ATTACHMENT C4

Hazardous Building Material Survey

Lincoln Avenue and Manchester Avenue
Anaheim, California 92801

STV Incorporated

1055 West Seventh Street, Suite 3150 | Los Angeles, California 90017

August 18, 2017 | Project No. 210248001





Geotechnical | Environmental | Construction Inspection & Testing | Forensic Engineering & Expert Witness

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Ninyo & Moore
Geotechnical & Environmental Sciences Consultants

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1 INTRODUCTION

In accordance with STV Incorporated's authorization, Ninyo & Moore has performed a hazardous building material survey (HBMS) in support of upcoming demolition activities within the property at Lincoln Avenue and Manchester Avenue, Anaheim, California (site; Figure 1). This report has been prepared in accordance with generally accepted environmental science and engineering practices. This report is based on conditions at the site at the time of the sampling activities and provides documentation of our findings and recommendations.

2 PURPOSE AND SCOPE OF SERVICES

The objectives of the survey is to provide information about current conditions within the site structure regarding the potential presence of asbestos containing materials (ACMs), lead containing surfaces (LCS), and other hazardous materials which are present within the building which will require removal prior to the planned demolition activities. For the purposes of this assessment, LCS refers to both lead-based paint (LBP) and other potential lead-containing materials, as defined by the California Department of Public Health (CDPH) and United States Department of Housing and Urban Development (HUD).

The scope of services we performed for the study is identified below.

- Performed a visual reconnaissance of the property to evaluate for the possible presence of ACMs and LCSs.
- Collected 47 bulk samples and submitted these samples to an independent laboratory for analysis of asbestos content. Samples were analyzed in accordance with the United States Environmental Protection Agency (EPA) recommended method of Polarized Light Microscopy (PLM) in accordance with EPA Test Method 600/R-93/116 July 93.
- Collected of 134 X-Ray fluorescence (XRF) readings (including calibrations) of potential LCS.
- Prepared field drawings showing ACM and LCS sample locations.
- Performed a visual assessment and quantification of miscellaneous hazardous materials including, but not limited to, fluorescent light bulbs (possible mercury); fluorescent light ballasts (possible polychlorinated biphenyl [PCB]-containing oils); high intensity light bulbs (possible mercury); thermostat switches (possible liquid mercury and/or batteries); emergency lighting and exit signs (possible lead acid or other metal containing batteries or tritium); heating, ventilation, and air-conditioning (HVAC) and refrigeration systems (possible chlorofluorocarbon [CFC] gas); and other possible hazardous materials.
- Prepared this HBMS report which presents our data and summarizes field activities, evaluated materials, and locations. This report includes field drawn sample location maps, a general building description, laboratory testing information, laboratory test results, and conclusions and recommendations.

3 SITE BUILDING DESCRIPTION

The site structure is composed of four separate auto garage units with addresses at 1514 West Lincoln Avenue, 1516 West Lincoln Avenue, 1518 West Lincoln Avenue and 1520 West Lincoln Avenue in the city of Anaheim (Figure 2). The structure is a one-story concrete-framed slab on grade building, which occupies an approximate 12,000 square foot (SF) area. Each individual unit has an office space, garage area and a restroom. The interior walls are concrete or drywall. The exterior walls are concrete. The flooring areas are either unfinished concrete, or finished with ceramic tiles and vinyl floor tiles in the offices and restrooms. The ceiling areas are finished with drywall in the offices and restrooms and are unfinished in the garages. The roof system includes built-up composition roofing materials.

4 FIELD LIMITATIONS

Since non-destructive sampling techniques were used, there is a possibility that additional ACMs and LCSs may be encountered in inaccessible areas (e.g., wall cavities, interstitial spaces) during building demolition activities.

5 ASBESTOS SAMPLE COLLECTION AND LABORATORY ANALYSIS

The asbestos survey was performed on July 28, 2017, by Mr. Pedro Rodriguez-Mendez, a California Department of Occupational Safety and Health (DOSH) Site Surveillance Technician. The survey was performed under the direct supervision of Mr. Michael Cushner, a DOSH Certified Asbestos Consultant. Consultant certificates are presented in Appendix A.

5.1 Asbestos Survey

The survey inspection and sampling procedures were performed in accordance with the guidelines published by the EPA in 40 Code of Federal Regulations (CFR) Part 763 Subpart E, October 30, 1987 (Asbestos Hazards Emergency Response Act [AHERA]); the EPA guidance document “Asbestos in Buildings: Simplified Sampling Scheme for Friable Surfacing Materials (EPA 560/5-85-030a, October 1985); the National Emission Standards for Hazardous Air Pollutants (NESHAP; 40 CFR Part 61, subpart M); and the South Coast Air Quality Management District (SCAQMD) Rule 1403.

The survey consisted of three parts including: visual inspection, sampling, and quantification of the building materials.

5.1.1 Visual Inspection

Initial observations were made throughout the structure to evaluate for the presence and condition of accessible suspect materials. Materials which were similar in general appearance were grouped into homogeneous sampling areas (areas in which the materials are uniform in color, texture, construction, or application date), as recommended by the EPA. Each homogeneous area was observed for material type, location, condition, and friability.

In accordance with the EPA and AHERA, suspect materials were placed in one of three categories:

- **Surfacing Materials** - materials generally applied via sprayed or trowel methods,
- **Thermal Systems Insulations (TSI)** - materials generally applied to various mechanical systems, or
- **Miscellaneous Materials** - any materials which do not fit in the Surfacing or TSI classifications.

If asbestos is identified in a sample from a homogeneous area, the entire homogeneous area is considered to contain asbestos.

Representative samples were collected from each homogeneous area within the survey area, except areas that were inaccessible, or areas of assumed ACM, within the limitations of the survey.

5.1.1.1 Friability Classifications

The definition of friability is any material containing more than one percent asbestos that, when dry, can be crumbled, pulverized, or reduced to powder by hand pressure. The EPA's NESHAP regulation has different material categories for ACMs. These categories are used when demolition or renovation projects are being conducted. Each identified suspect homogeneous material was placed in one of the following EPA classifications:

- **Category I Non-friable** - NESHAP defines a Category I non-friable ACM as packing, gaskets, resilient floor covering (except sheet flooring products which are considered friable), and asphalt roofing products which contain more than one percent asbestos.
- **Category II Non-friable** - NESHAP defines a Category II non-friable ACM as any material, except for Category I non-friable ACM, which contains more than one percent asbestos and cannot be reduced to a powder by hand pressure when dry.

- **Regulated Asbestos Containing Material (RACM)** - is (a) friable asbestos material, (b) Category I nonfriable ACM that has become friable, (c) Category I nonfriable ACM that will be or has been subjected to sanding, grinding, cutting or abrading, or (d) Category II nonfriable ACM that has a high probability of becoming or has become crumbled, pulverized, or reduced to powder by the forces expected to act on the material in the course of demolition or renovation operations.

5.1.2 Sampling Procedures

Following the walkthrough, the inspectors collected selected samples of accessible materials identified as suspect ACM. EPA, AHERA, NESHAP, and SCAQMD guidelines were used to determine the sampling protocol. Sampling locations were chosen to be representative of the homogeneous material. Samples of surfacing material were collected in general accordance with the EPA sampling protocol outlined in EPA 560/5-85-030a, October 1985. Representative samples were taken from already damaged areas or areas which were the least visible. Samples of miscellaneous materials were taken as randomly as possible, while attempting to sample already damaged areas so as to minimize disturbance of the material. Generally, three samples of each homogeneous material were collected of miscellaneous materials and TSI, if present.

5.1.3 Quantification

Quantities of accessible and/or exposed building materials that were suspected of containing asbestos were estimated by taking approximate measurements in the field. Quantities are presented in SF or linear feet to be used as a guide for contractor estimates on bidding for abatement activities. It is the abatement contractor's responsibility to confirm quantities prior to bidding and removal.

5.2 Asbestos Laboratory Analysis Procedures

Analysis was performed at EM Lab P&K (EM Lab), Irvine, California. EM Lab is a National Volunteer Laboratory Accreditation Program accredited laboratory. A chain-of-custody, documenting the possession of the samples from the time they were collected until analyzed and stored, was submitted with the bulk samples. The original chain-of-custody accompanied the materials at all times. Custody documentation began at the time samples were collected and each transferor retained a copy of the chain-of-custody record.

Analysis was performed by using the bulk sample for visual observation and slide preparation(s) for microscopic examination and identification. The samples were mounted on slides and then analyzed for asbestos (chrysotile, amosite, crocidolite, anthophyllite, and actinolite/tremolite), fibrous non-asbestos constituents (mineral wool, paper, etc.), and non- fibrous constituents.

Refractive indices, morphology, color, pleochroism, birefringence, extinction characteristics, and signs of elongation identified asbestos. The same characteristics were used to identify the non-asbestos constituents.

The microscopist visually estimated relative amounts of each constituent by determining the volume of each constituent in proportion to the total volume of the sample, using a stereoscope. The bulk samples were analyzed by PLM with dispersion staining as described by the method of the determination of asbestos in bulk insulation, EPA/600/R-93/116, July 1993. This is a standard method of analysis in optical mineralogy and the currently accepted method for the determination of asbestos in bulk samples. A suspect material is immersed in a solution of known refractive index and subjected to illumination by polarized light. The characteristic color displays which result, enable mineral identification.

6 LCS SURVEY

The LCS survey was performed on July 28, 2017, by Mr. Peter Kelley, a CDPH Lead-Related Construction (LRC) Inspector/Assessor. The survey was performed under the supervision of Mr. Michael Cushner, a CDPH LRC Inspector/Assessor and Project Monitor. Consultant certificates are presented in Appendix A.

The survey was conducted using a portable NITON XLp 300A XRF spectrum analyzer in accordance with accepted environmental science and engineering practices. The protocol used for selecting components and sampling locations was that contained in the federal HUD "Guidelines for the Evaluation and Control of Lead-Based Paint Hazards in Housing" (Chapter 7 "Lead-Based Paint Inspection"), except the inspection was limited to accessible materials and once a pattern was recognized for the component results, fewer readings for each component were collected.

The XRF analyzer used for the testing is a direct-reading instrument that determines the concentration of lead in paints by subjecting the paint to energy from a small radioactive source when the instrument is held against the paint and analyzing the absorption of X-Rays by the paint. The instrument was calibrated to the manufacturer's specifications and was also verified, at least every four hours and at the beginning and completion of each set of readings, against known lead sample standards produced by the National Institute of Standards and Testing. The XRF instrument measures lead in units of milligrams of lead per square centimeter of tested surface (mg/cm^2). The CDPH requires that after a lead evaluation is performed a copy of CDPH form 8552 "Lead Hazard Evaluation Report" should be submitted. Ninyo & Moore has faxed this form to the CDPH and a copy is included in Appendix B.

7 INVENTORY OF UNIVERSAL WASTES

A visual evaluation of the structure was performed to quantify miscellaneous hazardous building materials. This included, but was not limited to, potential mercury-containing thermostats, switches, and fluorescent light tubes; items potentially containing PCBs; potential tritium or battery-containing exit signs; and potential CFC-containing refrigeration systems.

8 SURVEY RESULTS

The following sections describe the survey results.

8.1 Asbestos Survey

A total of 47 samples of suspect ACMs were collected and transferred to EM Lab for analysis. The lower limit of reliable detection for asbestos using the PLM method is approximately 1 percent by volume. In the state of California, DOSH regulations define asbestos containing construction materials (ACCMs) if one sample from a homogeneous area contains asbestos content of greater than one tenth of 1 percent (>0.1 percent). Materials in which no asbestos was detected are defined in the laboratory report as “None detected.” Materials containing asbestos, but in amounts less than 1 percent, are defined as containing “trace” amounts and for the purpose of this report are assumed to be ACCM. If inaccessible suspect ACMs were present which were suspect of being ACM or ACCM, they will be noted to be assumed asbestos containing.

8.2 Asbestos Results Summary

Based on observations and the analytical results of bulk samples collected during the survey, ACMs were detected within the property. The ACMs and assumed ACMs found to be present are described in Table 1. Other building materials which were sampled and found to be non-asbestos containing are summarized in Table 2. A copy of the laboratory analytical report and chain-of-custody record is presented in Appendix C. General photographic documentation of the ACMs is presented in Appendix D. The sampling locations of the materials found to be ACM are presented within the field drawings provided in Appendix E.

Table 1 – Positive Asbestos Survey Results

Material	Location	ACM Category	Condition	Approximate Quantity	Photograph No.
Exterior					
Penetration mastic	Roof	NESHAP Category II Non-friable	Good	30 SF ACM	2
Mastic at HVAC seams	Roof	NESHAP Category II Non-friable	Good	10 SF ACM	2
1514 West Lincoln Avenue					
NA					
1516 West Lincoln Avenue					
NA					
1518 West Lincoln Avenue					
Vinyl floor sheeting	Restroom	NESHAP Category II Non-friable	Good	25 SF ACM	3
Mastic associated with 1' x 1' gray vinyl floor tile	Offices	NESHAP Category II Non-friable	Good	200 SF ACM	4
1520 West Lincoln Avenue					
NA					

Notes:
ACM – asbestos containing material
HVAC – heating, ventilation and air conditioning
NA – not applicable
NESHAP – National Emission Standards for Hazardous Air Pollutants
No. – number
SF – square feet
' – foot

Please note that quantities of ACMs are approximate. It is the abatement contractor's responsibility to confirm quantities prior to bidding and removal activities.

Table 2 – Non-Asbestos Containing Materials Sampled

Sample Material Description	Material Location
Exterior	
Roof core asphalt sheeting	Roof
Parapet wall	Roof
Expansion joints	Roof
1514 West Lincoln Avenue	
Drywall and joint compound	Office, Garage, Restroom
1' x 1' gray vinyl floor tile and mastic	Office
Vinyl floor sheeting and mastic	Restroom
Acoustic (popcorn) ceiling	Office
Black cove base and mastic	Office
1516 West Lincoln Avenue	
Drywall and joint compound	Office, Restroom, Garage
Acoustic (popcorn) ceiling	Office
1518 West Lincoln Avenue	
Drywall and joint compound	Office, Restroom
Acoustic (popcorn) ceiling	Office
1520 West Lincoln Avenue	
NA	

Notes:
' – foot
NA – not applicable

8.3 Lead-Containing Surfaces Summary

Federal efforts to regulate LBP began with the LBP Poison Prevention Act in 1971. In 1973, the Consumer Product Safety Commission (CPSC) defined LBP as paint having lead content equal to or greater than 0.5 percent by weight in a dry film of newly applied paint. In 1978, the CPSC lowered the allowable lead levels in new paint to 0.06 percent. HUD developed guidelines relating to HUD facilities that specified lead content of 0.5 percent as an action level in determining the need for corrective action. Federal and State DOSH do not define the amount of lead in paint to a regulatory requirement, rather the activities, or task, define when the regulation is in effect. Both Federal and State standards use the term "trigger task" activities. In the work place, employers must make certain assumptions of the exposure levels and comply with regulations based on the level of disturbance rather than the lead level.

A total of 134 XRF readings were collected from the representative testing combinations (e.g., unique combination of room equivalent, building component, and substrate) within the structure. LCSs were detected within the structure which is planned for demolition. Building components with detectable quantity greater than or equal to 1.0 mg/cm^2 are presented in Table 3 below. A summary of the XRF analysis data is included in the attached Table A. General photographic documentation is presented in Appendix D.

Table 3 – Lead Results Summary

Room/Area	Component	Substrate	Condition	Color	Approximate Quantity	Photograph No.
Exterior						
Exterior	Bollard	Metal	Poor	Yellow	12 each	5
Exterior	Sewer grate	Metal	Poor	Gray	1 SF	6
1514 West Lincoln Avenue						
NA						
1516 West Lincoln Avenue						
Office, Restroom	Floor tile	Ceramic	Intact	White	123 SF	7
Office, Restroom	Baseboard	Ceramic	Intact	White	25 LF	7
Office and Break Room	Crown molding	Wood	Intact	White	100 LF	8
1518 West Lincoln Avenue						
NA						
1520 West Lincoln Avenue						
NA						

Notes:
LF – linear feet
NA – not applicable
No. – number
SF – square feet

Please note that quantities of LCSs are approximate. It is the abatement contractor's responsibility to confirm quantities prior to bidding and removal activities.

8.4 Universal Wastes Inventory

Universal wastes were found within the structure. The universal wastes and locations are presented below in Table 4.

Table 4 – Universal Waste Inventory

Hazardous Material Location	Hazardous Material Description	Estimated Quantity
Exterior		
Roof	HVAC units (refrigerant)	2 each
Ladder to Roof	Bird droppings	40 SF
1514 West Lincoln Avenue		
Throughout	Light ballasts	12
Throughout	Fluorescent lights	24
Office	Water-stained ceiling	4 SF
Garage	Waste oil pit/Clarifier	1 each
Garage	Box of fluorescent lights	1 each
Garage	Paint cans	8 containers
Office	Mercury thermostat switches	2 each
1516 West Lincoln Avenue		
Throughout	Light ballasts	16
Throughout	Fluorescent light ballasts	30
North garage	Oil staining on floor	900 SF
1518 West Lincoln Avenue		
Throughout	Light ballasts	7
Throughout	Fluorescent light ballasts	14
1520 West Lincoln Avenue		
Throughout	Light ballasts	4
Throughout	Fluorescent light ballasts	8
Garage	Oil staining on east wall	60 SF

Notes:
HVAC – heating, ventilation and air conditioning
SF – square feet

9 RECOMMENDATIONS

The following recommendations are provided:

9.1 Asbestos

- The identified ACMs should not be disturbed. Prior to demolition activities which would disturb identified ACMs and assumed ACMs, a licensed abatement removal contractor should remove the ACMs. The licensed abatement contractor must maintain current licenses as required by applicable state or local jurisdictions for the removal, transporting, disposal, or other regulated activities.

- Applicable laws and regulations should be followed, including those provisions requiring notification to regulatory agencies, building occupants, demolition contractors, and workers of the presence of asbestos.

- Asbestos abatement monitoring consulting services should be performed by a third party environmental consultant, to include oversight of abatement contractor activities to be performed in accordance with the abatement specifications, daily air monitoring,

clearances, verification of complete removal of hazardous materials, and preparation of a closeout report summarizing the abatement activities.

9.2 Lead

- The identified LCSs should not be disturbed. The lead containing ceramic tile removal activities should be performed by a licensed abatement contractor with certified lead personnel. The exterior paint in the non-intact condition (bollard and sewer gate) should be stabilized and the substrate should be encapsulated. All lead related removal activities should be performed in accordance with the DOSH Lead in Construction Standard, Title 8 California Code of Regulations (CCR) 1532.1.

- Proper LCS waste stream categorization is required for the two lead containing wastes. A composite sample of each of the representative LCS material should be analyzed for total lead for comparison with the Total Threshold Limit Concentration in accordance with EPA reference method SW-846. If the concentration of total lead is greater than or equal to 1,000 mg/kg, the LCS waste material must be disposed at a landfill which can receive such wastes. If the concentration is less than 50 mg/kg the sample may be disposed as construction debris, if it is to remain in California. If the total lead result is greater than or equal to 50 mg/kg and less than 1,000 mg/kg, the sample must be further analyzed for soluble lead by the Waste Extraction Test for comparison with the Soluble Threshold Limit Concentration (STLC) as described in Title 22 CCR 66261.24a. Additionally, if the result is greater than or equal to 100 mg/kg the sample must be further analyzed for leachable lead by the Toxicity Characteristic Leaching Procedure (TCLP) for comparison with the Resource Conservation and Recovery Act (RCRA) limits. Based on the results of the soluble and leachable analysis the waste material may require disposal as a RCRA-Hazardous waste or non-RCRA- (California-) Hazardous waste.

- Lead abatement monitoring consulting services should be performed by a third party environmental consultant, to include oversight of abatement contractor activities to be performed in accordance with the abatement specifications, daily air monitoring, clearances, verification of complete removal of hazardous materials, and preparation of a closeout report summarizing the abatement activities.

9.3 Universal Wastes

- Universal wastes discussed in this report (Table 4), should be removed and properly recycled or disposed by the licensed abatement contractor prior to renovation activities. Contractor should provide proper manifesting for all hazardous materials removed and recycled to prove the disposal of all materials was completed in accordance with local, state, and federal requirements.

- If demolition plans change to renovations for re-occupancy the following universal wastes (bird droppings at exterior ladder; and water stained ceiling in Unit 1514) will require additional investigation in order to develop recommendations for remediation.

- The oil pit/clarifier observed in Unit 1514 may contain liquids and should be emptied prior to building demolition. The liquid should be waste characterized for appropriate disposal. Limited soil sampling (borings) should be performed at two locations, one on each end of the waste oil pit/clarifier to confirm that petroleum hydrocarbons have not penetrated to the subsurface.

- The oil staining and light ponding observed at the flooring area within Unit 1514 should be cleaned up and waste characterized for appropriate disposal. Once the oil has been cleaned, the concrete should be observed for cracks. If cracks in the concrete are present, limited soil sampling (boring) should be performed to confirm that petroleum hydrocarbons have not penetrated to the subsurface.

- Monitoring consulting services should be performed by a third party environmental consultant, to ensure the appropriate removal of the hazardous materials prior to building demolition activities.

10 LIMITATIONS

Ninyo & Moore's opinions and recommendations regarding environmental conditions, as presented in this report, are based on limited sampling and chemical analysis. Further assessment of potential adverse environmental impacts may be accomplished by a more comprehensive assessment. The samples collected and used for testing, and the observations made, are believed to be representative of the area(s) evaluated. However, if additional suspect ACMs or LCSs are encountered during renovation activities, these materials should be sampled by qualified personnel, and analyzed for content prior to further disturbance. In addition, please note that quantities of ACMs and LCSs are approximate. These numbers should be confirmed prior to removal or repair activities.

The environmental services described in this report have been conducted in general accordance with current regulatory guidelines and the standard-of-care exercised by environmental consultants performing similar work in the project area. No warranty, expressed or implied, is made regarding the professional opinions presented in this report. Variations in site conditions may exist and conditions not observed or described in this report may be encountered during subsequent activities.

This document is intended to be used only in its entirety. No portion of the document, by itself, is designed to completely represent any aspect of the project described herein. Ninyo & Moore should be contacted if the reader requires any additional information, or has questions regarding content, interpretations presented, or completeness of this document.

The environmental interpretations and opinions contained in this report are based on the results of laboratory tests and analyses intended to detect the presence and concentration of specific chemical or physical constituents in samples collected from the subject site. The testing and analyses have been conducted by an independent laboratory which is certified by the State of California to conduct such tests. Ninyo & Moore has no involvement in, or control over, such testing and analysis. Ninyo & Moore, therefore, disclaims responsibility for any inaccuracy in such laboratory results.

Our conclusions, recommendations, and opinions are based on an analysis of the observed site conditions. It should be understood that the conditions of a site can change with time as a result of natural processes or the activities of man at the subject site or nearby sites. In addition, changes to the applicable laws, regulations, codes, and standards of practice may occur due to government action or the broadening of knowledge. The findings of this report may, therefore, be invalidated over time, in part or in whole, by changes over which Ninyo & Moore has no control.

Table A – XRF Readings Summary

Reading No.	Room	Floor	Side	Component	Substrate	Condition	Color	Action Level (mg/cm^2)	Results	Approximate Quantity	Lead Reading (mg/cm^2)
5	**Start**			**Standard Calibration Check 1.04 +/- 0.06 mg/cm^2**				**1.0**	**Positive**	**1.03**	**1.05**
6				**Standard Calibration Check 1.04 +/- 0.06 mg/cm^2**				**1.0**	**Positive**	**0.98**	**1.08**
7				**Standard Calibration Check 1.04 +/- 0.06 mg/cm_2**				**1.0**	**Positive**	**1.03**	**1.04**
8	Roof	R	Center	Skylight	Metal	Intact	White	1.0	Negative	NA	0.0
9	Roof	R	Center	HVAC	Metal	Intact	Gray	1.0	Negative	NA	0.0
10	Roof	R	Center	HVAC	Metal	Intact	Gray	1.0	Negative	NA	0.0
11	Roof	R	Center	Skylight	Metal	Intact	White	1.0	Negative	NA	0.0
12	Roof	R	Center	Vent	Metal	Intact	White	1.0	Negative	NA	0.0
13	Roof	R	Center	HVAC control box	Metal	Intact	White	1.0	Negative	NA	0.0
14	Roof	R	NE	Ladder	Metal	Fair	Gray	1.0	Negative	NA	0.0
15	Exterior	E	NE	Roof access ladder	Metal	Fair	Gray	1.0	Negative	NA	0.0
16	Exterior	E	NE	Roof access ladder	Metal	Intact	Black	1.0	Negative	NA	0.0
17	Exterior	E	NE	Wall	Concrete	Intact	Gray	1.0	Negative	NA	0.0
18	Exterior	E	NE	Wall	Concrete	Intact	Black	1.0	Negative	NA	0.0
19	Exterior	E	Center	Wall	Concrete	Intact	Gray	1.0	Negative	NA	0.0
20	Exterior	E	Center	Wall	Concrete	Intact	Black	1.0	Negative	NA	0.0
21	Exterior	E	NW	Wall	Concrete	Intact	Gray	1.0	Negative	NA	0.0
22	Exterior	E	NW	Wall	Concrete	Intact	Black	1.0	Negative	NA	0.0
23	Exterior	E	NW	Rolling door	Metal	Intact	Black	1.0	Negative	NA	0.0
24	Exterior	E	Center	Rolling door	Metal	Intact	Gray	1.0	Negative	NA	0.0
25	Exterior	E	E	Rolling door	Metal	Intact	Black	1.0	Negative	NA	0.0
26	Exterior	E	E	Gutter	Metal	Intact	Black	1.0	Negative	NA	0.0
27	Exterior	E	Center	Gutter	Metal	Intact	Gray	1.0	Negative	NA	0.0
28	Exterior	E	N	Gutter	Metal	Intact	Black	1.0	Negative	NA	0.0
29	Exterior	E	1514	Wall	Wood	Fair	Gray	1.0	Negative	NA	0.0
30	Exterior	E	1514	Wall	Wood	Fair	Gray	1.0	Negative	NA	0.0
31	Exterior	E	1514	Electrical box	Metal	Intact	Gray	1.0	Negative	NA	0.0
32	Exterior	E	1514	Electrical box	Metal	Intact	Black	1.0	Negative	NA	0.0
33	Exterior	E	1514	Floor	Concrete	Poor	Gray	1.0	Negative	NA	0.0
34	**Exterior**	**E**	**Center**	**Bollard**	**Metal**	**Poor**	**Yellow**	**1.0**	**Positive**	**12 each**	**0.92**
35	**Exterior**	**E**	**Parking**	**Bollard**	**Metal**	**Poor**	**Yellow**	**1.0**	**Positive**	**12 each**	**0.49**
36	Exterior	E	Parking	Transformer	Metal	Intact	Green	1.0	Negative	NA	0.0
37	Exterior	E	1520	Gate	Metal	Intact	Black	1.0	Negative	NA	0.0
38	Exterior	E	1520	Door frame	Metal	Intact	Black	1.0	Negative	NA	0.0
39	Exterior	E	1520	Door	Metal	Intact	Black	1.0	Negative	NA	0.0
40	1514 Office	1	E	Wall	Drywall	Intact	White	1.0	Negative	NA	0.0
41	1514 Office	1	S	Wall	Drywall	Intact	Beige	1.0	Negative	NA	0.0
42	1514 Office	1	N	Wall	Concrete	Fair	White	1.0	Negative	NA	0.0
43	1514 Office	1	-	Ceiling	Drywall	Fair	White	1.0	Negative	NA	0.0
44	1514 Office	1	-	Partition	Drywall	Intact	White	1.0	Negative	NA	0.0
45	1514 Garage	1	N	Wall	Concrete	Intact	White	1.0	Negative	NA	0.0
46	1514 Garage	1	S	Wall	Concrete	Intact	White	1.0	Negative	NA	0.0
47	1514 Garage	1	S	Column	Wood	Intact	White	1.0	Negative	NA	0.0

Table A – XRF Readings Summary

Reading No.	Room	Floor	Side	Component	Substrate	Condition	Color	Action Level (mg/cm^2)	Results	Approximate Quantity	Lead Reading (mg/cm^2)
48	1514 Garage	1	E	Door	Metal	Intact	White	1.0	Negative	NA	0.0
49	1514 Garage	1	E	Door frame	Metal	Intact	White	1.0	Negative	NA	0.0
50	1514 Garage	1	S	Conduit	Metal	Intact	White	1.0	Negative	NA	0.0
51	1514 Garage	1	E	Conduit	Metal	Intact	White	1.0	Negative	NA	0.0
52	1514 Garage	1	N	Conduit	Metal	Intact	White	1.0	Negative	NA	0.0
53	1514 Garage	1	E	Baseboard	Wood	Intact	White	1.0	Negative	NA	0.0
54	1514 Garage	1	S	Baseboard	Wood	Intact	White	1.0	Negative	NA	0.0
55	1514 Bathroom	1	W	Sink	Porcelain	Intact	White	1.0	Negative	NA	0.0
56	1514 Bathroom	1	W	Toilet	Porcelain	Intact	White	1.0	Negative	NA	0.0
57	1514 Garage	1	-	Parking stripe	Concrete	Intact	Yellow	1.0	Negative	NA	0.0
58	1516 Office	1	-	Ceiling	Drywall	Intact	White	1.0	Negative	NA	0.0
59	1516 Office	1	N	Wall	Wood	Intact	Purple	1.0	Negative	NA	0.0
60	1516 Office	1	S	Wall	Wood	Intact	Purple	1.0	Negative	NA	0.0
61	1516 Office	1	-	Floor tile	Ceramic	Intact	Black	1.0	Negative	NA	0.0
62	**1516 Office**	**1**	**-**	**Floor tile**	**Ceramic**	**Intact**	**White**	**1.0**	**Positive**	**102 SF**	**0.24**
63	1516 Office	1	E	Baseboard	Ceramic	Intact	Black	1.0	Negative	NA	0.0
64	**1516 Office**	**1**	**E**	**Baseboard**	**Ceramic**	**Intact**	**White**	**1.0**	**Positive**	**5 SF**	**0.32**
65	1516 Office	1	E	Window frame	Wood	Intact	Purple	1.0	Negative	NA	0.09
66	1516 Office	1	N	Wall	Concrete	Intact	Purple	1.0	Negative	NA	0.0
67	**1516 Office**	**1**	**W**	**Crown Molding**	**Wood**	**Intact**	**White**	**1.0**	**Positive**	**100 LF**	**0.21**
68	1516 Break Room	1	E	Wall	Wood	Intact	White	1.0	Negative	NA	0.0
69	**1516 Break Room**	**1**	**N**	**Crown Molding**	**Wood**	**Intact**	**White**	**1.0**	**Positive**	**Same as 67**	**0.23**
70	1516 Break Room	1	-	Ceiling	Drywall	Intact	White	1.0	Negative	NA	0.0
71	1516 Break Room	1	E	Door	Wood	Intact	Brown	1.0	Negative	NA	0.0
72	1516 Garage	1	W	Floor	Concrete	Poor	Red	1.0	Negative	NA	0.0
73	1516 Garage	1	W	Wall	Drywood	Intact	White	1.0	Negative	NA	0.0
74	1516 Garage	1	E	Wall	Drywall	Intact	White	1.0	Negative	NA	0.0
75	1516 Garage	1	W	Wall	Wood	Intact	White	1.0	Negative	NA	0.0
76	1516 Garage	1	S	Wall	Concrete	Intact	White	1.0	Negative	NA	0.0
77	1516 Garage	1	S	Column	Wood	Intact	White	1.0	Negative	NA	0.0
78	**1516 Restroom**	**1**	**-**	**Floor tile**	**Ceramic**	**Intact**	**White**	**1.0**	**Positive**	**21 SF**	**0.30**
79	1516 Restroom	1	-	Floor tile	Ceramic	Intact	Black	1.0	Negative	NA	0.0
80	1516 Restroom	1	N	Baseboard	Ceramic	Intact	Black	1.0	Negative	NA	0.0
81	**1516 Restroom**	**1**	**S**	**Baseboard**	**Ceramic**	**Intact**	**White**	**1.0**	**Positive**	**25 LF**	**0.25**
82	1516 Restroom	1	W	Sink	Porcelain	Intact	White	1.0	Negative	NA	0.0
83	1516 Restroom	1	W	Toilet	Porcelain	Intact	White	1.0	Negative	NA	0.0
84	1516 Restroom	1	S	Wall	Drywall	Intact	White	1.0	Negative	NA	0.0
85	1516 Restroom	1	-	Ceiling	Drywall	Intact	White	1.0	Negative	NA	0.0
86	1516 Restroom	1	E	Door	Wood	Intact	White	1.0	Negative	NA	0.0
87	1518 Garage	1	W	Wall	Concrete	Intact	White	1.0	Negative	NA	0.0
88	1518 Garage	1	W	Wall	Concrete	Intact	Red	1.0	Negative	NA	0.0
89	1518 Garage	1	E	Wall	Drywall	Intact	Red	1.0	Negative	NA	0.0
90	1518 Garage	1	W	Column	Wood	Intact	Red	1.0	Negative	NA	0.0
91	1518 Garage	1	W	Column	Wood	Intact	White	1.0	Negative	NA	0.0

Table A – XRF Readings Summary

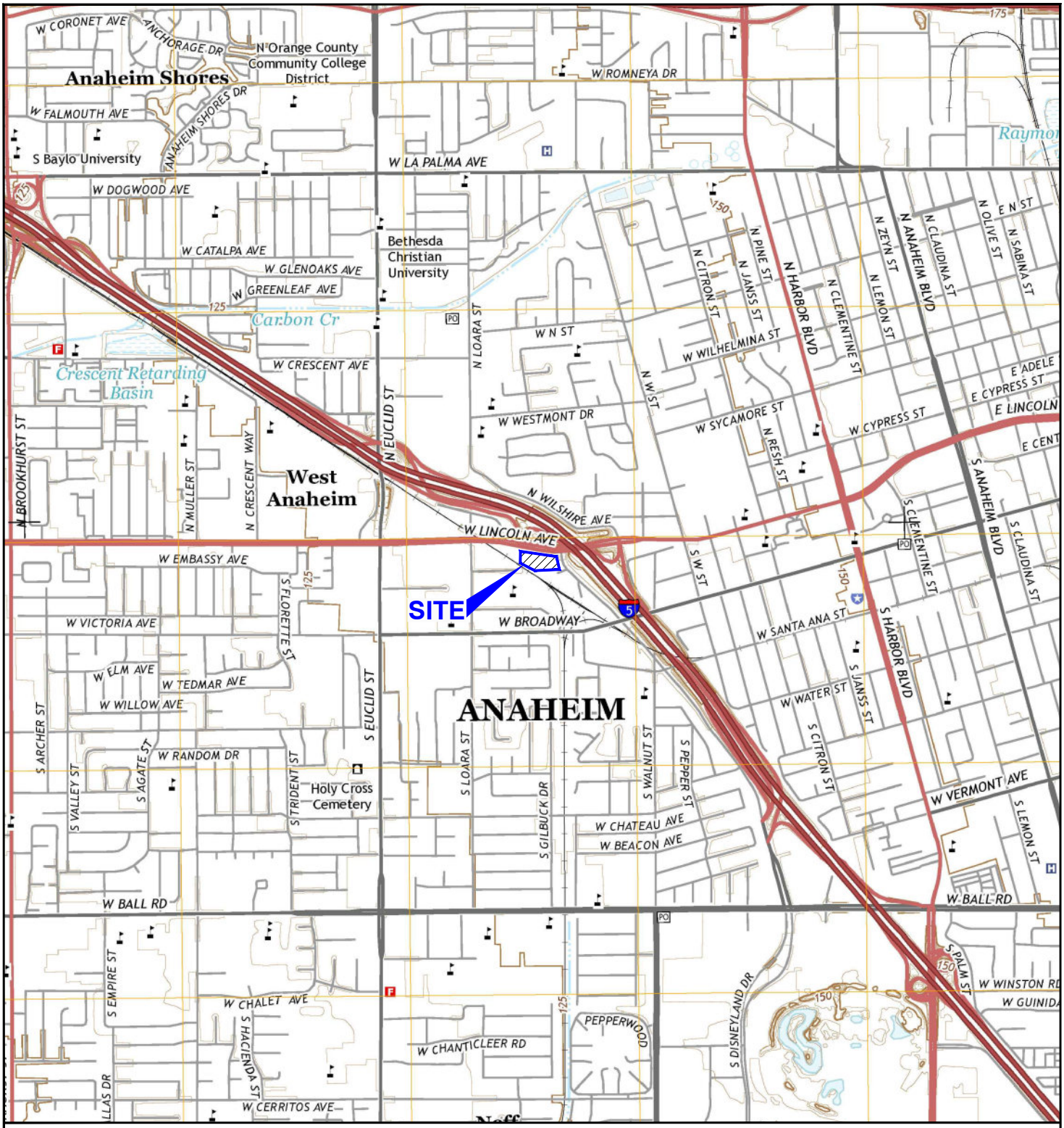
Reading No.	Room	Floor	Side	Component	Substrate	Condition	Color	Action Level (mg/cm^2)	Results	Approximate Quantity	Lead Reading (mg/cm^2)
92	1518 Garage	1	-	Floor paint	Concrete	Poor	Gray	1.0	Negative	NA	0.0
93	1518 Restroom	1	E	Wall	Drywall	Intact	White	1.0	Negative	NA	0.0
94	1518 Restroom	1	-	Ceiling	Drywall	Intact	White	1.0	Negative	NA	0.0
95	1518 Restroom	1	S	Sink	Porcelain	Intact	White	1.0	Negative	NA	0.0
96	1518 Restroom	1	S	Toilet	Porcelain	Intact	White	1.0	Negative	NA	0.0
97	1518 Restroom	1	E	Door	Wood	Intact	White	1.0	Negative	NA	0.0
98	1518 Garage	1	SW	Baseboard	Wood	Intact	White	1.0	Negative	NA	0.0
99	1518 Office	1	E	Wall	Drywall	Intact	Green	1.0	Negative	NA	0.0
100	1518 Office	1	-	Ceiling	Drywall	Intact	White	1.0	Negative	NA	0.0
101	1518 Office	1	N	Baseboard	Wood	Intact	White	1.0	Negative	NA	0.0
102	1518 Office	1	S	Window sill	Drywall	Intact	Gray	1.0	Negative	NA	0.0
103	1518 Office	1	S	Door	Wood	Intact	Brown	1.0	Negative	NA	0.0
104	1520 Office	1	-	Ceiling	Drywall	Intact	White	1.0	Negative	NA	0.0
105	1520 Office	1	S	Wall	Drywall	Intact	Brown	1.0	Negative	NA	0.0
106	1520 Office	1	E	Wall	Concrete	Intact	Tan	1.0	Negative	NA	0.0
107	1520 Office	1	W	Door frame	Wood	Intact	White	1.0	Negative	NA	0.0
108	1520 Office	1	-	Floor tile	Ceramic	Intact	White	1.0	Negative	NA	0.0
109	1520 Office	1	-	Floor tile	Ceramic	Intact	White	1.0	Negative	NA	0.0
110	1520 Storage	1	-	Ceiling	Drywall	Intact	White	1.0	Negative	NA	0.0
111	1520 Storage	1	W	Wall	Drywall	Intact	White	1.0	Negative	NA	0.0
112	1520 Storage	1	N	Wall frame	Wood	Intact	White	1.0	Negative	NA	0.0
113	1520 Storage	1	S	Door frame	Wood	Intact	White	1.0	Negative	NA	0.0
114	1520 Storage	1	-	Floor	Concrete	Intact	Red	1.0	Negative	NA	0.0
115	1520 Storage	1	-	Floor	Concrete	Intact	Red	1.0	Negative	NA	0.0
116	1520 Garage	1	W	Wall	Drywall	Fair	Blue	1.0	Negative	NA	0.0
117	1520 Garage	1	W	Wall	Concrete	Fair	Blue	1.0	Negative	NA	0.0
118	1520 Garage	1	W	Baseboard	Wood	Fair	Blue	1.0	Negative	NA	0.0
119	1520 Garage	1	E	Baseboard	Wood	Fair	Blue	1.0	Negative	NA	0.0
120	1520 Restroom	1	S	Wall	Drywood	Intact	Blue	1.0	Negative	NA	0.0
121	1520 Restroom	1	-	Ceiling	Drywood	Intact	Beige	1.0	Negative	NA	0.0
122	1520 Restroom	1	E	Door	Wood	Intact	Black	1.0	Negative	NA	0.0
123	1520 Restroom	1	E	Door frame	Wood	Intact	Blue	1.0	Negative	NA	0.0
124	1520 Restroom	1	N	Sink	Porcelain	Intact	White	1.0	Negative	NA	0.0
125	1520 Restroom	1	N	Toilet	Porcelain	Intact	White	1.0	Negative	NA	0.0
126	1520 Restroom	1	-	Floor tile	Ceramic	Intact	Tan	1.0	Negative	NA	0.0
127	1520 Restroom	1	-	Floor tile	Ceramic	Intact	Tan	1.0	Negative	NA	0.0
128	1520 Restroom	1	W	Slashguard	Plastic	Intact	Beige	1.0	Negative	NA	0.0
129	1520 Restroom	1	S	Slashguard	Plastic	Intact	Beige	1.0	Negative	NA	0.0
130	1520 Restroom	1	W	Baseboard	Ceramic	Intact	Tan	1.0	Negative	NA	0.0
131	1520 Restroom	1	E	Baseboard	Ceramic	Intact	Tan	1.0	Negative	NA	0.0
132	Exterior	1	N	Parking stripe	Asphalt	Poor	Blue	1.0	Negative	NA	0.0
133	**Exterior**	**1**	**N**	**Sewer grate**	**Metal**	**Poor**	**Gray**	**1.0**	**Positive**	**1 SF**	**0.05**
134	Exterior	1	N	Wall	Wood	Intact	Gray	1.0	Negative	NA	0.0
135	Exterior	1	W	Wall	Concrete	Intact	Beige	1.0	Negative	NA	0.0

Table A – XRF Readings Summary

Reading No.	Room	Floor	Side	Component	Substrate	Condition	Color	Action Level (mg/cm^2)	Results	Approximate Quantity	Lead Reading (mg/cm^2)
136	End			Standard Calibration Check 1.04 +/- 0.06 mg/cm^2				1.0	Positive	1.1	1.02
137				Standard Calibration Check 1.04 +/- 0.06 mg/cm^2				1.0	Positive	1.03	0.98
138				Standard Calibration Check 1.04 +/- 0.06 mg/cm^2				1.0	Positive	1.04	1.00

Notes:
HVAC - heating, ventilation and air conditioning
mg/cm^2 - micrograms per cubic centimeter
LF - linear feet
No. - number
NA - not applicable
SF - square feet
XRF - X-Ray fluorescence

FIGURES



NOTE: DIMENSIONS, DIRECTIONS AND LOCATIONS ARE APPROXIMATE. I REFERENCE: USGS, 2015.

210248001_SL.dwg 08/09/2017 JP

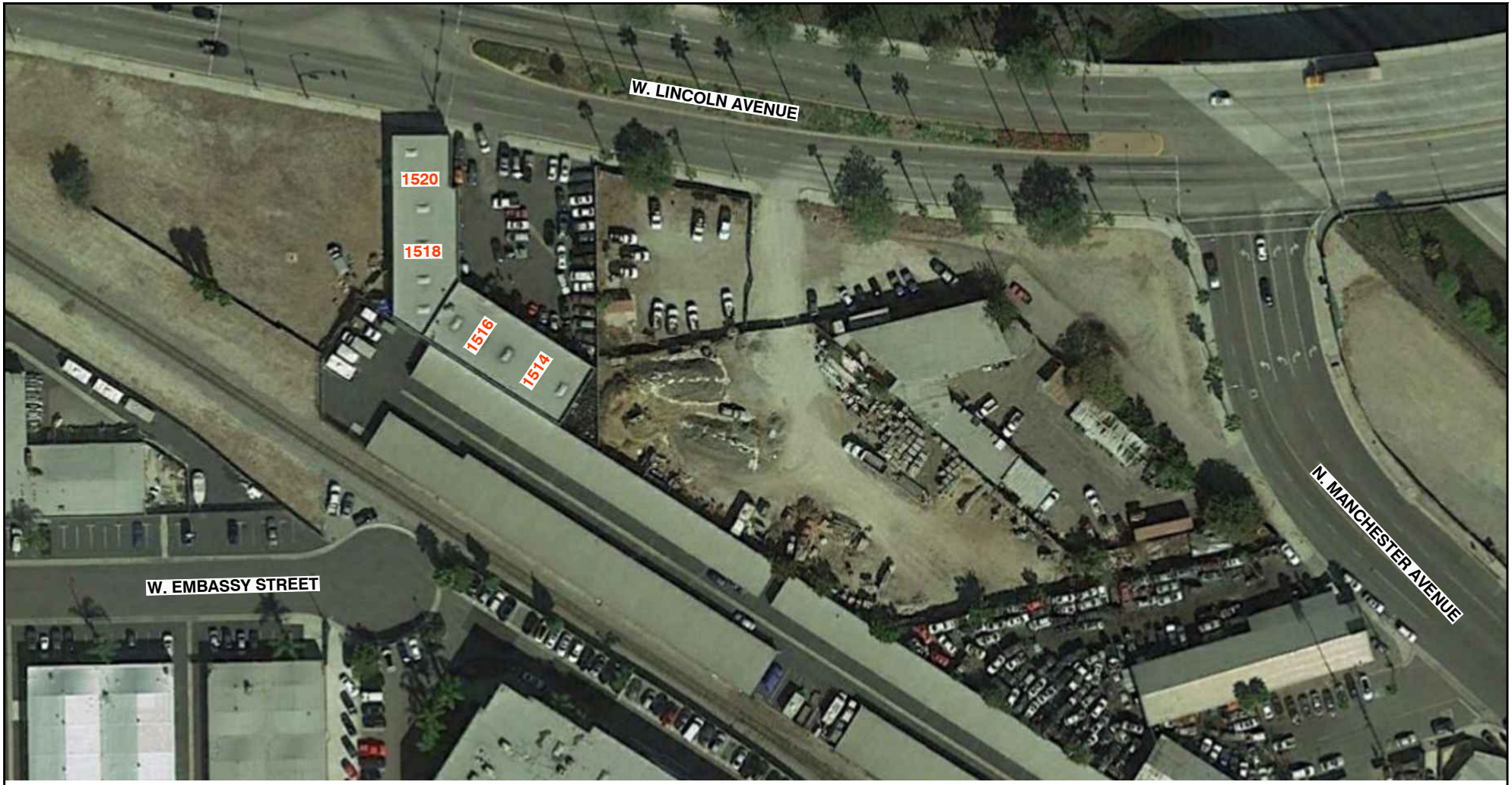
FIGURE 1

SITE LOCATION

LINCOLN AVENUE AND MANCHESTER AVENUE
ANAHEIM, CALIFORNIA

210248001 I 8/17

Ninyo & Moore
Geotechnical & Environmental Sciences Consultants



LEGEND

1520 ADDRESS

NOTE: DIMENSIONS, DIRECTIONS AND LOCATIONS ARE APPROXIMATE. I REFERENCE: GOOGLE EARTH, 2017.

N

FEET

0 100 200

FIGURE 2

SITE PLAN

LINCOLN AVENUE AND MANCHESTER AVENUE
ANAHEIM, CALIFORNIA

210248001 I 8/17

Ninyo & Moore
Geotechnical & Environmental Sciences Consultants

210248001_SP.dwg 08/09/2017 JP

APPENDIX A

Consultant Certificates

State of California
Division of Occupational Safety and Health
Certified Asbestos Consultant

Peter F Kelley
Name

Certification No. **15-5463**

Expires on **07/14/18**

This certification was issued by the Division of Occupational Safety and Health as authorized by Sections 7180 et seq. of the Business and Professions Code.

State of California Department of Public Health

Lead-Related Construction Certificate

Certificate Type

Inspector/Assessor

Expiration Date

04/08/2018

Peter F. Kelley

ID #: 18995

State of California Department of Public Health

Lead-Related Construction Certificate

Certificate Type: Sampling Technician

Expiration Date: 01/09/2018

Pedro Rodriguez

ID #: 23793

State of California
Division of Occupational Safety and Health
Certified Site Surveillance Technician

Pedro Rodriguez-Mendez
Name

Certification No. 13-5109

Expires on 01/15/18

This certification was issued by the Division of Occupational Safety and Health as authorized by Sections 7180 et seq. of the Business and Professions Code.

State of California
Division of Occupational Safety and Health
Certified Asbestos Consultant

Michael S Cushner
Name

Certification No. **11-4711**

Expires on **07/20/18**

This certification was issued by the Division of Occupational Safety and Health as authorized by Sections 7180 et seq. of the Business and Professions Code.

State of California Department of Public Health

Lead-Related Construction Certificate

Certificate Type	Expiration Date
Inspector/Assessor	09/26/2017
Project Monitor	09/26/2017

Michael S. Cushner

ID #: 16953

APPENDIX B

California Department of Public Health Form 8552

State of California—Health and Human Services Agency

California Department of Public Health

LEAD HAZARD EVALUATION REPORT

Section 1 — Date of Lead Hazard Evaluation 7/28/17

Section 2 — Type of Lead Hazard Evaluation (Check one box only)

☑ Lead Inspection ☐ Risk assessment ☐ Clearance Inspection ☐ Other (specify) _____

Section 3 — Structure Where Lead Hazard Evaluation Was Conducted

Address [number, street, apartment (if applicable)]	City	County	Zip Code
1514-1520 West Lincoln Avenue	Anaheim	Orange	92801

Construction date (year) of structure	Type of structure		Children living in structure?	
1970s	☐ Multi-unit building	☐ School or daycare	☐ Yes	☑ No
	☐ Single family dwelling	☑ Other commercial	☐ Don't Know	

Section 4 — Owner of Structure (if business/agency, list contact person)

Name	Telephone number
Orange County Transportation Agency	714.560.6282

Address [number, street, apartment (if applicable)]	City	State	Zip Code
550 S. Main St.	Orange	CA	92868

Section 5 — Results of Lead Hazard Evaluation (check all that apply)

☑ No lead-based paint detected ☐ Intact lead-based paint detected ☐ Deteriorated lead-based paint detected

☐ No lead hazards detected ☐ Lead-contaminated dust found ☐ Lead-contaminated soil found ☐ Other_____

Section 6 — Individual Conducting Lead Hazard Evaluation

Name	Telephone number
Peter Kelley	949.689.8679

Address [number, street, apartment (if applicable)]	City	State	Zip Code
475 Goddard, Suite 200	Irvine	CA	92618

CDPH certification number	Signature	Date
18995	Peter Kelley	8/1/17

Name and CDPH certification number of any other individuals conducting sampling or testing (if applicable)

Section 7 — Attachments

A. A foundation diagram or sketch of the structure indicating the specifc locations of each lead hazard or presence of lead-based paint;
B. Each testing method, device, and sampling procedure used;
C. All data collected, including quality control data, laboratory results, including laboratory name, address, and phone number.

First copy and attachments retained by inspector

Second copy and attachments retained by owner

Third copy only (no attachments) mailed or faxed to:

California Department of Public Health
Childhood Lead Poisoning Prevention Branch Reports
850 Marina Bay Parkway, Building P, Third Floor
Richmond, CA 94804-6403
Fax: (510) 620-5656

APPENDIX C

Analytical Results and Chain-of-Custody Records

EMLab P&K
A TestAmerica Company

Report for:

Mr. Mike Cushner
Ninyo & Moore - Irvine
475 Goddard
Suite 200
Irvine, CA 92618

Regarding: Project: 210248001; OCTA
EML ID: 1766890

Approved by:

Approved Signatory
Gregorio Delgado

Dates of Analysis:
Asbestos PLM: 08-02-2017

Service SOPs: Asbestos PLM (EPA Methods 600/R-93/116 & 600/M4-82-020, SOP EM-AS-S-1267)

All samples were received in acceptable condition unless noted in the Report Comments portion in the body of the report. The results relate only to the items tested. The results include an inherent uncertainty of measurement associated with estimating percentages by polarized light microscopy. Measurement uncertainty data for sample results with >1% asbestos concentration can be provided when requested.

EMLab P&K ("the Company") shall have no liability to the client or the client's customer with respect to decisions or recommendations made, actions taken or courses of conduct implemented by either the client or the client's customer as a result of or based upon the Test Results. In no event shall the Company be liable to the client with respect to the Test Results except for the Company's own willful misconduct or gross negligence nor shall the Company be liable for incidental or consequential damages or lost profits or revenues to the fullest extent such liability may be disclaimed by law, even if the Company has been advised of the possibility of such damages, lost profits or lost revenues. In no event shall the Company's liability with respect to the Test Results exceed the amount paid to the Company by the client therefor.

EMLab P&K
6310 Rothway St., Houston, TX 77040
(800) 651-4802 Fax (623) 780-7695 www.emlab.com

Client: Ninyo & Moore - Irvine
C/O: Mr. Mike Cushner
Re: 210248001; OCTA

Date of Sampling: 07-28-2017
Date of Receipt: 07-28-2017
Date of Report: 08-02-2017

ASBESTOS PLM REPORT: EPA-600/M4-82-020 & EPA METHOD 600/R-93-116

Total Samples Submitted:	47
Total Samples Analyzed:	47
Total Samples with Layer Asbestos Content > 1%:	11

Location: 1, 1514-1520, Eastern - Roof Core Asphalt Sheeting

Lab ID-Version‡: 8259025-1

Sample Layers	Asbestos Content
Black Roofing Shingle with Gray Pebbles	ND
Black Roofing Tar and Felt	ND
Black Roofing Tar and Felt	ND
Composite Non-Asbestos Content:	15% Glass Fibers
Sample Composite Homogeneity:	Poor

Location: 2, 1514-1520, Central - Roof Core Asphalt Sheeting

Lab ID-Version‡: 8259026-1

Sample Layers	Asbestos Content
Black Roofing Shingle with Gray Pebbles	ND
Black Roofing Tar and Felt	ND
Black Roofing Tar and Felt	ND
Composite Non-Asbestos Content:	15% Glass Fibers
Sample Composite Homogeneity:	Poor

Location: 3, 1514-1520, Western (North) - Roof Core Asphalt Sheeting

Lab ID-Version‡: 8259027-1

Sample Layers	Asbestos Content
Black Roofing Shingle with Gray Pebbles	ND
Black Roofing Tar and Felt	ND
Black Roofing Tar and Felt	ND
Black Roofing Tar and Felt	ND
Composite Non-Asbestos Content:	20% Glass Fibers
Sample Composite Homogeneity:	Poor

Inhomogeneous samples are separated into homogeneous subsamples and analyzed individually. ND means no fibers were detected. When detected, the minimum detection and reporting limit is less than 1% unless point counting is performed. Floor tile samples may contain large amounts of interference material and it is recommended that the sample be analyzed by gravimetric point count analysis to lower the detection limit and to aid in asbestos identification.
‡ A "Version" indicated by -"x" after the Lab ID# with a value greater than 1 indicates a sample with amended data. The revision number is reflected by the value of "x".

EMLab P&K
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(800) 651-4802 Fax (623) 780-7695 www.emlab.com

Client: Ninyo & Moore - Irvine
C/O: Mr. Mike Cushner
Re: 210248001; OCTA

Date of Sampling: 07-28-2017
Date of Receipt: 07-28-2017
Date of Report: 08-02-2017

ASBESTOS PLM REPORT: EPA-600/M4-82-020 & EPA METHOD 600/R-93-116

Location: 4, 1514-1520, Eastern (North) - Parapet Wall Asphalt Sheeting Lab ID-Version‡: 8259028-1

Sample Layers	Asbestos Content
Black Roofing Shingle with Gray Pebbles	ND
Black Roofing Tar	ND
Gray Cementitious Material	ND
Composite Non-Asbestos Content:	15% Glass Fibers
Sample Composite Homogeneity:	Poor

Inhomogeneous samples are separated into homogeneous subsamples and analyzed individually. ND means no fibers were detected. When detected, the minimum detection and reporting limit is less than 1% unless point counting is performed. Floor tile samples may contain large amounts of interference material and it is recommended that the sample be analyzed by gravimetric point count analysis to lower the detection limit and to aid in asbestos identification.
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Client: Ninyo & Moore - Irvine
C/O: Mr. Mike Cushner
Re: 210248001; OCTA

Date of Sampling: 07-28-2017
Date of Receipt: 07-28-2017
Date of Report: 08-02-2017

ASBESTOS PLM REPORT: EPA-600/M4-82-020 & EPA METHOD 600/R-93-116

Location: 5, 1514-1520, Central - Parapet Wall Asphalt Sheeting Lab ID-Version‡: 8259029-1

Sample Layers	Asbestos Content
Black Roofing Shingle with Gray Pebbles	ND
Black Roofing Tar	ND
Composite Non-Asbestos Content:	10% Glass Fibers
Sample Composite Homogeneity:	Poor

Location: 6, 1514-1520, Western (South) - Parapet Wall Asphalt Sheeting Lab ID-Version‡: 8259030-1

Sample Layers	Asbestos Content
Black Roofing Shingle with Gray Pebbles	ND
Black Roofing Tar	ND
Composite Non-Asbestos Content:	10% Glass Fibers
Sample Composite Homogeneity:	Poor

Location: 7, 1514-1520, Eastern (Central) - Penetration Mastic Lab ID-Version‡: 8259031-1

Sample Layers	Asbestos Content
Gray/Black Roofing Mastic with Pebbles	10% Chrysotile
Black Roofing Tar	ND
Sample Composite Homogeneity:	Poor

Location: 8, 1514-1520, Central (Central) - Penetration Mastic Lab ID-Version‡: 8259032-1

Sample Layers	Asbestos Content
Black Roofing Mastic	10% Chrysotile
Black Roofing Tar	ND
Sample Composite Homogeneity:	Poor

Inhomogeneous samples are separated into homogeneous subsamples and analyzed individually. ND means no fibers were detected. When detected, the minimum detection and reporting limit is less than 1% unless point counting is performed. Floor tile samples may contain large amounts of interference material and it is recommended that the sample be analyzed by gravimetric point count analysis to lower the detection limit and to aid in asbestos identification.
‡ A "Version" indicated by -"x" after the Lab ID# with a value greater than 1 indicates a sample with amended data. The revision number is reflected by the value of "x".

EMLab P&K
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Client: Ninyo & Moore - Irvine
C/O: Mr. Mike Cushner
Re: 210248001; OCTA

Date of Sampling: 07-28-2017
Date of Receipt: 07-28-2017
Date of Report: 08-02-2017

ASBESTOS PLM REPORT: EPA-600/M4-82-020 & EPA METHOD 600/R-93-116

Location: 9, 1514-1520, Western (Central) - Penetration Mastic Lab ID-Version‡: 8259033-1

Sample Layers	Asbestos Content
Gray/Black Roofing Mastic with Pebbles	10% Chrysotile
Black Roofing Tar	ND
Sample Composite Homogeneity:	Poor

Location: 10, 1514-1520, At Roof NE - Expansion Joint Lab ID-Version‡: 8259034-1

Sample Layers	Asbestos Content
Gray Expansion Joint with Yellow Foam	ND
Sample Composite Homogeneity:	Moderate

Location: 11, 1514-1520, At Perimeter NW - Expansion Joint Lab ID-Version‡: 8259035-1

Sample Layers	Asbestos Content
Gray Expansion Joint with Black Coating	ND
Sample Composite Homogeneity:	Moderate

Location: 12, 1514-1520, At Perimeter North - Expansion Joint Lab ID-Version‡: 8259036-1

Sample Layers	Asbestos Content
Gray Expansion Joint with Yellow Foam	ND
Sample Composite Homogeneity:	Moderate

Inhomogeneous samples are separated into homogeneous subsamples and analyzed individually. ND means no fibers were detected. When detected, the minimum detection and reporting limit is less than 1% unless point counting is performed. Floor tile samples may contain large amounts of interference material and it is recommended that the sample be analyzed by gravimetric point count analysis to lower the detection limit and to aid in asbestos identification.
‡ A "Version" indicated by -"x" after the Lab ID# with a value greater than 1 indicates a sample with amended data. The revision number is reflected by the value of "x".

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Client: Ninyo & Moore - Irvine
C/O: Mr. Mike Cushner
Re: 210248001; OCTA

Date of Sampling: 07-28-2017
Date of Receipt: 07-28-2017
Date of Report: 08-02-2017

ASBESTOS PLM REPORT: EPA-600/M4-82-020 & EPA METHOD 600/R-93-116

Location: 13, 1514-1520, Central at HVAC Seams - Mastic Lab ID-Version‡: 8259037-1

Sample Layers	Asbestos Content
Gray/Black Roofing Mastic	10% Chrysotile
Sample Composite Homogeneity:	Moderate

Location: 14, 1514-1520, HVAC at Seams (Central) - Mastic Lab ID-Version‡: 8259038-1

Sample Layers	Asbestos Content
Gray/Black Roofing Mastic	10% Chrysotile
Sample Composite Homogeneity:	Moderate

Location: 15, 1514-1520, HVAC at Seams (Central) - Mastic Lab ID-Version‡: 8259039-1

Sample Layers	Asbestos Content
Gray/Black Roofing Mastic	10% Chrysotile
Sample Composite Homogeneity:	Moderate

Location: 16, 1514, Office Wall (N) - Drywall and Joint Compound Lab ID-Version‡: 8259040-1

Sample Layers	Asbestos Content
White Drywall with Brown Paper	ND
White Joint Compound	ND
Cream Tape	ND
White Texture with Multilayered Paint	ND
Composite Non-Asbestos Content:	15% Cellulose < 1% Glass Fibers
Sample Composite Homogeneity:	Poor

Inhomogeneous samples are separated into homogeneous subsamples and analyzed individually. ND means no fibers were detected. When detected, the minimum detection and reporting limit is less than 1% unless point counting is performed. Floor tile samples may contain large amounts of interference material and it is recommended that the sample be analyzed by gravimetric point count analysis to lower the detection limit and to aid in asbestos identification.
‡ A "Version" indicated by -"x" after the Lab ID# with a value greater than 1 indicates a sample with amended data. The revision number is reflected by the value of "x".

EMLab P&K
6310 Rothway St., Houston, TX 77040
(800) 651-4802 Fax (623) 780-7695 www.emlab.com

Client: Ninyo & Moore - Irvine
C/O: Mr. Mike Cushner
Re: 210248001; OCTA

Date of Sampling: 07-28-2017
Date of Receipt: 07-28-2017
Date of Report: 08-02-2017

ASBESTOS PLM REPORT: EPA-600/M4-82-020 & EPA METHOD 600/R-93-116

Location: 17, 1514, Garage Wall (W) - Drywall and Joint Compound Lab ID-Version‡: 8259041-1

Sample Layers	Asbestos Content
White Drywall with Brown Paper	ND
White Foam with Blue Paint	ND
Composite Non-Asbestos Content:	15% Cellulose < 1% Glass Fibers
Sample Composite Homogeneity:	Moderate

Location: 18, 1514, Restroom Ceiling (C) - Drywall and Joint Compound Lab ID-Version‡: 8259042-1

Sample Layers	Asbestos Content
Pink Drywall with Brown Paper	ND
White Joint Compound with Gray Paint	ND
Composite Non-Asbestos Content:	15% Cellulose
Sample Composite Homogeneity:	Moderate

Location: 19, 1514, NE Floor at Office - 1x1 VFT Gray and Mastic Lab ID-Version‡: 8259043-1

Sample Layers	Asbestos Content
Gray Floor Tile	ND
Yellow Mastic	ND
Sample Composite Homogeneity:	Moderate

Location: 20, 1514, Central Floor at Office - 1x1 VFT Gray and Mastic Lab ID-Version‡: 8259044-1

Sample Layers	Asbestos Content
Gray Floor Tile	ND
Yellow Mastic with White Compound	ND
Sample Composite Homogeneity:	Moderate

Inhomogeneous samples are separated into homogeneous subsamples and analyzed individually. ND means no fibers were detected. When detected, the minimum detection and reporting limit is less than 1% unless point counting is performed. Floor tile samples may contain large amounts of interference material and it is recommended that the sample be analyzed by gravimetric point count analysis to lower the detection limit and to aid in asbestos identification.
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Re: 210248001; OCTA

Date of Sampling: 07-28-2017
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Date of Report: 08-02-2017

ASBESTOS PLM REPORT: EPA-600/M4-82-020 & EPA METHOD 600/R-93-116

Location: 21, 1514, NW Floor at Office - 1x1 VFT Gray and Mastic Lab ID-Version‡: 8259045-1

Sample Layers	Asbestos Content
Gray Floor Tile	ND
Yellow Mastic	ND
Sample Composite Homogeneity:	Moderate

Location: 22, 1514, Restroom Floor (N) - VF Sheeting and Mastic Lab ID-Version‡: 8259046-1

Sample Layers	Asbestos Content
Gray Sheet Flooring with Fibrous Backing	ND
White Mastic	ND
Composite Non-Asbestos Content:	5% Synthetic Fibers 2% Glass Fibers
Sample Composite Homogeneity:	Moderate

Location: 23, 1514, Restroom Floor (Central) - VF Sheeting and Mastic Lab ID-Version‡: 8259047-1

Sample Layers	Asbestos Content
Tan Sheet Flooring with Fibrous Backing	ND
Cream Mastic	ND
Composite Non-Asbestos Content:	10% Cellulose 2% Synthetic Fibers
Sample Composite Homogeneity:	Moderate

Location: 24, 1514, Office at (E) Ceiling - Acoustic Ceiling (Popcorn) Lab ID-Version‡: 8259048-1

Sample Layers	Asbestos Content
White Popcorn Ceiling	ND
Sample Composite Homogeneity:	Good

Inhomogeneous samples are separated into homogeneous subsamples and analyzed individually. ND means no fibers were detected. When detected, the minimum detection and reporting limit is less than 1% unless point counting is performed. Floor tile samples may contain large amounts of interference material and it is recommended that the sample be analyzed by gravimetric point count analysis to lower the detection limit and to aid in asbestos identification.
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ASBESTOS PLM REPORT: EPA-600/M4-82-020 & EPA METHOD 600/R-93-116

Location: 25, 1514, Office at (W) Ceiling - Acoustic Ceiling (Popcorn) Lab ID-Version‡: 8259049-1

Sample Layers	Asbestos Content
White Popcorn Ceiling	ND
Sample Composite Homogeneity:	Good

Location: 26, 1514, Office at (C) Ceiling - Acoustic Ceiling (Popcorn) Lab ID-Version‡: 8259050-1

Sample Layers	Asbestos Content
White Popcorn Ceiling	ND
Sample Composite Homogeneity:	Good

Location: 27, 1514, At Office Wall (NE) - Cove Base/Black/Mastic Lab ID-Version‡: 8259051-1

Sample Layers	Asbestos Content
Black Baseboard	ND
Yellow Mastic	ND
Brown Mastic	ND
White Texture with Beige Paper	ND
Composite Non-Asbestos Content:	3% Cellulose
Sample Composite Homogeneity:	Poor

Location: 28, 1516, Office (E) Wall - Drywall and Joint Compound Lab ID-Version‡: 8259052-1

Sample Layers	Asbestos Content
White Drywall with Brown Paper	ND
White Joint Compound with Gray Paint	ND
White Joint Compound with White Paint	ND
Composite Non-Asbestos Content:	10% Cellulose < 1% Glass Fibers
Sample Composite Homogeneity:	Poor

Inhomogeneous samples are separated into homogeneous subsamples and analyzed individually. ND means no fibers were detected. When detected, the minimum detection and reporting limit is less than 1% unless point counting is performed. Floor tile samples may contain large amounts of interference material and it is recommended that the sample be analyzed by gravimetric point count analysis to lower the detection limit and to aid in asbestos identification.
‡ A "Version" indicated by -"x" after the Lab ID# with a value greater than 1 indicates a sample with amended data. The revision number is reflected by the value of "x".

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Date of Sampling: 07-28-2017
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ASBESTOS PLM REPORT: EPA-600/M4-82-020 & EPA METHOD 600/R-93-116

Location: 29, 1516, Restroom (Ceiling) - Drywall and Joint Compound Lab ID-Version‡: 8259053-1

Sample Layers	Asbestos Content
Brown Drywall with Brown/Green Paper	ND
White Joint Compound	ND
Cream Tape	ND
White Texture with Light Gray Paint	ND
Composite Non-Asbestos Content:	15% Cellulose < 1% Glass Fibers
Sample Composite Homogeneity:	Poor

Location: 30, 1516, Garage Wall (W) - Drywall and Joint Compound Lab ID-Version‡: 8259054-1

Sample Layers	Asbestos Content
White Drywall with Brown Paper	ND
White Joint Compound with Off-White Paint	ND
Composite Non-Asbestos Content:	15% Cellulose < 1% Glass Fibers
Sample Composite Homogeneity:	Poor

Location: 31, 1516, Front Office (N) - Acoustic Ceiling (Popcorn) Lab ID-Version‡: 8259055-1

Sample Layers	Asbestos Content
Off-White Popcorn Ceiling	ND
Sample Composite Homogeneity:	Good

Location: 32, 1516, Back Office (CTR) - Acoustic Ceiling (Popcorn) Lab ID-Version‡: 8259056-1

Sample Layers	Asbestos Content
Off-White Popcorn Ceiling	ND
Sample Composite Homogeneity:	Good

Inhomogeneous samples are separated into homogeneous subsamples and analyzed individually. ND means no fibers were detected. When detected, the minimum detection and reporting limit is less than 1% unless point counting is performed. Floor tile samples may contain large amounts of interference material and it is recommended that the sample be analyzed by gravimetric point count analysis to lower the detection limit and to aid in asbestos identification.
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ASBESTOS PLM REPORT: EPA-600/M4-82-020 & EPA METHOD 600/R-93-116

Location: 33, 1516, Back Office (CTR) - Acoustic Ceiling (Popcorn)

Lab ID-Version‡: 8259057-1

Sample Layers	Asbestos Content
Off-White Popcorn Ceiling	ND
Sample Composite Homogeneity:	Good

Location: 34, 1518, Restroom Ceiling - Drywall and Joint Compound

Lab ID-Version‡: 8259058-1

Sample Layers	Asbestos Content
White Drywall with Brown Paper	ND
White Joint Compound	ND
Cream Tape	ND
White Texture with Gray Paint	ND
Composite Non-Asbestos Content:	15% Cellulose < 1% Glass Fibers
Sample Composite Homogeneity:	Poor

Location: 35, 1518, Back Office Wall (E) -Drywall and Joint Compound

Lab ID-Version‡: 8259059-1

Sample Layers	Asbestos Content
White Drywall with Brown Paper	ND
White Joint Compound	ND
Cream Tape	ND
White Texture with Multilayered Paint	ND
White Joint Compound with Cream Paint	ND
White Joint Compound with Red Paint	ND
Composite Non-Asbestos Content:	15% Cellulose < 1% Glass Fibers
Sample Composite Homogeneity:	Poor

Location: 36, 1518, Office Wall (W) -Drywall and Joint Compound

Lab ID-Version‡: 8259060-1

Sample Layers	Asbestos Content
White Drywall with Brown Paper	ND
White Joint Compound with Red Paint	ND
Composite Non-Asbestos Content:	10% Cellulose < 1% Glass Fibers
Sample Composite Homogeneity:	Poor

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Client: Ninyo & Moore - Irvine
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Re: 210248001; OCTA

Date of Sampling: 07-28-2017
Date of Receipt: 07-28-2017
Date of Report: 08-02-2017

ASBESTOS PLM REPORT: EPA-600/M4-82-020 & EPA METHOD 600/R-93-116

Location: 37, 1518, Restroom NE Floor - VF Sheeting Lab ID-Version‡: 8259061-1

Sample Layers	Asbestos Content
Gray Sheet Flooring with Fibrous Backing	15% Chrysotile
Tan Mastic	ND
Sample Composite Homogeneity:	Moderate

Location: 38, 1518, Restroom NW Floor - VF Sheeting Lab ID-Version‡: 8259062-1

Sample Layers	Asbestos Content
Gray Sheet Flooring with Fibrous Backing	15% Chrysotile
Tan Mastic	ND
Sample Composite Homogeneity:	Moderate

Location: 39, 1518, Office Back at NE - Acoustic Ceiling (Popcorn) Lab ID-Version‡: 8259063-1

Sample Layers	Asbestos Content
Off-White Popcorn Ceiling	ND
Sample Composite Homogeneity:	Good

Location: 40, 1518, Office Front (CTR) - Acoustic Ceiling (Popcorn) Lab ID-Version‡: 8259064-1

Sample Layers	Asbestos Content
Off-White Popcorn Ceiling	ND
Sample Composite Homogeneity:	Good

Inhomogeneous samples are separated into homogeneous subsamples and analyzed individually. ND means no fibers were detected. When detected, the minimum detection and reporting limit is less than 1% unless point counting is performed. Floor tile samples may contain large amounts of interference material and it is recommended that the sample be analyzed by gravimetric point count analysis to lower the detection limit and to aid in asbestos identification.
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Re: 210248001; OCTA

Date of Sampling: 07-28-2017
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ASBESTOS PLM REPORT: EPA-600/M4-82-020 & EPA METHOD 600/R-93-116

Location: 41, 1518, Office Front (CTR) - Acoustic Ceiling (Popcorn) Lab ID-Version‡: 8259065-1

Sample Layers	Asbestos Content
Off-White Popcorn Ceiling	ND
Sample Composite Homogeneity:	Good

Location: 42, 1518, Office (Back) (E) Floor - 1x1 Gray VFT and Mastic Lab ID-Version‡: 8259066-1

Sample Layers	Asbestos Content
Dark Gray Floor Tile	ND
Tan Mastic	ND
Black Mastic	3% Chrysotile
Sample Composite Homogeneity:	Poor

Location: 43, 1518, Office (Back) (W) Floor - 1x1 Gray VFT and Mastic Lab ID-Version‡: 8259067-1

Sample Layers	Asbestos Content
Dark Gray Floor Tile	ND
Tan Mastic	ND
Black Mastic	3% Chrysotile
Sample Composite Homogeneity:	Poor

Location: 44, 1518, Office (Front) (CTR) Floor - 1x1 Gray VFT and Mastic Lab ID-Version‡: 8259068-1

Sample Layers	Asbestos Content
Dark Gray Floor Tile	ND
Tan Mastic	ND
Black Mastic	5% Chrysotile
Sample Composite Homogeneity:	Poor

Inhomogeneous samples are separated into homogeneous subsamples and analyzed individually. ND means no fibers were detected. When detected, the minimum detection and reporting limit is less than 1% unless point counting is performed. Floor tile samples may contain large amounts of interference material and it is recommended that the sample be analyzed by gravimetric point count analysis to lower the detection limit and to aid in asbestos identification.
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Client: Ninyo & Moore - Irvine
C/O: Mr. Mike Cushner
Re: 210248001; OCTA

Date of Sampling: 07-28-2017
Date of Receipt: 07-28-2017
Date of Report: 08-02-2017

ASBESTOS PLM REPORT: EPA-600/M4-82-020 & EPA METHOD 600/R-93-116

Location: 45, 1518, Front Office E Wall - Drywall and Joint Compound Lab ID-Version‡: 8259069-1

Sample Layers	Asbestos Content
White Drywall with Brown Paper	ND
White Joint Compound with Blue Paint	ND
Composite Non-Asbestos Content:	10% Cellulose < 1% Glass Fibers
Sample Composite Homogeneity:	Moderate

Location: 46, 1518, Restroom Ceiling (CTR) - Drywall and Joint Compound Lab ID-Version‡: 8259070-1

Sample Layers	Asbestos Content
White Drywall with Brown Paper	ND
White Joint Compound with Blue Paint	ND
Composite Non-Asbestos Content:	10% Cellulose < 1% Glass Fibers
Sample Composite Homogeneity:	Moderate

Location: 47, 1518, Back Office E/Upper Wall - Drywall and Joint Compound Lab ID-Version‡: 8259071-1

Sample Layers	Asbestos Content
White Drywall with Brown Paper	ND
White Joint Compound	ND
Cream Tape	ND
White Texture with Multilayered Paint	ND
Composite Non-Asbestos Content:	15% Cellulose < 1% Glass Fibers
Sample Composite Homogeneity:	Poor

Inhomogeneous samples are separated into homogeneous subsamples and analyzed individually. ND means no fibers were detected. When detected, the minimum detection and reporting limit is less than 1% unless point counting is performed. Floor tile samples may contain large amounts of interference material and it is recommended that the sample be analyzed by gravimetric point count analysis to lower the detection limit and to aid in asbestos identification.
‡ A "Version" indicated by -"x" after the Lab ID# with a value greater than 1 indicates a sample with amended data. The revision number is reflected by the value of "x".

ASBESTOS BULK SAMPLE DATA SHEET

Ninyo & Moore 475 Goddard, Suite 200 Irvine, CA 92618 Tel: (949) 753-7070 Fax: (949) 753-7071	Project Name : OCTA Project No.: 210248001 Project Manager: Michael Cushnier mcushner@ninyoandmoore.com	Date Sampled: Sampled By: Pedro Rodriguez prodriguez@ninyoandmoore.com	Laboratory: EMLab Tel: Fax:

CHAIN OF CUSTODY INFORMATION: Analysis:PLM EPA 600/R-93/116 TAT: Standard/Normal

001766890

Relinquished By: (sign/print)	Company	Date	Time(24 hr.)	Received By: (sign/print)
Pedro Rodriguez	Ninyo & Moore	7/28/17		7/28/17 1047

LabID	Sample ID	Building Number	Sample Location	HA No.	Sample Description	Quantity (SF/LF/EA)	Friable (Y/N)	Condition
	1	1514-1520	Eastern	1	Roof Core Asphalt Sheets	1,200 SF	N	good
	2		Central					
	3		Western (north)					
	4		Eastern (North)	2	Parapet wall	200 SF	N	good
	5		Central					
	6		Western (south)					
	7		Eastern (central)	3	Penetration mastic	30 SF	N	good
	8		Central (central)					
	9		Western (central)					
	10		@ Roof NE	4	Expansion Joint	400 LF	N	good
	11		@ Perimeter NW					
	12		@ Perimeter North					
	13		Central @ HVAC Seams	5	Mastic	10 SF	N	good

ASBESTOS BULK SAMPLE DATA SHEET

Ninyo & Moore
475 Goddard, Suite 200
Irvine, CA 92618
Tel: (949) 753-7070
Fax: (949) 753-7071

Project Name : OCTA
Project No.: 210248001
Project Manager: Michael Cushner
mcushner@ninyoandmoore.com

Date Sampled:
Sampled By: Pedro Rodriguez
prodriguez@ninyoandmoore.com

Laboratory:
EMLab
Tel:
Fax:

001766890

CHAIN OF CUSTODY INFORMATION: Analysis:PLM EPA 600/R-93/116 TAT: Standard/Normal

Relinquished By: (sign/print)	Company	Date	Time(24 hr.)	Received By: (sign/print)	
/ Pedro Rodriguez	Ninyo & Moore	7/28/17			7/28/17
/					

LabID	Sample ID	Building Number	Sample Location	HA No.	Sample Description	Quantity (SF/LF/EA)	Friable (Y/N)	Condition
	14	1514-1520	HVAC @ Seams (central)	5	mastic	10SF	N	good
	15	↓	↓	↓	↓	↓	↓	↓
	16	1514	office wall (N)	6	Drywall + joint compound	1,000SF	Y	good
	17		Garage wall (W)	↓	↓	↓	↓	↓
	18		Restroom Cshy (C)	↓	↓	↓	↓	↓
	19		NE Floor @ office	7	1x1' VFT gray + mastic	200SF	N	good
	20		central	↓	↓	↓	↓	↓
	21		NW	↓	↓	↓	↓	↓
	22		Restroom Floor (N)	8	VF Sheeting + mastic	25SF	N	good
	23		↓ (CTR)	8	↓	↓	↓	↓
	24		Office @ (E) Cshy	9	Acoustic (Popcorn) Ceiling	200SF	Y	good
	25		(W)	↓	↓	↓	↓	↓
	26	↓	(C)	↓	↓	↓	↓	↓

ASBESTOS BULK SAMPLE DATA SHEET

Ninyo & Moore
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Irvine, CA 92618
Tel: (949) 753-7070
Fax: (949) 753-7071

Project Name: OCTA
Project No.: 210248001
Project Manager: Michael Cushner
mcushner@ninyoandmoore.com

Date Sampled:
Sampled By: Pedro Rodriguez
prodriguez@ninyoandmoore.com

Laboratory: EMLab
Tel:
Fax:

CHAIN OF CUSTODY INFORMATION: Analysis: PLM EPA 600/R-93/116 TAT: Standard/Normal

001766890

Relinquished By: (sign/print)	Company	Date	Time(24 hr.)	Received By: (sign/print)
Pedro Rodriguez	Ninyo & Moore	7/28/17		7/28/17

LabID	Sample ID	Building Number	Sample Location	HA No.	Sample Description	Quantity (SF/LF/EA)	Friable (Y/N)	Condition
	27	1514	@ offices wall (NE)	10	Cove Base/Black/mastic	60LF	N	good
	28	1516	offices (E) wall	11	Drywall/joint compound	1,000 SF	N	good
	29		Restroom (ceiling)					
	30		Storage wall (N)					
	31		Front offices (N)	12	Acoustic Ceiling (Popcorn)	750 SF	Y	good
	32		Back offices (CTR)					
	33		(CTR)					
	34	1518	Restroom ceiling	13	Drywall/joint comp.	1,000 SF	Y	good
	35		Back offices wall (E)					
	36		Back offices wall (W)					
	37		Restroom NE Floor	14	V.F. Sheeting	25 SF	N	good
	38		NW					
	39		office Back @ NE	15	Acoustic Ceiling (Popcorn)	200 SF	Y	good

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ASBESTOS BULK SAMPLE DATA SHEET

Ninyo & Moore 475 Goddard, Suite 200 Irvine, CA 92618 Tel: (949) 753-7070 Fax: (949) 753-7071	Project Name: OCTA Project No.: 210248001 Project Manager: Michael Cushner mcushner@ninyoandmoore.com	Date Sampled: Sampled By: Pedro Rodriguez prodriguez@ninyoandmoore.com	Laboratory: En Lab Tel: Fax:

CHAIN OF CUSTODY INFORMATION: Analysis: PLM EPA 600/R-93/116 TAT: Standard/Normal

001766890

Relinquished By: (sign/print)	Company	Date	Time(24 hr.)	Received By: (sign/print)
/ Pedro Rodriguez	Ninyo & Moore	7/28/17		7/28/17

LabID	Sample ID	Building Number	Sample Location	HA No.	Sample Description	Quantity (SF/LF/EA)	Friable (Y/N)	Condition
	40	1518	office front (CTR)	15	(popcorn) acoustic ceiling	200SF	Y	good
	41	↓	↓ ↓ (CTR)	↓	↓ ↓	↓	↓	↓
	42	1518	office (Back) (E) Floor	16	IX Grey VFT + mastic	200SF	N	good
	43	↓	↓ (W)	↓	↓ ↓	↓	↓	↓
	44	↓	↓ (Front) (CTR) ↓	↓	↓ ↓	↓	↓	↓
	45		Front office SE Wall	17	Drywall + Joint Cap.	1,000SF	Y	good
	46		Restroom ceiling (CTR)	↓	↓ ↓	↓	↓	↓
	47		Back office E/upper Wall	↓	↓ ↓	↓	↓	↓

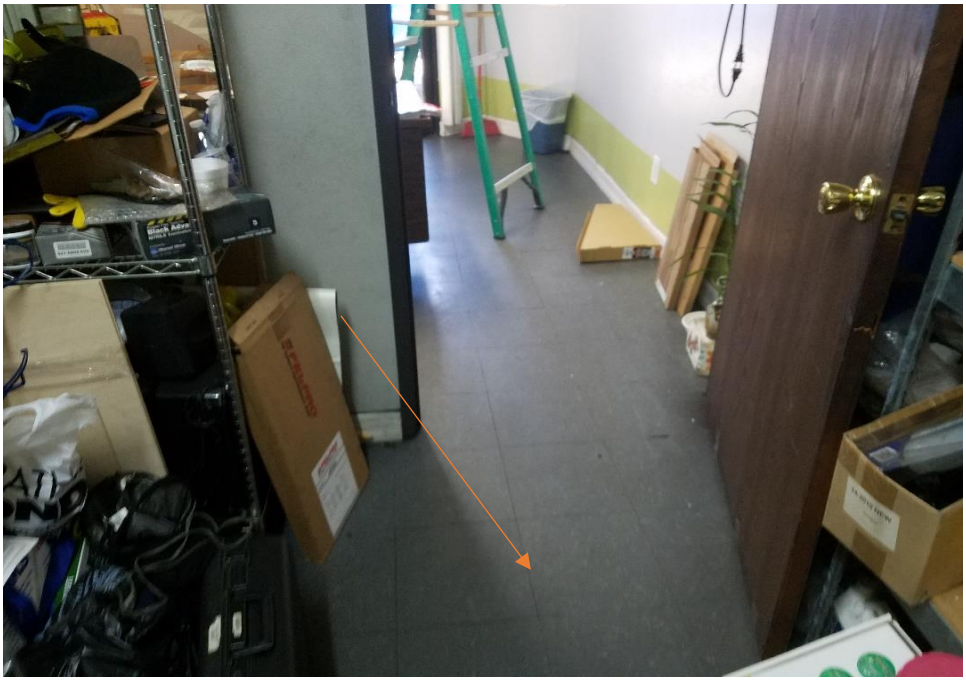
APPENDIX D

Photographs

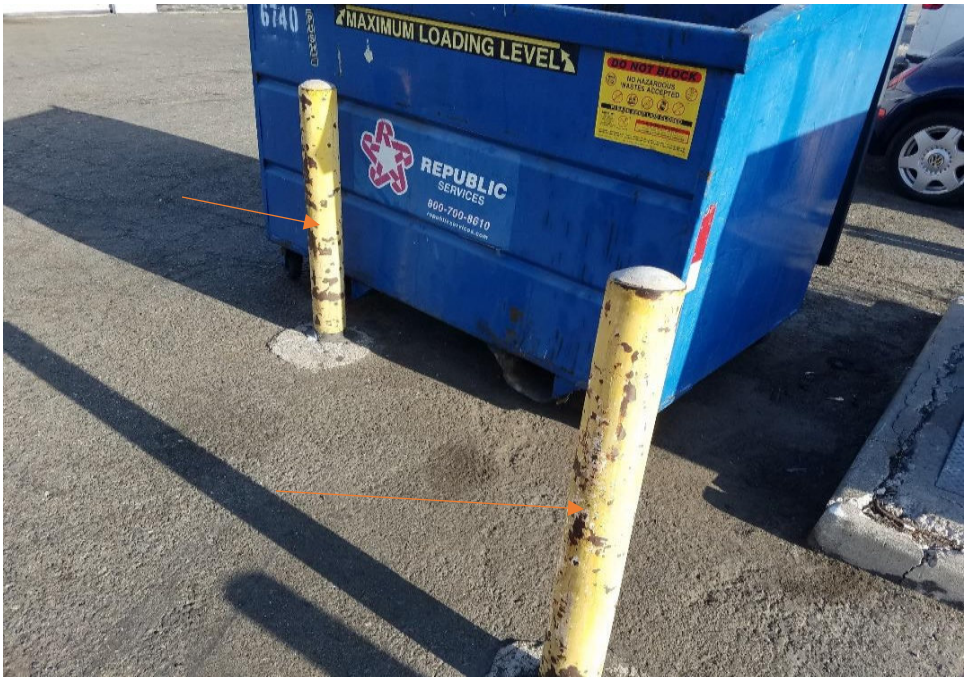
Photograph 1: **General view of the site structure.**

Photograph 2: **View of the asbestos containing penetration mastic and HVAC seam mastic.**

Photograph 3: **View of the asbestos containing vinyl floor sheeting in Unit 1518 restroom.**



Photograph 4: **View of the asbestos containing 1’ x 1’ gray vinyl floor tile and mastic in Unit 1518.**



Photograph 5: **View of the lead-containing paint on bollards with paint in a poor condition.**

Photograph 6: **View of the lead-containing paint sewer grate in a poor condition.**

Photograph 7: **View of the lead-containing white ceramic wall tile and baseboard in Unit 1516 office.**

Photograph 8: **View of the lead-containing white wood crown molding in Unit 1516 office and break room.**

Photograph 9: **View of exterior rooftop HVAC units.**

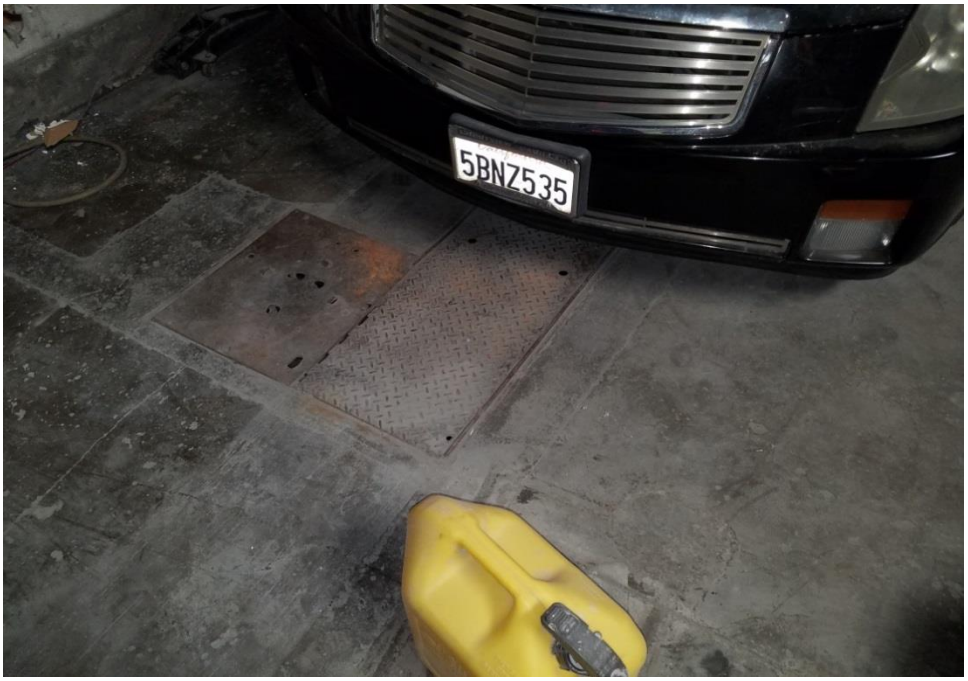
Photograph 10: **View of bird droppings at exterior roof access ladder.**

Photograph 11: **View of representative fluorescent lights and ballasts.**

Photograph 12: **View of representative mercury-containing thermostat switches.**

Photograph 13: **View of paint cans.**

Photograph 14: **View of oil staining located in Unit 1514.**



Photograph 15: **View of either oil pit or clarifier located in Unit 1514.**

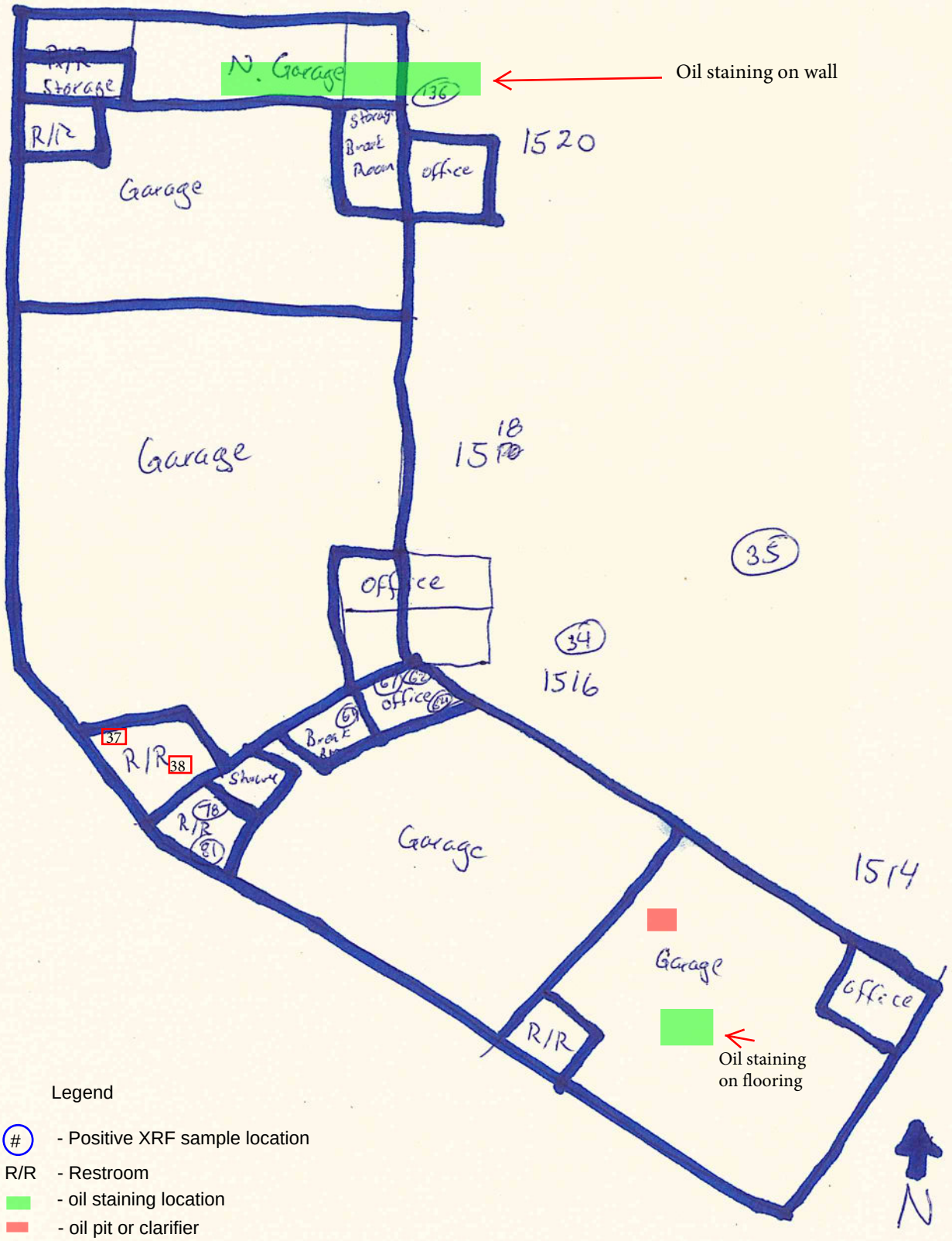
APPENDIX E

Field Drawing

Ninyo & Moore

Project Name OCTA
Project Number 210248001
Calculated By PFK/PRM Date 7/28/17
Checked By MSC Date 8/17/17
Scale N/A Date ~~Date~~ 3 of 3

Lead



Legend

(#) - Positive XRF sample location
R/R - Restroom
- oil staining location
- oil pit or clarifier
37 - interior asbestos sample location

Ninyo & Moore

Geotechnical & Environmental Sciences Consultants

475 Goddard, Suite 200 | Irvine, California 92618 | p. 949.753.7070

SAN DIEGO | IRVINE | LOS ANGELES | FONTANA | OAKLAND | SAN FRANCISCO | SACRAMENTO

SAN JOSE | PHOENIX | TUCSON | PRESCOTT | LAS VEGAS | DENVER | BROOMFIELD | HOUSTON

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APPENDIX I

CONCEPTUAL DRAINAGE STUDY

Prepared for:

Orange County Transportation Authority
Agreement C-6-1108

Transit Security & Operations Center (TSOC)

1512-20 W. Lincoln Ave, Anaheim, California

APN 250-111-03 & 250-122-12

Conceptual Drainage Study

September 8, 2017

Prepared by:

9130 Anaheim Place, Suite 210
Rancho Cucamonga, CA 91730-8566
STV Project No. 4018849

TABLE OF CONTENTS

1. EXECUTIVE SUMMARY

This report concludes the findings for the existing drainage condition, design considerations, methodology, and the sustainable drainage resolutions for the proposed Transit Security and Operation Center (TSOC), which is located at 1512-1520 W. Lincoln Avenue, Anaheim. The results of this report can be used as the basis to facilitate final drainage design of the facility site.

The project site was found to be located within Zone X (flood depth being less than 1' in a 100-yr storm event or area protected by levees) defined by Federal Emergency Management Agency (FEMA), per Flood Insurance Rate Map (FIRM) 06059C0133J (see Appendix A).

The gross project site area is 2.85 acres with 18% imperviousness before the proposed development. The soil beneath the site was classified as Hydrologic Soil Group B, which means that the site soil has a moderate infiltration or transmission rates when thoroughly wetted.

The existing drainage pattern will remain unchanged and will continue to discharge to the existing drainage system on Lincoln Avenue. However, the proposed development is anticipated to significantly increase the impervious area from 18% to approximately 90%. According to the Small Area Unit Hydrograph analysis attached in Appendix D, the project run-off volume would be 16% higher than the existing conditions and will cause a Hydrologic Conditions of Concern (HCOC). Therefore, the use of onsite retention facility is expected such that the ultimate stormwater discharge volume would not exceed 5% of the existing site discharge per the hydromodification requirements defined in the Orange County's Model WQMP.

2-year and 100-year hydrologic analyses were conducted for both the existing condition and conceptual study. The 2-year model was used to check against

hydromodification requirements and the 100-year model was used to evaluate the drainage impact caused by the proposed development.

The project has assumed that all uninfluenced existing drainage facilities were properly designed and fully functional. This report addresses only the impact caused by the proposed improvements within the defined site area. OCTA is not responsible for the other known or unknown offsite area drainage issues.

2. EXISTING AND PROPOSED DRAINAGE CONDITIONS

2.1 Project Description

The new OCTA TSOC is located at 1512-20 W. Lincoln Ave, Anaheim with combined site area of 2.85 ac. The new facility will provide the following functions with improved efficiency and space for future expansion:

- Operations Training (Bus)
- Central Communications (Bus)
- Field Operations (Bus)
- Transit Police Cervices (Bus, Paratransit & Rail)
- Emergency Operations Center (Agency-wide)
- File Storage

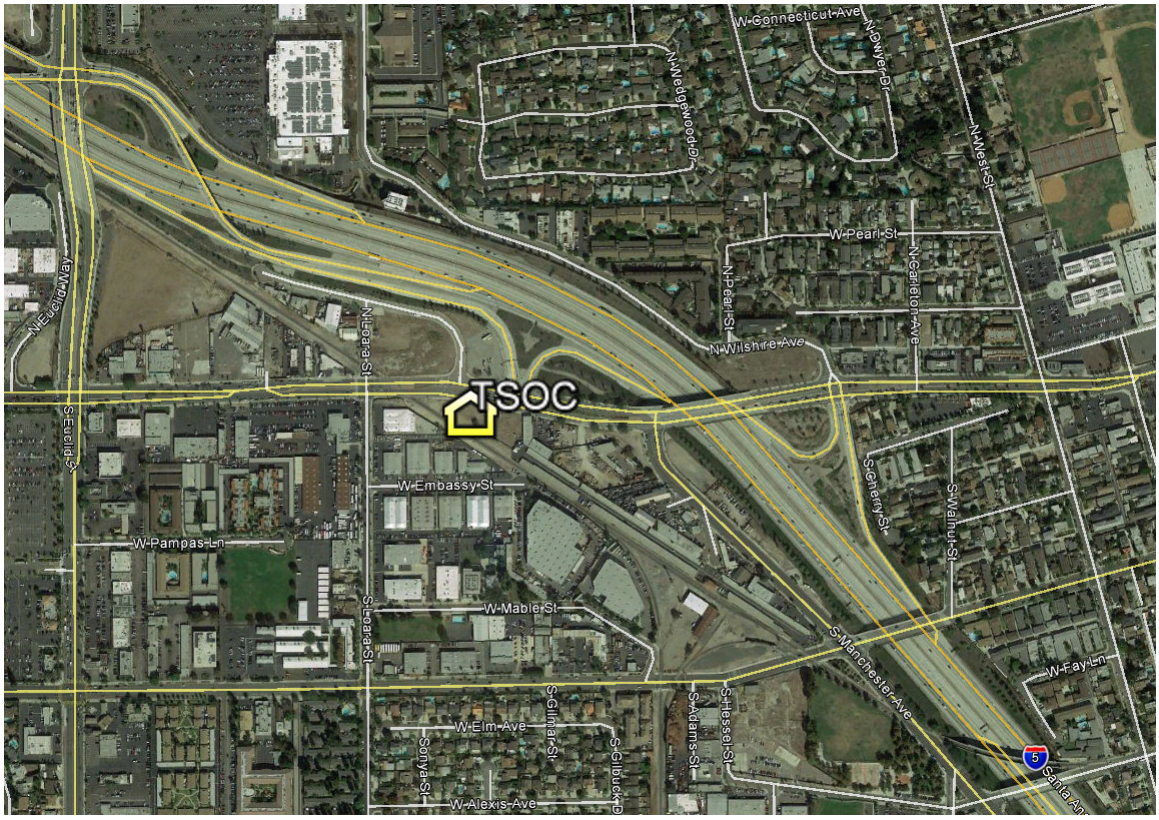


Figure 2.1.1 – Vicinity Map

2.2 Existing Drainage Condition

The project site consists of two properties (APN 250-111-03 & 250-122-12). The site abuts the existing Union Pacific Railroad right-of-way and is bounded by Lincoln Avenue and Manchester Avenue. No significant offsite run-on was observed.

The existing onsite drainage direction is from south to north by means of surface flow. Surface discharge currently drains to Lincoln Ave and flows to a sump catch basin (see Drainage Map for Existing Condition in Appendix C). The catch basin connects to the existing 3' x 3' RCB owned by the City of Anaheim, which discharges to the Orange County Flood Control District's facility B01P01, as shown in Figure 2.2.1.

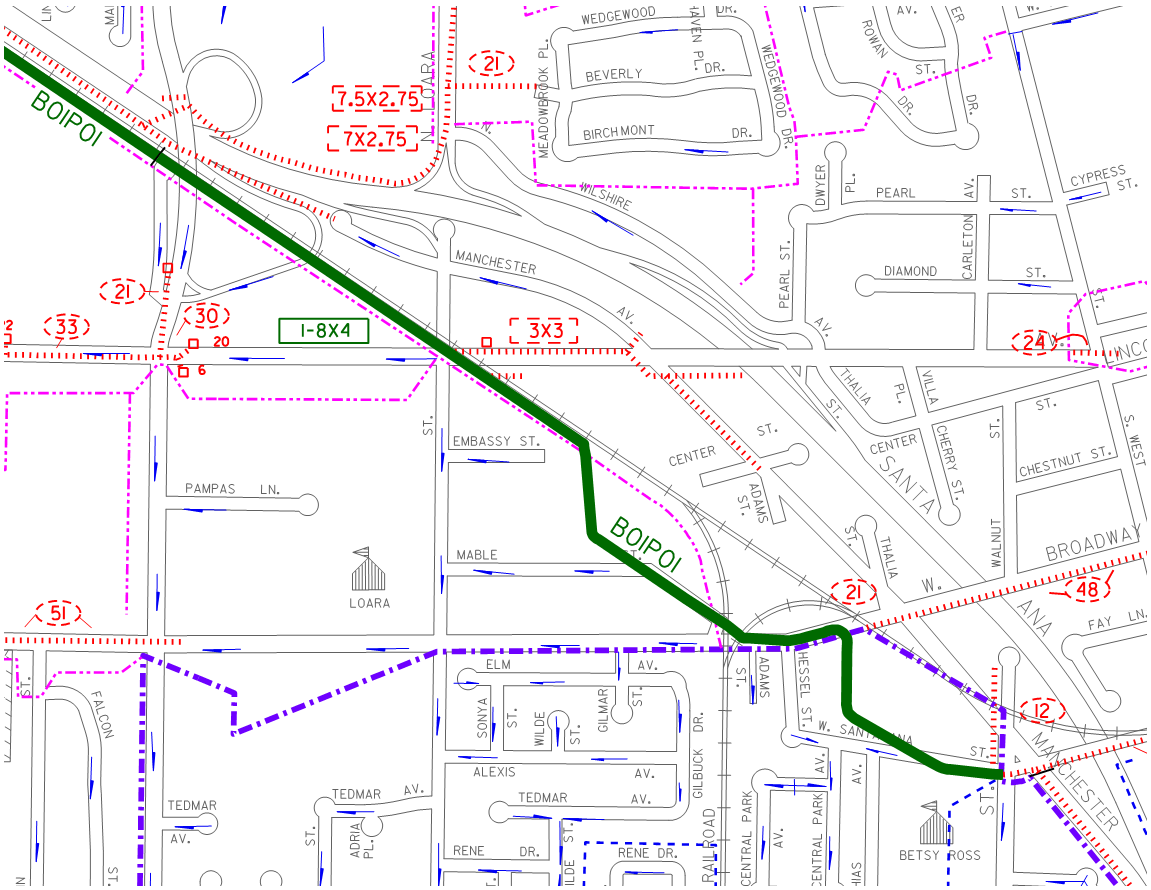


Figure 2.2.1 – Existing Drainage Systems Nearby

The project site was found to be located near Federal Emergency Management Agency (FEMA) Special Flood Hazard Area (SFHA) per the current FIRM 06059C0133J (see Appendix A).

2.3 Conceptual Drainage Design

Surface Drainage

The proposed development will utilize gutter and ribbon drain to convey onsite concentrated flow. At some locations where flood width or pond depth becomes a concern, drainage inlets shall be proposed to help control the surface water amount such that the proposed building facility will be at least 1' above a 100-year storm event.

Roof Drainage

Roof stormwater should be collected in a controlled manner. If an inclined roof will be proposed for the building structure, rain gutter can be utilized to intercept the nuisance flow from the roof. Concrete down spouts or rip-rap may also be utilized at landscaped areas to minimize splash effect. At where a roof drain needs to discharge near a pedestrian access, curb outlet or direct connection to onsite drainage system shall be considered to minimize excessive sheet flow on side walk or parking lot.

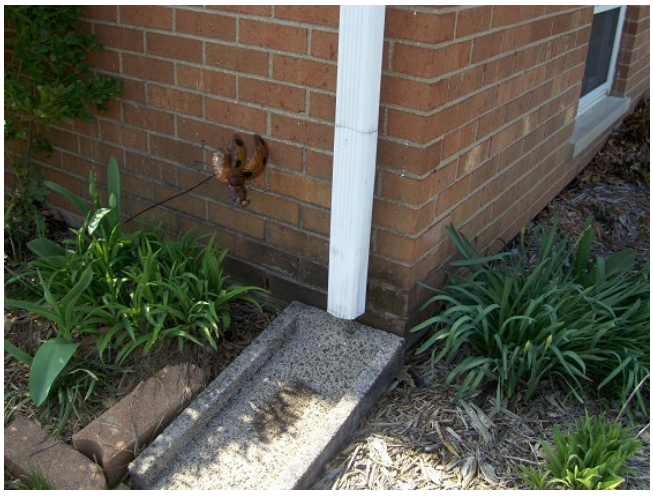


Figure 2.3.1 – Typical Concrete Down Spout at Landscaped Area

Figure 2.3.2 – Typical Roof Drain Curb Outlet at Sidewalk

Onsite Infiltration

The soil below the project site is classified as Hydrologic Soil Group (HSG) “B” with moderate infiltration rates per Orange County Hydrology Manual, which may favor onsite infiltration for flow attenuation or stormwater treatment purposes. If open basin is not an option, an underground infiltration system may be considered to address hydromodification issues.

Figure 2.3.3 – Typical Underground Infiltration Chambers

3. METHODOLOGY

3.1 Hydrology

All hydrologic calculations performed for the project are in conformance with the Rational Method described in *Orange County Hydrology Manual (1986)*. Advanced Engineering Software (AES) HydroWin 2016 was utilized to perform Time of Concentration calculation, channel routing and peak discharge calculations.

The hydrologic models have adopted a HSG “B” per the soil map (see Appendix B) attached in the hydrology manual.

Regression equation from *Mean Precipitation Intensities for Non-mountainous Areas* (Hydrology Manual Fig B-3) was used to calculate the rainfall intensities in 10-year and 100-year analyses. Soil Loss Rate calculation was based on the approach as stated in Hydrology Manual Section C. Antecedent Moisture Content (AMC) I was adopted for the 2-year analysis and AMC III was adopted for the 100-year analysis, per the hydrology manual recommendation. The 2-year model was used to check against hydromodification requirements and the 100-year model was used to evaluate the drainage impact caused by the proposed development.

Small Area Unit Hydrograph Method per *Appendix J in Orange County Hydrology Manual* was utilized to estimate the project site run-off volume. 2-year 24-hour design storm was used to check against hydromodification requirements as defined in *Orange County Model WQMP*. The drainage map and the results of the hydrology calculation have been included in Appendix C and Appendix D, respectively.

3.2 Hydraulic Design Criteria

The project site drainage design will comply with Appendix G Section G401.5 (Storm drainage) of the *2016 California Building Code* and *City of Anaheim Municipal Code*. The following criteria were established for code compliance:

Onsite Pipe System – Since there is no specific requirement from the City regarding design storm event used for pipe design, the project has adopted a storm event such that the proposed storm drain can intercept sufficient surface flow and the water depth onsite will not cause any objectionable flood hazard.

10-year design storm event can be used for hydraulic capacity calculation such that hydraulic grade line (HGL) will be at least 6" below the site finished grade.

Onsite Catch Basin Inlet – 100-year design storm event will be used to check against the catch basin inlet capacity. The 100-yr surface flow or pond elevation shall be kept at a minimum 1 foot lower than the facility finished floor elevation.

4. SUMMARY

	2-yr Existing Conditions	2-yr Conceptual Study	100-yr Existing Conditions	100-yr Conceptual Study
Area (ac)	2.85			
Time of Concentration (min)	22.88	7.92	17.45	7.17
% change		-65%		-59%
Runoff (cfs)	0.98	3.67	7.03	10.34
% change		274%		47%
Runoff Volume (ac-ft)	0.06	0.28		
Runoff Volume (CF)	2614	12197		
% change		367%		

Table 4.1 – Hydrology Model Results Summary

Assumption

The conceptual study was conducted based on an assumed drainage concept which was illustrated in the Drainage Map – Conceptual Study attached in Appendix C. All conceptual design and elevations presented are subject to change in final engineering.

Drainage Impact

The results show that the time of concentration will be approximately 59% to 65% faster than the existing conditions. The runoff discharge rates increase 274% and 47% in 2-yr storm event and 100-yr storm event respectively. It is noted that the site soil was found to be HSG “B”, which means that the soil beneath the site has a moderate infiltration rates to absorb surface flow during the dry conditions. More stormwater will become direct run-off when the site soil becomes saturated and it explains why there is a different degree of percentage increase between the low-flow and peak-flow storm events.

In addition, the major drainage impact will result from the significant increase of impervious area, which will contribute more stormwater run-off during the peak flow event.

In the conceptual study, the calculated 2-year 24-hour run-off volume is 12197 CF, which is 367% higher than the existing conditions and will cause a Hydrologic Conditions of Concern (HCOC). The HCOC shall be addressed in the final engineering stage by preparing a project specific Water Quality Management Plan.

Hydrologic Conditions of Concern

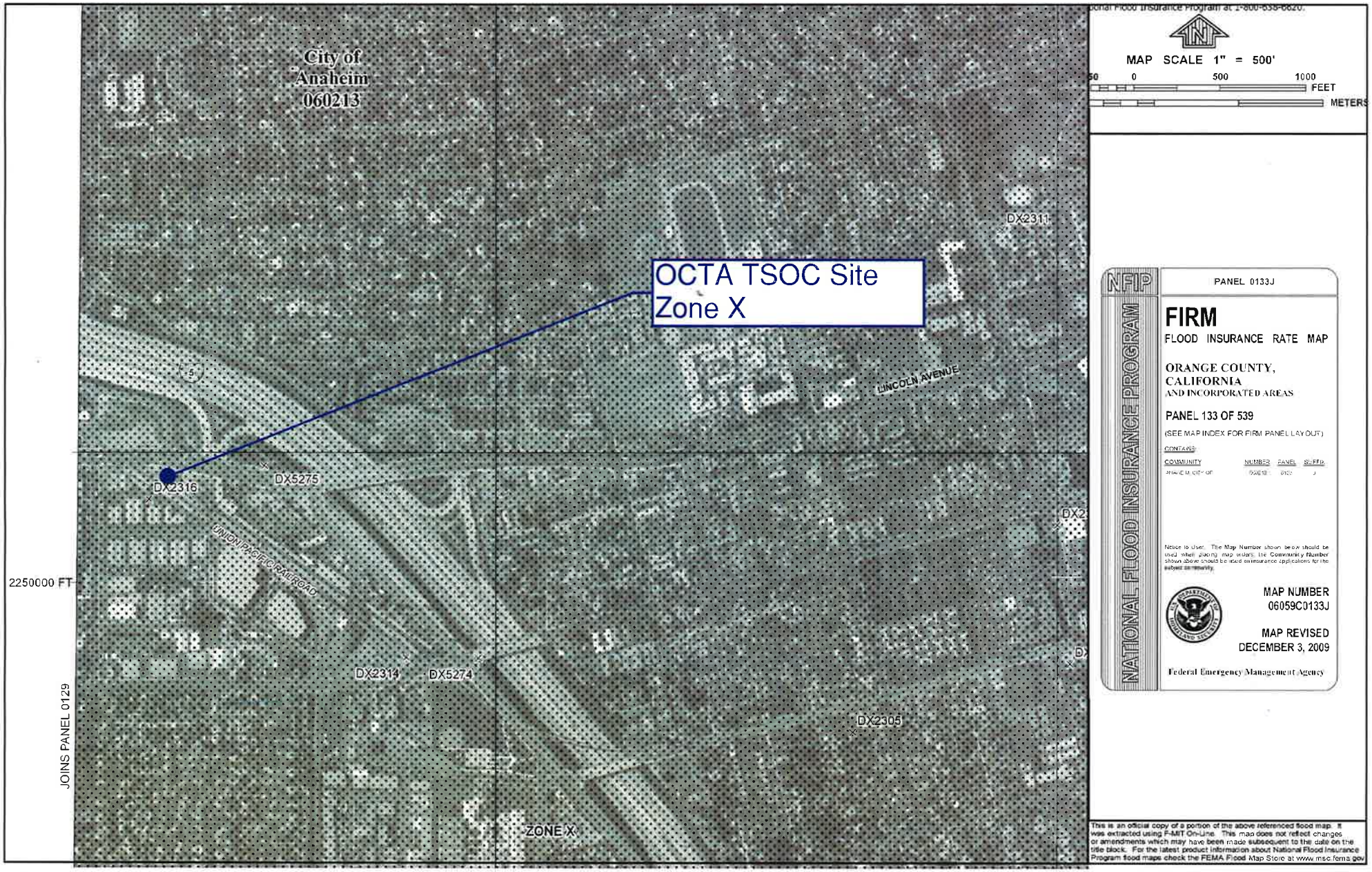
According to the County's Model WQMP, in the North Orange County permit area, HCOCs are considered to exist if any streams located downstream from the project are determined to be potentially susceptible to hydromodification impacts and either of the following conditions exists:

- Post-development runoff volume for the 2-yr, 24-hr storm exceeds the pre-development runoff volume for the 2-yr, 24-hr storm by more than 5 percent;

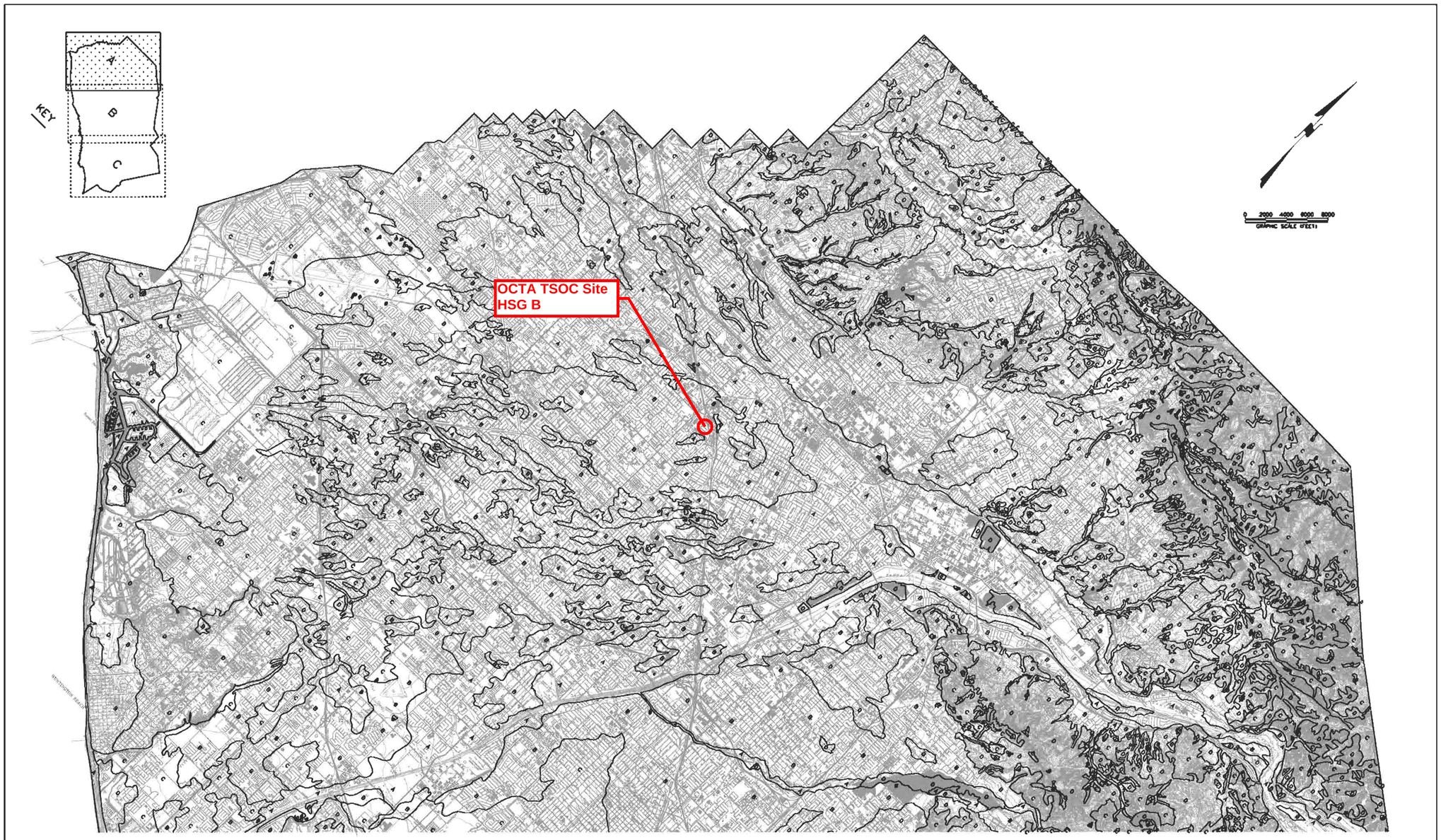
- Time of concentration of post-development runoff for the 2-yr, 24-hr storm event exceeds the time of concentration of the pre-development condition for the 2-yr, 24-hr storm event by more than 5 percent (in consideration that modifications in the time of concentration due to LID retention and biotreatment BMPs are acceptable)."

With the definitions above, the proposed development 2-yr 24-hour runoff is 274% higher than the existing conditions. Therefore, HCOC exists and mitigation will be required. If a volume based mitigation method will be proposed, it needs to retain the Design Capture Volume as defined in the County's Model WQMP. Hydromodification requirements and detail calculation should be included in the project specific WQMP in final engineering.

APPENDIX A – Flood Insurance Rate Map


City of
Anaheim
060213
OCTA TSOC Site
Zone X
DX2311
LINCOLN AVENUE
DX2316
DX5275
UNION PACIFIC RAILROAD
DX2314
DX5274
DX2305
ZONE X
2250000 FT
JOINS PANEL 0129
MAP SCALE 1" = 500'
0
500
1000
FEET
METERS
NFIP
NATIONAL FLOOD INSURANCE PROGRAM
PANEL 0133J
FIRM
FLOOD INSURANCE RATE MAP
ORANGE COUNTY,
CALIFORNIA
AND INCORPORATED AREAS
PANEL 133 OF 539
(SEE MAP INDEX FOR FIRM PANEL LAY OUT)
CONTAINS:
COMMUNITY
NUMBER
PANEL
SUFFIX
Notice to User: The Map Number shown below should be used when placing map orders; the Community Number shown above should be used on insurance applications for the subject community.
MAP NUMBER
06059C0133J
MAP REVISED
DECEMBER 3, 2009
Federal Emergency Management Agency
This is an official copy of a portion of the above referenced flood map. It was extracted using F-MIT On-Line. This map does not reflect changes or amendments which may have been made subsequent to the date on the title block. For the latest product information about National Flood Insurance Program flood maps check the FEMA Flood Map Store at www.msc.fema.gov

APPENDIX B – Soil Map



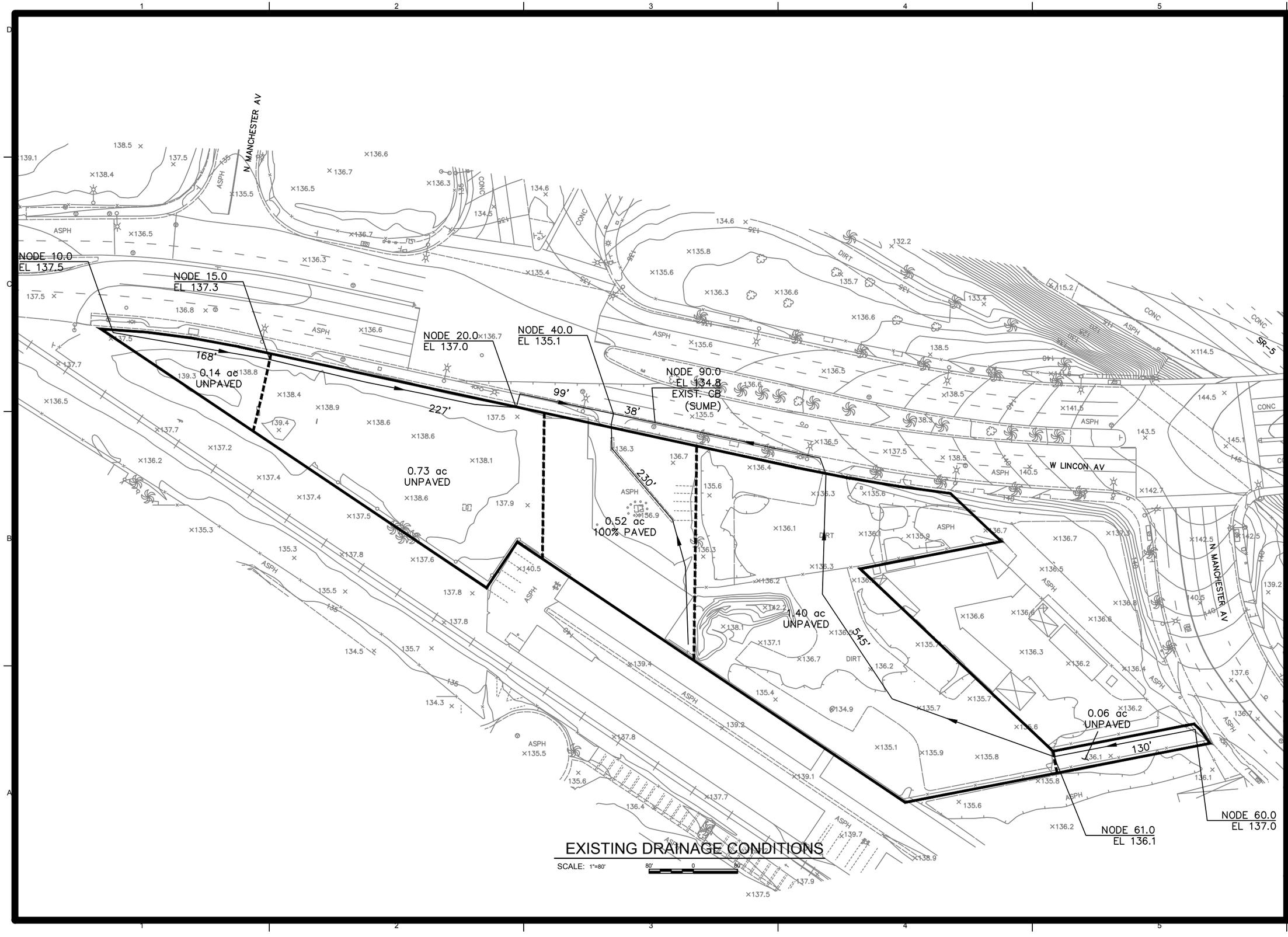
ORANGE COUNTY
HYDROLOGY MANUAL

LEGEND
A B C D HYDROLOGIC SOIL GROUPS
HYDROLOGIC SOIL GROUP BOUNDARY

SOURCES:
BASE MAP - ORANGE COUNTY/RESOURCES & DEVELOPMENT MANAGEMENT DEPT GEOMATICS AND LAND INFORMATION SYSTEMS DIVISION
SOIL GROUPS - SOIL SURVEY OF ORANGE COUNTY AND WESTERN PART OF RIVERSIDE COUNTY, CALIFORNIA, USDA, SOIL CONSERVATION SERVICE, 1978.

HYDROLOGIC CLASSIFICATION OF SOILS
ORANGE COUNTY, CALIFORNIA
PLATE A

APPENDIX C – Drainage Maps



OCTA

CONSULTANTS

STV 100 Years

1055 West Seventh Street
Suite 3150
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Tel: (213) 482-9444
Fax: (213)482-5278

SEALS

PROJECT IDENTIFICATION

PRELIMINARY ENGINEERING
OCTA - TRANSIT SECURITY &
OPERATIONS CENTER

MARK	DATE	DESCRIPTION	BY

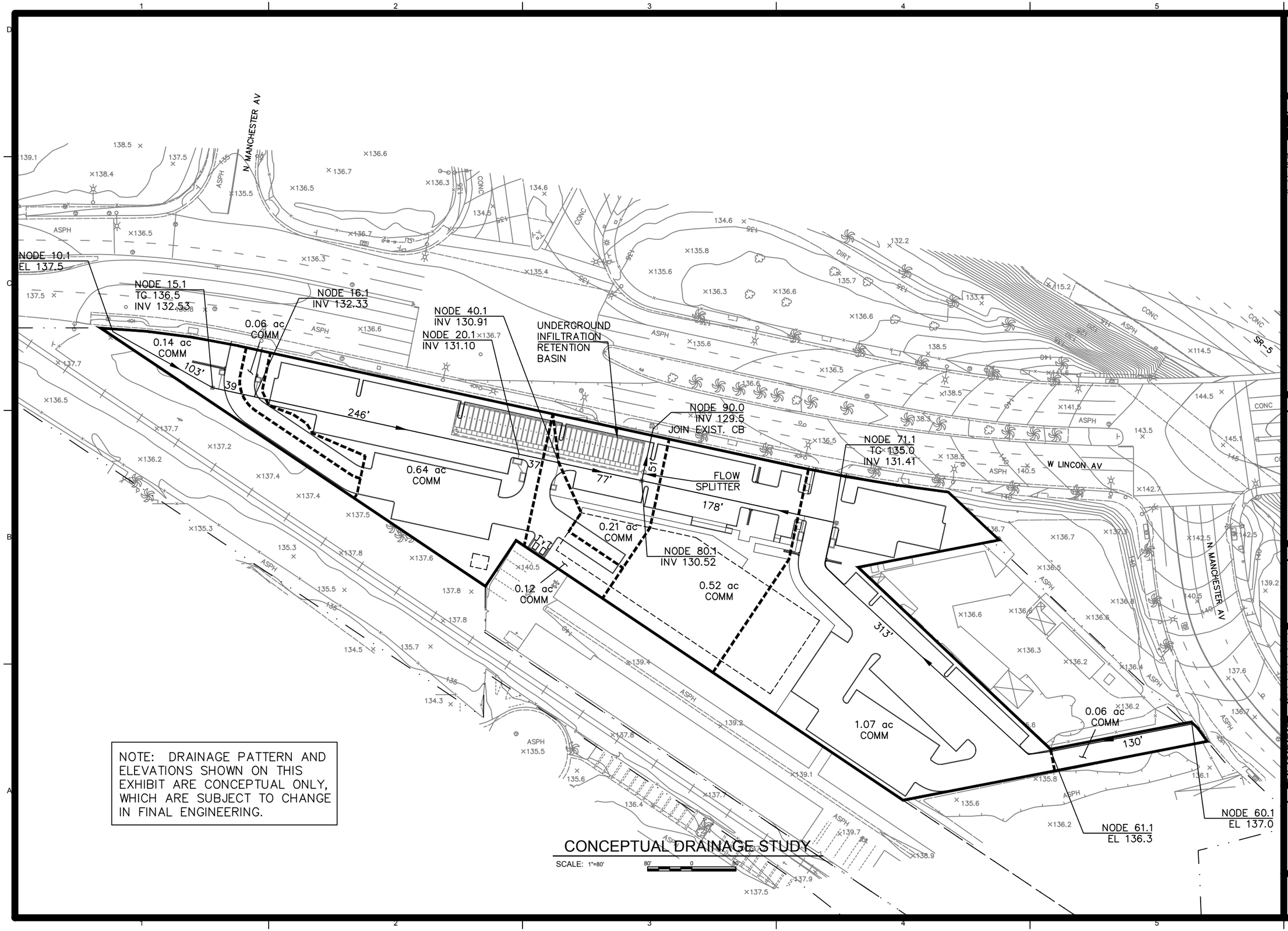
ISSUE BLOCK

PROJECT NO.: 4018849
DESIGNED BY: -
DRAWN BY: -
CHECKED BY: -
APPROVED BY: -
COPYRIGHT: -

SHEET TITLE

DRAINAGE MAP EXISTING CONDITIONS

DWG NO:	SHT NO:
-	-



NOTE: DRAINAGE PATTERN AND ELEVATIONS SHOWN ON THIS EXHIBIT ARE CONCEPTUAL ONLY, WHICH ARE SUBJECT TO CHANGE IN FINAL ENGINEERING.

CONCEPTUAL DRAINAGE STUDY

SCALE: 1"=80' 80' 0 80'

OCTA

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SHEET TITLE

DRAINAGE MAP CONCEPTUAL STUDY

DWG NO: -

SHT NO: -

APPENDIX D – Hydrology Calculation

```
**************************************************************************
            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 1613

                          Analysis prepared by:

                                 STV Inc.
                           9130 Anaheim Pl, Ste 210
                          Rancho Cucamonga, CA 91730


 ************************* DESCRIPTION OF STUDY *************************
* OCTA TSOC                                                             *
* Exist Drainage Conditions                                             *
* 2-yr storm event analysis                                             *
 ************************************************************************

  FILE NAME: TSOC2E.DAT
  TIME/DATE OF STUDY: 19:53 09/04/2017
========================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
========================================================================
                     --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =    2.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  *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

  UNIT-HYDROGRAPH MODEL SELECTIONS/PARAMETERS:
    WATERSHED LAG = 0.80 * Tc
    USED "VALLEY UNDEVELOPED" S-GRAPH FOR DEVELOPMENTS OF
    2 UNITS/ACRE AND LESS; AND "VALLEY DEVELOPED" S-GRAPH
    FOR DEVELOPMENTS OF 3-4 UNITS/ACRE AND MORE.
    SIERRA MADRE DEPTH-AREA FACTORS USED.
                      AREA-AVERAGED
          DURATION    RAINFALL(INCH)
          5-MINUTES         0.19
         30-MINUTES         0.40
          1-HOUR            0.53
          3-HOUR            0.89
          6-HOUR            1.22
         24-HOUR            2.05
  *ANTECEDENT MOISTURE CONDITION (AMC) I ASSUMED FOR UNIT HYDROGRAPH METHOD*


**************************************************************************
  FLOW PROCESS FROM NODE     10.00 TO NODE     15.00 IS CODE =  21
--------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
==========================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   168.00
  ELEVATION DATA: UPSTREAM(FEET) =    137.50  DOWNSTREAM(FEET) =    137.30

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   15.673
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.175
  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.)
  URBAN POOR COVER
  "TURF"                    B        0.14      0.30     1.000    56   15.67
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA RUNOFF(CFS) =      0.11
  TOTAL AREA(ACRES) =      0.14   PEAK FLOW RATE(CFS) =      0.11

****************************************************************************
  FLOW PROCESS FROM NODE     15.00 TO NODE     20.00 IS CODE =  91
----------------------------------------------------------------------------
  >>>>>COMPUTE "V" GUTTER FLOW TRAVEL TIME THRU SUBAREA<<<<<
============================================================================
  UPSTREAM NODE ELEVATION(FEET) =    137.30
  DOWNSTREAM NODE ELEVATION(FEET) =    137.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   227.00
  "V" GUTTER WIDTH(FEET) =   4.00   GUTTER HIKE(FEET) =  0.160
  PAVEMENT LIP(FEET) =  0.030   MANNING'S N = .0350
  PAVEMENT CROSSFALL(DECIMAL NOTATION) = 0.01000
  MAXIMUM DEPTH(FEET) =   0.20
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  0.970
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp          Ap     SCS
     LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  URBAN POOR COVER
  "TURF"                    B        0.73      0.30     1.000    56
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      0.30
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   0.61
  AVERAGE FLOW DEPTH(FEET) =   0.20   FLOOD WIDTH(FEET) =    6.00
  "V" GUTTER FLOW TRAVEL TIME(MIN.) =   6.20   Tc(MIN.) =   21.87
  SUBAREA AREA(ACRES) =    0.73       SUBAREA RUNOFF(CFS) =    0.44
  EFFECTIVE AREA(ACRES) =    0.87     AREA-AVERAGED Fm(INCH/HR) =   0.30
  AREA-AVERAGED Fp(INCH/HR) =   0.30  AREA-AVERAGED Ap =   1.00
  TOTAL AREA(ACRES) =        0.9         PEAK FLOW RATE(CFS) =       0.52

         ==>>ERROR:FLOW EXCEEDS CAPACITY OF CHANNEL WITH
             NORMAL DEPTH EQUAL TO SPECIFIED MAXIMUM ALLOWABLE DEPTH.
             AS AN APPROXIMATION, TRAVEL TIME CALCULATIONS ARE BASED
             ON FLOW DEPTH EQUAL TO THE SPECIFIED MAXIMUM ALLOWABLE DEPTH.


  END OF SUBAREA "V" GUTTER HYDRAULICS:
  DEPTH(FEET) =  0.20   FLOOD WIDTH(FEET) =    6.00
  FLOW VELOCITY(FEET/SEC.) =   1.07   DEPTH*VELOCITY(FT*FT/SEC) =   0.21
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     20.00 =     395.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     20.00 TO NODE     40.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  137.00  DOWNSTREAM ELEVATION(FEET) =  135.10
  STREET LENGTH(FEET) =    99.00   CURB HEIGHT(INCHES) =  8.0
  STREET HALFWIDTH(FEET) = 30.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  20.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.018
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.018

  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) =       0.74
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.22
    HALFSTREET FLOOD WIDTH(FEET) =    3.22
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.59
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.57
  STREET FLOW TRAVEL TIME(MIN.) =   0.64   Tc(MIN.) =   22.51
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  0.955
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp          Ap     SCS
     LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                B        0.52      0.30     0.100    36
```

```
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA AREA(ACRES) =    0.52      SUBAREA RUNOFF(CFS) =    0.43
  EFFECTIVE AREA(ACRES) =      1.39    AREA-AVERAGED Fm(INCH/HR) =  0.20
  AREA-AVERAGED Fp(INCH/HR) =  0.30  AREA-AVERAGED Ap =  0.66
  TOTAL AREA(ACRES) =        1.4        PEAK FLOW RATE(CFS) =       0.95

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.24   HALFSTREET FLOOD WIDTH(FEET) =   4.53
  FLOW VELOCITY(FEET/SEC.) =  2.51   DEPTH*VELOCITY(FT*FT/SEC.) =   0.61
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     40.00 =     494.00 FEET.

****************************************************************************
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----------------------------------------------------------------------------
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============================================================================
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  STREET LENGTH(FEET) =    38.00   CURB HEIGHT(INCHES) =  8.0
  STREET HALFWIDTH(FEET) = 30.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  20.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.018
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.018

  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) =       0.95
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.28
    HALFSTREET FLOOD WIDTH(FEET) =    6.41
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    1.69
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.47
  STREET FLOW TRAVEL TIME(MIN.) =   0.38   Tc(MIN.) =   22.88
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  0.946
  SUBAREA AREA(ACRES) =    0.00      SUBAREA RUNOFF(CFS) =    0.00
  EFFECTIVE AREA(ACRES) =      1.39    AREA-AVERAGED Fm(INCH/HR) =  0.20
  AREA-AVERAGED Fp(INCH/HR) =  0.30  AREA-AVERAGED Ap =  0.66
  TOTAL AREA(ACRES) =        1.4        PEAK FLOW RATE(CFS) =       0.95
  NOTE: PEAK FLOW RATE DEFAULTED TO UPSTREAM VALUE

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.28   HALFSTREET FLOOD WIDTH(FEET) =   6.41
  FLOW VELOCITY(FEET/SEC.) =  1.69   DEPTH*VELOCITY(FT*FT/SEC.) =   0.47
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     90.00 =     532.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     40.00 TO NODE     90.00 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.) =   22.88
  RAINFALL INTENSITY(INCH/HR) =   0.95
  AREA-AVERAGED Fm(INCH/HR) =  0.20
  AREA-AVERAGED Fp(INCH/HR) =  0.30
  AREA-AVERAGED Ap =  0.66
  EFFECTIVE STREAM AREA(ACRES) =       1.39
  TOTAL STREAM AREA(ACRES) =       1.39
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       0.95

****************************************************************************
  FLOW PROCESS FROM NODE     60.00 TO NODE     61.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   130.00
  ELEVATION DATA: UPSTREAM(FEET) =    137.00  DOWNSTREAM(FEET) =    136.10

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    9.947
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.525
  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.)
  URBAN POOR COVER
  "TURF"                      B        0.06      0.30     1.000    56    9.95
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA RUNOFF(CFS) =      0.07
  TOTAL AREA(ACRES) =      0.06   PEAK FLOW RATE(CFS) =      0.07

****************************************************************************
  FLOW PROCESS FROM NODE     61.00 TO NODE     90.00 IS CODE =  62
----------------------------------------------------------------------------
  ** WARNING: Computed Flowrate is less than 0.1 cfs,
               Routing Algorithm is UNAVAILABLE.

****************************************************************************
  FLOW PROCESS FROM NODE     61.00 TO NODE     90.00 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.) =    9.95
  RAINFALL INTENSITY(INCH/HR) =   1.53
  AREA-AVERAGED Fm(INCH/HR) =  0.30
  AREA-AVERAGED Fp(INCH/HR) =  0.30
  AREA-AVERAGED Ap =  1.00
  EFFECTIVE STREAM AREA(ACRES) =       0.06
  TOTAL STREAM AREA(ACRES) =       0.06
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       0.07

  ** CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
      1        0.95   22.88    0.946  0.30( 0.20) 0.66       1.4      10.00
      2        0.07    9.95    1.525  0.30( 0.30) 1.00       0.1      60.00

  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        0.80    9.95    1.525  0.30( 0.21) 0.69       0.7      60.00
      2        0.98   22.88    0.946  0.30( 0.20) 0.68       1.4      10.00

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       0.98    Tc(MIN.) =    22.88
  EFFECTIVE AREA(ACRES) =       1.45   AREA-AVERAGED Fm(INCH/HR) =  0.20
  AREA-AVERAGED Fp(INCH/HR) =  0.30  AREA-AVERAGED Ap =  0.68
  TOTAL AREA(ACRES) =       1.4
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     90.00 =     532.00 FEET.
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        1.4  TC(MIN.) =     22.88
  EFFECTIVE AREA(ACRES) =      1.45  AREA-AVERAGED Fm(INCH/HR)=  0.20
  AREA-AVERAGED Fp(INCH/HR) =  0.30  AREA-AVERAGED Ap = 0.677
  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        0.80    9.95    1.525  0.30( 0.21) 0.69       0.7      60.00
      2        0.98   22.88    0.946  0.30( 0.20) 0.68       1.4      10.00
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

♀

```
**************************************************************************
            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
           (Reference: 1986 ORANGE COUNTY HYDROLOGY CRITERION)
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                          Analysis prepared by:

                                 STV Inc.
                           9130 Anaheim Pl, Ste 210
                          Rancho Cucamonga, CA 91730


 ************************* DESCRIPTION OF STUDY *************************
* OCTA TSOC                                                             *
* Conceptual Drainage Study                                             *
* 2-yr storm event analysis                                             *
 ************************************************************************

  FILE NAME: TSOC2.DAT
  TIME/DATE OF STUDY: 19:54 09/04/2017
==========================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
==========================================================================
                     --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =    2.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  *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 0.0312 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

  UNIT-HYDROGRAPH MODEL SELECTIONS/PARAMETERS:
    WATERSHED LAG = 0.80 * Tc
    USED "VALLEY UNDEVELOPED" S-GRAPH FOR DEVELOPMENTS OF
    2 UNITS/ACRE AND LESS; AND "VALLEY DEVELOPED" S-GRAPH
    FOR DEVELOPMENTS OF 3-4 UNITS/ACRE AND MORE.
    SIERRA MADRE DEPTH-AREA FACTORS USED.
                      AREA-AVERAGED
          DURATION    RAINFALL(INCH)
          5-MINUTES         0.19
         30-MINUTES         0.40
          1-HOUR            0.53
          3-HOUR            0.89
          6-HOUR            1.22
         24-HOUR            2.05
  *ANTECEDENT MOISTURE CONDITION (AMC) I ASSUMED FOR UNIT HYDROGRAPH METHOD*


**************************************************************************
  FLOW PROCESS FROM NODE     10.10 TO NODE     15.10 IS CODE =  21
--------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
==========================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   103.00
  ELEVATION DATA: UPSTREAM(FEET) =    137.50  DOWNSTREAM(FEET) =    136.50

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    5.000
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  2.264
  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               B        0.14      0.30      0.100    36    5.00
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =      0.28
  TOTAL AREA(ACRES) =      0.14   PEAK FLOW RATE(CFS) =      0.28

****************************************************************************
  FLOW PROCESS FROM NODE     15.10 TO NODE     16.10 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   132.53  DOWNSTREAM(FEET) =   132.33
  FLOW LENGTH(FEET) =    39.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   2.4 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   1.98
  GIVEN PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      0.28
  PIPE TRAVEL TIME(MIN.) =   0.33    Tc(MIN.) =    5.33
  LONGEST FLOWPATH FROM NODE     10.10 TO NODE     16.10 =     142.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     15.10 TO NODE     16.10 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =    5.33
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  2.182
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
     LAND USE              GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL               B        0.06      0.30      0.100    36
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA AREA(ACRES) =     0.06      SUBAREA RUNOFF(CFS) =     0.12
  EFFECTIVE AREA(ACRES) =      0.20   AREA-AVERAGED Fm(INCH/HR) =  0.03
  AREA-AVERAGED Fp(INCH/HR) =  0.30  AREA-AVERAGED Ap =  0.10
  TOTAL AREA(ACRES) =        0.2       PEAK FLOW RATE(CFS) =       0.39

****************************************************************************
  FLOW PROCESS FROM NODE     16.10 TO NODE     20.10 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   132.33  DOWNSTREAM(FEET) =   131.10
  FLOW LENGTH(FEET) =   246.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   2.8 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   2.19
  GIVEN PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      0.39
  PIPE TRAVEL TIME(MIN.) =   1.87    Tc(MIN.) =    7.20
  LONGEST FLOWPATH FROM NODE     10.10 TO NODE     20.10 =     388.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     16.10 TO NODE     20.10 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =    7.20
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.836
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
     LAND USE              GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL               B        0.64      0.30      0.100    36
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA AREA(ACRES) =     0.64      SUBAREA RUNOFF(CFS) =     1.04
  EFFECTIVE AREA(ACRES) =      0.84   AREA-AVERAGED Fm(INCH/HR) =  0.03
  AREA-AVERAGED Fp(INCH/HR) =  0.30  AREA-AVERAGED Ap =  0.10
  TOTAL AREA(ACRES) =        0.8       PEAK FLOW RATE(CFS) =       1.37

****************************************************************************
  FLOW PROCESS FROM NODE     20.10 TO NODE     40.10 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
```

```
  ELEVATION DATA: UPSTREAM(FEET) =   131.10  DOWNSTREAM(FEET) =   130.91
  FLOW LENGTH(FEET) =    37.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   5.3 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   3.18
  GIVEN PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       1.37
  PIPE TRAVEL TIME(MIN.) =   0.19    Tc(MIN.) =    7.39
  LONGEST FLOWPATH FROM NODE     10.10 TO NODE     40.10 =     425.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     20.10 TO NODE     40.10 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =    7.39
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.808
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp          Ap     SCS
       LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                  B        0.12      0.30     0.100    36
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA AREA(ACRES) =    0.12      SUBAREA RUNOFF(CFS) =    0.19
  EFFECTIVE AREA(ACRES) =      0.96   AREA-AVERAGED Fm(INCH/HR) =  0.03
  AREA-AVERAGED Fp(INCH/HR) =  0.30  AREA-AVERAGED Ap =  0.10
  TOTAL AREA(ACRES) =        1.0       PEAK FLOW RATE(CFS) =       1.54

****************************************************************************
  FLOW PROCESS FROM NODE     40.10 TO NODE     80.10 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   130.91  DOWNSTREAM(FEET) =   130.52
  FLOW LENGTH(FEET) =    77.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   5.6 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   3.26
  GIVEN PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       1.54
  PIPE TRAVEL TIME(MIN.) =   0.39    Tc(MIN.) =    7.79
  LONGEST FLOWPATH FROM NODE     10.10 TO NODE     80.10 =     502.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     40.10 TO NODE     80.10 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =    7.79
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.755
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp          Ap     SCS
       LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                  B        0.21      0.30     0.100    36
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA AREA(ACRES) =    0.21      SUBAREA RUNOFF(CFS) =    0.33
  EFFECTIVE AREA(ACRES) =      1.17   AREA-AVERAGED Fm(INCH/HR) =  0.03
  AREA-AVERAGED Fp(INCH/HR) =  0.30  AREA-AVERAGED Ap =  0.10
  TOTAL AREA(ACRES) =        1.2       PEAK FLOW RATE(CFS) =       1.82

****************************************************************************
  FLOW PROCESS FROM NODE     40.10 TO NODE     80.10 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.) =    7.79
  RAINFALL INTENSITY(INCH/HR) =   1.76
  AREA-AVERAGED Fm(INCH/HR) =  0.03
  AREA-AVERAGED Fp(INCH/HR) =  0.30
  AREA-AVERAGED Ap =  0.10
  EFFECTIVE STREAM AREA(ACRES) =       1.17
  TOTAL STREAM AREA(ACRES) =       1.17
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       1.82

****************************************************************************
  FLOW PROCESS FROM NODE     60.10 TO NODE     61.10 IS CODE =  21
----------------------------------------------------------------------------
```

```
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
================================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   130.00
  ELEVATION DATA: UPSTREAM(FEET) =    137.00  DOWNSTREAM(FEET) =    136.30

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    6.056
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  2.028
  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                 B        0.06      0.30      0.100    36    6.06
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =      0.11
  TOTAL AREA(ACRES) =      0.06   PEAK FLOW RATE(CFS) =      0.11

********************************************************************************
  FLOW PROCESS FROM NODE     61.10 TO NODE     71.10 IS CODE =  91
--------------------------------------------------------------------------------
  >>>>>COMPUTE "V" GUTTER FLOW TRAVEL TIME THRU SUBAREA<<<<<
================================================================================
  UPSTREAM NODE ELEVATION(FEET) =    136.30
  DOWNSTREAM NODE ELEVATION(FEET) =    135.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   313.00
  "V" GUTTER WIDTH(FEET) =   4.00   GUTTER HIKE(FEET) =  0.160
  PAVEMENT LIP(FEET) =  0.010   MANNING'S N = .0150
  PAVEMENT CROSSFALL(DECIMAL NOTATION) = 0.01000
  MAXIMUM DEPTH(FEET) =   0.50
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.534
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp          Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                 B        1.07      0.30      0.100    36
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      0.81
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.38
  AVERAGE FLOW DEPTH(FEET) =   0.20   FLOOD WIDTH(FEET) =   10.32
  "V" GUTTER FLOW TRAVEL TIME(MIN.) =   3.79   Tc(MIN.) =    9.85
  SUBAREA AREA(ACRES) =    1.07      SUBAREA RUNOFF(CFS) =    1.45
  EFFECTIVE AREA(ACRES) =    1.13     AREA-AVERAGED Fm(INCH/HR) =   0.03
  AREA-AVERAGED Fp(INCH/HR) =   0.30  AREA-AVERAGED Ap =   0.10
  TOTAL AREA(ACRES) =        1.1         PEAK FLOW RATE(CFS) =       1.53

  END OF SUBAREA "V" GUTTER HYDRAULICS:
  DEPTH(FEET) =  0.24   FLOOD WIDTH(FEET) =   18.05
  FLOW VELOCITY(FEET/SEC.) =   1.35   DEPTH*VELOCITY(FT*FT/SEC) =   0.32
  LONGEST FLOWPATH FROM NODE     60.10 TO NODE     71.10 =     443.00 FEET.

********************************************************************************
  FLOW PROCESS FROM NODE     71.10 TO NODE     80.10 IS CODE =  41
--------------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
================================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   131.41  DOWNSTREAM(FEET) =   130.52
  FLOW LENGTH(FEET) =   178.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   5.6 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   3.25
  GIVEN PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       1.53
  PIPE TRAVEL TIME(MIN.) =   0.91    Tc(MIN.) =   10.76
  LONGEST FLOWPATH FROM NODE     60.10 TO NODE     80.10 =     621.00 FEET.

********************************************************************************
  FLOW PROCESS FROM NODE     71.10 TO NODE     80.10 IS CODE =  81
--------------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
================================================================================
  MAINLINE Tc(MIN.) =   10.76
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.458
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp          Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                 B        0.52      0.30      0.100    36
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
```

```
  SUBAREA AREA(ACRES) =    0.52      SUBAREA RUNOFF(CFS) =    0.67
  EFFECTIVE AREA(ACRES) =      1.65   AREA-AVERAGED Fm(INCH/HR) =  0.03
  AREA-AVERAGED Fp(INCH/HR) =  0.30  AREA-AVERAGED Ap =  0.10
  TOTAL AREA(ACRES) =        1.6       PEAK FLOW RATE(CFS) =       2.12

****************************************************************************
  FLOW PROCESS FROM NODE     71.10 TO NODE     80.10 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.) =   10.76
  RAINFALL INTENSITY(INCH/HR) =   1.46
  AREA-AVERAGED Fm(INCH/HR) =  0.03
  AREA-AVERAGED Fp(INCH/HR) =  0.30
  AREA-AVERAGED Ap =  0.10
  EFFECTIVE STREAM AREA(ACRES) =       1.65
  TOTAL STREAM AREA(ACRES) =       1.65
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       2.12

  ** CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1        1.82    7.79    1.755  0.30( 0.03) 0.10       1.2      10.10
      2        2.12   10.76    1.458  0.30( 0.03) 0.10       1.6      60.10

  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        3.67    7.79    1.755  0.30( 0.03) 0.10       2.4      10.10
      2        3.62   10.76    1.458  0.30( 0.03) 0.10       2.8      60.10

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       3.67    Tc(MIN.) =     7.79
  EFFECTIVE AREA(ACRES) =       2.36   AREA-AVERAGED Fm(INCH/HR) =  0.03
  AREA-AVERAGED Fp(INCH/HR) =  0.30  AREA-AVERAGED Ap =  0.10
  TOTAL AREA(ACRES) =       2.8
  LONGEST FLOWPATH FROM NODE     60.10 TO NODE     80.10 =     621.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     80.10 TO NODE     90.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   130.52  DOWNSTREAM(FEET) =   129.50
  FLOW LENGTH(FEET) =    51.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  24.0 INCH PIPE IS   5.6 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.65
  GIVEN PIPE DIAMETER(INCH) =  24.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       3.67
  PIPE TRAVEL TIME(MIN.) =   0.13    Tc(MIN.) =    7.92
  LONGEST FLOWPATH FROM NODE     60.10 TO NODE     90.00 =     672.00 FEET.
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =       2.8  TC(MIN.) =      7.92
  EFFECTIVE AREA(ACRES) =      2.36  AREA-AVERAGED Fm(INCH/HR)=  0.03
  AREA-AVERAGED Fp(INCH/HR) =  0.30  AREA-AVERAGED Ap = 0.100
  PEAK FLOW RATE(CFS)   =       3.67

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1        3.67    7.92    1.739  0.30( 0.03) 0.10       2.4      10.10
      2        3.62   10.89    1.448  0.30( 0.03) 0.10       2.8      60.10
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

♀

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**************************************************************************
            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
           (Reference: 1986 ORANGE COUNTY HYDROLOGY CRITERION)
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                          Analysis prepared by:

                                 STV Inc.
                           9130 Anaheim Pl, Ste 210
                          Rancho Cucamonga, CA 91730


 ************************* DESCRIPTION OF STUDY *************************
* OCTA TSOC                                                             *
* Exist Drainage Conditions                                             *
* 100-yr storm event analysis                                           *
 ************************************************************************

  FILE NAME: TSOC100E.DAT
  TIME/DATE OF STUDY: 00:20 09/04/2017
==========================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
==========================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =  100.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  *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 0.0313 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

  UNIT-HYDROGRAPH MODEL SELECTIONS/PARAMETERS:
    WATERSHED LAG = 0.80 * Tc
    USED "VALLEY UNDEVELOPED" S-GRAPH FOR DEVELOPMENTS OF
    2 UNITS/ACRE AND LESS; AND "VALLEY DEVELOPED" S-GRAPH
    FOR DEVELOPMENTS OF 3-4 UNITS/ACRE AND MORE.
    SIERRA MADRE DEPTH-AREA FACTORS USED.
                      AREA-AVERAGED
          DURATION    RAINFALL(INCH)
          5-MINUTES         0.52
         30-MINUTES         1.09
          1-HOUR            1.45
          3-HOUR            2.43
          6-HOUR            3.36
         24-HOUR            5.63
*ANTECEDENT MOISTURE CONDITION (AMC) III ASSUMED FOR UNIT HYDROGRAPH METHOD*


**************************************************************************
  FLOW PROCESS FROM NODE     10.00 TO NODE     15.00 IS CODE =  21
--------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
==========================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   168.00
  ELEVATION DATA: UPSTREAM(FEET) =    137.50  DOWNSTREAM(FEET) =    137.30

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   15.673
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.215
  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.)
  URBAN POOR COVER
  "TURF"                    B        0.14      0.30     1.000    90   15.67
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA RUNOFF(CFS) =      0.37
  TOTAL AREA(ACRES) =      0.14   PEAK FLOW RATE(CFS) =      0.37

****************************************************************************
  FLOW PROCESS FROM NODE     15.00 TO NODE     20.00 IS CODE =  91
----------------------------------------------------------------------------
  >>>>>COMPUTE "V" GUTTER FLOW TRAVEL TIME THRU SUBAREA<<<<<
============================================================================
  UPSTREAM NODE ELEVATION(FEET) =    137.30
  DOWNSTREAM NODE ELEVATION(FEET) =    137.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   227.00
  "V" GUTTER WIDTH(FEET) =   4.00   GUTTER HIKE(FEET) =  0.160
  PAVEMENT LIP(FEET) =  0.030   MANNING'S N = .0350
  PAVEMENT CROSSFALL(DECIMAL NOTATION) = 0.01000
  MAXIMUM DEPTH(FEET) =   0.20
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.048
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp          Ap     SCS
     LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  URBAN POOR COVER
  "TURF"                    B        0.73      0.30     1.000    90
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      1.21
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.48
  AVERAGE FLOW DEPTH(FEET) =   0.20   FLOOD WIDTH(FEET) =    6.00
  "V" GUTTER FLOW TRAVEL TIME(MIN.) =   1.53   Tc(MIN.) =   17.20
  SUBAREA AREA(ACRES) =    0.73       SUBAREA RUNOFF(CFS) =    1.81
  EFFECTIVE AREA(ACRES) =    0.87     AREA-AVERAGED Fm(INCH/HR) =   0.30
  AREA-AVERAGED Fp(INCH/HR) =   0.30  AREA-AVERAGED Ap =   1.00
  TOTAL AREA(ACRES) =        0.9         PEAK FLOW RATE(CFS) =       2.15

         ==>>ERROR:FLOW EXCEEDS CAPACITY OF CHANNEL WITH
             NORMAL DEPTH EQUAL TO SPECIFIED MAXIMUM ALLOWABLE DEPTH.
             AS AN APPROXIMATION, TRAVEL TIME CALCULATIONS ARE BASED
             ON FLOW DEPTH EQUAL TO THE SPECIFIED MAXIMUM ALLOWABLE DEPTH.


  END OF SUBAREA "V" GUTTER HYDRAULICS:
  DEPTH(FEET) =  0.20   FLOOD WIDTH(FEET) =    6.00
  FLOW VELOCITY(FEET/SEC.) =   4.39   DEPTH*VELOCITY(FT*FT/SEC) =   0.88
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     20.00 =     395.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     20.00 TO NODE     40.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  137.00  DOWNSTREAM ELEVATION(FEET) =  135.10
  STREET LENGTH(FEET) =    99.00   CURB HEIGHT(INCHES) =  8.0
  STREET HALFWIDTH(FEET) = 30.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  20.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.018
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.018

  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) =       2.85
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.33
    HALFSTREET FLOOD WIDTH(FEET) =    9.28
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.95
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.97
  STREET FLOW TRAVEL TIME(MIN.) =   0.56   Tc(MIN.) =   17.76
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  2.993
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp          Ap     SCS
     LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                B        0.52      0.30     0.100    76
```

```
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA AREA(ACRES) =    0.52      SUBAREA RUNOFF(CFS) =    1.39
  EFFECTIVE AREA(ACRES) =      1.39    AREA-AVERAGED Fm(INCH/HR) =  0.20
  AREA-AVERAGED Fp(INCH/HR) =  0.30  AREA-AVERAGED Ap =  0.66
  TOTAL AREA(ACRES) =        1.4        PEAK FLOW RATE(CFS) =       3.50

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.35   HALFSTREET FLOOD WIDTH(FEET) =  10.27
  FLOW VELOCITY(FEET/SEC.) =  3.08   DEPTH*VELOCITY(FT*FT/SEC.) =   1.06
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     40.00 =     494.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     40.00 TO NODE     90.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  135.10  DOWNSTREAM ELEVATION(FEET) =  134.80
  STREET LENGTH(FEET) =    38.00   CURB HEIGHT(INCHES) =  8.0
  STREET HALFWIDTH(FEET) = 30.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  20.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.018
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.018

  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) =       3.50
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.39
    HALFSTREET FLOOD WIDTH(FEET) =   12.54
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.19
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.85
  STREET FLOW TRAVEL TIME(MIN.) =   0.29   Tc(MIN.) =   18.05
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  2.965
  SUBAREA AREA(ACRES) =    0.00      SUBAREA RUNOFF(CFS) =    0.00
  EFFECTIVE AREA(ACRES) =      1.39    AREA-AVERAGED Fm(INCH/HR) =  0.20
  AREA-AVERAGED Fp(INCH/HR) =  0.30  AREA-AVERAGED Ap =  0.66
  TOTAL AREA(ACRES) =        1.4        PEAK FLOW RATE(CFS) =       3.50
  NOTE: PEAK FLOW RATE DEFAULTED TO UPSTREAM VALUE

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.39   HALFSTREET FLOOD WIDTH(FEET) =  12.54
  FLOW VELOCITY(FEET/SEC.) =  2.19   DEPTH*VELOCITY(FT*FT/SEC.) =   0.85
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     90.00 =     532.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     40.00 TO NODE     90.00 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.) =   18.05
  RAINFALL INTENSITY(INCH/HR) =   2.97
  AREA-AVERAGED Fm(INCH/HR) =  0.20
  AREA-AVERAGED Fp(INCH/HR) =  0.30
  AREA-AVERAGED Ap =  0.66
  EFFECTIVE STREAM AREA(ACRES) =       1.39
  TOTAL STREAM AREA(ACRES) =       1.39
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       3.50

****************************************************************************
  FLOW PROCESS FROM NODE     60.00 TO NODE     61.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   130.00
  ELEVATION DATA: UPSTREAM(FEET) =    137.00  DOWNSTREAM(FEET) =    136.10

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    9.947
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.172
  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.)
URBAN POOR COVER
"TURF"                     B        0.06      0.30      1.000    90    9.95
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
SUBAREA RUNOFF(CFS) =      0.21
TOTAL AREA(ACRES) =      0.06   PEAK FLOW RATE(CFS) =      0.21

****************************************************************************
FLOW PROCESS FROM NODE     61.00 TO NODE     90.00 IS CODE =  62
----------------------------------------------------------------------------
>>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
UPSTREAM ELEVATION(FEET) =  136.10  DOWNSTREAM ELEVATION(FEET) =  134.80
STREET LENGTH(FEET) =   545.00   CURB HEIGHT(INCHES) =  8.0
STREET HALFWIDTH(FEET) = 30.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  20.00
INSIDE STREET CROSSFALL(DECIMAL) =  0.018
OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.018

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) =       1.96
  STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
  STREET FLOW DEPTH(FEET) =  0.39
  HALFSTREET FLOOD WIDTH(FEET) =   12.62
  AVERAGE FLOW VELOCITY(FEET/SEC.) =    1.21
  PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.47
STREET FLOW TRAVEL TIME(MIN.) =   7.51   Tc(MIN.) =   17.45
* 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.023
SUBAREA LOSS RATE DATA(AMC III):
 DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS
     LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
URBAN POOR COVER
"TURF"                     B        1.40      0.30      1.000    90
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
SUBAREA AREA(ACRES) =    1.40      SUBAREA RUNOFF(CFS) =    3.43
EFFECTIVE AREA(ACRES) =      1.46    AREA-AVERAGED Fm(INCH/HR) =  0.30
AREA-AVERAGED Fp(INCH/HR) =  0.30  AREA-AVERAGED Ap =  1.00
TOTAL AREA(ACRES) =        1.5        PEAK FLOW RATE(CFS) =       3.58

END OF SUBAREA STREET FLOW HYDRAULICS:
DEPTH(FEET) = 0.45   HALFSTREET FLOOD WIDTH(FEET) =  16.37
FLOW VELOCITY(FEET/SEC.) =  1.38   DEPTH*VELOCITY(FT*FT/SEC.) =   0.63
LONGEST FLOWPATH FROM NODE     60.00 TO NODE     90.00 =     675.00 FEET.

****************************************************************************
FLOW PROCESS FROM NODE     61.00 TO NODE     90.00 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.) =   17.45
RAINFALL INTENSITY(INCH/HR) =   3.02
AREA-AVERAGED Fm(INCH/HR) =  0.30
AREA-AVERAGED Fp(INCH/HR) =  0.30
AREA-AVERAGED Ap =  1.00
EFFECTIVE STREAM AREA(ACRES) =       1.46
TOTAL STREAM AREA(ACRES) =       1.46
PEAK FLOW RATE(CFS) AT CONFLUENCE =       3.58

** CONFLUENCE DATA **
 STREAM       Q      Tc   Intensity   Fp(Fm)      Ap      Ae     HEADWATER
 NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
    1        3.50   18.05    2.965  0.30( 0.20) 0.66       1.4      10.00
    2        3.58   17.45    3.023  0.30( 0.30) 1.00       1.5      60.00

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        7.03   17.45    3.023  0.30( 0.25) 0.84       2.8      60.00
      2        7.00   18.05    2.965  0.30( 0.25) 0.84       2.8      10.00

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       7.03    Tc(MIN.) =    17.45
  EFFECTIVE AREA(ACRES) =       2.80   AREA-AVERAGED Fm(INCH/HR) =  0.25
  AREA-AVERAGED Fp(INCH/HR) =  0.30  AREA-AVERAGED Ap =  0.84
  TOTAL AREA(ACRES) =        2.8
  LONGEST FLOWPATH FROM NODE     60.00 TO NODE     90.00 =     675.00 FEET.
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        2.8  TC(MIN.) =     17.45
  EFFECTIVE AREA(ACRES) =      2.80  AREA-AVERAGED Fm(INCH/HR)=  0.25
  AREA-AVERAGED Fp(INCH/HR) =  0.30  AREA-AVERAGED Ap = 0.839
  PEAK FLOW RATE(CFS)   =       7.03

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
      1        7.03   17.45    3.023  0.30( 0.25) 0.84       2.8      60.00
      2        7.00   18.05    2.965  0.30( 0.25) 0.84       2.8      10.00
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

♀

```
**************************************************************************
            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
           (Reference: 1986 ORANGE COUNTY HYDROLOGY CRITERION)
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                          Analysis prepared by:

                                 STV Inc.
                           9130 Anaheim Pl, Ste 210
                          Rancho Cucamonga, CA 91730


 ************************* DESCRIPTION OF STUDY *************************
* OCTA TSOC                                                             *
* Conceptual Drainage Study                                             *
* 100-yr storm event analysis                                           *
 ************************************************************************

  FILE NAME: TSOC100.DAT
  TIME/DATE OF STUDY: 19:10 09/04/2017
========================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
========================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =  100.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  *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 0.0313 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

  UNIT-HYDROGRAPH MODEL SELECTIONS/PARAMETERS:
    WATERSHED LAG = 0.80 * Tc
    USED "VALLEY UNDEVELOPED" S-GRAPH FOR DEVELOPMENTS OF
    2 UNITS/ACRE AND LESS; AND "VALLEY DEVELOPED" S-GRAPH
    FOR DEVELOPMENTS OF 3-4 UNITS/ACRE AND MORE.
    SIERRA MADRE DEPTH-AREA FACTORS USED.
                      AREA-AVERAGED
          DURATION    RAINFALL(INCH)
          5-MINUTES         0.52
         30-MINUTES         1.09
          1-HOUR            1.45
          3-HOUR            2.43
          6-HOUR            3.36
         24-HOUR            5.63
*ANTECEDENT MOISTURE CONDITION (AMC) III ASSUMED FOR UNIT HYDROGRAPH METHOD*


**************************************************************************
  FLOW PROCESS FROM NODE     10.10 TO NODE     15.10 IS CODE =  21
--------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
==========================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   103.00
  ELEVATION DATA: UPSTREAM(FEET) =    137.50  DOWNSTREAM(FEET) =    136.50

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    5.000
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  6.187
  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                B        0.14      0.30      0.100    76    5.00
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =      0.78
  TOTAL AREA(ACRES) =      0.14   PEAK FLOW RATE(CFS) =      0.78

****************************************************************************
  FLOW PROCESS FROM NODE     15.10 TO NODE     16.10 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   132.53  DOWNSTREAM(FEET) =   132.33
  FLOW LENGTH(FEET) =    39.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   4.0 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   2.70
  GIVEN PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.78
  PIPE TRAVEL TIME(MIN.) =   0.24    Tc(MIN.) =    5.24
  LONGEST FLOWPATH FROM NODE     10.10 TO NODE     16.10 =     142.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     15.10 TO NODE     16.10 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =    5.24
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  6.023
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
     LAND USE              GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                B        0.06      0.30      0.100    76
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA AREA(ACRES) =     0.06      SUBAREA RUNOFF(CFS) =     0.32
  EFFECTIVE AREA(ACRES) =      0.20   AREA-AVERAGED Fm(INCH/HR) =  0.03
  AREA-AVERAGED Fp(INCH/HR) =  0.30  AREA-AVERAGED Ap =  0.10
  TOTAL AREA(ACRES) =        0.2       PEAK FLOW RATE(CFS) =       1.08

****************************************************************************
  FLOW PROCESS FROM NODE     16.10 TO NODE     20.10 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   132.33  DOWNSTREAM(FEET) =   131.10
  FLOW LENGTH(FEET) =   246.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   4.7 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   2.94
  GIVEN PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       1.08
  PIPE TRAVEL TIME(MIN.) =   1.40    Tc(MIN.) =    6.64
  LONGEST FLOWPATH FROM NODE     10.10 TO NODE     20.10 =     388.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     16.10 TO NODE     20.10 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =    6.64
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  5.261
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
     LAND USE              GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                B        0.64      0.30      0.100    76
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA AREA(ACRES) =     0.64      SUBAREA RUNOFF(CFS) =     3.01
  EFFECTIVE AREA(ACRES) =      0.84   AREA-AVERAGED Fm(INCH/HR) =  0.03
  AREA-AVERAGED Fp(INCH/HR) =  0.30  AREA-AVERAGED Ap =  0.10
  TOTAL AREA(ACRES) =        0.8       PEAK FLOW RATE(CFS) =       3.95

****************************************************************************
  FLOW PROCESS FROM NODE     20.10 TO NODE     40.10 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
```

```
  ELEVATION DATA: UPSTREAM(FEET) =   131.10  DOWNSTREAM(FEET) =   130.91
  FLOW LENGTH(FEET) =    37.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   9.4 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.23
  GIVEN PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       3.95
  PIPE TRAVEL TIME(MIN.) =   0.15    Tc(MIN.) =    6.78
  LONGEST FLOWPATH FROM NODE     10.10 TO NODE     40.10 =     425.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     20.10 TO NODE     40.10 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =    6.78
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  5.196
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp          Ap     SCS
       LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                  B        0.12      0.30     0.100    76
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA AREA(ACRES) =    0.12      SUBAREA RUNOFF(CFS) =    0.56
  EFFECTIVE AREA(ACRES) =      0.96   AREA-AVERAGED Fm(INCH/HR) =  0.03
  AREA-AVERAGED Fp(INCH/HR) =  0.30  AREA-AVERAGED Ap =  0.10
  TOTAL AREA(ACRES) =        1.0       PEAK FLOW RATE(CFS) =       4.46

****************************************************************************
  FLOW PROCESS FROM NODE     40.10 TO NODE     80.10 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   130.91  DOWNSTREAM(FEET) =   130.52
  FLOW LENGTH(FEET) =    77.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  18.0 INCH PIPE IS  10.2 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.33
  GIVEN PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       4.46
  PIPE TRAVEL TIME(MIN.) =   0.30    Tc(MIN.) =    7.08
  LONGEST FLOWPATH FROM NODE     10.10 TO NODE     80.10 =     502.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     40.10 TO NODE     80.10 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =    7.08
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  5.070
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp          Ap     SCS
       LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                  B        0.21      0.30     0.100    76
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA AREA(ACRES) =    0.21      SUBAREA RUNOFF(CFS) =    0.95
  EFFECTIVE AREA(ACRES) =      1.17   AREA-AVERAGED Fm(INCH/HR) =  0.03
  AREA-AVERAGED Fp(INCH/HR) =  0.30  AREA-AVERAGED Ap =  0.10
  TOTAL AREA(ACRES) =        1.2       PEAK FLOW RATE(CFS) =       5.31

****************************************************************************
  FLOW PROCESS FROM NODE     40.10 TO NODE     80.10 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.) =    7.08
  RAINFALL INTENSITY(INCH/HR) =   5.07
  AREA-AVERAGED Fm(INCH/HR) =  0.03
  AREA-AVERAGED Fp(INCH/HR) =  0.30
  AREA-AVERAGED Ap =  0.10
  EFFECTIVE STREAM AREA(ACRES) =       1.17
  TOTAL STREAM AREA(ACRES) =       1.17
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       5.31

****************************************************************************
  FLOW PROCESS FROM NODE     60.10 TO NODE     61.10 IS CODE =  21
----------------------------------------------------------------------------
```

```
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
================================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   130.00
  ELEVATION DATA: UPSTREAM(FEET) =    137.00  DOWNSTREAM(FEET) =    136.30

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    6.056
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  5.544
  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                 B        0.06      0.30      0.100    76    6.06
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =      0.30
  TOTAL AREA(ACRES) =      0.06   PEAK FLOW RATE(CFS) =      0.30

********************************************************************************
  FLOW PROCESS FROM NODE     61.10 TO NODE     71.10 IS CODE =  91
--------------------------------------------------------------------------------
  >>>>>COMPUTE "V" GUTTER FLOW TRAVEL TIME THRU SUBAREA<<<<<
================================================================================
  UPSTREAM NODE ELEVATION(FEET) =    136.30
  DOWNSTREAM NODE ELEVATION(FEET) =    135.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   313.00
  "V" GUTTER WIDTH(FEET) =   4.00   GUTTER HIKE(FEET) =  0.160
  PAVEMENT LIP(FEET) =  0.010   MANNING'S N = .0150
  PAVEMENT CROSSFALL(DECIMAL NOTATION) = 0.01000
  MAXIMUM DEPTH(FEET) =   0.50
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.203
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp          Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                 B        1.07      0.30      0.100    76
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      2.27
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.39
  AVERAGE FLOW DEPTH(FEET) =   0.26   FLOOD WIDTH(FEET) =   22.95
  "V" GUTTER FLOW TRAVEL TIME(MIN.) =   3.76   Tc(MIN.) =    9.82
  SUBAREA AREA(ACRES) =    1.07      SUBAREA RUNOFF(CFS) =    4.02
  EFFECTIVE AREA(ACRES) =    1.13     AREA-AVERAGED Fm(INCH/HR) =   0.03
  AREA-AVERAGED Fp(INCH/HR) =   0.30  AREA-AVERAGED Ap =   0.10
  TOTAL AREA(ACRES) =        1.1         PEAK FLOW RATE(CFS) =       4.24

  END OF SUBAREA "V" GUTTER HYDRAULICS:
  DEPTH(FEET) =  0.31   FLOOD WIDTH(FEET) =   31.71
  FLOW VELOCITY(FEET/SEC.) =   1.50   DEPTH*VELOCITY(FT*FT/SEC) =   0.46
  LONGEST FLOWPATH FROM NODE     60.10 TO NODE     71.10 =     443.00 FEET.

********************************************************************************
  FLOW PROCESS FROM NODE     71.10 TO NODE     80.10 IS CODE =  41
--------------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
================================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   131.41  DOWNSTREAM(FEET) =   130.52
  FLOW LENGTH(FEET) =   178.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   9.9 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.26
  GIVEN PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       4.24
  PIPE TRAVEL TIME(MIN.) =   0.70    Tc(MIN.) =   10.52
  LONGEST FLOWPATH FROM NODE     60.10 TO NODE     80.10 =     621.00 FEET.

********************************************************************************
  FLOW PROCESS FROM NODE     71.10 TO NODE     80.10 IS CODE =  81
--------------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
================================================================================
  MAINLINE Tc(MIN.) =   10.52
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.041
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp          Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                 B        0.52      0.30      0.100    76
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
```

```
  SUBAREA AREA(ACRES) =    0.52      SUBAREA RUNOFF(CFS) =    1.88
  EFFECTIVE AREA(ACRES) =      1.65   AREA-AVERAGED Fm(INCH/HR) =  0.03
  AREA-AVERAGED Fp(INCH/HR) =  0.30  AREA-AVERAGED Ap =  0.10
  TOTAL AREA(ACRES) =        1.6       PEAK FLOW RATE(CFS) =       5.96

****************************************************************************
  FLOW PROCESS FROM NODE     71.10 TO NODE     80.10 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.) =   10.52
  RAINFALL INTENSITY(INCH/HR) =   4.04
  AREA-AVERAGED Fm(INCH/HR) =  0.03
  AREA-AVERAGED Fp(INCH/HR) =  0.30
  AREA-AVERAGED Ap =  0.10
  EFFECTIVE STREAM AREA(ACRES) =       1.65
  TOTAL STREAM AREA(ACRES) =       1.65
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       5.96

  ** CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1        5.31    7.08    5.070  0.30( 0.03) 0.10       1.2      10.10
      2        5.96   10.52    4.041  0.30( 0.03) 0.10       1.6      60.10

  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       10.34    7.08    5.070  0.30( 0.03) 0.10       2.3      10.10
      2       10.18   10.52    4.041  0.30( 0.03) 0.10       2.8      60.10

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      10.34    Tc(MIN.) =     7.08
  EFFECTIVE AREA(ACRES) =       2.28   AREA-AVERAGED Fm(INCH/HR) =  0.03
  AREA-AVERAGED Fp(INCH/HR) =  0.30  AREA-AVERAGED Ap =  0.10
  TOTAL AREA(ACRES) =       2.8
  LONGEST FLOWPATH FROM NODE     60.10 TO NODE     80.10 =     621.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     80.10 TO NODE     90.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   130.52  DOWNSTREAM(FEET) =   129.50
  FLOW LENGTH(FEET) =    51.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  24.0 INCH PIPE IS   9.5 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   8.92
  GIVEN PIPE DIAMETER(INCH) =  24.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      10.34
  PIPE TRAVEL TIME(MIN.) =   0.10    Tc(MIN.) =    7.17
  LONGEST FLOWPATH FROM NODE     60.10 TO NODE     90.00 =     672.00 FEET.
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =       2.8  TC(MIN.) =      7.17
  EFFECTIVE AREA(ACRES) =      2.28  AREA-AVERAGED Fm(INCH/HR)=  0.03
  AREA-AVERAGED Fp(INCH/HR) =  0.30  AREA-AVERAGED Ap = 0.100
  PEAK FLOW RATE(CFS)   =      10.34

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1       10.34    7.17    5.031  0.30( 0.03) 0.10       2.3      10.10
      2       10.18   10.61    4.020  0.30( 0.03) 0.10       2.8      60.10
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

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OCFCD	Small Area Runoff Hydrograph Calculations	Project:	OCTA TSOC			Sheet
Hydrology Manual	Loss Rate Calculation Worksheet	By:	RW	Date:	9/4/2017	
Section C		Checked:		Date:		1 of 2

LOSS RATE DATA

[1] Soil Group (Plate A, B, or C)	[2] Pervious Area Soil Cover Type	[3] Curve Number (AMC II) (Figure C-3)	[4] AMC	[5] Adj CN Based on AMC (Table C.1)	[6] "S" (Formula C.2)	[7] Initial Abstract. Ia (Formula C.1)	[8] Design Storm (year)	[9] P24 (in) (Fig B-1)	[10] Subarea Aj (ac)	[11] 24-hr Yield Fraction Yj (Formula C.3)	[12] Yj * Aj (ac) [11] x [10]	[13] Max. Loss Rate / Soil F_p (in/hr) (Table C.2)	[14] Pervious Fration a_p / Land Use (Fig. C-4)	[15] Area Max Loss Rate Fm (in/hr) (Formula C.7)
B	Urban - Turf	74	I	56	7.86	1.57	2	2.05	0.14	0.01	0.00	0.3	1	0.3
	Poor Cover													
B	Urban - Turf	74	I	56	7.86	1.57	2	2.05	0.73	0.01	0.01	0.3	1	0.3
	Poor Cover													
B	Industrial	98	I	36	17.78	3.56	2	2.05	0.52	0	0.00	0.3	0.1	0.03
B	Urban - Turf	74	I	56	7.86	1.57	2	2.05	1.4	0.01	0.01	0.3	1	0.3
	Poor Cover													
B	Urban - Turf	74	I	56	7.86	1.57	2	2.05	0.06	0.01	0.00	0.3	1	0.3
	Poor Cover													
								∑[10]=	2.85	∑[12]=	0.02		∑[15]=	1.23

Loss Rate Calculation Summary

Scenario = Existing Conditions

Design Storm Event = 2 -year

2-yr 24-hr Rainfall Intensity (I) = 0.0854 in/hr

Weighted Avg 24-hr yield fraction (Y) = ∑[12] / ∑[10] = 0.01

Low Loss Fraction (Y_L) = 1 - Y = **0.99**

Adjusted Low Loss Rate (F*)= Y_L * I = **0.0845** in/hr

Weighted Avg Catchment Max. Loss Rate (Fm) = 0.2507 in/hr

Note: [11] has zero value when [7] is greater than [9] (i.e. Ia > P24)

OCFCD Hydrology Manual Section C	**Small Area Runoff Hydrograph Calculations** Loss Rate Calculation Worksheet	Project: OCTA TSOC	By: RW	Date: 9/4/2017	Checked:	Date:	Sheet 2 of 2

LOSS RATE DATA

[1] Soil Group (Plate A, B, or C)	[2] Pervious Area Soil Cover Type	[3] Curve Number (AMC II) (Figure C-3)	[4] AMC	[5] Adj CN Based on AMC (Table C.1)	[6] "S" (Formula C.2)	[7] Initial Abstract. Ia (Formula C.1)	[8] Design Storm (year)	[9] P24 (in) (Fig B-1)	[10] Subarea Aj (ac)	[11] 24-hr Yield Fraction Yj (Formula C.3)	[12] Yj * Aj (ac) [11] x [10]	[13] Max. Loss Rate / Soil F_p (in/hr) (Table C.2)	[14] Pervious Fration a_p / Land Use (Fig. C-4)	[15] Area Max Loss Rate Fm (in/hr) (Formula C.7)
B	Commercial	56	I	36	17.78	3.56	2	2.05	2.85	0	0.00	0.3	0.1	0.03
								∑[10]=	2.85	∑[12]=	0		∑[15]=	0.03

Loss Rate Calculation Summary

Scenario = Conceptual Study

Design Storm Event = 2 -year

2-yr 24-hr Rainfall Intensity (I) = 0.0854 in/hr

Weighted Avg 24-hr yield fraction (Y) = ∑[12] / ∑[10] = 0

Low Loss Fraction (Y_L) = 1 - Y = **1**

Adjusted Low Loss Rate (F*)= Y_L * I = **0.0854** in/hr

Weighted Avg Catchment Max. Loss Rate (Fm) = 0.03 in/hr

Note: [11] has zero value when [7] is greater than [9] (i.e. Ia > P24)

```
**************************************************************************
                    SMALL AREA UNIT HYDROGRAPH MODEL
==========================================================================
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             Ver. 23.0  Release Date: 07/01/2016  License ID 1613

                          Analysis prepared by:

                                 STV Inc.
                             9130 Anaheim Place
                                 Suite 210
                           Rancho Cucamonga, CA 91730

**************************************************************************
--------------------------------------------------------------------------

 Problem Descriptions:
  OCTA TSOC
  Existing Drainage Conditions
  2-year run-off volume
--------------------------------------------------------------------------


    RATIONAL METHOD CALIBRATION COEFFICIENT = 0.90
    TOTAL CATCHMENT AREA(ACRES) =    2.85
    SOIL-LOSS RATE, Fm,(INCH/HR) =  0.251
    LOW LOSS FRACTION = 0.990
    TIME OF CONCENTRATION(MIN.) = 22.88
    SMALL AREA PEAK Q COMPUTED USING PEAK FLOW RATE FORMULA
    ORANGE COUNTY "VALLEY" RAINFALL VALUES ARE USED
    RETURN FREQUENCY(YEARS) =   2
       5-MINUTE POINT RAINFALL VALUE(INCHES) =  0.19
      30-MINUTE POINT RAINFALL VALUE(INCHES) =  0.40
       1-HOUR   POINT RAINFALL VALUE(INCHES) =  0.53
       3-HOUR   POINT RAINFALL VALUE(INCHES) =  0.89
       6-HOUR   POINT RAINFALL VALUE(INCHES) =  1.22
      24-HOUR   POINT RAINFALL VALUE(INCHES) =  2.05

--------------------------------------------------------------------------

    TOTAL CATCHMENT   RUNOFF  VOLUME(ACRE-FEET) =     0.06
    TOTAL CATCHMENT SOIL-LOSS VOLUME(ACRE-FEET) =     0.42

**************************************************************************
  TIME     VOLUME       Q    0.        2.5       5.0       7.5      10.0
 (HOURS)    (AF)      (CFS)
--------------------------------------------------------------------------
  0.37      0.0000      0.00  Q         .         .         .         .
  0.75      0.0000      0.00  Q         .         .         .         .
  1.13      0.0001      0.00  Q         .         .         .         .
  1.51      0.0001      0.00  Q         .         .         .         .
  1.89      0.0001      0.00  Q         .         .         .         .
  2.27      0.0001      0.00  Q         .         .         .         .
  2.65      0.0002      0.00  Q         .         .         .         .
  3.03      0.0002      0.00  Q         .         .         .         .
  3.42      0.0002      0.00  Q         .         .         .         .
  3.80      0.0003      0.00  Q         .         .         .         .
  4.18      0.0003      0.00  Q         .         .         .         .
  4.56      0.0003      0.00  Q         .         .         .         .
  4.94      0.0004      0.00  Q         .         .         .         .
  5.32      0.0004      0.00  Q         .         .         .         .
  5.70      0.0004      0.00  Q         .         .         .         .
  6.09      0.0005      0.00  Q         .         .         .         .
  6.47      0.0005      0.00  Q         .         .         .         .
  6.85      0.0005      0.00  Q         .         .         .         .
  7.23      0.0006      0.00  Q         .         .         .         .
  7.61      0.0006      0.00  Q         .         .         .         .
  7.99      0.0006      0.00  Q         .         .         .         .
  8.37      0.0007      0.00  Q         .         .         .         .
  8.75      0.0007      0.00  Q         .         .         .         .
  9.14      0.0008      0.00  Q         .         .         .         .
  9.52      0.0008      0.00  Q         .         .         .         .
  9.90      0.0008      0.00  Q         .         .         .         .
 10.28      0.0009      0.00  Q         .         .         .         .
 10.66      0.0009      0.00  Q         .         .         .         .
 11.04      0.0010      0.00  Q         .         .         .         .
 11.42      0.0010      0.00  Q         .         .         .         .
 11.81      0.0011      0.00  Q         .         .         .         .
 12.19      0.0012      0.00  Q         .         .         .         .
 12.57      0.0012      0.00  Q         .         .         .         .
 12.95      0.0013      0.00  Q         .         .         .         .
 13.33      0.0014      0.00  Q         .         .         .         .
 13.71      0.0015      0.00  Q         .         .         .         .
 14.09      0.0016      0.00  Q         .         .         .         .
 14.47      0.0017      0.00  Q         .         .         .         .
 14.86      0.0018      0.00  Q         .         .         .         .
 15.24      0.0020      0.00  Q         .         .         .         .
```

15.62	0.0021	0.01	Q	.	.	.	.
16.00	0.0045	0.15	Q	.	.	.	.
16.38	0.0346	1.76	.	Q	.	.	.
16.76	0.0624	0.01	Q	.	.	.	.
17.14	0.0626	0.00	Q	.	.	.	.
17.53	0.0627	0.00	Q	.	.	.	.
17.91	0.0628	0.00	Q	.	.	.	.
18.29	0.0629	0.00	Q	.	.	.	.
18.67	0.0629	0.00	Q	.	.	.	.
19.05	0.0630	0.00	Q	.	.	.	.
19.43	0.0630	0.00	Q	.	.	.	.
19.81	0.0631	0.00	Q	.	.	.	.
20.19	0.0631	0.00	Q	.	.	.	.
20.58	0.0632	0.00	Q	.	.	.	.
20.96	0.0632	0.00	Q	.	.	.	.
21.34	0.0632	0.00	Q	.	.	.	.
21.72	0.0633	0.00	Q	.	.	.	.
22.10	0.0633	0.00	Q	.	.	.	.
22.48	0.0633	0.00	Q	.	.	.	.
22.86	0.0634	0.00	Q	.	.	.	.
23.25	0.0634	0.00	Q	.	.	.	.
23.63	0.0634	0.00	Q	.	.	.	.
24.01	0.0634	0.00	Q	.	.	.	.
24.39	0.0635	0.00	Q	.	.	.	.

TIME DURATION(minutes) OF PERCENTILES OF ESTIMATED PEAK FLOW RATE:
(Note: 100% of Peak Flow Rate estimate assumed to have
an instantaneous time duration)

Percentile of Estimated Peak Flow Rate	Duration (minutes)
0%	1441.4
10%	22.9
20%	22.9
30%	22.9
40%	22.9
50%	22.9
60%	22.9
70%	22.9
80%	22.9
90%	22.9

```
******************************************************************************
                    SMALL AREA UNIT HYDROGRAPH MODEL
==============================================================================
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             Ver. 23.0  Release Date: 07/01/2016  License ID 1613

                          Analysis prepared by:

                                 STV Inc.
                              9130 Anaheim Place
                                  Suite 210
                            Rancho Cucamonga, CA 91730

******************************************************************************
------------------------------------------------------------------------------

 Problem Descriptions:
  OCTA TSOC
  Conceptual Drainage Study
  2-yr run-off volume
------------------------------------------------------------------------------


    RATIONAL METHOD CALIBRATION COEFFICIENT = 0.90
    TOTAL CATCHMENT AREA(ACRES) =    2.85
    SOIL-LOSS RATE, Fm,(INCH/HR) =  0.030
    LOW LOSS FRACTION = 1.000
    TIME OF CONCENTRATION(MIN.) =  7.92
    SMALL AREA PEAK Q COMPUTED USING PEAK FLOW RATE FORMULA
    ORANGE COUNTY "VALLEY" RAINFALL VALUES ARE USED
    RETURN FREQUENCY(YEARS) =   2
       5-MINUTE POINT RAINFALL VALUE(INCHES) =  0.19
      30-MINUTE POINT RAINFALL VALUE(INCHES) =  0.40
       1-HOUR   POINT RAINFALL VALUE(INCHES) =  0.53
       3-HOUR   POINT RAINFALL VALUE(INCHES) =  0.89
       6-HOUR   POINT RAINFALL VALUE(INCHES) =  1.22
      24-HOUR   POINT RAINFALL VALUE(INCHES) =  2.05

------------------------------------------------------------------------------

    TOTAL CATCHMENT   RUNOFF  VOLUME(ACRE-FEET) =     0.28
    TOTAL CATCHMENT SOIL-LOSS VOLUME(ACRE-FEET) =     0.20

******************************************************************************
  TIME     VOLUME       Q    0.        2.5       5.0       7.5      10.0
 (HOURS)    (AF)      (CFS)
------------------------------------------------------------------------------
  0.03      0.0000      0.00  Q         .         .         .         .
  0.16      0.0000      0.01  Q         .         .         .         .
  0.29      0.0001      0.01  Q         .         .         .         .
  0.42      0.0002      0.01  Q         .         .         .         .
  0.56      0.0002      0.01  Q         .         .         .         .
  0.69      0.0003      0.01  Q         .         .         .         .
  0.82      0.0004      0.01  Q         .         .         .         .
  0.95      0.0005      0.01  Q         .         .         .         .
  1.08      0.0005      0.01  Q         .         .         .         .
  1.22      0.0006      0.01  Q         .         .         .         .
  1.35      0.0007      0.01  Q         .         .         .         .
  1.48      0.0008      0.01  Q         .         .         .         .
  1.61      0.0010      0.01  Q         .         .         .         .
  1.74      0.0011      0.01  Q         .         .         .         .
  1.88      0.0012      0.01  Q         .         .         .         .
  2.01      0.0013      0.01  Q         .         .         .         .
  2.14      0.0014      0.01  Q         .         .         .         .
  2.27      0.0016      0.01  Q         .         .         .         .
  2.40      0.0017      0.01  Q         .         .         .         .
  2.54      0.0019      0.01  Q         .         .         .         .
  2.67      0.0020      0.01  Q         .         .         .         .
  2.80      0.0022      0.01  Q         .         .         .         .
  2.93      0.0024      0.02  Q         .         .         .         .
  3.06      0.0025      0.02  Q         .         .         .         .
  3.20      0.0027      0.02  Q         .         .         .         .
  3.33      0.0029      0.02  Q         .         .         .         .
  3.46      0.0031      0.02  Q         .         .         .         .
  3.59      0.0033      0.02  Q         .         .         .         .
  3.72      0.0035      0.02  Q         .         .         .         .
  3.86      0.0037      0.02  Q         .         .         .         .
  3.99      0.0039      0.02  Q         .         .         .         .
  4.12      0.0042      0.02  Q         .         .         .         .
  4.25      0.0044      0.02  Q         .         .         .         .
  4.38      0.0046      0.02  Q         .         .         .         .
  4.52      0.0049      0.02  Q         .         .         .         .
  4.65      0.0052      0.02  Q         .         .         .         .
  4.78      0.0054      0.02  Q         .         .         .         .
  4.91      0.0057      0.03  Q         .         .         .         .
  5.04      0.0060      0.03  Q         .         .         .         .
  5.18      0.0063      0.03  Q         .         .         .         .
```

5.31	0.0066	0.03	Q	.	.	.	.
5.44	0.0069	0.03	Q	.	.	.	.
5.57	0.0072	0.03	Q	.	.	.	.
5.70	0.0075	0.03	Q	.	.	.	.
5.84	0.0079	0.03	Q	.	.	.	.
5.97	0.0082	0.03	Q	.	.	.	.
6.10	0.0086	0.03	Q	.	.	.	.
6.23	0.0089	0.03	Q	.	.	.	.
6.36	0.0093	0.04	Q	.	.	.	.
6.50	0.0097	0.04	Q	.	.	.	.
6.63	0.0101	0.04	Q	.	.	.	.
6.76	0.0105	0.04	Q	.	.	.	.
6.89	0.0109	0.04	Q	.	.	.	.
7.02	0.0113	0.04	Q	.	.	.	.
7.16	0.0118	0.04	Q	.	.	.	.
7.29	0.0122	0.04	Q	.	.	.	.
7.42	0.0127	0.04	Q	.	.	.	.
7.55	0.0132	0.04	Q	.	.	.	.
7.68	0.0137	0.05	Q	.	.	.	.
7.82	0.0142	0.05	Q	.	.	.	.
7.95	0.0147	0.05	Q	.	.	.	.
8.08	0.0152	0.05	Q	.	.	.	.
8.21	0.0158	0.05	Q	.	.	.	.
8.34	0.0163	0.05	Q	.	.	.	.
8.48	0.0169	0.05	Q	.	.	.	.
8.61	0.0175	0.05	Q	.	.	.	.
8.74	0.0181	0.06	Q	.	.	.	.
8.87	0.0187	0.06	Q	.	.	.	.
9.00	0.0194	0.06	Q	.	.	.	.
9.14	0.0200	0.06	Q	.	.	.	.
9.27	0.0207	0.06	Q	.	.	.	.
9.40	0.0214	0.06	Q	.	.	.	.
9.53	0.0221	0.07	Q	.	.	.	.
9.66	0.0228	0.07	Q	.	.	.	.
9.80	0.0236	0.07	Q	.	.	.	.
9.93	0.0243	0.07	Q	.	.	.	.
10.06	0.0251	0.07	Q	.	.	.	.
10.19	0.0260	0.08	Q	.	.	.	.
10.32	0.0268	0.08	Q	.	.	.	.
10.46	0.0277	0.08	Q	.	.	.	.
10.59	0.0286	0.08	Q	.	.	.	.
10.72	0.0295	0.08	Q	.	.	.	.
10.85	0.0304	0.09	Q	.	.	.	.
10.98	0.0314	0.09	Q	.	.	.	.
11.12	0.0324	0.09	Q	.	.	.	.
11.25	0.0334	0.10	Q	.	.	.	.
11.38	0.0345	0.10	Q	.	.	.	.
11.51	0.0356	0.10	Q	.	.	.	.
11.64	0.0367	0.11	Q	.	.	.	.
11.78	0.0379	0.11	Q	.	.	.	.
11.91	0.0391	0.11	Q	.	.	.	.
12.04	0.0403	0.12	Q	.	.	.	.
12.17	0.0418	0.16	Q	.	.	.	.
12.30	0.0436	0.17	Q	.	.	.	.
12.44	0.0455	0.17	Q	.	.	.	.
12.57	0.0474	0.18	Q	.	.	.	.
12.70	0.0493	0.18	Q	.	.	.	.
12.83	0.0513	0.19	Q	.	.	.	.
12.96	0.0534	0.19	Q	.	.	.	.
13.10	0.0556	0.20	Q	.	.	.	.
13.23	0.0578	0.21	Q	.	.	.	.
13.36	0.0601	0.21	Q	.	.	.	.
13.49	0.0625	0.22	Q	.	.	.	.
13.62	0.0649	0.23	Q	.	.	.	.
13.76	0.0675	0.24	Q	.	.	.	.
13.89	0.0702	0.25	Q	.	.	.	.
14.02	0.0730	0.26	.Q	.	.	.	.
14.15	0.0759	0.28	.Q	.	.	.	.
14.28	0.0791	0.30	.Q	.	.	.	.
14.42	0.0825	0.31	.Q	.	.	.	.
14.55	0.0860	0.34	.Q	.	.	.	.
14.68	0.0897	0.35	.Q	.	.	.	.
14.81	0.0937	0.38	.Q	.	.	.	.
14.94	0.0979	0.40	.Q	.	.	.	.
15.08	0.1025	0.44	.Q	.	.	.	.
15.21	0.1074	0.46	.Q	.	.	.	.
15.34	0.1128	0.53	. Q	.	.	.	.
15.47	0.1185	0.52	. Q	.	.	.	.
15.60	0.1245	0.59	. Q	.	.	.	.
15.74	0.1314	0.68	. Q	.	.	.	.
15.87	0.1407	1.02	. Q	.	.	.	.
16.00	0.1539	1.41	. Q	.	.	.	.
16.13	0.1856	4.39	.	.	Q	.	.
16.26	0.2140	0.81	. Q	.	.	.	.
16.40	0.2213	0.53	. Q	.	.	.	.
16.53	0.2269	0.49	.Q	.	.	.	.
16.66	0.2318	0.42	.Q	.	.	.	.
16.79	0.2361	0.36	.Q	.	.	.	.

16.92	0.2398	0.32	.Q	.	.	.	.
17.06	0.2432	0.29	.Q	.	.	.	.
17.19	0.2462	0.26	.Q	.	.	.	.
17.32	0.2489	0.24	Q	.	.	.	.
17.45	0.2513	0.22	Q	.	.	.	.
17.58	0.2536	0.20	Q	.	.	.	.
17.72	0.2558	0.19	Q	.	.	.	.
17.85	0.2578	0.18	Q	.	.	.	.
17.98	0.2597	0.17	Q	.	.	.	.
18.11	0.2614	0.14	Q	.	.	.	.
18.24	0.2627	0.11	Q	.	.	.	.
18.38	0.2639	0.10	Q	.	.	.	.
18.51	0.2650	0.10	Q	.	.	.	.
18.64	0.2660	0.09	Q	.	.	.	.
18.77	0.2670	0.09	Q	.	.	.	.
18.90	0.2679	0.08	Q	.	.	.	.
19.04	0.2688	0.08	Q	.	.	.	.
19.17	0.2696	0.07	Q	.	.	.	.
19.30	0.2703	0.07	Q	.	.	.	.
19.43	0.2711	0.07	Q	.	.	.	.
19.56	0.2718	0.06	Q	.	.	.	.
19.70	0.2724	0.06	Q	.	.	.	.
19.83	0.2730	0.06	Q	.	.	.	.
19.96	0.2736	0.05	Q	.	.	.	.
20.09	0.2742	0.05	Q	.	.	.	.
20.22	0.2747	0.05	Q	.	.	.	.
20.36	0.2752	0.04	Q	.	.	.	.
20.49	0.2757	0.04	Q	.	.	.	.
20.62	0.2762	0.04	Q	.	.	.	.
20.75	0.2766	0.04	Q	.	.	.	.
20.88	0.2770	0.04	Q	.	.	.	.
21.02	0.2774	0.03	Q	.	.	.	.
21.15	0.2778	0.03	Q	.	.	.	.
21.28	0.2781	0.03	Q	.	.	.	.
21.41	0.2784	0.03	Q	.	.	.	.
21.54	0.2787	0.03	Q	.	.	.	.
21.68	0.2790	0.03	Q	.	.	.	.
21.81	0.2793	0.02	Q	.	.	.	.
21.94	0.2796	0.02	Q	.	.	.	.
22.07	0.2798	0.02	Q	.	.	.	.
22.20	0.2800	0.02	Q	.	.	.	.
22.34	0.2802	0.02	Q	.	.	.	.
22.47	0.2804	0.02	Q	.	.	.	.
22.60	0.2806	0.02	Q	.	.	.	.
22.73	0.2808	0.02	Q	.	.	.	.
22.86	0.2810	0.01	Q	.	.	.	.
23.00	0.2811	0.01	Q	.	.	.	.
23.13	0.2813	0.01	Q	.	.	.	.
23.26	0.2814	0.01	Q	.	.	.	.
23.39	0.2815	0.01	Q	.	.	.	.
23.52	0.2816	0.01	Q	.	.	.	.
23.66	0.2817	0.01	Q	.	.	.	.
23.79	0.2818	0.01	Q	.	.	.	.
23.92	0.2819	0.01	Q	.	.	.	.
24.05	0.2819	0.01	Q	.	.	.	.
24.18	0.2819	0.00	Q	.	.	.	.

TIME DURATION(minutes) OF PERCENTILES OF ESTIMATED PEAK FLOW RATE:
(Note: 100% of Peak Flow Rate estimate assumed to have
an instantaneous time duration)

Percentile of Estimated Peak Flow Rate	Duration (minutes)
0%	1441.4
10%	87.1
20%	23.8
30%	15.8
40%	7.9
50%	7.9
60%	7.9
70%	7.9
80%	7.9
90%	7.9