PRELIMINARY HYDROLOGY STUDY

FOR

T.T.M. 36567

CITY OF LAKE ELSINORE
STATE OF CALIFORNIA

PREPARED FOR:

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TABLE OF CONTENTS

Report

Results and Summary

Hydrology Maps

Exhibits

Appendix - Computation Output Files

Report

- General Project -

Tentative Tract Map (TTM) 36567, also known as "South Shore II," is a proposed development located in the City of Lake Elsinore, Riverside County, California (see Figure 1). The proposed project is a 68 acre subdivision for single family residents. The development includes about 144 single family lots, an onsite drainage basin, and a public park. The project takes its primary and secondary access from the adjacent development to the west, Tract 35337.

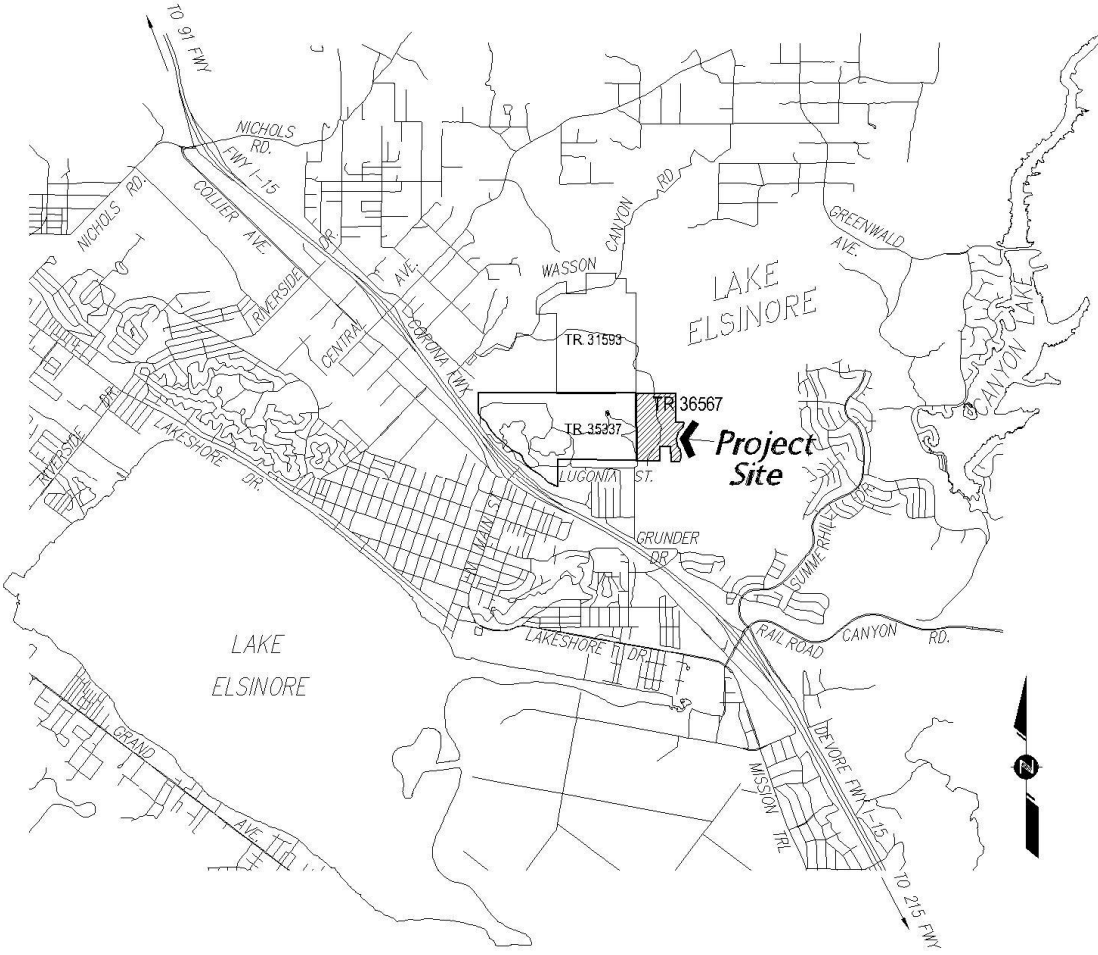


Figure 1: Vicinity Map
No Scale

- Design Criteria -

Natural drainage courses traversing the site must be conveyed through the site, or should be collected and conveyed in such a manner that is approved by the City Engineer. The drainage system shall be designed to ensure that runoff from the developed condition is equal to or less than the runoff under the existing conditions of the same storm frequency.

Onsite peak flow rates for the 10-year storm event are to be managed at or below the curb line; peak flow rates for the 100-year storm event are to be managed within the right-of-way (R/W) limits. If these limits are exceeded, underground storm drain facilities must be provided to lower the water surface levels in the roadway to or below the maximum indicated levels.

Water quality treatment and conveyance is to be provided in accordance with NPDES requirements to be implemented per the Regional Water Quality Control Board standards and guidelines for the Santa Ana Watershed. The required water quality treatment volumes and basin capacities are determined per the City’s adopted Water Quality Management Plan (WQMP) handbook. Reference the project specific Preliminary WQMP for design worksheets and detailed information. The water quality basin must provide an outlet designed to retain a minimum of half of the water quality design volume for a minimum of 24 hours and the remaining water quality design volume for a minimum of 48 hours, but no longer than 72 hours.

Furthermore, the project must be evaluated in order to determine whether or not a hydraulic condition of concern (HCOC) exists. In accordance with the most recently adopted WQMP for the Santa Ana Watershed, this project falls within the applicable zone for HCOC determination. The Preliminary WQMP provides the evaluation of the runoff from the 24-hour duration of the 2-Year Storm Frequency for pre-condition versus post-condition runoff parameters.

Overall, the project site must be designed to safely convey the 100-Year storm event through the site should failure of the underground storm drain system occur. Any further criteria for this report is provided by and based on the RCFCWCD hydrology manual.

- Scope of Report -

The purpose of this study is to calculate the storm water runoff associated with the proposed development as necessary to satisfy the City’s conditions and requirements for the drainage study. Results from this study will be used to (1) provide the design flow rates that the storm drain system is designed to manage, and (2) analyze the increase runoff due to development and determine whether or not storm mitigation will be necessary. This study considers the conveyance of all the local onsite and tributary offsite drainage flows for the built out condition.

- Methodology -

Rational method hydrology is implemented to calculate the 100-year and 10-year storm frequency peak flow rates. Drainage areas are determined and defined using ridgeline boundaries and “link-node” streams. The rational calculations are performed by Rational Method Riverside County (“RRIV”) provided in the Civil Design Software suite that is recommended generally accepted by RCFCWCD and throughout the County of Riverside. Rainfall, loss rates, and other such data that is pertinent to the rational method calculations are determined by “RRIV” and summarized within the output files provided herein. By combining the “link-node” rational method in the “RRIV” program with street depth and catch basin capture calculations, the storm drain pipes and catch basin sizes are determined. These values dictate the placement and sizing of the underground drainage facilities based upon the street capacity. This method makes use of “RRIV” for primarily three values: peak flow rates, time of concentration, and accumulated drainage area.

Synthetic unit hydrograph modeling is used in accordance with City and RCFCWCD requirements and guidelines to study the appropriate storm return frequencies and durations to be mitigated. Mitigation for the necessary conditions will be achieved through the detention basin and the use of a control outlet valve structure. The software employed to compute the unit hydrographs and basin routing calculations are contained within the Civil Design Software suite and recommended by RCFCWCD. Rainfall, loss rates, AMC requirements, and other such data that is pertinent to the development of the unit hydrographs are based upon Increased Runoff Criteria typically required by RCFCWCD.

- Pre-Developed Condition -

By in large, the soil type for the majority of this site has a high runoff potential, as designated by the U.S. Soils Conservation Service (SCS) as Soil Groups C and D. These areas are characterized as having a low capacity to transmit water, thereby resulting in a slow to very slow rate of infiltration, and a relatively high volume of runoff. The appropriate ratio of each soil group is used in the existing condition model of this study. Another factor that adds to the high potential for storm runoff due to the existing soil type is that the site also has poor ground cover. For purposes of these study computations, poor soil cover is basically defined by SCS as a watershed having less than fifty-percent of its ground surface covered by tree canopy and brush.

Another factor that will generate a high rate of runoff in the existing condition is the significant relief across the site. Generally, the lay of the land flows in a southerly direction towards Lake Elsinore, which sits about one and one-half miles downstream of the subject tract. The highest elevation within the site is approximately 1820 feet MSL and the lowest elevation is approximately 1500 feet MSL. The existing terrain is mountainous with significant hill and valley formations. Storm runoff from

the site takes several different local paths from the project site prior to reaching the Lake, the ultimate discharge point. Well defined ridgeline formations divide the site into distinct drainage areas that create flow paths primarily in a southerly direction. There are three significant natural flowlines that outlet across the south boundary of the project. Other minor natural flowlines outlet across the north boundary of the project and remain largely unaffected by the development.

- Post-Developed Condition –

The South Shore II development proposes to support approximately 150 single family residential lots, a public park, and an onsite drainage basin that serves as the water quality basin. The drainage concept basically consists of two systems. The first system is the development area. The second system is the undeveloped natural area. The site and drainage facilities are designed to keep the two systems independent of one another. At no point within the project does the runoff from the natural area mix with the runoff from the developed area.

The first system mainly consists of a mainline storm drain located in the backbone street that is designed to convey runoff from the development directly to the basin. The basin is designed to be in compliance with the County's Design Handbook for Low Impact Development Best Management Practices. The basin is an in-line, extended detention basin. The primary basin area plus the forebay area have an overall volume capacity of about 40,000 cubic feet. The basin is designed to treat about 44 acres of development. All tributary storm flows from the storm drain system will be discharged into the basin. The basin is designed to treat the first flush flows for water quality through the use of a discharge control device. The outlet pipe will discharge the mitigated flows back into the corresponding existing flowline. An emergency overspill structure is provided for the basin in case of an outlet structure failure.

The second system mainly consists of a drainage channel located adjacent to the back of the most easterly lots. This storm drain line is designed to intercept and convey the natural runoff that is tributary to the development. The flows from the natural area do not mix with the flows from the developed area and ultimately discharge back into the corresponding existing flowline at the south boundary.

Results and Summary

This study divides and models the site into seven existing condition drainage areas and eight developed condition drainage areas. The existing areas are designated as Areas 1 through 7, and the developed areas are

designated as Areas "A" through "G," as depicted on the Existing Condition and Developed Condition Hydrology Maps, respectively.

Rational method analysis was performed on the existing and developed conditions. The node model data flow sheets for each analysis are provided for reference in the Exhibits section of this report. The results from the rational method analysis are used to compare the existing condition versus the developed condition flow rates at the outlet points.

Table 1 is provided to summarize the results of the rational method study. The table presents the peak 100-Year flow rate values for purposes of comparison where appropriate.

Table 1: Rational Method Summary (100-Year Storm)

Developed Condition Area	Equiv. Existing Condition Area	Developed Q(100yr)	Existing Q(100yr)	Developed Total Area (Ac)	Existing Total Area (ac)
A	1	123	167	63.8	66.3
B		44			
C	2	4	10	0.9	2.7
D	3	1.7	1.2	1.2	1.7
E	4	3	5	0.6	1.0
F	5	7	7	1.8	1.9
G	6	16	15	4.4	5.0
H	7	14	13	3.6	4.3
			Totals	76.3	82.9

It may be observed that there is a difference between the total developed condition drainage area and the total existing condition drainage area (i.e. 76.3 vs. 82.9 acres). The "onsite" drainage area tributary to the outlet points in the developed condition is less than the drainage area tributary to the outlets in the existing condition. The reduction in the overall drainage area is caused by the development of the adjacent tract to the west, namely Tract 35337, also called "Spyglass Ranch."

According to the rational results, when compared to the existing condition flow rates, the developed condition flow rates at each respective outlet point are either (1) equal to or less than the existing condition, or (2) do not exceed the existing condition by more than one cubic-feet-per-second (cfs). The rational results indicate that there is no need for storm mitigation at any of the project's outlet points.

Areas "A" and "B"

Area "A" and Area "B" are the largest drainage areas in the post-developed condition that make up the majority of the project. Areas "A" and "B" occur within comparable drainage Area 1 of the pre-developed, or existing condition. One may observe that Areas "A" and "B" combined are smaller than Area 1. This is due to the proposed grading for the adjacent Spyglass Ranch development that retains the otherwise offsite drainage area

tributary to the subject tract. Area “A” is designed to drain to the onsite extended drainage basin. Area “B” is designed to remain independent of Area “A” and will discharge directly to its corresponding existing flowline.

Areas “C”, “D”, “E”, and “F”

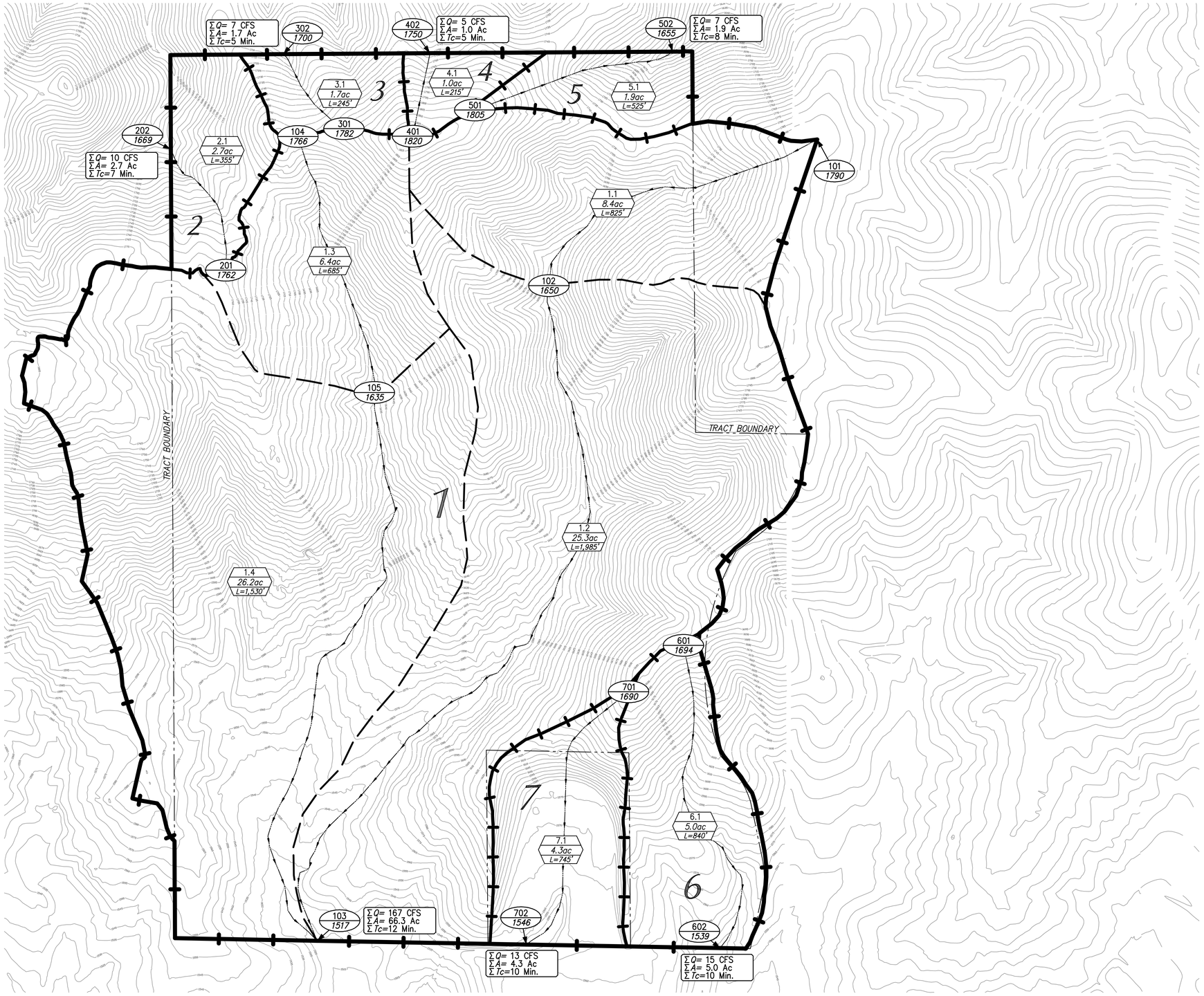
Areas “C”, “D”, “E”, and “F” are minor drainage areas in the post-developed condition that occur along the north project boundary. The comparable drainage areas in the pre-developed, or existing condition based upon the drainage outlets are Area 2, 3, 4, and 5, respectively. The flowlines of these areas originate onsite and flow northerly across and out of the project’s boundary. The post-developed runoff from these areas does not require mitigation as there is no increase in the developed condition flow rates.

Areas “G” and “H”

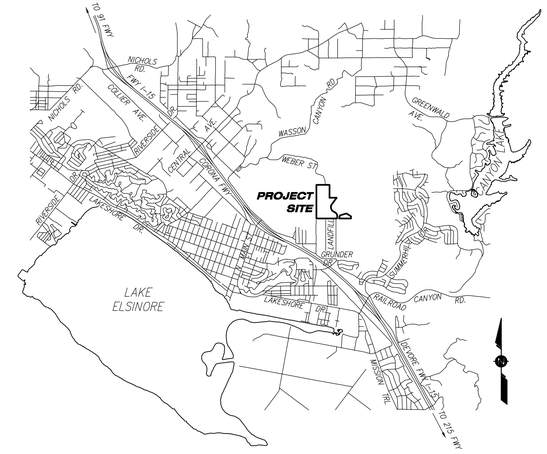
Area “G” and “H” are drainage areas in the post-developed condition that are located in southeasterly vicinity of the site. The comparable drainage areas in the pre-developed, or existing condition are Areas 6 and 7, respectively. This area is basically comprised of the proposed park site and supporting manufactured slopes. The rational analysis indicates that the developed condition peak flow rate of these Areas do not exceed the pre-developed condition by more than 1 cfs. Furthermore, the drainage areas are within one acre of the natural existing condition, therefore no storm mitigation is necessary for these areas.

- Conclusion -

The projected flows that will be discharged to the existing properties and facilities downstream of the proposed development are permissible within the criteria and specifications indicated in this study. The tributary offsite flows from the adjacent tract to the west are reduced in the developed condition and thereby reducing the overall onsite drainage area tributary to the outlet points. Overall, historic flows are matched or reduced at the outlet points without the need for onsite storm mitigation. The first flush runoff will be conveyed to an onsite extended detention basin for water quality treatment. Overall, the entire site is designed to safely convey and manage the runoff from the 100-year storm event.



COUNTY OF RIVERSIDE, CITY OF LAKE ELSINORE



VICINITY MAP

THOMAS GUIDE – RIVERSIDE COUNTY (2007) PAGE 866, GRID F-2
N.T.S.

LEGEND

00.0 / 100 ac / L=1000'	AREA DESCRIPTION AREA (ACRES) REACH/STREAM LENGTH (ft.)
ΣQ= 100.00 CFS ΣA= 100.00 Ac ΣTc=00.00 Min.	SUMMATION SUMMARY
1000 / 1800	NODE NUMBER NODE ELEVATION
	STUDY AREA BOUNDARY
	WATERSHED BOUNDARY
	SUB-AREA BOUNDARY
	SURFACE FLOW PATH

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CITY OF LAKE ELSINORE
TRACT 32013 HYDROLOGY STUDY

EXISTING CONDITION HYDROLOGY MAP

DATE PREPARED: APRIL 2013

SHEET 1 OF 1

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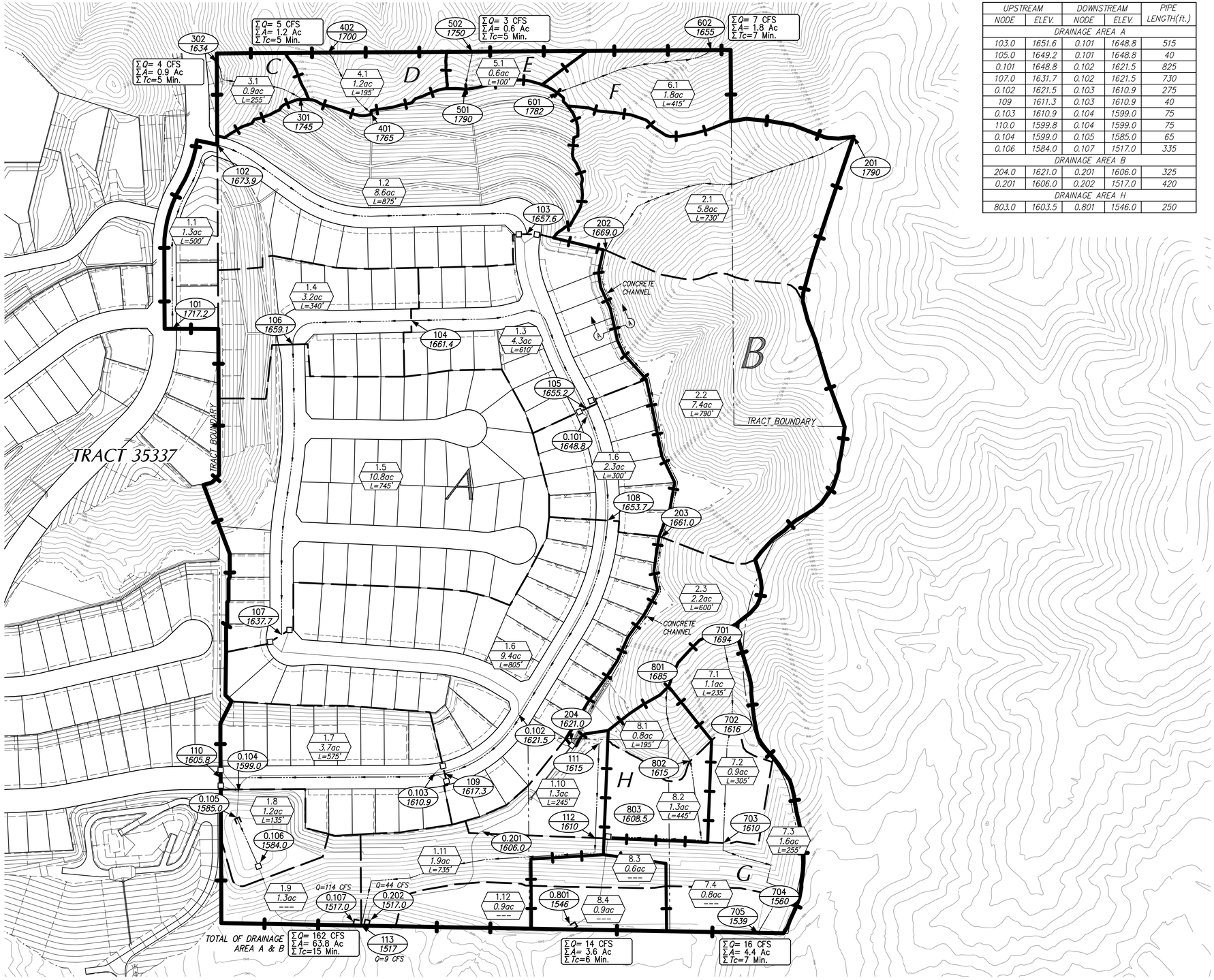
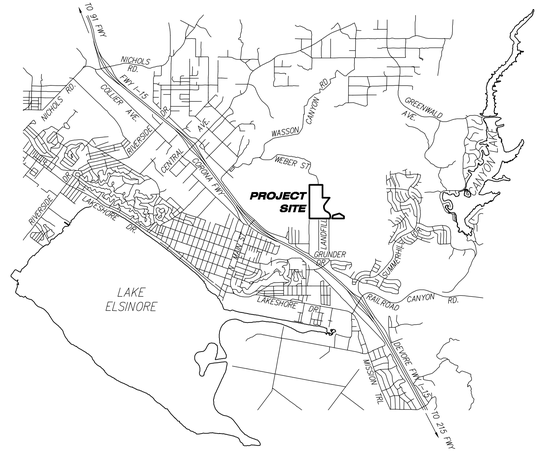


UPSTREAM		DOWNSTREAM		PIPE
NODE	ELEV.	NODE	ELEV.	LENGTH(ft.)
DRAINAGE AREA A				
103.0	1651.6	0.101	1648.8	515
105.0	1649.2	0.101	1648.8	40
0.101	1648.8	0.102	1621.5	825
107.0	1631.7	0.102	1621.5	730
0.102	1621.5	0.103	1610.9	275
109	1611.3	0.103	1610.9	40
0.103	1610.9	0.104	1599.0	75
110.0	1599.8	0.104	1599.0	75
0.104	1599.0	0.105	1585.0	65
0.106	1584.0	0.107	1517.0	335
DRAINAGE AREA B				
204.0	1621.0	0.201	1606.0	325
0.201	1606.0	0.202	1517.0	420
DRAINAGE AREA H				
803.0	1603.5	0.801	1546.0	250

COUNTY OF RIVERSIDE, CITY OF LAKE ELSINORE

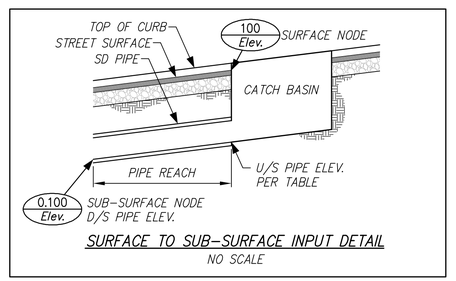


VICINITY MAP

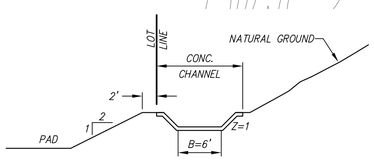
THOMAS GUIDE – RIVERSIDE COUNTY (2007) PAGE 866, GRID F-2
N.T.S.

LEGEND

- 00.0 / 100 ac / L=1000' — AREA DESCRIPTION / AREA (ACRES) / REACH/STREAM LENGTH (ft.)
- Σ Q= 100.00 CFS, Σ A= 100.00 Ac, Σ Tc=00.00 Min. — SUMMATION SUMMARY
- 1000 / 1800 — NODE NUMBER / NODE ELEVATION
- STUDY AREA BOUNDARY
- WATERSHED BOUNDARY
- SUB-AREA BOUNDARY
- SURFACE FLOW PATH
- STORM DRAIN INLET
- STORM DRAIN PIPE/CULVERT
- STORM DRAIN OUTLET



SURFACE TO SUB-SURFACE INPUT DETAIL
NO SCALE



SECTION A-A
NO SCALE

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CITY OF LAKE ELSINORE
TRACT 32013 HYDROLOGY STUDY

100 YEAR DEVELOPED CONDITION HYDROLOGY MAP

DATE PREPARED: APRIL 2013

SHEET 1 OF 1

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