design flowrate														
1	Enter Project area tributary to BMP(s), *A* (acres)	A=	1.67	2.69	0.18	2.22	2.16	2.10	2.35	0.04	0.12	0.24	0.06	acres
2	Enter Project Imperviousness, *imp* (unitless)	imp=	80%	80%	80%	80%	80%	80%	80%	80%	80%	80%	80%	%
3	Calculate runoff coefficient, *C = (0.75 x imp) + 0.15*	C=	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	
4	Calculate design flowrate, $Q_{design} = (C \times i_{design} \times A)$	Q_{design}=	0.326	0.525	0.035	0.433	0.421	0.410	0.458	0.008	0.023	0.047	0.012	cfs
Supporting Calculations														
Describe System:														
	Proprietary BioTreatment (BIO-7):													
	Unit Size / Model =		*MWS-L-8-20*	*MWS-L-8-20*	*MWS-L-8-20*	*MWS-L-8-16*	*MWS-L-8-16*	*MWS-L-8-20*	*MWS-L-4-8*					
	Unit Size / Model Treatment Capacity =		*0.577*	*0.577*	*0.577*	*0.462*	*0.462*	*0.577*	*0.115*					cfs
	Number of Units Needed =		*1*	*1*	*1*	*1*	*1*	*1*	*1*					
	Total Bio-treatment Provided =		*0.577*	*0.577*	*0.577*	*0.462*	*0.462*	*0.577*	*0.115*					cfs

Figure III.4. Capture Efficiency Nomograph for Off-line Flow-based Systems in Orange County



Harvest & Reuse Irrigation Demand Calculations

4/4/2024

Storm Water Design Caputre Volume (SQDV)

Drainage Area / Land Use Type	Impervious Area (ac)	Irrigated Area (ac)	% impervious	Runoff Coefficient	Design Storm Depth (in)	Drainage Area (acres)	DCV (ft^3)	DCV (gal)
DMA A1	1.34	0.33	80%	0.750	0.75	1.670	**3,409.9**	**25,506**
DMA A2	2.15	0.54	80%	0.750	0.75	2.690	**5,492.6**	**41,085**
DMA B1	1.78	0.44	80%	0.750	0.75	2.220	**4,533.0**	**33,907**
DMA B2	1.73	0.43	80%	0.750	0.75	2.160	**4,410.5**	**32,990**
DMA B3	1.68	0.42	80%	0.750	0.75	2.100	**4,287.9**	**32,074**
DMA C1	1.88	0.47	80%	0.750	0.75	2.350	**4,798.4**	**35,892**
DMA C2	0.03	0.01	80%	0.750	0.75	0.040	**81.7**	**611**
DMA C3	0.10	0.02	80%	0.750	0.75	0.120	**245.0**	**1,833**
DMA D1	0.19	0.05	80%	0.750	0.75	0.240	**490.1**	**3,666**
DMA D2	0.05	0.01	80%	0.750	0.75	0.060	**122.5**	**916**
DMA E1	0.38	0.09	80%	0.750	0.75	0.470	**959.7**	**7,178**

	Eto
Irvine	3.00
Laguna Beach	2.75
Santa Ana	2.93

Modified

$EAWU = \frac{(Eto \times KL \times LA \times 0.015)}{IE}$

$EIATA = \frac{LA \times KL}{(IE \times \text{Tributary Imp. Area})}$

High-use Turf Landscaping

Drainage Area / Land Use Type	Total Area (ac)	Total Area (sf)	% Impervious	Impervious (sf)	Pervious / LA (sf)	Eto	KL	Modified EAWU	EAWU/ Impervious Acre	Minimum EAWU/ Impervious Acre (Table X.6)	Feasible?	EIATA	Minimum EIATA (Table X.8)	Drawdown (days)	Drawdown (hours)	% Capture (Fig. III.2)
DMA A1	1.6700	72,745	80%	58,196	14,549	2.93	0.7	497.33	372.26	610	No	0.19	0.42	51.3	1,231	
DMA A2	2.6900	117,176	80%	93,741	23,435	2.93	0.7	801.10	372.26	610	No	0.19	0.42	51.3	1,231	
DMA B1	2.2200	96,703	80%	77,363	19,341	2.93	0.7	661.13	372.26	611	No	0.19	0.42	51.3	1,231	
DMA B2	2.1600	94,090	80%	75,272	18,818	2.93	0.7	643.26	372.26	612	No	0.19	0.42	51.3	1,231	
DMA B3	2.1000	91,476	80%	73,181	18,295	2.93	0.7	625.39	372.26	613	No	0.19	0.42	51.3	1,231	
DMA C1	2.3500	102,366	80%	81,893	20,473	2.93	0.7	699.84	372.26	614	No	0.19	0.42	51.3	1,231	
DMA C2	0.0400	1,742	80%	1,394	348	2.93	0.7	11.91	372.26	615	No	0.19	0.42	51.3	1,231	
DMA C3	0.1200	5,227	80%	4,182	1,045	2.93	0.7	35.74	372.26	616	No	0.19	0.42	51.3	1,231	
DMA D1	0.2400	10,454	80%	8,364	2,091	2.93	0.7	71.47	372.26	617	No	0.19	0.42	51.3	1,231	
DMA D2	0.0600	2,614	80%	2,091	523	2.93	0.7	17.87	372.26	618	No	0.19	0.42	51.3	1,231	
DMA E1	0.4700	20,473	80%	16,379	4,095	2.93	0.7	139.97	372.26	619	No	0.19	0.42	51.3	1,231	

Low Water Use Landscaping

Drainage Area / Land Use Type	Total Area (ac)	Total Area (sf)	% Impervious	Impervious (sf)	Pervious / LA (sf)	Eto	KL	Modified EAWU	EAWU/ Impervious Acre	Minimum EAWU/ Impervious Acre (Table X.6)	Feasible?	EIATA	Minimum EIATA (Table X.8)	Drawdown (days)	Drawdown (hours)	% Capture (Fig. III.2)
DMA A1	1.670	72,745	80%	58,196	14,549	2.93	0.35	248.67	186.13	610	No	0.10	0.84	102.6	2,462	
DMA A2	2.690	117,176	80%	93,741	23,435	2.93	0.35	400.55	186.13	610	No	0.10	0.84	102.6	2,462	
DMA B1	2.220	96,703	80%	77,363	19,341	2.93	0.35	330.56	186.13	611	No	0.10	0.84	102.6	2,462	
DMA B2	2.160	94,090	80%	75,272	18,818	2.93	0.35	321.63	186.13	612	No	0.10	0.84	102.6	2,462	
DMA B3	2.100	91,476	80%	73,181	18,295	2.93	0.35	312.70	186.13	613	No	0.10	0.84	102.6	2,462	
DMA C1	2.350	102,366	80%	81,893	20,473	2.93	0.35	349.92	186.13	614	No	0.10	0.84	102.6	2,462	
DMA C2	0.040	1,742	80%	1,394	348	2.93	0.35	5.96	186.13	615	No	0.10	0.84	102.6	2,462	
DMA C3	0.120	5,227	80%	4,182	1,045	2.93	0.35	17.87	186.13	616	No	0.10	0.84	102.6	2,462	
DMA D1	0.240	10,454	80%	8,364	2,091	2.93	0.35	35.74	186.13	617	No	0.10	0.84	102.6	2,462	
DMA D2	0.060	2,614	80%	2,091	523	2.93	0.35	8.93	186.13	618	No	0.10	0.84	102.6	2,462	
DMA E1	0.470	20,473	80%	16,379	4,095	2.93	0.35	69.98	186.13	619	No	0.10	0.84	102.6	2,462	

Blend of High-Use and Low-Use Landscaping

Drainage Area / Land Use Type	Total Area (ac)	Total Area (sf)	% Impervious	Impervious (sf)	Pervious / LA (sf)	Eto	KL	Modified EAWU	EAWU/ Impervious Acre	Minimum EAWU/ Impervious Acre (Table X.6)	Feasible?	EIATA	Minimum EIATA (interpo-lated)	Drawdown (days)	Drawdown (hours)	% Capture (Fig. III.2)
DMA A1	1.670	72,745	80%	58,196	14,549	2.93	0.55	390.76	292.49	610	No	0.15	0.63	65.3	1,567	
DMA A2	2.690	117,176	80%	93,741	23,435	2.93	0.55	629.43	292.49	610	No	0.15	0.63	65.3	1,567	
DMA B1	2.220	96,703	80%	77,363	19,341	2.93	0.55	519.46	292.49	611	No	0.15	0.63	65.3	1,567	
DMA B2	2.160	94,090	80%	75,272	18,818	2.93	0.55	505.42	292.49	612	No	0.15	0.63	65.3	1,567	
DMA B3	2.100	91,476	80%	73,181	18,295	2.93	0.55	491.38	292.49	613	No	0.15	0.63	65.3	1,567	
DMA C1	2.350	102,366	80%	81,893	20,473	2.93	0.55	549.88	292.49	614	No	0.15	0.63	65.3	1,567	
DMA C2	0.040	1,742	80%	1,394	348	2.93	0.55	9.36	292.49	615	No	0.15	0.63	65.3	1,567	
DMA C3	0.120	5,227	80%	4,182	1,045	2.93	0.55	28.08	292.49	616	No	0.15	0.63	65.3	1,567	
DMA D1	0.240	10,454	80%	8,364	2,091	2.93	0.55	56.16	292.49	617	No	0.15	0.63	65.3	1,567	
DMA D2	0.060	2,614	80%	2,091	523	2.93	0.55	14.04	292.49	618	No	0.15	0.63	65.3	1,567	
DMA E1	0.470	20,473	80%	16,379	4,095	2.93	0.55	109.98	292.49	619	No	0.15	0.63	65.3	1,567	

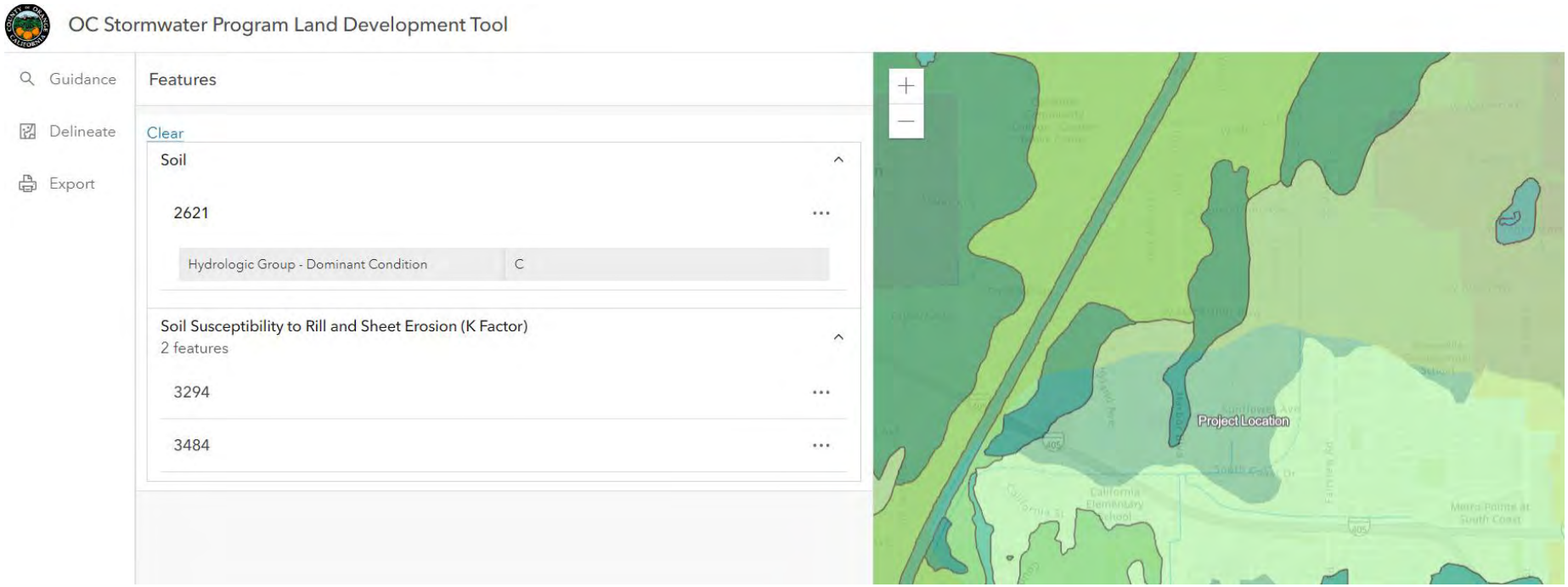
TABLE X.6: HARVESTED WATER DEMAND THRESHOLDS FOR MINIMUM PARTIAL CAPTURE

Design Capture Storm Depth, inches	Wet Season Demand Required for Minimum Partial Capture, gpd per impervious acre
0.60	490
0.65	530
0.70	570
0.75	610
0.80	650
0.85	690
0.90	730
0.95	770
1.00	810

TABLE X.8: MINIMUM IRRIGATED AREA FOR POTENTIAL PARTIAL CAPTURE FEASIBILITY

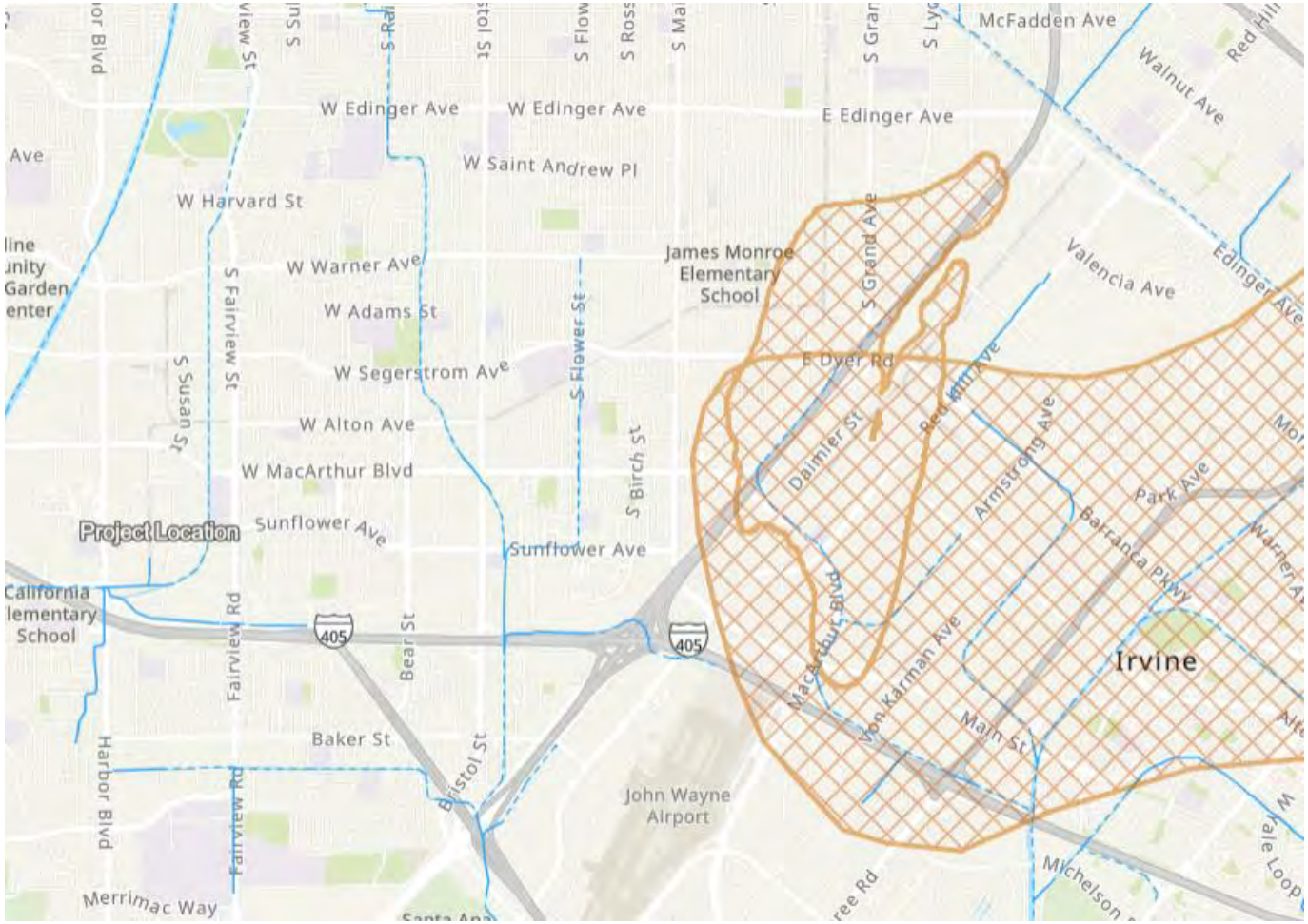
General Landscape Type	Conservation Design: KL = 0.35			Active Turf Areas: KL = 0.7		
Closest ET Station	Irvine	Santa Ana	Laguna	Irvine	Santa Ana	Laguna
Design Capture Storm Depth, inches	Minimum Required Irrigated Area per Tributary Impervious Acre for Potential Partial Capture, ac/ac					
0.60	0.66	0.68	0.72	0.33	0.34	0.36
0.65	0.72	0.73	0.78	0.36	0.37	0.39
0.70	0.77	0.79	0.84	0.39	0.39	0.42
0.75	0.83	0.84	0.9	0.41	0.42	0.45
0.80	0.88	0.9	0.96	0.44	0.45	0.48
0.85	0.93	0.95	1.02	0.47	0.48	0.51
0.90	0.99	1.01	1.08	0.49	0.51	0.54
0.95	1.04	1.07	1.14	0.52	0.53	0.57
1.00	1.1	1.12	1.2	0.55	0.56	0.6

Source: Technical Guidance Document for the Preparation of Conceptual/Preliminary and/or Project Water Quality Management Plans (WQMPs). March 22, 2011. Appendix X.



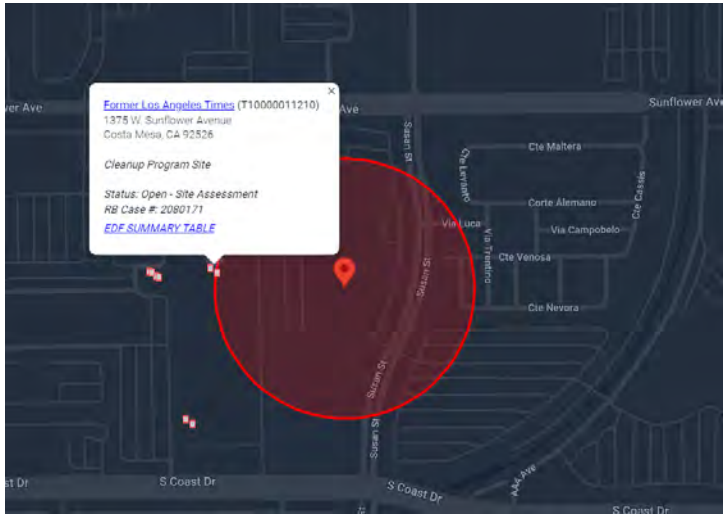
Soil Type: C

Soil susceptibility



Close proximity to groundwater contamination plume (approximately 3 miles west of selenium containment area)

Geotracker Search (500 ft):



- 1 open site within 500 ft of project area:
  - 

FORMER LOS ANGELES TIMES (T10000011210) - (MAP) SIGN UP FOR EMAIL ALERT

1375 W. SUNFLOWER AVENUE
COSTA MESA, CA 92626
ORANGE COUNTY
CLEANUP PROGRAM SITE (INFO)
OPEN - SITE ASSESSMENT AS OF 1/12/2018 - DEFINITION
PRINTABLE CASE SUMMARY / CSM REPORT

CLEANUP OVERSIGHT AGENCIES
SANTA ANA RWQCB (REGION 8) (LEAD) - CASE #: 208017
CASE MANAGER: GONGDE CHEN

Summary | Cleanup Action Report | Regulatory Activities | Environmental Data (ESI) | Site Maps / Documents | Community Involvement | Related Cases

Regulatory Profile PRINTABLE CASE SUMMARY

CLEANUP STATUS - DEFINITIONS
OPEN - SITE ASSESSMENT AS OF 1/12/2018 - CLEANUP STATUS HISTORY

POTENTIAL CONTAMINANTS OF CONCERN
DIESEL, OTHER PETROLEUM, TETRACHLOROETHYLENE (PCE), TRICHLOROETHYLENE (TCE)

POTENTIAL MEDIA OF CONCERN
AQUIFER USED FOR DRINKING WATER SUPPLY, SOIL VAPOR

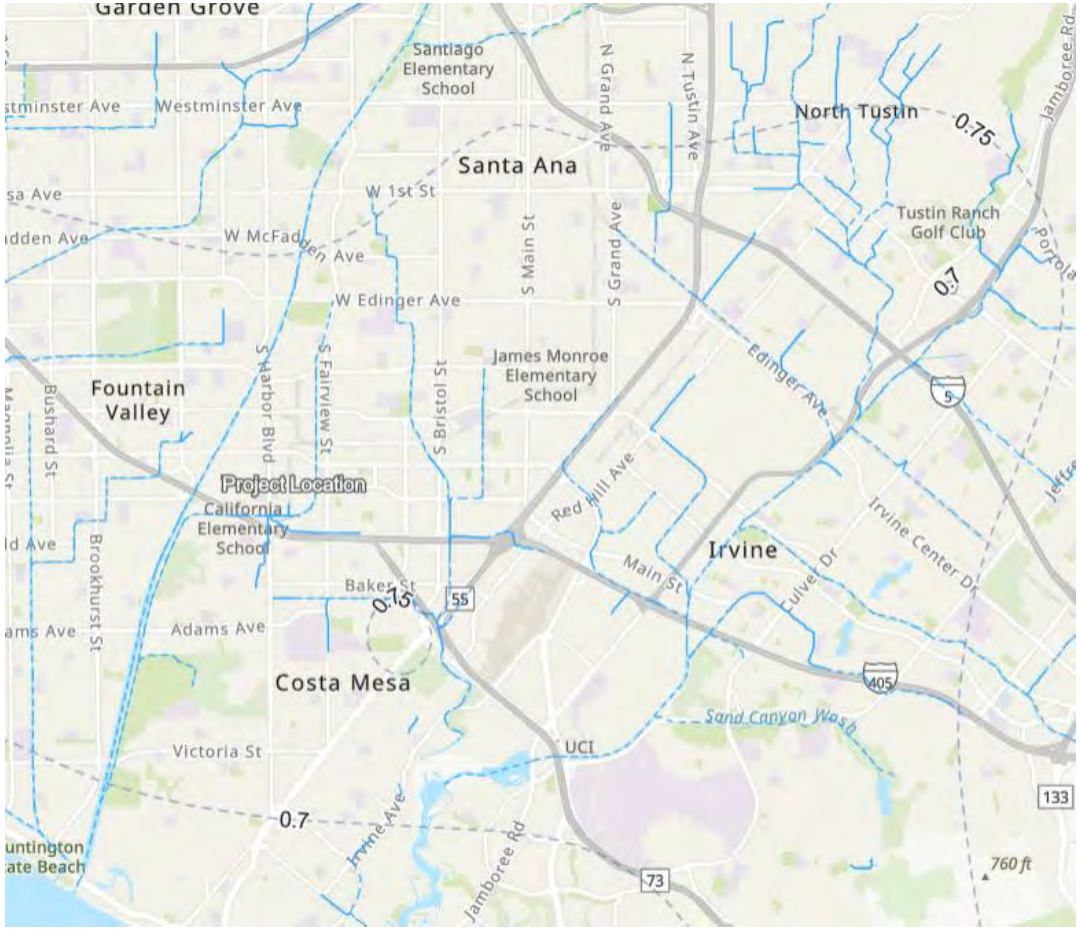
FILE LOCATION
ALL FILES ARE ON GEOTRACKER OR IN THE LOCAL AGENCY DATABASE

DESIGNATED GROUNDWATER BENEFICIAL USE(S) - DEFINITIONS
MUN, AGR, IND, PROC, 8 - Note: Also incl parts of 801.13, 801.14, 845.61 - Note: Also incl parts of 801.13, 801.14, 845.61, 845.63.

DWR GROUNDWATER SUB-BASIN NAME
Coastal Plain Of Orange County (8-001)

CALWATER WATERSHED NAME
Santa Ana River - Lower Santa Ana River - East Coastal Plain (801.11)

Source: https://geotracker.waterboards.ca.gov/map/?CMD=runreport&myaddress=3333+Susan+St%2C+Costa+Mesa%2C+CA+92626



Rainfall 85th percentile: between 0.70”- 0.75”

Source: [OC Land Development (ocgis.com)]

Table 2.7: Infiltration BMP Feasibility Worksheet

	Infeasibility Criteria	*Yes*	*No*
1	**Would Infiltration BMPs pose significant risk for groundwater related concerns?** Refer to Appendix VII (Worksheet I) for guidance on groundwater-related infiltration feasibility criteria.	X	
Provide basis: Historically high groundwater of 10 feet bgs Summarize findings of studies provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.			
2	Would Infiltration BMPs **pose significant risk of increasing risk of geotechnical hazards that cannot be mitigated to an acceptable level**? (Yes if the answer to any of the following questions is yes, as established by a geotechnical expert): The BMP can only be located less than 50 feet away from slopes steeper than 15 percent The BMP can only be located less than eight feet from building foundations or an alternative setback. A study prepared by a geotechnical professional or an available watershed study substantiates that stormwater infiltration would potentially result in significantly increased risks of geotechnical hazards that cannot be mitigated to an acceptable level.		X
Provide basis: Summarize findings of studies provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.			
3	Would infiltration of the DCV from drainage area **violate downstream water rights**?		X
Provide basis: Summarize findings of studies provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.			

Table 2.7: Infiltration BMP Feasibility Worksheet (continued)

	Partial Infeasibility Criteria	***Yes***	***No***
4	Is proposed infiltration facility **located on HSG D soils** or the site geotechnical investigation identifies presence of soil characteristics which support categorization as D soils?		X
Provide basis: Summarize findings of studies provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.			
5	Is **measured infiltration rate below proposed facility less than 0.3 inches per hour**? This calculation shall be based on the methods described in Appendix VII.	X	
Provide basis: Geotechnical found clayey soils that would produce and infiltration rate less than 0.3 in/hr. Summarize findings of studies provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.			
6	Would **reduction of over predeveloped conditions cause impairments to downstream beneficial uses, such as change of seasonality of ephemeral washes or increased discharge of contaminated groundwater to surface waters?**		X
Provide citation to applicable study and summarize findings relative to the amount of infiltration that is permissible: Summarize findings of studies provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.			
7	Would **an increase in infiltration over predeveloped conditions cause impairments to downstream beneficial uses, such as change of seasonality of ephemeral washes or increased discharge of contaminated groundwater to surface waters?**		X
Provide citation to applicable study and summarize findings relative to the amount of infiltration that is permissible: Summarize findings of studies provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.			

Table 2.7: Infiltration BMP Feasibility Worksheet (continued)

Infiltration Screening Results (check box corresponding to result):		
8	Is there substantial evidence that infiltration from the project would result in a significant increase in I&I to the sanitary sewer that cannot be sufficiently mitigated? (See Appendix XVII) Provide narrative discussion and supporting evidence: Summarize findings of studies provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.	No
9	If any answer from row 1-3 is yes: infiltration of any volume is **not feasible** within the DMA or equivalent. Provide basis: **Infiltration is deemed infeasible.** Summarize findings of infeasibility screening	Yes
10	If any answer from row 4-7 is yes, infiltration is **permissible but is not presumed to be feasible for the entire DCV.** Criteria for designing biotreatment BMPs to achieve the maximum feasible infiltration and ET shall apply. Provide basis: Summarize findings of infeasibility screening	Yes
11	If all answers to rows 1 through 11 are no, infiltration of the full DCV is potentially feasible, BMPs must be designed to infiltrate the full DCV to the maximum extent practicable.	

ATTACHMENT C

NOTICE OF TRANSFER OF RESPONSIBILITY

NOTICE OF TRANSFER OF RESPONSIBILITY

WATER QUALITY MANAGEMENT PLAN

The Hive Live
Parcel Map No. 94-120, Lot 3

Submission of this Notice Of Transfer of Responsibility constitutes notice to the City of Costa Mesa that responsibility for the Water Quality Management Plan ("WQMP") for the subject property identified below, and implementation of that plan, is being transferred from the Previous Owner (and his/her agent) of the site (or a portion thereof) to the New Owner, as further described below.

I. Previous Owner/ Previous Responsible Party Information

Company/ Individual Name:		Contact Person:	
Street Address:		Title:	
City:	State:	ZIP:	Phone:

II. Information about Site Transferred

Name of Project (if applicable):	
Title of WQMP Applicable to site:	
Street Address of Site (if applicable):	
Planning Area (PA) and/ or Tract Number(s) for Site:	Lot Numbers (if Site is a portion of a tract):
Date WQMP Prepared (and revised if applicable):	

III. New Owner/ New Responsible Party Information

Company/ Individual Name:		Contact Person:	
Street Address:		Title:	
City:	State:	ZIP:	Phone:

IV. Ownership Transfer Information

General Description of Site Transferred to New Owner:	General Description of Portion of Project/ Parcel Subject to WQMP Retained by Owner (if any):
Lot/ Tract Numbers of Site Transferred to New Owner:	
Remaining Lot/ Tract Numbers Subject to WQMP Still Held by Owner (if any):	
Date of Ownership Transfer:	

Note: When the Previous Owner is transferring a Site that is a portion of a larger project/ parcel addressed by the WQMP, as opposed to the entire project/parcel addressed by the WQMP, the General Description of the Site transferred and the remainder of the project/ parcel no transferred shall be set forth as maps attached to this notice. These maps shall show those portions of a project/ parcel addressed by the WQMP that are transferred to the New Owner (the Transferred Site), those portions retained by the Previous Owner, and those portions previously transferred by Previous Owner. Those portions retained by Previous Owner shall be labeled as "Previously Transferred".

V. Purpose of Notice of Transfer

The purposes of this Notice of Transfer of Responsibility are: 1) to track transfer of responsibility for implementation and amendment of the WQMP when property to which the WQMP is transferred from the Previous Owner to the New Owner, and 2) to facilitate notification to a transferee of property subject to a WQMP that such New Order is now the Responsible Party of record for the WQMP for those portions of the site that it owns.

VI. Certifications

A. Previous Owner

I certify under penalty of law that I am no longer the owner of the Transferred Site as described in Section II above. I have provided the New Owner with a copy of the WQMP applicable to the Transferred Site that the New Owner is acquiring from the Previous Owner.

Printed Name of Previous Owner Representative:	Title:
Signature of Previous Owner Representative:	Date:

B. New Owner

I certify under penalty of law that I am the owner of the Transferred Site, as described in Section II above, that I have been provided a copy of the WQMP, and that I have informed myself and understand the New Owner's responsibilities related to the WQMP,

its implementation, and Best Management Practices associated with it. I understand that by signing this notice, the New Owner is accepting all ongoing responsibilities for implementation and amendment of the WQMP for the Transferred Site, which the New Owner has acquired from the Previous Owner.

Printed Name of New Owner Representative:	Title:
Signature:	Date:

ATTACHMENT D

BMP MAINTENANCE SUPPLEMENT / O&M PLAN

OPERATIONS AND MAINTENANCE (O&M) PLAN

Water Quality Management Plan

For

The Hive Live

3333 Susan St, Costa Mesa, CA 92626

140-042-12

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BMP INSPECTION & MAINTENANCE RESPONSIBILITY MATRIX			
BMP Applicable? Yes/No	BMP Name and BMP Implementation, Maintenance and Inspection Procedures	Implementation, Maintenance, and Inspection Frequency and Schedule	Person or Entity with Operation & Maintenance Responsibility
NON-STRUCTURAL SOURCE CONTROL BMPs			
Yes	N1. Education for Property Owners, Tenants and Occupants Educational materials will be provided to tenants, including brochures and restrictions to reduce pollutants from reaching the storm drain system. Examples include tips for pet care, household tips, and proper household hazardous waste disposal.	Educational materials will be provided to tenants annually. Materials to be distributed are found in Appendix C of this WQMP. Tenants will be provided these materials by the Property Management prior to occupancy and annually thereafter. Frequency: Annually	Legacy Partners
Yes	N2. Activity Restrictions The owner shall develop ongoing activity restrictions that include those that have the potential to create adverse impacts on water quality. Activities include, but are not limited to: handling and disposal of contaminants, fertilizer and pesticide application restrictions, litter control and pick-up, and vehicle or equipment repair and maintenance in non-designated areas, as well as any other activities that may potentially contribute to water pollution.	The Owner will prescribe activity restrictions to protect surface water quality, through lease terms or other equally effective measure, for the property. Restrictions include, but are not limited to, prohibiting vehicle maintenance or vehicle washing. Frequency: Ongoing	Legacy Partners

BMP INSPECTION & MAINTENANCE RESPONSIBILITY MATRIX			
BMP Applicable? Yes/No	BMP Name and BMP Implementation, Maintenance and Inspection Procedures	Implementation, Maintenance, and Inspection Frequency and Schedule	Person or Entity with Operation & Maintenance Responsibility
Yes	N3. Common Area Landscape Management The Owner shall be responsible for ongoing maintenance and management of landscaped areas on the project site, consistent with OC DAMP Section 5.5, Management Guidelines for Use of Fertilizers as well as City standards. Program includes how to reduce the potential pollutant sources of fertilizer and pesticide uses, utilization of water-efficient landscaping practices, ongoing trimming and other landscape maintenance activities and proper disposal of landscape wastes by the owner and/or contractors.	Maintenance shall be consistent with City requirements. Fertilizer and/or pesticide usage shall be consistent with County Management Guidelines for Use of Fertilizers (OC DAMP Section 5.5). Maintenance includes mowing, weeding, and debris removal on a weekly basis. Trimming, replanting, and replacement of mulch shall be performed on an as-needed basis to prevent exposure of erodible surfaces. Trimmings, clippings, and other landscape wastes shall be properly disposed of in accordance with local regulations. Materials temporarily stockpiled during maintenance activities shall be placed away from water courses and storm drains inlets. <u>Frequency:</u> Monthly	Legacy Partners

BMP INSPECTION & MAINTENANCE RESPONSIBILITY MATRIX			
BMP Applicable? Yes/No	BMP Name and BMP Implementation, Maintenance and Inspection Procedures	Implementation, Maintenance, and Inspection Frequency and Schedule	Person or Entity with Operation & Maintenance Responsibility
Yes	N4. BMP Maintenance The Owner will be responsible for the implementation and maintenance of each applicable LID and structural BMP prescribed for the project. Inspection and maintenance will be carried out by property management staff and/or contractors.	Maintenance of structural BMPs implemented at the project site shall be performed at the frequency prescribed in this WQMP. Records of inspections and BMP maintenance shall be kept by the Owner and shall be available for review upon request. Frequency: Ongoing	Legacy Partners
No	N5. Title 22 CCR Compliance (How development will comply)	Not Applicable	
No	N6. Local Industrial Permit Compliance	Not Applicable	
No	N7. Spill Contingency Plan	Not Applicable	
No	N8. Underground Storage Tank Compliance	Not Applicable	
No	N9. Hazardous Materials Disclosure Compliance	Not Applicable	
No	N10. Uniform Fire Code Implementation	Not Applicable	

BMP INSPECTION & MAINTENANCE RESPONSIBILITY MATRIX			
BMP Applicable? Yes/No	BMP Name and BMP Implementation, Maintenance and Inspection Procedures	Implementation, Maintenance, and Inspection Frequency and Schedule	Person or Entity with Operation & Maintenance Responsibility
Yes	N11. Common Area Litter Control The property management will be responsible for performing trash pickup and sweeping of littered common areas as needed, and weekly at a minimum. Any trash/debris waste collected shall be properly disposed of in accordance with local regulations. Responsibilities will also include noting improper disposal of materials and reporting such violations for further investigation.	Litter patrol, violations investigations, reporting and other litter control activities shall be performed on a weekly basis and in conjunction with routine maintenance activities. Frequency: Weekly	Legacy Partners
Yes	N12. Employee Training All employees of the property owner/management and any contractors will require training to ensure that employees are aware of maintenance activities that may result in pollutants reaching the storm drain. Training will include, but not be limited to, spill cleanup procedures, proper waste disposal, and housekeeping practices.	The Owner shall educate all new employees/managers on storm water pollution prevention, particularly good housekeeping practices, prior to the start of the rainy season (October 1). Refresher courses shall be conducted on an as needed basis. Materials that may be utilized on BMP maintenance are included in Appendix D. Frequency: Annually	Legacy Partners
No	N13. Housekeeping of Loading Docks	Not Applicable	

BMP INSPECTION & MAINTENANCE RESPONSIBILITY MATRIX			
BMP Applicable? Yes/No	BMP Name and BMP Implementation, Maintenance and Inspection Procedures	Implementation, Maintenance, and Inspection Frequency and Schedule	Person or Entity with Operation & Maintenance Responsibility
Yes	N14. Common Area Catch Basin Inspection All on-site storm drain inlets shall be inspected by the Owner, and cleaned when the sump is 40% full and annually at a minimum.	Catch basin inlets and other drainage facilities shall be inspected annually. Inlets and other facilities shall be cleaned when the sump is 40% full and annually at a minimum. Frequency: Monthly (inspections), Annually (cleanout)	Legacy Partners
Yes	N15. Street Sweeping Private Streets and Parking Lots The Owner shall be responsible for sweeping all roadways (i.e. fire access road) and uncovered parking areas within the project on a monthly basis.	Parking areas and drive aisles within the project shall be swept at a minimum frequency monthly as well as once per year prior to the storm season, no later than October 1st each year. Frequency: Monthly	Legacy Partners
No	N16. Retail Gasoline Outlets	Not Applicable	
STRUCTURAL SOURCE CONTROL BMPs			

BMP INSPECTION & MAINTENANCE RESPONSIBILITY MATRIX			
BMP Applicable? Yes/No	BMP Name and BMP Implementation, Maintenance and Inspection Procedures	Implementation, Maintenance, and Inspection Frequency and Schedule	Person or Entity with Operation & Maintenance Responsibility
Yes	S1. Provide storm drain system stenciling and signage The phrase "NO DUMPING! DRAINS TO OCEAN", or an equally effective phrase approved by the City, will be stenciled on all major storm drain inlets within the project site to alert the public to the destination of pollutants discharged into storm water. Stencils shall be in place prior to release of certificate of occupancy.	Stenciling shall be inspected for legibility no later than the beginning of the rainy season on October 1st of each year. Stenciling must be re-stenciled to maintain legibility as necessary and when deemed necessary by the local inspecting agency. Frequency: Annually	Legacy Partners
No	S2. Design and construct outdoor material storage areas to reduce pollution introduction	Not Applicable	
	S3. Design and construct trash and waste storage areas to reduce pollution introduction All trash and waste shall be stored in containers that have lids or tarps to minimize direct precipitation into the containers. The trash storage areas will be designed to City standards, and will be walled, roofed, have gates and proper drainage per City standards.	Trash receptacles will be monitored and emptied by management of the Bowery. Trash will be taken from the interior trash rooms to the exterior trash storage areas at the time trash collection is set to occur. The four trash storage areas will drain into a water quality inlet to prevent discharge of spilled contaminants, consistent with local design standards. Frequency: Ongoing	Legacy Partners

BMP INSPECTION & MAINTENANCE RESPONSIBILITY MATRIX			
BMP Applicable? Yes/No	BMP Name and BMP Implementation, Maintenance and Inspection Procedures	Implementation, Maintenance, and Inspection Frequency and Schedule	Person or Entity with Operation & Maintenance Responsibility
Yes	S4. Use efficient irrigation systems & landscape design, water conservation, smart controllers, and source control The Owner will be responsible for the installation and maintenance of all common landscape areas utilizing similar planting materials with similar water requirements to reduce excess irrigation runoff. Includes implementation of efficient irrigation systems for common area landscaping including, but not limited to, provisions for water sensors and programmable irrigation cycles. This includes smart timers, rain sensors, and moisture shut-off valves.	In conjunction with routine maintenance, verify that landscape design continues to function properly by adjusting systems to eliminate overspray to hardscape areas and to verify that irrigation timing and cycle lengths are adjusted in accordance to water demands, given the time of year, weather, and day or nighttime temperatures. System testing shall occur twice per year. Water from testing/flushing shall be collected and properly disposed to the sewer system and shall not discharge to the storm drain system. Frequency: Monthly	Legacy Partners
No	S5. Protect slopes and channels and provide energy dissipation	Not Applicable	
No	S6. Dock areas	Not Applicable	
No	S7. Maintenance bays	Not Applicable	
No	S8. Vehicle wash areas	Not Applicable	
No	S9. Outdoor processing areas	Not Applicable	
No	S10. Equipment wash areas	Not Applicable	

BMP INSPECTION & MAINTENANCE RESPONSIBILITY MATRIX			
BMP Applicable? Yes/No	BMP Name and BMP Implementation, Maintenance and Inspection Procedures	Implementation, Maintenance, and Inspection Frequency and Schedule	Person or Entity with Operation & Maintenance Responsibility
No	S11. Fueling areas	Not Applicable	
No	S12. Hillside landscaping	Not Applicable	
No	S13. Wash water control for food preparation areas	Not Applicable	
No	S14. Community car wash racks	Not Applicable	

BMP INSPECTION & MAINTENANCE RESPONSIBILITY MATRIX		
BMP Name and BMP Implementation, Maintenance and Inspection Procedures	Implementation, Maintenance, and Inspection Frequency and Schedule	Person or Entity with Operation & Maintenance Responsibility
LOW IMPACT DEVELOPMENT BMPs		

BMP INSPECTION & MAINTENANCE RESPONSIBILITY MATRIX		
BMP Name and BMP Implementation, Maintenance and Inspection Procedures	Implementation, Maintenance, and Inspection Frequency and Schedule	Person or Entity with Operation & Maintenance Responsibility
Biotreatment BMP # 1: Modular Wetland Systems (MWS) Modular Wetlands by Modular Wetlands Systems, Inc. are proprietary biotreatment systems that utilize multi-stage treatment processes. The pre-treatment chamber contains the first three stages of treatment, and includes a catch basin inlet filter to capture trash, debris, gross solids and sediments, a settling chamber for separating out larger solids, and a media filter cartridge for capturing fine TSS, metals, nutrients, and bacteria. Runoff then flows through the wetland chamber where treatment is achieved through a variety of physical, chemical, and biological processes. As storm water passes down through the planting soil, pollutants are filtered, adsorbed, biodegraded and sequestered by the soil and plants, functioning similar to bioretention systems. The discharge chamber at the end of the unit collects treated flows and discharges back into the storm drain system.	Inspect system at a minimum of once every six months, prior to the start of the rainy season (October 1), and after major storm events. Typical maintenance includes removing trash & debris from the catch basin screening filter (by hand), removal of sediment and solids in the settlement chamber (vacuum truck), replacement of the BioMediaGREENTM filter cartridge, and replacement of the BioMediaGREENTM drain down filter (if equipped). In addition, plants within the wetland chamber will require trimming in conjunction with landscape maintenance activities. See attached manufacturer's specifications for additional requirements. Frequency: 2x per year	Legacy Partners
PRE-TREATMENT/GROSS SOLIDS REMOVAL BMPs		

BMP INSPECTION & MAINTENANCE RESPONSIBILITY MATRIX		
BMP Name and BMP Implementation, Maintenance and Inspection Procedures	Implementation, Maintenance, and Inspection Frequency and Schedule	Person or Entity with Operation & Maintenance Responsibility
Treatment Control BMP # 1: Connector Pipe Screen (CPS) Inspections should occur annually or after major storm events to check for the following and remove accordingly: standing water, sediment, and trash & debris. Maintenance should occur when the catch basin is at 40% capacity. Typical maintenance will include removal of sediment and solids using a vacuum truck.	Inspections should occur annually or after major storm events to check for the following and remove accordingly: standing water, sediment, and trash & debris. Maintenance should occur when the catch basin is at 40% capacity. Typical maintenance will include removal of sediment and solids using a vacuum truck. Frequency: Annually and after large storm event	Legacy Partners

Required Permits

Permits are not required for the implementation, operation, and maintenance of the BMPs.

Forms to Record BMP Implementation, Maintenance, and Inspection

The form that will be used to record implementation, maintenance, and inspection of BMPs is attached.

Recordkeeping

All records must be maintained for at least five (5) years and must be made available for review upon request.

Waste Management

Any waste generated from maintenance activities will be disposed of properly. Wash water and other waste from maintenance activities is not to be discharged or disposed of into the storm drain system. Clippings from landscape maintenance (i.e. prunings) will be collected and disposed of properly off-site, and will not be washed into the streets, local area drains/conveyances, or catch basin inlets.

RECORD OF BMP IMPLEMENTATION, MAINTENANCE, AND INSPECTION

Today's Date: _____

Name of Person Performing Activity (Printed): _____

Signature: _____

BMP Name (As Shown in O&M Plan)	Brief Description of Implementation, Maintenance, and Inspection Activity Performed

RECORD OF BMP IMPLEMENTATION, MAINTENANCE, AND INSPECTION

Today's Date: _____

Name of Person Performing Activity (Printed): _____

Signature: _____

BMP Name (As Shown in O&M Plan)	Brief Description of Implementation, Maintenance, and Inspection Activity Performed

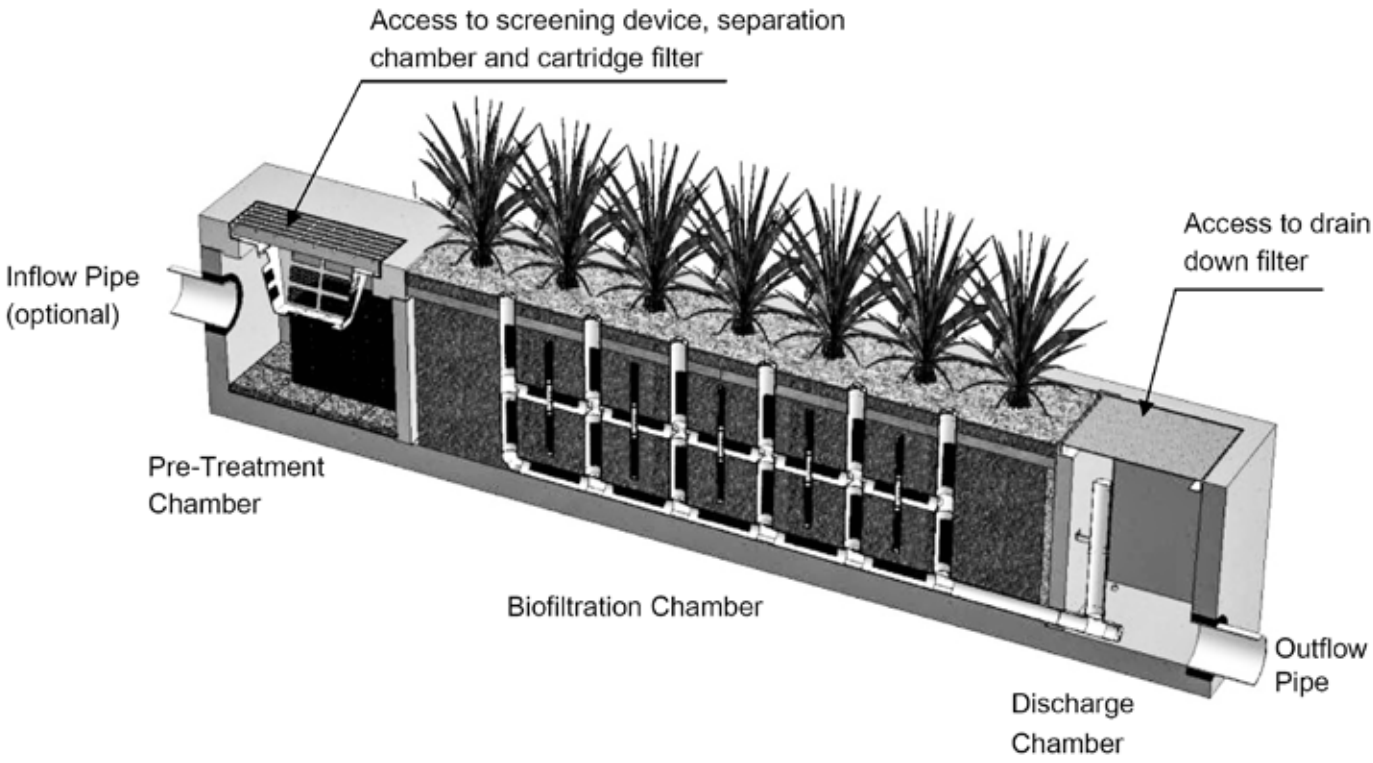
CONTECH®
ENGINEERED SOLUTIONS

Modular Wetlands® Linear
Operation & Maintenance Manual

MODULAR WETLANDS®

Maintenance Summary

- Remove Trash from Screening Device – average maintenance interval is 6 to 12 months.
  - *(5 minute average service time).*
- Remove Sediment from Separation Chamber – average maintenance interval is 12 to 24 months.
  - *(10 minute average service time).*
- Replace Cartridge Filter Media – average maintenance interval 12 to 24 months.
  - *(10-15 minute per cartridge average service time).*
- Replace Drain Down Filter Media – average maintenance interval is 12 to 24 months.
  - *(5 minute average service time).*
- Trim Vegetation – average maintenance interval is 6 to 12 months.
  - *(Service time varies).*



System Diagram

Maintenance Procedures

Screening Device

1. Remove grate or manhole cover to gain access to the screening device in the Pre- Treatment Chamber. Vault type units do not have screening device. Maintenance can be performed without entry.
2. Remove all pollutants collected by the screening device. Removal can be done manually or with the use of a vacuum truck.
3. Screening device can easily be removed from the Pre-Treatment Chamber to gain access to separation chamber and media filters below. Replace grate or manhole cover when completed.

Separation Chamber

1. Perform maintenance procedures of screening device listed above before maintaining the separation chamber.
2. With a pressure washer, spray down pollutants accumulated on walls and cartridge filters.
3. Vacuum out Separation Chamber and remove all accumulated pollutants. Replace screening device, grate or manhole cover when completed.

Cartridge Filters

1. Perform maintenance procedures on screening device and separation chamber before maintaining cartridge filters.
2. Enter separation chamber.
3. Unscrew the two bolts holding the lid on each cartridge filter and remove lid.
4. Remove each of 4 to 8 media cages holding the media in place.
5. Spray down the cartridge filter to remove any accumulated pollutants.
6. Vacuum out old media and accumulated pollutants.
7. Reinstall media cages and fill with new media from manufacturer or outside supplier. Manufacturer will provide specification of media and sources to purchase.
8. Replace the lid and tighten down bolts. Replace screening device, grate or manhole cover when completed.

Drain Down Filter

1. Remove hatch or manhole cover over discharge chamber and enter chamber. Entry into chambers may require confined space training based on state and local regulations.
2. Unlock and lift drain down filter housing and remove old media block. Replace with new media block. Lower drain down filter housing and lock into place.
3. Exit chamber and replace hatch or manhole cover.

Maintenance Notes

1. Following maintenance and/or inspection, it is recommended the maintenance operator prepare a maintenance/ inspection record. The record should include any maintenance activities performed, amount and description of debris collected, and condition of the system and its various filter mechanisms.
2. The owner should keep maintenance/inspection record(s) for a minimum of five years from the date of maintenance. These records should be made available to the governing municipality for inspection upon request at any time.
3. Transport all debris, trash, organics and sediments to approved facility for disposal in accordance with local and state requirements.
4. Entry into chambers may require confined space training based on state and local regulations.
5. No fertilizer shall be used in the Biofiltration Chamber.
6. Irrigation should be provided as recommended by manufacturer and/or landscape architect. Amount of irrigation required is dependent on plant species. Some plants may require irrigation.

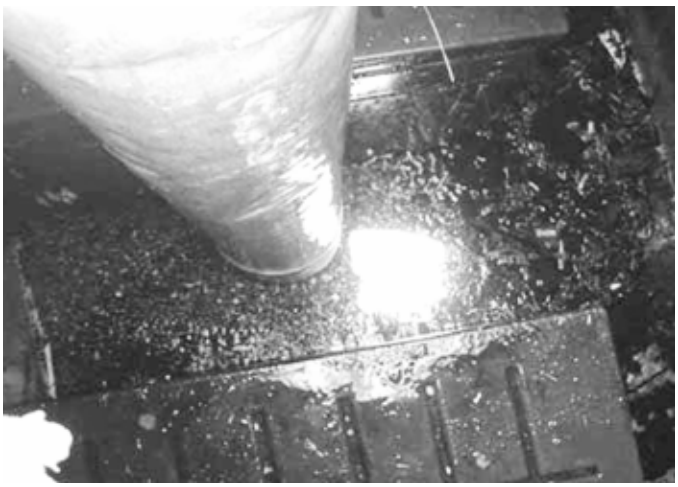
Maintenance Procedure Illustration

Screening Device

The screening device is located directly under the manhole or grate over the Pre-Treatment Chamber. It's mounted directly underneath for easy access and cleaning. Device can be cleaned by hand or with a vacuum truck.

Separation Chamber

The separation chamber is located directly beneath the screening device. It can be quickly cleaned using a vacuum truck or by hand. A pressure washer is useful to assist in the cleaning process.



Cartridge Filters

The cartridge filters are located in the Pre-Treatment chamber connected to the wall adjacent to the biofiltration chamber. The cartridges have removable tops to access the individual media filters. Once the cartridge is open media can be easily removed and replaced by hand or a vacuum truck.

Drain Down Filter

The drain down filter is located in the Discharge Chamber. The drain filter unlocks from the wall mount and hinges up. Remove filter block and replace with new block.

Trim Vegetation

Vegetation should be maintained in the same manner as surrounding vegetation and trimmed as needed. No fertilizer shall be used on the plants. Irrigation per the recommendation of the manufacturer and or landscape architect. Different types of vegetation requires different amounts of irrigation.

CONTECH® ENGINEERED SOLUTIONS

Inspection Report
Modular Wetlands Linear

Project Name _____

Project Address _____
(city) (Zip Code)

Owner / Management Company _____

Contact _____ Phone ( ) –

Inspector Name _____ Date ____/____/____ Time _____ AM / PM

Type of Inspection ☐ Routine ☐ Follow Up ☐ Complaint ☐ Storm Storm Event in Last 72-hours? ☐ No ☐ Yes

Weather Condition _____ Additional Notes _____

For Office Use Only
(Reviewed By)
(Date) Office personnel to complete section to the left.

Inspection Checklist

Modular Wetland System Type (Curb, Grate or UG Vault): _____ Size (22', 14' or etc.): _____

Structural Integrity:	**Yes**	**No**	**Comments**
Damage to pre-treatment access cover (manhole cover/grate) or cannot be opened using normal lifting pressure?			
Damage to discharge chamber access cover (manhole cover/grate) or cannot be opened using normal lifting pressure?			
Does the MWS unit show signs of structural deterioration (cracks in the wall, damage to frame)?			
Is the inlet/outlet pipe or drain down pipe damaged or otherwise not functioning properly?			
Working Condition:			
Is there evidence of illicit discharge or excessive oil, grease, or other automobile fluids entering and clogging the unit?			
Is there standing water in inappropriate areas after a dry period?			
Is the filter insert (if applicable) at capacity and/or is there an accumulation of debris/trash on the shelf system?			
Does the depth of sediment/trash/debris suggest a blockage of the inflow pipe, bypass or cartridge filter? If yes, specify which one in the comments section. Note depth of accumulation in in pre-treatment chamber.			Depth:
Does the cartridge filter media need replacement in pre-treatment chamber and/or discharge chamber?			Chamber:
Any signs of improper functioning in the discharge chamber? Note issues in comments section.			
Other Inspection Items:			
Is there an accumulation of sediment/trash/debris in the wetland media (if applicable)?			
Is it evident that the plants are alive and healthy (if applicable)? Please note Plant Information below.			
Is there a septic or foul odor coming from inside the system?			

Waste:	**Yes**	**No**
Sediment / Silt / Clay		
Trash / Bags / Bottles		
Green Waste / Leaves / Foliage		

Recommended Maintenance	
No Cleaning Needed	
Schedule Maintenance as Planned	
Needs Immediate Maintenance	

Plant Information	
Damage to Plants	
Plant Replacement	
Plant Trimming	

Additional Notes: _____

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Cleaning and Maintenance Report
Modular Wetlands Linear

Project Name _____

Project Address _____
(city) (Zip Code)

Owner / Management Company _____

Contact _____ Phone ( ) –

Inspector Name _____ Date ____/____/_____ Time _____AM / PM

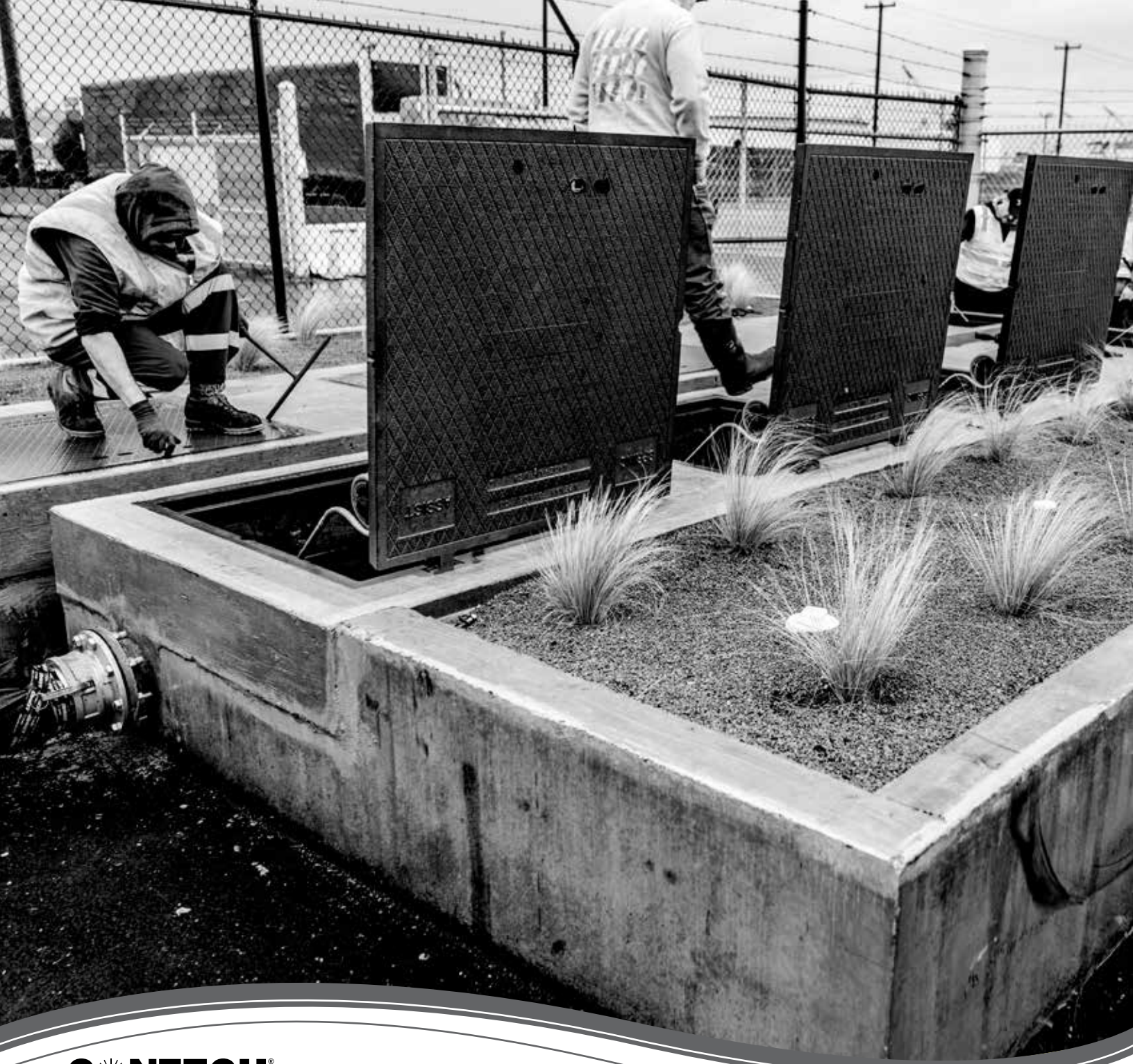
For Office Use Only
(Reviewed By)
(Date)
Office personnel to complete section to the left.

Type of Inspection ☐ Routine ☐ Follow Up ☐ Complaint ☐ Storm Storm Event in Last 72-hours? ☐ No ☐ Yes

Weather Condition _____ Additional Notes _____

Site Map #	GPS Coordinates of Insert	Manufacturer / Description / Sizing	Trash Accumulation	Foliage Accumulation	Sediment Accumulation	Total Debris Accumulation	Condition of Media 25/50/75/100 (will be changed @ 75%)	Operational Per Manufactures' Specifications (If not, why?)
	Lat: Long:	MWS Catch Basins						
		MWS Sedimentation Basin						
		Media Filter Condition						
		Plant Condition						
		Drain Down Media Condition						
		Discharge Chamber Condition						
		Drain Down Pipe Condition						
		Inlet and Outlet Pipe Condition						

Comments:



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SUPPORT

DRAWINGS AND SPECIFICATIONS ARE AVAILABLE AT WWW.CONTECHES.COM

Modular Wetlands Maintenance Guide 08/22

Inspecting the Connector Pipe Screen (CPS):
The CPS device, like any other stormwater treatment device requires maintenance to remain efficient as a stormwater filter. Fabco Industries highly recommends inspecting the system within the first year after installation following the steps below. Inspection and cleaning should be performed only after NO rainfall for at least 24 hours. If working in the street, proper safety equipment should be worn, including but not limited to a hardhat, vest, gloves and eye protection, and local traffic safety rules & regulations should be followed. Begin by removing the manhole access covers located over the catch basin structure. Allow several minutes for the system to vent. CAUTION: Grates can be extremely heavy. Some type of lifting mechanism is highly recommended.

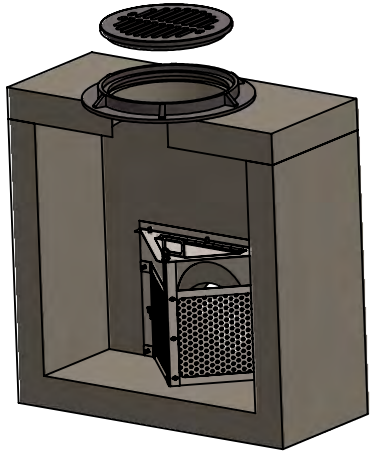
Visually inspect all chambers for heavy sediment, trash, and debris loading. A battery powered flashlight or droplight is recommended for thorough inspection. Some telltale signs that cleaning is necessary are as follows:

- Waterline marks within a couple inches of the top of the bypass weir.
- Standing water in the chamber at or above the screen level.
- Cannot see the screen surface area because it is covered with sediment, trash and debris, etc.

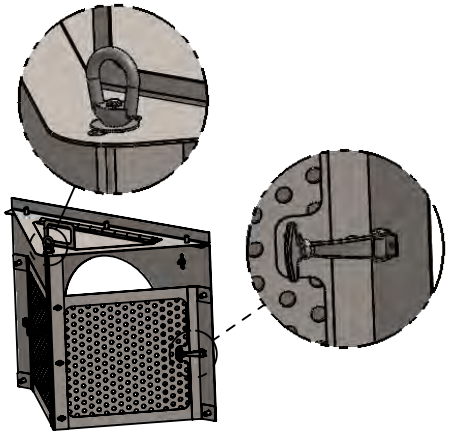
Cleaning Frequency:
The CPS device requires periodic cleaning. There are no hard and fast rules in this regard. Small units and installation sites with higher than expected sediment loads or areas with significant trees and foliage require more maintenance. In general, Fabco Industries recommends cleaning out the unit(s) at least two times per year by removing the trash and debris, sand and silt, either manually or with a vacuum assisted device.

Disposal:
All liquid, oils, sediment, debris, trash and other accumulates captured by the CPS unit must be handled and disposed of in accordance with local, state, and federal regulations. Disposal considerations must be part of a well-planed and scheduled maintenance regime. Solid waste disposal can typically be coordinated with a local landfill, whereas liquid waste can be disposed of at either a wastewater treatment plant, or a municipal vacuum truck decant facility.

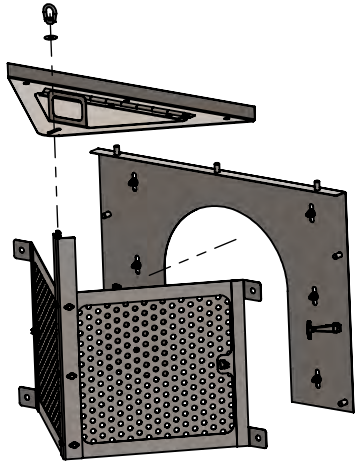
Step 1:
Remove the storm grate or manhole cover to gain access to the CPS unit. Remove any trapped sediment or debris that might impede flow or performance.



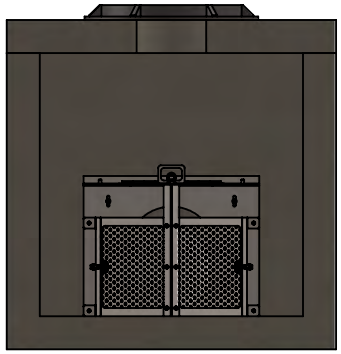
Step 2:
If necessary, the CPS unit can be quickly removed for deeper cleaning or jetting operations. Simply remove the Eye-Nut and release both Draw Latches to gain full access to the outlet pipe.



Step 3:
After completing the maintenance operations, reattach the Cover and Front Screen Assemblies and again secure them in place with the Eye-Nut and Draw Latches.



Step 4:
As a final step, and before reinstalling the grate or manhole cover, be sure to clean the work area making sure not to leave behind any tools or objects that may cause a traffic hazard or a pedestrian tripping hazard. Install the storm grate or manhole cover making sure it is seated properly on the frame.



FERGUSON WATERWORKS

fabco Industries Inc

TITLE: **MAINTENANCE GUIDE**

REV: **A**

CONNECTOR PIPE SCREEN (CPS) WITH QUICK RELEASE

ATTACHMENT E

CONDITIONS OF APPROVAL

ATTACHMENT F

Soils & Geotechnical Results

David Pinto, Project Manager
Legacy Partners
5141 California Avenue, Suite 100
Irvine, CA 92617

February 15, 2024
NOVA Project No. 3023028

Subject: Infiltration Feasibility Investigation for Proposed Stormwater Quality Improvements
The Hive - Proposed Residential Multi-Family Development
Susan Street and West Sunflower Avenue
Costa Mesa, CA 92626

Dear Mr. Pinto:

NOVA Services, Inc. (NOVA) is pleased to present our report describing the infiltration feasibility investigation for the “The Hive” Building project. Our services were conducted in general accordance with our proposal dated September 29, 2023.

NOVA appreciates the opportunity to be of service to Legacy Partners. If you have any questions regarding this report, please do not hesitate to call us at 949.388.7710.

Sincerely,
NOVA Services, Inc.

Sam Bergeland
Staff Geologist

Paul Kim, GE, CEG
Principal Engineer

INFILTRATION FEASIBILITY INVESTIGATION

The Hive

Susan Street and West Sunflower Avenue, Costa Mesa, CA 92626

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List of Figures

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1. INTRODUCTION

This report presents the results of the infiltration feasibility investigation NOVA performed for the "The Hive" project. As currently planned, the project will consist of the design and construction of three five-story residential wrap buildings with six level garages. The purpose of our work is to provide conclusions and recommendations regarding the infiltration feasibility of the project. Figure 1-1 presents the site vicinity on an open street map. Figure 1-2 presents a site location map.

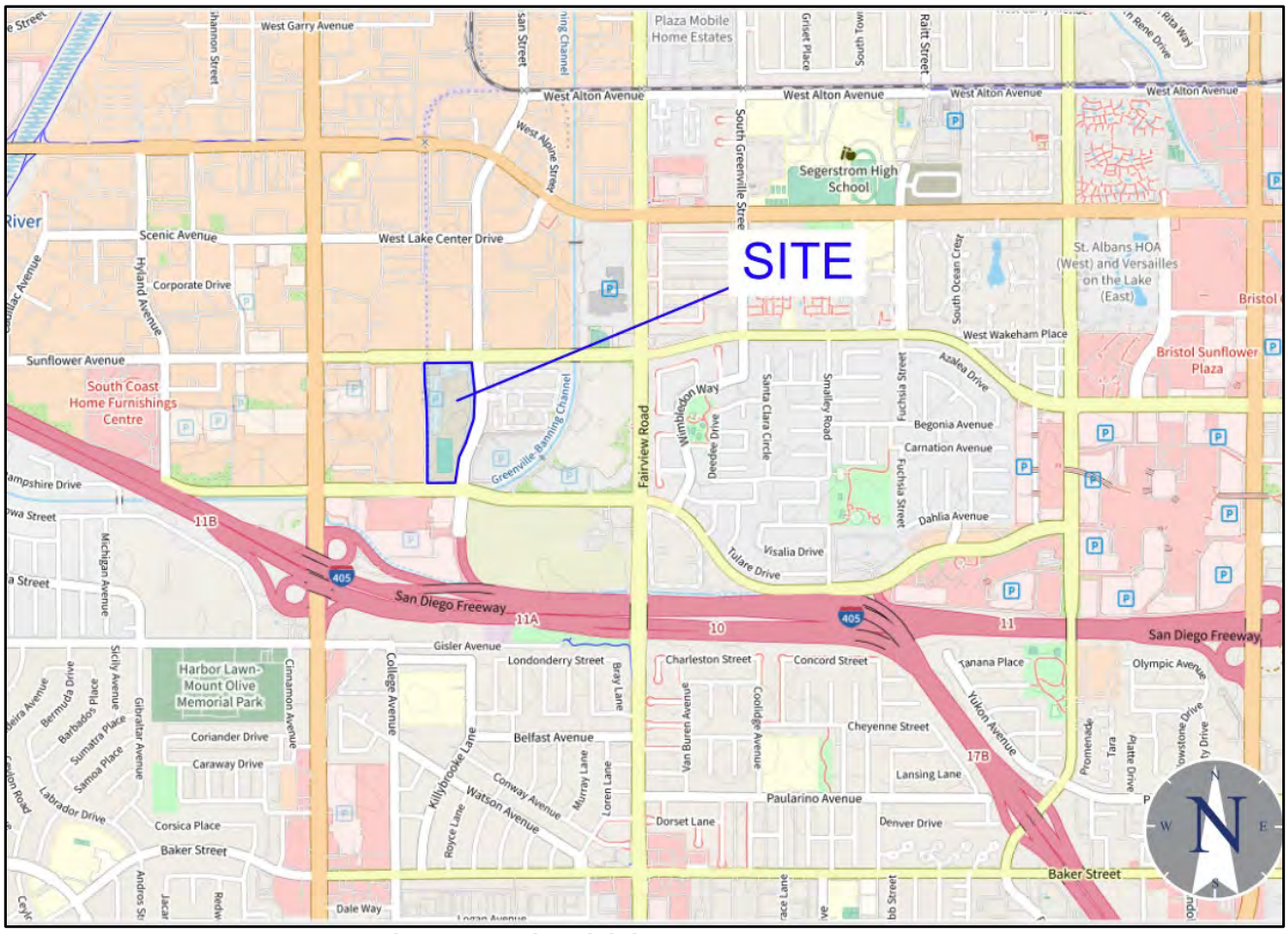


Figure 1-1. Site Vicinity Map – Openstreetmap.org

Figure 1-2. Site Location Map

2. SCOPE OF WORK

2.1. Field Investigation

NOVA explored the subsurface conditions by drilling four geotechnical borings (B-1 through B-4) to depths up to about 51½ feet below the ground surface (bgs) using a truck-mounted drill rig equipped with a hollow-stem auger as well as two Cone Penetration Test ('CPT', after ASTM D5778) soundings (CPT-1 through CPT-2) that were extended to a depth of up to 100ft with a 30-ton CPT rig. Figure 2-1 presents the approximate locations of the borings. Plate 1 presents the exploration locations on a larger scale.

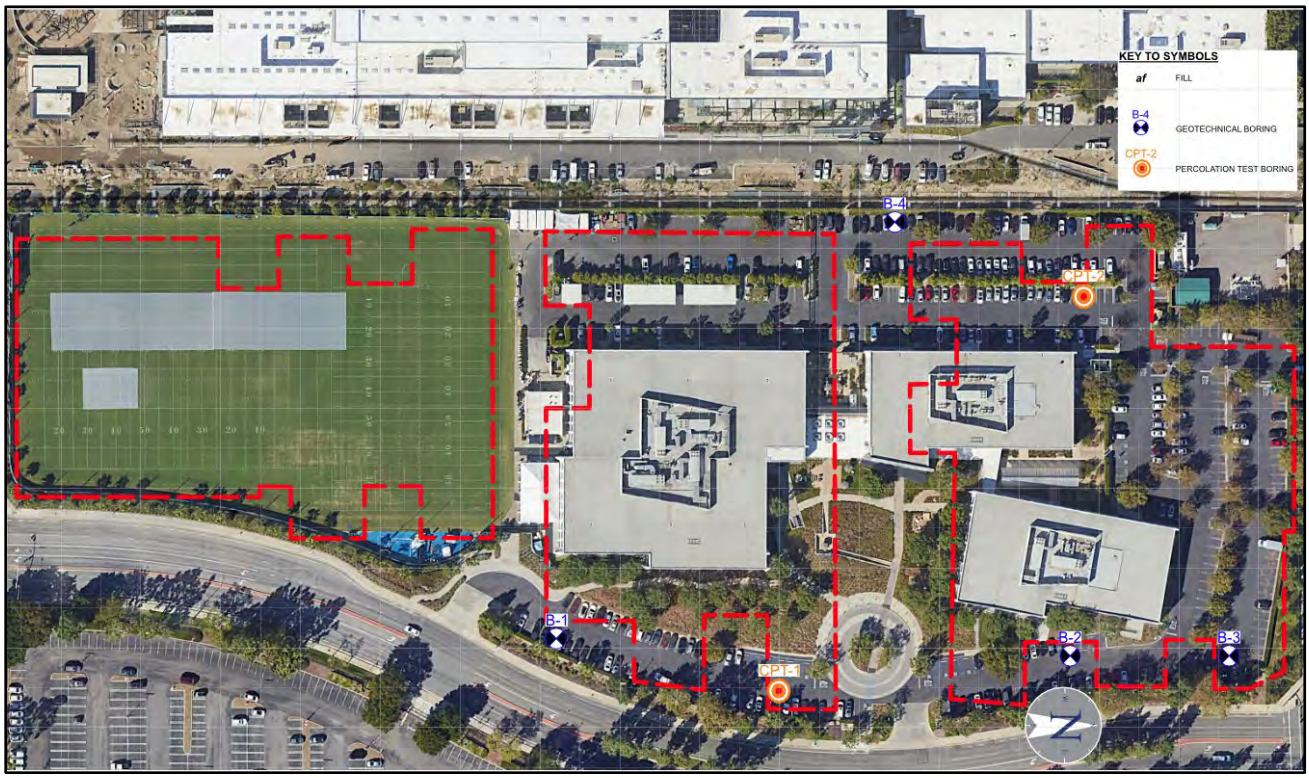


Figure 2-1. Subsurface Exploration Map

A NOVA engineer logged the borings and collected samples of the materials encountered for laboratory testing. Relatively undisturbed samples were obtained using a modified California (CAL) sampler, a ring-lined split tube sampler with a 3-inch outer diameter and 2½-inch inner diameter. Standard Penetration Tests (SPT) were performed in the borings using a 2-inch outer diameter and 1⅜-inch inner diameter split tube sampler. The CAL and SPT samplers were driven using an automatic hammer with a calibrated Energy Transfer Ratio (ETR) of 81.5%. The number of blows needed to drive the sampler 18 inches is noted in three, 6-inch intervals on the logs. Sampler refusal was encountered when 50 blows were applied during any one of the three 6-inch intervals, a total of 100 blows was applied, or there was no discernible sampler advancement during the application of 10 successive blows. The field blow counts, N, were corrected to a standard hammer (cathead and rope)

with a 60% ETR. The corrected blow counts are noted on the boring logs as N_{60}. Disturbed bulk samples were obtained from the SPT sampler and the drill cuttings. Appendix B presents logs of the borings. Soils are classified according to the Unified Soil Classification System.

2.2. Laboratory Testing

NOVA tested selected samples from the borings to evaluate soil classification and engineering properties and develop geotechnical conclusions and recommendations. The laboratory tests consisted of in-place dry density and moisture content, particle-size distribution, Atterberg limits, expansion index, corrosivity, and direct shear. Appendix C presents the results of the laboratory tests and brief explanations of the test procedures.

2.3. Analysis and Report Preparation

The results of the field investigation and laboratory testing were evaluated to develop conclusions and recommendations regarding the infiltration feasibility of the proposed construction and site improvements.

3. SITE AND PROJECT DESCRIPTION

3.1. Site Description

The approximately 13.5-acre, irregular shaped site is located at 3333 Susan street in the City of Costa Mesa. The site is bounded by Sunflower Avenue to the north, Susan Street to the east, Coast Drive to the south, and a mix of warehouse and commercial use buildings and associated parking to the west. The western limit of the property is also adjacent to a portion of abandoned railway.

The site is relatively level with elevations ranging from +30 feet mean sea level(msl) to +34 feet msl throughout the site (elevations are sourced from Google Earth). The site is used for a variety of purposes including: three connected two-story buildings for commercial use with associated parking within the northern, western, and eastern portions of the property. An athletic field is developed within the southern portion of the property. Additionally, two small stand alone single-story buildings are present adjacent to the north west entrance.

Review of aerial photography from the earliest aerial survey available from 1953 indicates the site was undeveloped. The vicinity of the site appears to be generally developed for agricultural purposes. Roads adjacent to the north and south of the site vicinity appear paved by 1963. By 1972, portions of the adjacent commercial buildings were developed. By 1992 additional commercial buildings west of the site were developed. Susan Street first appears in photographs in 1996. Development of the site property began in 2003. By 2004 the commercial buildings on the subject property were developed. By 2018, the athletic field had been developed. The site has remained relatively unchanged since then.

3.2. Proposed Construction

Review of schematic plans indicates the project will consist of the design of three five-story residential wrap structures with six level garages with no subterranean levels. These residential buildings contain between 320 units and 370 units. For each apartment building, there is an associated swimming pool with adjacent hardscape and landscape. Between structures there are planned to be recreational areas, landscaping, and various types of flatwork improvements. We anticipate there will also be improvements to the pavement for the fire lane located adjacent to the proposed building limits and associated underground utilities to and from the structure. We understand the proposed finished grades will generally match the existing grades; therefore, design cuts and fills are anticipated to be minimal. Earthwork is anticipated to consist of remedial and fine grading, footing excavations, backfilling underground utilities, subgrade preparation, and pavement construction.

4. GEOLOGY AND SUBSURFACE CONDITIONS

4.1. Regional Geology

The site is located within the Peninsular Ranges Geomorphic Province of California, which stretches from the Los Angeles basin to the tip of Baja California in Mexico. This province is characterized as a series of northwest-trending mountain ranges separated by subparallel fault zones and a coastal plain of subdued landforms. The mountain ranges are underlain primarily by Mesozoic metamorphic rocks that were intruded by plutonic rocks of the western Peninsular Ranges batholith, while the coastal plain is underlain by subsequently deposited marine and nonmarine sedimentary formations. The site is located within the coastal plain portion of the province and is underlain by Quaternary, Late Holocene to Late Pleistocene alluvial deposits. Figure 4-1 presents the regional geology in the vicinity of the site.

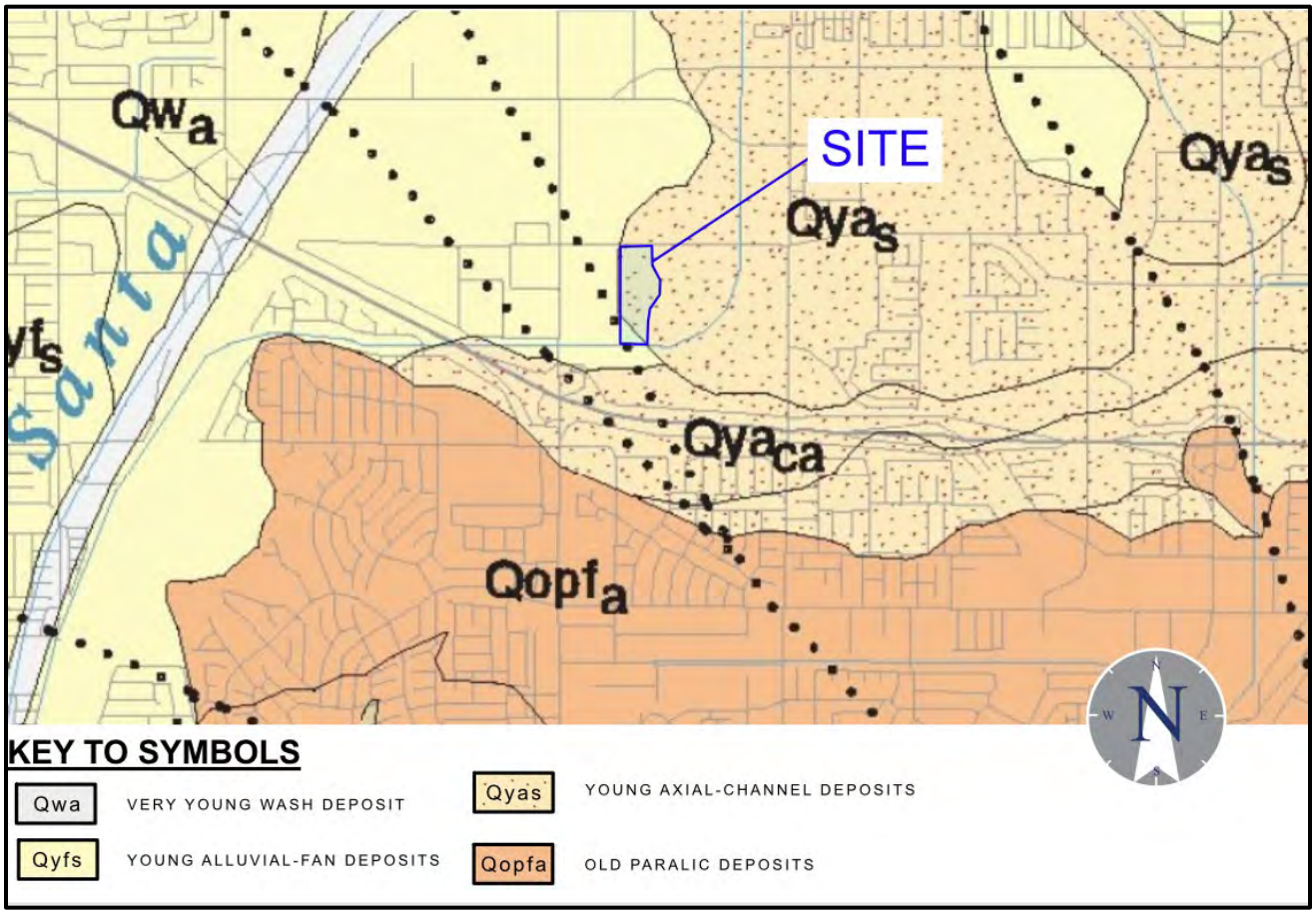


Figure 4-1. Geologic map of the San Bernardino and Santa Ana 30' x 60' quadrangles, California 2006

4.2. Site-Specific Geology

Subsurface investigation by NOVA indicates that the site is underlain by minor fill and alluvial deposits. The description of the material encountered in the borings is presented below. Plate 1 (provided following the text of the report) presents site-specific geology.

Fill (af): Fill was encountered in all the four borings with an approximate thickness up to about 3 feet. As encountered in the borings, the fill generally consist of slightly moist to moist, soft to stiff sandy silt and sandy clay to loose to medium dense clayey sand. NOVA has no records regarding the placement and compaction of the fill; therefore, the fill is considered undocumented and at risk for wide variations in quality.

Alluvium (Qa): The site is underlain by Quaternary-aged Alluvium. As encountered in the borings, the alluvium consist of olive brown and brown with variable red brown mottling, firm to stiff, sandy clay to clay and sandy silt to clayey silt. Layers of sand were observed at 25 feet and 40 feet.

Groundwater: Groundwater was encountered in the borings between 22 ft and 24 ft below ground surface. Based on the review of the referenced CDMG Special Report, the site is mapped with a historical groundwater depth of 10 feet.

5. CONCLUSIONS

Based on the results of NOVA's investigation, the near surface soils are comprised of cohesive soils that would result in a very low infiltration rate, less than the required minimum measured rate of 0.3 inches per hour by the local jurisdictional agenccy. Infiltration into the cohesive soils is likely to result in clogging and mounding. Additionally, the historic high groundwater depth is shallow (approximately 10 feet below grade). As a result, treatment of stormwater will require the use of other options such as bio-filtration.

6. CLOSURE

In the performance of professional services, NOVA exercises the level of care and skill ordinarily exercised by members of the geotechnical profession currently practicing under similar conditions and in the same locality. The client recognizes that subsurface conditions may vary from those encountered at the boring locations and that the data, interpretations, and recommendations reported herein are based solely on the information obtained by NOVA. NOVA will be responsible for those data, interpretations, and recommendations, but shall not be responsible for interpretations by others of the information developed. Our services consist of professional consultation and observation only, and no warranty whatsoever, express or implied, is made or intended in connection with the work performed or to be performed by us, or by our proposal for consulting or other services, or by our furnishing of oral or written reports or findings.

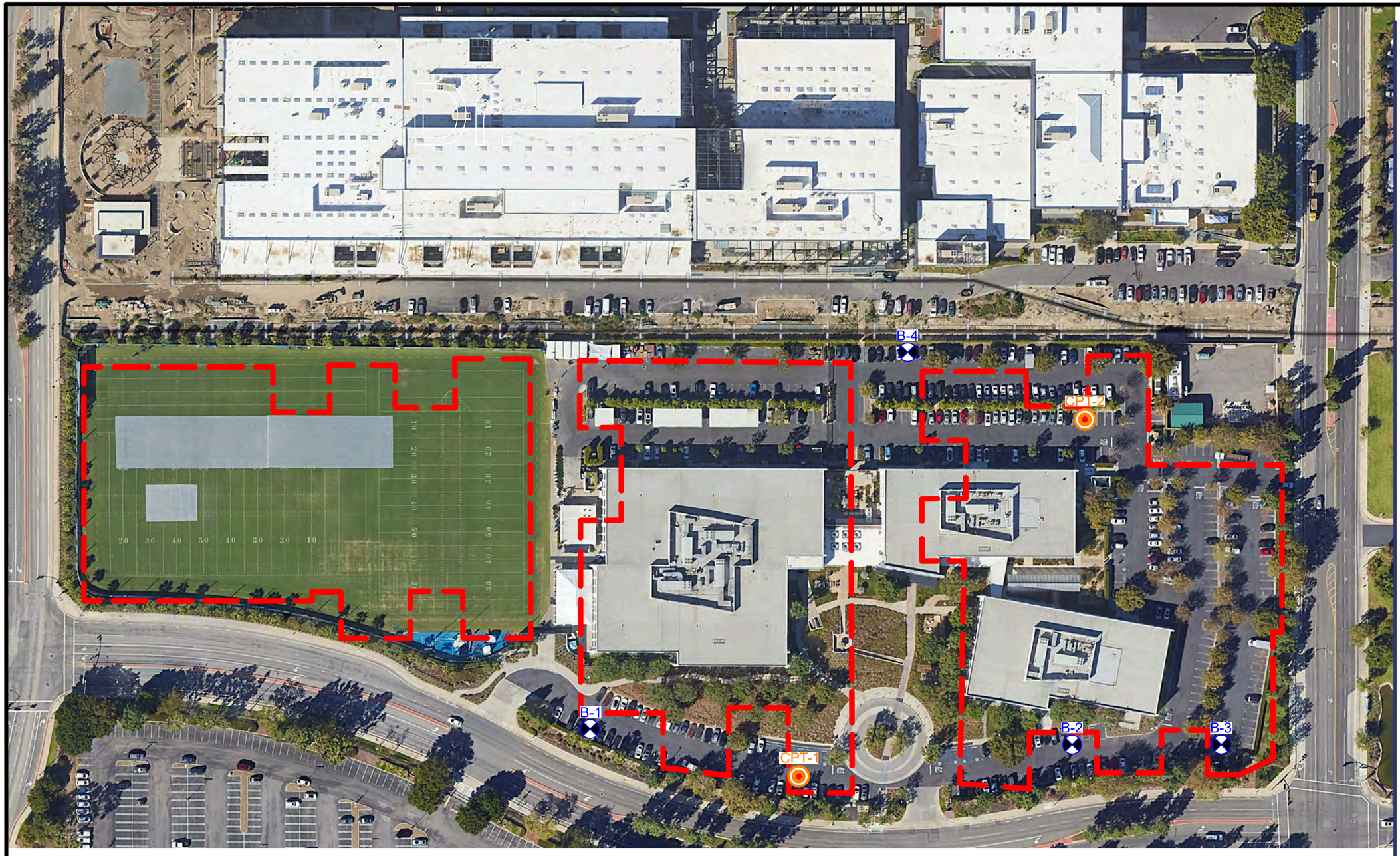
7. REFERENCES

California Geological Survey (CGS), 1997, Seismic Hazard Report for the Anaheim and Newport Beach 7.5-Minute Quadrangles, Orang County, California, SHZR 03, 1997.

California State Water Resources Control Board (2022), “GeoTracker,” accessed February 2024.

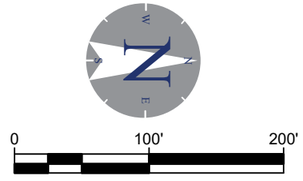
Historic Aerials Website, https://www.historicaerials.com/viewer, accessed February 2024.

PLATES



KEY TO SYMBOLS

af	FILL
B-4	GEOTECHNICAL BORING
CPT-2	PERCOLATION TEST BORING



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HIVE LIVE

SUSAN STREET AND W. SUNFLOWER AVENUE
COSTA MESA, CALIFORNIA

PROJECT NO.:	3023028
DRAWN BY:	PK
REVIEWED BY:	PK
SCALE:	1"=100'

DRAWING TITLE:

GEOTECHNICAL MAP

PLATE NO. 1 OF 1

APPENDIX A
USE OF THE GEOTECHNICAL REPORT

Important Information About Your

Geotechnical Engineering Report

Subsurface problems are a principal cause of construction delays, cost overruns, claims, and disputes.

The following information is provided to help you manage your risks.

Geotechnical Services Are Performed for Specific Purposes, Persons, and Projects

Geotechnical engineers structure their services to meet the specific needs of their clients. A geotechnical engineering study conducted for a civil engineer may not fulfill the needs of a construction contractor or even another civil engineer. Because each geotechnical engineering study is unique, each geotechnical engineering report is unique, prepared *solely* for the client. No one except you should rely on your geotechnical engineering report without first conferring with the geotechnical engineer who prepared it. *And no one — not even you* — should apply the report for any purpose or project except the one originally contemplated.

Read the Full Report

Serious problems have occurred because those relying on a geotechnical engineering report did not read it all. Do not rely on an executive summary. Do not read selected elements only.

A Geotechnical Engineering Report Is Based on A Unique Set of Project-Specific Factors

Geotechnical engineers consider a number of unique, project-specific factors when establishing the scope of a study. Typical factors include: the client's goals, objectives, and risk management preferences; the general nature of the structure involved, its size, and configuration; the location of the structure on the site; and other planned or existing site improvements, such as access roads, parking lots, and underground utilities. Unless the geotechnical engineer who conducted the study specifically indicates otherwise, do not rely on a geotechnical engineering report that was:

- not prepared for you,
- not prepared for your project,
- not prepared for the specific site explored, or
- completed before important project changes were made.

Typical changes that can erode the reliability of an existing geotechnical engineering report include those that affect:

- the function of the proposed structure, as when it's changed from a parking garage to an office building, or from a light industrial plant to a refrigerated warehouse,
- elevation, configuration, location, orientation, or weight of the proposed structure,
- composition of the design team, or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project changes—even minor ones—and request an assessment of their impact. *Geotechnical engineers cannot accept responsibility or liability for problems that occur because their reports do not consider developments of which they were not informed.*

Subsurface Conditions Can Change

A geotechnical engineering report is based on conditions that existed at the time the study was performed. *Do not rely on a geotechnical engineering report* whose adequacy may have been affected by: the passage of time; by man-made events, such as construction on or adjacent to the site; or by natural events, such as floods, earthquakes, or groundwater fluctuations. *Always* contact the geotechnical engineer before applying the report to determine if it is still reliable. A minor amount of additional testing or analysis could prevent major problems.

Most Geotechnical Findings Are Professional Opinions

Site exploration identifies subsurface conditions only at those points where subsurface tests are conducted or samples are taken. Geotechnical engineers review field and laboratory data and then apply their professional judgment to render an opinion about subsurface conditions throughout the site. Actual subsurface conditions may differ—sometimes significantly—from those indicated in your report. Retaining the geotechnical engineer who developed your report to provide construction observation is the most effective method of managing the risks associated with unanticipated conditions.

A Report's Recommendations Are *Not* Final

Do not overrely on the construction recommendations included in your report. *Those recommendations are not final,* because geotechnical engineers develop them principally from judgment and opinion. Geotechnical engineers can finalize their recommendations only by observing actual

subsurface conditions revealed during construction. *The geotechnical engineer who developed your report cannot assume responsibility or liability for the report's recommendations if that engineer does not perform construction observation.*

A Geotechnical Engineering Report Is Subject to Misinterpretation

Other design team members' misinterpretation of geotechnical engineering reports has resulted in costly problems. Lower that risk by having your geotechnical engineer confer with appropriate members of the design team after submitting the report. Also retain your geotechnical engineer to review pertinent elements of the design team's plans and specifications. Contractors can also misinterpret a geotechnical engineering report. Reduce that risk by having your geotechnical engineer participate in prebid and preconstruction conferences, and by providing construction observation.

Do Not Redraw the Engineer's Logs

Geotechnical engineers prepare final boring and testing logs based upon their interpretation of field logs and laboratory data. To prevent errors or omissions, the logs included in a geotechnical engineering report should *never* be redrawn for inclusion in architectural or other design drawings. Only photographic or electronic reproduction is acceptable, *but recognize that separating logs from the report can elevate risk.*

Give Contractors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can make contractors liable for unanticipated subsurface conditions by limiting what they provide for bid preparation. To help prevent costly problems, give contractors the complete geotechnical engineering report, *but* preface it with a clearly written letter of transmittal. In that letter, advise contractors that the report was not prepared for purposes of bid development and that the report's accuracy is limited; encourage them to confer with the geotechnical engineer who prepared the report (a modest fee may be required) and/or to conduct additional study to obtain the specific types of information they need or prefer. A prebid conference can also be valuable. *Be sure contractors have sufficient time* to perform additional study. Only then might you be in a position to give contractors the best information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions.

Read Responsibility Provisions Closely

Some clients, design professionals, and contractors do not recognize that geotechnical engineering is far less exact than other engineering disciplines. This lack of understanding has created unrealistic expectations that have led to disappointments, claims, and disputes. To help reduce the risk of such outcomes, geotechnical engineers commonly include a variety of explanatory provisions in their reports. Sometimes labeled "limitations" many of these provisions indicate where geotechnical engineers' responsibilities begin and end, to help others recognize their own responsibilities and risks. *Read these provisions closely.* Ask questions. Your geotechnical engineer should respond fully and frankly.

Geoenvironmental Concerns Are Not Covered

The equipment, techniques, and personnel used to perform a *geoenvironmental* study differ significantly from those used to perform a *geotechnical* study. For that reason, a geotechnical engineering report does not usually relate any geoenvironmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated environmental problems have led to numerous project failures.* If you have not yet obtained your own geoenvironmental information, ask your geotechnical consultant for risk management guidance. *Do not rely on an environmental report prepared for someone else.*

Obtain Professional Assistance To Deal with Mold

Diverse strategies can be applied during building design, construction, operation, and maintenance to prevent significant amounts of mold from growing on indoor surfaces. To be effective, all such strategies should be devised for the *express purpose* of mold prevention, integrated into a comprehensive plan, and executed with diligent oversight by a professional mold prevention consultant. Because just a small amount of water or moisture can lead to the development of severe mold infestations, a number of mold prevention strategies focus on keeping building surfaces dry. While groundwater, water infiltration, and similar issues may have been addressed as part of the geotechnical engineering study whose findings are conveyed in this report, the geotechnical engineer in charge of this project is not a mold prevention consultant; ***none of the services performed in connection with the geotechnical engineer's study were designed or conducted for the purpose of mold prevention. Proper implementation of the recommendations conveyed in this report will not of itself be sufficient to prevent mold from growing in or on the structure involved.***

Rely, on Your ASFE-Member Geotechncial Engineer for Additional Assistance

Membership in ASFE/The Best People on Earth exposes geotechnical engineers to a wide array of risk management techniques that can be of genuine benefit for everyone involved with a construction project. Confer with you ASFE-member geotechnical engineer for more information.

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APPENDIX B
BORING LOGS

MAJOR DIVISIONS				TYPICAL NAMES
COARSE-GRAINED SOILS MORE THAN HALF IS COARSER THAN NO. 200 SIEVE	GRAVEL MORE THAN HALF COARSE FRACTION IS LARGER THAN NO. 4 SIEVE	CLEAN GRAVEL WITH LESS THAN 15% FINES	GW	WELL-GRADED GRAVEL WITH OR WITHOUT SAND
			GP	POORLY GRADED GRAVEL WITH OR WITHOUT SAND
		GRAVEL WITH 15% OR MORE FINES	GM	SILTY GRAVEL WITH OR WITHOUT SAND
			GC	CLAYEY GRAVEL WITH OR WITHOUT SAND
	SAND MORE THAN HALF COARSE FRACTION IS FINER THAN NO. 4 SIEVE SIZE	CLEAN SAND WITH LESS THAN 15% FINES	SW	WELL-GRADED SAND WITH OR WITHOUT GRAVEL
			SP	POORLY GRADED SAND WITH OR WITHOUT GRAVEL
		SAND WITH 15% OR MORE FINES	SM	SILTY SAND WITH OR WITHOUT GRAVEL
			SC	CLAYEY SAND WITH OR WITHOUT GRAVEL
FINE-GRAINED SOILS MORE THAN HALF IS FINER THAN NO. 200 SIEVE	SILTS AND CLAYS LIQUID LIMIT 50% OR LESS		ML	SILT WITH OR WITHOUT SAND OR GRAVEL
			CL	LEAN CLAY WITH OR WITHOUT SAND OR GRAVEL
			OL	ORGANIC SILT OR CLAY OF LOW TO MEDIUM PLASTICITY WITH OR WITHOUT SAND OR GRAVEL
	SILTS AND CLAYS LIQUID LIMIT GREATER THAN 50%		MH	ELASTIC SILT WITH OR WITHOUT SAND OR GRAVEL
			CH	FAT CLAY WITH OR WITHOUT SAND OR GRAVEL
			OH	ORGANIC SILT OR CLAY OF HIGH PLASTICITY WITH OR WITHOUT SAND OR GRAVEL
HIGHLY ORGANIC SOILS			PT	PEAT AND OTHER HIGHLY ORGANIC SOILS

- GROUNDWATER / STABILIZED
- GROUNDWATER SEEPAGE
- BULK SAMPLE
- SPT SAMPLE (ASTM D1586)
- MOD. CAL. SAMPLE (ASTM D3550)
- UNRELIABLE BLOW COUNTS
- GEOLOGIC CONTACT
- SOIL TYPE CHANGE

LAB TEST ABBREVIATIONS

CR	CORROSIVITY
MD	MAXIMUM DENSITY
DS	DIRECT SHEAR
EI	EXPANSION INDEX
AL	ATTERBERG LIMITS
SA	SIEVE ANALYSIS
RV	RESISTANCE VALUE
CN	CONSOLIDATION
SE	SAND EQUIVALENT

LOG ABBREVIATIONS

REF	REFUSAL

RELATIVE DENSITY OF COHESIONLESS SOILS		CONSISTENCY OF COHESIVE SOILS		
RELATIVE DENSITY	SPT N60 BLOWS/FOOT	CONSISTENCY	SPT N60 BLOWS/FOOT	POCKET PENETROMETER MEASUREMENT (TSF)
VERY LOOSE	0 - 4	VERY SOFT	0 - 2	0 - 0.25
LOOSE	5 - 10	SOFT	3 - 4	0.26 - 0.50
MEDIUM DENSE	11 - 30	MEDIUM STIFF	5 - 8	0.51 - 1.0
DENSE	31 - 50	STIFF	9 - 15	1.1 - 2.0
VERY DENSE	OVER 50	VERY STIFF	16 - 30	2.1 - 4.0
		HARD	OVER 30	OVER 4.0

NUMBER OF BLOWS OF 140 LB HAMMER FALLING 30 INCHES TO DRIVE A 2 INCH O.D. (1-3/8 INCH I.D.) SPLIT-BARREL SAMPLER THE LAST 12 INCHES OF AN 18-INCH DRIVE (ASTM-1586 STANDARD PENETRATION TEST).

IF THE SEATING INTERVAL (1st 6 INCH INTERVAL) IS NOT ACHIEVED, N IS REPORTED AS REF. IF MORE THAN 50 BLOWS ARE RECORDED IN ANY 6-INCH INTERVAL, $_{60}$ IS REPORTED AS REF.

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SUBSURFACE EXPLORATION LEGEND

LOG OF BORING B-1

DATE DRILLED: DEC 8, 2023 **DRILLING EQUPMENT:** CME 75 **SAMPLE METHOD:** HAMMER: 140 LBS., DROP: 30 IN (AUTO)

ELEVATION (FT): +31 (Google Earth) **DRILLING METHOD:** 8-INCH HOLLOW STEM AUGER **LOGGED BY:** PK

GROUNDWATER DEPTH (FT): N/A **NOTES:** ETR~81.5% **REVIEWED BY:** PK

DEPTH (FT)	BULK SAMPLE	CAL/SPT SAMPLE	BLOWS PER 6 IN N	N_{60}	MOISTURE (%)	DRY DENSITY (pcf)	SOIL CLASS (USCS)	SOIL DESCRIPTION *SUMMARY OF SUBSURFACE CONDITIONS* *(USCS; COLOR, MOISTURE, DENSITY, GRAIN SIZE, OTHER)*	LAB TESTS
0								**3 INCHES OF A.C. OVER 6 INCHES OF AB**	
	X						SC	**ARTIFICIAL FILL (af):** SANDY CLAY/ CLAYEY SAND, *OLIVE BROWN, SL MOIST TO MOIST, DENSE, FINE GRAINED, MICACEOUS*	AL
	X							**ALLUVIUM (Qa):** *SILTY CLAY, OLIVE BROWN, MOIST, STIFF*	EI DS
5	X	■	6 8 10	12	25.7	99.1	ML	*INCREASED SILT CONTENT*	CN
10		■	3 4 7	8	33.3	87.3	CL	*CLAY, BROWN TO OLIVE BROWN, MOIST TO WET, STIFF*	
15		⧸	2 2 4	9	36.5				
20		⧸	2 1 2	4	23.3			*MEDIUM STIFF*	
								BORING TERMINATED AT 21½ FT. NO GROUNDWATER ENCOUNTERED.	
25									
30									

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DRAFTED BY: PK | PROJECT: 3023028 | APPENDIX: B.1

LOG OF BORING B-2

DATE DRILLED: DEC 8, 2023 **DRILLING EQUPMENT:** CME 75 **SAMPLE METHOD:** HAMMER: 140 LBS., DROP: 30 IN (AUTO)

ELEVATION (FT): +29 (Google Earth) **DRILLING METHOD:** 8-INCH HOLLOW STEM AUGER **LOGGED BY:** PK

GROUNDWATER DEPTH (FT): 24 **NOTES:** ETR~81.5% **REVIEWED BY:** PK

DEPTH (FT)	BULK SAMPLE	CAL/SPT SAMPLE	BLOWS PER 6 IN N	N_{60}	MOISTURE (%)	DRY DENSITY (pcf)	SOIL CLASS (USCS)	SOIL DESCRIPTION *SUMMARY OF SUBSURFACE CONDITIONS* *(USCS; COLOR, MOISTURE, DENSITY, GRAIN SIZE, OTHER)*	LAB TESTS
0								**3 INCHES OF A.C. OVER 6 INCHES OF AB**	
							ML	**ARTIFICIAL FILL(af):** *SANDY SILT, OLIVE BROWN, SLIGHTLY MOIST TO MOIST, MICACEOUS, FINE GRAINED*	
							SP	*SAND, GRAY BROWN, SLIGHTLY MOIST TO MOIST AT 3'*	
5		■	3 7 13	13	28.7	91.0	CL	**ALLUVIUM (Qa):***CLAY, MOTTLED OLIVE BROWN TO BROWN, SLIGHTLY MOIST TO MOIST, STIFF* *INCREASED SILT, FINE GRAINED SAND*	CN
10		■	3 7 6	10	35.0	86.0	ML	*CLAYEY SILT, WET, STIFF*	CN
15		⁄	2 2 2	6			CH	*CLAY, OLIVE BROWN, MOIST, MEDIUM STIFF, CONTAINS CALICHE STRINGERS*	AL
20		⁄	1 2 2	6	28.6			*WATER AT 24'*	
25		⁄	4 9 15	37	17.7		CL	*SANDY CLAY, MOTTLED BROWN AND OLIVE BROWN WITH BLACK CARBONATE SPECS, HARD, GRAY CALICHE STRINGERS*	
30									

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DRAFTED BY: DB | PROJECT: 3023028 | APPENDIX: B.2

LOG OF BORING B-2(CONT.)

DATE DRILLED: DEC 8, 2023 **DRILLING EQUPMENT:** CME 75 **SAMPLE METHOD:** HAMMER: 140 LBS., DROP: 30 IN (AUTO)

ELEVATION (FT): +29 (Google Earth) **DRILLING METHOD:** 8-INCH HOLLOW STEM AUGER **LOGGED BY:** PK

GROUNDWATER DEPTH (FT): N/A **NOTES:** ETR~81.5% **REVIEWED BY:** PK

DEPTH (FT)	BULK SAMPLE	CAL/SPT SAMPLE	BLOWS PER 6 IN N	N_{60}	MOISTURE (%)	DRY DENSITY (pcf)	SOIL CLASS (USCS)	SOIL DESCRIPTION *SUMMARY OF SUBSURFACE CONDITIONS* *(USCS; COLOR, MOISTURE, DENSITY, GRAIN SIZE, OTHER)*	LAB TESTS
30			2 2 2	7			CL	*SANDY CLAY, BROWN, MOIST, MEDIUM STIFF, CLAYEY SAND NOTED AT TIP OF SAMPLER*	AL
35			2 3 3	10	21.1		SP CL	*SAND, MOTTLED GRAY AND BROWN, MORE OR LESS SATURATED, LOOSE, COARSE* *CLAY, MOTTLED OLIVE BROWN AND BROWN, MOIST, STIFF, AT 35'*	
40			3 5 5	16	22.6		SP CL	*SAND, MEDIUM DENSE* *SILTLY CLAY, MOTTLED RED BROWN AND OLIVE BROWN, VERY STIFF AT41'*	
45			5 16 25	67			SP	*SAND, VERY DENSE*	
50								*SAMPLE LOST*	
								BORING TERMINATED AT 51½ FT. GROUNDWATER ENCOUNTERED AT 24FT.	
55									
60									

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DRAFTED BY: DB | PROJECT: 3023028 | APPENDIX: B.3

LOG OF BORING B-3

DATE DRILLED: DEC 8, 2023 **DRILLING EQUPMENT:** CME 75 **SAMPLE METHOD:** HAMMER: 140 LBS., DROP: 30 IN (AUTO)

ELEVATION (FT): +28 (Google Earth) **DRILLING METHOD:** 8-INCH HOLLOW STEM AUGER **LOGGED BY:** PK

GROUNDWATER DEPTH (FT): N/A **NOTES:** ETR~81.5% **REVIEWED BY:** PK

DEPTH (FT)	BULK SAMPLE	CAL/SPT SAMPLE	BLOWS PER 6 IN N	N_{60}	MOISTURE (%)	DRY DENSITY (pcf)	SOIL CLASS (USCS)	SOIL DESCRIPTION *SUMMARY OF SUBSURFACE CONDITIONS* *(USCS; COLOR, MOISTURE, DENSITY, GRAIN SIZE, OTHER)*	LAB TESTS
0	X	X						**3 INCHES OF A.C. OVER 6 INCHES OF AB**	AL
	X	X					ML	**ARTIFICIAL FILL (AF):** *SANDY SILT, OLIVE BROWN, SLIGHTLY MOIST TO MOIST, MICACEOUS, FINE GRAINED*	EI DS CR
	X	X					SP	*SAND, GRAY, SLIGHTLY MOIST*	
5		■	6 8 14	15	25.4	96.5	CL	**ALLUVIUM (Qa):** *CLAY, OLIVE BROWN, SLIGHTLY MOIST TO MOIST, STIFF*	CN
10		■	7 11 7	14	29.5	91.6	ML	*SANDY SILT, MOTTLED BROWN, OLIVE BROWN, AND RED BROWN, STIFF, FINE GRAINED, MICACEOUS*	
15		⁄	2 2 3	7	33.0		CL	*CLAY, OLIVE BROWN, MOIST TO WET, MEDIUM STIFF*	
20		⁄	2 2 2	6	36.3				
								BORING TERMINATED AT 21½ FT. NO GROUNDWATER ENCOUNTERED.	
25									
30									

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DRAFTED BY: DB | PROJECT: 3023028 | APPENDIX: B.4

LOG OF BORING B-4

DATE DRILLED: DEC 8, 2023 **DRILLING EQUPMENT:** CME 75 **SAMPLE METHOD:** HAMMER: 140 LBS., DROP: 30 IN (AUTO)

ELEVATION (FT): +30 (Google Earth) **DRILLING METHOD:** 8-INCH HOLLOW STEM AUGER **LOGGED BY:** PK

GROUNDWATER DEPTH (FT): 23 **NOTES:** ETR~81.5% **REVIEWED BY:** PK

DEPTH (FT)	BULK SAMPLE	CAL/SPT SAMPLE	BLOWS PER 6 IN N	N_{60}	MOISTURE (%)	DRY DENSITY (pcf)	SOIL CLASS (USCS)	SOIL DESCRIPTION *SUMMARY OF SUBSURFACE CONDITIONS* *(USCS; COLOR, MOISTURE, DENSITY, GRAIN SIZE, OTHER)*	LAB TESTS
0								**3 INCHES OF A.C. OVER 6 INCHES OF AB**	
								ARTIFICIAL FILL (af): SANDY CLAY/ CLAYEY SAND, *OLIVE BROWN, SL MOIST TO MOIST, DENSE, FINE GRAINED, MICACEOUS*	
							SC	**ALLUVIUM (Qa):** *CLAYEY SAND, OLIVE BROWN, MOIST TO WET, VERY LOOSE, FINE GRAINED, MICACEOUS*	
5		■	3 3 3	4	33.4	86.5			CN
10		■	2 2 2	3	33.7	88.7	CL	*CLAY, MOTTLED BROWN AND RED BROWN, MOIST TO WET, SOFT, CALICHE STRINGERS PRESENT*	CN
15		⧸	2 1 2	4	36.2			*MEDIUM STIFF*	AL
20		⧸	2 3 3	9				*STIFF* *WATER AT 23'*	
25		⧸	4 9 16	39			SC	*CLAYEY SAND, MOTTLED BROWN AND GRAY WITH BLACK CARBONATE SPECS, WET, DENSE, SCATTERED CALICHE STRINGERS*	AL
30									

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DRAFTED BY: DB | PROJECT: 3023028 | APPENDIX: B.5

LOG OF BORING B-4(CONT.)

DATE DRILLED: DEC 8, 2023 **DRILLING EQUPMENT:** CME 75 **SAMPLE METHOD:** HAMMER: 140 LBS., DROP: 30 IN (AUTO)

ELEVATION (FT): +30 (Google Earth) **DRILLING METHOD:** 8-INCH HOLLOW STEM AUGER **LOGGED BY:** PK

GROUNDWATER DEPTH (FT): 23 **NOTES:** ETR~81.5% **REVIEWED BY:** PK

DEPTH (FT)	BULK SAMPLE	CAL/SPT SAMPLE	BLOWS PER 6 IN N	N_{60}	MOISTURE (%)	DRY DENSITY (pcf)	SOIL CLASS (USCS)	SOIL DESCRIPTION *SUMMARY OF SUBSURFACE CONDITIONS* *(USCS; COLOR, MOISTURE, DENSITY, GRAIN SIZE, OTHER)*	LAB TESTS
30			3 5 7	20	30.6		SP CL	*SAND, BROWN, SATURATED, MEDIUM DENSE, COARSE GRAINED* *SANDY CLAY, BROWN, MOIST TO WET, VERY STIFF*	AL
35			2 3 5	13	28.6		CL	*SATURATED, STIFF* *CLAY, MOTTLED GRAY AND OLIVE BROWN, SLIGHTLY MOIST TO MOIST, STIFF*	
40			7 15 18	54			SP	*SAND, BROWN, SATURATED, DENSE, COARSE GRAINED*	
45			5 16 4	33	18.1			*DENSE, COARSENESS DECREASES WITH DEPTH*	
50			8 12 14	42					
								BORING TERMINATED AT 51½ FT. GROUNDWATER ENCOUNTERED AT 23 FT.	
55									
60									

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DRAFTED BY: DB | PROJECT: 3023028 | APPENDIX: B.6

APPENDIX C
LABORATORY TESTING

Laboratory tests were performed in accordance with the generally accepted American Society for Testing and Materials (ASTM) test methods or suggested procedures. Brief descriptions of the tests performed are presented below:

- **CLASSIFICATION:** *Field classifications were verified in the laboratory by visual examination. The final soil classifications are in accordance with the Unified Soils Classification System and are presented on the exploration logs in Appendix B.*
- **MOISTURE CONTENT (ASTM D2216):** *A test was performed on a selected represenative soil sample to evaluate the water (moisture) content by mass of soil, rock, and similar materials where the reduction in mass by drying is due to loss of water. The test sample is dried in an oven at a temperature of 110° ± 5°C to a constant mass. The loss of mass due to drying is considered to be water. The water (moisture) content was determined in general accordance with ASTM D2216.*
- **MOISTURE AND DENSITY OF SOIL IN PLACE (ASTM D2937):** *In-place moisture contents and dry densities were determined for representative soil samples. This information was an aid to classification and permitted recognition of variations in material consistency with depth. The dry unit weight is determined in pounds per cubic foot, and the in-place moisture content is determined as a percentage of the soil's dry weight. The results are summarized in the exploration logs presented in Appendix B. The moisture and density of the soil was determined in general accordance with ASTM D2937.*
- **GRADATION ANALYSIS (ASTM D6913):** *Gradation analyses were performed on representative soil samples in general accordance with ASTM D422. The grain size distributions of the samples were determined in general accordance with ASTM D6913.*
- **ATTERBERG LIMITS (ASTM D4318):** *Tests were performed on selected representative fine-grained soil samples to evaluate the liquid limits, plastic limits, and plasticity indexes in general accordance with ASTM D4318. These test results were utilized to evaluate the soil classification in accordance with the Unified Soil Classification System.*
- **EXPANSION INDEX (ASTM D4829):** *The expansion indexes of selected materials were evaluated in general accordance with ASTM D4829. Specimens were molded under a specified compactive energy at approximately 50 percent saturation (plus or minus 1 percent). The prepared 1-inch thick by 4-inch diameter specimens were loaded with a surcharge of 144 pounds per square foot and were inundated with tap water. Readings of volumetric swell were made for a period of 24 hours.*
- **CORROSIVITY (CAL. TEST METHOD 417, 422, 643):** *Soil PH, and minimum resistivity tests were performed on a representative soil sample in general accordance with test method CT 643. The sulfate and chloride content of the selected sample were evaluated in general accordance with CT 417 and CT 422, respectively.*
- **MAXIMUM DENSITY AND OPTIMUM MOISTURE CONTENT (ASTM D1557 METHOD A,B,C):** *The maximum dry density and optimum moisture content of typical soils were determined in the laboratory in accordance with ASTM Standard Test D 1557, Method A, Method B, Method C*

Soil samples not tested are now stored in our laboratory for future reference and evaluation, if needed. Unless notified to the contrary, samples will be disposed of 90 days from the date of this report.

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LAB TEST SUMMARY

Proposed Residential Multi-Family Development

Hive Live

Susan Street and West Sunflower Avenue, Costa Mesa, CA 92606

DRAFTED BY: SB	REVIEWED BY: PK	PROJECT: 3023028	FIGURE: C.1

Laboratory tests were performed in accordance with the generally accepted American Society for Testing and Materials (ASTM) test methods or suggested procedures. Brief descriptions of the tests performed are presented below:

- **DIRECT SHEAR:** *The shear strength parameters, angle of internal friction adn cohesion, were determined from undisturbed samples obtained from our exploratory borings. The test was performed in general conformance with ASTM D 3080. For each test, the three specimens were artificially saturated in the laboratory and were sheared under submergerd conditions and varied loads at an appropriate rate of constant rate of strain. Residual shear of the Mission Valley Formation along bedding was determined by repeatedly shearing a sample in the direct shear machine.*

- **CONSOLIDATION PROPERTIES (ASTM D2435):** *Tests were performed on selected relatively undisturbed soil samples in general accordance with ASTM D2435. The samples were inundated during testing to represent adverse field conditions. The percent of consolidation for each load cycle was recorded as a ratio of the amount of vertical compression to the original height of the sample.*

Soil samples not tested are now stored in our laboratory for future reference and evaluation, if needed. Unless notified to the contrary, samples will be disposed of 90 days from the date of this report.

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LAB TEST SUMMARY

Proposed Residential Multi-Family Development

Hive Live

Susan Street and West Sunflower Avenue, Costa Mesa, CA 92606

DRAFTED BY: SB	REVIEWED BY: PK	PROJECT: 3023028	FIGURE: C.1a

Maximum Dry Density and Optimum Moisture Content (ASTM D1557)

Sample Location	Sample Depth (ft.)	Soil Description	Maximum Dry Density (pcf)	Optimum Moisture Content (%)
B-1	0 - 5	Clayey Sand	115.6	12.7
B-4	0 - 5	Clayey Sand	112.5	13.9

Atterberg Limits (ASTM D4318)

Sample Location	Sample Depth (ft.)	Liquid Limit, LL	Plastic Limit PL	Plasticity Index, PI
B-1	0 - 5	34	17	17
B-2	15	61	20	41
B-2	30	30	15	15
B-4	0 - 5	36	18	18
B-4	20	36	12	24
B-4	25	40	15	25

Expansion Index (ASTM D4829)

Sample Location	Sample Depth (ft.)	Expansion Index	Expansion Potential
B-1	0 - 5	26	Low
B-4	0 - 5	25	Low

Classification of Expansive Soil (ASTM D4829)

Expansion Index	Expansion Potential
0-20	Very Low
21-50	Low
51-90	Medium
91-130	High
>130	Very High

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LAB TEST RESULTS

Proposed Residential Multi-Family Development

Hive Live

Susan Street and West Sunflower Avenue, Costa Mesa, CA 92606

DRAFTED BY: SB	REVIEWED BY: PK	PROJECT: 3023028	FIGURE: C.2

Corrosivity (Cal. Test Method 417,422,643)

Sample Location	Sample Depth (ft.)	pH	Resistivity (Ohm-cm)	Sulfate Content (ppm)	Sulfate Content (%)	Chloride Content (ppm)	Chloride Content (%)
B-1	0 - 5	8.09	2600	24	0.002	27	0.003
B-4	0 - 5	8.13	1800	33	0.003	19	0.002

Water-Soluble Sulfate Exposure (ACI 318 Table 19.3.1.1 and Table 19.3.2.1)

Water-Soluble Sulfate (SO_4) in Soil (% by Weight)	Exposure Severity	Exposure Class	Cement Type (ASTM C150)	Max. W/C	Min. f_c' (psi)
$SO_4 < 0.10$	N/A	S0	No type restriction	N/A	2,500
$0.10 \leq SO_4 < 0.20$	Moderate	S1	II	0.50	4,000
$0.20 \leq SO_4 \leq 0.20$	Severe	S2	V	0.45	4,500
$SO_4 > 2.00$	Very Severe	S3	V plus pozzolan or slag cement	0.45	4,500

Direct Shear (ASTM D3080)

Sample Location	Sample Depth (ft.)	Soil Description	Friction Angle Peak/Ultimate (degrees)	Apparent Cohesion Peak/Ultimate (psf)
B-1	0 - 5	Clayey Sand	27/28	300/140
B-4	0 - 5	Clayey Sand	31/31	90/12

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LAB TEST RESULTS

Proposed Residential Multi-Family Development

Hive Live

Susan Street and West Sunflower Avenue, Costa Mesa, CA 92606

DRAFTED BY: SB	REVIEWED BY: PK	PROJECT: 3023028	FIGURE: C.2a

Classification Test Results

Sample Location	Sample Depth (ft.)	USCS Soil Type	Passing No. 200 (%)
B-2	15	CH	98
B-2	30	CL	74
B-2	45	SC	14
B-4	20	CL	89
B-4	40	SP	10

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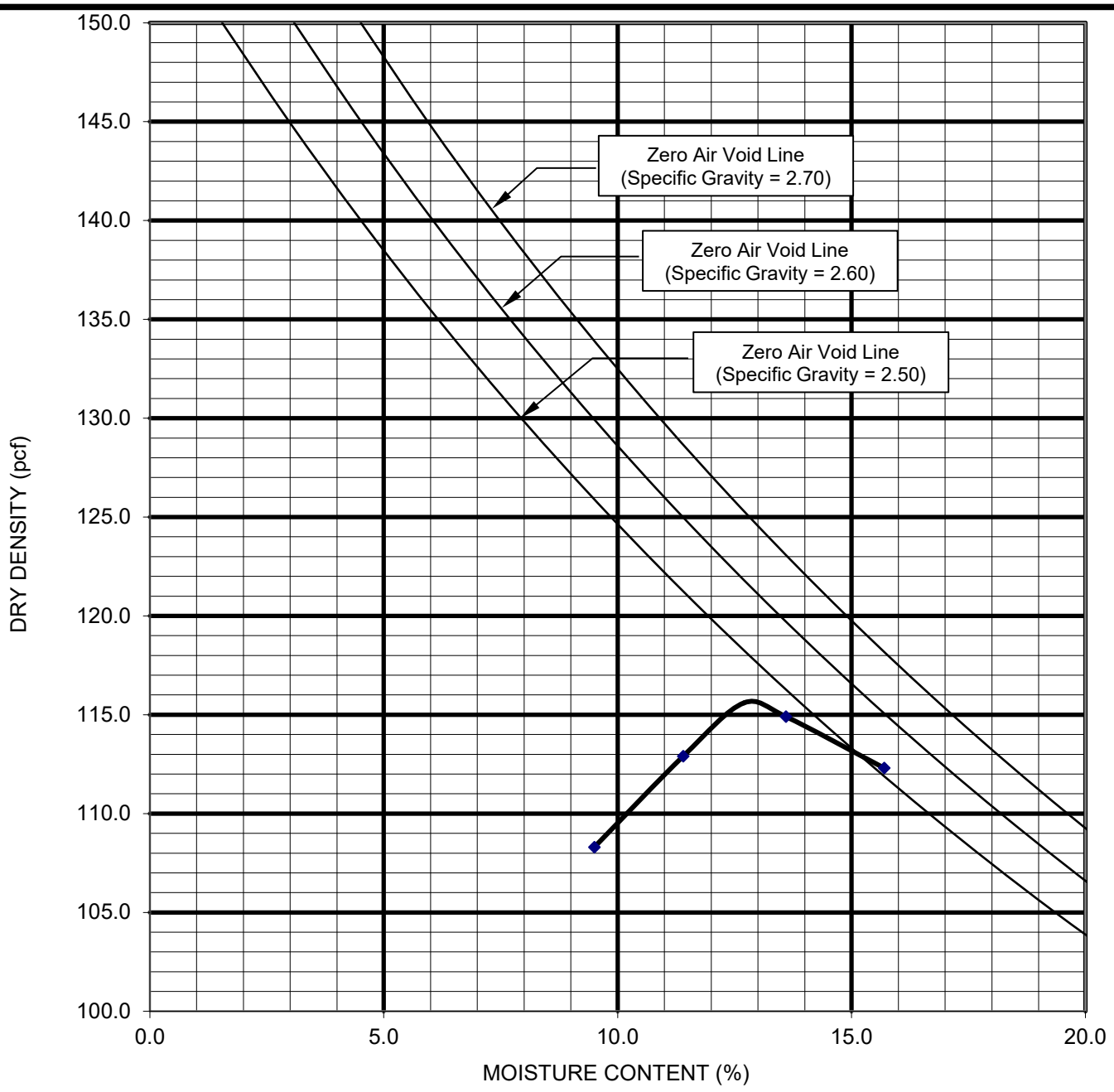
CLASSIFICATION TEST RESULTS

Proposed Residential Multi-Family Development

Hive Live

Susan Street and West Sunflower Avenue, Costa Mesa, CA 92606

DRAFTED BY: SB	REVIEWED BY: PK	PROJECT: 3023028	FIGURE: C.3



Sample Location	Soil Description	Maximum Dry Density (pcf)	Optimum Moisture Content (%)
B-1 @ 0'-5'	LIGHT GRAY BROWN CLAYEY SAND	115.6	12.7
Dry Density and Moisture Content Values Corrected for Oversize (ASTM D4718)			

PERFORMED IN GENERAL ACCORDANCE WITH: ☑ ASTM D 1557 ☐ ASTM D 698 METHOD: ☑ A ☐ B ☐ C

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PROCTOR DENSITY TEST RESULTS

Proposed Residential Multi-Family Development

Hive Live

Susan Street and West Sunflower Avenue, Costa Mesa, CA 92606

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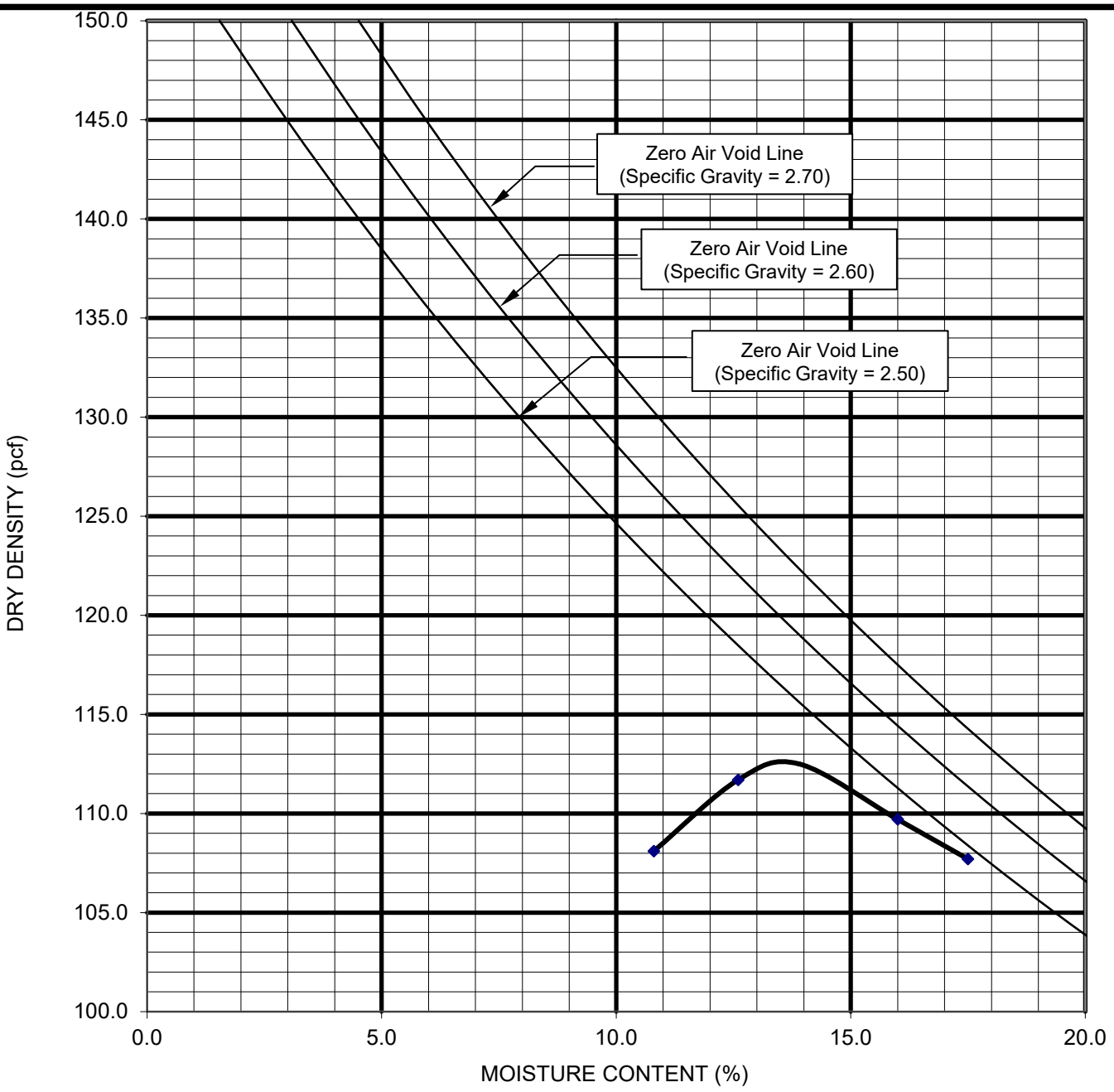

Sample Location	Soil Description	Maximum Dry Density (pcf)	Optimum Moisture Content (%)
B-4 @ 0'-5'	MEDIUM GRAY BROWN CLAYEY SAND	112.5	13.9
Dry Density and Moisture Content Values Corrected for Oversize (ASTM D4718)			

PERFORMED IN GENERAL ACCORDANCE WITH: ☑ ASTM D 1557 ☐ ASTM D 698 METHOD: ☑ A ☐ B ☐ C

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PROCTOR DENSITY TEST RESULTS

Proposed Residential Multi-Family Development

Hive Live

Susan Street and West Sunflower Avenue, Costa Mesa, CA 92606

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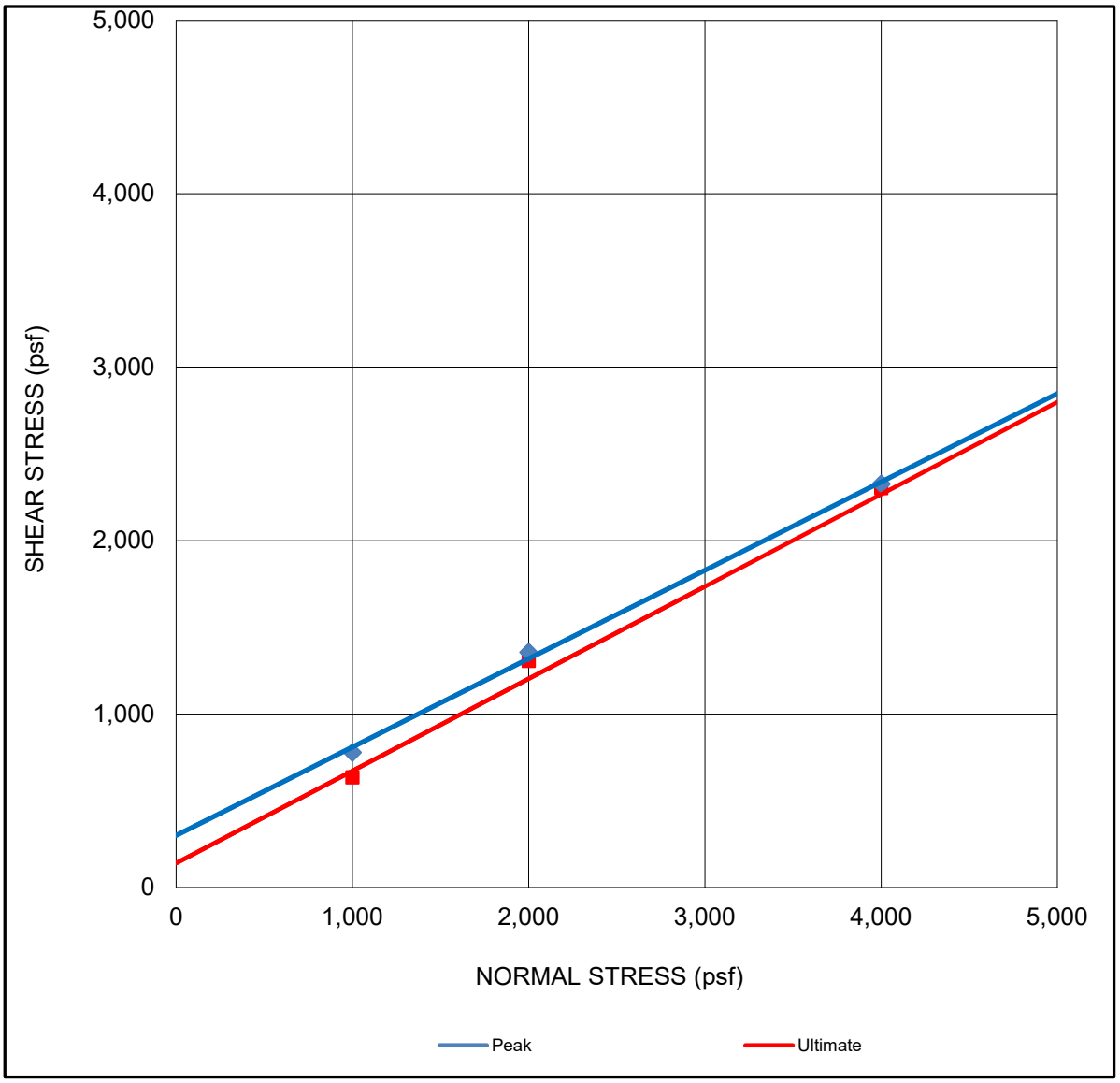

Sample: B-1 @ 0'-5'

Description: : Clayey Sand

Sample Type: REMOLD

Strain Rate: 0.025 in./min.

	Peak	Ultimate
ϕ'	27 °	28 °
C'	300 psf	140 psf

	REMOLD	As Tested
γ_d	103.5 pcf	103.5 pcf
w_c	13.0 %	23.8 %

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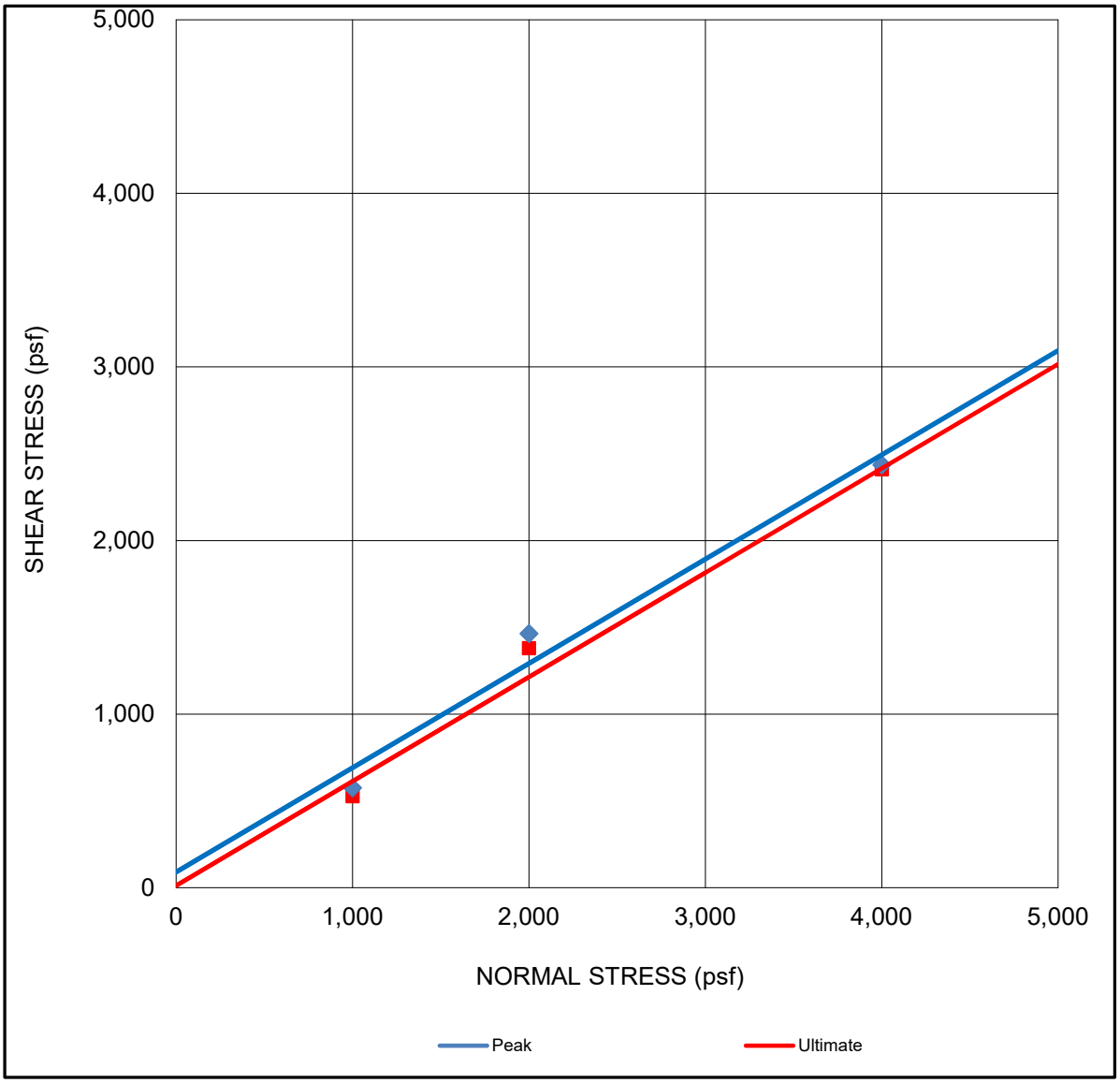
DIRECT SHEAR TEST RESULTS

Proposed Residential Multi-Family Development

Hive Live

Susan Street and West Sunflower Avenue, Costa Mesa, CA 92606

DRAFTED BY: SB	REVIEWED BY: PK	PROJECT: 3023028	FIGURE: C.6



Sample: B-4 @ 0'-5'

Description: SC

Sample Type: REMOLD

Strain Rate: 0.025 in./min.

	Peak	Ultimate
ϕ'	31 °	31 °
C'	90 psf	12 psf

	REMOLD	As Tested
γ_d	100.8 pcf	100.8 pcf
w_c	13.6 %	27.8 %

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DIRECT SHEAR TEST RESULTS

Proposed Residential Multi-Family Development

Hive Live

Susan Street and West Sunflower Avenue, Costa Mesa, CA 92606

DRAFTED BY: SB	REVIEWED BY: PK	PROJECT: 3023028	FIGURE: C.7

ATTACHMENT G

HYDROLOGY CALCULATIONS

LEGEND:

Symbol	Description
(magenta dash-dot line)	DRAINAGE STUDY LIMITS
(blue dashed line)	MAJOR DRAINAGE BOUNDARY
(black dashed line)	SUBAREA DRAINAGE BOUNDARY
— SD —	EXISTING STORM DRAIN
A1 / 0.96 AC	AREA DESIGNATION / AREA (ACRES)
L=100'	FLOW DIRECTION / FLOW LENGTH
1.0 CFS / 10 MIN	FLOW RATE (CFS) / Tc (MIN)
100	HYDROLOGY NODE
(grey box)	BUILDING FOOTPRINT

DMA A (TO EX 30" SD AT SUSAN STREET):
4.64 AC
Q2=6.8CFS
Q25=15.2CFS
Q100=19.6CFS

DMA B (TO EX 48" SD AT SOUTH COAST):
6.72 AC
Q2=9.2CFS
Q25=20.4CFS
Q100=26.3CFS

DMA C (TO EX 18" SD AT SUSAN STREET):
2.24 AC
Q2=3.0CFS
Q25=6.6CFS
Q100=8.5CFS

DMA D (TO EX 18" SD AT SUNFLOWER):
0.18 AC
Q2=0.3CFS
Q25=0.6CFS
Q100=0.8CFS

DMA E (OFFSITE RUNOFF TO WESTERLY PARCEL):
0.47 AC
Q2=0.4CFS
Q25=1.0CFS
Q100=1.3CFS

SITE PARAMETERS

HYDROLOGY SOIL GROUP: C

TOTAL DRAINAGE STUDY ACREAGE: 14.25 AC
COMMERCIAL LAND USE PERVIOUSNESS COEFFICIENT USED

FEMA FLOOD ZONE X PER FIRM MAP NO 06059C0258J (EFFECTIVE 12/03/2009)

ZONE X = AREA WITH REDUCED FLOOD RISK DUE TO LEVEE

EFFECTIVE LOMRS = LOMR 09-09-2809P (EFFECTIVE 12/04/2009)

SCALE: 1" = 50'

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EXISTING DRAINAGE MAP

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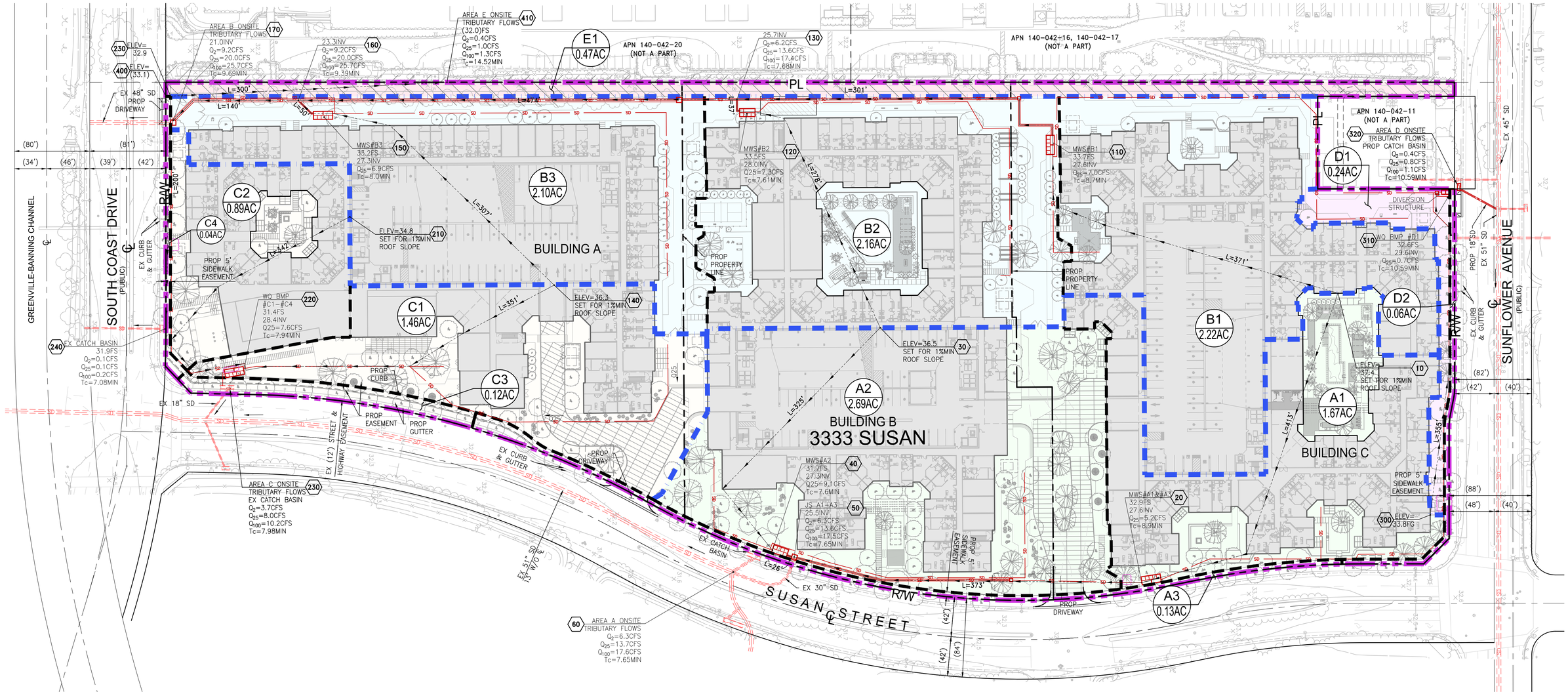

LEGEND:

- DRAINAGE STUDY LIMITS
- MAJOR DRAINAGE BOUNDARY
- SUBAREA DRAINAGE BOUNDARY
- EXISTING STORM DRAIN
- PROPOSED STORM DRAIN
- A1 / 0.96 AC — AREA DESIGNATION / AREA (ACRES)
- L=100' — FLOW DIRECTION / FLOW LENGTH
- 1.0 CFS / 10 MIN — FLOW RATE (CFS) / Tc (MIN)
- 100 — HYDROLOGY NODE
- BUILDING FOOTPRINT

DMA A (TO EX 30" SD AT SUSAN STREET):
4.49 AC
Q_2=6.3CFS
Q_{25}=13.7CFS
Q_{100}=17.6CFS

DMA B (TO EX 48" SD AT SOUTH COAST):
6.48 AC
Q_2=9.2CFS
Q_{25}=20.0CFS
Q_{100}=25.7CFS

DMA C (TO EX 18" SD AT SUSAN STREET AND 18" SD AT SOUTH COAST):
2.51 AC
Q_2=3.8CFS
Q_{25}=8.1CFS
Q_{100}=10.4CFS

DMA D (TO EX 18" SD AT SUNFLOWER):
0.30 AC
Q_2=0.4CFS
Q_{25}=0.8CFS
Q_{100}=1.1CFS

DMA E (OFFSITE RUNOFF TO WESTERLY PARCEL):
0.47 AC
Q_2=0.4CFS
Q_{25}=1.0CFS
Q_{100}=1.3CFS

SITE PARAMETERS

HYDROLOGY SOIL GROUP: C

TOTAL DRAINAGE STUDY ACREAGE: 14.25 AC
APARTMENT LAND USE PERVIOUSNESS COEFFICIENT USED

FEMA FLOOD ZONE X PER FIRM MAP NO 06059C0258J (EFFECTIVE 12/03/2009)

ZONE X = AREA WITH REDUCED FLOOD RISK DUE TO LEVEE

EFFECTIVE LOMRS = LOMR 09-09-2809P (EFFECTIVE 12/04/2009)

N

50' 0' 25' 50' 100'

SCALE: 1" = 50'

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PROPOSED DRAINAGE MAP

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SHEET 2 OF 2

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PRELIMINARY DRAINAGE ANALYSIS

Prepared for:

LEGACY PARTNER

5141 CALIFORNIA AVENUE, SUITE 100

IRVINE, CA 92617

Prepared by:

SHELBY SHIRLOCK, P.E.

Date Prepared: September, 2024

Project Number: [424-028-02]

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PRELIMINARY DRAINAGE REPORT

HIVE LIVE

COSTA MESA, CA – COUNTY OF ORANGE

SEPTEMBER, 2024

PRELIMINARY DRAINAGE REPORT

HIVE LIVE

COSTA MESA, CA – COUNTY OF ORANGE

SEPTEMBER, 2024

PRELIMINARY DRAINAGE REPORT

HIVE LIVE

COSTA MESA, CA – COUNTY OF ORANGE

SEPTEMBER, 2024

PRELIMINARY DRAINAGE ANALYSIS

FOR

Hive Live

3333 Susan Street, Costa Mesa, CA
County of Orange

Prepared By:

Shelby Shirlock, PE RCE C75912
Fuscoe Engineering, Irvine
600 Wilshire Blvd. #1470
Los Angeles, CA 90017

For

LEGACY PARTNER
5141 California Avenue, Suite 100
Irvine, CA 92617

TABLE OF CONTENTS

1.0 INTRODUCTION

1.1 GEOGRAPHIC SETTING

The proposed Hive Live apartment project is about a 14.3 acre private site located in the City of Costa Mesa, Orange County, California. The project site is bounded by private industrial properties to the west, Sunflower Avenue to the north, Susan Street to the east, and South Coast Drive to the south. *See Section 1.4 for Location Map*.

The project site is located at FEMA flood zone 'X' per FEMA Flood Insurance Rate Map (FIRM) No. 06059C0258J, map revised December 3, 2009. Flood Zone 'X' represents Area with Reduced Flood Risk due to levee (See Appendix 1).

1.2 PURPOSE OF THIS REPORT

The purpose of this report is to identify and analyze the existing drainage conditions & post development impacts, in order to provide adequate drainage facilities for the proposed development located in the City of Costa Mesa, California.

This drainage study will analyze and compare the 2-year, 25-year & 100-year storm events for the existing and proposed conditions. Outcomes of the analysis will facilitate the conceptual layout of a drainage system to adequately convey storm runoff through the site without adversely impacting surrounding areas.

This analysis will also demonstrate that the storm water and flood protection goals as outlined in the Orange County Design Manual have been met. See Section 4.0 for Design Criteria.

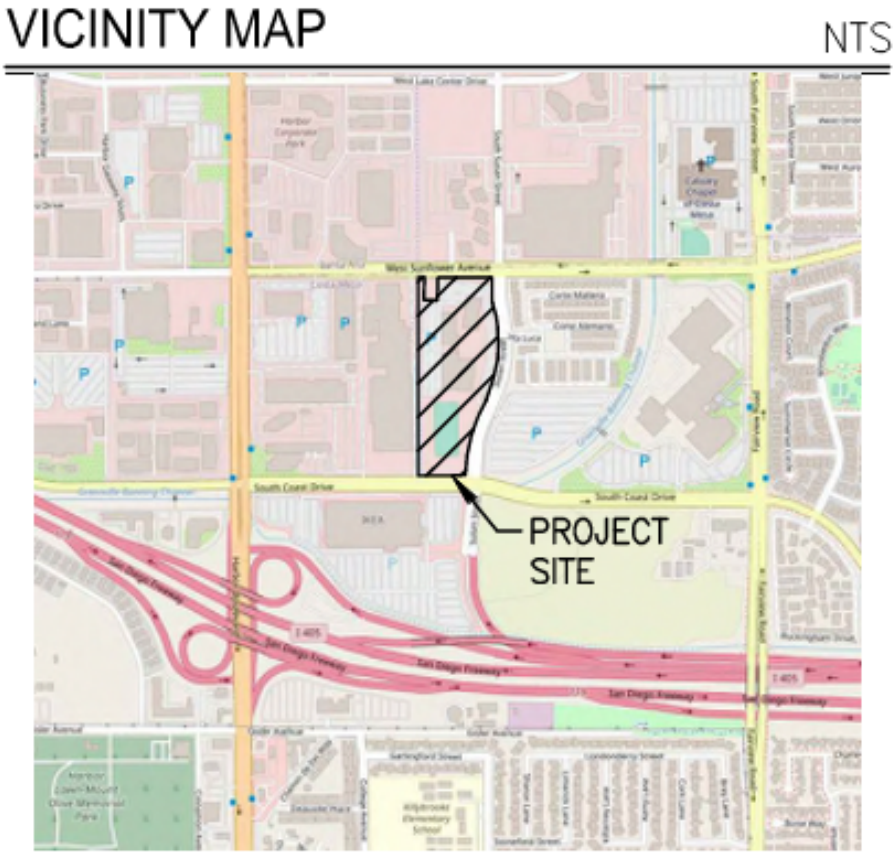
1.3 METHODOLOGY

This study was prepared in conformance with the Orange County Hydrology Manual. A.E.S. Computer Software (Version 21) was utilized to compile the hydrologic data and to determine the peak discharges and time of concentrations at those specific storm frequencies.

Bentley Flowmaster software which calculates using Manning's equation and the County of Orange Local Drainage Manual chart 9B are used for nominal pipes and drain inlets capacities.

See Appendices 3-4 for reference

1.4 PROJECT SITE LOCATION MAP



The Project Site is identified in the location map shown above.

2.0 EXISTING TOPOGRAPHIC & HYDROLOGIC CONDITIONS

2.1 EXISTING TOPOGRAPHY

The approximate 14.3-acres project site area currently is being occupied by existing commercial office structures, football field, paved parking lot and landscaping. Susan Street, Sunflower Avenue, and South Coast Drive are the traditional street consisting of vehicular roadway and pedestrian parkway with sidewalks and landscape. The site is generally flat with about a 6-foot vertical grade difference between the high and low points on the site.

The site's hydrologic soil group is 'C' per USDA Soil Map (See Appendix 1)

2.2 EXISTING DRAINAGE PATTERN AND STORM DRAIN FACILITIES

The existing site is currently divided into 5 drainage management areas (DMA).

DMA A (4.64 Ac) is the northeast onsite area which includes an existing office building, the east portion of the commercial building, parking lot, curbs, gutters, and landscaping. Runoff from this area is conveyed through existing curb and gutters, which are captured by on-site storm drain inlets and bioswales. These are connected to the existing storm drain system, to a 30" storm drain at the R/W at Susan Street. This 30-inch public storm drain lateral connects to the existing 51" storm drain main along the Susan Street downstream.

DMA B (6.72 Ac) is the westerly onsite area which includes the west portion of the existing building at the middle of the site, west half of the existing football field, parking lots, and landscaping. Runoff from this area is conveyed through existing curb and gutters and are captured by onsite drain inlets or bioswales. Runoff captured from these inlets are conveyed by an existing storm drain lateral on the west of the site. The downstream storm drain system ties into the existing 48-inch storm drain at the R/W. This public storm drain lateral eventually connects to Greenville banning channel downstream.

DMA C (2.24 Ac) is the southeast area which includes the east half of football field, sidewalk, and landscaping. Runoff form this area drains is capture by onsite storm drain system that is connected to existing public catch basin at Susan Street. Area C3 is an area that flows to the public street surface and eventually captured by the catch basin inlet. This existing catch basin has an existing 18-inch storm drain lateral that connects to the existing 51" storm drain main along the Susan Street. This 51-inch storm drain main along Susan connects to the Greenville banning channel downstream.

DMA D (0.18 Ac), is the northerly onsite area which includes private drive aisle and landscaping. Runoff from this area drains towards to the Sunflower Avenue and captured by an existing catch basin located next to existing driveway at Sunflower. This public catch basin has a storm drain lateral that connects to the existing 51-inch storm drain main along Sunflower Avenue.

DMA E (0.47 Ac), is the westerly onsite area which includes half of recently paved pathway and landscaping. Runoff form this area flows towards to the adjacent property to the west.

Refer to *Appendices 2 and 3* for Existing Improvements, Hydrology Map and Calculations.

PROPOSED PROJECT & HYDROLOGIC CONDITIONS

3.1 PROPOSED PROJECT

The proposed 3 phase, 1,050 unit apartment project consists of three 5-story residential buildings, with parking structures, drive aisles, pathways, amenities, and landscaping. The proposed development is estimated to be more pervious than the existing conditions. The proposed project will have project BMP's to mitigate the stormwater runoff. A separate Water Quality Management Plan (WQMP) will demonstrate the stormwater treatment requirements.

3.2 PROPOSED DRAINAGE PATTERN AND STORM DRAIN FACILITIES

The proposed project area is divided into 5 drainage management areas (DMA's)

The proposed development will maintain the historic discharge point. Generally, onsite stormwater runoff will be captured by localized catch basins and area drain inlets, and flows will be diverted into high and low flows. The low flows will be routed first to treatment points with Modular Wetlands Systems (MWS) to treat the proposed runoff.

The proposed DMA A (4.49 Ac), is the northeast onsite area which consists of east half of proposed buildings B and C, drive aisles, pathway, and landscaping. The drainage in this area will flow to area drains which will collected by a proposed MWS unit, as required per the project specific WQMP. This MWS unit has an internal diversion system whereas the low flows will be routed internally to a biofiltration media and high flows will bypass the internal weir onto the private storm drain outfall. The downstream storm drain system will tie into the existing 30-inch storm drain at the R/W. This 30-inch public storm drain lateral connects to the existing 51" storm drain main along the Susan Street downstream. A small portion of DMA A (A3/0.13Ac) will be the proposed sidewalk easement area that will flow onto Susan Street. This will be collected by an existing catch basin on Susan that flows to the existing 51" storm drain main along Susan.

The proposed DMA B (6.58 Ac), is the westerly onsite area which consists of west portions of buildings A, B and C, drive aisles, pathway, amenities, and landscaping. The drainage in this area will flow to several onsite catch basins and proposed MWS units, as required per the project specific WQMP. The downstream storm drain system will be designed to convey the 25-yr (high) flows and tie into the existing 48-inch storm drain at the R/W. This public storm drain lateral eventually connects to Greenville banning channel downstream.

The proposed DMA C (2.45 Ac), is the southeast area which consists of south and east part of building A, drive aisles, pathway, and landscaping. The drainage in this area will flow to several onsite area drains and proposed MWS unit, as required per the project specific WQMP. The downstream storm drain system will be designed to convey the 25-yr (high) flows and tie into the existing catch basin at the R/W. This existing catch basin has an existing 18-

inch storm drain lateral that connects to the existing 51" storm drain main along the Susan Street. Small portion of DMA C (C2/0.12Ac) will be the proposed sidewalk easement areas that will flow onto existing catch basin at Susan Street. The existing catch basin on Susan flows to the existing 51" storm drain main along Susan. This 51-inch storm drain main along Susan connects to the Greenville banning channel downstream. The existing catch basin on South Coast drive connects as well to the Greenville banning channel downstream.

The proposed DMA D (0.22 Ac), is northerly onsite area which consists of landscaping, drive aisles, and walkway. The drainage in this area will be conveyed via surface and collected via area drains and catch basin inlets into private storm drain system. There will be a diversion structure downstream of the private storm system in which the required storm water quality flows will be routed to a proposed MWS unit before discharging to a relocated catch basin at Sunflower Avenue. A small portion of the DMA D (D2/0.06Ac) will be the proposed sidewalk easement areas that will flow onto the new catch basin at Sunflower Street. This public catch basin will have a storm drain lateral that will connect to the existing 51-inch storm drain main along Sunflower Avenue.

DMA E (0.47 Ac), is the westerly onsite area which includes half of recently paved pathway and landscaping. Area E will stay the same as the current condition and no site disturbance is anticipated on this area from the project. Runoff form this area flow towards to the adjacent property.

DMA F (0.04 Ac), is the southerly area which consists of proposed sidewalk easement towards South Coast Drive. The drainage in this area will flow into the existing catch basin at the South Coast Drive. This existing catch basin has an existing 18-inch storm drain lateral that connects to the Greenville-Banning Channel storm drain main (14'x10.5' RC box) along South Coast Drive.

The site will be graded as such to have overland runoff for severe storms and the finish floor is set at least a foot over the 100 year-storm.

Refer to *Appendices 2 to 5* for Proposed Hydrology maps and calculations.

4.0 DESIGN CRITERIA

The proposed storm drain systems will be designed to be consistent with the following goals and guidelines:

- Onsite design storm is based on a 25-year frequency in sump conditions for catch basins and the connecting storm drains also use a 25-year frequency.
- Velocity should not exceed 20 FPS in a standard wall R.C.P.
- Where velocity exceeds 20 FPS, a special wall R.C.P. with a minimum of 1½-inch steel clearance on the inside surface shall be used.
- Maximum velocity in special cover R.C.P. shall be 45 FPS.
- On local streets one lane shall be free of storm water in a 25-year storm event.
- Maximum W.S. in catch basins for design conditions shall be 0.5' below inlet (FL.) elevation.
- Once water is picked up in a storm drain, it should remain in the system.
- Pipe size may not be decreased downstream without the City's approval.

4.1 REFERENCES

- Orange County Hydrology Manual, 1986
- Orange County Local Drainage Manuel, 1986
- City of Orange Existing Improvement Plans and Drainage Reports
- City of Orange Master Plan of Drainage
- NCSS Web Soil Survey
- AES hydrologic software

5.0 RESULTS AND CONCLUSIONS

A summary of the 2-year, 25-year and 100-year peak flow analysis for existing and proposed conditions are provided in the tables on the succeeding pages (See Tables 5.1 to 5.9). Per the separate report (Water Quality Management Plan or WQMP), it is determined that the site is not susceptible for Hydromodification impacts.

As a result of the site development and improvements, the overall site proposed condition peak flows will decrease from the existing conditions. The proposed Time of Concentration (Tc) at the longest flow path (existing node 180/proposed node 170) will decrease or would be faster from the existing by about 11.4%.

DMA's A & B shows the peak flows tributary to the collecting storm drain to be reduced slightly from the existing conditions.

DMA C's proposed 25-year storm peak flows will increase (1.3cfs/20%) from the existing conditions. Considering the increased proposed peak flows to this existing catch basin and storm drain lateral at Susan Street, an additional water surface pressure gradient study is conducted to determine the existing infrastructure has capacity to convey the proposed flow increase. Per the attached study on Appendix 5, This flow increase in this existing catch basin & storm drain lateral, is anticipated to raise the hydraulic grade line (HGL) by about 0.12'. The proposed water surface (W.S.) level (28.0) will be about 3.0' below the catch basin flow line (31.0').

DMA C combined with the flows from DMA A is tributary to the same existing 51-inch storm drain along Susan Street. The peak 25-year storm flows from these areas will slightly decrease (-0.2cfs/-0.9%) from existing conditions. *See Table 5.7.*

DMA D & DMA E does not change from existing conditions.

DMA F shows an increase in peak flows by 0.1 cfs for the 25-year storm event. Considering the increased proposed peak flows to this existing catch basin and storm drain lateral at South Coast Drive, an additional water surface pressure gradient study is conducted to determine the existing infrastructure has capacity to convey the proposed flow increase. Per the attached study on Appendix 5, This flow increase of 0.1 cfs in this existing catch basin & storm drain lateral, is anticipated to raise the hydraulic grade line (HGL) by about 0.02'. The proposed water surface (W.S.) level (27.8') will be about 2.7' below the catch basin flow line (30.5').

It is our opinion that the proposed site development's stormwater drainage will not have an adverse effect on any of the existing or proposed improvements within the project or adjacent public streets. In addition, all design criteria outlined above will be met and provided in the final hydrology report.

See Appendix 2 for Existing and Proposed Drainage Maps and Appendix 3 & 4 for Calculations.

DRAINAGE MANAGEMENT AREAS PEAK RUNOFF COMPARISON CHART

Table 5.1 – DRAINAGE MANAGEMENT AREA A (DMA A)

ONSITE TRIBUTARY AREAS TO EX 30 INCH AT SUSAN STREET				
Event	Existing (CFS)	Proposed (CFS)	Δ (CFS)	Percentage Change
2-Year	6.9	6.3	-0.6	-8.7%
25-Year	15.2	13.7	-1.5	-9.9%
100-Year	19.6	17.6	-2.0	-10.2%

Table 5.2 – DRAINAGE MANAGEMENT AREA B (DMA B)

ONSITE TRIBUTARY AREAS TO EX 48 INCH SD AT SOUTH COAST				
Event	Existing (CFS)	Proposed (CFS)	Δ (CFS)	Percentage Change
2-Year	9.8	9.3	-0.5	-5.1%
25-Year	21.5	20.3	-1.2	-5.6%
100-Year	27.7	26.1	-1.6	-5.8%

Table 5.3 – DRAINAGE MANAGEMENT AREA C (DMA C)

ONSITE TRIBUTARY AREAS TO EX 18 INCH SD LATERAL AT SUSAN				
Event	Existing (CFS)	Proposed (CFS)	Δ (CFS)	Percentage Change
2-Year	3.0	3.6	0.6	20.0%
25-Year	6.6	7.9	1.3	19.7%
100-Year	8.5	10.2	1.7	20.0%

Table 5.4 – DRAINAGE MANAGEMENT AREA D (DMA D)

ONSITE TRIBUTARY AREAS TO EX 18 INCH SD LATERAL AT SUNFLOWER				
Event	Existing (CFS)	Proposed (CFS)	Δ (CFS)	Percentage Change
2-Year	0.3	0.3	0.0	0.0%
25-Year	0.6	0.6	0.0	0.0%
100-Year	0.8	0.8	0.0	0.0%

Table 5.5 - DRAINAGE MANAGEMENT AREA E (DMA E)
No Disturbance therefore no changes

ONSITE TRIBUTARY AREAS TO WESTERLY PARCEL				
Event	Existing (CFS)	Proposed (CFS)	Δ (CFS)	Percentage Change
2-Year	0.4	0.4	0.0	0.0%
25-Year	1.0	1.0	0.0	0.0%
100-Year	1.3	1.3	0.0	0.0%

Table 5.6 – DRAINAGE MANAGEMENT AREA F (DMA F)

ONSITE TRIBUTARY AREAS TO EX 18 INCH SD LATERAL AT SOUTH COAST				
Event	Existing (CFS)	Proposed (CFS)	Δ (CFS)	Percentage Change
2-Year	0.0	0.06	0.06	
25-Year	0.0	0.13	0.13	
100-Year	0.0	0.20	0.20	

Table 5.7

ONSITE TRIBUTARY AREAS (DMA A + C) TO EX 51 INCH SD MAIN AT SUSAN				
Event	Existing (CFS)	Proposed (CFS)	Δ (CFS)	Percentage Change
2-Year	9.9	9.9	0.0	0.0%
25-Year	21.8	21.6	-0.2	-0.9%
100-Year	28.1	27.8	-0.3	-1.1%

Table 5.8 – SITE TOTAL PEAK Q

Site Total Peak Q Summary				
Event	Existing (CFS)	Proposed (CFS)	Δ (CFS)	Percentage Change
2-Year	20.4	20.0	-0.4	-2.0%
25-Year	44.9	43.6	-1.3	-2.9%
100-Year	57.9	56.2	-1.7	-2.9%

Table 5.9 – SITE TOTAL TIME OF CONCENTRATION

Site Total Time of Concentration Summary				
Event	Existing (minutes)[1]	Proposed (minutes)[1]	Δ (minutes)	Percentage Change
2-Year	10.93	9.68	1.25	11.4%
25-Year	10.18	9.34	0.84	8.3%
100-Year	9.92	9.29	0.63	6.3%

1 - Tc considered at Area B (Existing Node 180/Proposed Node 170)

6.0 APPENDICES

Appendix 1 *Supporting Maps and Plans*

FEMA (FIRM) Map, Soil Map & Improvement Plans

Appendix 2 *Hydrology Maps*

Existing and Proposed Conditions

Appendix 3 *Existing Hydrology Calculations*

2 year, 25 year & 100 year storm frequencies

Appendix 4 *Proposed Hydrology Calculations*

2 year , 25 year & 100 year storm frequencies

Appendix 5 *Estimated Drain Inlets and Storm Drain Pipe Capacity Calculations*

Orange County Local Drainage Manual Catch Basin Sizing Chart

Pipe Capacity Calculations (Manning's equation using flowmaster software)

Water Surface Pressure Gradient (WSPG) Calculations and Exhibits for existing catch basin & storm drain with increased flows

APPENDIX 1

SUPPORTING MAPS AND PLANS
(FEMA MAP, SOIL MAP, IMPROVEMENT PLANS)

National Flood Hazard Layer FIRMette

FEMA

Basemap Imagery Source: USGS National Map 2023

Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS
- Without Base Flood Elevation (BFE) *Zone A, V, A99*
- With BFE or Depth *Zone AE, AO, AH, VE, AR*
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD
- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee. See Notes. *Zone X*
- Area with Flood Risk due to Levee *Zone D*

OTHER AREAS
- NO SCREEN Area of Minimal Flood Hazard *Zone X*
- Effective LOMRs
- Area of Undetermined Flood Hazard *Zone D*

GENERAL STRUCTURES
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES
- 20.2 Cross Sections with 1% Annual Chance
- 17.5 Water Surface Elevation
- Coastal Transect
- Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature

MAP PANELS
- Digital Data Available
- No Digital Data Available
- Unmapped

N

The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 11/7/2023 at 2:24 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

Map Scale: 1:2,450 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 35 70 140 210

Feet: 0 100 200 400 600

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 11N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Orange County and Part of Riverside County, California
Survey Area Data: Version 17, Aug 30, 2023

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jan 17, 2023—Feb 8, 2023

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
123	Bolsa silt loam, drained	14.4	100.0%
Totals for Area of Interest		**14.4**	**100.0%**

Orange County and Part of Riverside County, California

123—Bolsa silt loam, drained

Map Unit Setting

National map unit symbol: hclz
Elevation: 0 to 680 feet
Mean annual precipitation: 11 to 15 inches
Mean annual air temperature: 62 to 65 degrees F
Frost-free period: 360 to 365 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

Bolsa and similar soils: 70 percent
Minor components: 30 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Bolsa

Setting

Landform: Alluvial fans
Landform position (three-dimensional): Talf
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Mixed alluvium derived from igneous, metamorphic and sedimentary rock

Typical profile

Ap1 - 0 to 6 inches: silt loam
Ap2 - 6 to 12 inches: silt loam
C1 - 12 to 18 inches: silt loam
C2 - 18 to 29 inches: silt loam
C3 - 29 to 39 inches: silty clay loam
C4 - 39 to 49 inches: silty clay loam
C5 - 49 to 55 inches: silty clay loam
Cg - 55 to 69 inches: silty clay loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat poorly drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.60 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: Rare
Frequency of ponding: None
Calcium carbonate, maximum content: 5 percent

Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: High (about 11.1 inches)

Interpretive groups
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3w
Hydrologic Soil Group: C
Ecological site: R019XG911CA - Loamy Fan
Hydric soil rating: No

Minor Components

Hueneme, fine sandy loam
Percent of map unit: 10 percent
Landform: Alluvial fans
Landform position (three-dimensional): Talf
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Chino, silty clay loam
Percent of map unit: 10 percent
Landform: Alluvial fans
Landform position (three-dimensional): Talf
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Metz, loamy sand
Percent of map unit: 4 percent
Landform: Alluvial fans
Landform position (three-dimensional): Talf
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Bolsa, sandy loam overwash
Percent of map unit: 2 percent
Landform: Alluvial fans
Landform position (three-dimensional): Talf
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

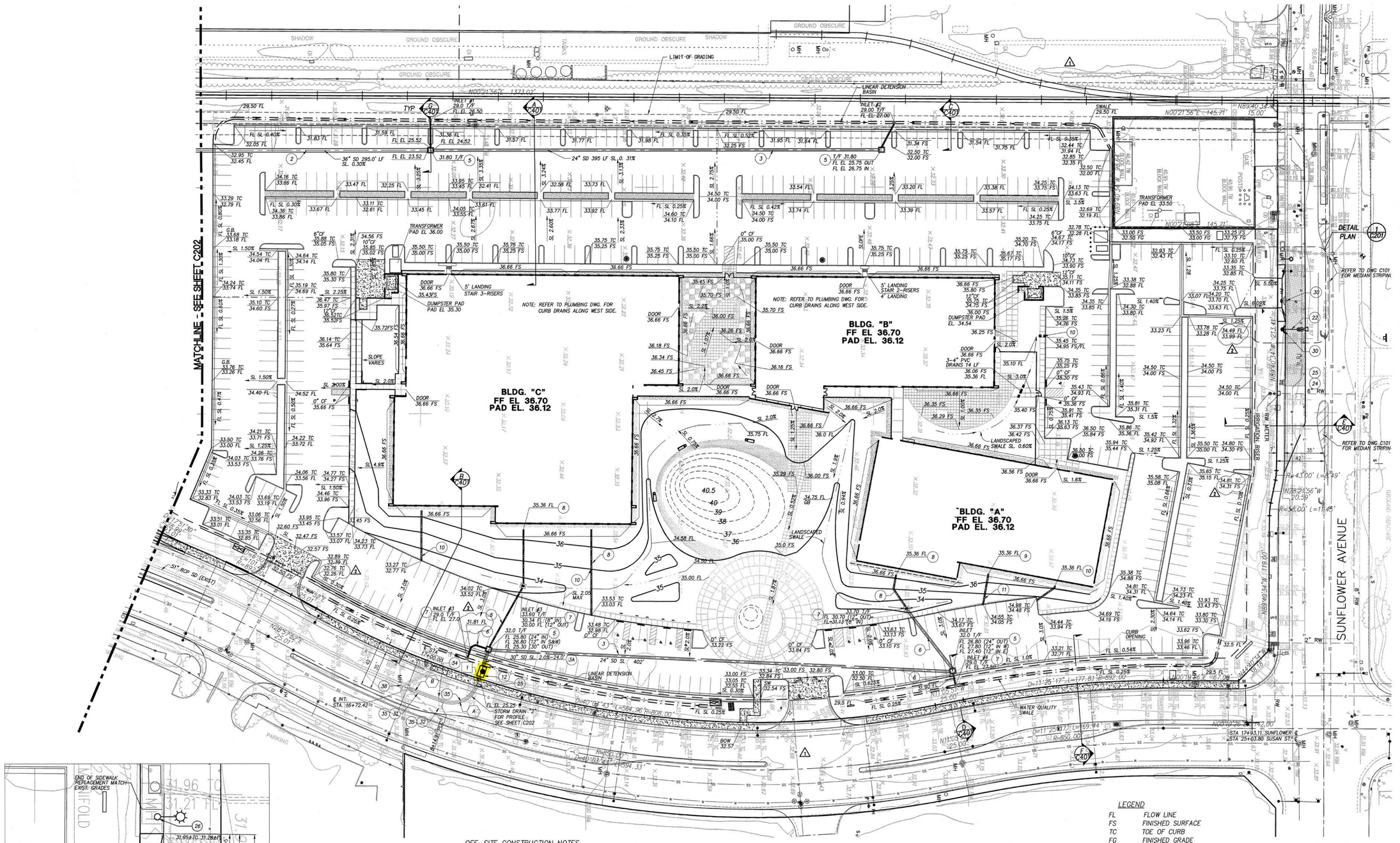
Omni, drained
Percent of map unit: 2 percent
Landform: Flood plains
Landform position (three-dimensional): Talf
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

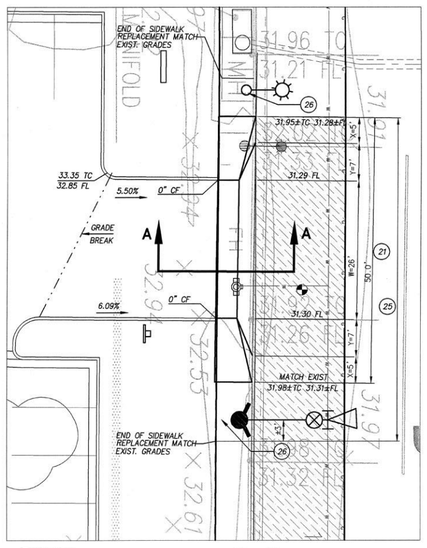
San emigdio, fine sandy loam
Percent of map unit: 2 percent

Landform: Flood plains
Landform position (three-dimensional): Talf
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

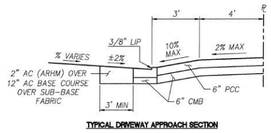
Data Source Information

Soil Survey Area: Orange County and Part of Riverside County, California
Survey Area Data: Version 17, Aug 30, 2023





DETAIL PLAN (1/C101)(1/C201)
SCALE: 1"=10'



TYPICAL DRIVEWAY APPROACH SECTION

SECTION A-A
N.T.S.
SUNFLOWER AVENUE

OFF-SITE CONSTRUCTION NOTES

20. CONSTRUCT 4" PCC SIDEWALK PER CITY OF COSTA MESA STD 412
21. CONSTRUCT DRIVEWAY APPROACH – TYPE II PER CITY OF COSTA MESA STD 514
22. RELOCATE STREET LIGHT TO LOCATION SHOWN
23. HORIZONTAL SAWCUT EXISTING CURB FACE OR REMOVE EXISTING AND CONSTRUCT TYPE (C-8) CURB AND GUTTER PER CITY OF COSTA MESA STD DWG NO. 312 OVER 6" CMB. PROTECT EXISTING STREET BY: SAWCUTTING THE JOINT BETWEEN EDGE OF GUTTER AND AC STREET PAVEMENT. EXTEND CURB AND GUTTER REMOVAL TO NEXT JOINT IF LESS THAN 8' AWAY. IF THE AC IS CUT OR DAMAGED, CONTRACTOR SHALL RECONSTRUCT A MINIMUM OF 3' OF AC ADJACENT TO NEW GUTTER, THE SLOT PAVE STRUCTURAL SECTION SHALL BE 14" FULL DEPTH AC OVER NATIVE, AND RESURFACE THE STREET PER CONSTRUCTION NOTE NO. 24.
24. IF THE AC IS CUT OR DAMAGED, RECONSTRUCT A MINIMUM OF 3' OF AC ADJACENT TO NEW GUTTER, THE SLOT PAVE STRUCTURAL SECTION SHALL BE 14" FULL DEPTH AC OVER NATIVE, AND RESURFACE STREET PER THE FOLLOWING MILL AND OVERLAY RESURFACING REQUIREMENTS:
    1. THE CONTRACTOR SHALL RESTORE THE ROADWAY SURFACE WITHIN THE WORK LIMITS BY MILLING AND OVERLAYING, MINIMUM OF 2", THE ENTIRE LANE(S) WHERE THE TRENCH IS LOCATED.
       A. FOR TRENCHES PERPENDICULAR TO TRAFFIC LANES: MILL AND OVERLAY SHALL EXTEND 50' ON BOTH SIDES OF THE TRENCH AND WILL INCLUDE THE ENTIRE TRAVEL LANES.
       B. FOR TRENCHES PARALLEL TO TRAFFIC LANES AND FOR SMALL EXCAVATIONS: MILL AND OVERLAY THE ENTIRE WIDTH OF THE TRAFFIC LANE FOR THE FULL LENGTH OF THE TRENCH, BUT NOT LESS THAN 100'.
    2. RESTORATION OF THE ROADWAY SHALL BE CONTINUOUS AND NO JOINTS WILL BE ALLOWED. ALL ROADWAYS WITHIN THE WORK LIMITS WILL BE RESTORED IN ONE OPERATION. NO PIECE-MEAL MILLING AND OVERLAYING WORK WILL BE PERMITTED. THE CONTRACTOR SHALL NOT PROCEED WITH THE MILLING AND OVERLAYING OPERATIONS UNTIL DIRECTION IS GIVEN BY THE CITY ENGINEER.
    3. ANY EXISTING IMPROVEMENTS DAMAGED BY THE CONTRACTOR SHALL BE REPLACED AS DIRECTED BY THE CITY ENGINEER.
    4. ASPHAULT RUBBER HOT MIX (ARHM) WET PROCESS SHALL CONFORM TO SUBSECTION 203-11 "ASPHAULT RUBBER HOT MIX GAP GRADED" (ARHM-GG) OF THE STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION. THE GRADED AGGREGATE SHALL CONFORM TO SUBSECTION 203-11 CLASS ARHM-GG-C.
    6. ARHM SURFACE COURSE SHALL BE TYPE C AND SHALL BE PROVIDED FOR THE SURFACE-WEARING COURSE ONLY.
    7. CONTRACTOR SHALL SUBMIT THE ASPHAULT MIX DESIGN TO THE CITY ENGINEER FOR APPROVAL PRIOR TO START OF WORK.
25. REMOVE EXISTING AND CONSTRUCT TYPE (C-8) CURB AND GUTTER PER CITY OF COSTA MESA STD DWG NO. 312 OVER 6" CMB. CONTRACTOR SHALL RECONSTRUCT A MINIMUM OF 3' OF AC ADJACENT TO NEW GUTTER. THE NEW SLOT PAVE STRUCTURAL SECTION SHALL BE 10" AC OVER 13" CMB OVER 14" OVEREXCAVATION AND RECOMPACTION. EXTEND CURB AND GUTTER REMOVAL TO NEXT JOINT IF LESS THAN 8' AWAY, PAINT ALL NEW FULL HEIGHT CURB RED ON SUNFLOWER AVENUE AND SOUTH COAST DRIVE.
26. REMOVE EXISTING PER CITY OF COSTA MESA STD. DWG. NO. 811 AND RECONSTRUCT COMMERCIAL SIDEWALK PER CITY OF COSTA MESA STD. DWG. NO. 412 OVER 4" CMB.
30. RELOCATE EXISTING FIRE HYDRANT TO LOCATION SHOWN. PROVIDE NEW HOT-TAP CONNECTION FROM EXIST. WATER MAIN PER MCWD STD 6. INSTALL NEW FIRE HYDRANT PER MCWD STD 4. PROVIDE PIPE BEDDING AND PIPE ZONE BACKFILL PER MCWD STD 18. CONTINUE BACKFILL PER CITY OF COSTA MESA STD 813. REPLACE PAVEMENT WITH MODIFIED SECTION OF 14" FULL DEPTH AC.
31. CONSTRUCT 30" RCP STORM DRAIN (2000-D).
32. CONSTRUCT 8" PVC STORM DRAIN (SDR 35).
33. CONSTRUCT 48" RCP STORM DRAIN (2000-D).
34. CONSTRUCT JUNCTION STRUCTURE PER APWA STD 332.1.
35. TRENCH PER CITY OF COSTA MESA STD PLAN 813 WITH MODIFIED STRUCTURAL SECTION OF 10" AC OVER 13" CMB OVER 14" OVEREXCAVATION AND RECOMPACTION.
38. CONSTRUCT CONCRETE COLLAR PER AWPA STD. 380-2. JOIN EXISTING STUB OUT IF AVAILABLE. OTHERWISE CONSTRUCT NEW JUNCTION STRUCTURE PER APWA STD 322-1.

ON-SITE CONSTRUCTION NOTES

2. CONSTRUCT 36" RCP STORM DRAIN, 2000-D
3. CONSTRUCT 24" RCP STORM DRAIN, 2000-D
3A. CONSTRUCT 30" RCP STORM DRAIN, 2000-D
5. PRECAST CONCRETE MANHOLE OR RECTANGULAR BOX W/3'X3' INLET GRATE
6. CONSTRUCT 12" PVC STORM DRAIN, SDR 35
7. INSTALL 18"X18" PRECAST CONCRETE INLET, BROOK PRODUCT MODEL 1818 OR APPROVED EQUAL
8. 8" PVC PIPE RAINWATER LEADER REFER TO PLUMBING DWGS FOR CONNECTION
9. 6" PVC PIPE RAINWATER LEADER REFER TO PLUMBING DWGS FOR CONNECTION
10. 4"X14" RECTANGULAR DRAIN. TRANSITION FROM 8" ROUND TO RECTANGULAR
11. 3"X12 1/2" RECTANGULAR DRAIN. TRANSITION FROM 6" ROUND TO RECTANGULAR
12. INSTALL CDS UNIT MODEL NUMBER PMSU 20-25 AS MANUFACTURED BY CDS TECH OR APPROVED EQUAL

GENERAL NOTES

1. ALL SITE SIDEWALKS HAVE A CROSS SLOPE OF 2.0%

LEGEND

FL	FLOW LINE
FS	FINISHED SURFACE
TC	TOE OF CURB
FG	FINISHED GRADE
SL	SLOPE
T/F	TOP OF FRAME
GB	GRADE BREAK
BOW	BACK OF WALK
— · · —	SWALE
—35—	FIN. GRADE CONTOURS
— — —	PROPERTY LINE

HYDRAULIC DATA

LINE	STA	TO	STA	Q_{25}	S_o	n	D	d_n	V_n	d_c	V_c	N_f
LINE "2"	7+81.87		8+57.07	11.40	0.0020	0.013	30"	2.5	5.1	1.71	7.0	1.14

NOTE: HYDRAULIC DATA FOR EXISTING LINE 51" STORM DRAIN UNDER SUSAN STREET IS PER NORRIS-REPKE INC. HYADRAULIC REPORT AND REPRESENTS FULL DEVELOPMENT FOR THIS PARCEL AND DEVELOPMENT OF HOME RANCH.

LINE DATA TABLE

□	BEARING	LENGTH
1	N71°10'53.4"W	6.56'

CURVE DATA TABLE

○	DELTA	RADIUS	LENGTH	TANGENT
A	90°38'58"	22.50'	35.60'	22.76'
B	02°15'41.8"	837.00'	33.04'	16.52'

PA- 02- 34

PRECISE GRADING CHECK NO. G 02- 00016

EMULEX
We network storage

Project:

EMULEX
3333 Susan Street
Costa Mesa, California

Prepared for:

Emulex
3535 Harbor Blvd.
Costa Mesa, CA 92626

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The Odell Building
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Los Angeles, CA 90014

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Brandow & Johnston Associates
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Newport Beach, CA 92660

Mechanical & Plumbing Engineers
Teuchtyens & Kahn
17877 Von Karman Avenue, Suite 100 — T 949.756.0565 F 949.756.0927
Irvine, CA 92614

Electrical Engineer
TSA Engineering Consulting Engineers
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Newport Beach, CA 92660-3189

Specifications
Bob Cloud, AIA/CSI
1048 Pine Street — T 310.314.7540 F 310.314.7540
Santa Monica, CA 90405

Key Plan

Professional seals

REGISTERED PROFESSIONAL ENGINEER — No. 49065 — CIVIL — STATE OF CALIFORNIA

No.	Issue Description	Date
	SCHEMATIC DESIGN SUBMITTAL	6/20/02
	SCHEMATIC DESIGN REVISED	7/16/02
	PLANNING SUBMITTAL	7/18/02
	DESIGN DEVELOPMENT	8/30/02
	PLANCHECK SUBMITTAL	10/11/02
1	Plancheck Resubmittal/Bld Set	1/13/02
2	Plancheck Resubmittal #2	12/4/02

Drawn by: TJ Reviewed by: BK

Project No: 02-0193-00

Sheet Titles:

PRECISE GRADING PLAN (NORTH)

Original drawing is 36" x 48". Scale entities accordingly if reduced.

PLANCHECK SUBMITTAL - SHELL PACKAGE

Sheet Number:

C201

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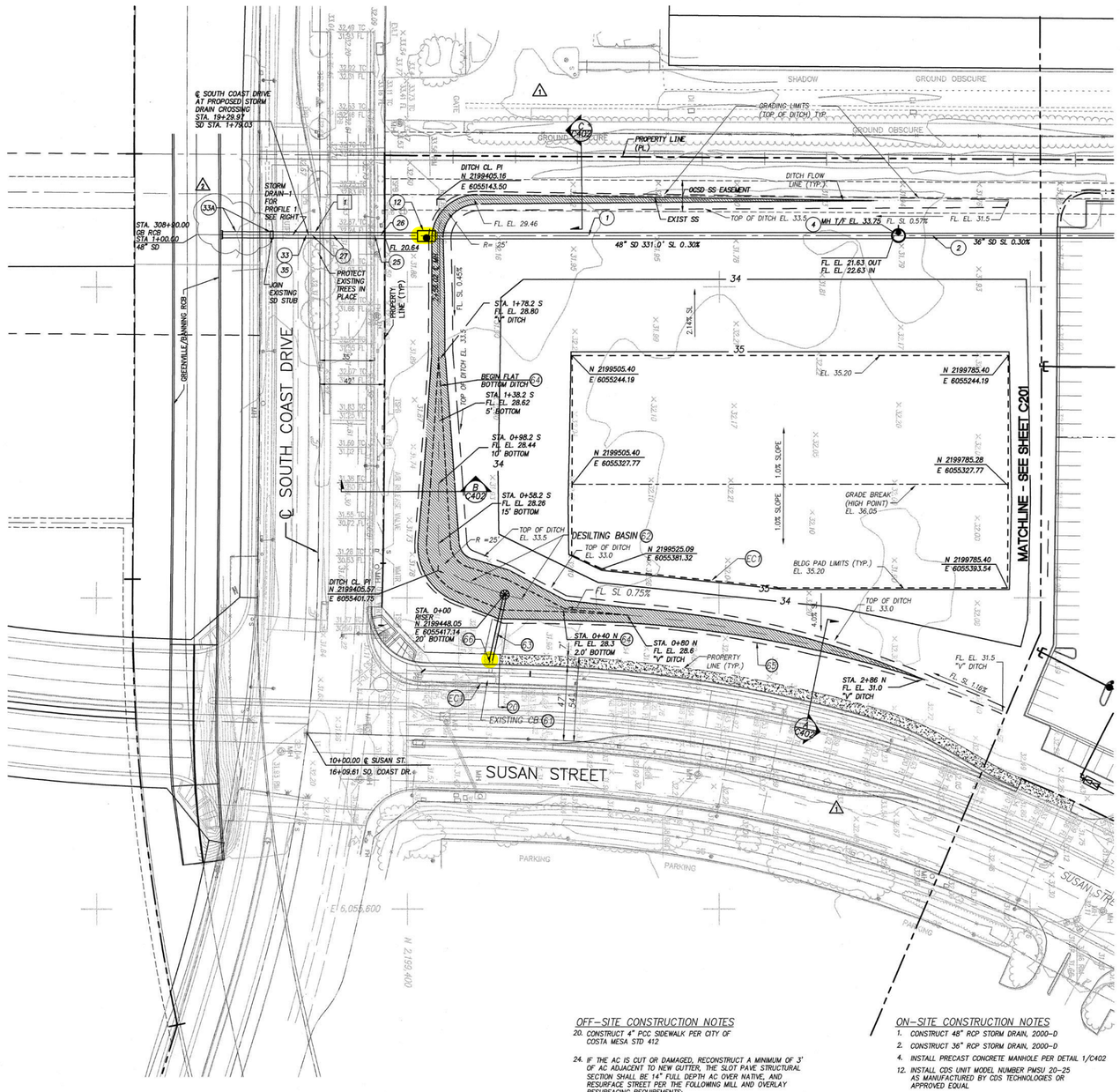
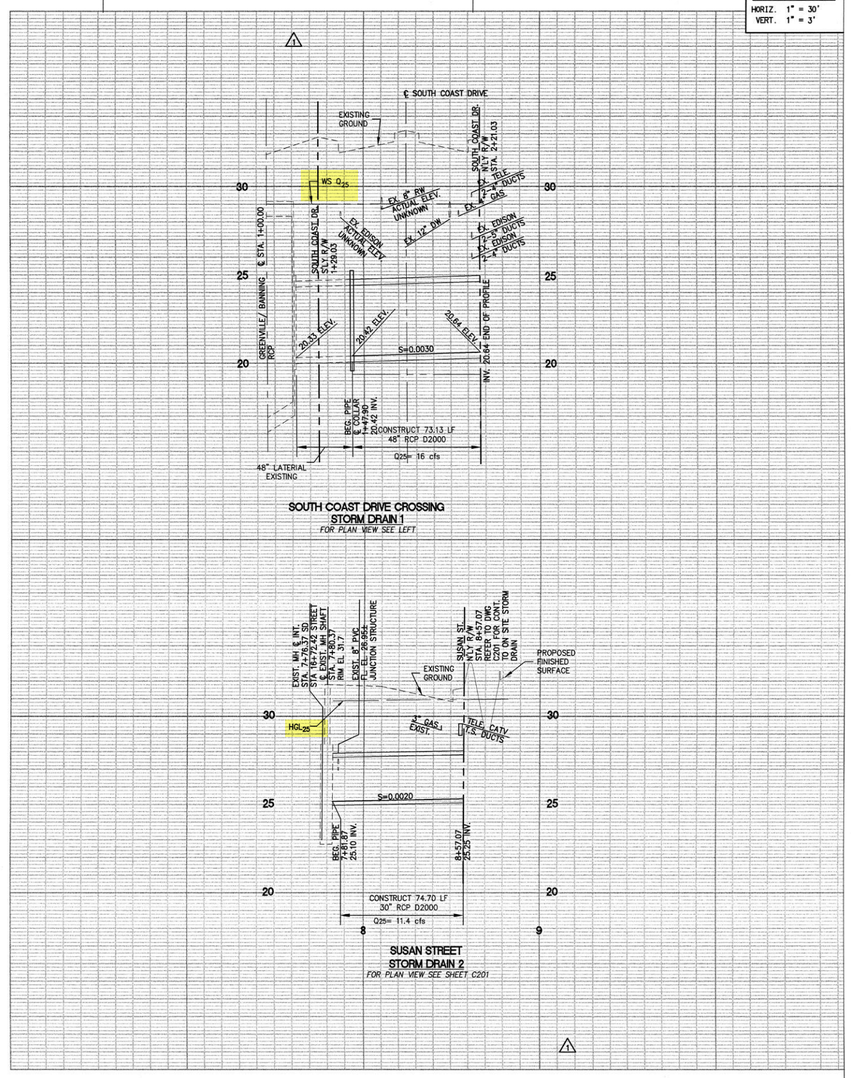




HYDRAULIC DATA											
LINE	STA TO STA	Q_{25}	S_o	n	D	d_n	V_n	d_c	V_c	N_f
LINE "1"	1+47.90 2+21.03	16.0	0.0030	0.013	48"	1.55	5.6	1.48	5.9	1.07

LINE DATA TABLE		
□	BEARING	LENGTH
1	N00°19'02"E	73.13

OFF-SITE CONSTRUCTION NOTES

20. CONSTRUCT 4" PCC SIDEWALK PER CITY OF COSTA MESA STD 412
24. IF THE AC IS CUT OR DAMAGED, RECONSTRUCT A MINIMUM OF 3' OF AC ADJACENT TO NEW GUTTER, THE SLOT PAVE STRUCTURAL SECTION SHALL BE 14" FULL DEPTH AC OVER NATIVE, AND RESURFACE STREET PER THE FOLLOWING MILL AND OVERLAY RESURFACING REQUIREMENTS:
    1. THE CONTRACTOR SHALL RESTORE THE ROADWAY SURFACE WITHIN THE WORK LIMITS BY MILLING AND OVERLAYING, MINIMUM OF2", THE ENTIRE LANE(S) WHERE THE TRENCH IS LOCATED.
       A. FOR TRENCHES PERPENDICULAR TO TRAFFIC LANES: MILL AND OVERLAY SHALL EXTEND 50' ON BOTH SIDES OF THE TRENCH AND WILL INCLUDE THE ENTIRE TRAVEL LANES.
       B. FOR TRENCHES PARALLEL TO TRAFFIC LANES AND FOR SMALL EXCAVATIONS: MILL AND OVERLAY THE ENTIRE WIDTH OF THE TRAFFIC LANE FOR THE FULL LENGTH OF THE TRENCH, BUT NOT LESS THAN 100'.
    2. RESTORATION OF THE ROADWAY SHALL BE CONTINUOUS AND NO JOINTS WILL BE ALLOWED. ALL ROADWAYS WITHIN THE WORK LIMITS WILL BE RESTORED IN ONE OPERATION. NO PIECE-MEAL MILLING AND OVERLAYING WORK WILL BE PERMITTED. THE CONTRACTOR SHALL NOT PROCEED WITH THE MILLING AND OVERLAYING OPERATIONS UNTIL DIRECTION IS GIVEN BY THE CITY ENGINEER.
    3. ANY EXISTING IMPROVEMENTS DAMAGED BY THE CONTRACTOR SHALL BE REPLACED AS DIRECTED BY THE CITY ENGINEER.
    4. ASPHALT RUBBER HOT MIX (ARHM) WET PROCESS SHALL CONFORM TO SUBSECTION 203-11 "ASPHAULT RUBBER HOT MIX GAP GRADED" (ARHM-GG) OF THE STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION. THE GRADED AGGREGATE SHALL CONFORM TO SUBSECTION 203-11 CLASS ARHM-GG-C.
    6. ARHM SURFACE COURSE SHALL BE TYPE C AND SHALL BE PROVIDED FOR THE SURFACE-WEARING COURSE ONLY.
    7. CONTRACTOR SHALL SUBMIT THE ASPHAULT MIX DESIGN TO THE CITY ENGINEER FOR APPROVAL PRIOR TO START OF WORK.
25. REMOVE EXISTING AND CONSTRUCT TYPE (C-8) CURB AND GUTTER PER CITY OF COSTA MESA STD DWG NO. 312 OVER 6" CMB. CONTRACTOR SHALL RECONSTRUCT A MINIMUM OF 3' OF AC ADJACENT TO NEW GUTTER. THE NEW SLOT PAVE STRUCTURAL SECTION SHALL BE 10" AC OVER 13" CMB OVER 14" OVEREXCAVATION AND RECOMPACTION. EXTEND CURB AND GUTTER REMOVAL TO NEXT JOINT IF LESS THAN 8' AWAY.
26. REMOVE EXISTING PER CITY OF COSTA MESA STD. DWG. NO. 811 AND RECONSTRUCT COMMERCIAL SIDEWALK PER CITY OF COSTA MESA STD. DWG. NO. 412 OVER 4" CMB.
27. REMOVE EXISTING AND CONSTRUCT TYPE A-8 CURB PER CITY OF COSTA MESA STD 311.
33. CONSTRUCT 48" RCP STORM DRAIN (2000-D).
33A. CONSTRUCT STORM DRAIN ENTRY PER PFRD/ STANDARD PLAN 1314 PIPE BEDDING PER PFRD/ STD PLAN 1319. ALL CONCRETE SHALL BE 500-c-3250
35. TRENCH PER CITY OF COSTA MESA STD PLAN 813 WITH MODIFIED STRUCTURAL SECTION OF 10" AC OVER 13" CMB OVER 14" OVEREXCAVATION AND RECOMPACTION.

ON-SITE CONSTRUCTION NOTES

1. CONSTRUCT 48" RCP STORM DRAIN, 2000-D
2. CONSTRUCT 36" RCP STORM DRAIN, 2000-D
4. INSTALL PRECAST CONCRETE MANHOLE PER DETAIL 1/C402
12. INSTALL CDS UNIT MODEL NUMBER PMSU 20-25 AS MANUFACTURED BY CDS TECHNOLOGIES OR APPROVED EQUAL

DESILTING BASIN CONSTRUCTION NOTES

6. EXIST. CATCH BASIN W/ 18" STUB TO R/W LINE FLOW LINE EL. 23.51 EXTEND 18" SD CSP DRAIN PIPE 15' LF (MIN) FL. EL. 23.60 AT RISER
22. DESILTING BASIN NO. 1 (SEE CALCULATIONS) - SEE DETAIL AT LEFT REFER TO DWG C501 FOR RISER DETAIL
23. INSTALL 60' LF 18" CSP 28.8 FL. EL. IN
24. BEGIN FLAT BOTTOM DITCH
25. TOP OF BASIN/ DITCH TO EXIST. GRADE
26. REMOVE BRICK AND MORTAR BULK HEAD AND CONSTRUCT COLLAR PER AWPA STD. 360-2 AND JOIN EXISTING RCP. POINT OF CONNECTION AT RIGHT OF WAY LINE.

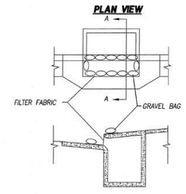
NOTES

1) NO WORK WITHIN PUBLIC RIGHT OF WAY IS APPROVED UNDER THIS PLAN. SEE SEPERATE STREET IMPROVEMENT PLAN FOR ALL STREET IMPROVEMENTS. ALL WORK WITHIN PUBLIC RIGHT OF WAY REQUIRES AN ENCROACHMENT PERMIT FROM THE PUBLIC SERVICES DEPT PRIOR TO START OF WORK
2) INSPECT ALL EROSION CONTROL FACILITIES ON A WEEKLY BASIS FOR WEAR AND CONFORMACE TO THIS PLAN.
3) AFTER 24 HOURS OF DETENSION, AND IF ADDITIONAL RAIN IS FORCAST WITHIN THE 72 HOURS, DRAIN "SETTLING ZONE" BY PUMPING. CONTACT PUBLIC SERVICES DEPARTMENT PRIOR TO PUMPING.
4) MAXIMUM DESIGN LIFE OF BASIN IS 18 MONTHES. AN UPDATED DESILTING PLAN MUST BE RESUBMITTED FOR THE REVIEW APPROVEL BY THE CITY, AND THE BASIN MUST BE REMODELED IN THE FIELD WITHIN 18 MONTHS OF INITAIL CONSTRUCTION.
5) DURING CONSTRUCTION THE ONSITE SUPERINTENDENT WILL INSPECT ALL EROSION CONTROL FACILITIES FOR WEAR AND CONFORMANCE TO PLAN ON A WEEKLY BASIS OR AFTER A RAINY DAY.
6) THE STABILIZED CONSTRUCTION ENTRANCE SHALL BE KEPT CLEAR OF DEBRIS DURING HAULING OF DIRT.
7) THE CONNECTION OF THE ON-SITE DESILTING BASIN, TO THE EXISTING OFF-SITE CATCH BASIN, IS ONLY TEMPORARY. THE FINAL STORM DRAIN DESIGN SHALL BE CONNECTED DIRECTLY INTO THE PUBLIC STORM DRAIN SYSTEM AND AS ALLOWED BY PLANNING ACTION PA -02-34
8) REFER TO DWG C501 FOR DETAILS OF DESILTING BASIN RISER AND OUTFALL PIPING.

SCALE: 1"=30'

30' 15' 0' 30' 60'
GRAPHIC SCALE: 1"=30'

PLAN VIEW



SECTION A-A

EXIST. CATCH BASIN PROTECTION DETAIL
NOT TO SCALE

DESILTING BASIN CALCULATIONS

CALCULATIONS IN COMPLIANCE WITH SWRCB ORDER NO. 99-08-DWQ NODES GENERAL PERMIT NO. CA 000002.

DESILTING BASIN

SEDIMENT YIELD = 3600 CF/AC
GRADED AREA = 3.0 AC.
REQUIRED STORAGE = 3.0 X 3600 = 10,800 CF
STORAGE PROVIDED = 11,400 CF
MAXIMUM STORAGE ELEV. = 30.8

PA- 02- 34

PRECISE GRADING CHECK NO. G 02- 00016

H:\PDATA\10102308\CADD\LAND\DLV\GRADING\PRECISE\2308P2202.DWG 12/09/02 1:48 pm

EMULEX
We network storage

Project:

EMULEX
3333 Susan Street
Costa Mesa, California

Prepared for:
Emulex
3535 Harbor Blvd.
Costa Mesa, CA 92626

HELLMUTH, OBATA + KASSABAUM, INC.

ARCHITECTURE, ENGINEERING, PLANNING, INTERIORS, GRAPHICS, CONSULTING

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Internet: http://www.hok.com

In association with:

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14725 Alton Parkway — T 949.472.3483 F 949.472.8122
Irvine, CA 92618

Landscape
Melendrez Design Partners
The Odell Building
617 South Olive Street – #1110 — T 213.673.4400 F 213.673.4410
Los Angeles, CA 90014

Structural Engineer
Brandow & Johnston Associates
20301 S.W. Birch Street, #100 — T 949.476.8319 F 949.855.0784
Newport Beach, CA 92660

Mechanical & Plumbing Engineers
Tauchiyama & Kishio
17877 Von Karman Avenue, Suite 100 — T 949.756.0565 F 949.756.0827
Irvine, CA 92614

Electrical Engineer
FSA Engineering Consulting Engineers
3420 Irvine Avenue, Suite 200 — T 949.852.9965 F 949.852.1657
Newport Beach, CA 92660-3189

Specifications
Bob Cloud, AIA/CSI
1048 Pine Street — T 310.314.7540 F 310.314.7540
Santa Monica, CA 90405

Key Plan

Professional seals

No.	Issue Description	Date
	SCHEMATIC DESIGN SUBMITTAL	6/20/02
	SCHEMATIC DESIGN REVISED	7/16/02
	PLANNING SUBMITTAL	7/18/02
	DESIGN DEVELOPMENT	8/30/02
	PLANCHECK SUBMITTAL	10/11/02
1	Plancheck Resubmittal/Bld Set	11/13/02
2	Plancheck Resubmittal #2	12/4/02

Drawn by: TJ Reviewed by: BK

Project No: 02-0193-00

Sheet Titles:

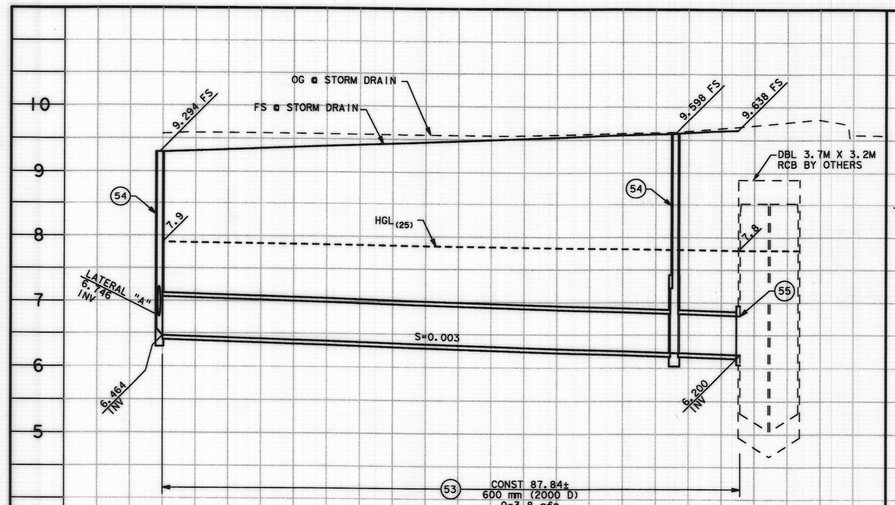
PRECISE GRADING PLAN (SOUTH)

Original drawing is 36" x 48". Scale entities accordingly if reduced

PLANCHECK SUBMITTAL - SHELL PACKAGE

Sheet Number:

C202



PROFILE
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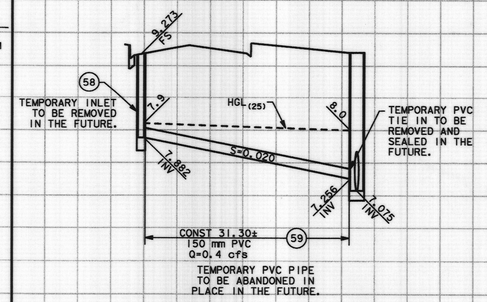
VERT 1:40



LATERAL "AA"

PROFILE
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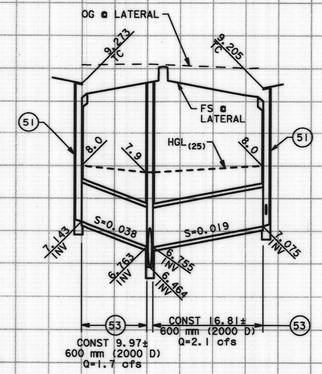

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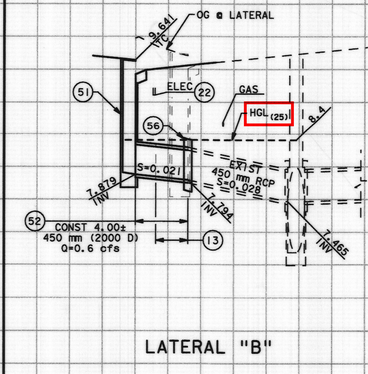
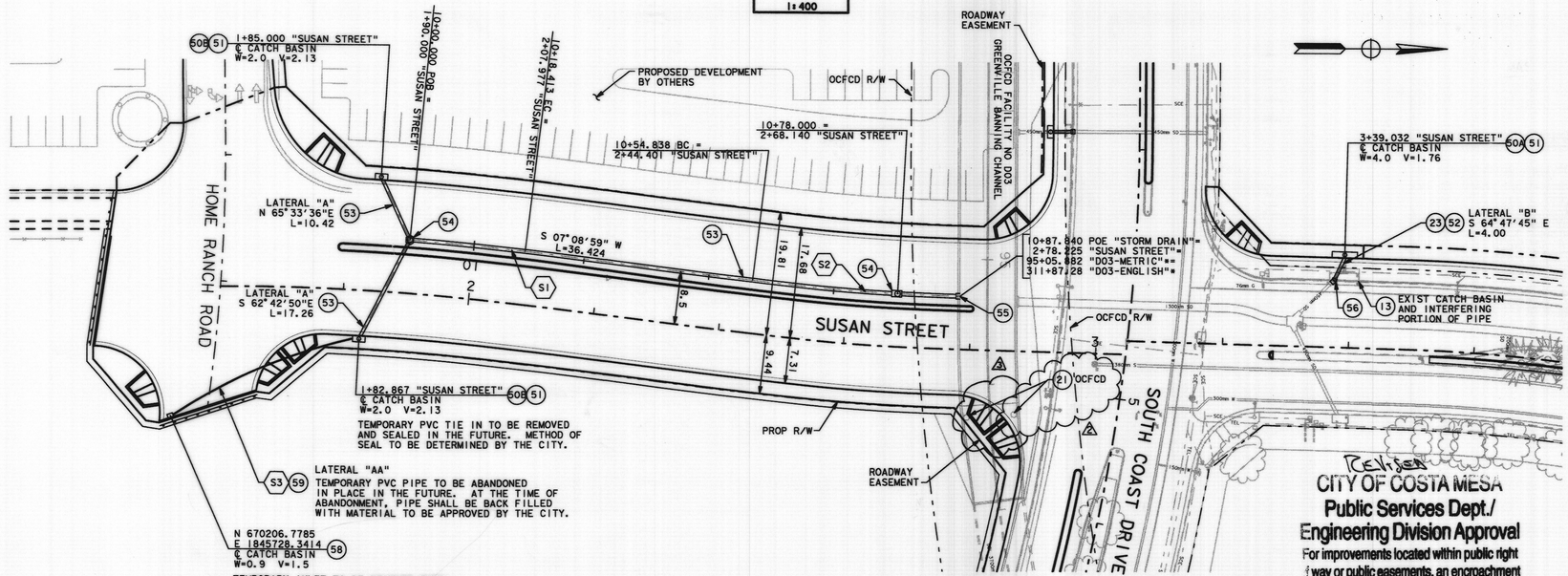


LATERAL "B"

PROFILE
HORZ 1:200
VERT 1:40

PLAN
1:400



* NOTE:
BASIS FOR STATIONING ALONG THE GREENVILLE BANNING CHANNEL ARE REFERENCED FROM DRAWING NOS.:
D03-701-3
D03S03-701-1
D03P02-701-2

Revised
CITY OF COSTA MESA
Public Services Dept./
Engineering Division Approval
For improvements located within public right of way or public easements, an encroachment permit is required prior to the start of work.
Approved by _____ Date 11-21-02

CONSTRUCTION NOTES MASTER LIST

13 REMOVE AND DISPOSE OF EXISTING IMPROVEMENTS. (TYPE SHOWN ON PLAN).
21 ADJUST TO GRADE. (TYPE SHOWN ON PLAN).
22 RELOCATE BEHIND NEW CURB. CONDUIT AND PULL BOX SHALL BE PER SCE APPROVED PLANS. CONTRACTOR TO COORDINATE WITH SCE. (TYPE SHOWN ON PLAN).
23 CONSTRUCT TRENCH PER CITY OF COSTA MESA STD 813. NO SLURRY BACKFILL ALLOWED FOR TRENCHES GREATER THAN 300 mm WIDE.
50A CONSTRUCT LOCAL DEPRESSION CASE A PER APWA 313-1.
50B CONSTRUCT LOCAL DEPRESSION CASE B PER APWA 313-1.
51 CONSTRUCT CATCH BASIN PER APWA 300-2 WITH OCEAN PRO DEBRIS GATE OR EQUAL. INSTALLATION OF THE GATE SHALL BE REVIEWED AND APPROVED BY THE CITY OF COSTA MESA.
52 CONSTRUCT 450 mm RCP. 2
53 CONSTRUCT 600 mm RCP.
54 CONSTRUCT MANHOLE PER APWA 321-1.
55 CONSTRUCT JUNCTION STRUCTURE PER PFRD 1314 (OCFCD PERMIT IS REQUIRED PRIOR TO CONSTRUCTION). 2
56 CONSTRUCT CONCRETE COLLAR PER APWA 380-3.
58 CONSTRUCT CATCH BASIN PER APWA 303-2 WITH OCEAN PRO DEBRIS GATE OR EQUAL. INSTALLATION OF THE GATE SHALL BE REVIEWED AND APPROVED BY THE CITY OF COSTA MESA.
59 CONSTRUCT 150 mm PVC.

CURVE DATA 2 02°56'34"

NO	R	Δ	T	L
S1	358.500	02°58'56"	9.209	18.413
S2	341.500	05°32'14"	16.514	33.003
S3	90.000	19°55'25"	15.807	31.296

AS BUILT DRAWINGS
Date Completed: 06/06/03
Proiect Number: PA-99-34

SEQUEIRA INFRASTRUCTURE ASSOCIATES
4 TECHNOLOGY DRIVE, SUITE 150
IRVINE, CA 92618
TEL (949) 753-5163
FAX (949) 753-5164

REGISTERED PROFESSIONAL ENGINEER DAVID B LEW No. C 59063 Exp. 6-30-03 CIVIL STATE OF CALIFORNIA

David Lew 11/11/02
DAVID B LEW, RCE 59063 DATE

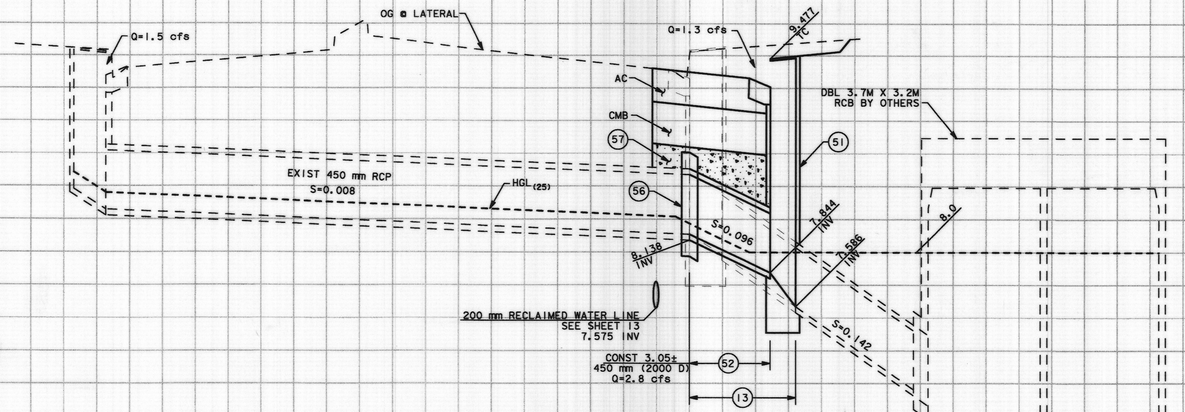
REVISIONS

NO.	DATE	DESCRIPTION	APP.
2	11/11/02	STORM DRAIN STANDARD MODIFICATIONS	
3	12/12/02	OCFCD MANHOLE GRADE ADJUSTMENT & CURVE DATA	

STORM DRAIN PLAN AND PROFILE
SUSAN STREET/SOUTH COAST DRIVE
CITY OF COSTA MESA
DEPARTMENT OF ENGINEERING SERVICES

SHEET 9 OF 18 SHEETS
PLAN NUMBER 2002-3.9

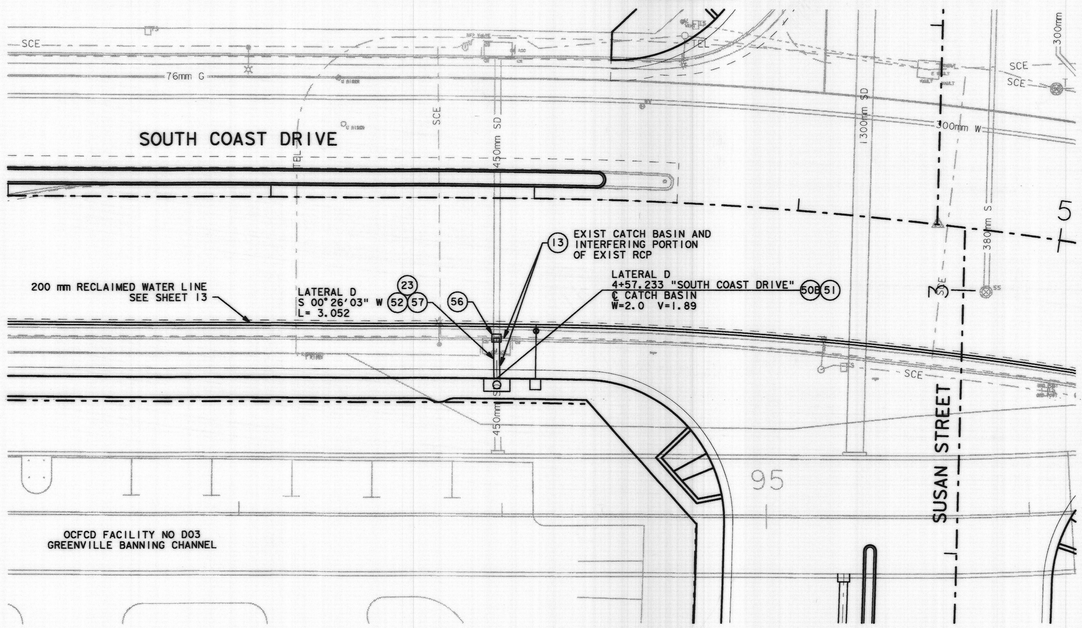
CAD FILE 02-3.9



LATERAL "D"

PROFILE
HORZ 1:100
VERT 1:20

PLAN
1:200



CONSTRUCTION NOTES MASTER LIST

13 REMOVE AND DISPOSE OF EXISTING IMPROVEMENTS. (TYPE SHOWN ON PLAN).

23 CONSTRUCT TRENCH PER CITY OF COSTA MESA STD 813. NO SLURRY BACKFILL ALLOWED FOR TRENCHES GREATER THAN 300 mm WIDE.

50B CONSTRUCT LOCAL DEPRESSION CASE B PER APWA 313-1.

△2 51 CONSTRUCT CATCH BASIN PER APWA 300-2 WITH OCEAN PRO DEBRIS GATE OR EQUAL. INSTALLATION OF THE GATE SHALL BE REVIEWED AND APPROVED BY THE CITY OF COSTA MESA.

52 CONSTRUCT 450 mm RCP.

56 CONSTRUCT CONCRETE COLLAR PER APWA 380-3.

57 CONSTRUCT 150 mm MIN CONCRETE BACKFILL.

REVISED
CITY OF COSTA MESA
Public Services Dept./
Engineering Division Approval
For improvements located within public right of way or public easements, an encroachment permit is required prior to the start of work.
Approved by _____ Date 11-21-02

AS BUILT DRAWINGS
Date Completed: 06/06/03
Proiect Number: PA-99-34

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REGISTERED PROFESSIONAL ENGINEER
DAVID B LEW
No. C 59063
Exp. 6-30-03
CIVIL
STATE OF CALIFORNIA

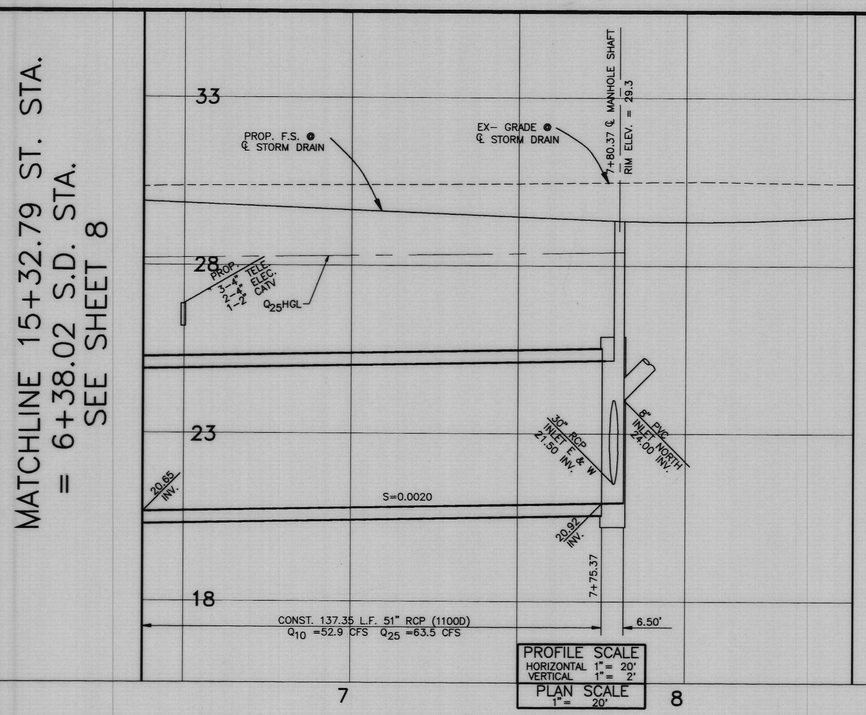
David Lew 11/11/02
DAVID B LEW, RCE 59063 DATE

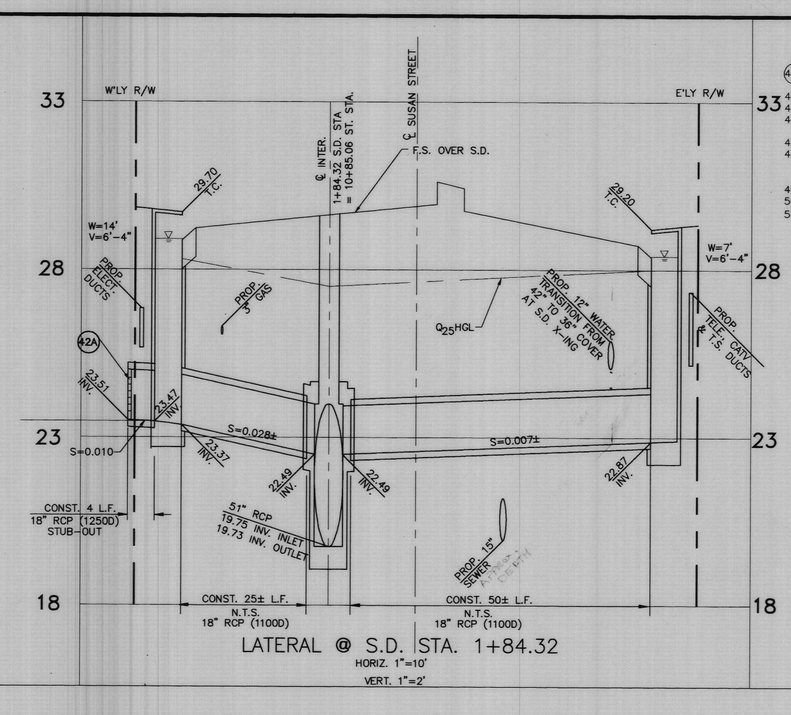
REVISIONS			
NO.	DATE	DESCRIPTION	APP.
△2	11/11/02	STORM DRAIN STANDARD MODIFICATIONS	

STORM DRAIN PLAN AND PROFILE
SUSAN STREET/SOUTH COAST DRIVE
CITY OF COSTA MESA
DEPARTMENT OF ENGINEERING SERVICES

SHEET 11 OF 16 SHEETS
PLAN NUMBER 2002-3.11

CAD FILE (CVD) ...DWG CD ... CPS 24
2002-3.11





CONSTRUCTION NOTES

(42A) CONSTRUCT 4 L.F. OF 18" RCP (1250 D) STUB-OUT FOR FUTURE CONNECTION. CONSTRUCT DOUBLE ROW BRICK AND MORTAR BULK HEAD AT END.

43 CONSTRUCT 51" RCP (1100 D) PER PROFILE ON SHEETS 8 AND 9.

44 CONSTRUCT 30" RCP (1000 D) PER PROFILE ON SHEET 9.

45 CONSTRUCT 24" RCP (1000 D) PER PROFILE ON SHEET 9. CONSTRUCT DOUBLE ROW BRICK AND MORTAR BULKHEAD AT END.

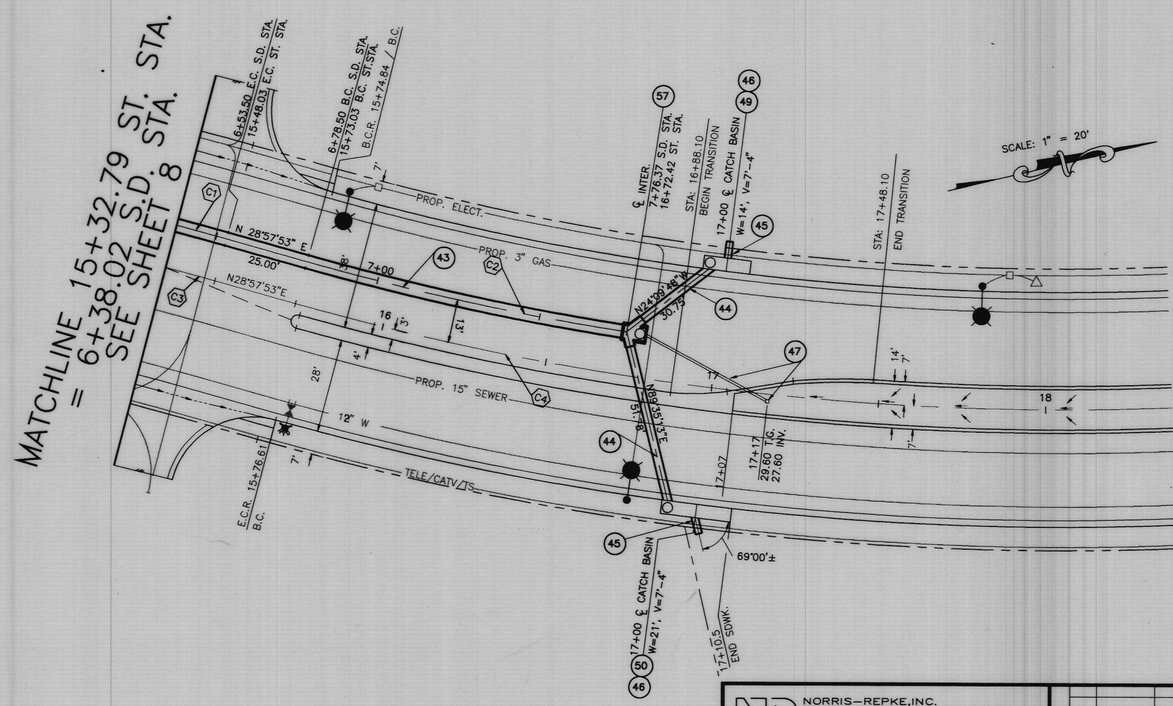
46 CONSTRUCT LOCAL DEPRESSION PER CITY OF COSTA MESA STD 315.

47 CONSTRUCT 12'X12' GRATE INLET (BROOKS NO. 1212) WITH CAST IRON PARKWAY GRATE (WT 29 LBS). CONSTRUCT 8" PVC (SDR-35) DRAIN PIPE FROM GRATE INLET TO MAIN LINE STORM DRAIN PER ELEVATIONS ON THE PLAN AND PROFILE.

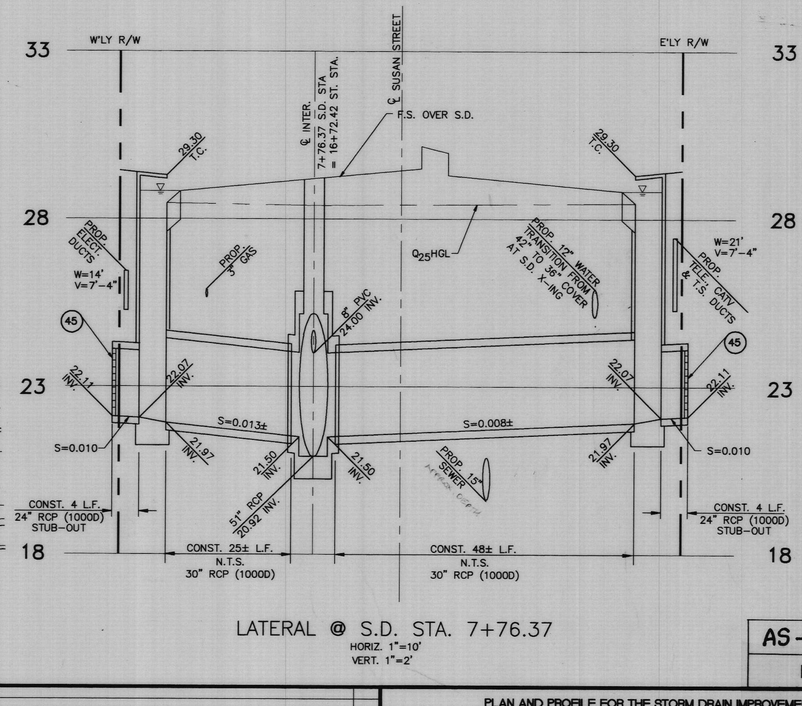
49 CONSTRUCT 14' CATCH BASIN (C.B. NO. 3) PER LACFCD STD 2- D163.

50 CONSTRUCT 21' CATCH BASIN (C.B. NO. 3) PER LACFCD STD 2- D163.

57 CONSTRUCT MANHOLE NO. 4 PER LACFCD STD 2-D113.



CURVE	DELTA	RADIUS	LENGTH	TANGENT	
C1	01°01'40"	863.00'	15.48'	7.74'	℄ STORM DRAIN
C2	06°41'58"	837.00'	97.87'	48.99'	℄ STORM DRAIN
C3	01°01'40"	850.00'	15.25'	7.62'	℄ STREET
C4	32°09'03"	850.00'	476.97'	244.95'	℄ STREET



AS-BUILT: 1/9/96

ISSUE DATE: 8/14/95

NORRIS-REPKE, INC.
Consulting Civil Engineers and Land Surveyors
600 N. TUSTIN AVENUE
SUITE 250
SANTA ANA CA. 92705-3736
TEL. (714) 973-2230
FAX. (714) 973-2263

REGISTERED PROFESSIONAL ENGINEER RANDALL G. BERRY No. C44642 Renew 3/31/98 CIVIL STATE OF CALIFORNIA

Randall Berry 6-30-95

RANDALL G. BERRY, RCE 44642 DATE

REVISIONS

NO.	DATE	DESCRIPTION	APP.

PLAN AND PROFILE FOR THE STORM DRAIN IMPROVEMENTS ON

SUSAN STREET

FROM S.D. STA. 6+37.71 TO S.D. STA. 7+76.06

CITY OF COSTA MESA

DEPARTMENT OF ENGINEERING SERVICES

SHEET 9 OF 21 SHEETS

PLAN NUMBER 95-02.9

SUS-SD11.DWG JN 5403

BABI PILE CORP. IRVINE, CA

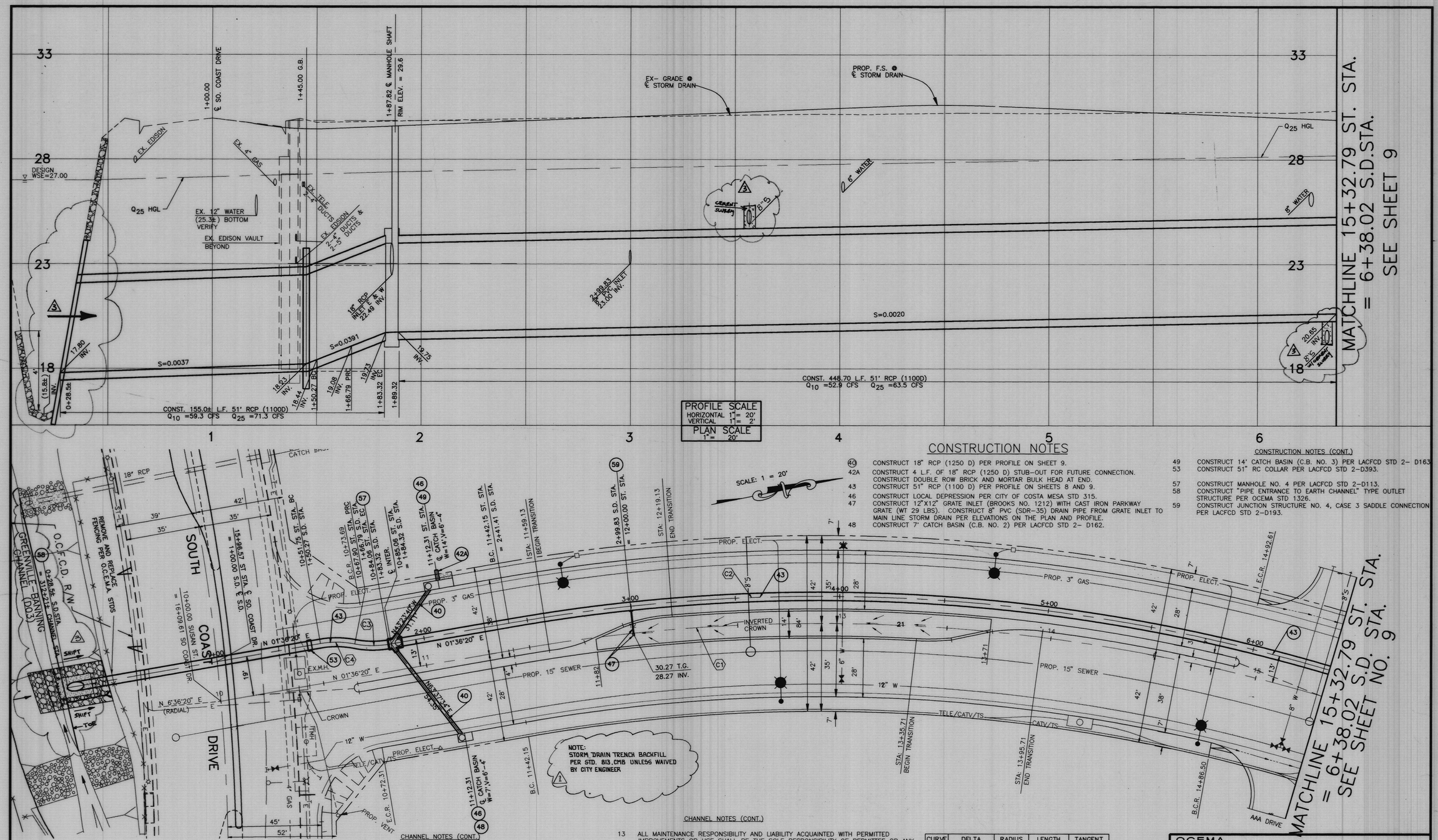
95-02.9

EPH 24

EPH 24

BAR FILE CORP. IRVINE, CA

95-02.8



CONSTRUCTION NOTES

(40) CONSTRUCT 18" RCP (1250 D) PER PROFILE ON SHEET 9.
42A CONSTRUCT 4 L.F. OF 18" RCP (1250 D) STUB-OUT FOR FUTURE CONNECTION. CONSTRUCT DOUBLE ROW BRICK AND MORTAR BULK HEAD AT END.
43 CONSTRUCT 51" RCP (1100 D) PER PROFILE ON SHEETS 8 AND 9.
46 CONSTRUCT LOCAL DEPRESSION PER CITY OF COSTA MESA STD 315.
47 CONSTRUCT 12"X12" GRATE INLET (BROOKS NO. 1212) WITH CAST IRON PARKWAY GRATE (WT 29 LBS). CONSTRUCT 8" PVC (SDR-35) DRAIN PIPE FROM GRATE INLET TO MAIN LINE STORM DRAIN PER ELEVATIONS ON THE PLAN AND PROFILE.
48 CONSTRUCT 7' CATCH BASIN (C.B. NO. 2) PER LACFCD STD 2- D162.
49 CONSTRUCT 14' CATCH BASIN (C.B. NO. 3) PER LACFCD STD 2- D163
53 CONSTRUCT 51" RC COLLAR PER LACFCD STD 2-D393.
57 CONSTRUCT MANHOLE NO. 4 PER LACFCD STD 2-D113.
58 CONSTRUCT "PIPE ENTRANCE TO EARTH CHANNEL" TYPE OUTLET STRUCTURE PER OCEMA STD 1326.
59 CONSTRUCT JUNCTION STRUCTURE NO. 4, CASE 3 SADDLE CONNECTION PER LACFCD STD 2-D193.

GREENVILLE-BANNING CHANNEL STRUCTURAL NOTES

1 GENERAL: CONTRACTOR SHALL VERIFY ALL DIMENSIONS AND ELEVATIONS PRIOR TO START OF ANY WORK AND SHALL NOTIFY ENGINEER IMMEDIATELY OF DISCREPANCIES.
2 APPLICABLE CODES & SPECIFICATIONS: CONSTRUCTION SHALL BE IN ACCORDANCE WITH THE LATEST EDITION OF THE STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION AND WITH THE CURRENT O.C.E.M.A. STANDARD PLANS. MORE PARTICULARLY THE OCEMA STANDARD PLANS 1801 - 1809 WHICH CONTAIN THE SPECIAL PROVISIONS. THE ABOVE SHALL GOVERN EXCEPT WHERE OTHER APPLICABLE CODES AND/OR NOTES ON THE PLAN ARE MORE RESTRICTIVE.
10 ANY ORANGE COUNTY FLOOD CONTROL DISTRICT IMPROVEMENTS DISTURBED OR DAMAGED DURING PERMITTED USE SHALL BE RESTORED AT PERMITTEE'S EXPENSE IN COMPLIANCE WITH EMA STANDARD PLANS AND TO THE SATISFACTION OF EMA INSPECTION PERSONNEL.

CHANNEL NOTES (CONT.)

11 PERMITTEE TO UNDERSTAND THAT ANY PERMITTED IMPROVEMENTS, THAT ARE DISTURBED OR DAMAGED BY ORANGE COUNTY FLOOD CONTROL DISTRICT DURING NORMAL MAINTENANCE OPERATIONS OR CHANNEL RECONSTRUCTION, ARE TO BE RESTORED BY PERMITTEE OR ANY FUTURE ASSIGNS, SUCCESSORS SOLELY AT THEIR EXPENSE.
12 ALL WORK SHALL BE PERFORMED DURING THE NON-STORM-SEASON (APRIL 16TH THROUGH OCTOBER 14TH).

CHANNEL NOTES (CONT.)

13 ALL MAINTENANCE RESPONSIBILITY AND LIABILITY ACQUAINTED WITH PERMITTED IMPROVEMENTS OR USE SHALL BE THE SOLE RESPONSIBILITY OF PERMITTEE OR ANY FUTURE ASSIGNS OR SUCCESSORS.
14 RCP BEDDING WITHIN R/W TO COMPLY WITH EMA STANDARD PLAN 1319 AND PERMITTEE TO MAINTAIN 90% RELATIVE COMPACTION.
15 ALL CHAIN LINK FENCING INCLUDING GATES THAT ARE INSTALLED OR REPAIRED WITHIN THE R/W ARE TO COMPLY WITH APWA STANDARD PLAN 600-0-0C.

CURVE	DELTA	RADIUS	LENGTH	TANGENT	
C1	26°19'53"	850.00'	390.64'	198.83'	℄ STREET
C2	26°19'53"	863.00'	396.61'	201.87'	℄ STORM DRAIN
C3	21°02'22"	45.00'	16.52'	8.36'	℄ STORM DRAIN
C4	21°02'22"	45.00'	16.52'	8.36'	℄ STORM DRAIN

AS-BUILT: 1/9/96

ISSUE DATE: 8/14/95

NORRIS-REPKE, INC.
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600 N. TUSTIN AVENUE
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Randall Berry 6-30-95
RANDALL G. BERRY, RCE 44642 DATE

REGISTERED PROFESSIONAL ENGINEER RANDALL G. BERRY No. C44642 Renew 3/31/98 CIVIL STATE OF CALIFORNIA

NO.	DATE	DESCRIPTION	APP.
1	8-8-95	ADD TRENCH NOTE	
2	12-7-95	"AS-BUILT" SHIFTED TOE OF OUTLET STRUCTURE TO FIT STRAIGHT LINE BETWEEN TWO ADJACENT EX. RIP-RAP TOES PER DIRECTION OF HECTOR BAZEA (OCEMA INSPECTOR).	CS

REVISIONS

O.C.E.M.A.
ENCHROACHMENT PERMIT No. 95-00558
APPROVED FOR FACILITY
ORANGE COUNTY FLOOD CONTROL DISTRICT DATE

PLAN AND PROFILE FOR THE STORM DRAIN IMPROVEMENTS ON

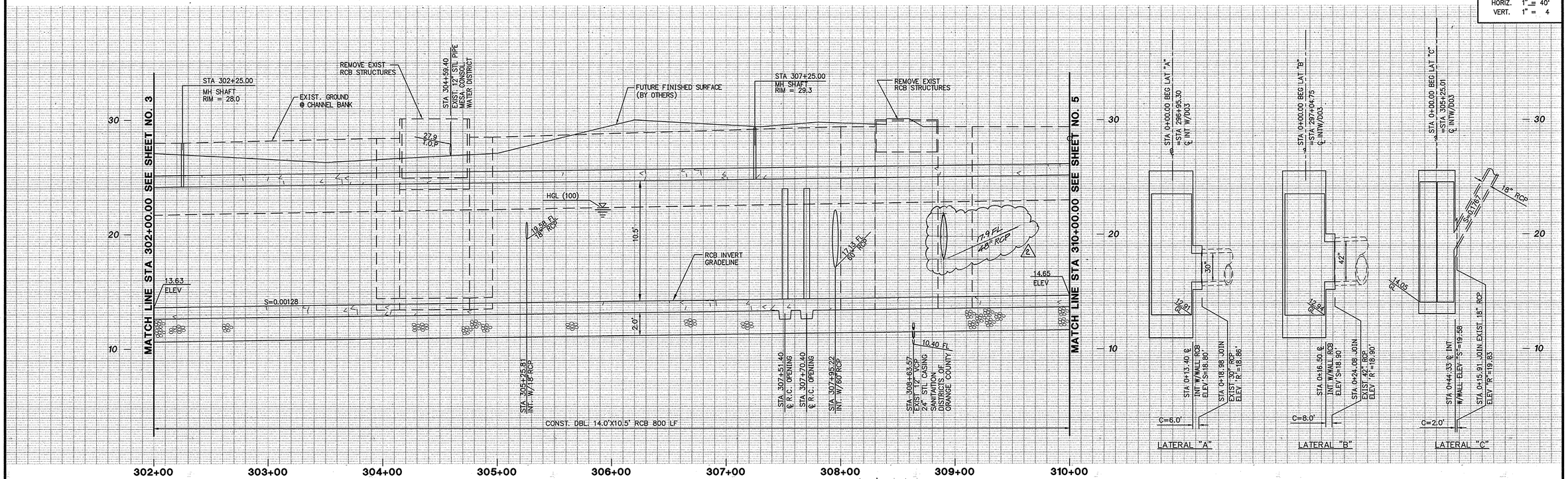
SUSAN STREET

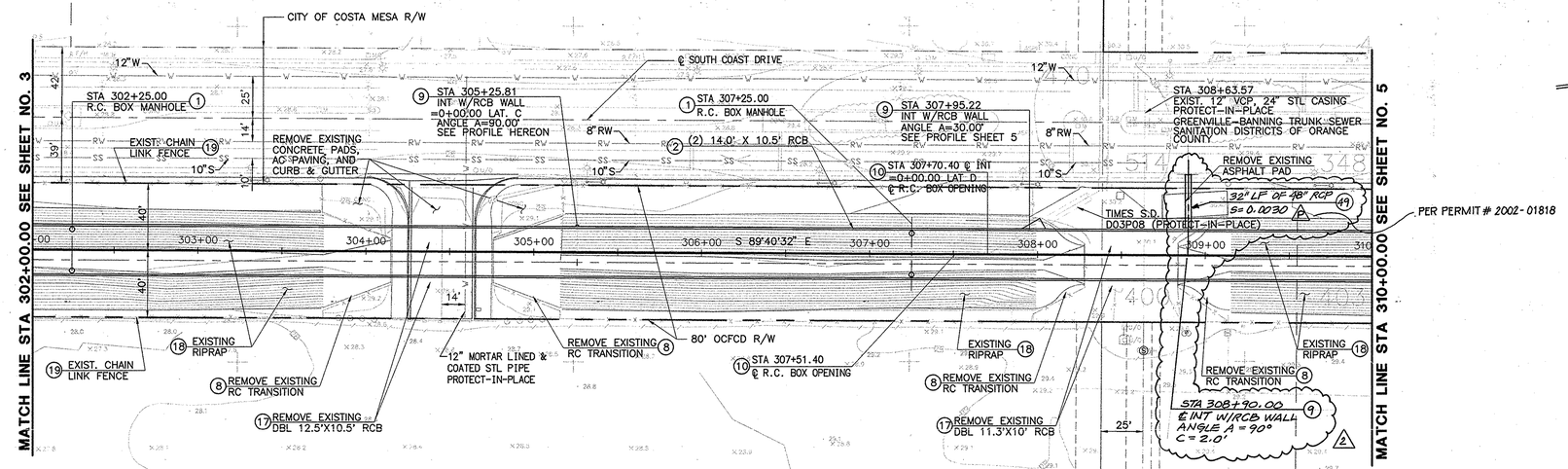
FROM GREENVILLE-BANNING CHANNEL TO S.D. STA. 6+37.71

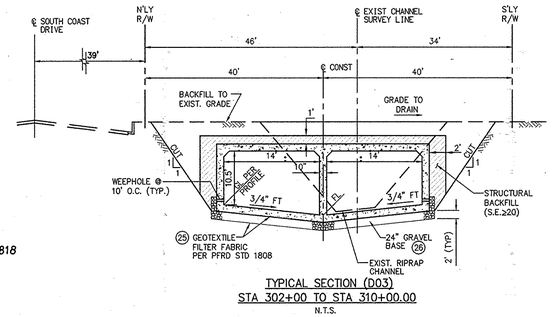
CITY OF COSTA MESA
DEPARTMENT OF ENGINEERING SERVICES

SHEET 8 OF 21 SHEETS
PLAN NUMBER 95-02.8

SUS-SD10.DWG JN 5403







TYPICAL SECTION (D03)
STA 302+00 TO STA 310+00.00
N.T.S.

1 1/2 0 1 2
3 inches on original drawing

CONSTRUCTION NOTES

1. CONSTRUCT R.C. BOX MANHOLE PER PF & RD STD. PLAN NO. 1506
2. CONSTRUCT DBL 14'X10.5' RCB PER PLAN, PROFILE AND DETAIL ON SHEET 9
8. REMOVE EXISTING TRANSITION STRUCTURE
9. CONSTRUCT JUNCTION STRUCTURE TYPE V PER PF&RD STD PLAN NO. 1314
10. CONSTRUCT R.C. BOX OPENING PER DETAIL ON SHEET 12
17. REMOVE EXISTING DBL BARREL RCB
18. REMOVE AND SALVAGE EXISTING LOOSE RIPRAP (DISPOSE GROUTED RIP-RAP)
19. REMOVE AND SALVAGE EXISTING CHAIN LINK FENCE AND GATES
25. INSTALL GEOTEXTILE FILTER FABRIC PER PFRD STD 1808
26. INSTALL 24" GRAVEL BASE
49. CONSTRUCT 48" RCP (D-1400)

AS BUILT PLANS

HYDRAULIC DATA

LINE	STA TO STA	Q_{100}*	S_o	n	b(ft)	D_n(ft)	V_n(fps)	D_c(ft)	V_c(fps)	N_f
D03	302+00.00 307+70.40	1067	0.00128	0.014	14.0	8.23	9.26	5.65	13.49	0.568
D03	307+70.40 310+00.00	1037	0.00128	0.014	14.0	8.05	9.20	5.54	13.36	0.571

* FLOW RATE PER CELL IN DBL RCB

CITY OF COSTA MESA
Public Services Dept./
Engineering Division Approval
For improvements located within public right of way or public easements, an encroachment permit is required prior to the start of work.
Approved by: _____ Date 4/12/02

REGISTERED PROFESSIONAL ENGINEER
JOHN McCARTHY
No. 47583
Exp. 12-31-03
CIVIL
STATE OF CALIFORNIA

GRAPHIC SCALE: 1"=40'
40' 30' 20' 10' 0' 40' 80'

RBF CONSULTING
PLANNING ■ DESIGN ■ CONSTRUCTION
14725 ALTON PARKWAY
IRVINE, CALIFORNIA 92618-2027
949.472.3505 ▪ FAX 949.472.8373 ▪ www.RBF.com
JOHN A. McCARTHY RCE 47583 DATE: 4/15/02

ORANGE COUNTY
PLANNING & DEVELOPMENT SERVICES
GREENVILLE - BANNING CHANNEL

FACILITY NO. D03
PLAN AND PROFILE
STA 302+00 TO STA 310+00

MARK	DATE	DESCRIPTION
A	12-2002	PERMIT # 2002-01818
4	5/16/03	AS-BUILT PLANS
2	8/15/02	ADD S.D LATERAL A8 STA 308+90

REVISIONS

DESIGNED TR
DRAWN EC, GHO CHECKED JAM
PREPARED UNDER SUPERVISION OF _____ DATE:
SCALE AS SHOWN DATE 4/02
DWG NO D03-701-3 D03S03-701-1 D03P02-701-2
SHEET 4/21

D03-701-3
D03S03-701-1
D03P02-701-2

21

4

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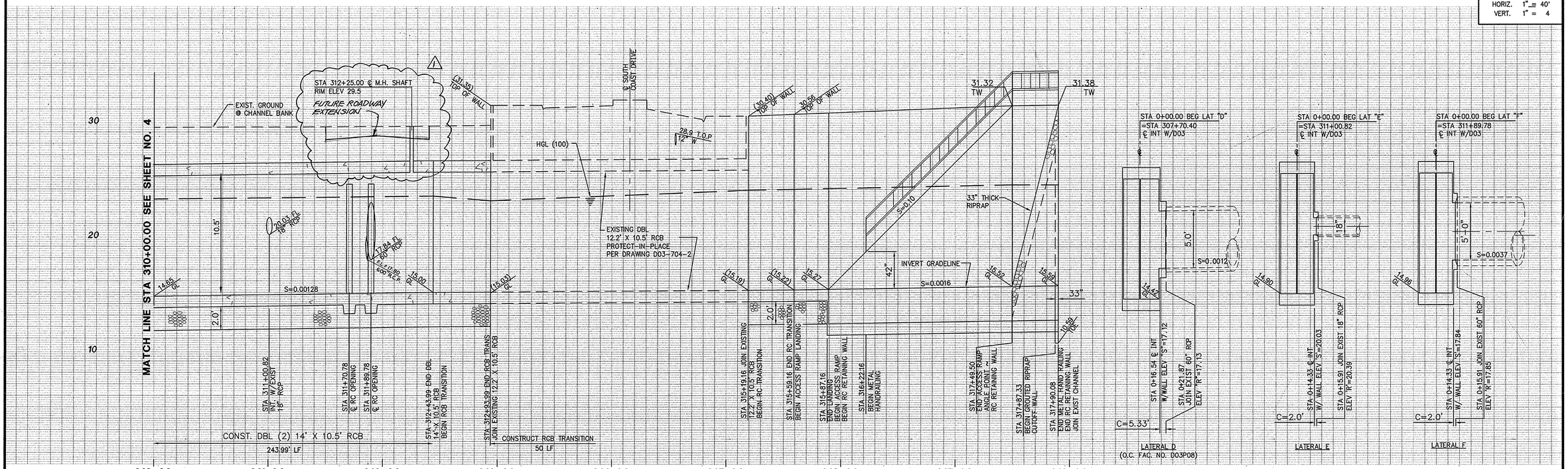
EXP 12/31/2003 - NAME CY
EXP 12/31/2003 - NAME CY


PROFILE SCALE
HORIZ. 1"= 40'
VERT. 1" = 4
MATCH LINE STA 310+00.00 SEE SHEET NO. 4
STA 312+25.00 ℄ M.H. SHAFT
RIM ELEV 29.5
FUTURE ROADWAY EXTENSION
EXIST. GROUND @ CHANNEL BANK
(31.35) TOP OF WALL
℄ SOUTH COAST DRIVE
HGL (100)
28.9 T.O.P. 12" W
(30.40) TOP OF WALL
30.56 TOP OF WALL
31.32 TW
31.38 TW
S=0.10
33" THICK RIPRAP
EXISTING DBL 12.2' X 10.5' RCB PROTECT-IN-PLACE PER DRAWING D03-704-2
INVERT GRADELINE
S=0.0016
S=0.00128
20.02 ft 18" RCP
17.84 ft 60" RCP
10.5'
2.0'
14.69' Q
15.00' Q
15.03' Q
15.19' Q
15.27' Q
15.71' Q
15.92' Q
16.38' Q
STA 311+00.82 INT. W/EXIST 18" RCP
STA 311+70.78 ℄ R.C. OPENING
STA 311+89.78 ℄ RC OPENING
STA 312+43.99 END DBL 14'X10.5' RCB BEGIN RCB TRANSITION
STA 312+93.99 END RCB TRANS. JOIN EXISTING 12.2' X 10.5' RCB
CONST. DBL (2) 14' X 10.5' RCB
243.99' LF
CONSTRUCT RCB TRANSITION
50 LF
STA 315+19.16 JOIN EXISTING 12.2' X 10.5' RCB BEGIN RC TRANSITION
STA 315+59.16 END RC TRANSITION BEGIN ACCESS RAMP LANDING
STA 315+87.16 END LANDING BEGIN ACCESS RAMP BEGIN RC RETAINING WALL
STA 316+22.16 BEGIN METAL HANDRAILING
STA 317+49.50 END ACCESS RAMP ANGLE POINT RC RETAINING WALL
STA 317+87.33 BEGIN GROUTED RIPRAP CUTOFF WALL
STA 317+90.08 END RC RETAINING WALL JOIN EXIST CHANNEL
42" INVERT GRADELINE
S=0.0016
2.0'
10.58' Q
STA 0+00.00 BEG LAT "D" =STA 307+70.40 ℄ INT W/D03
STA 0+16.54 ℄ INT W/WALL ELEV "S"=17.12
STA 0+21.87 JOIN EXIST 60" RCP ELEV "R"=17.13
5.0'
S=0.0012
14.84' Q
14.74' Q
C=5.33'
LATERAL D
(O.C. FAC. NO. D03P08)
STA 0+00.00 BEG LAT "E" =STA 311+00.82 ℄ INT W/D03
STA 0+14.33 ℄ INT W/ WALL ELEV "S"=20.03
STA 0+15.91 JOIN EXIST 18" RCP ELEV "R"=20.39
PI 1+90
18"
C=2.0'
LATERAL E
STA 0+00.00 BEG LAT "F" =STA 311+89.78 ℄ INT W/D03
STA 0+14.33 ℄ INT W/ WALL ELEV "S"=17.84
STA 0+15.91 JOIN EXIST 60" RCP ELEV "R"=17.85
PI 1+90
5'-0"
S=0.0037
C=2.0'
LATERAL F
310+00
311+00
312+00
313+00
314+00
315+00
316+00
317+00
318+00
STA 318+25 END AGGREGATE BASE MAINTENANCE ROAD
2002-01711 STREET IMPROVEMENTS, ROADWAY AND TRAFFIC EQUIPMENTS
2002-01710 8" RECLAIMED WATERLINE C900 PURPLE PVC
STA 311+89.78 LAT "F" INT W/RCB WALL ANGLE A=88.72' SEE PROFILE HEREON
(2) 14.0' X 10.5' RCB
EXISTING CHAIN LINK FENCE
STA 311+00.82 LAT "E" INT W/RCB WALL ANGLE A=90.00' SEE PROFILE HEREON
REMOVE EXISTING R.C. TRANSITION
SUSAN STREET
Δ=10°23'56" R=1000.00' L=181.50' T=91.00'
REMOVE EXIST. RC TRANSITION PER LIMITS SHOWN ON SHEET 13
CHAIN LINK FENCE & GATE PROTECT-IN-PLACE
EXISTING (2) 12.2' X 10.5' RCB PROTECT-IN-PLACE PER DRAWING D03-704-2
12"W
STA 314+82.43 BEG AGGREGATE BASE MAINTENANCE ROAD
N72°59'44"W L=28.95'
118'±
S89°40'32"E
CATCH BASIN W=2.0' V=1.89'
BLOWOFF ASSEMBLY
EXISTING RIPRAP
STA 311+70.78 ℄ R.C. OPENING
STA 311+89.78 ℄ INT =0+00.00 LAT "F" ℄ R.C. OPENING
STA 312+00.37 BC
2002-01711 STA. 311+87.28 600mm R.C.P.
STA 312+50.00 RC BOX MANHOLE
STA 312+43.99 END DBL 14'X10.5' RCB BEGIN RCB TRANSITION
STA 312+93.99 END RCB TRANSITION JOIN EXISTING DBL 12.2'X10.5' RCB
2002-01710 CONCRETE ENCASEMENT
STA 314+17.84 ℄ D03 =STA 18+19.88 ℄ SOUTH COAST DR
STA 315+19.16 JOIN EXIST 12.2'x10.5' RCB BEGIN GUARD CABLE FENCE
STA 315+59.16 BEG ACCESS RAMP LANDING END RC TRANSITION
STA 315+87.16 END ACCESS RAMP LANDING BEG ACCESS RAMP BEG RC RETAINING WALL BEG GROUTED RIPRAP PROTECTION
CITY OF COSTA MESA R/W
OCFCD R/W
STA 317+90.08 END RC RETAINING WALL JOIN EXIST CHANNEL, END GROUTED RIPRAP SLOPE PROTECTION
STA 317+87.33 BEGIN GROUTED RIPRAP CUTOFF WALL
STA 317+49.50 END ACCESS RAMP ANGLE POINT RC RETAINING WALL BEGIN GROUTED RIPRAP SLOPE PROTECTION BEGIN GUARD CABLE FENCE
GUARD CABLE FENCE
METAL HAND RAILING
OCFCD R/W
S=0.10
42"
14'
39'
SOUTH COAST DRIVE
℄ SOUTH COAST DRIVE
N'LY R/W
℄ EXIST CHANNEL SURVEY LINE
S'LY R/W
46'
34'
39'
40'
℄ CONST
40'
BACKFILL TO EXIST. GRADE
GRADE TO DRAIN
WEEPHOLE @ 10' O.C. (TYP.)
3/4" FT
STRUCTURAL BACKFILL (S.E.≥20)
GEOTEXTILE-FILTER FABRIC PER PFRD STD 1808
24" GRAVEL BASE
EXIST. RIPRAP CHANNEL
2' (TYP)
TYPICAL SECTION
STA 310+00.00 TO STA 312+43.99
N.T.S.
CITY OF COSTA MESA
Public Services Dept./
Engineering Division Approved
For improvements located within public right of way or public easements, an encroachment permit is required prior to the start of work.
Approved by
Date 4/12/02
1 1/2 0 1 2
3 inches on original drawing
MATCH LINE STA 310+00.00 SEE SHEET NO. 4
CONSTRUCTION NOTES
(1) CONSTRUCT R.C. BOX MANHOLE PER PF & RD STD. PLAN NO. 1506
(2) CONSTRUCT DBL 14'X10.5' RCB PER PLAN, PROFILE AND DETAIL ON SHEET 9
(3) CONSTRUCT DOWEL JOINTS PER PF&RD STD PLAN NO. 1318
(4) CONSTRUCT DBL RCB TRANSITION PER PLAN, PROFILE AND DETAILS ON SHEET 9
(8) REMOVE EXISTING TRANSITION STRUCTURE
(9) CONSTRUCT JUNCTION STRUCTURE TYPE V PER PF&RD STD PLAN NO. 1314
(10) CONSTRUCT R.C. BOX OPENING PER DETAIL ON SHEET 12
(11) JOIN EXISTING HEADWALL PER DETAIL ON SHEET 12
(12) CONSTRUCT N'LY R.C. TRANSITION WALL PER PLAN, PROFILE AND DETAILS ON SHEET 13
(13) CONSTRUCT ACCESS RAMP LANDING AS PER PLAN, PROFILE AND DETAILS ON SHEET 13
(14) CONSTRUCT ACCESS RAMP AS PER DETAILS ON SHEET 13
(15) CONSTRUCT R.C. RETAINING WALL PER PLAN, PROFILE, AND DETAILS ON SHEET 14
(18) REMOVE AND SALVAGE EXISTING LOOSE RIPRAP (DISPOSE GROUTED RIPRAP)
(19) REMOVE AND SALVAGE EXISTING CHAIN LINK FENCE AND GATES
(20) INSTALL GROUTED RIPRAP PER PLAN, PROFILE AND DETAILS ON SHEET 12
(23) GROUT EXISTING RIPRAP PER DETAIL ON SHEET 12
(24) INSTALL METAL HAND RAILING PER APWA STD PLAN 606-1-OC
(25) INSTALL GEOTEXTILE FILTER FABRIC PER PF&RD STD PLAN 1808
(26) INSTALL 24" GRAVEL BASE
(27) CONSTRUCT 6" THICK AB ROADWAY PER LIMITS SHOWN ON PLANS
(28) CONSTRUCT GUARD CABLE FENCE PER PFRD STD PLAN 1413
HYDRAULIC DATA
LINE | STA TO STA | Q100* | Sb | n | b(ft) | DH(ft) | Vn(fps) | Dc(ft) | Vc(fps) | Nf
D03 | 310+00.00 311+89.78 | 1037 | 0.00128 | 0.014 | 14.0 | 8.08 | 9.17 | 5.54 | 13.36 | 0.569
D03 | 311+89.78 312+93.99 | 1025 | 0.00128 | 0.014 | 14.0 | 8.01 | 9.14 | 5.50 | 13.31 | 0.569
* FLOW RATE PER CELL IN DBL RCB
STORM DRAIN CURVE DATA
℄ | Δ OR BEARING | RADIUS | LENGTH | TANGENT
C | 18°16'26" | 692.48' | 93.62' | 46.88'
AS BUILT PLANS
NOTICE TO CONTRACTOR: CONTRACTOR TO VERIFY THE ELEVATION AND HORIZONTAL POSITION OF EXISTING FACILITIES AT ALL JOIN LOCATIONS PRIOR TO BEGINNING CONSTRUCTION. IF ANY DISCREPANCIES EXIST WITH PLANS, THE ENGINEER SHALL BE NOTIFIED AND NO CONSTRUCTION ON THOSE FACILITIES SHALL BEGIN UNTIL THE DISCREPANCIES ARE RESOLVED.
REGISTERED PROFESSIONAL ENGINEER JOHN McCARTHY No. 47583 Exp. 12-31-03 CIVIL STATE OF CALIFORNIA
40' 30' 20' 10' 0' 40' 80'
GRAPHIC SCALE: 1"=40'
RBF CONSULTING
PLANNING ■ DESIGN ■ CONSTRUCTION
14725 ALTON PARKWAY
IRVINE, CALIFORNIA 92618-2027
949.472.3505 ▪ FAX 949.472.8373 ▪ www.RBF.com
JOHN F. McCARTHY RCE 47583 DATE: 11/15/02
ORANGE COUNTY PLANNING & DEVELOPMENT SERVICES
GREENVILLE - BANNING CHANNEL
FACILITY NO. D03
PLAN AND PROFILE
STA 310+00 TO STA 318+00
12-2002 PERMIT # 2002-01711
12-2002 PERMIT # 2002-01710
6-26-03, 2002-01711, 600mm R.C.P.
5/16/03 AS-BUILT PLANS
8/16/02 REVISE COVER HT. STA 311+25 TO STA 312+43
MARK DATE DESCRIPTION
REVISIONS
DESIGNED TR
DRAWN EC, GHO CHECKED JAM
PREPARED UNDER SUPERVISION OF DATE:
SCALE AS SHOWN DATE 4/02 DWG NO. D03-701-3, D03303-701-1, D03P02-701-2
SHEET 5/21
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D03303-701-1
D03P02-701-2
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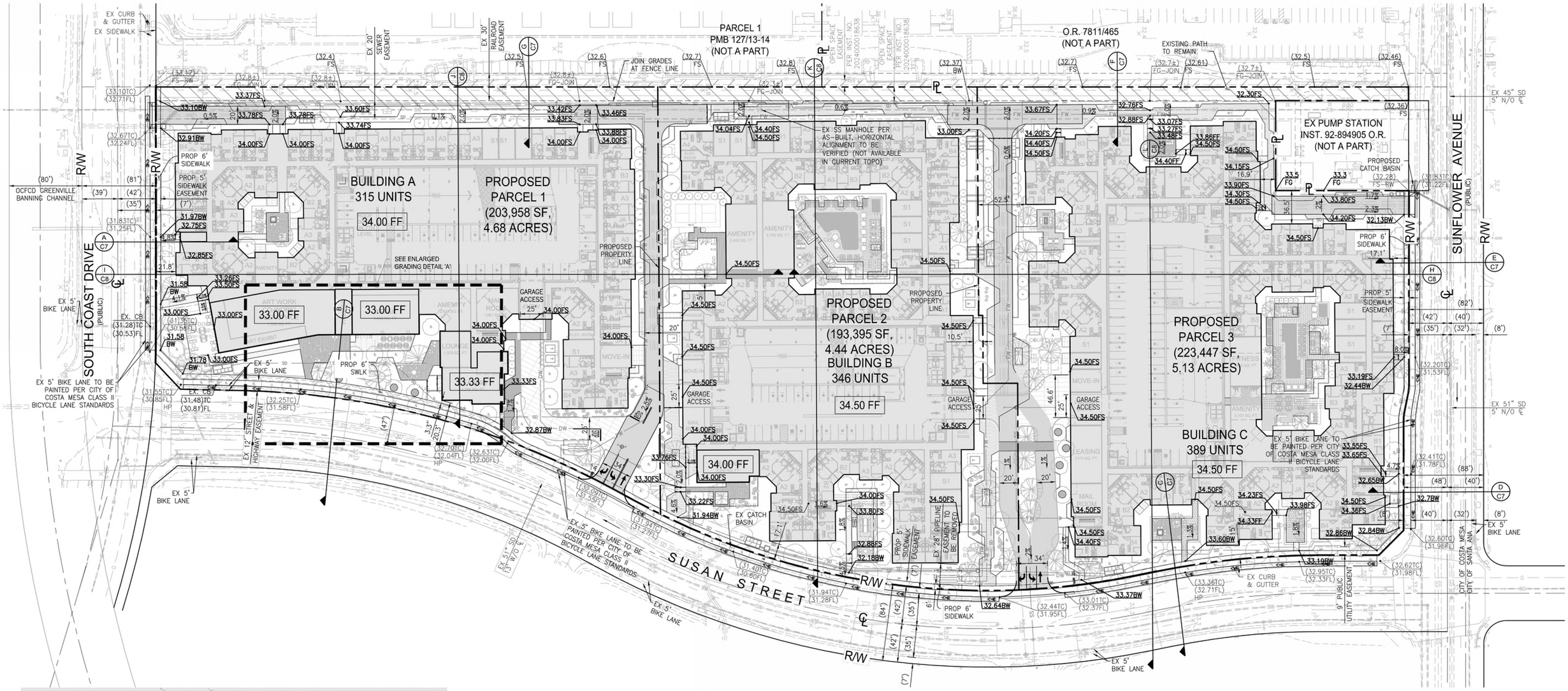
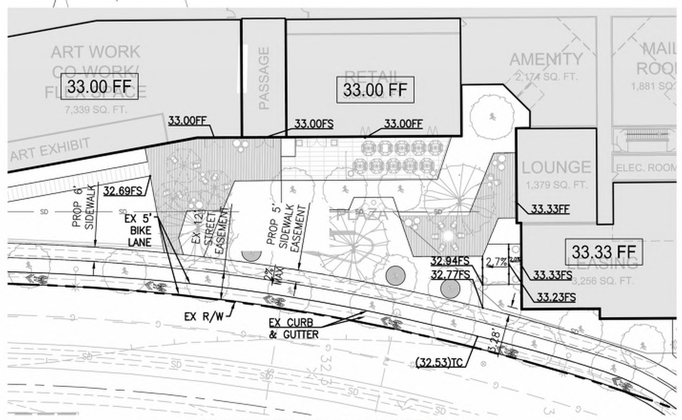
21





ENLARGED GRADING DETAIL 'A'
SCALE: 1"=30'

ABBREVIATIONS

BW	BACK OF WALK
CL	CENTERLINE
DW	DOMESTIC WATER
EX	EXISTING
FF	FINISHED FLOOR
FS	FINISHED SURFACE
FH	FIRE HYDRANT
FW	FIRE WATER
MH	MANHOLE
℄	PROPERTY LINE
PROP	PROPOSED
R/W	RIGHT OF WAY
SD	STORM DRAIN
SS	SANITARY SEWER
VCP	VITRIFIED CLAY PIPE

LEGEND

- CENTERLINE
- EX EASEMENT LINE
- EX R/W OR PROPERTY LINE

PAD ASSUMPTIONS

1. BUILDING FG = FF – 12"
2. FIRE ACCESS ROAD FG = FS – 12"
3. HARDSCAPE FG = FS –6"

ESTIMATED GRADING QUANTITIES

	CUT (CY)	FILL (CY)	NET (CY)
RAW VOLUMES:	32,470	6,470	26,000
	32,470	6,470	26,000(EXPORT)

DISTURBED AREA: 13.4 AC

50' 0' 25' 50' 100'
SCALE: 1" = 50'

LEGACY PARTNERS
Invesco
HIVE LIVE COSTA MESA, CA

FUSCOE ENGINEERING
FULL CIRCLE THINKING
600 Wilshire Blvd Suite 1470 Los Angeles, Ca 90017
213.988.8802
fuscoe.com

REGISTERED PROFESSIONAL ENGINEER
SHELBY L. SHIROCK
NO. C75912
EXP. 06/30/24
CIVIL
STATE OF CALIFORNIA

CONCEPTUAL GRADING
ENTITLEMENT PACKAGE
3333 SUSAN ST
COSTA MESA CA 92626

AO

C5

SCALE: PER PLAN
JOB NO.: 424–028
DATE: 07–11–2024

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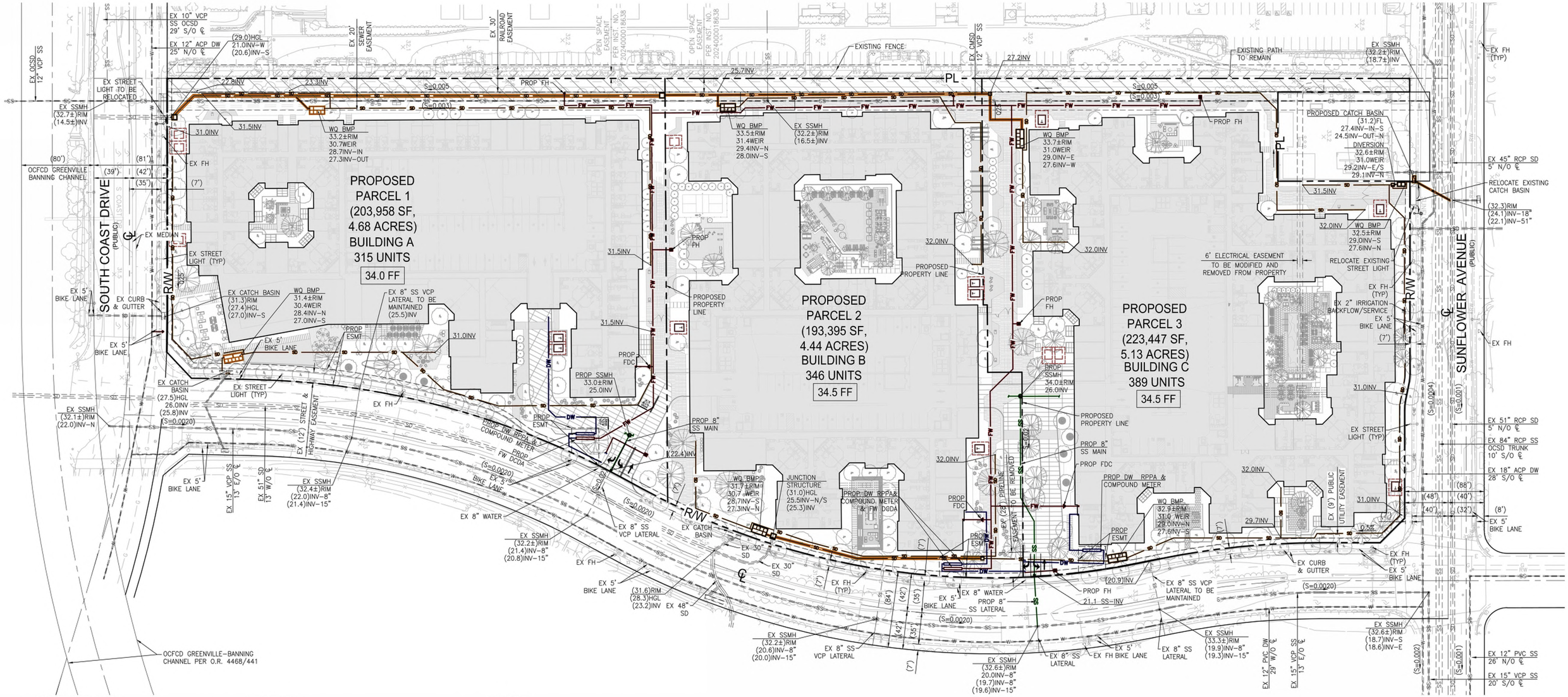


ABBREVIATIONS

CL	CENTERLINE
DCDA	DOUBLE CHECK DETECTOR ASSEMBLY
DW	DOMESTIC WATER
EX	EXISTING
FH	FIRE HYDRANT
FW	FIRE WATER
INV	INVERT
MH	MANHOLE
℄	PROPERTY LINE
PROP	PROPOSED
RPP	REDUCED PRESSURE PRINCIPLE ASSEMBLY
R/W	RIGHT OF WAY
SD	STORM DRAIN
SS	SANITARY SEWER
VCP	VITRIFIED CLAY PIPE

LEGEND

- CENTERLINE
- EX EASEMENT LINE
- EX R/W OR PROPERTY LINE
- FW — PROPOESD FIRE WATER LINE
- DW — PROPOSED DOMESTIC WATER LINE
- SS — PROPOSED SANITARY SEWER LINE
- SD — PROPOSED STORM DRAIN
- PROPOSED TRANSFORMER

NOTE

1. BACKFLOWS PER MESA WATER STANDARDS (36" MINIMUM FROM CURBS AND SIDEWALKS). TO BE SCREENED PER LANDSCAPE PLANS.

EXISTING UTILITY DEPTHS ARE BEST ESTIMATED FROM RECORD DRAWINGS AND AERIAL TOPOGRAPHY. PRECISE FIELD SURVEY VERIFICATION IS NECESSARY TO CONFIRM DURING FINAL ENGINEERING

LEGACY PARTNERS · Invesco · HIVE LIVE COSTA MESA, CA

FUSCOE ENGINEERING
FULL CIRCLE THINKING®
600 Wilshire Blvd Suite 1470 Los Angeles, Ca 90017
213.988.8802 fuscoe.com

REGISTERED PROFESSIONAL ENGINEER SHELBY L. SHIRLOCK NO. C75912 EXP. 06/30/24 CIVIL STATE OF CALIFORNIA

CONCEPTUAL UTILITIES

ENTITLEMENT PACKAGE

3333 SUSAN ST
COSTA MESA CA 92626

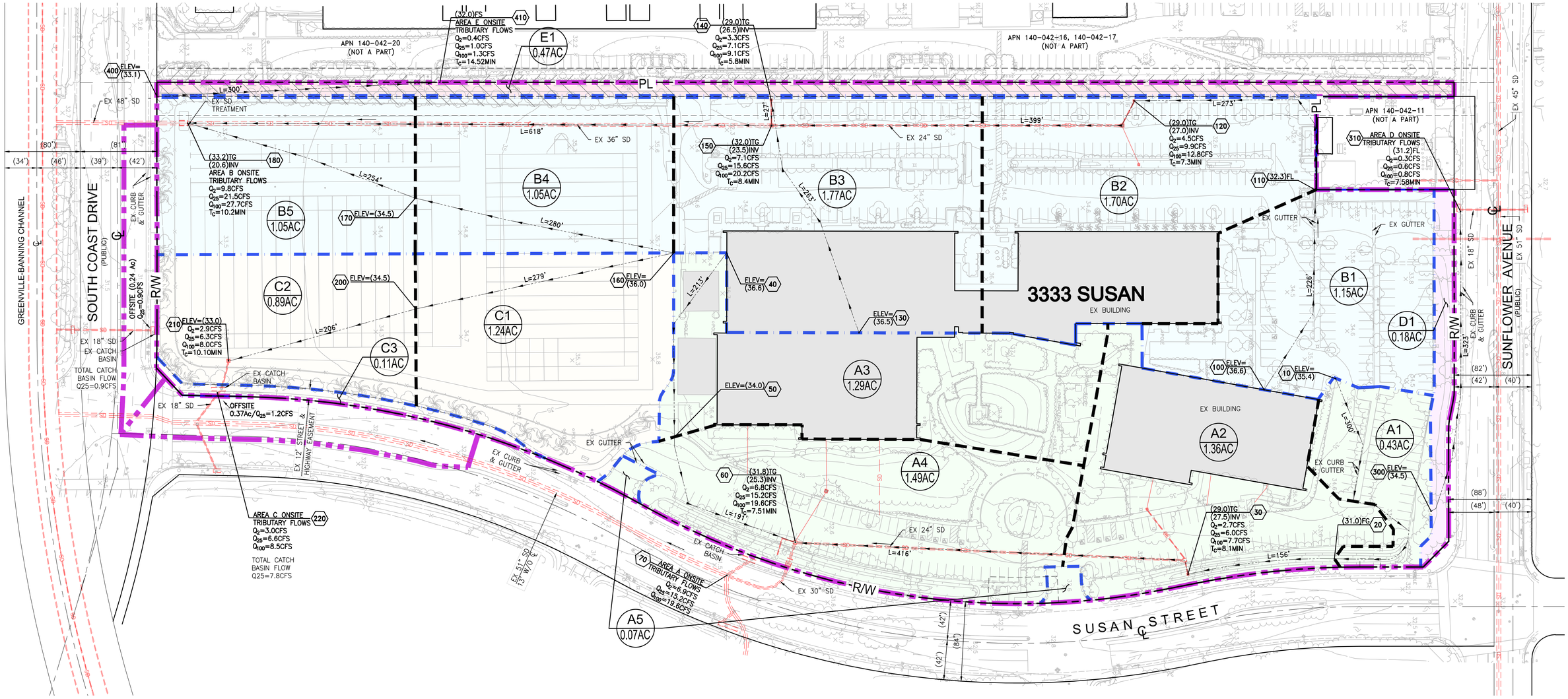
AO

C6

SCALE: PER PLAN
JOB NO.: 424–028
DATE: 07–11–2024

APPENDIX 2

HYDROLOGY MAPS



LEGEND:

- DRAINAGE STUDY LIMITS
- MAJOR DRAINAGE BOUNDARY
- SUBAREA DRAINAGE BOUNDARY
- SD — EXISTING STORM DRAIN
- A1 / 0.96 AC — AREA DESIGNATION / AREA (ACRES)
- L=100' — FLOW DIRECTION / FLOW LENGTH
- 1.0 CFS / 10 MIN — FLOW RATE (CFS) / Tc (MIN)
- 100 — HYDROLOGY NODE
- BUILDING FOOTPRINT

DMA A (TO EX 30" SD AT SUSAN STREET):
4.64 AC
Q2=6.9CFS
Q25=15.2CFS
Q100=19.6CFS

DMA B (TO EX 48" SD AT SOUTH COAST):
6.72 AC
Q2=9.8CFS
Q25=21.5CFS
Q100=27.7CFS

DMA C (TO EX 18" SD AT SUSAN STREET):
2.24 AC
Q2=3.0CFS
Q25=6.6CFS
Q100=8.5CFS

DMA D (TO EX 18" SD AT SUNFLOWER):
0.18 AC
Q2=0.3CFS
Q25=0.6CFS
Q100=0.8CFS

DMA E (OFFSITE RUNOFF TO WESTERLY PARCEL):
0.47 AC
Q2=0.4CFS
Q25=1.0CFS
Q100=1.3CFS

SITE PARAMETERS

HYDROLOGY SOIL GROUP: C

TOTAL DRAINAGE STUDY ACREAGE: 14.25 AC

EXISTING DEVELOPMENT TYPE: COMMERCIAL (PERVIOUS RATIO: 10%)

FEMA FLOOD ZONE X PER FIRM MAP NO 06059C0258J (EFFECTIVE 12/03/2009)

ZONE X = AREA WITH REDUCED FLOOD RISK DUE TO LEVEE

EFFECTIVE LOMRS = LOMR 09-09-2809P (EFFECTIVE 12/04/2009)

TOTAL SITE EXISTING FLOWS:
14.25 AC
Q2=20.4CFS
Q25=44.9CFS
Q100=57.9CFS

N

50' 0' 25' 50' 100'
SCALE: 1" = 50'

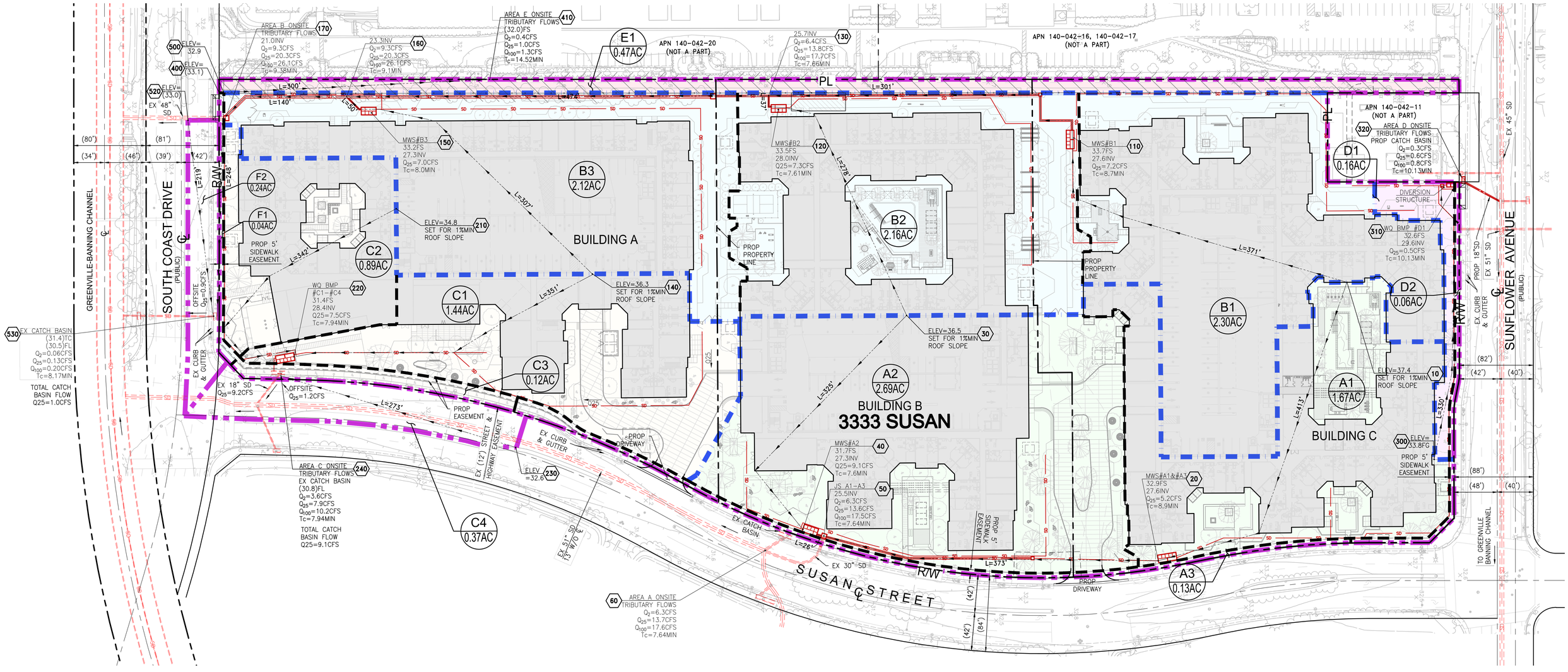
HIVE LIVE
COSTA MESA, CA

HIVE LIVE
3333 SUSAN ST, COSTA MESA, CA

EXISTING DRAINAGE MAP

FUSCOE ENGINEERING
FULL CIRCLE THINKING
600 Wilshire Blvd Suite 1470
Los Angeles, Ca 90017
213.988.8802
fuscoe.com

JOB NO. 424-028
DRAWN BY: FEI
SHEET 1 OF 2



LEGEND:

- DRAINAGE STUDY LIMITS
- MAJOR DRAINAGE BOUNDARY
- SUBAREA DRAINAGE BOUNDARY
- EXISTING STORM DRAIN
- PROPOSED STORM DRAIN
- A1 / 0.96 AC — AREA DESIGNATION / AREA (ACRES)
- L=100' — FLOW DIRECTION / FLOW LENGTH
- 1.0 CFS / 10 MIN — FLOW RATE (CFS) / Tc (MIN)
- 100 — HYDROLOGY NODE
- BUILDING FOOTPRINT

DMA A (TO EX 30" SD AT SUSAN STREET):
4.49 AC
Q_2=6.3CFS
Q_{25}=13.7CFS
Q_{100}=17.6CFS

DMA B (TO EX 48" SD AT SOUTH COAST):
6.58 AC
Q_2=9.3CFS
Q_{25}=20.3CFS
Q_{100}=26.1CFS

DMA C (TO EX 18" SD AT SUSAN STREET):
2.45 AC
Q_2=3.6CFS
Q_{25}=7.9CFS
Q_{100}=10.2CFS

DMA D (TO EX 18" SD AT SUNFLOWER):
0.22 AC
Q_2=0.3CFS
Q_{25}=0.6CFS
Q_{100}=0.8CFS

DMA E (OFFSITE RUNOFF TO WESTERLY PARCEL):
0.47 AC
Q_2=0.4CFS
Q_{25}=1.0CFS
Q_{100}=1.3CFS

DMA F (TO EX 18" SD LATERAL AT SOUTH COAST):
0.04 AC
Q_2=0.06CFS
Q_{25}=0.13CFS
Q_{100}=0.20CFS

SITE PARAMETERS

HYDROLOGY SOIL GROUP: C

TOTAL DRAINAGE STUDY ACREAGE: 14.25 AC

PROPOSED DEVELOPMENT TYPE: APARTMENT (PERVIOUS RATIO: 20%)

FEMA FLOOD ZONE X PER FIRM MAP NO 06059C0258J (EFFECTIVE 12/03/2009)

ZONE X = AREA WITH REDUCED FLOOD RISK DUE TO LEVEE

EFFECTIVE LOMRS = LOMR 09-09-2809P (EFFECTIVE 12/04/2009)

TOTAL SITE PROPOSED FLOWS:
14.25 AC
Q_2=20.0CFS
Q_{25}=43.6CFS
Q_{100}=56.2CFS

N

50' 0' 25' 50' 100'

SCALE: 1" = 50'

HIVE LIVE
COSTA MESA, CA

HIVE LIVE
3333 SUSAN ST, COSTA MESA, CA

PROPOSED DRAINAGE MAP

FUSCOE ENGINEERING
FULL CIRCLE THINKING
600 Wilshire Blvd
Suite 1470
Los Angeles, Ca 90017
213.988.8802
fuscoe.com

JOB NO. 424-028
DRAWN BY: FEI
SHEET 2 OF 2

APPENDIX 3

EXISTING HYDROLOGY CALCULATIONS

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******************************************************************************
             RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            (Reference: 1986 ORANGE COUNTY HYDROLOGY CRITERION)
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                            Analysis prepared by:

                           Fuscoe Engineering, Inc.
                              600 Wilshire Blvd
                                  Suite 1470
                            Los Angeles, CA 90017

 ************************** DESCRIPTION OF STUDY **************************
*                              HIVE LIVE                                 *
*                            EXISTING CONDITIONS                         *
*                              2 YEAR STORM                              *
 ****************************************************************************

  FILE NAME: HIVE.DAT
  TIME/DATE OF STUDY: 09:35 08/21/2024
============================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
============================================================================
                     --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =    2.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =   3.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.90
  *DATA BANK RAINFALL USED*
  *ANTECEDENT MOISTURE CONDITION (AMC) I ASSUMED FOR RATIONAL METHOD*

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0313 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
  *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

******************************************************************************
  FLOW PROCESS FROM NODE     10.00 TO NODE     20.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   300.00
  ELEVATION DATA: UPSTREAM(FEET) =     35.40  DOWNSTREAM(FEET) =     31.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    6.926
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.878
  SUBAREA Tc AND LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
```

```
  COMMERCIAL                  C        0.43      0.25     0.100    50    6.93
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =      0.72
  TOTAL AREA(ACRES) =      0.43   PEAK FLOW RATE(CFS) =      0.72

****************************************************************************
  FLOW PROCESS FROM NODE     20.00 TO NODE     30.00 IS CODE =  61
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STANDARD CURB SECTION USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =   31.00  DOWNSTREAM ELEVATION(FEET) =   29.00
  STREET LENGTH(FEET) =   156.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 30.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  20.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.76
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.29
    HALFSTREET FLOOD WIDTH(FEET) =    8.04
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.30
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.66
  STREET FLOW TRAVEL TIME(MIN.) =   1.13   Tc(MIN.) =    8.06
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.721
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                  C        1.36      0.25     0.100    50
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA AREA(ACRES) =    1.36      SUBAREA RUNOFF(CFS) =    2.08
  EFFECTIVE AREA(ACRES) =      1.79    AREA-AVERAGED Fm(INCH/HR) =  0.03
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.10
  TOTAL AREA(ACRES) =        1.8        PEAK FLOW RATE(CFS) =       2.73

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.32   HALFSTREET FLOOD WIDTH(FEET) =   9.83
  FLOW VELOCITY(FEET/SEC.) =  2.52   DEPTH*VELOCITY(FT*FT/SEC.) =   0.81
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     30.00 =     456.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     30.00 TO NODE     60.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    27.50  DOWNSTREAM(FEET) =    25.30
  FLOW LENGTH(FEET) =   416.00   MANNING'S N =  0.013
  ASSUME FULL-FLOWING PIPELINE
  PIPE-FLOW VELOCITY(FEET/SEC.) =   3.48
  PIPE FLOW VELOCITY = (TOTAL FLOW)/(PIPE CROSS SECTION AREA)
  GIVEN PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       2.73
  PIPE TRAVEL TIME(MIN.) =   1.99    Tc(MIN.) =   10.05
```

```
 LONGEST FLOWPATH FROM NODE     10.00 TO NODE     60.00 =     872.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     60.00 TO NODE     60.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
 TIME OF CONCENTRATION(MIN.) =   10.05
 RAINFALL INTENSITY(INCH/HR) =   1.52
 AREA-AVERAGED Fm(INCH/HR) =  0.03
 AREA-AVERAGED Fp(INCH/HR) =  0.25
 AREA-AVERAGED Ap =  0.10
 EFFECTIVE STREAM AREA(ACRES) =       1.79
 TOTAL STREAM AREA(ACRES) =       1.79
 PEAK FLOW RATE(CFS) AT CONFLUENCE =       2.73

****************************************************************************
 FLOW PROCESS FROM NODE     40.00 TO NODE     50.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
 INITIAL SUBAREA FLOW-LENGTH(FEET) =   213.00
 ELEVATION DATA: UPSTREAM(FEET) =     36.60  DOWNSTREAM(FEET) =     34.00

 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    6.265
 *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.989
 SUBAREA Tc AND LOSS RATE DATA(AMC  I ):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS   Tc
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
 COMMERCIAL                 C        1.29      0.25     0.100    50    6.26
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
 SUBAREA RUNOFF(CFS) =      2.28
 TOTAL AREA(ACRES) =      1.29   PEAK FLOW RATE(CFS) =      2.28

****************************************************************************
 FLOW PROCESS FROM NODE     50.00 TO NODE     60.00 IS CODE =  61
----------------------------------------------------------------------------
 >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>(STANDARD CURB SECTION USED)<<<<<
============================================================================
 UPSTREAM ELEVATION(FEET) =   34.00  DOWNSTREAM ELEVATION(FEET) =   31.80
 STREET LENGTH(FEET) =   191.00   CURB HEIGHT(INCHES) =  6.0
 STREET HALFWIDTH(FEET) = 30.00

 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  10.00
 INSIDE STREET CROSSFALL(DECIMAL) =  0.020
 OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
 STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
 Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

   **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       3.47
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) =  0.35
   HALFSTREET FLOOD WIDTH(FEET) =   11.15
   AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.55
```

```
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.89
 STREET FLOW TRAVEL TIME(MIN.) =   1.25   Tc(MIN.) =    7.51
 *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.792
 SUBAREA LOSS RATE DATA(AMC  I ):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 COMMERCIAL                 C        1.49      0.25     0.100    50
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
 SUBAREA AREA(ACRES) =    1.49      SUBAREA RUNOFF(CFS) =    2.37
 EFFECTIVE AREA(ACRES) =      2.78    AREA-AVERAGED Fm(INCH/HR) =  0.03
 AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.10
 TOTAL AREA(ACRES) =        2.8        PEAK FLOW RATE(CFS) =       4.42

 END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.37   HALFSTREET FLOOD WIDTH(FEET) =  12.30
 FLOW VELOCITY(FEET/SEC.) =  2.71   DEPTH*VELOCITY(FT*FT/SEC.) =   1.01
 LONGEST FLOWPATH FROM NODE     40.00 TO NODE     60.00 =     404.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     60.00 TO NODE     60.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
 >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
 TIME OF CONCENTRATION(MIN.) =    7.51
 RAINFALL INTENSITY(INCH/HR) =   1.79
 AREA-AVERAGED Fm(INCH/HR) =  0.03
 AREA-AVERAGED Fp(INCH/HR) =  0.25
 AREA-AVERAGED Ap =  0.10
 EFFECTIVE STREAM AREA(ACRES) =       2.78
 TOTAL STREAM AREA(ACRES) =       2.78
 PEAK FLOW RATE(CFS) AT CONFLUENCE =       4.42

 ** CONFLUENCE DATA **
  STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
  NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
     1        2.73   10.05    1.516  0.25( 0.03) 0.10       1.8      10.00
     2        4.42    7.51    1.792  0.25( 0.03) 0.10       2.8      40.00

 RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
 CONFLUENCE FORMULA USED FOR  2 STREAMS.

 ** PEAK FLOW RATE TABLE **
  STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
  NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
     1        6.84    7.51    1.792  0.25( 0.03) 0.10       4.1      40.00
     2        6.46   10.05    1.516  0.25( 0.03) 0.10       4.6      10.00

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =       6.84    Tc(MIN.) =     7.51
 EFFECTIVE AREA(ACRES) =       4.12   AREA-AVERAGED Fm(INCH/HR) =  0.03
 AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.10
 TOTAL AREA(ACRES) =        4.6
 LONGEST FLOWPATH FROM NODE     10.00 TO NODE     60.00 =     872.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     60.00 TO NODE     70.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
```

```
 MAINLINE Tc(MIN.) =    7.51
 *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.792
 SUBAREA LOSS RATE DATA(AMC  I ):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 COMMERCIAL                 C        0.07      0.25     0.100    50
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
 SUBAREA AREA(ACRES) =    0.07      SUBAREA RUNOFF(CFS) =    0.11
 EFFECTIVE AREA(ACRES) =      4.19   AREA-AVERAGED Fm(INCH/HR) =  0.02
 AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.10
 TOTAL AREA(ACRES) =        4.6       PEAK FLOW RATE(CFS) =       6.84
 NOTE: PEAK FLOW RATE DEFAULTED TO UPSTREAM VALUE

****************************************************************************
 FLOW PROCESS FROM NODE    100.00 TO NODE    110.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
 INITIAL SUBAREA FLOW-LENGTH(FEET) =   226.00
 ELEVATION DATA: UPSTREAM(FEET) =     36.60  DOWNSTREAM(FEET) =     32.30

 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    5.870
 *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  2.065
 SUBAREA Tc AND LOSS RATE DATA(AMC  I ):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
 COMMERCIAL                 C        1.15      0.25     0.100    50    5.87
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
 SUBAREA RUNOFF(CFS) =      2.11
 TOTAL AREA(ACRES) =      1.15   PEAK FLOW RATE(CFS) =      2.11

****************************************************************************
 FLOW PROCESS FROM NODE    110.00 TO NODE    120.00 IS CODE =  61
----------------------------------------------------------------------------
 >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>(STANDARD CURB SECTION USED)<<<<<
============================================================================
 UPSTREAM ELEVATION(FEET) =   32.30  DOWNSTREAM ELEVATION(FEET) =   29.00
 STREET LENGTH(FEET) =   273.00   CURB HEIGHT(INCHES) =  8.0
 STREET HALFWIDTH(FEET) = 30.00

 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  10.00
 INSIDE STREET CROSSFALL(DECIMAL) =  0.020
 OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
 STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
 Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

   **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       3.46
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) =  0.37
   HALFSTREET FLOOD WIDTH(FEET) =   10.61
   AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.63
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.97
 STREET FLOW TRAVEL TIME(MIN.) =   1.73   Tc(MIN.) =    7.60
 *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.780
 SUBAREA LOSS RATE DATA(AMC  I ):
```

```
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
       LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                  C        1.70      0.25      0.100    50
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA AREA(ACRES) =    1.70      SUBAREA RUNOFF(CFS) =    2.68
  EFFECTIVE AREA(ACRES) =      2.85    AREA-AVERAGED Fm(INCH/HR) =  0.03
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.10
  TOTAL AREA(ACRES) =        2.8        PEAK FLOW RATE(CFS) =       4.50

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.40   HALFSTREET FLOOD WIDTH(FEET) =  11.88
  FLOW VELOCITY(FEET/SEC.) =  2.81   DEPTH*VELOCITY(FT*FT/SEC.) =   1.11
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    120.00 =     499.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    120.00 TO NODE    150.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    27.00  DOWNSTREAM(FEET) =    23.50
  FLOW LENGTH(FEET) =   399.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  24.0 INCH PIPE IS   7.7 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.15
  GIVEN PIPE DIAMETER(INCH) =  24.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       4.50
  PIPE TRAVEL TIME(MIN.) =   1.29    Tc(MIN.) =    8.89
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    150.00 =     898.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    150.00 TO NODE    150.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    8.89
  RAINFALL INTENSITY(INCH/HR) =   1.63
  AREA-AVERAGED Fm(INCH/HR) =  0.03
  AREA-AVERAGED Fp(INCH/HR) =  0.25
  AREA-AVERAGED Ap =  0.10
  EFFECTIVE STREAM AREA(ACRES) =       2.85
  TOTAL STREAM AREA(ACRES) =       2.85
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       4.50

****************************************************************************
  FLOW PROCESS FROM NODE    130.00 TO NODE    140.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   263.00
  ELEVATION DATA: UPSTREAM(FEET) =     36.50  DOWNSTREAM(FEET) =     29.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    5.752
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  2.089
  SUBAREA Tc AND LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS   Tc
       LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  COMMERCIAL                  C        1.77      0.25      0.100    50    5.75
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
```

```
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =      3.29
  TOTAL AREA(ACRES) =      1.77   PEAK FLOW RATE(CFS) =      3.29

****************************************************************************
  FLOW PROCESS FROM NODE    140.00 TO NODE    150.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    26.50  DOWNSTREAM(FEET) =    23.50
  FLOW LENGTH(FEET) =    27.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   4.4 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  12.44
  GIVEN PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       3.29
  PIPE TRAVEL TIME(MIN.) =   0.04    Tc(MIN.) =    5.79
  LONGEST FLOWPATH FROM NODE    130.00 TO NODE    150.00 =     290.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    150.00 TO NODE    150.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    5.79
  RAINFALL INTENSITY(INCH/HR) =   2.08
  AREA-AVERAGED Fm(INCH/HR) =  0.03
  AREA-AVERAGED Fp(INCH/HR) =  0.25
  AREA-AVERAGED Ap =  0.10
  EFFECTIVE STREAM AREA(ACRES) =       1.77
  TOTAL STREAM AREA(ACRES) =       1.77
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       3.29

  ** CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
      1        4.50    8.89    1.627  0.25( 0.03) 0.10       2.8     100.00
      2        3.29    5.79    2.081  0.25( 0.03) 0.10       1.8     130.00

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR  2 STREAMS.

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
      1        7.05    5.79    2.081  0.25( 0.03) 0.10       3.6     130.00
      2        7.06    8.89    1.627  0.25( 0.03) 0.10       4.6     100.00

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       7.06    Tc(MIN.) =     8.89
  EFFECTIVE AREA(ACRES) =       4.62   AREA-AVERAGED Fm(INCH/HR) =  0.03
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.10
  TOTAL AREA(ACRES) =        4.6
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    150.00 =     898.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    150.00 TO NODE    180.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
```

```
==========================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    23.50  DOWNSTREAM(FEET) =    20.60
  FLOW LENGTH(FEET) =   618.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  36.0 INCH PIPE IS   9.8 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.52
  GIVEN PIPE DIAMETER(INCH) =  36.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       7.06
  PIPE TRAVEL TIME(MIN.) =   2.28    Tc(MIN.) =   11.17
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    180.00 =    1516.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    180.00 TO NODE    180.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =   11.17
  RAINFALL INTENSITY(INCH/HR) =   1.43
  AREA-AVERAGED Fm(INCH/HR) =  0.03
  AREA-AVERAGED Fp(INCH/HR) =  0.25
  AREA-AVERAGED Ap =  0.10
  EFFECTIVE STREAM AREA(ACRES) =       4.62
  TOTAL STREAM AREA(ACRES) =       4.62
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       7.06

****************************************************************************
  FLOW PROCESS FROM NODE    160.00 TO NODE    170.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   280.00
  ELEVATION DATA: UPSTREAM(FEET) =     36.00  DOWNSTREAM(FEET) =     34.50

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    8.240
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.699
  SUBAREA Tc AND LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  COMMERCIAL                 C        1.05      0.25      0.100    50    8.24
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =      1.58
  TOTAL AREA(ACRES) =      1.05   PEAK FLOW RATE(CFS) =      1.58

****************************************************************************
  FLOW PROCESS FROM NODE    170.00 TO NODE    180.00 IS CODE =  91
----------------------------------------------------------------------------
  >>>>>COMPUTE "V" GUTTER FLOW TRAVEL TIME THRU SUBAREA<<<<<
============================================================================
  UPSTREAM NODE ELEVATION(FEET) =     34.50
  DOWNSTREAM NODE ELEVATION(FEET) =     33.20
  CHANNEL LENGTH THRU SUBAREA(FEET) =   254.00
  "V" GUTTER WIDTH(FEET) =   2.00   GUTTER HIKE(FEET) =  0.080
  PAVEMENT LIP(FEET) =  0.020   MANNING'S N = .0150
  PAVEMENT CROSSFALL(DECIMAL NOTATION) = 0.02000
  MAXIMUM DEPTH(FEET) =   1.00
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.445
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
```

```
  COMMERCIAL                  C        1.05      0.25     0.100    50
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      2.25
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.57
  AVERAGE FLOW DEPTH(FEET) =   0.24   FLOOD WIDTH(FEET) =   16.33
  "V" GUTTER FLOW TRAVEL TIME(MIN.) =   2.69   Tc(MIN.) =   10.93
  SUBAREA AREA(ACRES) =    1.05       SUBAREA RUNOFF(CFS) =    1.34
  EFFECTIVE AREA(ACRES) =    2.10     AREA-AVERAGED Fm(INCH/HR) =   0.03
  AREA-AVERAGED Fp(INCH/HR) =   0.25  AREA-AVERAGED Ap =   0.10
  TOTAL AREA(ACRES) =        2.1         PEAK FLOW RATE(CFS) =       2.68

  END OF SUBAREA "V" GUTTER HYDRAULICS:
  DEPTH(FEET) =  0.26   FLOOD WIDTH(FEET) =   17.73
  FLOW VELOCITY(FEET/SEC.) =   1.60   DEPTH*VELOCITY(FT*FT/SEC) =   0.41
  LONGEST FLOWPATH FROM NODE    160.00 TO NODE    180.00 =     534.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    180.00 TO NODE    180.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =   10.93
  RAINFALL INTENSITY(INCH/HR) =   1.44
  AREA-AVERAGED Fm(INCH/HR) =  0.03
  AREA-AVERAGED Fp(INCH/HR) =  0.25
  AREA-AVERAGED Ap =  0.10
  EFFECTIVE STREAM AREA(ACRES) =       2.10
  TOTAL STREAM AREA(ACRES) =       2.10
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       2.68

  ** CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
      1        7.05    8.07    1.720  0.25( 0.03) 0.10       3.6     130.00
      1        7.06   11.17    1.427  0.25( 0.03) 0.10       4.6     100.00
      2        2.68   10.93    1.445  0.25( 0.03) 0.10       2.1     160.00

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR  2 STREAMS.

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
      1        9.41    8.07    1.720  0.25( 0.03) 0.10       5.2     130.00
      2        9.74   10.93    1.445  0.25( 0.03) 0.10       6.6     160.00
      3        9.71   11.17    1.427  0.25( 0.03) 0.10       6.7     100.00

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       9.74    Tc(MIN.) =    10.93
  EFFECTIVE AREA(ACRES) =       6.64   AREA-AVERAGED Fm(INCH/HR) =  0.03
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.10
  TOTAL AREA(ACRES) =        6.7
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    180.00 =    1516.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    160.00 TO NODE    200.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
```

```
==========================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   279.00
  ELEVATION DATA: UPSTREAM(FEET) =     36.00  DOWNSTREAM(FEET) =     34.50

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    8.223
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.701
  SUBAREA Tc AND LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  COMMERCIAL                 C        1.24      0.25     0.100    50    8.22
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =      1.87
  TOTAL AREA(ACRES) =      1.24   PEAK FLOW RATE(CFS) =      1.87

**************************************************************************
  FLOW PROCESS FROM NODE    200.00 TO NODE    210.00 IS CODE =  91
--------------------------------------------------------------------------
  >>>>>COMPUTE "V" GUTTER FLOW TRAVEL TIME THRU SUBAREA<<<<<
==========================================================================
  UPSTREAM NODE ELEVATION(FEET) =     34.50
  DOWNSTREAM NODE ELEVATION(FEET) =     33.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   206.00
  "V" GUTTER WIDTH(FEET) =   2.00   GUTTER HIKE(FEET) =  0.080
  PAVEMENT LIP(FEET) =  0.020   MANNING'S N = .0150
  PAVEMENT CROSSFALL(DECIMAL NOTATION) = 0.02000
  MAXIMUM DEPTH(FEET) =   1.00
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.512
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                 C        0.89      0.25     0.100    50
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      2.47
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.83
  AVERAGE FLOW DEPTH(FEET) =   0.24   FLOOD WIDTH(FEET) =   15.80
  "V" GUTTER FLOW TRAVEL TIME(MIN.) =   1.88   Tc(MIN.) =   10.10
  SUBAREA AREA(ACRES) =    0.89       SUBAREA RUNOFF(CFS) =    1.19
  EFFECTIVE AREA(ACRES) =    2.13     AREA-AVERAGED Fm(INCH/HR) =   0.02
  AREA-AVERAGED Fp(INCH/HR) =   0.25  AREA-AVERAGED Ap =   0.10
  TOTAL AREA(ACRES) =        2.1         PEAK FLOW RATE(CFS) =       2.85

  END OF SUBAREA "V" GUTTER HYDRAULICS:
  DEPTH(FEET) =  0.25   FLOOD WIDTH(FEET) =   16.85
  FLOW VELOCITY(FEET/SEC.) =   1.88   DEPTH*VELOCITY(FT*FT/SEC) =   0.47
  LONGEST FLOWPATH FROM NODE    160.00 TO NODE    210.00 =     485.00 FEET.

**************************************************************************
  FLOW PROCESS FROM NODE    210.00 TO NODE    220.00 IS CODE =  81
--------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
==========================================================================
  MAINLINE Tc(MIN.) =   10.10
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.512
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                 C        0.11      0.25     0.100    50
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA AREA(ACRES) =    0.11       SUBAREA RUNOFF(CFS) =    0.15
```

```
  EFFECTIVE AREA(ACRES) =      2.24   AREA-AVERAGED Fm(INCH/HR) =  0.03
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.10
  TOTAL AREA(ACRES) =        2.2       PEAK FLOW RATE(CFS) =       3.00

****************************************************************************
  FLOW PROCESS FROM NODE    300.00 TO NODE    310.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   323.00
  ELEVATION DATA: UPSTREAM(FEET) =     34.50  DOWNSTREAM(FEET) =     31.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    7.578
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.783
  SUBAREA Tc AND LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  COMMERCIAL                 C        0.18      0.25     0.100    50    7.58
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =      0.28
  TOTAL AREA(ACRES) =      0.18   PEAK FLOW RATE(CFS) =      0.28

****************************************************************************
  FLOW PROCESS FROM NODE    400.00 TO NODE    410.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   300.00
  ELEVATION DATA: UPSTREAM(FEET) =     33.10  DOWNSTREAM(FEET) =     32.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   14.519
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.228
  SUBAREA Tc AND LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  PUBLIC PARK                C        0.47      0.25     0.850    50   14.52
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.850
  SUBAREA RUNOFF(CFS) =      0.43
  TOTAL AREA(ACRES) =      0.47   PEAK FLOW RATE(CFS) =      0.43
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        0.5  TC(MIN.) =     14.52
  EFFECTIVE AREA(ACRES) =      0.47  AREA-AVERAGED Fm(INCH/HR)=  0.21
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap = 0.850
  PEAK FLOW RATE(CFS)   =       0.43
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

```
******************************************************************************
             RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            (Reference: 1986 ORANGE COUNTY HYDROLOGY CRITERION)
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                            Analysis prepared by:

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                            Los Angeles, CA 90017

 ************************** DESCRIPTION OF STUDY **************************
*                              HIVE LIVE                                   *
*                            EXISTING CONDITIONS                           *
*                             25 YEAR STORM                                *
 ******************************************************************************

  FILE NAME: HIVE.DAT
  TIME/DATE OF STUDY: 07:36 08/22/2024
==============================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
==============================================================================
                     --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =   25.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =   3.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.90
  *DATA BANK RAINFALL USED*
  *ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD*

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0313 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
  *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

******************************************************************************
  FLOW PROCESS FROM NODE     10.00 TO NODE     20.00 IS CODE =  21
------------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
==============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   300.00
  ELEVATION DATA: UPSTREAM(FEET) =     35.40  DOWNSTREAM(FEET) =     31.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    6.926
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  4.011
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
```

```
  COMMERCIAL                  C        0.43      0.25     0.100    69    6.93
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =      1.54
  TOTAL AREA(ACRES) =      0.43   PEAK FLOW RATE(CFS) =      1.54

****************************************************************************
  FLOW PROCESS FROM NODE     20.00 TO NODE     30.00 IS CODE =  61
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STANDARD CURB SECTION USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =   31.00  DOWNSTREAM ELEVATION(FEET) =   29.00
  STREET LENGTH(FEET) =   156.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 30.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  20.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       3.81
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.35
    HALFSTREET FLOOD WIDTH(FEET) =   11.29
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.74
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.96
  STREET FLOW TRAVEL TIME(MIN.) =   0.95   Tc(MIN.) =    7.88
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.730
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                  C        1.36      0.25     0.100    69
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA AREA(ACRES) =    1.36      SUBAREA RUNOFF(CFS) =    4.53
  EFFECTIVE AREA(ACRES) =      1.79    AREA-AVERAGED Fm(INCH/HR) =  0.03
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.10
  TOTAL AREA(ACRES) =        1.8        PEAK FLOW RATE(CFS) =       5.97

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.40   HALFSTREET FLOOD WIDTH(FEET) =  13.63
  FLOW VELOCITY(FEET/SEC.) =  3.02   DEPTH*VELOCITY(FT*FT/SEC.) =   1.20
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     30.00 =     456.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     30.00 TO NODE     60.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    27.50  DOWNSTREAM(FEET) =    25.30
  FLOW LENGTH(FEET) =   416.00   MANNING'S N =  0.013
  ASSUME FULL-FLOWING PIPELINE
  PIPE-FLOW VELOCITY(FEET/SEC.) =   7.60
  PIPE FLOW VELOCITY = (TOTAL FLOW)/(PIPE CROSS SECTION AREA)
  GIVEN PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       5.97
  PIPE TRAVEL TIME(MIN.) =   0.91    Tc(MIN.) =    8.79
```

```
 LONGEST FLOWPATH FROM NODE     10.00 TO NODE     60.00 =     872.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     60.00 TO NODE     60.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
 TIME OF CONCENTRATION(MIN.) =    8.79
 RAINFALL INTENSITY(INCH/HR) =   3.51
 AREA-AVERAGED Fm(INCH/HR) =  0.03
 AREA-AVERAGED Fp(INCH/HR) =  0.25
 AREA-AVERAGED Ap =  0.10
 EFFECTIVE STREAM AREA(ACRES) =       1.79
 TOTAL STREAM AREA(ACRES) =       1.79
 PEAK FLOW RATE(CFS) AT CONFLUENCE =       5.97

****************************************************************************
 FLOW PROCESS FROM NODE     40.00 TO NODE     50.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
 INITIAL SUBAREA FLOW-LENGTH(FEET) =   213.00
 ELEVATION DATA: UPSTREAM(FEET) =     36.60  DOWNSTREAM(FEET) =     34.00

 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    6.265
 *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  4.246
 SUBAREA Tc AND LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS   Tc
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
 COMMERCIAL                 C        1.29      0.25     0.100    69    6.26
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
 SUBAREA RUNOFF(CFS) =      4.90
 TOTAL AREA(ACRES) =      1.29   PEAK FLOW RATE(CFS) =      4.90

****************************************************************************
 FLOW PROCESS FROM NODE     50.00 TO NODE     60.00 IS CODE =  61
----------------------------------------------------------------------------
 >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>(STANDARD CURB SECTION USED)<<<<<
============================================================================
 UPSTREAM ELEVATION(FEET) =   34.00  DOWNSTREAM ELEVATION(FEET) =   31.80
 STREET LENGTH(FEET) =   191.00   CURB HEIGHT(INCHES) =  6.0
 STREET HALFWIDTH(FEET) = 30.00

 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  10.00
 INSIDE STREET CROSSFALL(DECIMAL) =  0.020
 OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
 STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
 Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

   **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       7.50
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) =  0.43
   HALFSTREET FLOOD WIDTH(FEET) =   15.27
   AVERAGE FLOW VELOCITY(FEET/SEC.) =    3.06
```

```
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.32
 STREET FLOW TRAVEL TIME(MIN.) =   1.04   Tc(MIN.) =    7.30
 *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.892
 SUBAREA LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 COMMERCIAL                 C        1.49      0.25     0.100    69
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
 SUBAREA AREA(ACRES) =    1.49      SUBAREA RUNOFF(CFS) =    5.19
 EFFECTIVE AREA(ACRES) =      2.78    AREA-AVERAGED Fm(INCH/HR) =  0.03
 AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.10
 TOTAL AREA(ACRES) =        2.8        PEAK FLOW RATE(CFS) =       9.68

 END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.46   HALFSTREET FLOOD WIDTH(FEET) =  16.86
 FLOW VELOCITY(FEET/SEC.) =  3.27   DEPTH*VELOCITY(FT*FT/SEC.) =   1.51
 LONGEST FLOWPATH FROM NODE     40.00 TO NODE     60.00 =     404.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     60.00 TO NODE     60.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
 >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
 TIME OF CONCENTRATION(MIN.) =    7.30
 RAINFALL INTENSITY(INCH/HR) =   3.89
 AREA-AVERAGED Fm(INCH/HR) =  0.03
 AREA-AVERAGED Fp(INCH/HR) =  0.25
 AREA-AVERAGED Ap =  0.10
 EFFECTIVE STREAM AREA(ACRES) =       2.78
 TOTAL STREAM AREA(ACRES) =       2.78
 PEAK FLOW RATE(CFS) AT CONFLUENCE =       9.68

 ** CONFLUENCE DATA **
  STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
  NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
     1        5.97    8.79    3.506  0.25( 0.03) 0.10       1.8      10.00
     2        9.68    7.30    3.892  0.25( 0.03) 0.10       2.8      40.00

 RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
 CONFLUENCE FORMULA USED FOR  2 STREAMS.

 ** PEAK FLOW RATE TABLE **
  STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
  NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
     1       15.19    7.30    3.892  0.25( 0.03) 0.10       4.3      40.00
     2       14.68    8.79    3.506  0.25( 0.03) 0.10       4.6      10.00

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =      15.19    Tc(MIN.) =     7.30
 EFFECTIVE AREA(ACRES) =       4.27   AREA-AVERAGED Fm(INCH/HR) =  0.03
 AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.10
 TOTAL AREA(ACRES) =        4.6
 LONGEST FLOWPATH FROM NODE     10.00 TO NODE     60.00 =     872.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     60.00 TO NODE     70.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
```

```
 MAINLINE Tc(MIN.) =    7.30
 *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.892
 SUBAREA LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 COMMERCIAL                 C        0.07      0.25     0.100    69
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
 SUBAREA AREA(ACRES) =    0.07      SUBAREA RUNOFF(CFS) =    0.24
 EFFECTIVE AREA(ACRES) =      4.34   AREA-AVERAGED Fm(INCH/HR) =  0.02
 AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.10
 TOTAL AREA(ACRES) =        4.6       PEAK FLOW RATE(CFS) =      15.19
 NOTE: PEAK FLOW RATE DEFAULTED TO UPSTREAM VALUE

****************************************************************************
 FLOW PROCESS FROM NODE    100.00 TO NODE    110.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
 INITIAL SUBAREA FLOW-LENGTH(FEET) =   226.00
 ELEVATION DATA: UPSTREAM(FEET) =     36.60  DOWNSTREAM(FEET) =     32.30

 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    5.870
 *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  4.405
 SUBAREA Tc AND LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
 COMMERCIAL                 C        1.15      0.25     0.100    69    5.87
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
 SUBAREA RUNOFF(CFS) =      4.53
 TOTAL AREA(ACRES) =      1.15   PEAK FLOW RATE(CFS) =      4.53

****************************************************************************
 FLOW PROCESS FROM NODE    110.00 TO NODE    120.00 IS CODE =  61
----------------------------------------------------------------------------
 >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>(STANDARD CURB SECTION USED)<<<<<
============================================================================
 UPSTREAM ELEVATION(FEET) =   32.30  DOWNSTREAM ELEVATION(FEET) =   29.00
 STREET LENGTH(FEET) =   273.00   CURB HEIGHT(INCHES) =  8.0
 STREET HALFWIDTH(FEET) = 30.00

 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  10.00
 INSIDE STREET CROSSFALL(DECIMAL) =  0.020
 OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
 STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
 Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

   **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       7.49
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) =  0.45
   HALFSTREET FLOOD WIDTH(FEET) =   14.76
   AVERAGE FLOW VELOCITY(FEET/SEC.) =    3.16
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.43
 STREET FLOW TRAVEL TIME(MIN.) =   1.44   Tc(MIN.) =    7.31
 *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.891
 SUBAREA LOSS RATE DATA(AMC  II):
```

```
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
       LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                  C        1.70      0.25      0.100    69
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA AREA(ACRES) =    1.70      SUBAREA RUNOFF(CFS) =    5.92
  EFFECTIVE AREA(ACRES) =      2.85    AREA-AVERAGED Fm(INCH/HR) =  0.03
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.10
  TOTAL AREA(ACRES) =        2.8        PEAK FLOW RATE(CFS) =       9.92

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.49   HALFSTREET FLOOD WIDTH(FEET) =  16.59
  FLOW VELOCITY(FEET/SEC.) =  3.37   DEPTH*VELOCITY(FT*FT/SEC.) =   1.65
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    120.00 =     499.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    120.00 TO NODE    150.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    27.00  DOWNSTREAM(FEET) =    23.50
  FLOW LENGTH(FEET) =   399.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  24.0 INCH PIPE IS  11.9 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.38
  GIVEN PIPE DIAMETER(INCH) =  24.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       9.92
  PIPE TRAVEL TIME(MIN.) =   1.04    Tc(MIN.) =    8.35
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    150.00 =     898.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    150.00 TO NODE    150.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    8.35
  RAINFALL INTENSITY(INCH/HR) =   3.61
  AREA-AVERAGED Fm(INCH/HR) =  0.03
  AREA-AVERAGED Fp(INCH/HR) =  0.25
  AREA-AVERAGED Ap =  0.10
  EFFECTIVE STREAM AREA(ACRES) =       2.85
  TOTAL STREAM AREA(ACRES) =       2.85
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       9.92

****************************************************************************
  FLOW PROCESS FROM NODE    130.00 TO NODE    140.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   263.00
  ELEVATION DATA: UPSTREAM(FEET) =     36.50  DOWNSTREAM(FEET) =     29.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    5.752
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  4.456
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS   Tc
       LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  COMMERCIAL                  C        1.77      0.25      0.100    69    5.75
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
```

```
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =      7.06
  TOTAL AREA(ACRES) =      1.77   PEAK FLOW RATE(CFS) =      7.06

****************************************************************************
  FLOW PROCESS FROM NODE    140.00 TO NODE    150.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    26.50  DOWNSTREAM(FEET) =    23.50
  FLOW LENGTH(FEET) =    27.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   6.9 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  15.15
  GIVEN PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       7.06
  PIPE TRAVEL TIME(MIN.) =   0.03    Tc(MIN.) =    5.78
  LONGEST FLOWPATH FROM NODE    130.00 TO NODE    150.00 =     290.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    150.00 TO NODE    150.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    5.78
  RAINFALL INTENSITY(INCH/HR) =   4.44
  AREA-AVERAGED Fm(INCH/HR) =  0.03
  AREA-AVERAGED Fp(INCH/HR) =  0.25
  AREA-AVERAGED Ap =  0.10
  EFFECTIVE STREAM AREA(ACRES) =       1.77
  TOTAL STREAM AREA(ACRES) =       1.77
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       7.06

  ** CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
      1        9.92    8.35    3.608  0.25( 0.03) 0.10       2.8     100.00
      2        7.06    5.78    4.443  0.25( 0.03) 0.10       1.8     130.00

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR  2 STREAMS.

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
      1       15.52    5.78    4.443  0.25( 0.03) 0.10       3.7     130.00
      2       15.64    8.35    3.608  0.25( 0.03) 0.10       4.6     100.00

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      15.64    Tc(MIN.) =     8.35
  EFFECTIVE AREA(ACRES) =       4.62   AREA-AVERAGED Fm(INCH/HR) =  0.03
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.10
  TOTAL AREA(ACRES) =        4.6
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    150.00 =     898.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    150.00 TO NODE    180.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
```

```
==========================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    23.50  DOWNSTREAM(FEET) =    20.60
  FLOW LENGTH(FEET) =   618.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  36.0 INCH PIPE IS  15.0 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.64
  GIVEN PIPE DIAMETER(INCH) =  36.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      15.64
  PIPE TRAVEL TIME(MIN.) =   1.83    Tc(MIN.) =   10.18
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    180.00 =    1516.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    180.00 TO NODE    180.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =   10.18
  RAINFALL INTENSITY(INCH/HR) =   3.23
  AREA-AVERAGED Fm(INCH/HR) =  0.03
  AREA-AVERAGED Fp(INCH/HR) =  0.25
  AREA-AVERAGED Ap =  0.10
  EFFECTIVE STREAM AREA(ACRES) =       4.62
  TOTAL STREAM AREA(ACRES) =       4.62
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      15.64

****************************************************************************
  FLOW PROCESS FROM NODE    160.00 TO NODE    170.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   280.00
  ELEVATION DATA: UPSTREAM(FEET) =     36.00  DOWNSTREAM(FEET) =     34.50

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    8.240
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.636
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  COMMERCIAL                 C        1.05      0.25      0.100    69    8.24
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =      3.41
  TOTAL AREA(ACRES) =      1.05   PEAK FLOW RATE(CFS) =      3.41

****************************************************************************
  FLOW PROCESS FROM NODE    170.00 TO NODE    180.00 IS CODE =  91
----------------------------------------------------------------------------
  >>>>>COMPUTE "V" GUTTER FLOW TRAVEL TIME THRU SUBAREA<<<<<
============================================================================
  UPSTREAM NODE ELEVATION(FEET) =     34.50
  DOWNSTREAM NODE ELEVATION(FEET) =     33.20
  CHANNEL LENGTH THRU SUBAREA(FEET) =   254.00
  "V" GUTTER WIDTH(FEET) =   2.00   GUTTER HIKE(FEET) =  0.080
  PAVEMENT LIP(FEET) =  0.020   MANNING'S N = .0150
  PAVEMENT CROSSFALL(DECIMAL NOTATION) = 0.02000
  MAXIMUM DEPTH(FEET) =   1.00
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.162
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
```

```
  COMMERCIAL                  C        1.05      0.25     0.100    69
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      4.89
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.84
  AVERAGE FLOW DEPTH(FEET) =   0.31   FLOOD WIDTH(FEET) =   22.65
  "V" GUTTER FLOW TRAVEL TIME(MIN.) =   2.31   Tc(MIN.) =   10.55
  SUBAREA AREA(ACRES) =    1.05       SUBAREA RUNOFF(CFS) =    2.96
  EFFECTIVE AREA(ACRES) =    2.10     AREA-AVERAGED Fm(INCH/HR) =   0.03
  AREA-AVERAGED Fp(INCH/HR) =   0.25  AREA-AVERAGED Ap =   0.10
  TOTAL AREA(ACRES) =        2.1         PEAK FLOW RATE(CFS) =       5.93

  END OF SUBAREA "V" GUTTER HYDRAULICS:
  DEPTH(FEET) =  0.33   FLOOD WIDTH(FEET) =   24.59
  FLOW VELOCITY(FEET/SEC.) =   1.90   DEPTH*VELOCITY(FT*FT/SEC) =   0.62
  LONGEST FLOWPATH FROM NODE    160.00 TO NODE    180.00 =     534.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    180.00 TO NODE    180.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =   10.55
  RAINFALL INTENSITY(INCH/HR) =   3.16
  AREA-AVERAGED Fm(INCH/HR) =  0.03
  AREA-AVERAGED Fp(INCH/HR) =  0.25
  AREA-AVERAGED Ap =  0.10
  EFFECTIVE STREAM AREA(ACRES) =       2.10
  TOTAL STREAM AREA(ACRES) =       2.10
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       5.93

  ** CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
      1       15.52    7.61    3.802  0.25( 0.03) 0.10       3.7     130.00
      1       15.64   10.18    3.226  0.25( 0.03) 0.10       4.6     100.00
      2        5.93   10.55    3.162  0.25( 0.03) 0.10       2.1     160.00

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR  2 STREAMS.

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
      1       20.68    7.61    3.802  0.25( 0.03) 0.10       5.3     130.00
      2       21.48   10.18    3.226  0.25( 0.03) 0.10       6.6     100.00
      3       21.26   10.55    3.162  0.25( 0.03) 0.10       6.7     160.00

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      21.48    Tc(MIN.) =    10.18
  EFFECTIVE AREA(ACRES) =       6.65   AREA-AVERAGED Fm(INCH/HR) =  0.03
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.10
  TOTAL AREA(ACRES) =        6.7
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    180.00 =    1516.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    160.00 TO NODE    200.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
```

```
==========================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   279.00
  ELEVATION DATA: UPSTREAM(FEET) =     36.00  DOWNSTREAM(FEET) =     34.50

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    8.223
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.640
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  COMMERCIAL                 C        1.24      0.25     0.100    69    8.22
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =      4.03
  TOTAL AREA(ACRES) =      1.24   PEAK FLOW RATE(CFS) =      4.03

**************************************************************************
  FLOW PROCESS FROM NODE    200.00 TO NODE    210.00 IS CODE =  91
--------------------------------------------------------------------------
  >>>>>COMPUTE "V" GUTTER FLOW TRAVEL TIME THRU SUBAREA<<<<<
==========================================================================
  UPSTREAM NODE ELEVATION(FEET) =     34.50
  DOWNSTREAM NODE ELEVATION(FEET) =     33.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   206.00
  "V" GUTTER WIDTH(FEET) =   2.00   GUTTER HIKE(FEET) =  0.080
  PAVEMENT LIP(FEET) =  0.020   MANNING'S N = .0150
  PAVEMENT CROSSFALL(DECIMAL NOTATION) = 0.02000
  MAXIMUM DEPTH(FEET) =   1.00
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.289
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                 C        0.89      0.25     0.100    69
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      5.35
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.13
  AVERAGE FLOW DEPTH(FEET) =   0.30   FLOOD WIDTH(FEET) =   21.95
  "V" GUTTER FLOW TRAVEL TIME(MIN.) =   1.61   Tc(MIN.) =    9.83
  SUBAREA AREA(ACRES) =    0.89       SUBAREA RUNOFF(CFS) =    2.61
  EFFECTIVE AREA(ACRES) =    2.13     AREA-AVERAGED Fm(INCH/HR) =   0.02
  AREA-AVERAGED Fp(INCH/HR) =   0.25  AREA-AVERAGED Ap =   0.10
  TOTAL AREA(ACRES) =        2.1         PEAK FLOW RATE(CFS) =       6.26

  END OF SUBAREA "V" GUTTER HYDRAULICS:
  DEPTH(FEET) =  0.31   FLOOD WIDTH(FEET) =   23.36
  FLOW VELOCITY(FEET/SEC.) =   2.21   DEPTH*VELOCITY(FT*FT/SEC) =   0.69
  LONGEST FLOWPATH FROM NODE    160.00 TO NODE    210.00 =     485.00 FEET.

**************************************************************************
  FLOW PROCESS FROM NODE    210.00 TO NODE    220.00 IS CODE =  81
--------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
==========================================================================
  MAINLINE Tc(MIN.) =    9.83
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.289
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                 C        0.11      0.25     0.100    69
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA AREA(ACRES) =    0.11       SUBAREA RUNOFF(CFS) =    0.32
```

```
  EFFECTIVE AREA(ACRES) =      2.24   AREA-AVERAGED Fm(INCH/HR) =  0.03
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.10
  TOTAL AREA(ACRES) =        2.2       PEAK FLOW RATE(CFS) =       6.58

****************************************************************************
  FLOW PROCESS FROM NODE    300.00 TO NODE    310.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   323.00
  ELEVATION DATA: UPSTREAM(FEET) =     34.50  DOWNSTREAM(FEET) =     31.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    7.578
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.812
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  COMMERCIAL                 C        0.18      0.25     0.100    69    7.58
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =      0.61
  TOTAL AREA(ACRES) =      0.18   PEAK FLOW RATE(CFS) =      0.61

****************************************************************************
  FLOW PROCESS FROM NODE    400.00 TO NODE    410.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   300.00
  ELEVATION DATA: UPSTREAM(FEET) =     33.10  DOWNSTREAM(FEET) =     32.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   14.519
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  2.638
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  PUBLIC PARK                C        0.47      0.25     0.850    69   14.52
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.850
  SUBAREA RUNOFF(CFS) =      1.03
  TOTAL AREA(ACRES) =      0.47   PEAK FLOW RATE(CFS) =      1.03
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        0.5  TC(MIN.) =     14.52
  EFFECTIVE AREA(ACRES) =      0.47  AREA-AVERAGED Fm(INCH/HR)=  0.21
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap = 0.850
  PEAK FLOW RATE(CFS)   =       1.03
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

```
_____________________________________________________________________________
*****************************************************************************
             RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            (Reference: 1986 ORANGE COUNTY HYDROLOGY CRITERION)
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                              Analysis prepared by:

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                             Los Angeles, CA 90017

 ************************** DESCRIPTION OF STUDY **************************
*                              HIVE LIVE                                    *
*                            EXISTING CONDITIONS                            *
*                            100 YEAR STORM                                 *
 *****************************************************************************

  FILE NAME: HIVE.DAT
  TIME/DATE OF STUDY: 07:36 08/22/2024
=============================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
=============================================================================
                     --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =  100.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =   3.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.90
  *DATA BANK RAINFALL USED*
  *ANTECEDENT MOISTURE CONDITION (AMC) III ASSUMED FOR RATIONAL METHOD*

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0312 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
  *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

*****************************************************************************
  FLOW PROCESS FROM NODE     10.00 TO NODE     20.00 IS CODE =  21
-----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
=============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   300.00
  ELEVATION DATA: UPSTREAM(FEET) =     35.40  DOWNSTREAM(FEET) =     31.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    6.926
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  5.134
  SUBAREA Tc AND LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
```

```
  COMMERCIAL                  C        0.43      0.25     0.100    86    6.93
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =      1.98
  TOTAL AREA(ACRES) =      0.43   PEAK FLOW RATE(CFS) =      1.98

****************************************************************************
  FLOW PROCESS FROM NODE     20.00 TO NODE     30.00 IS CODE =  61
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STANDARD CURB SECTION USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =   31.00  DOWNSTREAM ELEVATION(FEET) =   29.00
  STREET LENGTH(FEET) =   156.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 30.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  20.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       4.89
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.38
    HALFSTREET FLOOD WIDTH(FEET) =   12.54
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.89
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.09
  STREET FLOW TRAVEL TIME(MIN.) =   0.90   Tc(MIN.) =    7.82
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.787
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                  C        1.36      0.25     0.100    86
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA AREA(ACRES) =    1.36      SUBAREA RUNOFF(CFS) =    5.83
  EFFECTIVE AREA(ACRES) =      1.79    AREA-AVERAGED Fm(INCH/HR) =  0.03
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.10
  TOTAL AREA(ACRES) =        1.8        PEAK FLOW RATE(CFS) =       7.67

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.43   HALFSTREET FLOOD WIDTH(FEET) =  15.04
  FLOW VELOCITY(FEET/SEC.) =  3.22   DEPTH*VELOCITY(FT*FT/SEC.) =   1.38
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     30.00 =     456.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     30.00 TO NODE     60.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    27.50  DOWNSTREAM(FEET) =    25.30
  FLOW LENGTH(FEET) =   416.00   MANNING'S N =  0.013
  ASSUME FULL-FLOWING PIPELINE
  PIPE-FLOW VELOCITY(FEET/SEC.) =   9.77
  PIPE FLOW VELOCITY = (TOTAL FLOW)/(PIPE CROSS SECTION AREA)
  GIVEN PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       7.67
  PIPE TRAVEL TIME(MIN.) =   0.71    Tc(MIN.) =    8.53
```

```
 LONGEST FLOWPATH FROM NODE     10.00 TO NODE     60.00 =     872.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     60.00 TO NODE     60.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
 TIME OF CONCENTRATION(MIN.) =    8.53
 RAINFALL INTENSITY(INCH/HR) =   4.55
 AREA-AVERAGED Fm(INCH/HR) =  0.03
 AREA-AVERAGED Fp(INCH/HR) =  0.25
 AREA-AVERAGED Ap =  0.10
 EFFECTIVE STREAM AREA(ACRES) =       1.79
 TOTAL STREAM AREA(ACRES) =       1.79
 PEAK FLOW RATE(CFS) AT CONFLUENCE =       7.67

****************************************************************************
 FLOW PROCESS FROM NODE     40.00 TO NODE     50.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
 INITIAL SUBAREA FLOW-LENGTH(FEET) =   213.00
 ELEVATION DATA: UPSTREAM(FEET) =     36.60  DOWNSTREAM(FEET) =     34.00

 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    6.265
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  5.437
 SUBAREA Tc AND LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS   Tc
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
 COMMERCIAL                 C        1.29      0.25      0.100    86    6.26
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
 SUBAREA RUNOFF(CFS) =      6.28
 TOTAL AREA(ACRES) =      1.29   PEAK FLOW RATE(CFS) =      6.28

****************************************************************************
 FLOW PROCESS FROM NODE     50.00 TO NODE     60.00 IS CODE =  61
----------------------------------------------------------------------------
 >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>(STANDARD CURB SECTION USED)<<<<<
============================================================================
 UPSTREAM ELEVATION(FEET) =   34.00  DOWNSTREAM ELEVATION(FEET) =   31.80
 STREET LENGTH(FEET) =   191.00   CURB HEIGHT(INCHES) =  6.0
 STREET HALFWIDTH(FEET) = 30.00

 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  10.00
 INSIDE STREET CROSSFALL(DECIMAL) =  0.020
 OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
 STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
 Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

   **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       9.62
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) =  0.46
   HALFSTREET FLOOD WIDTH(FEET) =   16.86
   AVERAGE FLOW VELOCITY(FEET/SEC.) =    3.25
```

```
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.51
  STREET FLOW TRAVEL TIME(MIN.) =   0.98   Tc(MIN.) =    7.24
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  5.003
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                 C        1.49      0.25     0.100    86
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA AREA(ACRES) =    1.49      SUBAREA RUNOFF(CFS) =    6.68
  EFFECTIVE AREA(ACRES) =      2.78    AREA-AVERAGED Fm(INCH/HR) =  0.03
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.10
  TOTAL AREA(ACRES) =        2.8        PEAK FLOW RATE(CFS) =      12.46

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.50   HALFSTREET FLOOD WIDTH(FEET) =  18.59
  FLOW VELOCITY(FEET/SEC.) =  3.48   DEPTH*VELOCITY(FT*FT/SEC.) =   1.74
  LONGEST FLOWPATH FROM NODE     40.00 TO NODE     60.00 =     404.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     60.00 TO NODE     60.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    7.24
  RAINFALL INTENSITY(INCH/HR) =   5.00
  AREA-AVERAGED Fm(INCH/HR) =  0.03
  AREA-AVERAGED Fp(INCH/HR) =  0.25
  AREA-AVERAGED Ap =  0.10
  EFFECTIVE STREAM AREA(ACRES) =       2.78
  TOTAL STREAM AREA(ACRES) =       2.78
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      12.46

  ** CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
      1        7.67    8.53    4.555  0.25( 0.03) 0.10       1.8      10.00
      2       12.46    7.24    5.003  0.25( 0.03) 0.10       2.8      40.00

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR  2 STREAMS.

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
      1       19.61    7.24    5.003  0.25( 0.03) 0.10       4.3      40.00
      2       19.01    8.53    4.555  0.25( 0.03) 0.10       4.6      10.00

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      19.61    Tc(MIN.) =     7.24
  EFFECTIVE AREA(ACRES) =       4.30   AREA-AVERAGED Fm(INCH/HR) =  0.03
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.10
  TOTAL AREA(ACRES) =        4.6
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     60.00 =     872.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     60.00 TO NODE     70.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
```

```
 MAINLINE Tc(MIN.) =    7.24
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  5.003
 SUBAREA LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 COMMERCIAL                 C        0.07      0.25      0.100    86
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
 SUBAREA AREA(ACRES) =    0.07      SUBAREA RUNOFF(CFS) =    0.31
 EFFECTIVE AREA(ACRES) =      4.37   AREA-AVERAGED Fm(INCH/HR) =  0.02
 AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.10
 TOTAL AREA(ACRES) =        4.6       PEAK FLOW RATE(CFS) =      19.61
 NOTE: PEAK FLOW RATE DEFAULTED TO UPSTREAM VALUE

****************************************************************************
 FLOW PROCESS FROM NODE    100.00 TO NODE    110.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
 INITIAL SUBAREA FLOW-LENGTH(FEET) =   226.00
 ELEVATION DATA: UPSTREAM(FEET) =     36.60  DOWNSTREAM(FEET) =     32.30

 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    5.870
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  5.644
 SUBAREA Tc AND LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS   Tc
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
 COMMERCIAL                 C        1.15      0.25      0.100    86    5.87
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
 SUBAREA RUNOFF(CFS) =      5.82
 TOTAL AREA(ACRES) =      1.15   PEAK FLOW RATE(CFS) =      5.82

****************************************************************************
 FLOW PROCESS FROM NODE    110.00 TO NODE    120.00 IS CODE =  61
----------------------------------------------------------------------------
 >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>(STANDARD CURB SECTION USED)<<<<<
============================================================================
 UPSTREAM ELEVATION(FEET) =   32.30  DOWNSTREAM ELEVATION(FEET) =   29.00
 STREET LENGTH(FEET) =   273.00   CURB HEIGHT(INCHES) =  8.0
 STREET HALFWIDTH(FEET) = 30.00

 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  10.00
 INSIDE STREET CROSSFALL(DECIMAL) =  0.020
 OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
 STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
 Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

   **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       9.63
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) =  0.49
   HALFSTREET FLOOD WIDTH(FEET) =   16.38
   AVERAGE FLOW VELOCITY(FEET/SEC.) =    3.35
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.63
 STREET FLOW TRAVEL TIME(MIN.) =   1.36   Tc(MIN.) =    7.23
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  5.010
 SUBAREA LOSS RATE DATA(AMC III):
```

```
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                 C        1.70      0.25      0.100    86
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA AREA(ACRES) =    1.70      SUBAREA RUNOFF(CFS) =    7.63
  EFFECTIVE AREA(ACRES) =      2.85    AREA-AVERAGED Fm(INCH/HR) =  0.03
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.10
  TOTAL AREA(ACRES) =        2.8        PEAK FLOW RATE(CFS) =      12.79

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.53   HALFSTREET FLOOD WIDTH(FEET) =  18.42
  FLOW VELOCITY(FEET/SEC.) =  3.57   DEPTH*VELOCITY(FT*FT/SEC.) =   1.88
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    120.00 =     499.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    120.00 TO NODE    150.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    27.00  DOWNSTREAM(FEET) =    23.50
  FLOW LENGTH(FEET) =   399.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  24.0 INCH PIPE IS  13.9 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.78
  GIVEN PIPE DIAMETER(INCH) =  24.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      12.79
  PIPE TRAVEL TIME(MIN.) =   0.98    Tc(MIN.) =    8.21
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    150.00 =     898.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    150.00 TO NODE    150.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    8.21
  RAINFALL INTENSITY(INCH/HR) =   4.66
  AREA-AVERAGED Fm(INCH/HR) =  0.03
  AREA-AVERAGED Fp(INCH/HR) =  0.25
  AREA-AVERAGED Ap =  0.10
  EFFECTIVE STREAM AREA(ACRES) =       2.85
  TOTAL STREAM AREA(ACRES) =       2.85
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      12.79

****************************************************************************
  FLOW PROCESS FROM NODE    130.00 TO NODE    140.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   263.00
  ELEVATION DATA: UPSTREAM(FEET) =     36.50  DOWNSTREAM(FEET) =     29.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    5.752
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  5.710
  SUBAREA Tc AND LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  COMMERCIAL                 C        1.77      0.25      0.100    86    5.75
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
```

```
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =      9.06
  TOTAL AREA(ACRES) =      1.77   PEAK FLOW RATE(CFS) =      9.06

****************************************************************************
  FLOW PROCESS FROM NODE    140.00 TO NODE    150.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    26.50  DOWNSTREAM(FEET) =    23.50
  FLOW LENGTH(FEET) =    27.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   8.1 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  15.95
  GIVEN PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       9.06
  PIPE TRAVEL TIME(MIN.) =   0.03    Tc(MIN.) =    5.78
  LONGEST FLOWPATH FROM NODE    130.00 TO NODE    150.00 =     290.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    150.00 TO NODE    150.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    5.78
  RAINFALL INTENSITY(INCH/HR) =   5.69
  AREA-AVERAGED Fm(INCH/HR) =  0.03
  AREA-AVERAGED Fp(INCH/HR) =  0.25
  AREA-AVERAGED Ap =  0.10
  EFFECTIVE STREAM AREA(ACRES) =       1.77
  TOTAL STREAM AREA(ACRES) =       1.77
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       9.06

  ** CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
      1       12.79    8.21    4.658  0.25( 0.03) 0.10       2.8     100.00
      2        9.06    5.78    5.694  0.25( 0.03) 0.10       1.8     130.00

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR  2 STREAMS.

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
      1       20.08    5.78    5.694  0.25( 0.03) 0.10       3.8     130.00
      2       20.19    8.21    4.658  0.25( 0.03) 0.10       4.6     100.00

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      20.19    Tc(MIN.) =     8.21
  EFFECTIVE AREA(ACRES) =       4.62   AREA-AVERAGED Fm(INCH/HR) =  0.03
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.10
  TOTAL AREA(ACRES) =        4.6
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    150.00 =     898.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    150.00 TO NODE    180.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
```

```
==========================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    23.50  DOWNSTREAM(FEET) =    20.60
  FLOW LENGTH(FEET) =   618.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  36.0 INCH PIPE IS  17.3 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.02
  GIVEN PIPE DIAMETER(INCH) =  36.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      20.19
  PIPE TRAVEL TIME(MIN.) =   1.71    Tc(MIN.) =    9.92
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    180.00 =    1516.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    180.00 TO NODE    180.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    9.92
  RAINFALL INTENSITY(INCH/HR) =   4.18
  AREA-AVERAGED Fm(INCH/HR) =  0.03
  AREA-AVERAGED Fp(INCH/HR) =  0.25
  AREA-AVERAGED Ap =  0.10
  EFFECTIVE STREAM AREA(ACRES) =       4.62
  TOTAL STREAM AREA(ACRES) =       4.62
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      20.19

****************************************************************************
  FLOW PROCESS FROM NODE    160.00 TO NODE    170.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   280.00
  ELEVATION DATA: UPSTREAM(FEET) =     36.00  DOWNSTREAM(FEET) =     34.50

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    8.240
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.647
  SUBAREA Tc AND LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  COMMERCIAL                 C        1.05      0.25      0.100    86    8.24
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =      4.37
  TOTAL AREA(ACRES) =      1.05   PEAK FLOW RATE(CFS) =      4.37

****************************************************************************
  FLOW PROCESS FROM NODE    170.00 TO NODE    180.00 IS CODE =  91
----------------------------------------------------------------------------
  >>>>>COMPUTE "V" GUTTER FLOW TRAVEL TIME THRU SUBAREA<<<<<
============================================================================
  UPSTREAM NODE ELEVATION(FEET) =     34.50
  DOWNSTREAM NODE ELEVATION(FEET) =     33.20
  CHANNEL LENGTH THRU SUBAREA(FEET) =   254.00
  "V" GUTTER WIDTH(FEET) =   2.00   GUTTER HIKE(FEET) =  0.080
  PAVEMENT LIP(FEET) =  0.020   MANNING'S N = .0150
  PAVEMENT CROSSFALL(DECIMAL NOTATION) = 0.02000
  MAXIMUM DEPTH(FEET) =   1.00
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.059
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
```

```
  COMMERCIAL                  C        1.05      0.25     0.100    86
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      6.28
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.93
  AVERAGE FLOW DEPTH(FEET) =   0.33   FLOOD WIDTH(FEET) =   25.12
  "V" GUTTER FLOW TRAVEL TIME(MIN.) =   2.19   Tc(MIN.) =   10.43
  SUBAREA AREA(ACRES) =    1.05       SUBAREA RUNOFF(CFS) =    3.81
  EFFECTIVE AREA(ACRES) =    2.10     AREA-AVERAGED Fm(INCH/HR) =   0.03
  AREA-AVERAGED Fp(INCH/HR) =   0.25  AREA-AVERAGED Ap =   0.10
  TOTAL AREA(ACRES) =        2.1         PEAK FLOW RATE(CFS) =       7.62

  END OF SUBAREA "V" GUTTER HYDRAULICS:
  DEPTH(FEET) =  0.35   FLOOD WIDTH(FEET) =   27.22
  FLOW VELOCITY(FEET/SEC.) =   2.00   DEPTH*VELOCITY(FT*FT/SEC) =   0.71
  LONGEST FLOWPATH FROM NODE    160.00 TO NODE    180.00 =     534.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    180.00 TO NODE    180.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =   10.43
  RAINFALL INTENSITY(INCH/HR) =   4.06
  AREA-AVERAGED Fm(INCH/HR) =  0.03
  AREA-AVERAGED Fp(INCH/HR) =  0.25
  AREA-AVERAGED Ap =  0.10
  EFFECTIVE STREAM AREA(ACRES) =       2.10
  TOTAL STREAM AREA(ACRES) =       2.10
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       7.62

  ** CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
      1       20.08    7.49    4.907  0.25( 0.03) 0.10       3.8     130.00
      1       20.19    9.92    4.179  0.25( 0.03) 0.10       4.6     100.00
      2        7.62   10.43    4.059  0.25( 0.03) 0.10       2.1     160.00

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR  2 STREAMS.

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
      1       26.70    7.49    4.907  0.25( 0.03) 0.10       5.3     130.00
      2       27.65    9.92    4.179  0.25( 0.03) 0.10       6.6     100.00
      3       27.23   10.43    4.059  0.25( 0.03) 0.10       6.7     160.00

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      27.65    Tc(MIN.) =     9.92
  EFFECTIVE AREA(ACRES) =       6.62   AREA-AVERAGED Fm(INCH/HR) =  0.03
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.10
  TOTAL AREA(ACRES) =        6.7
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    180.00 =    1516.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    160.00 TO NODE    200.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
```

```
================================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   279.00
  ELEVATION DATA: UPSTREAM(FEET) =     36.00  DOWNSTREAM(FEET) =     34.50

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    8.223
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.653
  SUBAREA Tc AND LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  COMMERCIAL                 C        1.24      0.25     0.100    86    8.22
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =      5.16
  TOTAL AREA(ACRES) =      1.24   PEAK FLOW RATE(CFS) =      5.16

****************************************************************************
  FLOW PROCESS FROM NODE    200.00 TO NODE    210.00 IS CODE =  91
----------------------------------------------------------------------------
  >>>>>COMPUTE "V" GUTTER FLOW TRAVEL TIME THRU SUBAREA<<<<<
============================================================================
  UPSTREAM NODE ELEVATION(FEET) =     34.50
  DOWNSTREAM NODE ELEVATION(FEET) =     33.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   206.00
  "V" GUTTER WIDTH(FEET) =   2.00   GUTTER HIKE(FEET) =  0.080
  PAVEMENT LIP(FEET) =  0.020   MANNING'S N = .0150
  PAVEMENT CROSSFALL(DECIMAL NOTATION) = 0.02000
  MAXIMUM DEPTH(FEET) =   1.00
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.221
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                 C        0.89      0.25     0.100    86
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      6.85
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.26
  AVERAGE FLOW DEPTH(FEET) =   0.32   FLOOD WIDTH(FEET) =   24.24
  "V" GUTTER FLOW TRAVEL TIME(MIN.) =   1.52   Tc(MIN.) =    9.75
  SUBAREA AREA(ACRES) =    0.89       SUBAREA RUNOFF(CFS) =    3.36
  EFFECTIVE AREA(ACRES) =    2.13     AREA-AVERAGED Fm(INCH/HR) =   0.02
  AREA-AVERAGED Fp(INCH/HR) =   0.25  AREA-AVERAGED Ap =   0.10
  TOTAL AREA(ACRES) =        2.1         PEAK FLOW RATE(CFS) =       8.04

  END OF SUBAREA "V" GUTTER HYDRAULICS:
  DEPTH(FEET) =  0.34   FLOOD WIDTH(FEET) =   25.82
  FLOW VELOCITY(FEET/SEC.) =   2.34   DEPTH*VELOCITY(FT*FT/SEC) =   0.79
  LONGEST FLOWPATH FROM NODE    160.00 TO NODE    210.00 =     485.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    210.00 TO NODE    220.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =    9.75
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.221
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                 C        0.11      0.25     0.100    86
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA AREA(ACRES) =    0.11       SUBAREA RUNOFF(CFS) =    0.42
```

```
  EFFECTIVE AREA(ACRES) =      2.24   AREA-AVERAGED Fm(INCH/HR) =  0.03
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.10
  TOTAL AREA(ACRES) =        2.2       PEAK FLOW RATE(CFS) =       8.46

****************************************************************************
  FLOW PROCESS FROM NODE    300.00 TO NODE    310.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   323.00
  ELEVATION DATA: UPSTREAM(FEET) =     34.50  DOWNSTREAM(FEET) =     31.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    7.578
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.875
  SUBAREA Tc AND LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  COMMERCIAL                 C        0.18      0.25     0.100    86    7.58
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =      0.79
  TOTAL AREA(ACRES) =      0.18   PEAK FLOW RATE(CFS) =      0.79

****************************************************************************
  FLOW PROCESS FROM NODE    400.00 TO NODE    410.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   300.00
  ELEVATION DATA: UPSTREAM(FEET) =     33.10  DOWNSTREAM(FEET) =     32.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   14.519
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.359
  SUBAREA Tc AND LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  PUBLIC PARK                C        0.47      0.25     0.850    86   14.52
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.850
  SUBAREA RUNOFF(CFS) =      1.33
  TOTAL AREA(ACRES) =      0.47   PEAK FLOW RATE(CFS) =      1.33
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        0.5  TC(MIN.) =     14.52
  EFFECTIVE AREA(ACRES) =      0.47  AREA-AVERAGED Fm(INCH/HR)=  0.21
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap = 0.850
  PEAK FLOW RATE(CFS)   =       1.33
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

APPENDIX 4

PROPOSED HYDROLOGY CALCULATIONS

```
******************************************************************************
             RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            (Reference: 1986 ORANGE COUNTY HYDROLOGY CRITERION)
          (c) Copyright 1983-2016 Advanced Engineering Software (aes)
              Ver. 23.0  Release Date: 07/01/2016  License ID 1355

                            Analysis prepared by:

                           Fuscoe Engineering, Inc.
                              600 Wilshire Blvd
                                  Suite 1470
                            Los Angeles, CA 90017

 ************************** DESCRIPTION OF STUDY **************************
*                                HIVE LIVE                                 *
*                             PROPOSED CONDITIONS                          *
*                                2 YEAR STORM                              *
 ****************************************************************************

  FILE NAME: HIVEP.DAT
  TIME/DATE OF STUDY: 11:32 09/09/2024
============================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
============================================================================
                     --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =    2.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =   3.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.90
  *DATA BANK RAINFALL USED*
  *ANTECEDENT MOISTURE CONDITION (AMC) I ASSUMED FOR RATIONAL METHOD*

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)   (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0313 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
  *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

******************************************************************************
  FLOW PROCESS FROM NODE     10.00 TO NODE     20.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   413.00
  ELEVATION DATA: UPSTREAM(FEET) =     37.40  DOWNSTREAM(FEET) =     32.90

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    8.902
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.626
  SUBAREA Tc AND LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
```

```
  APARTMENTS                  C        1.67      0.25     0.200    50    8.90
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA RUNOFF(CFS) =      2.37
  TOTAL AREA(ACRES) =      1.67   PEAK FLOW RATE(CFS) =      2.37

****************************************************************************
  FLOW PROCESS FROM NODE     20.00 TO NODE     50.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    27.60  DOWNSTREAM(FEET) =    25.50
  FLOW LENGTH(FEET) =   373.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   7.0 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   3.75
  GIVEN PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       2.37
  PIPE TRAVEL TIME(MIN.) =   1.66    Tc(MIN.) =   10.56
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     50.00 =     786.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     50.00 TO NODE     50.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =   10.56
  RAINFALL INTENSITY(INCH/HR) =   1.47
  AREA-AVERAGED Fm(INCH/HR) =  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.25
  AREA-AVERAGED Ap =  0.20
  EFFECTIVE STREAM AREA(ACRES) =       1.67
  TOTAL STREAM AREA(ACRES) =       1.67
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       2.37

****************************************************************************
  FLOW PROCESS FROM NODE     30.00 TO NODE     40.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   325.00
  ELEVATION DATA: UPSTREAM(FEET) =     36.50  DOWNSTREAM(FEET) =     31.70

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    7.611
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.779
  SUBAREA Tc AND LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  APARTMENTS                  C        2.69      0.25     0.200    50    7.61
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA RUNOFF(CFS) =      4.19
  TOTAL AREA(ACRES) =      2.69   PEAK FLOW RATE(CFS) =      4.19

****************************************************************************
  FLOW PROCESS FROM NODE     40.00 TO NODE     50.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
```

```
==========================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    27.30  DOWNSTREAM(FEET) =    25.50
  FLOW LENGTH(FEET) =    26.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   4.9 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  10.87
  GIVEN PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       4.19
  PIPE TRAVEL TIME(MIN.) =   0.04    Tc(MIN.) =    7.65
  LONGEST FLOWPATH FROM NODE     30.00 TO NODE     50.00 =     351.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     50.00 TO NODE     50.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
==========================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    7.65
  RAINFALL INTENSITY(INCH/HR) =   1.77
  AREA-AVERAGED Fm(INCH/HR) =  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.25
  AREA-AVERAGED Ap =  0.20
  EFFECTIVE STREAM AREA(ACRES) =       2.69
  TOTAL STREAM AREA(ACRES) =       2.69
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       4.19

  ** CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1        2.37   10.56    1.474  0.25( 0.05) 0.20       1.7      10.00
      2        4.19    7.65    1.773  0.25( 0.05) 0.20       2.7      30.00

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR  2 STREAMS.

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1        6.26    7.65    1.773  0.25( 0.05) 0.20       3.9      30.00
      2        5.83   10.56    1.474  0.25( 0.05) 0.20       4.4      10.00

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       6.26    Tc(MIN.) =     7.65
  EFFECTIVE AREA(ACRES) =       3.90   AREA-AVERAGED Fm(INCH/HR) =  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.20
  TOTAL AREA(ACRES) =        4.4
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     50.00 =     786.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     50.00 TO NODE     60.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
==========================================================================
  MAINLINE Tc(MIN.) =    7.65
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.773
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
       LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  APARTMENTS                  C        0.13      0.25     0.200    50
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA AREA(ACRES) =    0.13      SUBAREA RUNOFF(CFS) =    0.20
```

```
  EFFECTIVE AREA(ACRES) =      4.03   AREA-AVERAGED Fm(INCH/HR) =  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.20
  TOTAL AREA(ACRES) =        4.5       PEAK FLOW RATE(CFS) =       6.26
  NOTE: PEAK FLOW RATE DEFAULTED TO UPSTREAM VALUE

****************************************************************************
  FLOW PROCESS FROM NODE     10.00 TO NODE    110.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   371.00
  ELEVATION DATA: UPSTREAM(FEET) =     37.40  DOWNSTREAM(FEET) =     33.70

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    8.680
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.649
  SUBAREA Tc AND LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  APARTMENTS                 C        2.30      0.25     0.200    50    8.68
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA RUNOFF(CFS) =      3.31
  TOTAL AREA(ACRES) =      2.30   PEAK FLOW RATE(CFS) =      3.31

****************************************************************************
  FLOW PROCESS FROM NODE    110.00 TO NODE    130.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    27.60  DOWNSTREAM(FEET) =    25.70
  FLOW LENGTH(FEET) =   301.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   8.1 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.28
  GIVEN PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       3.31
  PIPE TRAVEL TIME(MIN.) =   1.17    Tc(MIN.) =    9.85
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE    130.00 =     672.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    130.00 TO NODE    130.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    9.85
  RAINFALL INTENSITY(INCH/HR) =   1.53
  AREA-AVERAGED Fm(INCH/HR) =  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.25
  AREA-AVERAGED Ap =  0.20
  EFFECTIVE STREAM AREA(ACRES) =       2.30
  TOTAL STREAM AREA(ACRES) =       2.30
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       3.31

****************************************************************************
  FLOW PROCESS FROM NODE     30.00 TO NODE    120.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
```

```
 INITIAL SUBAREA FLOW-LENGTH(FEET) =   278.00
 ELEVATION DATA: UPSTREAM(FEET) =     36.50  DOWNSTREAM(FEET) =     33.50

 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    7.613
 *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.778
 SUBAREA Tc AND LOSS RATE DATA(AMC  I ):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS   Tc
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
 APARTMENTS                  C        2.16      0.25     0.200    50    7.61
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
 SUBAREA RUNOFF(CFS) =      3.36
 TOTAL AREA(ACRES) =      2.16   PEAK FLOW RATE(CFS) =      3.36

****************************************************************************
 FLOW PROCESS FROM NODE    120.00 TO NODE    130.00 IS CODE =  41
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =    28.00  DOWNSTREAM(FEET) =    25.70
 FLOW LENGTH(FEET) =    37.00   MANNING'S N =  0.013
 DEPTH OF FLOW IN  18.0 INCH PIPE IS   4.5 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   9.81
 GIVEN PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =       3.36
 PIPE TRAVEL TIME(MIN.) =   0.06    Tc(MIN.) =    7.68
 LONGEST FLOWPATH FROM NODE     30.00 TO NODE    130.00 =     315.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    130.00 TO NODE    130.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
 >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
 TIME OF CONCENTRATION(MIN.) =    7.68
 RAINFALL INTENSITY(INCH/HR) =   1.77
 AREA-AVERAGED Fm(INCH/HR) =  0.05
 AREA-AVERAGED Fp(INCH/HR) =  0.25
 AREA-AVERAGED Ap =  0.20
 EFFECTIVE STREAM AREA(ACRES) =       2.16
 TOTAL STREAM AREA(ACRES) =       2.16
 PEAK FLOW RATE(CFS) AT CONFLUENCE =       3.36

 ** CONFLUENCE DATA **
  STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
  NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
     1        3.31    9.85    1.534  0.25( 0.05) 0.20       2.3      10.00
     2        3.36    7.68    1.770  0.25( 0.05) 0.20       2.2      30.00

 RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
 CONFLUENCE FORMULA USED FOR  2 STREAMS.

 ** PEAK FLOW RATE TABLE **
  STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
  NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
     1        6.35    7.68    1.770  0.25( 0.05) 0.20       4.0      30.00
     2        6.21    9.85    1.534  0.25( 0.05) 0.20       4.5      10.00

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
```

```
  PEAK FLOW RATE(CFS) =       6.35    Tc(MIN.) =     7.68
  EFFECTIVE AREA(ACRES) =       3.95   AREA-AVERAGED Fm(INCH/HR) =  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.20
  TOTAL AREA(ACRES) =        4.5
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE    130.00 =     672.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    130.00 TO NODE    160.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    25.70  DOWNSTREAM(FEET) =    23.30
  FLOW LENGTH(FEET) =   474.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  24.0 INCH PIPE IS  10.8 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.64
  GIVEN PIPE DIAMETER(INCH) =  24.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       6.35
  PIPE TRAVEL TIME(MIN.) =   1.70    Tc(MIN.) =    9.38
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE    160.00 =    1146.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    160.00 TO NODE    160.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    9.38
  RAINFALL INTENSITY(INCH/HR) =   1.58
  AREA-AVERAGED Fm(INCH/HR) =  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.25
  AREA-AVERAGED Ap =  0.20
  EFFECTIVE STREAM AREA(ACRES) =       3.95
  TOTAL STREAM AREA(ACRES) =       4.46
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       6.35

****************************************************************************
  FLOW PROCESS FROM NODE    140.00 TO NODE    150.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   307.00
  ELEVATION DATA: UPSTREAM(FEET) =     36.30  DOWNSTREAM(FEET) =     33.20

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    8.027
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.725
  SUBAREA Tc AND LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  APARTMENTS                 C        2.12      0.25     0.200    50    8.03
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA RUNOFF(CFS) =      3.20
  TOTAL AREA(ACRES) =      2.12   PEAK FLOW RATE(CFS) =      3.20

****************************************************************************
  FLOW PROCESS FROM NODE    150.00 TO NODE    160.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
```

```
==========================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    27.30  DOWNSTREAM(FEET) =    23.30
  FLOW LENGTH(FEET) =    50.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   4.1 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  10.58
  GIVEN PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       3.20
  PIPE TRAVEL TIME(MIN.) =   0.08    Tc(MIN.) =    8.11
  LONGEST FLOWPATH FROM NODE    140.00 TO NODE    160.00 =     357.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    160.00 TO NODE    160.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
==========================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    8.11
  RAINFALL INTENSITY(INCH/HR) =   1.72
  AREA-AVERAGED Fm(INCH/HR) =  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.25
  AREA-AVERAGED Ap =  0.20
  EFFECTIVE STREAM AREA(ACRES) =       2.12
  TOTAL STREAM AREA(ACRES) =       2.12
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       3.20

  ** CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1        6.35    9.38    1.578  0.25( 0.05) 0.20       4.0      30.00
      1        6.21   11.57    1.399  0.25( 0.05) 0.20       4.5      10.00
      2        3.20    8.11    1.715  0.25( 0.05) 0.20       2.1     140.00

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR  2 STREAMS.

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1        9.18    8.11    1.715  0.25( 0.05) 0.20       5.5     140.00
      2        9.28    9.38    1.578  0.25( 0.05) 0.20       6.1      30.00
      3        8.80   11.57    1.399  0.25( 0.05) 0.20       6.6      10.00

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       9.28    Tc(MIN.) =     9.38
  EFFECTIVE AREA(ACRES) =       6.07   AREA-AVERAGED Fm(INCH/HR) =  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.20
  TOTAL AREA(ACRES) =        6.6
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE    160.00 =    1146.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    160.00 TO NODE    170.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
==========================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    23.30  DOWNSTREAM(FEET) =    21.00
  FLOW LENGTH(FEET) =   140.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  36.0 INCH PIPE IS   8.2 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   7.63
  GIVEN PIPE DIAMETER(INCH) =  36.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       9.28
```

```
  PIPE TRAVEL TIME(MIN.) =   0.31    Tc(MIN.) =    9.68
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE    170.00 =    1286.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    140.00 TO NODE    220.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   351.00
  ELEVATION DATA: UPSTREAM(FEET) =     36.30  DOWNSTREAM(FEET) =     31.40

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    7.938
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.736
  SUBAREA Tc AND LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  APARTMENTS                 C        1.44      0.25     0.200    50    7.94
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA RUNOFF(CFS) =      2.19
  TOTAL AREA(ACRES) =      1.44   PEAK FLOW RATE(CFS) =      2.19

****************************************************************************
  FLOW PROCESS FROM NODE    220.00 TO NODE    220.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    7.94
  RAINFALL INTENSITY(INCH/HR) =   1.74
  AREA-AVERAGED Fm(INCH/HR) =  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.25
  AREA-AVERAGED Ap =  0.20
  EFFECTIVE STREAM AREA(ACRES) =       1.44
  TOTAL STREAM AREA(ACRES) =       1.44
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       2.19

****************************************************************************
  FLOW PROCESS FROM NODE    210.00 TO NODE    220.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   342.00
  ELEVATION DATA: UPSTREAM(FEET) =     34.80  DOWNSTREAM(FEET) =     31.40

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    8.407
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.680
  SUBAREA Tc AND LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  APARTMENTS                 C        0.89      0.25     0.200    50    8.41
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA RUNOFF(CFS) =      1.31
  TOTAL AREA(ACRES) =      0.89   PEAK FLOW RATE(CFS) =      1.31

****************************************************************************
  FLOW PROCESS FROM NODE    220.00 TO NODE    220.00 IS CODE =   1
```

```
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    8.41
  RAINFALL INTENSITY(INCH/HR) =   1.68
  AREA-AVERAGED Fm(INCH/HR) =  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.25
  AREA-AVERAGED Ap =  0.20
  EFFECTIVE STREAM AREA(ACRES) =       0.89
  TOTAL STREAM AREA(ACRES) =       0.89
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       1.31

  ** CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
      1        2.19    7.94    1.736  0.25( 0.05) 0.20       1.4     140.00
      2        1.31    8.41    1.680  0.25( 0.05) 0.20       0.9     210.00

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR  2 STREAMS.

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
      1        3.46    7.94    1.736  0.25( 0.05) 0.20       2.3     140.00
      2        3.42    8.41    1.680  0.25( 0.05) 0.20       2.3     210.00

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       3.46    Tc(MIN.) =     7.94
  EFFECTIVE AREA(ACRES) =       2.28   AREA-AVERAGED Fm(INCH/HR) =  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.20
  TOTAL AREA(ACRES) =        2.3
  LONGEST FLOWPATH FROM NODE    140.00 TO NODE    220.00 =     351.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    220.00 TO NODE    240.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =    7.94
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.736
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  APARTMENTS                 C        0.12      0.25     0.200    50
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA AREA(ACRES) =    0.12      SUBAREA RUNOFF(CFS) =    0.18
  EFFECTIVE AREA(ACRES) =      2.40   AREA-AVERAGED Fm(INCH/HR) =  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.20
  TOTAL AREA(ACRES) =        2.4       PEAK FLOW RATE(CFS) =       3.64

****************************************************************************
  FLOW PROCESS FROM NODE    240.00 TO NODE    240.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    7.94
```

```
  RAINFALL INTENSITY(INCH/HR) =   1.74
  AREA-AVERAGED Fm(INCH/HR) =  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.25
  AREA-AVERAGED Ap =  0.20
  EFFECTIVE STREAM AREA(ACRES) =       2.40
  TOTAL STREAM AREA(ACRES) =       2.45
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       3.64

****************************************************************************
  FLOW PROCESS FROM NODE    230.00 TO NODE    240.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   273.00
  ELEVATION DATA: UPSTREAM(FEET) =     32.60  DOWNSTREAM(FEET) =     30.80

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    8.340
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.688
  SUBAREA Tc AND LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  APARTMENTS                 C        0.37      0.25     0.200    50    8.34
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA RUNOFF(CFS) =      0.55
  TOTAL AREA(ACRES) =      0.37   PEAK FLOW RATE(CFS) =      0.55

****************************************************************************
  FLOW PROCESS FROM NODE    240.00 TO NODE    240.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    8.34
  RAINFALL INTENSITY(INCH/HR) =   1.69
  AREA-AVERAGED Fm(INCH/HR) =  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.25
  AREA-AVERAGED Ap =  0.20
  EFFECTIVE STREAM AREA(ACRES) =       0.37
  TOTAL STREAM AREA(ACRES) =       0.37
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       0.55

  ** CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)      Ap     Ae     HEADWATER
   NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
      1        3.64    7.94    1.736  0.25( 0.05) 0.20       2.4     140.00
      1        3.59    8.41    1.680  0.25( 0.05) 0.20       2.4     210.00
      2        0.55    8.34    1.688  0.25( 0.05) 0.20       0.4     230.00

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR  2 STREAMS.

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)      Ap     Ae     HEADWATER
   NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
      1        4.18    7.94    1.736  0.25( 0.05) 0.20       2.8     140.00
      2        4.15    8.34    1.688  0.25( 0.05) 0.20       2.8     230.00
      3        4.14    8.41    1.680  0.25( 0.05) 0.20       2.8     210.00
```

```
  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       4.18    Tc(MIN.) =     7.94
  EFFECTIVE AREA(ACRES) =       2.75   AREA-AVERAGED Fm(INCH/HR) =  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.20
  TOTAL AREA(ACRES) =        2.8
  LONGEST FLOWPATH FROM NODE    140.00 TO NODE    240.00 =     351.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    300.00 TO NODE    310.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   330.00
  ELEVATION DATA: UPSTREAM(FEET) =     33.80  DOWNSTREAM(FEET) =     32.60

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   10.135
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.509
  SUBAREA Tc AND LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  APARTMENTS                 C        0.16      0.25     0.200    50   10.13
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA RUNOFF(CFS) =      0.21
  TOTAL AREA(ACRES) =      0.16   PEAK FLOW RATE(CFS) =      0.21

****************************************************************************
  FLOW PROCESS FROM NODE    310.00 TO NODE    320.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   10.13
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.509
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  APARTMENTS                 C        0.06      0.25     0.200    50
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA AREA(ACRES) =     0.06      SUBAREA RUNOFF(CFS) =     0.08
  EFFECTIVE AREA(ACRES) =      0.22   AREA-AVERAGED Fm(INCH/HR) =  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.20
  TOTAL AREA(ACRES) =        0.2       PEAK FLOW RATE(CFS) =       0.29

****************************************************************************
  FLOW PROCESS FROM NODE    400.00 TO NODE    410.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   300.00
  ELEVATION DATA: UPSTREAM(FEET) =     33.10  DOWNSTREAM(FEET) =     32.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   14.519
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.228
  SUBAREA Tc AND LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  PUBLIC PARK                C        0.47      0.25     0.850    50   14.52
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
```

```
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.850
  SUBAREA RUNOFF(CFS) =      0.43
  TOTAL AREA(ACRES) =      0.47   PEAK FLOW RATE(CFS) =      0.43

****************************************************************************
  FLOW PROCESS FROM NODE    500.00 TO NODE    530.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   248.00
  ELEVATION DATA: UPSTREAM(FEET) =     32.90  DOWNSTREAM(FEET) =     31.40

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    8.166
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.708
  SUBAREA Tc AND LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  APARTMENTS                 C        0.04      0.25     0.200    50    8.17
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA RUNOFF(CFS) =      0.06
  TOTAL AREA(ACRES) =      0.04   PEAK FLOW RATE(CFS) =      0.06

****************************************************************************
  FLOW PROCESS FROM NODE    530.00 TO NODE    530.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    8.17
  RAINFALL INTENSITY(INCH/HR) =   1.71
  AREA-AVERAGED Fm(INCH/HR) =  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.25
  AREA-AVERAGED Ap =  0.20
  EFFECTIVE STREAM AREA(ACRES) =       0.04
  TOTAL STREAM AREA(ACRES) =       0.04
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       0.06

****************************************************************************
  FLOW PROCESS FROM NODE    520.00 TO NODE    530.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   219.00
  ELEVATION DATA: UPSTREAM(FEET) =     33.00  DOWNSTREAM(FEET) =     30.50

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    6.843
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.891
  SUBAREA Tc AND LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  APARTMENTS                 C        0.24      0.25     0.200    50    6.84
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA RUNOFF(CFS) =      0.40
  TOTAL AREA(ACRES) =      0.24   PEAK FLOW RATE(CFS) =      0.40

****************************************************************************
```

```
 FLOW PROCESS FROM NODE    530.00 TO NODE    530.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
 >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
 TIME OF CONCENTRATION(MIN.) =    6.84
 RAINFALL INTENSITY(INCH/HR) =   1.89
 AREA-AVERAGED Fm(INCH/HR) =  0.05
 AREA-AVERAGED Fp(INCH/HR) =  0.25
 AREA-AVERAGED Ap =  0.20
 EFFECTIVE STREAM AREA(ACRES) =       0.24
 TOTAL STREAM AREA(ACRES) =       0.24
 PEAK FLOW RATE(CFS) AT CONFLUENCE =       0.40

 ** CONFLUENCE DATA **
  STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
  NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
     1        0.06    8.17    1.708  0.25( 0.05) 0.20       0.0     500.00
     2        0.40    6.84    1.891  0.25( 0.05) 0.20       0.2     520.00

 RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
 CONFLUENCE FORMULA USED FOR  2 STREAMS.

 ** PEAK FLOW RATE TABLE **
  STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
  NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
     1        0.45    6.84    1.891  0.25( 0.05) 0.20       0.3     520.00
     2        0.42    8.17    1.708  0.25( 0.05) 0.20       0.3     500.00

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =       0.45    Tc(MIN.) =     6.84
 EFFECTIVE AREA(ACRES) =       0.27   AREA-AVERAGED Fm(INCH/HR) =  0.05
 AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.20
 TOTAL AREA(ACRES) =        0.3
 LONGEST FLOWPATH FROM NODE    500.00 TO NODE    530.00 =     248.00 FEET.
============================================================================
 END OF STUDY SUMMARY:
 TOTAL AREA(ACRES)     =        0.3  TC(MIN.) =      6.84
 EFFECTIVE AREA(ACRES) =      0.27  AREA-AVERAGED Fm(INCH/HR)=  0.05
 AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap = 0.200
 PEAK FLOW RATE(CFS)   =       0.45

 ** PEAK FLOW RATE TABLE **
  STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
  NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
     1        0.45    6.84    1.891  0.25( 0.05) 0.20       0.3     520.00
     2        0.42    8.17    1.708  0.25( 0.05) 0.20       0.3     500.00
============================================================================
============================================================================
 END OF RATIONAL METHOD ANALYSIS
```

```
******************************************************************************
             RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            (Reference: 1986 ORANGE COUNTY HYDROLOGY CRITERION)
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                            Analysis prepared by:

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                                  Suite 1470
                            Los Angeles, CA 90017

 ************************** DESCRIPTION OF STUDY **************************
*                               HIVE LIVE                                  *
*                            PROPOSED CONDITIONS                           *
*                              25 YEAR STORM                               *
 ******************************************************************************

  FILE NAME: HIVEP.DAT
  TIME/DATE OF STUDY: 11:33 09/09/2024
==============================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
==============================================================================
                     --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =   25.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =   3.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.90
  *DATA BANK RAINFALL USED*
  *ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD*

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)     SIDE / SIDE/ WAY    (FT)    (FT)  (FT)   (FT)    (n)
===  =====  =========  ==================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0312 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
  *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

******************************************************************************
  FLOW PROCESS FROM NODE     10.00 TO NODE     20.00 IS CODE =  21
------------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
==============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   413.00
  ELEVATION DATA: UPSTREAM(FEET) =     37.40  DOWNSTREAM(FEET) =     32.90

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    8.902
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.480
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
```

```
  APARTMENTS                  C        1.67      0.25     0.200    69    8.90
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA RUNOFF(CFS) =      5.16
  TOTAL AREA(ACRES) =      1.67   PEAK FLOW RATE(CFS) =      5.16

****************************************************************************
  FLOW PROCESS FROM NODE     20.00 TO NODE     50.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    27.60  DOWNSTREAM(FEET) =    25.50
  FLOW LENGTH(FEET) =   373.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  18.0 INCH PIPE IS  11.0 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.56
  GIVEN PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       5.16
  PIPE TRAVEL TIME(MIN.) =   1.36    Tc(MIN.) =   10.26
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     50.00 =     786.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     50.00 TO NODE     50.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =   10.26
  RAINFALL INTENSITY(INCH/HR) =   3.21
  AREA-AVERAGED Fm(INCH/HR) =  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.25
  AREA-AVERAGED Ap =  0.20
  EFFECTIVE STREAM AREA(ACRES) =       1.67
  TOTAL STREAM AREA(ACRES) =       1.67
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       5.16

****************************************************************************
  FLOW PROCESS FROM NODE     30.00 TO NODE     40.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   325.00
  ELEVATION DATA: UPSTREAM(FEET) =     36.50  DOWNSTREAM(FEET) =     31.70

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    7.611
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.803
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  APARTMENTS                  C        2.69      0.25     0.200    69    7.61
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA RUNOFF(CFS) =      9.09
  TOTAL AREA(ACRES) =      2.69   PEAK FLOW RATE(CFS) =      9.09

****************************************************************************
  FLOW PROCESS FROM NODE     40.00 TO NODE     50.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
```

```
================================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    27.30  DOWNSTREAM(FEET) =    25.50
  FLOW LENGTH(FEET) =    26.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   7.3 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  13.49
  GIVEN PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       9.09
  PIPE TRAVEL TIME(MIN.) =   0.03    Tc(MIN.) =    7.64
  LONGEST FLOWPATH FROM NODE     30.00 TO NODE     50.00 =     351.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     50.00 TO NODE     50.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    7.64
  RAINFALL INTENSITY(INCH/HR) =   3.79
  AREA-AVERAGED Fm(INCH/HR) =  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.25
  AREA-AVERAGED Ap =  0.20
  EFFECTIVE STREAM AREA(ACRES) =       2.69
  TOTAL STREAM AREA(ACRES) =       2.69
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       9.09

  ** CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1        5.16   10.26    3.211  0.25( 0.05) 0.20       1.7      10.00
      2        9.09    7.64    3.794  0.25( 0.05) 0.20       2.7      30.00

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR  2 STREAMS.

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1       13.63    7.64    3.794  0.25( 0.05) 0.20       3.9      30.00
      2       12.83   10.26    3.211  0.25( 0.05) 0.20       4.4      10.00

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      13.63    Tc(MIN.) =     7.64
  EFFECTIVE AREA(ACRES) =       3.93   AREA-AVERAGED Fm(INCH/HR) =  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.20
  TOTAL AREA(ACRES) =        4.4
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     50.00 =     786.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     50.00 TO NODE     60.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =    7.64
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.794
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  APARTMENTS                 C        0.13      0.25     0.200    69
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA AREA(ACRES) =    0.13      SUBAREA RUNOFF(CFS) =    0.44
```

```
  EFFECTIVE AREA(ACRES) =      4.06   AREA-AVERAGED Fm(INCH/HR) =  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.20
  TOTAL AREA(ACRES) =        4.5       PEAK FLOW RATE(CFS) =      13.69

****************************************************************************
  FLOW PROCESS FROM NODE     10.00 TO NODE    110.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   371.00
  ELEVATION DATA: UPSTREAM(FEET) =     37.40  DOWNSTREAM(FEET) =     33.70

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    8.680
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.530
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  APARTMENTS                 C        2.30      0.25     0.200    69    8.68
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA RUNOFF(CFS) =      7.20
  TOTAL AREA(ACRES) =      2.30   PEAK FLOW RATE(CFS) =      7.20

****************************************************************************
  FLOW PROCESS FROM NODE    110.00 TO NODE    130.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    27.60  DOWNSTREAM(FEET) =    25.70
  FLOW LENGTH(FEET) =   301.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  18.0 INCH PIPE IS  13.5 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.07
  GIVEN PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       7.20
  PIPE TRAVEL TIME(MIN.) =   0.99    Tc(MIN.) =    9.67
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE    130.00 =     672.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    130.00 TO NODE    130.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    9.67
  RAINFALL INTENSITY(INCH/HR) =   3.32
  AREA-AVERAGED Fm(INCH/HR) =  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.25
  AREA-AVERAGED Ap =  0.20
  EFFECTIVE STREAM AREA(ACRES) =       2.30
  TOTAL STREAM AREA(ACRES) =       2.30
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       7.20

****************************************************************************
  FLOW PROCESS FROM NODE     30.00 TO NODE    120.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   278.00
```

```
 ELEVATION DATA: UPSTREAM(FEET) =     36.50  DOWNSTREAM(FEET) =     33.50

 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    7.613
 *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.802
 SUBAREA Tc AND LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
 APARTMENTS                 C        2.16      0.25     0.200    69    7.61
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
 SUBAREA RUNOFF(CFS) =      7.29
 TOTAL AREA(ACRES) =      2.16   PEAK FLOW RATE(CFS) =      7.29

****************************************************************************
 FLOW PROCESS FROM NODE    120.00 TO NODE    130.00 IS CODE =  41
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =    28.00  DOWNSTREAM(FEET) =    25.70
 FLOW LENGTH(FEET) =    37.00   MANNING'S N =  0.013
 DEPTH OF FLOW IN  18.0 INCH PIPE IS   6.7 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  12.22
 GIVEN PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =       7.29
 PIPE TRAVEL TIME(MIN.) =   0.05    Tc(MIN.) =    7.66
 LONGEST FLOWPATH FROM NODE     30.00 TO NODE    130.00 =     315.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    130.00 TO NODE    130.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
 >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
 TIME OF CONCENTRATION(MIN.) =    7.66
 RAINFALL INTENSITY(INCH/HR) =   3.79
 AREA-AVERAGED Fm(INCH/HR) =  0.05
 AREA-AVERAGED Fp(INCH/HR) =  0.25
 AREA-AVERAGED Ap =  0.20
 EFFECTIVE STREAM AREA(ACRES) =       2.16
 TOTAL STREAM AREA(ACRES) =       2.16
 PEAK FLOW RATE(CFS) AT CONFLUENCE =       7.29

 ** CONFLUENCE DATA **
  STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
  NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
     1        7.20    9.67    3.321  0.25( 0.05) 0.20       2.3      10.00
     2        7.29    7.66    3.788  0.25( 0.05) 0.20       2.2      30.00

 RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
 CONFLUENCE FORMULA USED FOR  2 STREAMS.

 ** PEAK FLOW RATE TABLE **
  STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
  NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
     1       13.82    7.66    3.788  0.25( 0.05) 0.20       4.0      30.00
     2       13.59    9.67    3.321  0.25( 0.05) 0.20       4.5      10.00

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =      13.82    Tc(MIN.) =     7.66
```

```
  EFFECTIVE AREA(ACRES) =       3.98   AREA-AVERAGED Fm(INCH/HR) =  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.20
  TOTAL AREA(ACRES) =        4.5
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE    130.00 =     672.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    130.00 TO NODE    160.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    25.70  DOWNSTREAM(FEET) =    23.30
  FLOW LENGTH(FEET) =   474.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  24.0 INCH PIPE IS  17.9 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.51
  GIVEN PIPE DIAMETER(INCH) =  24.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      13.82
  PIPE TRAVEL TIME(MIN.) =   1.44    Tc(MIN.) =    9.10
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE    160.00 =    1146.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    160.00 TO NODE    160.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    9.10
  RAINFALL INTENSITY(INCH/HR) =   3.44
  AREA-AVERAGED Fm(INCH/HR) =  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.25
  AREA-AVERAGED Ap =  0.20
  EFFECTIVE STREAM AREA(ACRES) =       3.98
  TOTAL STREAM AREA(ACRES) =       4.46
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      13.82

****************************************************************************
  FLOW PROCESS FROM NODE    140.00 TO NODE    150.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   307.00
  ELEVATION DATA: UPSTREAM(FEET) =     36.30  DOWNSTREAM(FEET) =     33.20

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    8.027
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.690
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  APARTMENTS                 C        2.12      0.25     0.200    69    8.03
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA RUNOFF(CFS) =      6.95
  TOTAL AREA(ACRES) =      2.12   PEAK FLOW RATE(CFS) =      6.95

****************************************************************************
  FLOW PROCESS FROM NODE    150.00 TO NODE    160.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
```

```
 ELEVATION DATA: UPSTREAM(FEET) =    27.30  DOWNSTREAM(FEET) =    23.30
 FLOW LENGTH(FEET) =    50.00   MANNING'S N =  0.013
 DEPTH OF FLOW IN  18.0 INCH PIPE IS   6.1 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  13.21
 GIVEN PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =       6.95
 PIPE TRAVEL TIME(MIN.) =   0.06    Tc(MIN.) =    8.09
 LONGEST FLOWPATH FROM NODE    140.00 TO NODE    160.00 =     357.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    160.00 TO NODE    160.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
 >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
 TIME OF CONCENTRATION(MIN.) =    8.09
 RAINFALL INTENSITY(INCH/HR) =   3.67
 AREA-AVERAGED Fm(INCH/HR) =  0.05
 AREA-AVERAGED Fp(INCH/HR) =  0.25
 AREA-AVERAGED Ap =  0.20
 EFFECTIVE STREAM AREA(ACRES) =       2.12
 TOTAL STREAM AREA(ACRES) =       2.12
 PEAK FLOW RATE(CFS) AT CONFLUENCE =       6.95

 ** CONFLUENCE DATA **
  STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
  NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
     1       13.82    9.10    3.437  0.25( 0.05) 0.20       4.0      30.00
     1       13.59   11.11    3.070  0.25( 0.05) 0.20       4.5      10.00
     2        6.95    8.09    3.674  0.25( 0.05) 0.20       2.1     140.00

 RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
 CONFLUENCE FORMULA USED FOR  2 STREAMS.

 ** PEAK FLOW RATE TABLE **
  STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
  NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
     1       20.09    8.09    3.674  0.25( 0.05) 0.20       5.7     140.00
     2       20.31    9.10    3.437  0.25( 0.05) 0.20       6.1      30.00
     3       19.38   11.11    3.070  0.25( 0.05) 0.20       6.6      10.00

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =      20.31    Tc(MIN.) =     9.10
 EFFECTIVE AREA(ACRES) =       6.10   AREA-AVERAGED Fm(INCH/HR) =  0.05
 AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.20
 TOTAL AREA(ACRES) =        6.6
 LONGEST FLOWPATH FROM NODE     10.00 TO NODE    160.00 =    1146.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    160.00 TO NODE    170.00 IS CODE =  41
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =    23.30  DOWNSTREAM(FEET) =    21.00
 FLOW LENGTH(FEET) =   140.00   MANNING'S N =  0.013
 DEPTH OF FLOW IN  36.0 INCH PIPE IS  12.3 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   9.54
 GIVEN PIPE DIAMETER(INCH) =  36.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      20.31
 PIPE TRAVEL TIME(MIN.) =   0.24    Tc(MIN.) =    9.34
```

```
 LONGEST FLOWPATH FROM NODE     10.00 TO NODE    170.00 =    1286.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    140.00 TO NODE    220.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
 INITIAL SUBAREA FLOW-LENGTH(FEET) =   351.00
 ELEVATION DATA: UPSTREAM(FEET) =     36.30  DOWNSTREAM(FEET) =     31.40

 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    7.938
 *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.713
 SUBAREA Tc AND LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
 APARTMENTS                 C        1.44      0.25     0.200    69    7.94
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
 SUBAREA RUNOFF(CFS) =      4.75
 TOTAL AREA(ACRES) =      1.44   PEAK FLOW RATE(CFS) =      4.75

****************************************************************************
 FLOW PROCESS FROM NODE    220.00 TO NODE    220.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
 TIME OF CONCENTRATION(MIN.) =    7.94
 RAINFALL INTENSITY(INCH/HR) =   3.71
 AREA-AVERAGED Fm(INCH/HR) =  0.05
 AREA-AVERAGED Fp(INCH/HR) =  0.25
 AREA-AVERAGED Ap =  0.20
 EFFECTIVE STREAM AREA(ACRES) =       1.44
 TOTAL STREAM AREA(ACRES) =       1.44
 PEAK FLOW RATE(CFS) AT CONFLUENCE =       4.75

****************************************************************************
 FLOW PROCESS FROM NODE    210.00 TO NODE    220.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
 INITIAL SUBAREA FLOW-LENGTH(FEET) =   342.00
 ELEVATION DATA: UPSTREAM(FEET) =     34.80  DOWNSTREAM(FEET) =     31.40

 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    8.407
 *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.595
 SUBAREA Tc AND LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
 APARTMENTS                 C        0.89      0.25     0.200    69    8.41
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
 SUBAREA RUNOFF(CFS) =      2.84
 TOTAL AREA(ACRES) =      0.89   PEAK FLOW RATE(CFS) =      2.84

****************************************************************************
 FLOW PROCESS FROM NODE    220.00 TO NODE    220.00 IS CODE =   1
----------------------------------------------------------------------------
```

```
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
================================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    8.41
  RAINFALL INTENSITY(INCH/HR) =   3.59
  AREA-AVERAGED Fm(INCH/HR) =  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.25
  AREA-AVERAGED Ap =  0.20
  EFFECTIVE STREAM AREA(ACRES) =       0.89
  TOTAL STREAM AREA(ACRES) =       0.89
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       2.84

  ** CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
      1        4.75    7.94    3.713  0.25( 0.05) 0.20       1.4     140.00
      2        2.84    8.41    3.595  0.25( 0.05) 0.20       0.9     210.00

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR  2 STREAMS.

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
      1        7.52    7.94    3.713  0.25( 0.05) 0.20       2.3     140.00
      2        7.43    8.41    3.595  0.25( 0.05) 0.20       2.3     210.00

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       7.52    Tc(MIN.) =     7.94
  EFFECTIVE AREA(ACRES) =       2.28   AREA-AVERAGED Fm(INCH/HR) =  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.20
  TOTAL AREA(ACRES) =        2.3
  LONGEST FLOWPATH FROM NODE    140.00 TO NODE    220.00 =     351.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    220.00 TO NODE    240.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =    7.94
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.713
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  APARTMENTS                 C        0.12      0.25     0.200    69
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA AREA(ACRES) =    0.12      SUBAREA RUNOFF(CFS) =    0.40
  EFFECTIVE AREA(ACRES) =      2.40   AREA-AVERAGED Fm(INCH/HR) =  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.20
  TOTAL AREA(ACRES) =        2.4       PEAK FLOW RATE(CFS) =       7.91

****************************************************************************
  FLOW PROCESS FROM NODE    240.00 TO NODE    240.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    7.94
  RAINFALL INTENSITY(INCH/HR) =   3.71
```

```
 AREA-AVERAGED Fm(INCH/HR) =  0.05
 AREA-AVERAGED Fp(INCH/HR) =  0.25
 AREA-AVERAGED Ap =  0.20
 EFFECTIVE STREAM AREA(ACRES) =       2.40
 TOTAL STREAM AREA(ACRES) =       2.45
 PEAK FLOW RATE(CFS) AT CONFLUENCE =       7.91

****************************************************************************
 FLOW PROCESS FROM NODE    230.00 TO NODE    240.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
 INITIAL SUBAREA FLOW-LENGTH(FEET) =   273.00
 ELEVATION DATA: UPSTREAM(FEET) =     32.60  DOWNSTREAM(FEET) =     30.80

 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    8.340
 *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.611
 SUBAREA Tc AND LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS   Tc
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
 APARTMENTS                 C        0.37      0.25     0.200    69    8.34
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
 SUBAREA RUNOFF(CFS) =      1.19
 TOTAL AREA(ACRES) =      0.37   PEAK FLOW RATE(CFS) =      1.19

****************************************************************************
 FLOW PROCESS FROM NODE    240.00 TO NODE    240.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
 >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
 TIME OF CONCENTRATION(MIN.) =    8.34
 RAINFALL INTENSITY(INCH/HR) =   3.61
 AREA-AVERAGED Fm(INCH/HR) =  0.05
 AREA-AVERAGED Fp(INCH/HR) =  0.25
 AREA-AVERAGED Ap =  0.20
 EFFECTIVE STREAM AREA(ACRES) =       0.37
 TOTAL STREAM AREA(ACRES) =       0.37
 PEAK FLOW RATE(CFS) AT CONFLUENCE =       1.19

 ** CONFLUENCE DATA **
  STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
  NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
     1        7.91    7.94    3.713  0.25( 0.05) 0.20       2.4     140.00
     1        7.82    8.41    3.595  0.25( 0.05) 0.20       2.4     210.00
     2        1.19    8.34    3.611  0.25( 0.05) 0.20       0.4     230.00

 RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
 CONFLUENCE FORMULA USED FOR  2 STREAMS.

 ** PEAK FLOW RATE TABLE **
  STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
  NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
     1        9.07    7.94    3.713  0.25( 0.05) 0.20       2.8     140.00
     2        9.02    8.34    3.611  0.25( 0.05) 0.20       2.8     230.00
     3        9.00    8.41    3.595  0.25( 0.05) 0.20       2.8     210.00

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
```

```
  PEAK FLOW RATE(CFS) =       9.07    Tc(MIN.) =     7.94
  EFFECTIVE AREA(ACRES) =       2.75   AREA-AVERAGED Fm(INCH/HR) =  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.20
  TOTAL AREA(ACRES) =        2.8
  LONGEST FLOWPATH FROM NODE    140.00 TO NODE    240.00 =     351.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    300.00 TO NODE    310.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   330.00
  ELEVATION DATA: UPSTREAM(FEET) =     33.80  DOWNSTREAM(FEET) =     32.60

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   10.135
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.234
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  APARTMENTS                 C        0.16      0.25     0.200    69   10.13
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA RUNOFF(CFS) =      0.46
  TOTAL AREA(ACRES) =      0.16   PEAK FLOW RATE(CFS) =      0.46

****************************************************************************
  FLOW PROCESS FROM NODE    310.00 TO NODE    320.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   10.13
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.234
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  APARTMENTS                 C        0.06      0.25     0.200    69
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA AREA(ACRES) =     0.06      SUBAREA RUNOFF(CFS) =     0.17
  EFFECTIVE AREA(ACRES) =      0.22   AREA-AVERAGED Fm(INCH/HR) =  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.20
  TOTAL AREA(ACRES) =        0.2       PEAK FLOW RATE(CFS) =       0.63

****************************************************************************
  FLOW PROCESS FROM NODE    400.00 TO NODE    410.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   300.00
  ELEVATION DATA: UPSTREAM(FEET) =     33.10  DOWNSTREAM(FEET) =     32.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   14.519
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  2.638
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  PUBLIC PARK                C        0.47      0.25     0.850    69   14.52
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.850
```

```
  SUBAREA RUNOFF(CFS) =      1.03
  TOTAL AREA(ACRES) =      0.47   PEAK FLOW RATE(CFS) =      1.03

****************************************************************************
  FLOW PROCESS FROM NODE    500.00 TO NODE    530.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   248.00
  ELEVATION DATA: UPSTREAM(FEET) =     32.90  DOWNSTREAM(FEET) =     31.40

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    8.166
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.654
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  APARTMENTS                 C        0.04      0.25      0.200    69    8.17
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA RUNOFF(CFS) =      0.13
  TOTAL AREA(ACRES) =      0.04   PEAK FLOW RATE(CFS) =      0.13

****************************************************************************
  FLOW PROCESS FROM NODE    530.00 TO NODE    530.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    8.17
  RAINFALL INTENSITY(INCH/HR) =   3.65
  AREA-AVERAGED Fm(INCH/HR) =  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.25
  AREA-AVERAGED Ap =  0.20
  EFFECTIVE STREAM AREA(ACRES) =       0.04
  TOTAL STREAM AREA(ACRES) =       0.04
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       0.13

****************************************************************************
  FLOW PROCESS FROM NODE    520.00 TO NODE    530.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   219.00
  ELEVATION DATA: UPSTREAM(FEET) =     33.00  DOWNSTREAM(FEET) =     30.50

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    6.843
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  4.039
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  APARTMENTS                 C        0.24      0.25      0.200    69    6.84
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA RUNOFF(CFS) =      0.86
  TOTAL AREA(ACRES) =      0.24   PEAK FLOW RATE(CFS) =      0.86

****************************************************************************
  FLOW PROCESS FROM NODE    530.00 TO NODE    530.00 IS CODE =   1
```

```
--------------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
================================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    6.84
  RAINFALL INTENSITY(INCH/HR) =   4.04
  AREA-AVERAGED Fm(INCH/HR) =  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.25
  AREA-AVERAGED Ap =  0.20
  EFFECTIVE STREAM AREA(ACRES) =       0.24
  TOTAL STREAM AREA(ACRES) =       0.24
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       0.86

  ** CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
      1        0.13    8.17    3.654  0.25( 0.05) 0.20       0.0     500.00
      2        0.86    6.84    4.039  0.25( 0.05) 0.20       0.2     520.00

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR  2 STREAMS.

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
      1        0.98    6.84    4.039  0.25( 0.05) 0.20       0.3     520.00
      2        0.91    8.17    3.654  0.25( 0.05) 0.20       0.3     500.00

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       0.98    Tc(MIN.) =     6.84
  EFFECTIVE AREA(ACRES) =       0.27   AREA-AVERAGED Fm(INCH/HR) =  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.20
  TOTAL AREA(ACRES) =        0.3
  LONGEST FLOWPATH FROM NODE    500.00 TO NODE    530.00 =     248.00 FEET.
================================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        0.3  TC(MIN.) =      6.84
  EFFECTIVE AREA(ACRES) =      0.27  AREA-AVERAGED Fm(INCH/HR)=  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap = 0.200
  PEAK FLOW RATE(CFS)   =       0.98

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
      1        0.98    6.84    4.039  0.25( 0.05) 0.20       0.3     520.00
      2        0.91    8.17    3.654  0.25( 0.05) 0.20       0.3     500.00
================================================================================
================================================================================
  END OF RATIONAL METHOD ANALYSIS
```

```
**************************************************************************
            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
           (Reference: 1986 ORANGE COUNTY HYDROLOGY CRITERION)
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             Ver. 23.0  Release Date: 07/01/2016  License ID 1355

                          Analysis prepared by:

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 ************************* DESCRIPTION OF STUDY *************************
*                              HIVE LIVE                                 *
*                            PROPOSED CONDITIONS                         *
*                              100 YEAR STORM                            *
 **************************************************************************

  FILE NAME: HIVEP.DAT
  TIME/DATE OF STUDY: 11:34 09/09/2024
==========================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
==========================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =  100.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =   3.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.90
  *DATA BANK RAINFALL USED*
  *ANTECEDENT MOISTURE CONDITION (AMC) III ASSUMED FOR RATIONAL METHOD*

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)   (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0312 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
  *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

**************************************************************************
  FLOW PROCESS FROM NODE     10.00 TO NODE     20.00 IS CODE =  21
--------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
==========================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   413.00
  ELEVATION DATA: UPSTREAM(FEET) =     37.40  DOWNSTREAM(FEET) =     32.90

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    8.902
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.446
  SUBAREA Tc AND LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
```

```
  APARTMENTS                  C        1.67      0.25     0.200    86    8.90
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA RUNOFF(CFS) =      6.61
  TOTAL AREA(ACRES) =      1.67   PEAK FLOW RATE(CFS) =      6.61

****************************************************************************
  FLOW PROCESS FROM NODE     20.00 TO NODE     50.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    27.60  DOWNSTREAM(FEET) =    25.50
  FLOW LENGTH(FEET) =   373.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  18.0 INCH PIPE IS  13.1 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.78
  GIVEN PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       6.61
  PIPE TRAVEL TIME(MIN.) =   1.30    Tc(MIN.) =   10.20
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     50.00 =     786.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     50.00 TO NODE     50.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =   10.20
  RAINFALL INTENSITY(INCH/HR) =   4.11
  AREA-AVERAGED Fm(INCH/HR) =  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.25
  AREA-AVERAGED Ap =  0.20
  EFFECTIVE STREAM AREA(ACRES) =       1.67
  TOTAL STREAM AREA(ACRES) =       1.67
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       6.61

****************************************************************************
  FLOW PROCESS FROM NODE     30.00 TO NODE     40.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   325.00
  ELEVATION DATA: UPSTREAM(FEET) =     36.50  DOWNSTREAM(FEET) =     31.70

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    7.611
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.864
  SUBAREA Tc AND LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  APARTMENTS                  C        2.69      0.25     0.200    86    7.61
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA RUNOFF(CFS) =     11.65
  TOTAL AREA(ACRES) =      2.69   PEAK FLOW RATE(CFS) =     11.65

****************************************************************************
  FLOW PROCESS FROM NODE     40.00 TO NODE     50.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
```

```
================================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    27.30  DOWNSTREAM(FEET) =    25.50
  FLOW LENGTH(FEET) =    26.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   8.4 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  14.40
  GIVEN PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      11.65
  PIPE TRAVEL TIME(MIN.) =   0.03    Tc(MIN.) =    7.64
  LONGEST FLOWPATH FROM NODE     30.00 TO NODE     50.00 =     351.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     50.00 TO NODE     50.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    7.64
  RAINFALL INTENSITY(INCH/HR) =   4.85
  AREA-AVERAGED Fm(INCH/HR) =  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.25
  AREA-AVERAGED Ap =  0.20
  EFFECTIVE STREAM AREA(ACRES) =       2.69
  TOTAL STREAM AREA(ACRES) =       2.69
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      11.65

  ** CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1        6.61   10.20    4.112  0.25( 0.05) 0.20       1.7      10.00
      2       11.65    7.64    4.853  0.25( 0.05) 0.20       2.7      30.00

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR  2 STREAMS.

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1       17.50    7.64    4.853  0.25( 0.05) 0.20       3.9      30.00
      2       16.46   10.20    4.112  0.25( 0.05) 0.20       4.4      10.00

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      17.50    Tc(MIN.) =     7.64
  EFFECTIVE AREA(ACRES) =       3.94   AREA-AVERAGED Fm(INCH/HR) =  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.20
  TOTAL AREA(ACRES) =        4.4
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     50.00 =     786.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     50.00 TO NODE     60.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =    7.64
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.853
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  APARTMENTS                 C        0.13      0.25     0.200    86
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA AREA(ACRES) =    0.13      SUBAREA RUNOFF(CFS) =    0.56
```

```
  EFFECTIVE AREA(ACRES) =      4.07   AREA-AVERAGED Fm(INCH/HR) =  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.20
  TOTAL AREA(ACRES) =        4.5       PEAK FLOW RATE(CFS) =      17.59

****************************************************************************
  FLOW PROCESS FROM NODE     10.00 TO NODE    110.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   371.00
  ELEVATION DATA: UPSTREAM(FEET) =     37.40  DOWNSTREAM(FEET) =     33.70

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    8.680
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.511
  SUBAREA Tc AND LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  APARTMENTS                 C        2.30      0.25     0.200    86    8.68
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA RUNOFF(CFS) =      9.23
  TOTAL AREA(ACRES) =      2.30   PEAK FLOW RATE(CFS) =      9.23

****************************************************************************
  FLOW PROCESS FROM NODE    110.00 TO NODE    130.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    27.60  DOWNSTREAM(FEET) =    25.70
  FLOW LENGTH(FEET) =   301.00   MANNING'S N =  0.013
  ASSUME FULL-FLOWING PIPELINE
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.23
  PIPE FLOW VELOCITY = (TOTAL FLOW)/(PIPE CROSS SECTION AREA)
  GIVEN PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       9.23
  PIPE TRAVEL TIME(MIN.) =   0.96    Tc(MIN.) =    9.64
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE    130.00 =     672.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    130.00 TO NODE    130.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    9.64
  RAINFALL INTENSITY(INCH/HR) =   4.25
  AREA-AVERAGED Fm(INCH/HR) =  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.25
  AREA-AVERAGED Ap =  0.20
  EFFECTIVE STREAM AREA(ACRES) =       2.30
  TOTAL STREAM AREA(ACRES) =       2.30
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       9.23

****************************************************************************
  FLOW PROCESS FROM NODE     30.00 TO NODE    120.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
```

```
 INITIAL SUBAREA FLOW-LENGTH(FEET) =   278.00
 ELEVATION DATA: UPSTREAM(FEET) =     36.50  DOWNSTREAM(FEET) =     33.50

 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    7.613
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.863
 SUBAREA Tc AND LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS   Tc
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
 APARTMENTS                  C        2.16      0.25     0.200    86    7.61
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
 SUBAREA RUNOFF(CFS) =      9.36
 TOTAL AREA(ACRES) =      2.16   PEAK FLOW RATE(CFS) =      9.36

****************************************************************************
 FLOW PROCESS FROM NODE    120.00 TO NODE    130.00 IS CODE =  41
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =    28.00  DOWNSTREAM(FEET) =    25.70
 FLOW LENGTH(FEET) =    37.00   MANNING'S N =  0.013
 DEPTH OF FLOW IN  18.0 INCH PIPE IS   7.7 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  13.07
 GIVEN PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =       9.36
 PIPE TRAVEL TIME(MIN.) =   0.05    Tc(MIN.) =    7.66
 LONGEST FLOWPATH FROM NODE     30.00 TO NODE    130.00 =     315.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    130.00 TO NODE    130.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
 >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
 TIME OF CONCENTRATION(MIN.) =    7.66
 RAINFALL INTENSITY(INCH/HR) =   4.85
 AREA-AVERAGED Fm(INCH/HR) =  0.05
 AREA-AVERAGED Fp(INCH/HR) =  0.25
 AREA-AVERAGED Ap =  0.20
 EFFECTIVE STREAM AREA(ACRES) =       2.16
 TOTAL STREAM AREA(ACRES) =       2.16
 PEAK FLOW RATE(CFS) AT CONFLUENCE =       9.36

 ** CONFLUENCE DATA **
  STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
  NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
     1        9.23    9.64    4.247  0.25( 0.05) 0.20       2.3      10.00
     2        9.36    7.66    4.846  0.25( 0.05) 0.20       2.2      30.00

 RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
 CONFLUENCE FORMULA USED FOR  2 STREAMS.

 ** PEAK FLOW RATE TABLE **
  STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
  NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
     1       17.74    7.66    4.846  0.25( 0.05) 0.20       4.0      30.00
     2       17.42    9.64    4.247  0.25( 0.05) 0.20       4.5      10.00

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
```

```
  PEAK FLOW RATE(CFS) =      17.74    Tc(MIN.) =     7.66
  EFFECTIVE AREA(ACRES) =       3.99   AREA-AVERAGED Fm(INCH/HR) =  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.20
  TOTAL AREA(ACRES) =        4.5
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE    130.00 =     672.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    130.00 TO NODE    160.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    25.70  DOWNSTREAM(FEET) =    23.30
  FLOW LENGTH(FEET) =   474.00   MANNING'S N =  0.013
  ASSUME FULL-FLOWING PIPELINE
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.65
  PIPE FLOW VELOCITY = (TOTAL FLOW)/(PIPE CROSS SECTION AREA)
  GIVEN PIPE DIAMETER(INCH) =  24.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      17.74
  PIPE TRAVEL TIME(MIN.) =   1.40    Tc(MIN.) =    9.06
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE    160.00 =    1146.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    160.00 TO NODE    160.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    9.06
  RAINFALL INTENSITY(INCH/HR) =   4.40
  AREA-AVERAGED Fm(INCH/HR) =  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.25
  AREA-AVERAGED Ap =  0.20
  EFFECTIVE STREAM AREA(ACRES) =       3.99
  TOTAL STREAM AREA(ACRES) =       4.46
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      17.74

****************************************************************************
  FLOW PROCESS FROM NODE    140.00 TO NODE    150.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   307.00
  ELEVATION DATA: UPSTREAM(FEET) =     36.30  DOWNSTREAM(FEET) =     33.20

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    8.027
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.717
  SUBAREA Tc AND LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  APARTMENTS                 C        2.12      0.25     0.200    86    8.03
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA RUNOFF(CFS) =      8.91
  TOTAL AREA(ACRES) =      2.12   PEAK FLOW RATE(CFS) =      8.91

****************************************************************************
  FLOW PROCESS FROM NODE    150.00 TO NODE    160.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
```

```
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
================================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    27.30  DOWNSTREAM(FEET) =    23.30
  FLOW LENGTH(FEET) =    50.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   7.0 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  14.14
  GIVEN PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       8.91
  PIPE TRAVEL TIME(MIN.) =   0.06    Tc(MIN.) =    8.09
  LONGEST FLOWPATH FROM NODE    140.00 TO NODE    160.00 =     357.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    160.00 TO NODE    160.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
================================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    8.09
  RAINFALL INTENSITY(INCH/HR) =   4.70
  AREA-AVERAGED Fm(INCH/HR) =  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.25
  AREA-AVERAGED Ap =  0.20
  EFFECTIVE STREAM AREA(ACRES) =       2.12
  TOTAL STREAM AREA(ACRES) =       2.12
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       8.91

  ** CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
      1       17.74    9.06    4.401  0.25( 0.05) 0.20       4.0      30.00
      1       17.42   11.06    3.925  0.25( 0.05) 0.20       4.5      10.00
      2        8.91    8.09    4.698  0.25( 0.05) 0.20       2.1     140.00

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR  2 STREAMS.

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
      1       25.82    8.09    4.698  0.25( 0.05) 0.20       5.7     140.00
      2       26.08    9.06    4.401  0.25( 0.05) 0.20       6.1      30.00
      3       24.85   11.06    3.925  0.25( 0.05) 0.20       6.6      10.00

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      26.08    Tc(MIN.) =     9.06
  EFFECTIVE AREA(ACRES) =       6.11   AREA-AVERAGED Fm(INCH/HR) =  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.20
  TOTAL AREA(ACRES) =        6.6
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE    160.00 =    1146.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    160.00 TO NODE    170.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
================================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    23.30  DOWNSTREAM(FEET) =    21.00
  FLOW LENGTH(FEET) =   140.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  36.0 INCH PIPE IS  14.0 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  10.22
  GIVEN PIPE DIAMETER(INCH) =  36.00    NUMBER OF PIPES =   1
```

```
  PIPE-FLOW(CFS) =      26.08
  PIPE TRAVEL TIME(MIN.) =   0.23    Tc(MIN.) =    9.29
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE    170.00 =    1286.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    140.00 TO NODE    220.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   351.00
  ELEVATION DATA: UPSTREAM(FEET) =     36.30  DOWNSTREAM(FEET) =     31.40

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    7.938
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.748
  SUBAREA Tc AND LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  APARTMENTS                 C        1.44      0.25     0.200    86    7.94
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA RUNOFF(CFS) =      6.09
  TOTAL AREA(ACRES) =      1.44   PEAK FLOW RATE(CFS) =      6.09

****************************************************************************
  FLOW PROCESS FROM NODE    220.00 TO NODE    220.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    7.94
  RAINFALL INTENSITY(INCH/HR) =   4.75
  AREA-AVERAGED Fm(INCH/HR) =  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.25
  AREA-AVERAGED Ap =  0.20
  EFFECTIVE STREAM AREA(ACRES) =       1.44
  TOTAL STREAM AREA(ACRES) =       1.44
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       6.09

****************************************************************************
  FLOW PROCESS FROM NODE    210.00 TO NODE    220.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   342.00
  ELEVATION DATA: UPSTREAM(FEET) =     34.80  DOWNSTREAM(FEET) =     31.40

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    8.407
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.594
  SUBAREA Tc AND LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  APARTMENTS                 C        0.89      0.25     0.200    86    8.41
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA RUNOFF(CFS) =      3.64
  TOTAL AREA(ACRES) =      0.89   PEAK FLOW RATE(CFS) =      3.64

****************************************************************************
```

```
 FLOW PROCESS FROM NODE    220.00 TO NODE    220.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
 >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
 TIME OF CONCENTRATION(MIN.) =    8.41
 RAINFALL INTENSITY(INCH/HR) =   4.59
 AREA-AVERAGED Fm(INCH/HR) =  0.05
 AREA-AVERAGED Fp(INCH/HR) =  0.25
 AREA-AVERAGED Ap =  0.20
 EFFECTIVE STREAM AREA(ACRES) =       0.89
 TOTAL STREAM AREA(ACRES) =       0.89
 PEAK FLOW RATE(CFS) AT CONFLUENCE =       3.64

 ** CONFLUENCE DATA **
  STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
  NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
     1        6.09    7.94    4.748  0.25( 0.05) 0.20       1.4     140.00
     2        3.64    8.41    4.594  0.25( 0.05) 0.20       0.9     210.00

 RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
 CONFLUENCE FORMULA USED FOR  2 STREAMS.

 ** PEAK FLOW RATE TABLE **
  STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
  NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
     1        9.64    7.94    4.748  0.25( 0.05) 0.20       2.3     140.00
     2        9.53    8.41    4.594  0.25( 0.05) 0.20       2.3     210.00

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =       9.64    Tc(MIN.) =     7.94
 EFFECTIVE AREA(ACRES) =       2.28   AREA-AVERAGED Fm(INCH/HR) =  0.05
 AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.20
 TOTAL AREA(ACRES) =        2.3
 LONGEST FLOWPATH FROM NODE    140.00 TO NODE    220.00 =     351.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    220.00 TO NODE    240.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN.) =    7.94
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.748
 SUBAREA LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 APARTMENTS                 C        0.12      0.25     0.200    86
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
 SUBAREA AREA(ACRES) =    0.12      SUBAREA RUNOFF(CFS) =    0.51
 EFFECTIVE AREA(ACRES) =      2.40   AREA-AVERAGED Fm(INCH/HR) =  0.05
 AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.20
 TOTAL AREA(ACRES) =        2.4       PEAK FLOW RATE(CFS) =      10.15

****************************************************************************
 FLOW PROCESS FROM NODE    240.00 TO NODE    240.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
```

```
  TIME OF CONCENTRATION(MIN.) =    7.94
  RAINFALL INTENSITY(INCH/HR) =   4.75
  AREA-AVERAGED Fm(INCH/HR) =  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.25
  AREA-AVERAGED Ap =  0.20
  EFFECTIVE STREAM AREA(ACRES) =       2.40
  TOTAL STREAM AREA(ACRES) =       2.45
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      10.15

****************************************************************************
  FLOW PROCESS FROM NODE    230.00 TO NODE    240.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   273.00
  ELEVATION DATA: UPSTREAM(FEET) =     32.60  DOWNSTREAM(FEET) =     30.80

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    8.340
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.615
  SUBAREA Tc AND LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS   Tc
       LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  APARTMENTS                  C        0.37      0.25     0.200    86    8.34
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA RUNOFF(CFS) =      1.52
  TOTAL AREA(ACRES) =      0.37   PEAK FLOW RATE(CFS) =      1.52

****************************************************************************
  FLOW PROCESS FROM NODE    240.00 TO NODE    240.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    8.34
  RAINFALL INTENSITY(INCH/HR) =   4.61
  AREA-AVERAGED Fm(INCH/HR) =  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.25
  AREA-AVERAGED Ap =  0.20
  EFFECTIVE STREAM AREA(ACRES) =       0.37
  TOTAL STREAM AREA(ACRES) =       0.37
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       1.52

  ** CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
      1       10.15    7.94    4.748  0.25( 0.05) 0.20       2.4     140.00
      1       10.02    8.41    4.594  0.25( 0.05) 0.20       2.4     210.00
      2        1.52    8.34    4.615  0.25( 0.05) 0.20       0.4     230.00

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR  2 STREAMS.

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
      1       11.64    7.94    4.748  0.25( 0.05) 0.20       2.8     140.00
      2       11.56    8.34    4.615  0.25( 0.05) 0.20       2.8     230.00
      3       11.53    8.41    4.594  0.25( 0.05) 0.20       2.8     210.00
```

```
  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      11.64    Tc(MIN.) =     7.94
  EFFECTIVE AREA(ACRES) =       2.75   AREA-AVERAGED Fm(INCH/HR) =  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.20
  TOTAL AREA(ACRES) =        2.8
  LONGEST FLOWPATH FROM NODE    140.00 TO NODE    240.00 =     351.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    300.00 TO NODE    310.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   330.00
  ELEVATION DATA: UPSTREAM(FEET) =     33.80  DOWNSTREAM(FEET) =     32.60

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   10.135
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.127
  SUBAREA Tc AND LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  APARTMENTS                 C        0.16      0.25     0.200    86   10.13
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA RUNOFF(CFS) =      0.59
  TOTAL AREA(ACRES) =      0.16   PEAK FLOW RATE(CFS) =      0.59

****************************************************************************
  FLOW PROCESS FROM NODE    310.00 TO NODE    320.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   10.13
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.127
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  APARTMENTS                 C        0.06      0.25     0.200    86
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA AREA(ACRES) =     0.06      SUBAREA RUNOFF(CFS) =     0.22
  EFFECTIVE AREA(ACRES) =      0.22   AREA-AVERAGED Fm(INCH/HR) =  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.20
  TOTAL AREA(ACRES) =        0.2       PEAK FLOW RATE(CFS) =       0.81

****************************************************************************
  FLOW PROCESS FROM NODE    400.00 TO NODE    410.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   300.00
  ELEVATION DATA: UPSTREAM(FEET) =     33.10  DOWNSTREAM(FEET) =     32.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   14.519
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.359
  SUBAREA Tc AND LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  PUBLIC PARK                C        0.47      0.25     0.850    86   14.52
```

```
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.850
  SUBAREA RUNOFF(CFS) =      1.33
  TOTAL AREA(ACRES) =      0.47   PEAK FLOW RATE(CFS) =      1.33

****************************************************************************
  FLOW PROCESS FROM NODE    500.00 TO NODE    530.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   248.00
  ELEVATION DATA: UPSTREAM(FEET) =     32.90  DOWNSTREAM(FEET) =     31.40

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    8.166
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.671
  SUBAREA Tc AND LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  APARTMENTS                 C        0.04      0.25     0.200    86    8.17
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA RUNOFF(CFS) =      0.17
  TOTAL AREA(ACRES) =      0.04   PEAK FLOW RATE(CFS) =      0.17

****************************************************************************
  FLOW PROCESS FROM NODE    530.00 TO NODE    530.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    8.17
  RAINFALL INTENSITY(INCH/HR) =   4.67
  AREA-AVERAGED Fm(INCH/HR) =  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.25
  AREA-AVERAGED Ap =  0.20
  EFFECTIVE STREAM AREA(ACRES) =       0.04
  TOTAL STREAM AREA(ACRES) =       0.04
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       0.17

****************************************************************************
  FLOW PROCESS FROM NODE    520.00 TO NODE    530.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   219.00
  ELEVATION DATA: UPSTREAM(FEET) =     33.00  DOWNSTREAM(FEET) =     30.50

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    6.843
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  5.169
  SUBAREA Tc AND LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  APARTMENTS                 C        0.24      0.25     0.200    86    6.84
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA RUNOFF(CFS) =      1.11
  TOTAL AREA(ACRES) =      0.24   PEAK FLOW RATE(CFS) =      1.11
```

```
**************************************************************************
 FLOW PROCESS FROM NODE    530.00 TO NODE    530.00 IS CODE =   1
--------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
 >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
==========================================================================
 TOTAL NUMBER OF STREAMS =  2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
 TIME OF CONCENTRATION(MIN.) =    6.84
 RAINFALL INTENSITY(INCH/HR) =   5.17
 AREA-AVERAGED Fm(INCH/HR) =  0.05
 AREA-AVERAGED Fp(INCH/HR) =  0.25
 AREA-AVERAGED Ap =  0.20
 EFFECTIVE STREAM AREA(ACRES) =       0.24
 TOTAL STREAM AREA(ACRES) =       0.24
 PEAK FLOW RATE(CFS) AT CONFLUENCE =       1.11

 ** CONFLUENCE DATA **
  STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
  NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
     1        0.17    8.17    4.671  0.25( 0.05) 0.20       0.0     500.00
     2        1.11    6.84    5.169  0.25( 0.05) 0.20       0.2     520.00

 RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
 CONFLUENCE FORMULA USED FOR  2 STREAMS.

 ** PEAK FLOW RATE TABLE **
  STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
  NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
     1        1.26    6.84    5.169  0.25( 0.05) 0.20       0.3     520.00
     2        1.16    8.17    4.671  0.25( 0.05) 0.20       0.3     500.00

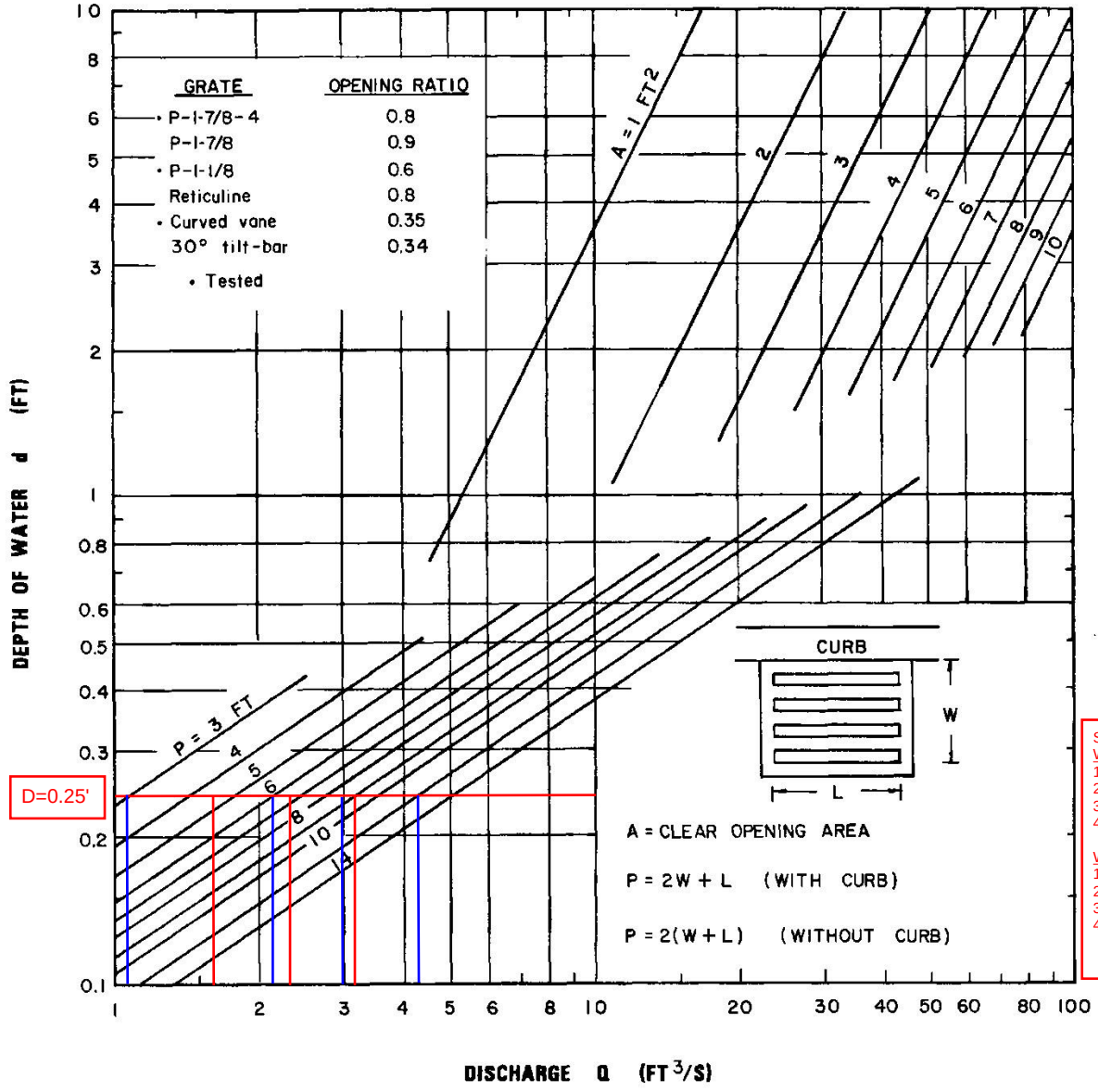
 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =       1.26    Tc(MIN.) =     6.84
 EFFECTIVE AREA(ACRES) =       0.27   AREA-AVERAGED Fm(INCH/HR) =  0.05
 AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.20
 TOTAL AREA(ACRES) =        0.3
 LONGEST FLOWPATH FROM NODE    500.00 TO NODE    530.00 =     248.00 FEET.
==========================================================================
 END OF STUDY SUMMARY:
 TOTAL AREA(ACRES)     =        0.3  TC(MIN.) =      6.84
 EFFECTIVE AREA(ACRES) =      0.27  AREA-AVERAGED Fm(INCH/HR)=  0.05
 AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap = 0.200
 PEAK FLOW RATE(CFS)   =       1.26

 ** PEAK FLOW RATE TABLE **
  STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
  NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
     1        1.26    6.84    5.169  0.25( 0.05) 0.20       0.3     520.00
     2        1.16    8.17    4.671  0.25( 0.05) 0.20       0.3     500.00
==========================================================================
==========================================================================
 END OF RATIONAL METHOD ANALYSIS
```

APPENDIX 5

ESTIMATED DRAIN INLETS & STORM DRAIN PIPE CAPACITY CALCULATIONS

CHART 9B



D=0.25'

SUMP CATCH BASIN (P)
WITH CURB (P=2W+L)
1'x1' = 3'
2'x2' = 6'
3'x3' = 9'
4'x4' = 12'

WITHOUT CURB (P=2(W+L))
1'x1' = 4'
2'x2' = 8'
3'x3' = 12'
4'x4' = 16'

Grate Inlet Capacity in Sump Conditions - English Units

Figure 3-21: Grate Inlet Capacity in Sump Conditions Assuming No Clogging (HEC 22) (Brown, et al., 2009)

D=0.25
APPLY 25% CLOGGING TO P

SUMP CATCH BASIN WITH CURB
P=3'; P=2.3' (25%); Q=N/A ; 1'x1'
P=6'; P=4.5' (25%); Q=1.7CFS ; 2'x2'
P=9'; P=6.8' (25%); Q=2.3CFS ; 3'x3'
P=12'; P=9' (25%); Q=3.2CFS ; 4'x4'

D=0.25
APPLY 25% CLOGGING TO P

SUMP CATCH BASIN WITHOUT CURB
P=4'; P=3' (25%); Q=1.1CFS ; 1'x1'
P=8'; P=6' (25%); Q=2.1CFS ; 2'x2'
P=12'; P=9' (25%); Q=3.0CFS ; 3'x3'
P=16'; P=12' (25%); Q=4.3CFS ; 4'x4'

Rating Table for Circular Pipe - 4-Inch

Project Description

Friction Method	Manning Formula
Solve For	Discharge

Input Data

Roughness Coefficient	0.013	
Channel Slope	0.00500	ft/ft
Normal Depth	0.33	ft
Diameter	0.33	ft

Channel Slope (ft/ft)	Discharge (ft³/s)	Velocity (ft/s)	Flow Area (ft²)	Wetted Perimeter (ft)	Top Width (ft)
0.00500	0.13	1.53	0.09	1.04	0.00
0.00600	0.14	1.68	0.09	1.04	0.00
0.00700	0.16	1.81	0.09	1.04	0.00
0.00800	0.17	1.94	0.09	1.04	0.00
0.00900	0.18	2.06	0.09	1.04	0.00
0.01000	0.19	2.17	0.09	1.04	0.00
0.01100	0.19	2.27	0.09	1.04	0.00
0.01200	0.20	2.37	0.09	1.04	0.00
0.01300	0.21	2.47	0.09	1.04	0.00
0.01400	0.22	2.56	0.09	1.04	0.00
0.01500	0.23	2.65	0.09	1.04	0.00
0.01600	0.23	2.74	0.09	1.04	0.00
0.01700	0.24	2.82	0.09	1.04	0.00
0.01800	0.25	2.91	0.09	1.04	0.00
0.01900	0.26	2.99	0.09	1.04	0.00
0.02000	0.26	3.06	0.09	1.04	0.00

Rating Table for Circular Pipe - 6-Inch

Project Description

Friction Method	Manning Formula
Solve For	Discharge

Input Data

Roughness Coefficient	0.013	
Channel Slope	0.00500	ft/ft
Normal Depth	0.50	ft
Diameter	0.50	ft

Channel Slope (ft/ft)	Discharge (ft³/s)	Velocity (ft/s)	Flow Area (ft²)	Wetted Perimeter (ft)	Top Width (ft)
0.00500	0.40	2.02	0.20	1.57	0.00
0.00600	0.43	2.21	0.20	1.57	0.00
0.00700	0.47	2.39	0.20	1.57	0.00
0.00800	0.50	2.56	0.20	1.57	0.00
0.00900	0.53	2.71	0.20	1.57	0.00
0.01000	0.56	2.86	0.20	1.57	0.00
0.01100	0.59	3.00	0.20	1.57	0.00
0.01200	0.61	3.13	0.20	1.57	0.00
0.01300	0.64	3.26	0.20	1.57	0.00
0.01400	0.66	3.38	0.20	1.57	0.00
0.01500	0.69	3.50	0.20	1.57	0.00
0.01600	0.71	3.61	0.20	1.57	0.00
0.01700	0.73	3.73	0.20	1.57	0.00
0.01800	0.75	3.83	0.20	1.57	0.00
0.01900	0.77	3.94	0.20	1.57	0.00
0.02000	0.79	4.04	0.20	1.57	0.00

Rating Table for Circular Pipe - 8 inch

Project Description

Friction Method	Manning Formula
Solve For	Discharge

Input Data

Roughness Coefficient	0.013	
Channel Slope	0.00500	ft/ft
Normal Depth	0.67	ft
Diameter	0.67	ft

Channel Slope (ft/ft)	Discharge (ft³/s)	Velocity (ft/s)	Flow Area (ft²)	Wetted Perimeter (ft)	Top Width (ft)
0.00500	0.89	2.53	0.35	2.01	0.10
0.00600	0.98	2.77	0.35	2.01	0.10
0.00700	1.06	3.00	0.35	2.01	0.10
0.00800	1.13	3.20	0.35	2.01	0.10
0.00900	1.20	3.40	0.35	2.01	0.10
0.01000	1.26	3.58	0.35	2.01	0.10
0.01100	1.32	3.76	0.35	2.01	0.10
0.01200	1.38	3.92	0.35	2.01	0.10
0.01300	1.44	4.08	0.35	2.01	0.10
0.01400	1.49	4.24	0.35	2.01	0.10
0.01500	1.55	4.39	0.35	2.01	0.10
0.01600	1.60	4.53	0.35	2.01	0.10
0.01700	1.65	4.67	0.35	2.01	0.10
0.01800	1.69	4.80	0.35	2.01	0.10
0.01900	1.74	4.94	0.35	2.01	0.10
0.02000	1.78	5.06	0.35	2.01	0.10

Rating Table for Circular Pipe - 10-Inch

Project Description

Friction Method	Manning Formula
Solve For	Discharge

Input Data

Roughness Coefficient	0.013	
Channel Slope	0.00500	ft/ft
Normal Depth	0.83	ft
Diameter	0.83	ft

Channel Slope (ft/ft)	Discharge (ft³/s)	Velocity (ft/s)	Flow Area (ft²)	Wetted Perimeter (ft)	Top Width (ft)
0.00500	1.53	2.83	0.54	2.61	0.00
0.00600	1.68	3.10	0.54	2.61	0.00
0.00700	1.81	3.35	0.54	2.61	0.00
0.00800	1.94	3.58	0.54	2.61	0.00
0.00900	2.06	3.80	0.54	2.61	0.00
0.01000	2.17	4.01	0.54	2.61	0.00
0.01100	2.27	4.20	0.54	2.61	0.00
0.01200	2.37	4.39	0.54	2.61	0.00
0.01300	2.47	4.57	0.54	2.61	0.00
0.01400	2.56	4.74	0.54	2.61	0.00
0.01500	2.65	4.91	0.54	2.61	0.00
0.01600	2.74	5.07	0.54	2.61	0.00
0.01700	2.83	5.22	0.54	2.61	0.00
0.01800	2.91	5.37	0.54	2.61	0.00
0.01900	2.99	5.52	0.54	2.61	0.00
0.02000	3.07	5.67	0.54	2.61	0.00

Rating Table for Circular Pipe - 12-Inch

Project Description

Friction Method	Manning Formula
Solve For	Discharge

Input Data

Roughness Coefficient	0.013	
Channel Slope	0.00500	ft/ft
Normal Depth	1.00	ft
Diameter	1.00	ft

Channel Slope (ft/ft)	Discharge (ft³/s)	Velocity (ft/s)	Flow Area (ft²)	Wetted Perimeter (ft)	Top Width (ft)
0.00500	2.52	3.21	0.79	3.14	0.00
0.00600	2.76	3.52	0.79	3.14	0.00
0.00700	2.98	3.80	0.79	3.14	0.00
0.00800	3.19	4.06	0.79	3.14	0.00
0.00900	3.38	4.31	0.79	3.14	0.00
0.01000	3.56	4.54	0.79	3.14	0.00
0.01100	3.74	4.76	0.79	3.14	0.00
0.01200	3.90	4.97	0.79	3.14	0.00
0.01300	4.06	5.17	0.79	3.14	0.00
0.01400	4.22	5.37	0.79	3.14	0.00
0.01500	4.37	5.56	0.79	3.14	0.00
0.01600	4.51	5.74	0.79	3.14	0.00
0.01700	4.65	5.92	0.79	3.14	0.00
0.01800	4.78	6.09	0.79	3.14	0.00
0.01900	4.91	6.26	0.79	3.14	0.00
0.02000	5.04	6.42	0.79	3.14	0.00

Rating Table for Circular Pipe - 15-Inch

Project Description

Friction Method	Manning Formula
Solve For	Discharge

Input Data

Roughness Coefficient	0.013	
Channel Slope	0.00500	ft/ft
Normal Depth	1.25	ft
Diameter	1.25	ft

Channel Slope (ft/ft)	Discharge (ft³/s)	Velocity (ft/s)	Flow Area (ft²)	Wetted Perimeter (ft)	Top Width (ft)
0.00500	4.57	3.72	1.23	3.93	0.00
0.00600	5.00	4.08	1.23	3.93	0.00
0.00700	5.40	4.40	1.23	3.93	0.00
0.00800	5.78	4.71	1.23	3.93	0.00
0.00900	6.13	4.99	1.23	3.93	0.00
0.01000	6.46	5.26	1.23	3.93	0.00
0.01100	6.77	5.52	1.23	3.93	0.00
0.01200	7.08	5.77	1.23	3.93	0.00
0.01300	7.36	6.00	1.23	3.93	0.00
0.01400	7.64	6.23	1.23	3.93	0.00
0.01500	7.91	6.45	1.23	3.93	0.00
0.01600	8.17	6.66	1.23	3.93	0.00
0.01700	8.42	6.86	1.23	3.93	0.00
0.01800	8.67	7.06	1.23	3.93	0.00
0.01900	8.90	7.26	1.23	3.93	0.00
0.02000	9.14	7.44	1.23	3.93	0.00

Rating Table for Circular Pipe - 18-Inch

Project Description

Friction Method	Manning Formula
Solve For	Discharge

Input Data

Roughness Coefficient	0.013	
Channel Slope	0.00500	ft/ft
Normal Depth	1.50	ft
Diameter	1.50	ft

Channel Slope (ft/ft)	Discharge (ft³/s)	Velocity (ft/s)	Flow Area (ft²)	Wetted Perimeter (ft)	Top Width (ft)
0.00500	7.43	4.20	1.77	4.71	0.00
0.00600	8.14	4.60	1.77	4.71	0.00
0.00700	8.79	4.97	1.77	4.71	0.00
0.00800	9.40	5.32	1.77	4.71	0.00
0.00900	9.97	5.64	1.77	4.71	0.00
0.01000	10.50	5.94	1.77	4.71	0.00
0.01100	11.02	6.23	1.77	4.71	0.00
0.01200	11.51	6.51	1.77	4.71	0.00
0.01300	11.98	6.78	1.77	4.71	0.00
0.01400	12.43	7.03	1.77	4.71	0.00
0.01500	12.86	7.28	1.77	4.71	0.00
0.01600	13.29	7.52	1.77	4.71	0.00
0.01700	13.70	7.75	1.77	4.71	0.00
0.01800	14.09	7.97	1.77	4.71	0.00
0.01900	14.48	8.19	1.77	4.71	0.00
0.02000	14.86	8.41	1.77	4.71	0.00

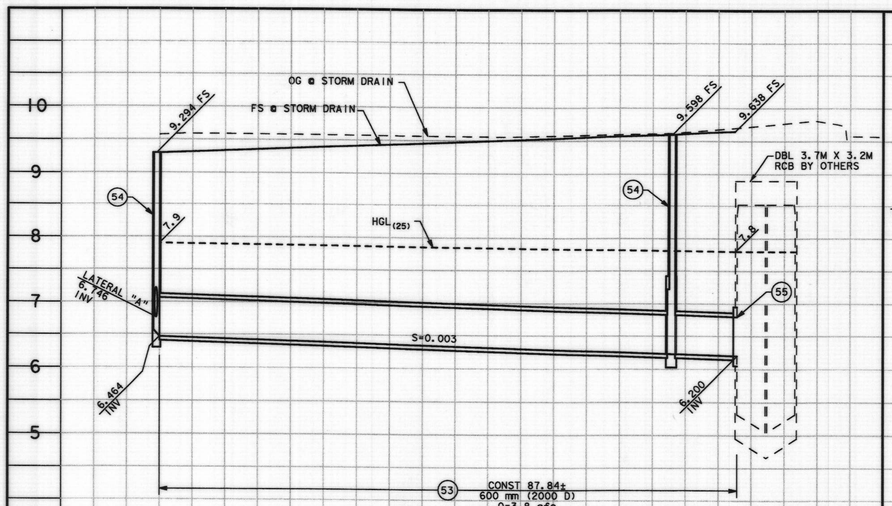
Rating Table for Circular Pipe - 24 Inch

Project Description	
Friction Method	Manning Formula
Solve For	Discharge

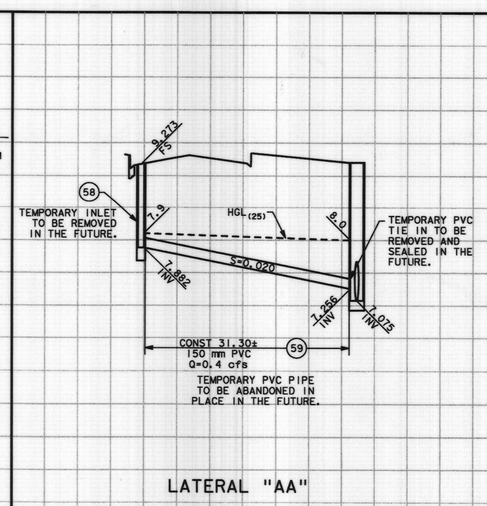
Input Data	
Roughness Coefficient	0.013
Channel Slope	0.005 ft/ft
Normal Depth	24.0 in
Diameter	24.0 in

Channel Slope (ft/ft)	Discharge (cfs)	Velocity (ft/s)	Flow Area (ft^2)	Wetted Perimeter (ft)	Top Width (ft)
0.005	16.14	5.14	3.1	6.2	0.08
0.006	17.68	5.63	3.1	6.2	0.08
0.007	19.09	6.08	3.1	6.2	0.08
0.008	20.41	6.50	3.1	6.2	0.08
0.009	21.65	6.89	3.1	6.2	0.08
0.010	22.82	7.26	3.1	6.2	0.08
0.011	23.93	7.62	3.1	6.2	0.08
0.012	25.00	7.96	3.1	6.2	0.08
0.013	26.02	8.28	3.1	6.2	0.08
0.014	27.00	8.59	3.1	6.2	0.08
0.015	27.95	8.90	3.1	6.2	0.08
0.016	28.86	9.19	3.1	6.2	0.08
0.017	29.75	9.47	3.1	6.2	0.08
0.018	30.61	9.75	3.1	6.2	0.08
0.019	31.45	10.01	3.1	6.2	0.08
0.020	32.27	10.27	3.1	6.2	0.08

THIS DMA B/Q25=1.3CFS INCREASE IS WILL IMPOSE A 0.12' HGL RISE IN THIS 18 INCH LATERAL. RIM IS STILL 1.0'+ THAN HGL STORM DRAIN LATERAL HAS CAPACITY.

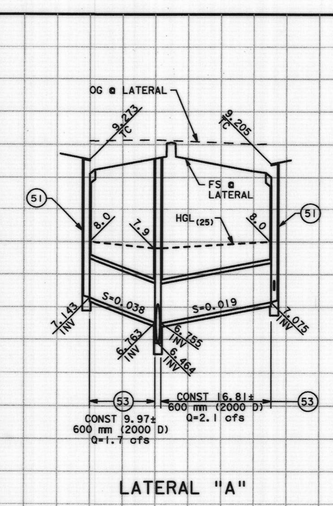


PROFILE HORZ 1:400 VERT 1:40



LATERAL "AA"

PROFILE HORZ 1:400 VERT 1:40



LATERAL "A"

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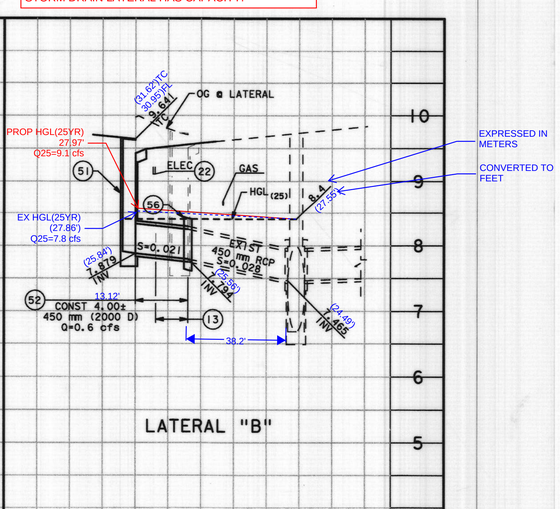
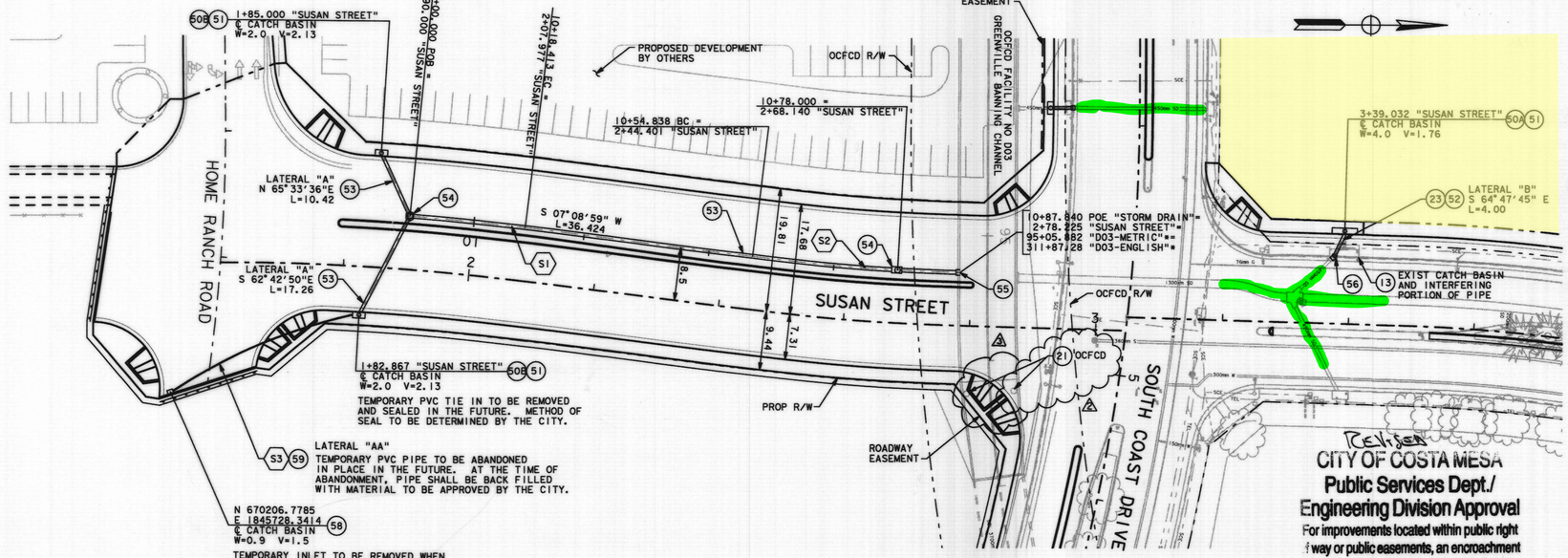


LATERAL "B"

PROFILE HORZ 1:200 VERT 1:40

PLAN 1:400



* NOTE:
BASIS FOR STATIONING ALONG THE GREENVILLE BANNING CHANNEL ARE REFERENCED FROM DRAWING NOS.:
D03-701-3
D03S03-701-1
D03P02-701-2

AS BUILT DRAWINGS
Date Completed: 06/06/03
Proiect Number: PA-99-34

CONSTRUCTION NOTES MASTER LIST

13 REMOVE AND DISPOSE OF EXISTING IMPROVEMENTS. (TYPE SHOWN ON PLAN).
21 ADJUST TO GRADE. (TYPE SHOWN ON PLAN).
22 RELOCATE BEHIND NEW CURB. CONDUIT AND PULL BOX SHALL BE PER SCE APPROVED PLANS. CONTRACTOR TO COORDINATE WITH SCE. (TYPE SHOWN ON PLAN).
23 CONSTRUCT TRENCH PER CITY OF COSTA MESA STD 813. NO SLURRY BACKFILL ALLOWED FOR TRENCHES GREATER THAN 300 mm WIDE.
50A CONSTRUCT LOCAL DEPRESSION CASE A PER APWA 313-1.
50B CONSTRUCT LOCAL DEPRESSION CASE B PER APWA 313-1.
51 CONSTRUCT CATCH BASIN PER APWA 300-2 WITH OCEAN PRO DEBRIS GATE OR EQUAL. INSTALLATION OF THE GATE SHALL BE REVIEWED AND APPROVED BY THE CITY OF COSTA MESA. 2
52 CONSTRUCT 450 mm RCP.
53 CONSTRUCT 600 mm RCP.
54 CONSTRUCT MANHOLE PER APWA 321-1.
55 CONSTRUCT JUNCTION STRUCTURE PER PFRD 1314 (OCFCD PERMIT IS REQUIRED PRIOR TO CONSTRUCTION). 2
56 CONSTRUCT CONCRETE COLLAR PER APWA 380-3.
58 CONSTRUCT CATCH BASIN PER APWA 303-2 WITH OCEAN PRO DEBRIS GATE OR EQUAL. INSTALLATION OF THE GATE SHALL BE REVIEWED AND APPROVED BY THE CITY OF COSTA MESA.
59 CONSTRUCT 150 mm PVC.

CURVE DATA 3

NO	R	Δ	T	L
S1	358.500	~~02°58'56"~~ 02°54'34"	9.209	18.413
S2	341.500	05°32'14"	16.514	33.003
S3	90.000	19°55'25"	15.807	31.296

CITY OF COSTA MESA
Public Services Dept./
Engineering Division Approval
For improvements located within public right of way or public easements, an encroachment permit is required prior to the start of work.
Approved by [signature] Date 11-21-02

SEQUEIRA INFRASTRUCTURE ASSOCIATES
4 TECHNOLOGY DRIVE, SUITE 150
IRVINE, CA 92618
TEL (949) 753-5163
FAX (949) 753-5164

REGISTERED PROFESSIONAL ENGINEER — DAVID B LEW — No. C 59063 Exp. 6-30-03 CIVIL — STATE OF CALIFORNIA

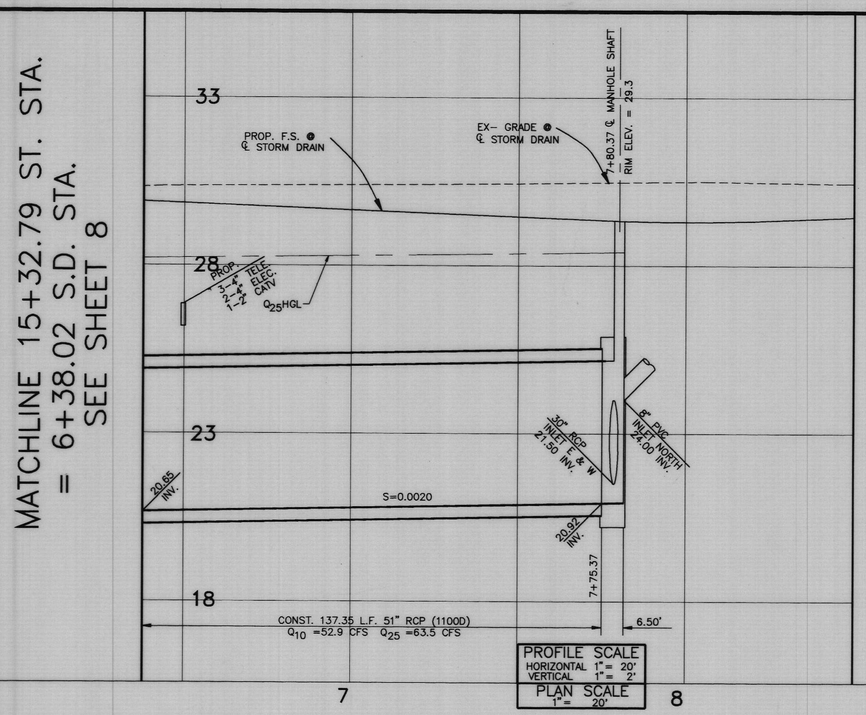
David Lew 11/11/02
DAVID B LEW, RCE 59063 DATE

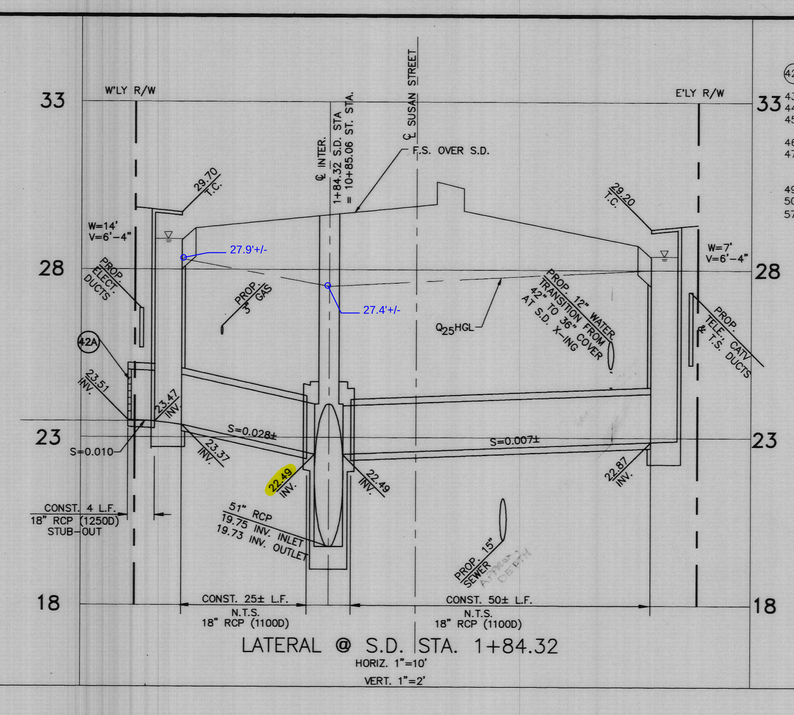
REVISIONS	NO.	DATE	DESCRIPTION	APP.
2		11/11/02	STORM DRAIN STANDARD MODIFICATIONS	
3		12/12/02	OCFCD MANHOLE GRADE ADJUSTMENT & CURVE DATA	

STORM DRAIN PLAN AND PROFILE
SUSAN STREET/SOUTH COAST DRIVE
CITY OF COSTA MESA
DEPARTMENT OF ENGINEERING SERVICES

SHEET 9 OF 18 SHEETS
PLAN NUMBER 2002-3.9

EAB FILE (VOL) WAVE D
2002-3.9



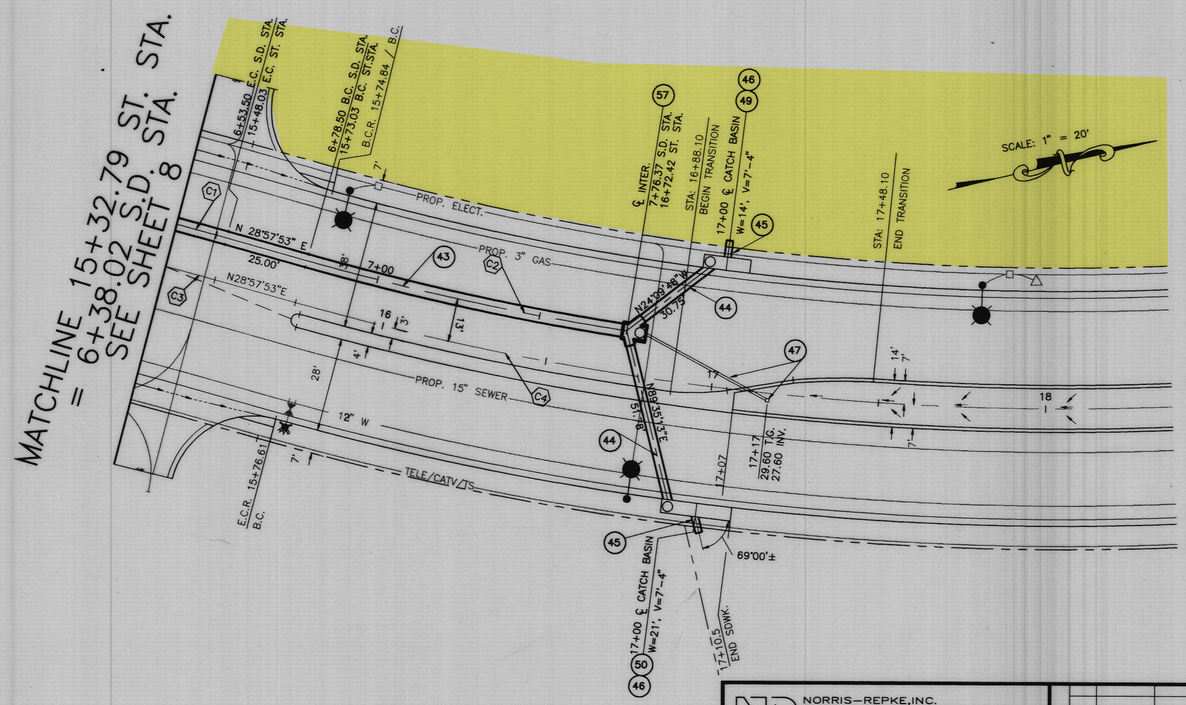


LATERAL @ S.D. STA. 1+84.32
HORIZ. 1"=10'
VERT. 1"=2'

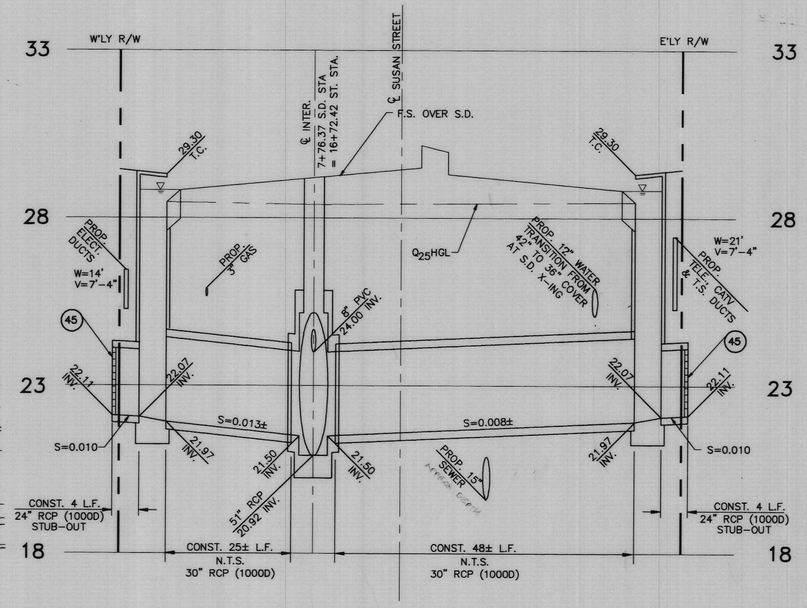
CONSTRUCTION NOTES

42A CONSTRUCT 4 L.F. OF 18" RCP (1250 D) STUB-OUT FOR FUTURE CONNECTION.
CONSTRUCT DOUBLE ROW BRICK AND MORTAR BULK HEAD AT END.
43 CONSTRUCT 51" RCP (1100 D) PER PROFILE ON SHEETS 8 AND 9.
44 CONSTRUCT 30" RCP (1000 D) PER PROFILE ON SHEET 9.
45 CONSTRUCT 24" RCP (1000 D) PER PROFILE ON SHEET 9. CONSTRUCT DOUBLE ROW BRICK AND MORTAR BULKHEAD AT END.
46 CONSTRUCT LOCAL DEPRESSION PER CITY OF COSTA MESA STD 315.
47 CONSTRUCT 12'X12' GRATE INLET (BROOKS NO. 1212) WITH CAST IRON PARKWAY GRATE (WT 29 LBS). CONSTRUCT 8" PVC (SDR-35) DRAIN PIPE FROM GRATE INLET TO MAIN LINE STORM DRAIN PER ELEVATIONS ON THE PLAN AND PROFILE.
49 CONSTRUCT 14' CATCH BASIN (C.B. NO. 3) PER LACFCD STD 2- D163.
50 CONSTRUCT 21' CATCH BASIN (C.B. NO. 3) PER LACFCD STD 2- D163.
57 CONSTRUCT MANHOLE NO. 4 PER LACFCD STD 2-D113.

THIS LATERAL PLAN IS BEFORE PLAN NO 2002-3.9.
THIS IS SHOWN ONLY FOR REFERENCE OF STORM DRAIN MAIN PLAN



CURVE	DELTA	RADIUS	LENGTH	TANGENT	
C1	01°01'40"	863.00'	15.48'	7.74'	℄ STORM DRAIN
C2	06°41'58"	837.00'	97.87'	48.99'	℄ STORM DRAIN
C3	01°01'40"	850.00'	15.25'	7.62'	℄ STREET
C4	32°09'03"	850.00'	476.97'	244.95'	℄ STREET



LATERAL @ S.D. STA. 7+76.37
HORIZ. 1"=10'
VERT. 1"=2'

AS-BUILT: 1/9/96
ISSUE DATE: 8/14/95

NORRIS-REPKE, INC.
Consulting Civil Engineers and Land Surveyors
600 N. TUSTIN AVENUE
SUITE 250
SANTA ANA CA. 92705-3736
TEL. (714) 973-2230
FAX. (714) 973-2263

REGISTERED PROFESSIONAL ENGINEER RANDALL G. BERRY No. C44642 Renew 3/31/98 CIVIL STATE OF CALIFORNIA

Randall Berry 6-30-95
RANDALL G. BERRY, RCE 44642 DATE

REVISIONS

NO.	DATE	DESCRIPTION	APP.

PLAN AND PROFILE FOR THE STORM DRAIN IMPROVEMENTS ON
SUSAN STREET
FROM S.D. STA. 6+37.71 TO S.D. STA. 7+76.06

CITY OF COSTA MESA
DEPARTMENT OF ENGINEERING SERVICES

SHEET 9 OF 21 SHEETS
PLAN NUMBER 95-02.9

SUS-SD11.DWG JN 5403

BABI PILE CORP. IRVINE, CA
95-02.9

EPH 24

PER DRAINAGE CALCS Q25 FOR PROPOSED DMA A & C TRIBUTARY TO THIS 51 INCH SUSAN STORM DRAIN IS LESSER THAN EXISTING (-0.2 CFS)

1+00.00 ℄ SO. COAST DRIVE

1+45.00 G.B.

1+87.82 ℄ MANHOLE SHAFT
RIM ELEV. = 29.6

EX- GRADE @ ℄ STORM DRAIN

PROP. F.S. @ ℄ STORM DRAIN

EX. EDISON

EX. 4" GAS

(27.22')HGL
(27.21')HGL

27.28'HGL
(27.28')HGL

27.42'HGL
(27.40')HGL

THIS DMA C/Q25=1.3CFS INCREASE IS WILL IMPOSE A 0.02' HGL RISE IN THIS 51 INCH MAIN. RIM IS STILL 1.0'+ THAN HGL
STORM DRAIN MAIN HAS CAPACITY.

DESIGN WSE=27.00

Q_{25} HGL

EX. 12" WATER (25.3± BOTTOM VERIFY

EX. EDISON VAULT BEYOND

EX. EDISON DUCTS & 2-5" DUCTS

EX. TELE DUCTS

PROP. Q25=9.1CFS
EX. Q25=7.8CFS

18" RCP INLET & W 22.49 INV.

SEE APPENDIX 2 HYDROLOGY MAPS (DMA C).

2-38.83 x 2.67 CB/C INLET 2.00 INV.

CEMENT SLURRY

8'-15

6" WATER

Q_{25} HGL

28.05'HGL
(28.03')HGL

8" WATER

MATCHLINE 15+32.79 ST. STA. = 6+38.02 S.D.STA. SEE SHEET 9

17.80 INV.

S=0.0037

S=0.0391

S=0.0020

19.75 INV.

20.65 INV.

0+28.5±

(15.8±)

18.53 INV.

18.44 INV.

1+50.27 BCR

19.08 INV. PRC

1+66.79 PRC

19.23 INV. EC

1+83.32 EC

1+89.32

CONST. 155.0± L.F. 51" RCP (1100D)
Q_{10} =59.3 CFS Q_{25} =71.3 CFS

CONST. 448.70 L.F. 51" RCP (1100D)
Q_{10} =52.9 CFS Q_{25} =63.5 CFS

PROPOSED FLOWS FROM DMA A IS LESSER THAN EXISTING (-1.5CFS)

PROFILE SCALE
HORIZONTAL 1"= 20'
VERTICAL 1"= 2'

PLAN SCALE
1"= 20'

CONSTRUCTION NOTES

(40) CONSTRUCT 18" RCP (1250 D) PER PROFILE ON SHEET 9.
42A CONSTRUCT 4 L.F. OF 18" RCP (1250 D) STUB-OUT FOR FUTURE CONNECTION.
43 CONSTRUCT DOUBLE ROW BRICK AND MORTAR BULK HEAD AT END.
46 CONSTRUCT 51" RCP (1100 D) PER PROFILE ON SHEETS 8 AND 9.
47 CONSTRUCT LOCAL DEPRESSION PER CITY OF COSTA MESA STD 315.
48 CONSTRUCT 12"X12" GRATE INLET (BROOKS NO. 1212) WITH CAST IRON PARKWAY GRATE (WT 29 LBS). CONSTRUCT 8" PVC (SDR-35) DRAIN PIPE FROM GRATE INLET TO MAIN LINE STORM DRAIN PER ELEVATIONS ON THE PLAN AND PROFILE.
CONSTRUCT 7' CATCH BASIN (C.B. NO. 2) PER LACFCD STD 2- D162.

CONSTRUCTION NOTES (CONT.)

49 CONSTRUCT 14' CATCH BASIN (C.B. NO. 3) PER LACFCD STD 2- D163
53 CONSTRUCT 51" RC COLLAR PER LACFCD STD 2-D393.
57 CONSTRUCT MANHOLE NO. 4 PER LACFCD STD 2-D113.
58 CONSTRUCT "PIPE ENTRANCE TO EARTH CHANNEL" TYPE OUTLET STRUCTURE PER OCEMA STD 1326.
59 CONSTRUCT JUNCTION STRUCTURE NO. 4, CASE 3 SADDLE CONNECTION PER LACFCD STD 2-D193.

CATCH BASIN

18" RCP

42'
39'
35'

REMOVE AND REPLACE FENCING PER O.C.E.M.A. STDS

O.C.F.C.D. R/W

GREENVILLE-BANNING CHANNEL (D03)

58 0+28.54 S.D.STA. = 312+21.11 CHANNEL STA.

SOUTH COAST DRIVE

1+00.00 ℄ SO. COAST DR. = 15+86.57 ST. STA. = 10+00.00 S.D.

10+00.00 SUSAN ST. = 16+09.61 SO. COAST DR.

SHIFT

TOE

N 01°36'20" E

N 6°36'20" E (RADIAL)

E.M.H.

CROWN

12" W

TELE/CATV/TS

PROP. ELECT.

SWD

PROP. VENT

45'
52'

10+54.75 ST. STA. BC = 1+50.27 S.D. STA.

10+72.69 ST. STA. PRC = 10+67.90 ST. STA. = 1+66.79 S.D. STA.

10+84.06 ST. STA. EC = 1+83.32 S.D. STA.

℄ INTER 10+85.06 ST. STA. = 1+84.32 S.D. STA.

11+12.31 ST. STA. ℄ CATCH BASIN W=14', V=6'-4"

B.C. 11+42.15 ST. STA. = 2+41.41 S.D. STA.

STA. 11+59.13 BEGIN TRANSITION

2+99.83 S.D. STA. = 12+00.00 ST. STA.

STA. 12+19.13 END TRANSITION

PROP. 3" GAS

N63°37'34"E 54.45

30.27 T.G.
28.27 INV.

11+82

PROP. 15" SEWER

INVERTED CROWN

NOTE:
STORM DRAIN TRENCH BACKFILL PER STD. 813.CMB UNLESS WAIVED BY CITY ENGINEER

B.C. 11+42.15

11+12.31 ℄ CATCH BASIN W=7', V=6'-4"

E.C.R. 10+72.31

STA. 13+35.71 BEGIN TRANSITION

STA. 13+95.71 END TRANSITION

B.C.R. 14+86.50

E.C.R. 14+92.61

AAA DRIVE

MATCHLINE 15+32.79 ST. STA. = 6+38.02 S.D. STA. SEE SHEET NO. 9

CHANNEL NOTES (CONT.)

11 PERMITTEE TO UNDERSTAND THAT ANY PERMITTED IMPROVEMENTS, THAT ARE DISTURBED OR DAMAGED BY ORANGE COUNTY FLOOD CONTROL DISTRICT DURING NORMAL MAINTENANCE OPERATIONS OR CHANNEL RECONSTRUCTION, ARE TO BE RESTORED BY PERMITTEE OR ANY FUTURE ASSIGNS, SUCCESSORS SOLELY AT THEIR EXPENSE.
12 ALL WORK SHALL BE PERFORMED DURING THE NON-STORM-SEASON (APRIL 16TH THROUGH OCTOBER 14TH).
13 ALL MAINTENANCE RESPONSIBILITY AND LIABILITY ACQUAINTED WITH PERMITTED IMPROVEMENTS OR USE SHALL BE THE SOLE RESPONSIBILITY OF PERMITTEE OR ANY FUTURE ASSIGNS OR SUCCESSORS.
14 RCP BEDDING WITHIN R/W TO COMPLY WITH EMA STANDARD PLAN 1319 AND PERMITTEE TO MAINTAIN 90% RELATIVE COMPACTION.
15 ALL CHAIN LINK FENCING INCLUDING GATES THAT ARE INSTALLED OR REPAIRED WITHIN THE R/W ARE TO COMPLY WITH APWA STANDARD PLAN 600-0-0C.

GREENVILLE-BANNING CHANNEL STRUCTURAL NOTES

1 GENERAL:
CONTRACTOR SHALL VERIFY ALL DIMENSIONS AND ELEVATIONS PRIOR TO START OF ANY WORK AND SHALL NOTIFY ENGINEER IMMEDIATELY OF DISCREPANCIES.
2 APPLICABLE CODES & SPECIFICATIONS:
CONSTRUCTION SHALL BE IN ACCORDANCE WITH THE LATEST EDITION OF THE STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION AND WITH THE CURRENT O.C.E.M.A. STANDARD PLANS. MORE PARTICULARLY THE OCEMA STANDARD PLANS 1801 – 1809 WHICH CONTAIN THE SPECIAL PROVISIONS. THE ABOVE SHALL GOVERN EXCEPT WHERE OTHER APPLICABLE CODES AND/OR NOTES ON THE PLAN ARE MORE RESTRICTIVE.
10 ANY ORANGE COUNTY FLOOD CONTROL DISTRICT IMPROVEMENTS DISTURBED OR DAMAGED DURING PERMITTED USE SHALL BE RESTORED AT PERMITTEE'S EXPENSE IN COMPLIANCE WITH EMA STANDARD PLANS AND TO THE SATISFACTION OF EMA INSPECTION PERSONNEL.

AS- BUILT: 1/9/96
ISSUE DATE: 8/14/95

NORRIS-REPKE, INC.
Consulting Civil Engineers and Land Surveyors
600 N. TUSTIN AVENUE
SUITE 250
SANTA ANA CA. 92705-3736
TEL. (714) 973-2230
FAX. (714) 973-2263

REGISTERED PROFESSIONAL ENGINEER RANDALL G. BERRY No. C44642 Renew 3/31/98 CIVIL STATE OF CALIFORNIA

Randall Berry 6-30-95
RANDALL G. BERRY, RCE 44642 DATE

REVISIONS	NO.	DATE	DESCRIPTION	APP.
	1	8-8-95	ADD TRENCH NOTE	
	2	12-7-95	"AS-BUILT" SHIFTED TOE OF OUTLET STRUCTURE TO FIT STRAIGHT LINE BETWEEN TWO ADJACENT EX. RIP-RAP TOES PER DIRECTION OF HECTOR BAZEA (OCEMA INSPECTOR).	KS

CURVE	DELTA	RADIUS	LENGTH	TANGENT	
C1	26°19'53"	850.00'	390.64'	198.83'	℄ STREET
C2	26°19'53"	863.00'	396.61'	201.87'	℄ STORM DRAIN
C3	21°02'22"	45.00'	16.52'	8.36'	℄ STORM DRAIN
C4	21°02'22"	45.00'	16.52'	8.36'	℄ STORM DRAIN

O.C.E.M.A.
ENCROACHMENT PERMIT No. 95-00558
APPROVED FOR FACILITY _____
ORANGE COUNTY FLOOD CONTROL DISTRICT DATE

PLAN AND PROFILE FOR THE STORM DRAIN IMPROVEMENTS ON

SUSAN STREET

FROM GREENVILLE-BANNING CHANNEL TO S.D. STA. 6+37.71

CITY OF COSTA MESA
DEPARTMENT OF ENGINEERING SERVICES

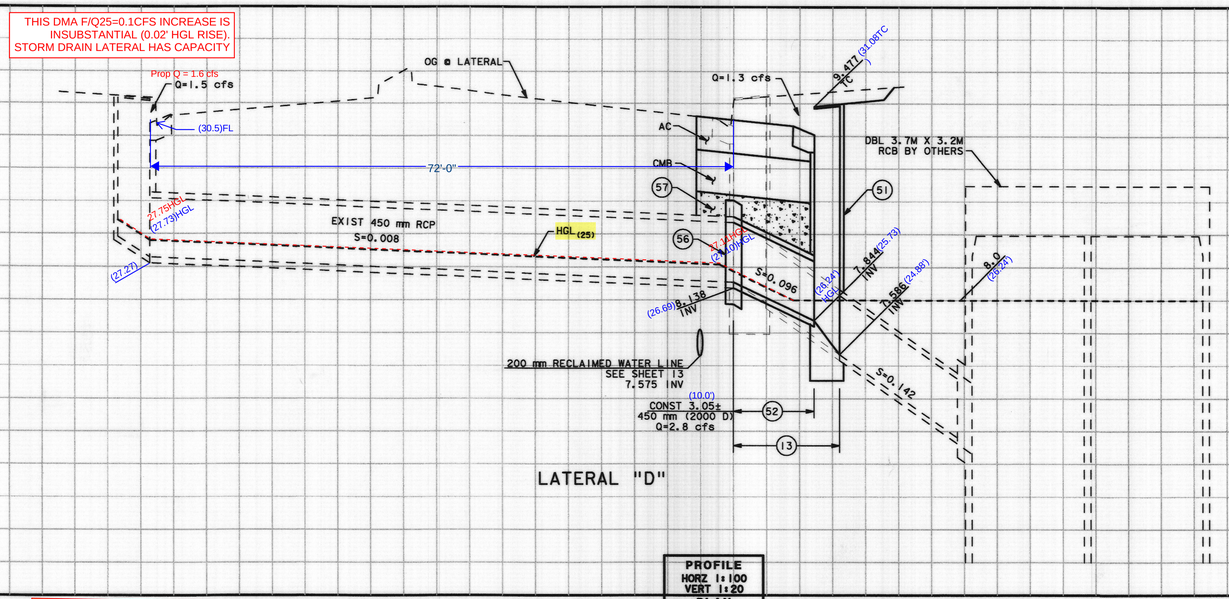
SHEET 8 OF 21 SHEETS
PLAN NUMBER 95-02.8

95-02.8

EPH 24
EAH FILE CORR. IRVINE, CA

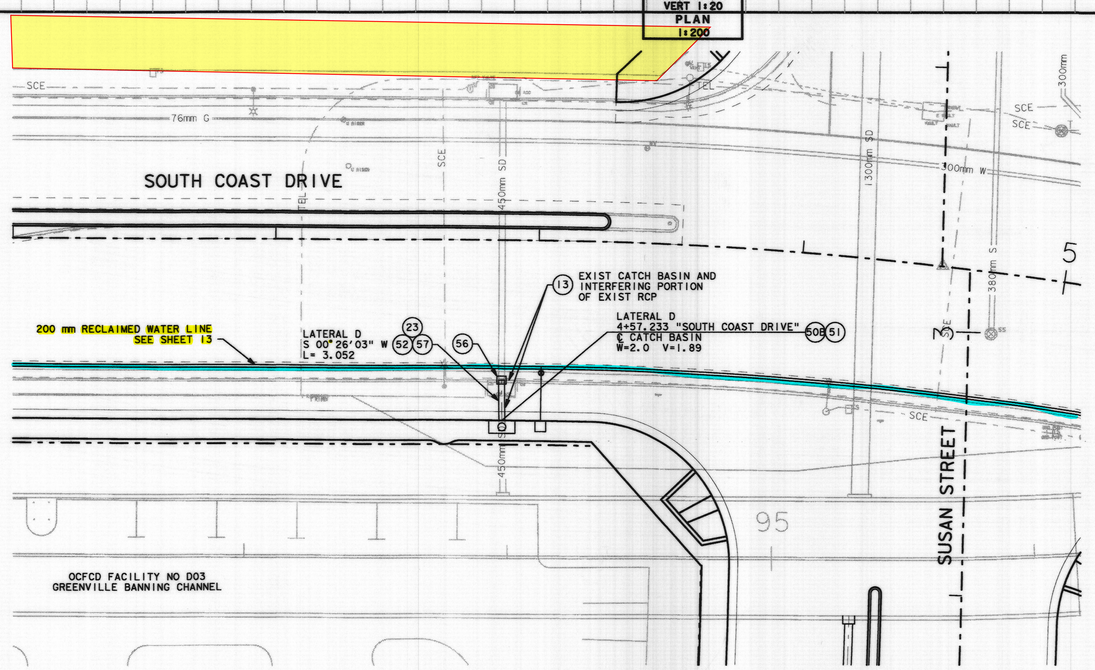
SUS-SD10.DWG JN 5403

THIS DMA F/Q25=0.1CFS INCREASE IS INSUBSTANTIAL (0.02' HGL RISE). STORM DRAIN LATERAL HAS CAPACITY



LATERAL "D"

PROFILE
HORZ 1:100
VERT 1:20
PLAN
1:200



CONSTRUCTION NOTES MASTER LIST

13 REMOVE AND DISPOSE OF EXISTING IMPROVEMENTS. (TYPE SHOWN ON PLAN).

23 CONSTRUCT TRENCH PER CITY OF COSTA MESA STD 813. NO SLURRY BACKFILL ALLOWED FOR TRENCHES GREATER THAN 300 mm WIDE.

50B CONSTRUCT LOCAL DEPRESSION CASE B PER APWA 313-1.

△2 51 CONSTRUCT CATCH BASIN PER APWA 300-2 WITH OCEAN PRO DEBRIS GATE OR EQUAL. INSTALLATION OF THE GATE SHALL BE REVIEWED AND APPROVED BY THE CITY OF COSTA MESA.

52 CONSTRUCT 450 mm RCP.

56 CONSTRUCT CONCRETE COLLAR PER APWA 380-3.

57 CONSTRUCT 150 mm MIN CONCRETE BACKFILL.

REVISED
CITY OF COSTA MESA
Public Services Dept./
Engineering Division Approval
For improvements located within public right of way or public easements, an encroachment permit is required prior to the start of work.
Approved by _____ Date 11-21-02

AS BUILT DRAWINGS
Date Completed: 06/06/03
Proiect Number: PA-99-34

SEQUEIRA INFRASTRUCTURE ASSOCIATES
4 TECHNOLOGY DRIVE, SUITE 150
IRVINE, CA 92618
TEL (949) 753-5163
FAX (949) 753-5164

REGISTERED PROFESSIONAL ENGINEER DAVID B LEW No. C 59063 Exp. 6-30-03 CIVIL STATE OF CALIFORNIA

David Lew 11/11/02
DAVID B LEW, RCE 59063 DATE

REVISIONS

NO.	DATE	DESCRIPTION	APP.
△2	11/11/02	STORM DRAIN STANDARD MODIFICATIONS	

STORM DRAIN PLAN AND PROFILE
SUSAN STREET/SOUTH COAST DRIVE
CITY OF COSTA MESA
DEPARTMENT OF ENGINEERING SERVICES

SHEET 11 OF 16 SHEETS
PLAN NUMBER 2002-3.11

2002-3.11

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

MATCH LINE STA 302+00.00 SEE SHEET NO. 3

STA 302+25.00
MH SHAFT
RIM = 28.0

EXIST. GROUND @ CHANNEL BANK

REMOVE EXIST RCB STRUCTURES

STA 304+59.40
EXIST. 12" STL PIPE
MESA CONSOL. WATER DISTRICT

27.9
7.0 D

FUTURE FINISHED SURFACE (BY OTHERS)

STA 307+25.00
MH SHAFT
RIM = 29.3

REMOVE EXIST RCB STRUCTURES

HGL (100)

19.95 FL
18" RCP

10.5'

17.13 FL
60" RCP

RCB INVERT GRADELINE

17.9 FL
48" RCP

13.63
ELEV

S=0.00128

2.0'

14.65
ELEV

STA 305+25.81
INT. W/ 60" RCP

STA 307+51.40
@ R.C. OPENING

STA 307+70.40
℄ R.C. OPENING

STA 307+95.22
INT. W/ 80" RCP

STA 308+63.57
EXIST. 12" VCP
24" STL CASING
SANITATION DISTRICTS OF ORANGE COUNTY

10.40 FL

CONST. DBL. 14.0'X10.5' RCB 800 LF

MATCH LINE STA 310+00.00 SEE SHEET NO. 5

302+00 303+00 304+00 305+00 306+00 307+00 308+00 309+00 310+00

30 20 10

STA 0+00.00 BEG LAT "A"
=STA 296+95.30
℄ INT W/D03

STA 0+13.40 ℄
INT W/WALL RCB
ELEV S=18.80'

STA 0+18.98 JOIN
EXIST 30" RCP
ELEV R=18.86'

C=6.0'

LATERAL "A"

STA 0+00.00 BEG LAT "B"
=STA 297+09.75
℄ INT W/D03

STA 0+16.50 ℄
INT W/WALL RCB
ELEV S=18.90'

STA 0+24.08 JOIN
EXIST 42" RCP
ELEV R=18.80'

C=8.0'

LATERAL "B"

STA 0+00.00 BEG LAT "C"
=STA 305+25.01
℄ INT W/D03

S=-17.67

18" RCP

4.05

STA 0+44.33 ℄ INT
W/WALL ELEV "S"=19.58'

STA 0+15.91 JOIN EXIST 18" RCP
ELEV "R"=19.83'

C=2.0'

LATERAL "C"

PER DRAINAGE REPORT DMA B
PROPOSED Q25 IS LESSER BY
1.2CFS THAN EXISTING. NO
ADVERSE EFFECT TO THIS SD

CITY OF COSTA MESA R/W

℄ SOUTH COAST DRIVE

MATCH LINE STA 302+00.00 SEE SHEET NO. 3

MATCH LINE STA 310+00.00 SEE SHEET NO. 5

STA 302+25.00
R.C. BOX MANHOLE (1)

EXIST. CHAIN LINK FENCE (19)

REMOVE EXISTING CONCRETE PADS, AC PAVING, AND CURB & GUTTER

STA 305+25.81
INT W/RCB WALL
=0+00.00 LAT. C
ANGLE A=90.00°
SEE PROFILE HEREON

STA 307+25.00
R.C. BOX MANHOLE (1)
(2) 14.0' X 10.5' RCB

STA 307+95.22
INT W/RCB WALL
ANGLE A=30.00°
SEE PROFILE SHEET 5

STA 307+70.40 ℄ INT
=0+00.00 LAT. D
℄ R.C. BOX OPENING (10)

STA 308+63.57
EXIST. 12" VCP, 24" STL CASING
PROTECT-IN-PLACE
GREENVILLE-BANNING TRUNK SEWER
SANITATION DISTRICTS OF ORANGE COUNTY

REMOVE EXISTING ASPHALT PAD

32' LF OF 48" RCP
S=0.0030 (49)

TIMES S.D. D03P08 (PROTECT-IN-PLACE)

PER PERMIT # 2002-01818

8" RW

10"S

12"W

303+00 304+00 305+00 306+00 S 89°40'32" E 307+00 308+00 309+00

EXISTING RIPRAP (18)

REMOVE EXISTING RC TRANSITION (8)

12" MORTAR LINED & COATED STL PIPE PROTECT-IN-PLACE

REMOVE EXISTING DBL 12.5'X10.5' RCB (17)

REMOVE EXISTING DBL 11.3'X10' RCB (17)

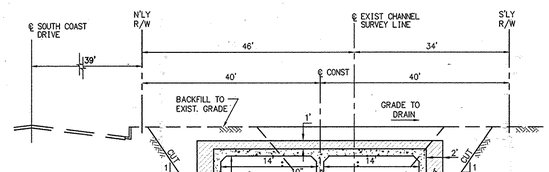
80' OCFCD R/W

STA 307+51.40
℄ R.C. BOX OPENING (10)

STA 308+90.00
℄ INT W/RCB WALL
ANGLE A=90°
C=2.0'

25'

40' 30' 20' 10' 0' 40' 80'
GRAPHIC SCALE: 1"=40'



TYPICAL SECTION (D03)
STA 302+00 TO STA 310+00.00
N.T.S.

1 1/2 0 1 2
3 inches on original drawing

CONSTRUCTION NOTES

(1) CONSTRUCT R.C. BOX MANHOLE PER PF & RD STD. PLAN NO. 1506
(2) CONSTRUCT DBL 14'X10.5' RCB PER PLAN, PROFILE AND DETAIL ON SHEET 9
(8) REMOVE EXISTING TRANSITION STRUCTURE
(9) CONSTRUCT JUNCTION STRUCTURE TYPE V PER PF&RD STD PLAN NO. 1314
(10) CONSTRUCT R.C. BOX OPENING PER DETAIL ON SHEET 12
(17) REMOVE EXISTING DBL BARREL RCB
(18) REMOVE AND SALVAGE EXISTING LOOSE RIPRAP (DISPOSE GROUTED RIP-RAP)
(19) REMOVE AND SALVAGE EXISTING CHAIN LINK FENCE AND GATES
(25) INSTALL GEOTEXTILE FILTER FABRIC PER PFRD STD 1808
(26) INSTALL 24" GRAVEL BASE
(49) CONSTRUCT 48" RCP (D-1400)

HYDRAULIC DATA

LINE	STA TO STA	Q_{100}*	S_o	n	b(ft)	D_n(ft)	V_n(fps)	D_c(ft)	V_c(fps)	N_f
D03	302+00.00 307+70.40	1067	0.00128	0.014	14.0	8.23	9.26	5.65	13.49	0.568
D03	307+70.40 310+00.00	1037	0.00128	0.014	14.0	8.05	9.20	5.54	13.36	0.571

* FLOW RATE PER CELL IN DBL RCB

AS BUILT PLANS

CITY OF COSTA MESA
Public Services Dept./
Engineering Division Approval
For improvements located within public right of way or public easements, an encroachment permit is required prior to the start of work.
Approved by: _____ Date 4/12/02

REGISTERED PROFESSIONAL ENGINEER
JOHN McCARTHY
No. 47583
Exp. 12-31-03
CIVIL
STATE OF CALIFORNIA

RBF CONSULTING
PLANNING ■ DESIGN ■ CONSTRUCTION
14725 ALTON PARKWAY
IRVINE, CALIFORNIA 92618-2027
949.472.3505 ▪ FAX 949.472.8373 ▪ www.RBF.com
JOHN A. McCARTHY RCE 47583 DATE: 4/15/02

ORANGE COUNTY
PLANNING & DEVELOPMENT SERVICES
GREENVILLE - BANNING CHANNEL

FACILITY NO. D03
PLAN AND PROFILE
STA 302+00 TO STA 310+00

MARK	DATE	DESCRIPTION
F	12-2002	PERMIT # 2002-01818
A	5/16/03	AS-BUILT PLANS
2	8/15/02	ADD S.D LATERAL A8 STA 308+90

REVISIONS

DESIGNED TR
DRAWN EC, GHO CHECKED JAM

PREPARED UNDER SUPERVISION OF _____ DATE:

SCALE AS SHOWN | DATE 4/02 | DWG NO D03-701-3, D03S03-701-1, D03P02-701-2

SHEET 4/21

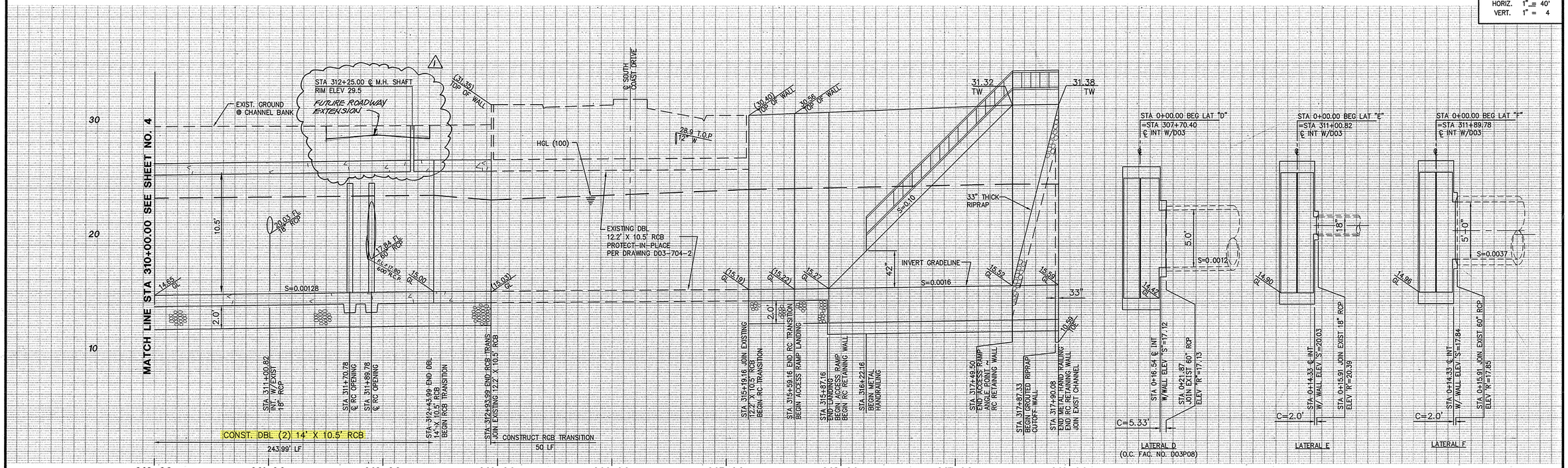
D03-701-3
D03S03-701-1
D03P02-701-2

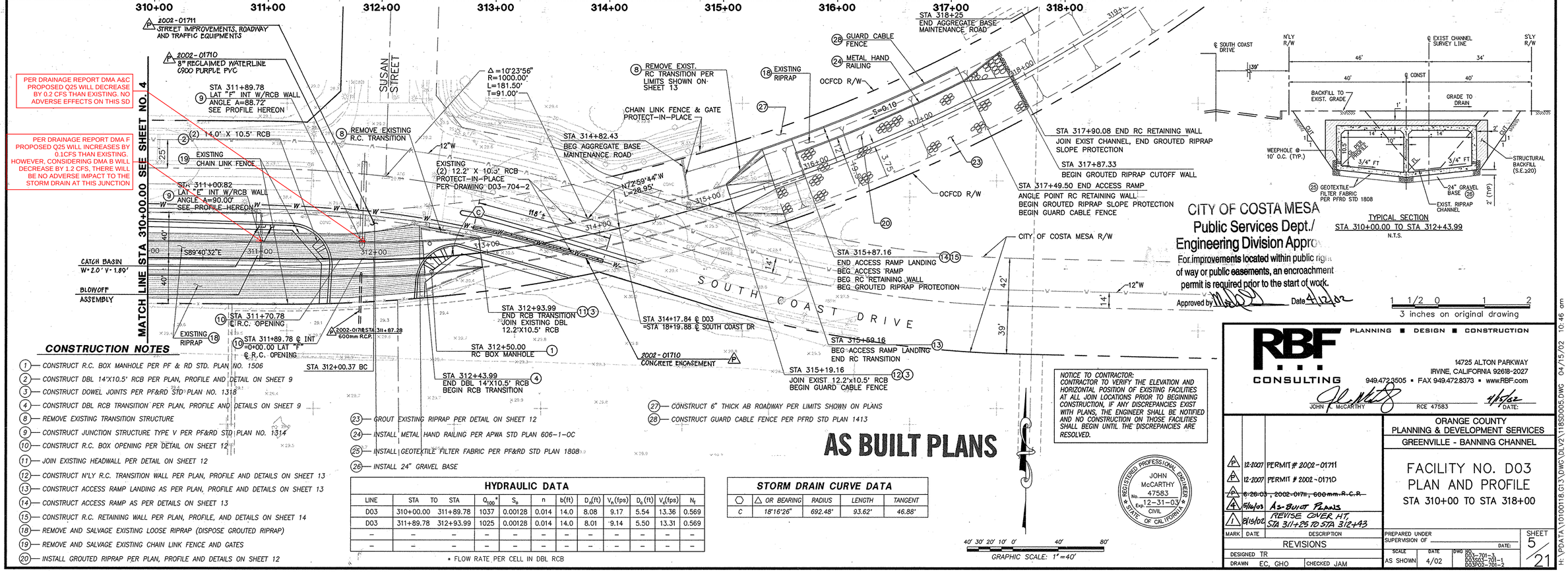
4
21

H:\PDATA\10100118.G13\DWG\DLV2\118SD004.DWG 04/15/02 10:44 am

EXP 12/31/2003 JOHN McCARTHY CIVIL STATE OF CALIFORNIA

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





CONSTRUCTION NOTES

1. CONSTRUCT R.C. BOX MANHOLE PER PF & RD STD. PLAN NO. 1506
2. CONSTRUCT DBL 14'X10.5' RCB PER PLAN, PROFILE AND DETAIL ON SHEET 9
3. CONSTRUCT DOWEL JOINTS PER PF&RD STD PLAN NO. 1318
4. CONSTRUCT DBL RCB TRANSITION PER PLAN, PROFILE AND DETAILS ON SHEET 9
8. REMOVE EXISTING TRANSITION STRUCTURE
9. CONSTRUCT JUNCTION STRUCTURE TYPE V PER PF&RD STD PLAN NO. 1314
10. CONSTRUCT R.C. BOX OPENING PER DETAIL ON SHEET 12
11. JOIN EXISTING HEADWALL PER DETAIL ON SHEET 12
12. CONSTRUCT N'LY R.C. TRANSITION WALL PER PLAN, PROFILE AND DETAILS ON SHEET 13
13. CONSTRUCT ACCESS RAMP LANDING AS PER PLAN, PROFILE AND DETAILS ON SHEET 13
14. CONSTRUCT ACCESS RAMP AS PER DETAILS ON SHEET 13
15. CONSTRUCT R.C. RETAINING WALL PER PLAN, PROFILE, AND DETAILS ON SHEET 14
18. REMOVE AND SALVAGE EXISTING LOOSE RIPRAP (DISPOSE GROUTED RIPRAP)
19. REMOVE AND SALVAGE EXISTING CHAIN LINK FENCE AND GATES
20. INSTALL GROUTED RIPRAP PER PLAN, PROFILE AND DETAILS ON SHEET 12
23. GROUT EXISTING RIPRAP PER DETAIL ON SHEET 12
24. INSTALL METAL HAND RAILING PER APWA STD PLAN 606-1-OC
25. INSTALL GEOTEXTILE FILTER FABRIC PER PF&RD STD PLAN 1808
26. INSTALL 24" GRAVEL BASE
27. CONSTRUCT 6" THICK AB ROADWAY PER LIMITS SHOWN ON PLANS
28. CONSTRUCT GUARD CABLE FENCE PER PFRD STD PLAN 1413

HYDRAULIC DATA

LINE	STA TO STA	Q_{100}*	S_o	n	b(ft)	D_H(ft)	V_n(fps)	D_c(ft)	V_c(fps)	N_f
D03	310+00.00 311+89.78	1037	0.00128	0.014	14.0	8.08	9.17	5.54	13.36	0.569
D03	311+89.78 312+93.99	1025	0.00128	0.014	14.0	8.01	9.14	5.50	13.31	0.569
–	– –	–	–	–	–	–	–	–	–	–
–	– –	–	–	–	–	–	–	–	–	–

* FLOW RATE PER CELL IN DBL RCB

STORM DRAIN CURVE DATA

◯	△ OR BEARING	RADIUS	LENGTH	TANGENT
C	18°16'26"	692.48'	93.62'	46.88'

AS BUILT PLANS

NOTICE TO CONTRACTOR:
CONTRACTOR TO VERIFY THE ELEVATION AND HORIZONTAL POSITION OF EXISTING FACILITIES AT ALL JOIN LOCATIONS PRIOR TO BEGINNING CONSTRUCTION. IF ANY DISCREPANCIES EXIST WITH PLANS, THE ENGINEER SHALL BE NOTIFIED AND NO CONSTRUCTION ON THOSE FACILITIES SHALL BEGIN UNTIL THE DISCREPANCIES ARE RESOLVED.

REGISTERED PROFESSIONAL ENGINEER JOHN McCARTHY No. 47583 Exp. 12-31-03 CIVIL STATE OF CALIFORNIA

GRAPHIC SCALE: 1"=40'

RBF CONSULTING
PLANNING ■ DESIGN ■ CONSTRUCTION
14725 ALTON PARKWAY
IRVINE, CALIFORNIA 92618-2027
949.472.3505 ▪ FAX 949.472.8373 ▪ www.RBF.com
JOHN F. McCARTHY RCE 47583 DATE: 11/15/02

MARK	DATE	DESCRIPTION
P	12-2001	PERMIT # 2002-01711
P	12-2001	PERMIT # 2002-01710
A	6-26-03	2002-01711, 600mm R.C.P.
A	5/16/03	AS-BUILT PLANS
1	8/15/02	REVISE COVER HT. STA 311+25 TO STA 312+43

REVISIONS

DESIGNED TR
DRAWN EC, GHO CHECKED JAM

ORANGE COUNTY
PLANNING & DEVELOPMENT SERVICES
GREENVILLE - BANNING CHANNEL

FACILITY NO. D03
PLAN AND PROFILE
STA 310+00 TO STA 318+00

PREPARED UNDER SUPERVISION OF _____ DATE: _____

SCALE AS SHOWN | DATE 4/02 | DWG NO. D03-704-3, D03B03-701-1, D03P02-701-2

SHEET 5/21

D03-704-3
D03B03-701-1
D03P02-701-2

5
21

H:\PDATA\1010018.013\DWG\DLV2\1185D005.DWG 04/15/02 10:46 am

EXISTING DMA C - SUSAN - 18 INCH

```
***********************************
Water Surface Profile Gradient (WSPG)
XP WSPG
Engine Version 3.1         19/04/2012
Innovyze              www.innovyze.com
***********************************

INPUT FILE
***********************************
F:\Projects\424\028\_Support Files\Reports\Hydrology\Preliminary Hydrology\WSPG\DMA C-LATERAL-Existing.wsx
Computed  09/10/24  10:51:48

TITLE INFORMATION
***********************************

WARNING SUMMARY
***********************************
 WARNING 06: Upstream channel and downstream channel are the same for transition EX 18 inch RCP. Use a reach instead?

RESULTS
***********************************


================================================================
   Main Line
----------------------------------------------------------------

 Composite Profile:

ELEMENT    TYPE       STATION    INVERT   GROUND   W.S.      DEPTH    Q   BARREL VELOC.  VELOC. ENERGY     SUPER   CRITICAL FROUDE  SLOPE    NORMAL   CROSS
NAME                             ELEV     ELEV     ELEV                          HEAD   GRADE LN   ELEV    DEPTH    NUMBER           DEPTH    SECTION
---------- ---------- ---------- -------- -------- --------  -------- ---------- ------- ------ ---------- ------  -------- ------  -------  ------   ---------
###
"Susan Ma" Outlet     160.28     24.49    29.60    27.550    3.060    7.80    1   4.41    0.30   27.85      0.000   1.082    0.000   0.00000  0.000    Circular Pipe
"EX 18 in" Transition 198.48     25.56    31.10    27.761    2.201    7.80    1   4.41    0.30   28.06      0.000   1.082    0.000   0.02801  0.000    Circular Pipe
"Existing" Junction   201.48     25.56    30.95    27.783    2.223    7.80    1   4.41    0.30   28.09      0.000   1.082    0.000   0.00000  0.000    Circular Pipe
"18 inch"  Reach      214.60     25.84    30.95    27.855    2.015    7.80    1   4.41    0.30   28.16      0.000   1.082    0.000   0.02134  0.757    Circular Pipe
"DMA C"    Headwrk    214.60     25.84    30.95    27.855    2.015    7.80    1   4.41    0.30   28.16      0.000   1.082    0.000   0.00000  0.000    Circular Pipe

 *) in the W.S.ELEV column indicates flooding, it is set whenever W.S.ELEV > GROUND ELEV
    i.p. = intermediate point processing results for reaches
```

PROPOSED DMA C - SUSAN - 18 INCH

```
***********************************
Water Surface Profile Gradient (WSPG)
XP WSPG
Engine Version 3.1         19/04/2012
Innovyze              www.innovyze.com
***********************************

INPUT FILE
***********************************
F:\Projects\424\028\_Support Files\Reports\Hydrology\Preliminary Hydrology\WSPG\DMA C-LATERAL-Prop.wsx
Computed  09/10/24  10:54:00

TITLE INFORMATION
***********************************

WARNING SUMMARY
***********************************
 WARNING 06: Upstream channel and downstream channel are the same for transition EX 18 inch RCP. Use a reach instead?

RESULTS
***********************************


================================================================
   Main Line
----------------------------------------------------------------

 Composite Profile:

ELEMENT    TYPE       STATION    INVERT   GROUND   W.S.      DEPTH    Q   BARREL VELOC.  VELOC. ENERGY     SUPER   CRITICAL FROUDE  SLOPE    NORMAL   CROSS
NAME                             ELEV     ELEV     ELEV                          HEAD   GRADE LN   ELEV    DEPTH    NUMBER           DEPTH    SECTION
---------- ---------- ---------- -------- -------- --------  -------- ---------- ------- ------ ---------- ------  -------- ------  -------  ------   ---------
###
"Susan Ma" Outlet     160.28     24.49    29.60    27.550    3.060    9.10    1   5.15    0.41   27.96      0.000   1.167    0.000   0.00000  0.000    Circular Pipe
"EX 18 in" Transition 198.48     25.56    31.10    27.837    2.277    9.10    1   5.15    0.41   28.25      0.000   1.167    0.000   0.02801  0.000    Circular Pipe
"Existing" Junction   201.48     25.56    30.95    27.867    2.307    9.10    1   5.15    0.41   28.28      0.000   1.167    0.000   0.00000  0.000    Circular Pipe
"18 inch"  Reach      214.60     25.84    30.95    27.965    2.125    9.10    1   5.15    0.41   28.38      0.000   1.167    0.000   0.02134  0.831    Circular Pipe
"DMA C"    Headwrk    214.60     25.84    30.95    27.965    2.125    9.10    1   5.15    0.41   28.38      0.000   1.167    0.000   0.00000  0.000    Circular Pipe

 *) in the W.S.ELEV column indicates flooding, it is set whenever W.S.ELEV > GROUND ELEV
    i.p. = intermediate point processing results for reaches
```

EXISTING DMA C - SUSAN - 51 INCH

```
***********************************
Water Surface Profile Gradient (WSPG)
XP WSPG
Engine Version 3.1         19/04/2012
Innovyze              www.innovyze.com
***********************************

INPUT FILE
***********************************
F:\Projects\424\028\_Support Files\Reports\Hydrology\Preliminary Hydrology\WSPG\Susan - 51 - Ex.wsx
Computed  09/09/24  20:55:23

TITLE INFORMATION
***********************************

WARNING SUMMARY
***********************************
 WARNING 25: Link type element Link2 has different invert elevation than its upstream node.
 WARNING 36: D/S processing stopped in junction Node2 because critical momentum is greater than maximum momentum.

RESULTS
***********************************


================================================================
   Main Line
================================================================

 Composite Profile:

ELEMENT    TYPE       STATION    INVERT   GROUND   W.S.      DEPTH    Q   BARREL VELOC.  VELOC. ENERGY     SUPER   CRITICAL FROUDE  SLOPE    NORMAL   CROSS
NAME                             ELEV     ELEV     ELEV                            HEAD   GRADE LN   ELEV    DEPTH    NUMBER           DEPTH    SECTION
---------- ---------- ---------- -------- -------- --------  -------- ---------- ------- ------ ---------- ------  -------- ------  -------  ------   ---------
###
"Node4"    Outlet     1000.00    17.80    29.50    27.000    9.200    71.30   1   5.03    0.39   27.39      0.000   2.507    0.000   0.00000  0.000    Circular Pipe
"Link3"    Reach      1117.00    18.23    29.60    27.209    8.979    71.30   1   5.03    0.39   27.60      0.000   2.507    0.000   0.00368  2.611    Circular Pipe
"Link2"    Reach      1155.32    19.73    29.60    27.277    7.547    71.30   1   5.03    0.39   27.67      0.000   2.507    0.000   0.03914  1.333    Circular Pipe
"Node2"    Junction   1161.32    19.75    29.60    27.396    7.646    63.50   1   4.48    0.31   27.71      0.000   2.359    0.000   0.00333  0.000    Circular Pipe
"Link1"    Reach      1610.02    20.65    30.00    28.030    7.380    63.50   1   4.48    0.31   28.34      0.000   2.359    0.000   0.00201  2.982    Circular Pipe
"Node1"    Headwrk    1610.02    20.65    30.00    28.030    7.380    63.50   1   4.48    0.31   28.34      0.000   2.359    0.000   0.00000  0.000    Circular Pipe

 *) in the W.S.ELEV column indicates flooding, it is set whenever W.S.ELEV > GROUND ELEV
    i.p. = intermediate point processing results for reaches
```

PROPOSED DMA C - SUSAN - 51 INCH

```
***********************************
Water Surface Profile Gradient (WSPG)
XP WSPG
Engine Version 3.1         19/04/2012
Innovyze              www.innovyze.com
***********************************

INPUT FILE
***********************************
F:\Projects\424\028\_Support Files\Reports\Hydrology\Preliminary Hydrology\WSPG\Susan - 51 - Prop.wsx
Computed  09/09/24  21:03:28

TITLE INFORMATION
***********************************

WARNING SUMMARY
***********************************
 WARNING 25: Link type element Link2 has different invert elevation than its upstream node.
 WARNING 36: D/S processing stopped in junction Node2 because critical momentum is greater than maximum momentum.

RESULTS
***********************************


================================================================
   Main Line
================================================================

 Composite Profile:

ELEMENT    TYPE       STATION    INVERT   GROUND   W.S.      DEPTH    Q   BARREL VELOC.  VELOC. ENERGY     SUPER   CRITICAL FROUDE  SLOPE    NORMAL   CROSS
NAME                             ELEV     ELEV     ELEV                            HEAD   GRADE LN   ELEV    DEPTH    NUMBER           DEPTH    SECTION
---------- ---------- ---------- -------- -------- --------  -------- ---------- ------- ------ ---------- ------  -------- ------  -------  ------   ---------
###
"Node4"    Outlet     1000.00    17.80    29.50    27.000    9.200    72.60   1   5.12    0.41   27.41      0.000   2.530    0.000   0.00000  0.000    Circular Pipe
"Link3"    Reach      1117.00    18.23    29.60    27.216    8.986    72.60   1   5.12    0.41   27.62      0.000   2.530    0.000   0.00368  2.643    Circular Pipe
"Link2"    Reach      1155.32    19.73    29.60    27.287    7.557    72.60   1   5.12    0.41   27.69      0.000   2.530    0.000   0.03914  1.346    Circular Pipe
"Node2"    Junction   1161.32    19.75    29.60    27.416    7.666    63.50   1   4.48    0.31   27.73      0.000   2.359    0.000   0.00333  0.000    Circular Pipe
"Link1"    Reach      1610.02    20.65    30.00    28.050    7.400    63.50   1   4.48    0.31   28.36      0.000   2.359    0.000   0.00201  2.982    Circular Pipe
"Node1"    Headwrk    1610.02    20.65    30.00    28.050    7.400    63.50   1   4.48    0.31   28.36      0.000   2.359    0.000   0.00000  0.000    Circular Pipe

 *) in the W.S.ELEV column indicates flooding, it is set whenever W.S.ELEV > GROUND ELEV
    i.p. = intermediate point processing results for reaches
```

EXISTING DMA F - SOUTH COAST - 18 INCH

```
************************************
Water Surface Profile Gradient (WSPG)
XP WSPG
Engine Version 3.1         19/04/2012
Innovyze              www.innovyze.com
************************************

INPUT FILE
************************************
F:\Projects\424\028\_Support Files\Reports\Hydrology\Preliminary Hydrology\WSPG\DMA F - 18 inch SD - Exist.wsx
Computed  09/09/24  20:27:25

TITLE INFORMATION
************************************

WARNING SUMMARY
************************************

RESULTS
************************************


================================================================
   Main Line
================================================================
 Composite Profile:

ELEMENT    TYPE       STATION    INVERT   GROUND   W.S.      DEPTH    Q   BARREL VELOC.  VELOC.  ENERGY     SUPER   CRITICAL FROUDE  SLOPE    NORMAL   CROSS
NAME                             ELEV     ELEV     ELEV                          HEAD   GRADE LN   ELEV    DEPTH    NUMBER           DEPTH    SECTION
---------- ---------- ---------- -------- -------- --------  -------- ---------- ------- ------ ---------- ------  -------- ------  -------  ------   ---------
###
"Outlet"   Outlet     1000.00    25.73    30.50    25.976    0.246    1.50    1   7.94    0.98   26.96      0.000   0.459    0.000   0.00000  0.000    Circular Pipe
           "i.p."     1001.89    25.91    30.50    26.165    0.253    1.50    1   7.61    0.90   27.06      0.000   0.459    3.199   0.09600  0.219    Circular Pipe
           "i.p."     1003.47    26.06    30.50    26.325    0.262    1.50    1   7.25    0.82   27.14      0.000   0.459    2.998   0.09600  0.219    Circular Pipe
           "i.p."     1004.71    26.18    30.50    26.453    0.271    1.50    1   6.91    0.74   27.20      0.000   0.459    2.810   0.09600  0.219    Circular Pipe
           "i.p."     1005.72    26.28    30.50    26.559    0.280    1.50    1   6.59    0.67   27.23      0.000   0.459    2.632   0.09600  0.219    Circular Pipe
           "i.p."     1006.54    26.36    30.50    26.647    0.289    1.50    1   6.29    0.61   27.26      0.000   0.459    2.466   0.09600  0.219    Circular Pipe
           "i.p."     1007.23    26.42    30.50    26.723    0.299    1.50    1   5.99    0.56   27.28      0.000   0.459    2.311   0.09600  0.219    Circular Pipe
           "i.p."     1007.80    26.48    30.50    26.788    0.309    1.50    1   5.71    0.51   27.30      0.000   0.459    2.165   0.09600  0.219    Circular Pipe
           "i.p."     1008.28    26.53    30.50    26.845    0.320    1.50    1   5.45    0.46   27.31      0.000   0.459    2.028   0.09600  0.219    Circular Pipe
           "i.p."     1008.69    26.56    30.50    26.895    0.330    1.50    1   5.19    0.42   27.31      0.000   0.459    1.899   0.09600  0.219    Circular Pipe
           "i.p."     1009.03    26.60    30.50    26.938    0.342    1.50    1   4.95    0.38   27.32      0.000   0.459    1.779   0.09600  0.219    Circular Pipe
           "i.p."     1009.31    26.62    30.50    26.977    0.353    1.50    1   4.72    0.35   27.32      0.000   0.459    1.666   0.09600  0.219    Circular Pipe
           "i.p."     1009.54    26.65    30.50    27.012    0.365    1.50    1   4.50    0.31   27.33      0.000   0.459    1.560   0.09600  0.219    Circular Pipe
           "i.p."     1009.73    26.66    30.50    27.042    0.378    1.50    1   4.29    0.29   27.33      0.000   0.459    1.461   0.09600  0.219    Circular Pipe
           "i.p."     1009.88    26.68    30.50    27.070    0.391    1.50    1   4.09    0.26   27.33      0.000   0.459    1.368   0.09600  0.219    Circular Pipe
"10"       Reach      1010.00    26.69    30.50    27.095    0.405    1.50    1   3.90    0.24   27.33      0.000   0.459    1.280   0.09600  0.219    Circular Pipe
           "i.p."     1059.23    27.09    30.50    27.491    0.405    1.50    1   3.90    0.24   27.73      0.000   0.459    1.280   0.00806  0.405    Circular Pipe
           "i.p."     1074.77    27.21    30.50    27.625    0.414    1.50    1   3.78    0.22   27.85      0.000   0.459    1.226   0.00806  0.405    Circular Pipe
           "i.p."     1079.81    27.25    30.50    27.680    0.428    1.50    1   3.61    0.20   27.88      0.000   0.459    1.147   0.00806  0.405    Circular Pipe
```

	"i.p."	1081.57	27.27	30.50	27.709	0.443	1.50	1	3.44	0.18	27.89	0.000	0.459	1.073	0.00806	0.405	Circular Pipe
"72"	Reach	1082.00	27.27	30.50	27.728	0.458	1.50	1	3.28	0.17	27.90	0.000	0.459	1.004	0.00806	0.405	Circular Pipe
"DMA F"	Headwrk	1082.00	27.27	30.50	27.729	0.459	1.50	1	3.27	0.17	27.90	0.000	0.459	0.000	0.00000	0.000	Circular Pipe

*) in the W.S.ELEV column indicates flooding, it is set whenever W.S.ELEV > GROUND ELEV
i.p. = intermediate point processing results for reaches

PROPOSED DMA F - SOUTH COAST - 18 INCH

```
************************************
Water Surface Profile Gradient (WSPG)
XP WSPG
Engine Version 3.1         19/04/2012
Innovyze              www.innovyze.com
************************************

INPUT FILE
************************************
F:\Projects\424\028\_Support Files\Reports\Hydrology\Preliminary Hydrology\WSPG\DMA F - 18 inch SD - Prop.wsx
Computed  09/09/24  20:35:00

TITLE INFORMATION
************************************

WARNING SUMMARY
************************************

RESULTS
************************************


================================================================
   Main Line
================================================================
 Composite Profile:

ELEMENT    TYPE       STATION    INVERT   GROUND   W.S.     DEPTH    Q   BARREL VELOC.  VELOC.  ENERGY     SUPER   CRITICAL FROUDE  SLOPE    NORMAL   CROSS
NAME                             ELEV     ELEV     ELEV                          HEAD   GRADE LN   ELEV    DEPTH    NUMBER           DEPTH    SECTION
---------- ---------- ---------- -------- -------- --------  -------- ---------- ------- ------ ---------- ------  -------- ------  -------  ------   ---------
###
"Node3"    Outlet     1000.00    25.73    30.50    25.985    0.255    1.60    1   8.04    1.00   26.99      0.000   0.475    0.000   0.00000  0.000    Circular Pipe
           "i.p."     1001.59    25.88    30.50    26.144    0.261    1.60    1   7.75    0.93   27.08      0.000   0.475    3.205   0.09600  0.226    Circular Pipe
           "i.p."     1003.22    26.04    30.50    26.310    0.270    1.60    1   7.39    0.85   27.16      0.000   0.475    3.003   0.09600  0.226    Circular Pipe
           "i.p."     1004.51    26.16    30.50    26.443    0.279    1.60    1   7.04    0.77   27.21      0.000   0.475    2.814   0.09600  0.226    Circular Pipe
           "i.p."     1005.56    26.26    30.50    26.552    0.289    1.60    1   6.72    0.70   27.25      0.000   0.475    2.637   0.09600  0.226    Circular Pipe
           "i.p."     1006.41    26.35    30.50    26.644    0.299    1.60    1   6.40    0.64   27.28      0.000   0.475    2.470   0.09600  0.226    Circular Pipe
           "i.p."     1007.12    26.41    30.50    26.722    0.309    1.60    1   6.10    0.58   27.30      0.000   0.475    2.314   0.09600  0.226    Circular Pipe
           "i.p."     1007.72    26.47    30.50    26.790    0.319    1.60    1   5.82    0.53   27.32      0.000   0.475    2.168   0.09600  0.226    Circular Pipe
           "i.p."     1008.22    26.52    30.50    26.849    0.330    1.60    1   5.55    0.48   27.33      0.000   0.475    2.031   0.09600  0.226    Circular Pipe
           "i.p."     1008.64    26.56    30.50    26.901    0.341    1.60    1   5.29    0.43   27.34      0.000   0.475    1.902   0.09600  0.226    Circular Pipe
           "i.p."     1008.99    26.59    30.50    26.946    0.353    1.60    1   5.05    0.40   27.34      0.000   0.475    1.781   0.09600  0.226    Circular Pipe
           "i.p."     1009.28    26.62    30.50    26.986    0.365    1.60    1   4.81    0.36   27.35      0.000   0.475    1.668   0.09600  0.226    Circular Pipe
           "i.p."     1009.53    26.64    30.50    27.022    0.378    1.60    1   4.59    0.33   27.35      0.000   0.475    1.562   0.09600  0.226    Circular Pipe
           "i.p."     1009.72    26.66    30.50    27.054    0.391    1.60    1   4.37    0.30   27.35      0.000   0.475    1.462   0.09600  0.226    Circular Pipe
           "i.p."     1009.88    26.68    30.50    27.082    0.404    1.60    1   4.17    0.27   27.35      0.000   0.475    1.368   0.09600  0.226    Circular Pipe
"Link2"    Reach      1010.00    26.69    30.50    27.108    0.418    1.60    1   3.98    0.25   27.35      0.000   0.475    1.281   0.09600  0.226    Circular Pipe
           "i.p."     1058.31    27.08    30.50    27.497    0.418    1.60    1   3.98    0.25   27.74      0.000   0.475    1.281   0.00806  0.418    Circular Pipe
           "i.p."     1074.51    27.21    30.50    27.637    0.428    1.60    1   3.85    0.23   27.87      0.000   0.475    1.226   0.00806  0.418    Circular Pipe
           "i.p."     1079.72    27.25    30.50    27.694    0.443    1.60    1   3.67    0.21   27.90      0.000   0.475    1.147   0.00806  0.418    Circular Pipe
```

	"i.p."	1081.55	27.27	30.50	27.724	0.458	1.60	1	3.50	0.19	27.91	0.000	0.475	1.073	0.00806	0.418	Circular Pipe
"Link1"	Reach	1082.00	27.27	30.50	27.744	0.474	1.60	1	3.34	0.17	27.92	0.000	0.475	1.004	0.00806	0.418	Circular Pipe
"Node1"	Headwrk	1082.00	27.27	30.50	27.745	0.475	1.60	1	3.33	0.17	27.92	0.000	0.475	0.000	0.00000	0.000	Circular Pipe

*) in the W.S.ELEV column indicates flooding, it is set whenever W.S.ELEV > GROUND ELEV
i.p. = intermediate point processing results for reaches