Preliminary Drainage Study
For
Harmony Grove Village Center
PDS2024-STP-24-007

RICK Job No.17164-D

February 23, 2024
Revised: March 20, 2025
Revised: July 31, 2025

RICK

PRELIMINARY DRAINAGE STUDY
FOR
HARMONY GROVE VILLAGE CENTER

PDS2024-STP-24-007

Job Number 17164-D

_____

Brendan Hastie
R.C.E #65809, Exp. 9/25

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February 23, 2024
Revised March 20, 2025
Revised July 31, 2025

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HARMONY GROVE VILLAGE CENTER

3rd Submittal Revision Page

July 31, 2025

Site plan revision required to update the driveway alignment in the 2nd Submittal. Comments were not issued for the report dated March 20, 2025. See 2nd Submittal Revision Page response to comments.

HARMONY GROVE VILLAGE CENTER

2nd Submittal Revision Page

March 20, 2025

Pursuant to the review comments completed on July 25, 2024, regarding the subject reports dated February 23, 2024, the following comments were addressed. Below is a list of the comments, followed by Rick Engineering Company's response:

REVIEW COMMENTS

Comment 5-3. Provide DECLARATION OF RESPONSIBLE CHARGE – See San Diego County Hydrology Manual, Figure 1-9. DRC needs to be signed and stamped by the engineer or record. Please have the final submitted DRC singed by the engineer of record.

> ***Response: A declaration of responsible charge has been provided. Will be signed and stamped when all other comments have been resolved.***

Comment 5-4. The final CEQA Drainage report shall be signed, stamped and dated by the responsible Registered Civil Engineer.

> ***Response: Reports will be signed and stamped when all other comments have been addressed on the final submittal.***

Comment 5-5. In the narrative of the report please provide a summary table of: pre- and post-development C, Tc, I, A,V100, Q100 without mitigation and Q100 with mitigation for each area (or point) where drainage discharges from the project. Peak runoff rates (cfs), velocities (fps) and identification of all erosive velocities (at all points of discharge) calculations for pre-development and post-development. The comparisons should be made about the same discharge points for each drainage basin affecting the site and adjacent properties. Per Section 1.3 Drainage Law of the Hydraulic Design Manual, 2014: upstream landowners may not increase the volume or velocity (including diversion) of surface flows to the detriment of downstream landowners consistent with "good neighbor" policies.

1st Review: Project is increasing peak flows to downstream storm drain system. Please provide mitigation/detention calculations, or provide documentation confirming the downstream system has capacity for the increase in flow. Please note if the project is proposing an increase in flow, the project will be subject to DPW Flood Control review and additional comments may be applicable at next review.

Response: A summary table has been provided comparing the originally assumed post-project conditions for which the backbone drainage system was constructed to support and the revised proposed condition for the site based on this project. A small increase is identified and considered negligible based on the size and capacity of the downstream system. The referenced study has been provided as a standalone document. Refer to the criteria outlined in Section 6.2.1 of the County Hydraulic Design Manual.

Comment 5-6. From the analysis of this drainage study, it appears that the pre-development comparison is based on a previous 2012 drainage study for Harmony Grove Village Phase 1 (referenced as the "Post-Project Assumed"). If this is approach is preferred, the submittal should include the complete previous drainage study and additional time and resources will need to review applicable assumptions and conclusions that may impact the current analysis. A recommended simplified approach would be to analyze the pre-development condition in it's current state as undeveloped vs developed (same project boundary/basin area).

- Note: This approach would be acceptable at the discretionary/feasibility level, however, Final Engineering level review may require additional analysis or different approach. Please verify with your Final Engineering reviewer.
- The drainage study proposes an increase in runoff which is not consistent with the HDM Section 1.3 and the County's "good neighbor" policy. Verify and revise to mitigate excess runoff flows to show no increase.

Response: This project is part of the overall Harmony Grove project. The Phase 1 project included this site and the final engineering drainage study was reviewed and approved by the County. Relevant excerpts are included in this Preliminary Drainage Study for ease of reference. The larger report has been included as a standalone document. All relevant sections have been highlighted for ease of review.

Comment 5-7. The project appears to increase the 100yr runoff rate from the project areas by approx. 1.94 cfs. Per the narrative, the project is ultimately discharging to an existing outfall into the Escondido Creek, outside of the project's property boundary.
Please obtain drainage waiver and release letters from all affected property owners or submit a detention routing analysis to mitigate the increase in the 100-year event flow rate to pre-project level or lower.

Further documentation must be provided to:

- Confirm the downstream storm drain system has capacity for the increase in flow (all basin areas flowing through storm drain to be considered, including off-site runoff)
- Confirm the volume or velocity of surface flows will not be increased to the detriment of adjacent and downstream landowners.

Response: As shown in the submitted Preliminary Drainage Study, the increase is negligible when compared to the overall watershed size within the larger Harmony Grove project area. The request for a "waiver" requirement does not seem applicable to this scenario.

Comment 5-8. Summary/Conclusion: Please discuss whether or not the proposed project would substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner which would result in substantial erosion or siltation on- or off-site?

Response: This comment is identified as "resolved", therefore, no response is required.

Comment 5-9. Discuss whether or not the proposed project would substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner which would result in flooding on- or off-site? Provide reasons and mitigations proposed.

Response: This comment is identified as "resolved", therefore, no response is required.

Comment 5-10. Discuss whether or not the proposed project would create or contribute runoff water which would exceed the capacity of existing or planned storm water drainage systems? Provide reasons and mitigations proposed.

Response: Discussion has been added to Section 5.0 of the report for clarity.

Comment 5-11. Discuss whether or not the proposed project would place housing within a 100-year flood hazard area as mapped on a federal Flood Hazard Boundary or Flood Insurance Rate Map or other flood hazard delineation map, including County Floodplain Maps? Provide reasons and mitigations proposed.

Response: This part of the Harmony Grove project is not in a Flood Hazard area. A FIRM has been provided in Appendix A of the report. Discussion has been added to Section 5.0 of the report for clarity.

Comment 5-12. Discuss whether or not the proposed project would place structures within a 100-year flood hazard area which would impede or redirect flood flows?

Response: This part of the Harmony Grove project is not in a Flood Hazard area. A FIRM has been provided in Appendix A of the report. Discussion has been added to Section 5.0 of the report for clarity.

Comment 5-13. Provide existing and proposed Hydrology Maps for each phase. The maps shall show existing and proposed culverts, discharge point with A & Q, flow path direction for each drainage basin. Show lines of inundation of the 100-year flood for a drainage basins over 25 acres. A minimum map size is 11"x17".

-Please provide an existing condition map

-Provide all proposed drainage improvements in the proposed condition map

Response: The existing condition drainage map has been provided from the previously approved Drainage Study (FULL DESIGN ONSITE DRAINAGE STUDY FOR HARMONY GROVE VILLAGE dated September 20, 2012).

Comment 5-14. Provide Hydrologic Soil Group Map.

Response: Comment appears to be previously resolved. HSG Map has been provided in Appendix A.

Comment 5-15. Provide Rainfall Isopluvials for 100 Year Rainfall Event - 6 Hours and 24 Hours Maps.

Response: Comment appears to be previously resolved. Isopluvials have been provided in Appendix A.

Comment 5-16. Provide Intensity-Duration Design Chart-Figure 3-1.

Response: Comment appears to be previously resolved. Intensity-Duration Design Chart has been provided in Appendix A.

Comment 5-17. Provide runoff coefficients for urban areas-Table 3-1.

Response: Comment appears to be previously resolved. Table 3-1 has been provided in Appendix A.

Comment 5-18. Provide Maximum Overland Flow Length and Initial Time of Concentration-Table 3-2

Response: Comment appears to be previously resolved. Table 3-2 has been provided in Appendix A.

Comment 5-19. Provide Rational Formula for Overland Time of Flow Nomograph Figure 3-3

Response: Comment appears to be previously resolved. Figure 3-3 has been provided in Appendix A.

Comment 5-20. Provide Nomograph for Determination of Time of Concentration or Travel Time for Natural Watersheds-Figure 3-4

Response: Comment appears to be previously resolved. Figure 3-4 has been provided in Appendix A.

Comment 5-21. Provide Computation of Effective Slope for Natural Watersheds Figure 3-5

Response: Comment appears to be previously resolved. Figure 3-5 has been provided in Appendix A.

Comment 5-22. Provide Detention storage routing calculations per Section 6.3.2 of the County of San Diego Hydraulic Design Manual (HDM), 2014

-The project may consider proposing to mitigate post-development runoff using detention via proposed biofiltration basins.

Per the County's Conjunctive Use requirements, detention water levels should be shown on BMP details, calling out and noting water levels for flood storage, pollutant control, and hydromodification, as well as freeboard and emergency overflow.

Response: Additional documentation has been provided in Appendix B to show downstream system has capacity.

Comment 5-23. Provide Tables showing Detention Basin Depth (ft) -Storage (ac-ft) -Outlet (Orifice Size (in)).

Response: If detention is incorporated, then these additional values can be provided during final engineering.

Comment 5-24. Provide Inflow Hydrograph per Section 6.3.1.1 of the HDM, Stage-Storage Curve (Section 6.3.1.2), Stage-Discharge Curve (Section 6.3.1.3)

Response: If detention is incorporated, then these additional values can be provided.

Comment 5-24. Provide Detention Facility Plans per Section 6.2.5 of the HDM. Show maximum design inflow and velocity, maximum total design outflow and velocity from the outlet, maximum design storage volume and water surface elevation,

Response: If detention is incorporated, then these additional values can be provided.

Comment 5-25. Provide appropriate details for facility inlet, outlet structures, energy dissipaters, maintenance measures and cross sections.

Response: This level of detail will be provided in Final Engineering.

Comment 5-26. Drainage Study Sections 3 & 4:

- Hydraulic calculations are required at discretionary stage if the project is proposing an increase to the downstream public storm drain system.
- Please provide capacity calculations for the existing pipe the project is tying into
- Provide capacity calculations for the proposed trench drains
- Provide street and inlet capacity calculations for impacted pipes
- Project may be subject to DPW Flood Control for any increase to the public storm drain system.

Response: Based on above responses, additional information has been provided in Appendix B for the downstream drainage system. Inlet sizing, mainline capacity calculation, and street capacity calculations will be provided in Final Engineering. Hydraulic analysis has been provided for the storm drain laterals connecting to the project site. Please refer to Appendix B of this report for provided hydraulic calculations.

DECLARATION OF RESPONSIBLE CHARGE

I hereby declare that I am the Engineer of Work for this Project, that I have exercised responsible charge over the design of the project as defined in Section 6703 of the Business and Professions Code, and that the design is consistent with current standards.

I understand that that check of project drawings and specification by the County of San Diego is confined to a review only and does not relieve me, as engineer of work, of my responsibilities for project design.

Brendan Hastie, R.C.E #65809, Exp. 9/25 Date

1.0 INTRODUCTION

This drainage report supports the preliminary design of the Harmony Grove Village Center project (herein referred to as "the project"). The project site is located within the County of San Diego, north of Escondido Creek and west of Country Club Drive. The vicinity map is shown in Figure 1, located at the end of this section.

This preliminary drainage study supports the plot plan development of lots 74 and 75. The project proposes to add 27 residential units with parking and walkways to the previously graded lots. The overall project site is approximately 2.7 acres. The proposed drainage improvements consist of the construction of several local inlets, area drains, and storm drain systems of 18-inch diameter or less connecting to downstream systems constructed by the approved Grading Plans for Harmony Grove Village Phase 1 (L-15656). The following approved report addresses the overall hydrologic and hydraulic analyses applicable to the backbone storm drain infrastructure conveying runoff form the project area:

- "Final Design Onsite Drainage Study for Harmony Grove Village (Phase 1, VTM 5365)", dated September 20, 2012, and prepared by Rick Engineering Company; hereafter referred to as "Phase 1 Drainage Study".

1.1 Existing Drainage Characteristics

The Project in its existing condition is separated into two lots on the north and south side of County Living Way. Both lots were previously graded but left undeveloped. The Phase 1 Drainage Study shows the north portion of Lot 74 draining north to basin 4000B and the south portion of Lot 74 drains to basin 5000B. Lot 75 drains to basin 4000B.. Lot 75 was graded to drain towards a sediment basin in the southeast corner of the lot. The sediment basin drains into the inlet at the northern corner of Country Living Way and Country Club Drive which connects into the 54-inch reinforced concrete pipe (RCP) along Country Living Way. The 54-inch RCP flows west along Country Living Way before turning south at Trail Blazer Lane and turning again to flow west along Starry Night Drive until it connects into the southbound 8-foot by 12-foot double box culvert. The double box culvert outfalls into an open channel that flows into an 8-foot by 10-foot quad box culvert under Harmony Village Drive outfalling into Escondido Creek.

The Phase 1 Drainage Study shows Lot 74 being split into two drainage basins with a ridgeline splitting the north and south portions of the lot at the end of the existing alley. The sediment basin in the northern drainage basin could not be constructed due to the location of the historic Johnston Ward House so the entire lot was graded towards the sediment basin in the southwest corner of the lot. The sediment basin drains into an 18-inch RCP flowing west along Alley 25 before turning south along Trail Blazer Lane where it increases a 30-inch RCP. The 30-inch RCP turns west to flow along California Polly Street and increases to a 36-inch RCP before eventually outfalling into the 8-foot by 10-foot quad box culvert under Harmony Village Drive.

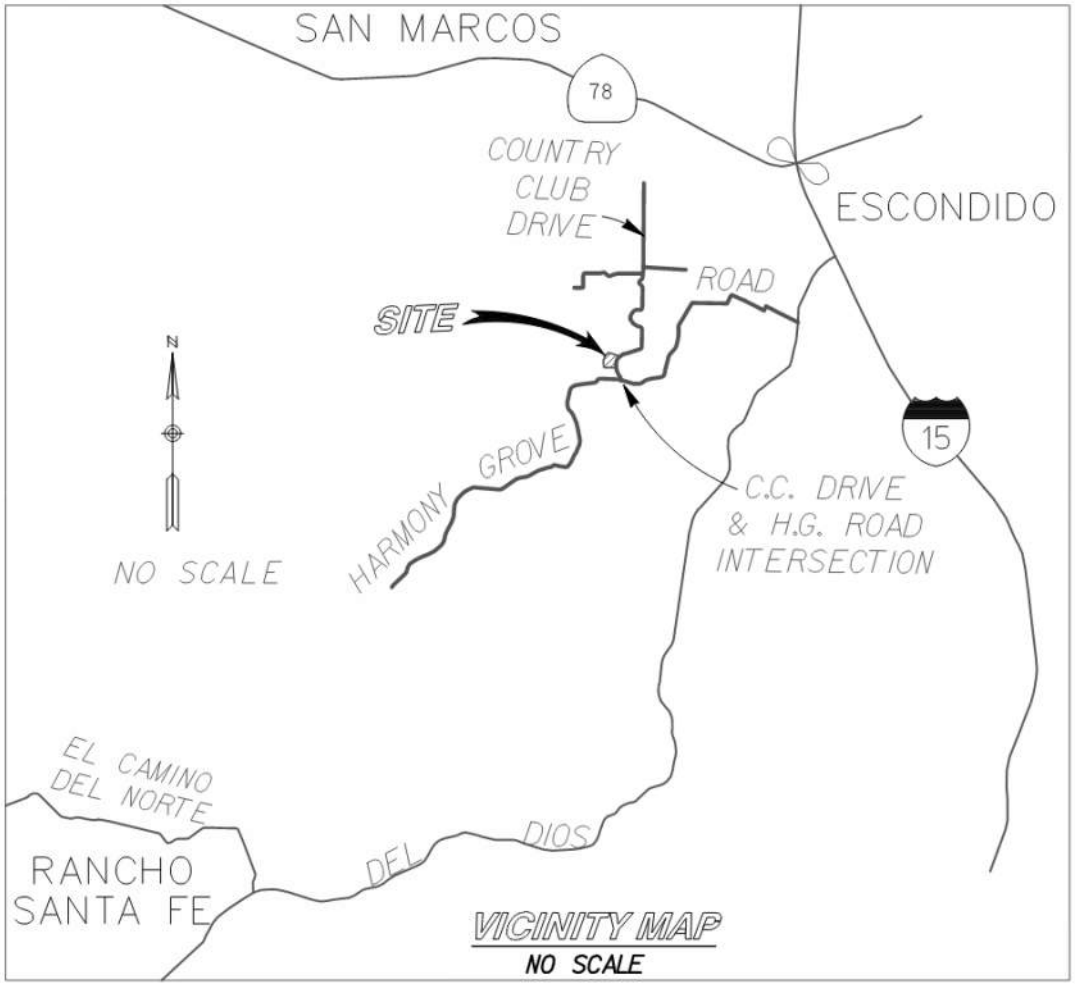
1.2 Proposed Drainage Characteristics

The proposed condition will restore the Lot 74 drainage to the original condition outlined in the Phase 1 Drainage Study. Lot 74 includes Basins 3, 4, and 5. Basin 3, comprised of the existing historical building and proposed parking lot will drain northeast to the proposed biofiltration basin north of the parking lot. The biofiltration basin will drain west, outletting into the existing inlet on Trail Blazer Lane which flows into the existing 54-inch RCP. Basin 4 flows east toward the biofiltration basin in the northeast corner of Lot 74. The biofiltration basin will drain south and connect into the biofiltration basin for Basin 5. Basin 5 follows existing grading to flow toward the biofiltration basin in the southeast corner of Lot 74. The biofiltration basin drains west to connect into the existing 18-inch low flow pipe collecting flows from the sediment basin. Lot 75 will be split into two drainage areas that ultimately drain to the same pre-project location. Basin 1, the western drainage area, will drain south towards a biofiltration basin draining into a proposed new connection to the existing 54-inch RCP running West along County Living Way. The eastern portion of Lot 74 (Basin 2) will follow existing drainage patterns to flow southeast towards a biofiltration basin and outletting into the existing inlet on the northern corner of Country Living Waya and County Club Drive. The inlet drains into the existing 54-inch RCP on County Living Way. All runoff from Lots 74 and 75 will eventually be collected in the existing 8-foot by 10-foot quad box culvert under Harmony Village Drive and outfall into Escondido Creek.

Refer to Section 2.3 and the Proposed Condition Drainage Study Map within Map Pocket 2 for more information regarding hydrology.

Existing storm drains have capacity for the 100-year peak flows draining from the site so no detention is proposed. Therefore, it is not anticipated that there will be adverse impacts on existing or planned storm water drainage systems because of the project. The proposed project is not expected to alter the existing drainage pattern in a manner which would result in flooding on- or off-site.

Figure 1 Vicinity Map



2.0 HYDROLOGY

2.1 Criteria

The hydrologic conditions were analyzed in accordance with the County of San Diego's design criteria.

Design Storm:	100-year, 6-hour
100-Year 6-Hour Precip. (inches):	P = 3.3 inches

June 2003 San Diego County *Hydrology Manual* Criteria

Soil Type:	C and D (See Appendix A)
Rainfall Intensity:	Intensity-Duration-Frequency (I-D-F) Curves within the June 2003 County of San Diego *Hydrology Manual* (inches per hour)

2.2 Hydrologic Results

The project site consists of 5 major drainage basins. The post-project actual peak flows calculated in this report were compared with the post-project assumed conditions calculated in the "Final Design Onsite Drainage Study for Harmony Grove Village (Phase 1, VTM 5365)" prepared by Rick Engineering Company dated September 20, 2012 to determine if the increased peak flows caused by the proposed impervious area are negligible.

Points of interest (POI) were defined at every biofiltration basin outlet into the existing storm drain. There are five POIs on the project site, each correlating with the sub-basin of the same name. Basin 1 drains toward a biofiltration basin in the southwest corner of Lot 75 which connects into the existing 54-inch RCP and drains to POI 1. Basin 2 flows southeast to a biofiltration basin in the southeast corner of Lot 75 and drains into the inlet on the northern corner of Country Living Way and Country Club Drive. The inlet connects to the existing 54-inch RCP at POI 2. Basin 3 captures the flow in the northwest corner of Lot 74 and drains to a biofiltration basin north of the proposed parking lot. The basin drains to an inlet on the corner of Country Living Way and Trail Blazer Lane and connects into the existing 54-inch RCP at POI 3. Basin 4 collects the flows from the four proposed housing units in the north portion of Lot 74 and drains to a biofiltration basin in the northeast corner of the lot. The biofiltration basin drains

to POI 4 at the inlet on the south corner of Country Living Way and Country Club Drive eventually confluencing with the Basin 2 flows in the 54-inch existing RCP

Basin 5 encompasses the proposed alleys and southern housing units in Lot 74 and is the only basin draining to the existing 18-inch low-flow RCP. The basin flows southeast to a biofiltration basin before connecting into the low flow pipe at POI 5.

The Modified Rational Method analysis was completed for the 100-year storm event for all basins in the post-project actual condition. A summary of the pre- and post-project hydrologic results are provided below in Tables 1 and 2.

Table 1 – Hydrologic Summary Table

POST-PROJECT PER PHASE 1 DRAINAGE STUDY BASIN NODE ID		ULTIMATE CONDITION DRAINAGE BASIN NODE ID	AREA PHASE-1 DRAINAGE STUDY (AC)	AREA ULTIMATE CONDITION (AC)		Q_{100} PER PHASE-1 DRAINAGE STUDY (CFS)	Q_{100} PER ULTIMATE CONDITION (CFS)		Δ PEAK FLOW (CFS)
					TOTAL AREA			TOTAL Q	
4000B	4885	POI 1	1.5	0.4	1.6	2.2	1.6	6.2	4.0
		POI 2		1.2			4.6		
	4940	POI 3	0.6	0.2	0.5	0.9	1.3	2.5	1.6
		POI 4		0.3			1.2		
5000B	5504	POI 5	0.4	0.6	0.6	0.8	2.6	2.6	1.8

Table 2 – Hydrologic Summary Table (Overall Watershed)

DRAINAGE BASIN ID	ULTIMATE TOTAL PEAK FLOW (CFS)	Δ PEAK FLOW (CFS)	% OF TOTAL WATERSHED
Ultimate Outfall	3404	7.4	0.2%

It can be observed that there is a slight increase in the peak discharge rate for the site due to the increase in imperviousness and decrease in time of concentration. However, the increases in flow accounts for a 0.2% of the total runoff outfalling into Escondido Creek and the increase is negligible.

The 100-year modified rational method calculations for post-project assumed and post-project actual conditions are provided in Appendix A, while the associated hydrologic drainage exhibits are located in Map Pockets 1 and 2.

3.0 HYDRAULICS

Hydraulic Methodology and Criteria

The 100-year post-project peak flow rates determined using the Modified Rational Method were used to size the on-site storm drain system. Normal depth calculations were used to size the pipes connecting the biofiltration basins to the existing storm drains. The Advanced Engineering Software (AES) Pipeflow computer program was used to model the hydraulic grade line within the existing storm drains. Pipeflow computes uniform and non-uniform steady flow water surface profiles and pressure gradients in circular pipes. Storm drain geometric information, Manning's roughness coefficient, discharge, as well as any known boundary conditions are required to complete the hydraulic model. Pipeflow can model supercritical, subcritical, or pressure flow as applicable, and accounts for losses that may occur due to friction, junction structures, bends, and other minor losses.

The AES Pipeflow codes and description are as follows:

Code 1: Friction Losses
Code 2: Manhole Losses
Code 3: Pipe-Bend Losses
Code 4: Sudden Pipe Enlargement
Code 5: Junction Losses
Code 6: Angle-Point Losses
Code 7: Sudden Pipe Reduction
Code 8: Catch Basin Entrance Losses
Code 9: Transition Losses

3.1 Pipe Sizing

Proposed Pipe Sizing Results

The proposed storm drain pipe sizes were designed using Manning's equation with a 30% sizing factor. The anticipated 100-year flow rate from the AES Rational Method was used to determine the pipe sizes. Refer to Appendix B for the normal depth pipe sizing results.

Existing Storm Drain Capacity Analysis Results

Existing storm drains were previously sized for the "Final Design Onsite Drainage Study for Harmony Grove Village", prepared by Rick Engineering Company, dated September 20, 2012.

The Pipeflow models from the previous report were updated to reflect the post-project condition peak flows from the project site.

The proposed storm drain will be constructed of reinforced concrete pipe (RCP). The Manning's roughness coefficient "n" used for the hydraulic calculations for RCP is 0.013. All existing connections are adequately sized to convey the 100-year peak flow rate from the biofiltration basins to the quad box culverts along Harmony Village Drive. The proposed pipe connecting the biofiltration basin in Basin 1 to the existing 54-inch RCP along Country Living way must be sized as at least an 18-inch RCP. The hydraulic analysis from the report titled "Final Design Onsite Drainage Study for Harmony Grove Village" dated September 20, 2012 prepared by Rick Engineering Company has been provided in Appendix B for the applicable storm drains and the entire report has been provided as a standalone document. Post-project hydraulic grade line callouts have been added to the approved grading plans for Harmony Grove Village Phase 1 attached in Appendix B to show that the constructed storm drains have adequate capacity for the increase in peak flow in the ultimate condition. Detailed pipe hydraulics for the existing mainline and storm drain laterals connecting to the project site are provided in Appendix B to show that the mainline and lateral systems have adequate capacity to convey the post-project peak flows with no adverse effects to the system as a whole.

4.0 DETENTION

Flood control 100-year detention will not be provided for any of the basins in Lots 74 or 75. The total Phase 1 drainage area and 100-year flow from Lots 74 and 75 is 2.5 acres and 3.93 cfs. The Ultimate Condition drainage area and 100-year flow is 2.7 acres and 11.3 cfs. The constructed storm drain is a 54-inch RCP and has capacity for an increased flow of 5.6-cfs. This project site is at the downstream end of the system and the peak flow from this project will have been conveyed through the 54-inch RCP before the peak flow for the mainline system is conveyed, thus not impacting the system. Section 6.2.1 of the County of San Diego Hydraulic Design Manual states that "detention basins may be required depending on site-specific conditions". Examples of these conditions and requirements include downstream drainage facilities are insufficient to convey post-project peak design flows. The existing downstream lateral 18-inch RCP pipes this project is proposing to connect to are steep and have capacity to sufficiently convey post-project discharge from this site. The hydraulic analysis for these lateral 18-inch RCP pipes is updated to show the increased flow and the proposed HGL's. The project is not anticipated to adversely affect the downstream drainage facilities. Refer to the hydraulic analysis in section 3.0 and Appendix B.

5.0 CEQA DETERMINATION OF SIGNIFICANCE

In accordance with the County of San Diego's *Guidelines for Determining Significance,* dated July 2007, this study evaluated the California Environmental Quality Act (CEQA) level potential for adverse environmental impacts by providing responses to following the questions:

Would the project:

- Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner which would result in substantial erosion or siltation on- or off-site?
    - **The project <u>will not significantly</u> alter the existing drainage patterns.**
- Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner that would result in flooding on or off-site?

- **The project <u>will not substantially increase</u> the amount or rate of surface runoff or the existing drainage pattern. The project proposes an increase of 6.6 cubic feet per second, which is a roughly 0.2% increase to the flow in the existing culvert. The applicable downstream culverts are determined to have capacity..**

- Create or contribute runoff water, which would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff?
  - **The project proposes water quality measures designed in accordance with County of San Diego guidelines to treat runoff from proposed impervious areas. The proposed development <u>will not significantly increase</u> the amount or rate of runoff. During the entitlement phase of the project, the capacities of the applicable culverts will be determined to handle the increased flow.,**
- Place housing within a 100-year flood hazard area as mapped on a federal Flood Hazard Boundary, a Flood Insurance Rate Map or another flood hazard delineation map?
  - **The project area is <u>not mapped</u> on a federal Flood Hazard Boundary, a Flood Insurance Rate Map, or another flood hazard delineation map.**
- Place within a 100-year flood hazard area structures, which would impede or redirect flood flows?
  - **The project <u>does not propose</u> structures within a 100-year flood hazard area that would impede, or redirect flows significantly.**
- Expose people or structures to a significant risk of loss, injury or death involving flooding, including flooding as a result of the failure of a levee or dam?
  - **<u>No levees or dams</u> exist within the drainage areas to the project, and <u>no levees or dams are proposed</u> by the project**
- Inundation by seiche, tsunami, or mudflow?
  - **The project site <u>is not subject to</u> inundation by seiche, tsunami, or mudflow.**

6.0 SUMMARY

This Drainage Study presents the hydrologic and hydraulic analyses for Harmony Grove Village Lots 74 and 75. The post-project actual condition peak discharge rates were determined using the Rational Method based on the hydrologic methodology and criteria described in the *San Diego County Hydrology Manual 2003.* The post-project assumed condition peak discharge rate was determined for Basins 4000B and 5000B in the "Final Design Onsite Drainage Study for Harmony Grove Village (Phase 1, VTM 5365)" prepared by Rick Engineering Company dated September 20, 2012.

Detailed storm drain sizes have been determined based on the 100-year peak flow rates and detention has not been proposed for the site since the existing storm drains have adequate capacity to convey the increased runoff from the site. Therefore, it is not anticipated that there will be adverse impacts on existing or planned storm water drainage systems as a result of the project. The proposed project is not expected to alter the existing drainage pattern in a manner which would result in flooding on- or off-site.

Post-project flows will be treated per the County of San Diego's BMP Design Manual, dated September 15, 2020. For more information on water quality sizing, please refer to the separate report titled, "Priority Development Project Storm Water Quality Management Plan (PDP SWQMP) for Harmony Grove Village Live Work for Lots 74 & 75," dated February 23, 2024 prepared by Rick Engineering Company (Job No. 17164D).

APPENDIX A

Hydrology

County of San Diego Hydrology Manual

Rainfall Isopluvials

100 Year Rainfall Event - 6 Hours

3.25 Isopluvial (inches)

HARMONY GROVE VILLAGE
LIVE WORK LOTS 74 & 75

Orange County
Riverside County
Imperial County
Pacific Ocean
Mexico
Site
OCEANSIDE
VISTA
CARLSBAD
ESCONDIDO
ENCINITAS
SOLANA BEACH
DEL MAR
POWAY
S.D. COUNTY
SANTEE
SAN DIEGO
EL CAJON
LA MESA
LEMON GROVE
CORONADO
CHULA VISTA
IMPERIAL BEACH
SD

117°30' 117°15' 117°00' 116°45' 116°30' 116°15'
33°30' 33°15' 33°00' 32°45' 32°30'

DPW GIS
Department of Public Works
Geographic Information Services

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3 0 3 Miles

County of San Diego Hydrology Manual

Rainfall Isopluvials

100 Year Rainfall Event - 24 Hours

5.5 ..... Isopluvial (inches)

HARMONY GROVE VILLAGE
LIVE WORK LOTS 74 & 75

Orange County

Riverside County

Imperial County

Pacific Ocean

Mexico

Site

OCEANSIDE
VISTA
CARLSBAD
ESCONDIDO
ENCINITAS
SOLANA BEACH
DEL MAR
POWAY
S.D. COUNTY
SANTEE
SAN DIEGO
EL CAJON
LA MESA
LEMON GROVE
CORONADO
CHULA VISTA
IMPERIAL BEACH
SD

117°30' 117°15' 117°00' 116°45' 116°30' 116°15'
33°30' 33°15' 33°00' 32°45' 32°30'

DPW GIS
Department of Public Works
Geographic Information Services

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3 0 3 Miles

Note that the Initial Time of Concentration should be reflective of the general land-use at the upstream end of a drainage basin. A single lot with an area of two or less acres does not have a significant effect where the drainage basin area is 20 to 600 acres.

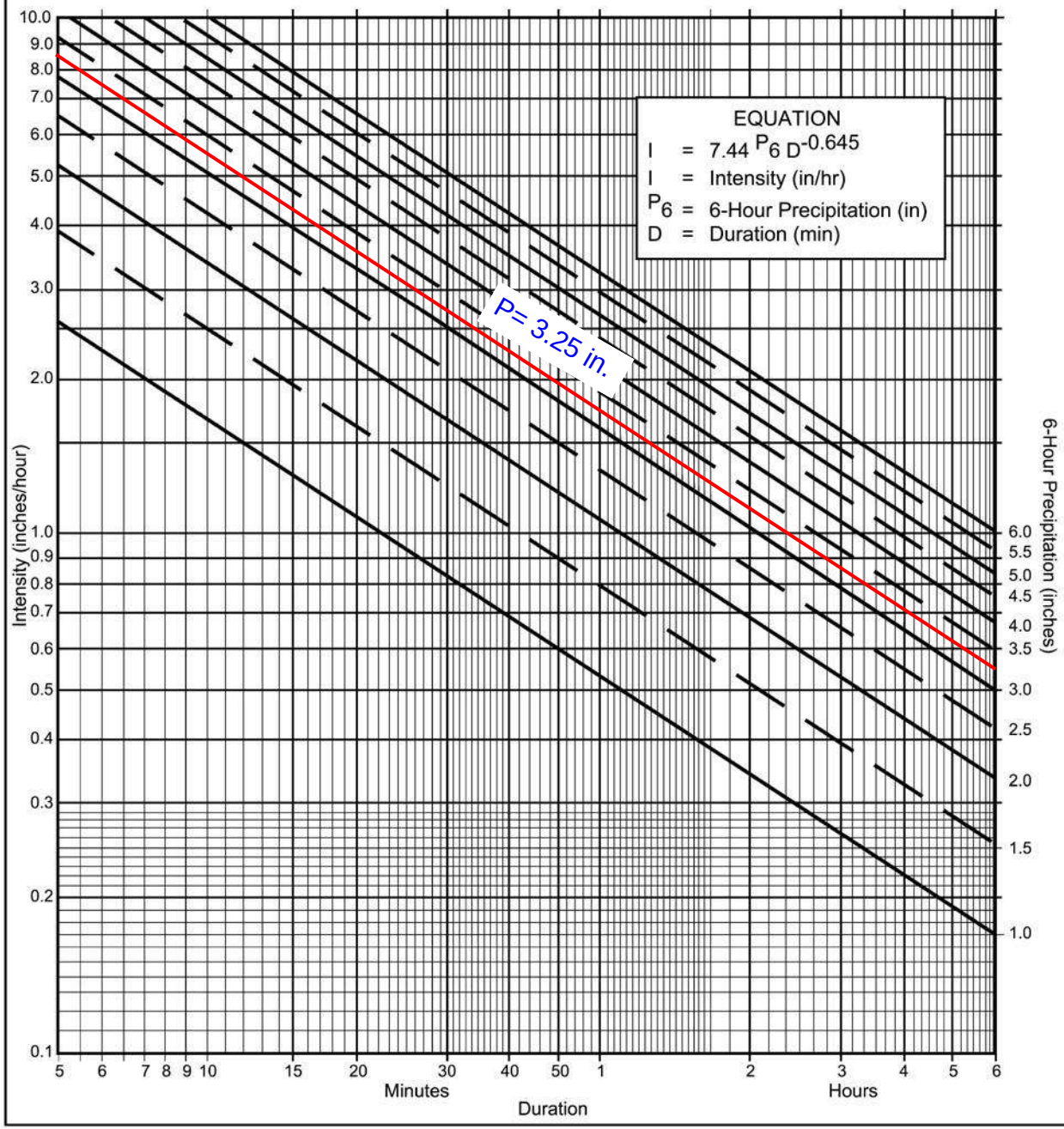
Table 3-2 provides limits of the length (Maximum Length (L_M)) of sheet flow to be used in hydrology studies. Initial T_i values based on average C values for the Land Use Element are also included. These values can be used in planning and design applications as described below. Exceptions may be approved by the "Regulating Agency" when submitted with a detailed study.

Table 3-2

MAXIMUM OVERLAND FLOW LENGTH (L_M) & INITIAL TIME OF CONCENTRATION (T_i)

Element*	DU/ Acre	.5%		1%		2%		3%		5%		10%	
		L_M	T_i	L_M	T_i	L_M	T_i	L_M	T_i	L_M	T_i	L_M	T_i
Natural		50	13.2	70	12.5	85	10.9	100	10.3	100	8.7	100	6.9
LDR	1	50	12.2	70	11.5	85	10.0	100	9.5	100	8.0	100	6.4
LDR	2	50	11.3	70	10.5	85	9.2	100	8.8	100	7.4	100	5.8
LDR	2.9	50	10.7	70	10.0	85	8.8	95	8.1	100	7.0	100	5.6
MDR	4.3	50	10.2	70	9.6	80	8.1	95	7.8	100	6.7	100	5.3
MDR	7.3	50	9.2	65	8.4	80	7.4	95	7.0	100	6.0	100	4.8
MDR	10.9	50	8.7	65	7.9	80	6.9	90	6.4	100	5.7	100	4.5
MDR	14.5	50	8.2	65	7.4	80	6.5	90	6.0	100	5.4	100	4.3
HDR	24	50	6.7	65	6.1	75	5.1	90	4.9	95	4.3	100	3.5
HDR	43	50	5.3	65	4.7	75	4.0	85	3.8	95	3.4	100	2.7
N. Com		50	5.3	60	4.5	75	4.0	85	3.8	95	3.4	100	2.7
G. Com		50	4.7	60	4.1	75	3.6	85	3.4	90	2.9	100	2.4
O.P./Com		50	4.2	60	3.7	70	3.1	80	2.9	90	2.6	100	2.2
Limited I.		50	4.2	60	3.7	70	3.1	80	2.9	90	2.6	100	2.2
General I.		50	3.7	60	3.2	70	2.7	80	2.6	90	2.3	100	1.9

*See Table 3-1 for more detailed description



Directions for Application:

(1) From precipitation maps determine 6 hr and 24 hr amounts for the selected frequency. These maps are included in the County Hydrology Manual (10, 50, and 100 yr maps included in the Design and Procedure Manual).

(2) Adjust 6 hr precipitation (if necessary) so that it is within the range of 45% to 65% of the 24 hr precipitation (not applicaple to Desert).

(3) Plot 6 hr precipitation on the right side of the chart.

(4) Draw a line through the point parallel to the plotted lines.

(5) This line is the intensity-duration curve for the location being analyzed.

Application Form:

(a) Selected frequency 100 year

(b) P_6 = 3.25 in., P_{24} = 5.5, $\frac{P_6}{P_{24}}$ = 59 %(2)

(c) Adjusted P_6(2) = 3.25 in.

(d) t_x = _____ min.

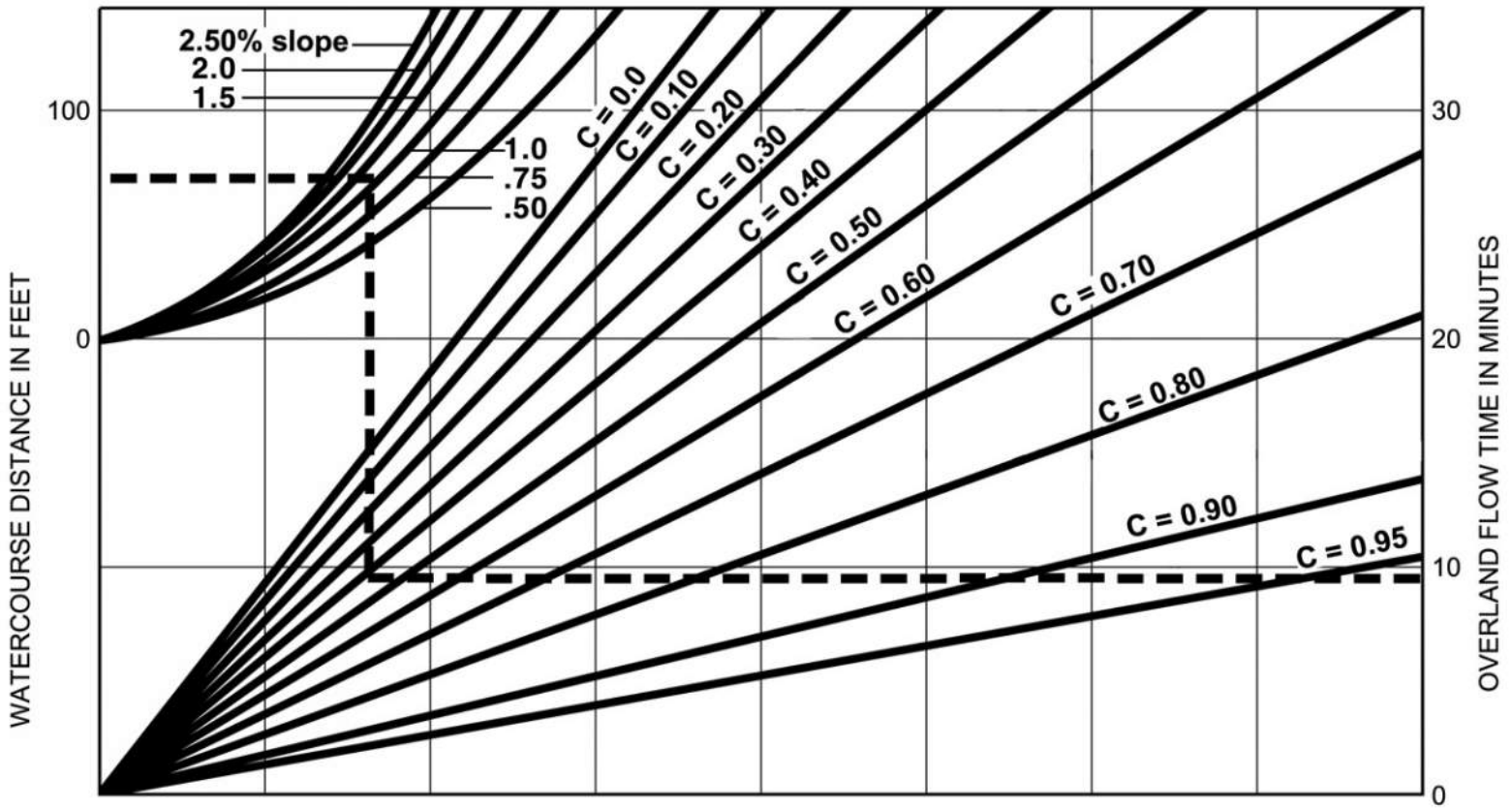
(e) I = _____ in./hr.

Note: This chart replaces the Intensity-Duration-Frequency curves used since 1965.

P6	1	1.5	2	2.5	3	3.5	4	4.5	5	5.5	6
Duration	I	I	I	I	I	I	I	I	I	I	I
5	2.63	3.95	5.27	6.59	7.90	9.22	10.54	11.86	13.17	14.49	15.81
7	2.12	3.18	4.24	5.30	6.36	7.42	8.48	9.54	10.60	11.66	12.72
10	1.68	2.53	3.37	4.21	5.05	5.90	6.74	7.58	8.42	9.27	10.11
15	1.30	1.95	2.59	3.24	3.89	4.54	5.19	5.84	6.49	7.13	7.78
20	1.08	1.62	2.15	2.69	3.23	3.77	4.31	4.85	5.39	5.93	6.46
25	0.93	1.40	1.87	2.33	2.80	3.27	3.73	4.20	4.67	5.13	5.60
30	0.83	1.24	1.66	2.07	2.49	2.90	3.32	3.73	4.15	4.56	4.98
40	0.69	1.03	1.38	1.72	2.07	2.41	2.76	3.10	3.45	3.79	4.13
50	0.60	0.90	1.19	1.49	1.79	2.09	2.39	2.69	2.98	3.28	3.58
60	0.53	0.80	1.06	1.33	1.59	1.86	2.12	2.39	2.65	2.92	3.18
90	0.41	0.61	0.82	1.02	1.23	1.43	1.63	1.84	2.04	2.25	2.45
120	0.34	0.51	0.68	0.85	1.02	1.19	1.36	1.53	1.70	1.87	2.04
150	0.29	0.44	0.59	0.73	0.88	1.03	1.18	1.32	1.47	1.62	1.76
180	0.26	0.39	0.52	0.65	0.78	0.91	1.04	1.18	1.31	1.44	1.57
240	0.22	0.33	0.43	0.54	0.65	0.76	0.87	0.98	1.08	1.19	1.30
300	0.19	0.28	0.38	0.47	0.56	0.66	0.75	0.85	0.94	1.03	1.13
360	0.17	0.25	0.33	0.42	0.50	0.58	0.67	0.75	0.84	0.92	1.00

Intensity-Duration Design Chart - Template

FIGURE 3-1



EXAMPLE:

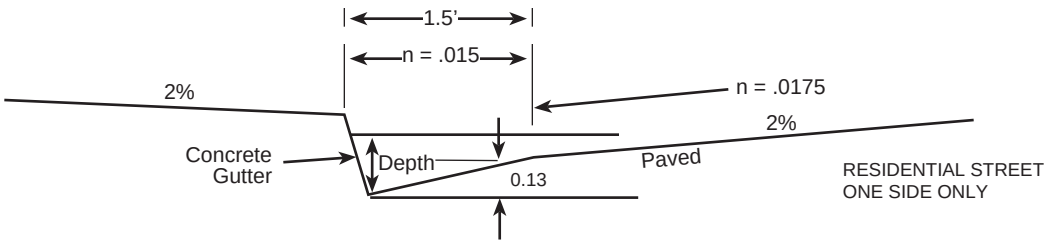
Given: Watercourse Distance (D) = 70 Feet
Slope (s) = 1.3%
Runoff Coefficient (C) = 0.41
Overland Flow Time (T) = 9.5 Minutes

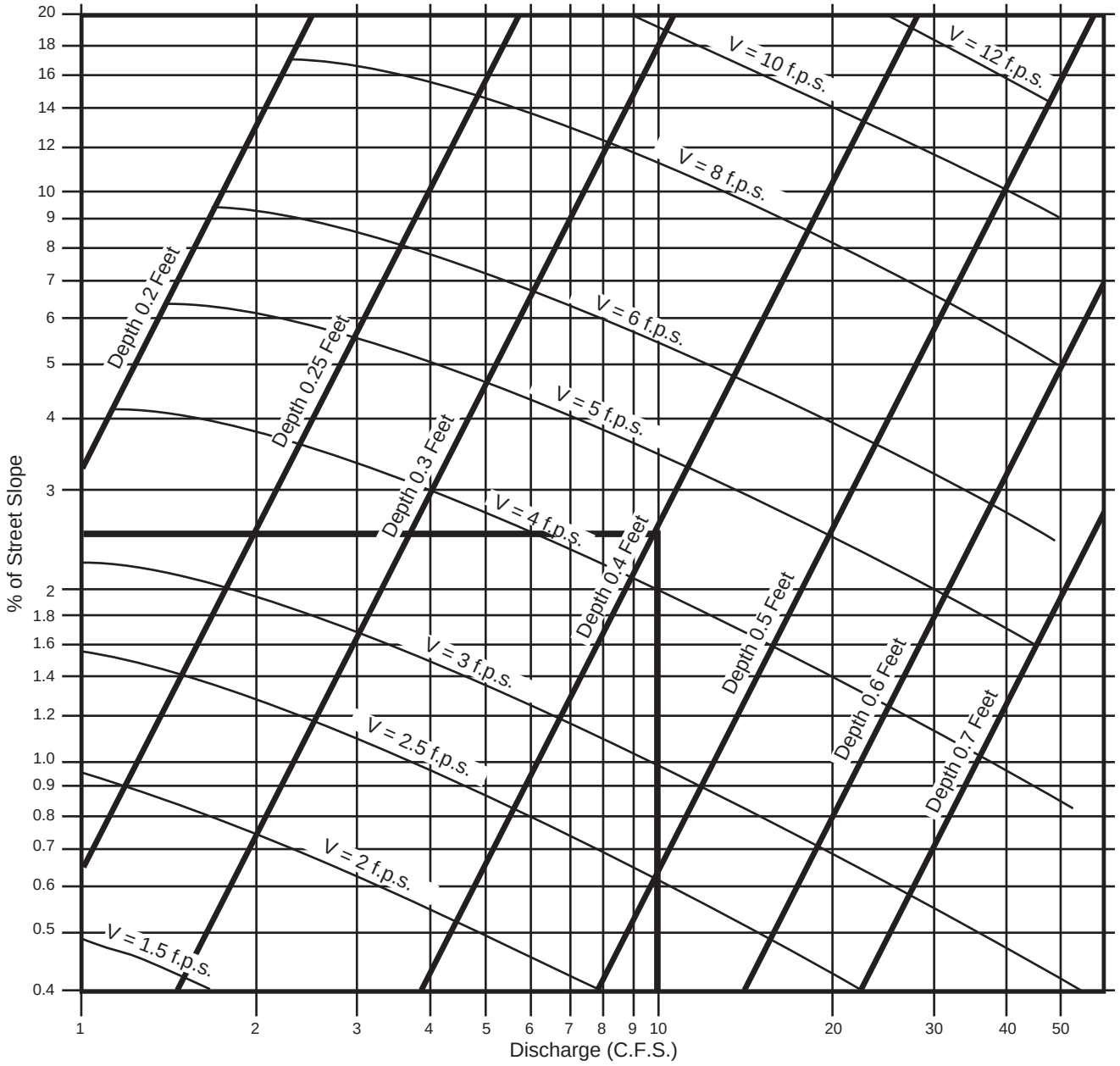
$$T = \frac{1.8\,(1.1-C)\sqrt{D}}{\sqrt[3]{s}}$$

SOURCE: Airport Drainage, Federal Aviation Administration, 1965

FIGURE 3-3

Rational Formula - Overland Time of Flow Nomograph





EXAMPLE:
Given: Q = 10 S = 2.5%
Chart gives: Depth = 0.4, Velocity = 4.4 f.p.s.

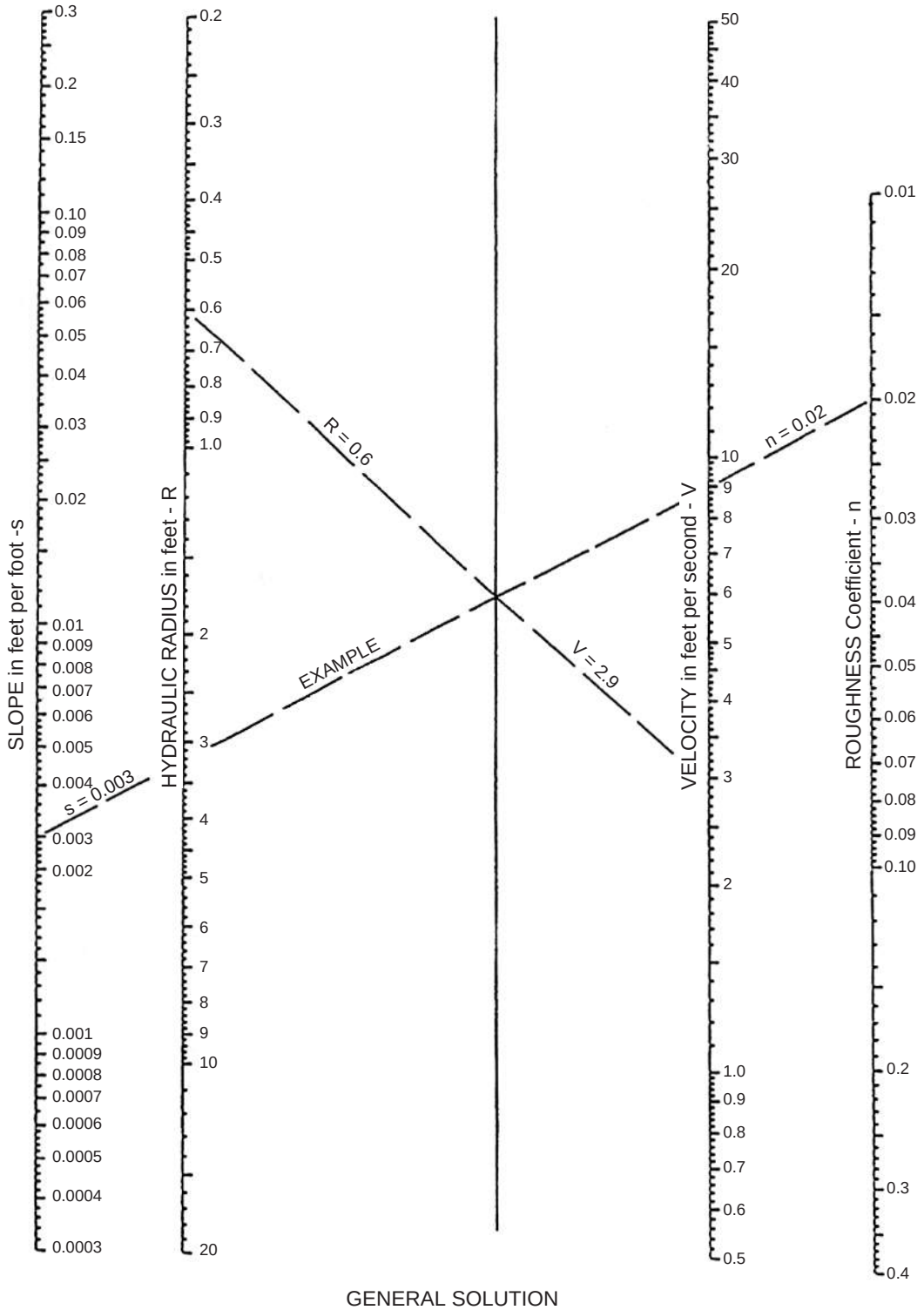
SOURCE: San Diego County Department of Special District Services Design Manual

F I G U R E

Gutter and Roadway Discharge - Velocity Chart

3-6

EQUATION: $V = \frac{1.49}{n} R^{2/3} s^{1/2}$



GENERAL SOLUTION

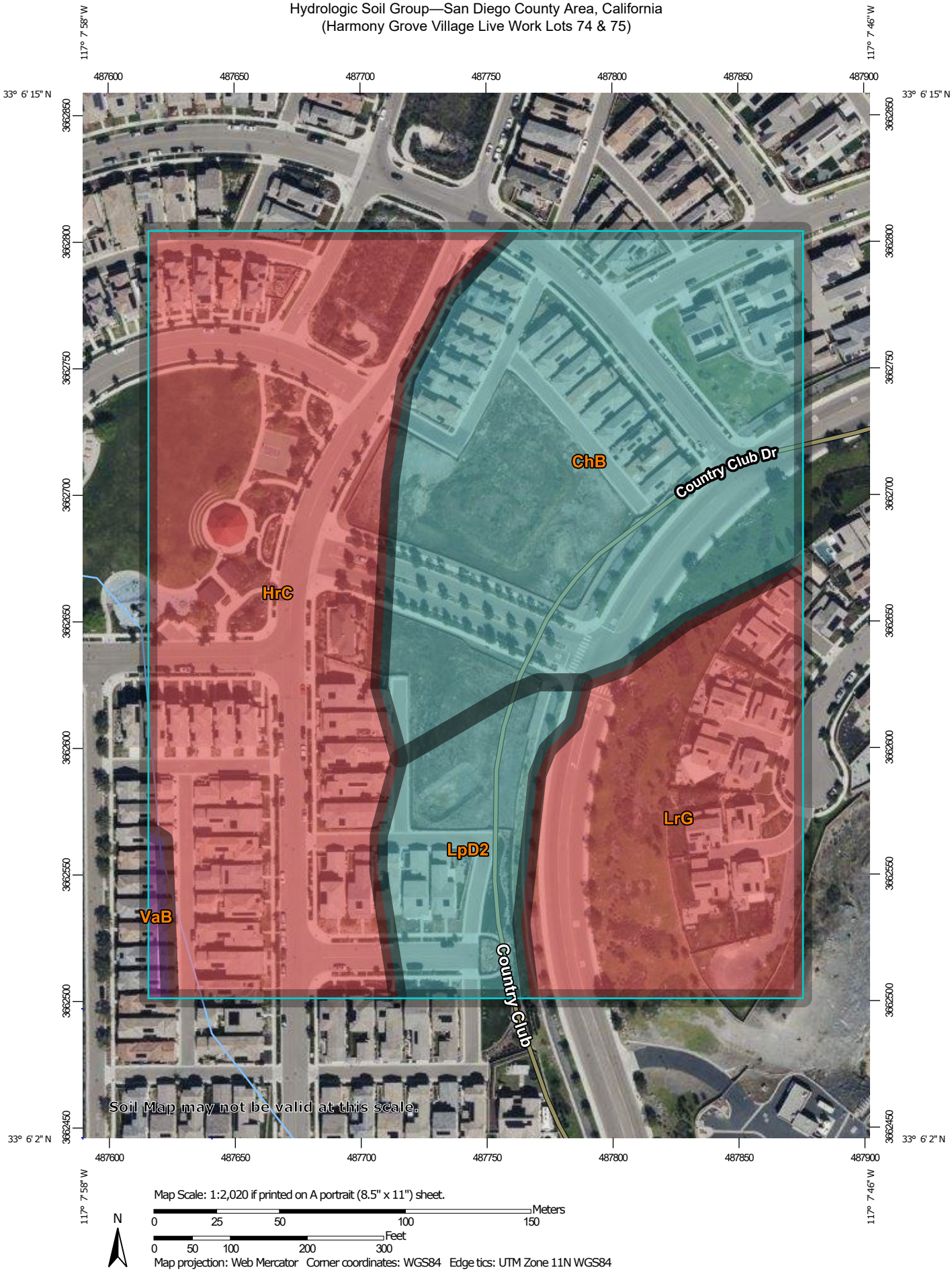
SOURCE: USDOT, FHWA, HDS-3 (1961)

FIGURE

Manning's Equation Nomograph

3-7

Hydrologic Soil Group—San Diego County Area, California
(Harmony Grove Village Live Work Lots 74 & 75)



MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

Soil Rating Polygons

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Lines

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Points

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Water Features

- Streams and Canals

Transportation

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

Background

- Aerial Photography

MAP INFORMATION

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

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

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

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

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

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

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

Soil Survey Area: San Diego County Area, California
Survey Area Data: Version 19, Aug 30, 2023

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

Date(s) aerial images were photographed: Mar 14, 2022—Mar 17, 2022

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

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
ChB	Chino fine sandy loam, 2 to 5 percent slopes	C	6.6	33.9%
HrC	Huerhuero loam, 2 to 9 percent slopes	D	7.4	37.9%
LpD2	Las Posas fine sandy loam, 9 to 15 percent slopes, eroded	C	1.6	8.3%
LrG	Las Posas loam, 30 to 65 percent slopes, stony	D	3.8	19.2%
VaB	Visalia sandy loam, 2 to 5 percent slopes	A	0.1	0.6%
Totals for Area of Interest			**19.6**	**100.0%**

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

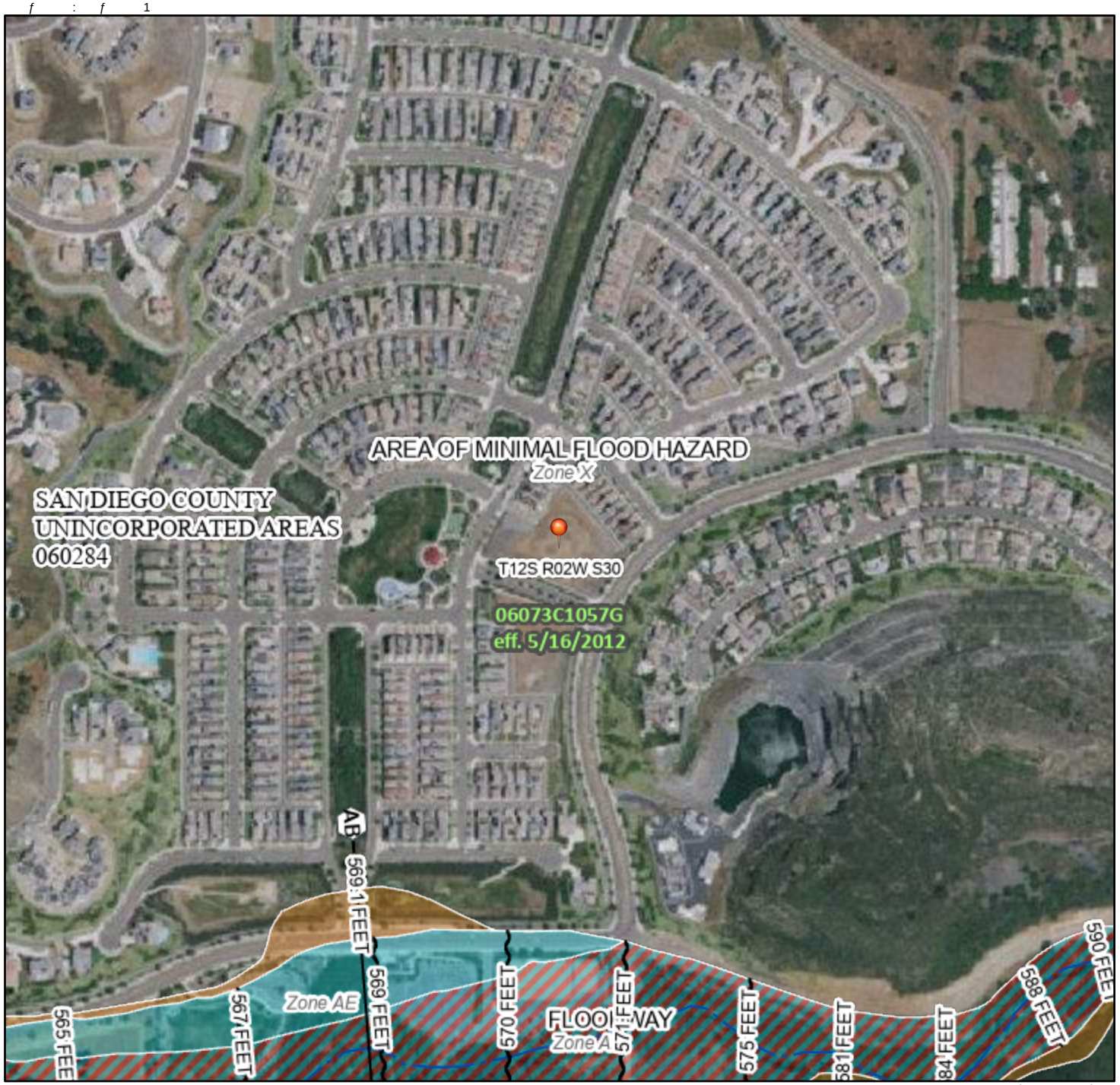
Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

1DWLRQDO)ORRG +D]DUG / FEMA |) F S H W W H

f : f 1



)HHW

f : f 1

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63(&,$/)/2 +$=$5' $5(

:LWKRXW %DVH)ORRG (O =RQH $ 9 $

:LWK %)(RU +HSWK 2 $+ 9

5HJXODWRU\ )ORRGZD\

$QQXDO &KDQFH)ORR RI DQQXDO FKDQFH IO GHSWK OHVV WKDQ RQH DUHDV RI OHVV WKDQ RQ

)XWXUH &RQGLWLRQV &KDQFH)ORRG +D]DUG

$UHD ZLWK 5HGXFHG)OR /HYHH 6HH 12WHV

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$UHD ZLWK)ORRG 5LVN

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&URVV 6HFWLRQV ZLW

:DWHU 6XUIDFH (OHYDWL

&RDVWDO 7UDQVHFW

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8QPDSSHG

7KH SLQ GLVSOD\HG RQ WKH SRLQW VHOHFWHG E\ WKH XV DQ DXWKRULWDWLYH SURSHU

7KLV PDS FRPSOLHV ZLWK)(0$ V VWDQ GLJLWDO IORRG PDSV LI LW LV QRW YR 7KH EDVHPDS VKRZQ FRPSOLHV ZLWK) DFFXUDF\ VWDQGDUGV

7KH IORRG KD]DUG LQIRUPDWLRQ LV GH DXWKRULWDWLYH 1)+/ ZHE VHUYLFHV S ZDV H[SRUWHG RQ DQG GRHV QRW UHIOHFW FKDQJHV RU DPHQGPHQWV VX WLPH 7KH 1)+/ DQG HIIHFWLYH LQIRUP EHFRPH VXSHUVHGHG E\ QHZ GDWD RYH

7KLV PDS LPDJH LV YRLG LI WKH RQH R HOHPHQWV GR QRW DSSHDU EDVHPDS OHJHQG VFDOH EDU PDS FUHDWLRQ G),50 SDQHO QXPEHU DQG),50 HIIHFWLY XQPDSSHG DQG XQPRGHUQL]HG DUHDV UHJXODWRU\ SXUSRVHV

1

%DVHPDS ,PDJHU\ 6RXUFH 86*6 1DWLRQDO 0DS

Post-Project Assumed AES Output
[100-Year]

```
**************************************************************************

            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT
                         2003,1985,1981 HYDROLOGY MANUAL
          (c) Copyright 1982-2011 Advanced Engineering Software (aes)
              Ver. 18.0 Release Date: 07/01/2011  License ID 1261

                              Analysis prepared by:

                            RICK ENGINEERING COMPANY
                                 5620 Friars Rd
                               San Diego CA 92110
                          Ph 619-291-0707  Fax 619-291-4165

 ************************* DESCRIPTION OF STUDY *************************
* HARMONY GROVE VILLAGE J-16412                                         *
* BASIN 4000B- SYSTEM L (UNIT 1)                                        *
* POST PROJECT  100-YR - 6-HOUR  STORM EVENT                            *
 *************************************************************************

  FILE NAME: HG4KBP00.RAT
  TIME/DATE OF STUDY: 08:43 07/11/2012
--------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
--------------------------------------------------------------------------
  2003 SAN DIEGO MANUAL CRITERIA

  USER SPECIFIED STORM EVENT(YEAR) = 100.00
  6-HOUR DURATION PRECIPITATION (INCHES) =   3.300
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.90
  SAN DIEGO HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: USE MODIFIED RATIONAL METHOD PROCEDURES FOR CONFLUENCE ANALYSIS
  *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 0.0160
  2   18.0     11.5    0.020/0.020/0.020   0.50    1.50 0.0100 0.125 0.0160
  3   27.0     20.5    0.020/0.020/0.020   0.50    1.50 0.0100 0.125 0.0160
  4   12.0      7.0    0.020/0.020/0.020   0.50    1.50 0.0100 0.125 0.0160
  5   20.0     15.0    0.020/0.020/0.020   0.25    1.50 0.0100 0.125 0.0160
  6   24.0     19.0    0.020/0.020/0.020   0.50    1.50 0.0100 0.125 0.0160
  7   20.0     15.0    0.020/0.020/0.020   0.50    1.50 0.0100 0.125 0.0160

  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.*

**************************************************************************
  FLOW PROCESS FROM NODE   4515.00 TO NODE   4517.00 IS CODE =  21
--------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
==========================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .7200
  S.C.S. CURVE NUMBER (AMC II) =   0
```

```
 100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.469
 *USER SPECIFIED(SUBAREA):
 USER-SPECIFIED RUNOFF COEFFICIENT = .3300
 S.C.S. CURVE NUMBER (AMC II) =   0
 TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.23
 TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.52
 AVERAGE FLOW DEPTH(FEET) =   0.14   TRAVEL TIME(MIN.) =   3.07
 Tc(MIN.) =   14.03
 SUBAREA AREA(ACRES) =     1.40       SUBAREA RUNOFF(CFS) =    2.06
 AREA-AVERAGE RUNOFF COEFFICIENT =  0.332
 TOTAL AREA(ACRES) =        1.5         PEAK FLOW RATE(CFS) =       2.23

 END OF SUBAREA CHANNEL FLOW HYDRAULICS:
 DEPTH(FEET) =  0.20   FLOW VELOCITY(FEET/SEC.) =   1.84
 LONGEST FLOWPATH FROM NODE   4865.00 TO NODE   4870.00 =     339.86 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE   4870.00 TO NODE   4885.00 IS CODE =  41
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   600.00  DOWNSTREAM(FEET) =   596.70
 FLOW LENGTH(FEET) =    42.93   MANNING'S N =  0.013
 DEPTH OF FLOW IN  18.0 INCH PIPE IS   3.5 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   9.39
 GIVEN PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =       2.23
 PIPE TRAVEL TIME(MIN.) =   0.08    Tc(MIN.) =   14.11
 LONGEST FLOWPATH FROM NODE   4865.00 TO NODE   4885.00 =     382.79 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE   4885.00 TO NODE   4885.00 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.) =   14.11
 RAINFALL INTENSITY(INCH/HR) =   4.45
 TOTAL STREAM AREA(ACRES) =     1.50
 PEAK FLOW RATE(CFS) AT CONFLUENCE =      2.23


 FLOW PROCESS FROM NODE   4880.00 TO NODE   4882.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
 *USER SPECIFIED(SUBAREA):
 USER-SPECIFIED RUNOFF COEFFICIENT = .8600
 S.C.S. CURVE NUMBER (AMC II) =   0
 INITIAL SUBAREA FLOW-LENGTH(FEET) =    50.00
 UPSTREAM ELEVATION(FEET) =    611.00
 DOWNSTREAM ELEVATION(FEET) =    610.50
 ELEVATION DIFFERENCE(FEET) =      0.50
 SUBAREA OVERLAND TIME OF FLOW(MIN.) =    3.055
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  8.695
 NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
 SUBAREA RUNOFF(CFS) =      0.75
 TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.75

****************************************************************************
 FLOW PROCESS FROM NODE   4882.00 TO NODE   4885.00 IS CODE =  62
```

```
  SUBAREA AREA(ACRES) =     0.50       SUBAREA RUNOFF(CFS) =    0.74
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.352
  TOTAL AREA(ACRES) =        0.6         PEAK FLOW RATE(CFS) =       0.89

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.14   FLOW VELOCITY(FEET/SEC.) =   1.11
  LONGEST FLOWPATH FROM NODE   4932.00 TO NODE   4937.00 =     292.21 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE   4937.00 TO NODE   4940.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   601.90  DOWNSTREAM(FEET) =   596.92
  FLOW LENGTH(FEET) =    18.39   MANNING'S N =  0.013
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   1.6 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  11.14
  GIVEN PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.89
  PIPE TRAVEL TIME(MIN.) =   0.03    Tc(MIN.) =   15.35
  LONGEST FLOWPATH FROM NODE   4932.00 TO NODE   4940.00 =     310.60 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE   4940.00 TO NODE   4943.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   596.59  DOWNSTREAM(FEET) =   595.33
  FLOW LENGTH(FEET) =    14.39   MANNING'S N =  0.013
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   2.1 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   7.48
  GIVEN PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.89
  PIPE TRAVEL TIME(MIN.) =   0.03    Tc(MIN.) =   15.38
  LONGEST FLOWPATH FROM NODE   4932.00 TO NODE   4943.00 =     324.99 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE   4943.00 TO NODE   4943.00 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.) =   15.38
  RAINFALL INTENSITY(INCH/HR) =   4.21
  TOTAL STREAM AREA(ACRES) =     0.60
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      0.89

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1        8.48     5.81        7.896          1.30
      2        0.89    15.38        4.212          0.60

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR  2 STREAMS.

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
```

```
**************************************************************************

            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT
                         2003,1985,1981 HYDROLOGY MANUAL
          (c) Copyright 1982-2003 Advanced Engineering Software (aes)
              Ver. 1.5A Release Date: 01/01/2003  License ID 1261

                              Analysis prepared by:

                             Rick Engineering Company
                           1223 University Ave., Suite 240
                             Riverside, California 92507


 ************************* DESCRIPTION OF STUDY *************************
* HARMONY GROVE VILLAGE, J-16412                                        *
* BASIN 5000B, SYSTEM C; 100-YR. 6-HR POST PROJECT                      *
* H:\16412\HYDRO\HYDROLOGY\RATIONALMETHOD\....                          *
 ************************************************************************

  FILE NAME: HG5KBP00.RAT
  TIME/DATE OF STUDY: 10:10 07/10/2012
------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
------------------------------------------------------------------------
  2003 SAN DIEGO MANUAL CRITERIA

  USER SPECIFIED STORM EVENT(YEAR) = 100.00
  6-HOUR DURATION PRECIPITATION (INCHES) =   3.300
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.90
  SAN DIEGO HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: USE MODIFIED RATIONAL METHOD PROCEDURES FOR CONFLUENCE ANALYSIS
  *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
  2   20.0     15.0    0.020/0.020/0.020   0.50    1.50 0.0100 0.125 0.0160
  3   22.0     17.0    0.020/0.020/0.020   0.50    1.50 0.0100 0.125 0.0160
  4   18.0     13.0    0.020/0.020/0.020   0.50    1.50 0.0100 0.125 0.0160
  5   17.0     12.0    0.020/0.020/0.020   0.50    1.50 0.0100 0.125 0.0160

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth = -0.10 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.*

**************************************************************************
  FLOW PROCESS FROM NODE   5500.00 TO NODE   5502.00 IS CODE =  21
--------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
==========================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .3600
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    40.00
  UPSTREAM ELEVATION(FEET) =    610.80
```

```
  DOWNSTREAM ELEVATION(FEET) =    609.80
  ELEVATION DIFFERENCE(FEET) =      1.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    6.207
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.563
  SUBAREA RUNOFF(CFS) =      0.27
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.27

****************************************************************************
  FLOW PROCESS FROM NODE   5502.00 TO NODE   5504.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    609.80  DOWNSTREAM(FEET) =    606.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   147.00   CHANNEL SLOPE =  0.0259
  CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =  90.000
  MANNING'S FACTOR = 0.040   MAXIMUM DEPTH(FEET) =  10.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.710
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      0.58
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   0.72
  AVERAGE FLOW DEPTH(FEET) =   0.09   TRAVEL TIME(MIN.) =   3.39
  Tc(MIN.) =   9.60
  SUBAREA AREA(ACRES) =     0.30       SUBAREA RUNOFF(CFS) =    0.60
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.352
  TOTAL AREA(ACRES) =      0.40         PEAK FLOW RATE(CFS) =       0.81

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.10   FLOW VELOCITY(FEET/SEC.) =   0.83
  LONGEST FLOWPATH FROM NODE   5500.00 TO NODE   5504.00 =   187.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE   5504.00 TO NODE   5505.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   596.67  DOWNSTREAM(FEET) =   593.27
  FLOW LENGTH(FEET) =   167.50   MANNING'S N =  0.013
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   2.9 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.35
  GIVEN PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      0.81
  PIPE TRAVEL TIME(MIN.) =   0.64    Tc(MIN.) =  10.24
  LONGEST FLOWPATH FROM NODE   5500.00 TO NODE   5505.00 =   354.50 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE   5504.50 TO NODE   5505.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.477
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .6700
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.4886
  SUBAREA AREA(ACRES) =    0.30   SUBAREA RUNOFF(CFS) =    1.10
  TOTAL AREA(ACRES) =      0.70   TOTAL RUNOFF(CFS) =    1.87
  TC(MIN.) =  10.24

****************************************************************************
```

Post-Project Actual Hand Calculations

[100-Year]

Harmony Grove Village Center
J-17164-D
March 17, 2025

100-YR PEAK FLOW FROM BASIN 1

RUNOFF COEFFICIENT (C):

Hydrologic Soil Group:	C & D	
County Element[1]:	Residential, 14 DU/A or less	

1. Table 3-1 of 2003 San Diego County Hydrology Manual

Pervious Runoff Coefficient:	0.3 & 0.35	
Percent Impervious:	72%	
C= Weighted Runoff Coefficient =	0.74	

RAINFALL INTENSITY:

P_6 = 100-yr, 6-hr Rainfall Isopluvial for the site =	3.25	inches
S = Surface slope	1.0	%
D = Length of the initial flowline	100	feet
T_i = Initial Time of Concentration	7.4	minutes

2. Table 3-2 of 2003 San Diego County Hydrology Manual

$T_{t,\ Shallow}$ = Shallow Concentrated Flow Time[3]		
= V / $L_{Shallow}$	0.67	minutes
V = Velocity	3.3	ft/sec
% Slope of Street	1.8	%
L = Length of Shallow Concentrated Flowpath	133	feet

3. Figure 3-6 of 2003 San Diego County Hydrology Manual

V= Pipe Flow Velocity[4]		
= (1.49 / n) * $R^{2/3}$ * $S^{1/2}$	4.5	ft/sec
R= d/4	0.25	feet
n= 0.013 for Reinforced Concrete Pipe	0.013	unitless
S= Slope of Pipe	0.01	decimal

4. Figure 3-7 of 2003 San Diego County Hydrology Manual
Assuming pipes are flowing full

$T_{t,\ Pipe}$ = Pipe Flow Time[5]		
= L / V	0.4	minutes
L= Length of Pipe (feet)	105	feet

T_C= Time of Concentration[4]		
= T_i + $T_{t,\ Overland}$ + $T_{t,\ Pipe}$	8.5	minutes

4. Section 3.1.4 of the 2003 San Diego County Hydrology Manual

I= Rainfall Intensity[5]		
= 7.44 (P_6) $T_c^{-0.645}$	6.10	in/hr

4. Section 3.1.4 of the 2003 San Diego County Hydrology Manual

PEAK DISCHARGES (Q):

A= Area of the basin	0.4	acres
Q = Peak Flow = CIA	**1.6**	**ft^3/sec**

Harmony Grove Village Center
J-17164-D
March 17, 2025

100-YR PEAK FLOW FROM BASIN 2

RUNOFF COEFFICIENT (C):

Hydrologic Soil Group:	C	
County Element[1]:	Residential, 14 DU/A or less	

1. Table 3-1 of 2003 San Diego County Hydrology Manual

Pervious Runoff Coefficient:	0.30	
Percent Impervious:	67%	
C= Weighted Runoff Coefficient =	0.70	

RAINFALL INTENSITY:

P_6 = 100-yr, 6-hr Rainfall Isopluvial for the site =	3.25	inches
S = Surface slope	1.0	%
D = Length of the initial flowline	100	feet
T_i = Initial Time of Concentration	7.4	minutes

2. Table 3-2 of 2003 San Diego County Hydrology Manual

$T_{t,\ Shallow}$ = Shallow Concentrated Flow Time[3]

= V / $L_{Shallow}$	1.59	minutes
V = Velocity	2.20	ft/sec
% Slope of Street	1.0	%
L = Length of Shallow Concentrated Flowpath	210	feet

3. Figure 3-6 of 2003 San Diego County Hydrology Manual 0.0

V= Pipe Flow Velocity[4]

= (1.49 / n) * $R^{2/3}$ * $S^{1/2}$	4.5	ft/sec
R= d/4	0.25	feet
n= 0.013 for Reinforced Concrete Pipe	0.013	unitless
S= Slope of Pipe	0.01	decimal

4. Figure 3-7 of 2003 San Diego County Hydrology Manual
Assuming pipes are flowing full

$T_{t,\ Pipe}$ = Pipe Flow Time[5]

= L / V	0.1	minutes
L= Length of Pipe (feet)	17	feet

T_C= Time of Concentration[4]

= T_i + $T_{t,\ Overland}$ + $T_{t,\ Pipe}$	9.1	minutes

4. Section 3.1.4 of the 2003 San Diego County Hydrology Manual

I= Rainfall Intensity[5]

= 7.44 (P_6) $T_c^{-0.645}$	5.84	in/hr

4. Section 3.1.4 of the 2003 San Diego County Hydrology Manual

PEAK DISCHARGES (Q):

A= Area of the basin	1.1	acres
Q = Peak Flow = CIA	**4.6**	**ft^3/sec**

Harmony Grove Village Center
J-17164-D
March 17, 2025

100-YR PEAK FLOW FROM BASIN 3

RUNOFF COEFFICIENT (C):

Hydrologic Soil Group:	C & D
County Element[1]:	Residential, 14 DU/A or less

1. Table 3-1 of 2003 San Diego County Hydrology Manual

Pervious Runoff Coefficient:	0.3 & 0.35
Percent Impervious:	62%
C= Weighted Runoff Coefficient =	0.69

RAINFALL INTENSITY:

P_6 = 100-yr, 6-hr Rainfall Isopluvial for the site =	3.25	inches
S = Surface slope	1.0	%
D = Length of the initial flowline	100	feet
T_i = Initial Time of Concentration	7.4	minutes

2. Table 3-2 of 2003 San Diego County Hydrology Manual

V= Pipe Flow Velocity[4]

= (1.49 / n) * $R^{2/3}$ * $S^{1/2}$	4.5	ft/sec
R= d/4	0.25	feet
n= 0.013 for Reinforced Concrete Pipe	0.013	unitless
S= Slope of Pipe	0.01	decimal

4. Figure 3-7 of 2003 San Diego County Hydrology Manual
Assuming pipes are flowing full

$T_{t, Pipe}$ = Pipe Flow Time[5]

= L / V	0.5	minutes
L= Length of Pipe (feet)	148	feet

T_C= Time of Concentration[4]

= T_i + $T_{t, Overland}$ + $T_{t, Pipe}$	7.9	minutes

4. Section 3.1.4 of the 2003 San Diego County Hydrology Manual

I= Rainfall Intensity[5]

= 7.44 (P_6) $T_c^{-0.645}$	6.35	in/hr

4. Section 3.1.4 of the 2003 San Diego County Hydrology Manual

PEAK DISCHARGES (Q):

A= Area of the basin	0.3	acres
Q = Peak Flow = CIA	**1.3**	**ft^3/sec**

Harmony Grove Village Center
J-17164-D
March 17, 2025

100-YR PEAK FLOW FROM BASIN 4

RUNOFF COEFFICIENT (C):

Hydrologic Soil Group:	C	
County Element[1]:	Residential, 14 DU/A or less	

1. Table 3-1 of 2003 San Diego County Hydrology Manual

Pervious Runoff Coefficient:	0.30	
Percent Impervious:	55%	
C= Weighted Runoff Coefficient =	0.63	

RAINFALL INTENSITY:

P_6 = 100-yr, 6-hr Rainfall Isopluvial for the site =	3.25	inches
S = Surface slope	1.0	%
D = Length of the initial flowline	100	feet
T_i = Initial Time of Concentration	7.4	minutes

2. Table 3-2 of 2003 San Diego County Hydrology Manual

$T_{t,\ Shallow}$ = Shallow Concentrated Flow Time[3]		
= V / $L_{Shallow}$	1.04	minutes
V = Velocity	2.25	ft/sec
% Slope of Street	1.0	%
L = Length of Shallow Concentrated Flowpath	140	feet

3. Figure 3-6 of 2003 San Diego County Hydrology Manual

0.0

V= Pipe Flow Velocity[4]		
= (1.49 / n) * $R^{2/3}$ * $S^{1/2}$	4.5	ft/sec
R= d/4	0.25	feet
n= 0.013 for Reinforced Concrete Pipe	0.013	unitless
S= Slope of Pipe	0.01	decimal

4. Figure 3-7 of 2003 San Diego County Hydrology Manual
Assuming pipes are flowing full

$T_{t,\ Pipe}$ = Pipe Flow Time[5]		
= L / V	0.2	minutes
L= Length of Pipe (feet)	64	feet
T_C= Time of Concentration[4]		
= T_i + $T_{t,\ Overland}$ + $T_{t,\ Pipe}$	8.7	minutes

4. Section 3.1.4 of the 2003 San Diego County Hydrology Manual

I= Rainfall Intensity[5]		
= 7.44 (P_6) $T_c^{-0.645}$	6.00	in/hr

4. Section 3.1.4 of the 2003 San Diego County Hydrology Manual

PEAK DISCHARGES (Q):

A= Area of the basin	0.3	acres
Q = Peak Flow = CIA	**1.2**	**ft^3/sec**

Harmony Grove Village Center
J-17164-D
March 17, 2025

100-YR PEAK FLOW FROM BASIN 5

RUNOFF COEFFICIENT (C):

Hydrologic Soil Group:	C
County Element[1]:	Residential, 14 DU/A or less

1. Table 3-1 of 2003 San Diego County Hydrology Manual

Pervious Runoff Coefficient:	0.30
Percent Impervious:	68%
C= Weighted Runoff Coefficient =	0.71

RAINFALL INTENSITY:

P_6 = 100-yr, 6-hr Rainfall Isopluvial for the site =	3.25	inches
S = Surface slope	1.0	%
D = Length of the initial flowline	100	feet
T_i = Initial Time of Concentration	7.4	minutes

2. Table 3-2 of 2003 San Diego County Hydrology Manual

$T_{t, Shallow}$ = Shallow Concentrated Flow Time[3]		
= V / $L_{Shallow}$	1.17	minutes
V = Velocity	2.20	ft/sec
% Slope of Street	1.0	%
L = Length of Shallow Concentrated Flowpath	155	feet

3. Figure 3-6 of 2003 San Diego County Hydrology Manual

V= Pipe Flow Velocity[4]		
= (1.49 / n) * $R^{2/3}$ * $S^{1/2}$	4.5	ft/sec
R= d/4	0.25	feet
n= 0.013 for Reinforced Concrete Pipe	0.013	unitless
S= Slope of Pipe	0.01	decimal

4. Figure 3-7 of 2003 San Diego County Hydrology Manual
Assuming pipes are flowing full

$T_{t, Pipe}$ = Pipe Flow Time[5]		
= L / V	0.7	minutes
L= Length of Pipe (feet)	187	feet
T_C= Time of Concentration[4]		
= T_i + $T_{t, Overland}$ + $T_{t, Pipe}$	9.3	minutes

4. Section 3.1.4 of the 2003 San Diego County Hydrology Manual

I= Rainfall Intensity[5]		
= 7.44 (P_6) $T_c^{-0.645}$	5.75	in/hr

4. Section 3.1.4 of the 2003 San Diego County Hydrology Manual

PEAK DISCHARGES (Q):

A= Area of the basin	0.6	acres
Q = Peak Flow = CIA	**2.6**	**ft^3/sec**

APPENDIX B

Pipe Sizing Calculations

Preliminary Storm Drain Size

The purpose of this table is to provide an estimated pipe size to convey the 100-year flow rates with a sizing factor.

Manning's n: 0.013

Sizing Factor (%): 30

	Slope at:	1.0%		2.0%		5.0%		8.0%	
Q_{100} (cfs[1])	Q_{100} with Sizing Factor (cfs[1])	Minimum Pipe Size[2] (feet)	Recommended Pipe Size (inches)	Minimum Pipe Size[2] (feet)	Recommended Pipe Size (inches)	Minimum Pipe Size[2] (feet)	Recommended Pipe Size (inches)	Minimum Pipe Size[2] (feet)	Recommended Pipe Size (inches)
0.5	0.7	0.53	8"	0.46	6"	0.39	6"	0.36	6"
1.0	1.3	0.68	10"	0.60	8"	0.51	6"	0.46	6"
1.4	1.8	0.78	10"	0.68	10"	0.58	8"	0.53	8"
1.8	2.3	0.84	10"	0.74	10"	0.62	8"	0.57	8"
2.0	2.6	0.89	12"	0.78	10"	0.66	8"	0.60	8"
2.1	2.7	0.90	12"	0.79	10"	0.67	8"	0.61	8"
2.5	3.3	0.97	12"	0.85	12"	0.71	10"	0.65	8"
3.0	3.9	1.03	18"	0.91	12"	0.76	10"	0.70	10"
3.1	4.0	1.05	18"	0.92	12"	0.77	10"	0.71	10"
3.5	4.6	1.09	18"	0.96	12"	0.81	10"	0.74	10"
4.0	5.2	1.15	18"	1.01	12"	0.85	12"	0.78	10"
4.5	5.9	1.20	18"	1.06	18"	0.89	12"	0.81	10"
5.0	6.5	1.25	18"	1.10	18"	0.93	12"	0.85	12"
5.5	7.2	1.30	18"	1.14	18"	0.96	12"	0.88	12"
6.0	7.8	1.34	18"	1.18	18"	0.99	12"	0.91	12"
6.5	8.5	1.38	18"	1.21	18"	1.02	18"	0.94	12"
7.0	9.1	1.42	18"	1.25	18"	1.05	18"	0.96	12"
7.1	9.3	1.43	18"	1.26	18"	1.06	18"	0.97	12"
7.5	9.8	1.46	18"	1.28	18"	1.08	18"	0.99	12"
8.0	10.4	1.49	18"	1.31	18"	1.10	18"	1.01	12"

Note:

1. "cfs" = cubic feet per second.

2. Minimum pipe sizes are calculated using the Manning's equation and are based on the flow rates with 30% factor.

```
**************************************************************************
          PIPE-FLOW HYDRAULICS COMPUTER PROGRAM PACKAGE
     (Reference: LACFCD,LACRD, AND OCEMA HYDRAULICS CRITERION)
   (c) Copyright 1982-2000 Advanced Engineering Software (aes)
       Ver. 8.0  Release Date: 01/01/2000  License ID 1261

                    Analysis prepared by:

                  Rick Engineering Company
                     5620 Friars Road
                   San Diego, CA  92110
                     (619) 291-0707

 ************************* DESCRIPTION OF STUDY *************************
* HARMONY GROVE J-16412-W                                               *
* SYSTEM C (BASIN 5000B)- NODE 5506 PROP COND 100-YR 6-HR               *
* DATE: 20120319                                                        *
 ************************************************************************

 FILE NAME: 5506.LAT
 TIME/DATE OF STUDY: 13:35 07/25/2012
```

```
**************************************************************************
              GRADUALLY VARIED FLOW ANALYSIS FOR PIPE SYSTEM
                    NODAL POINT STATUS TABLE
              (Note: "*" indicates nodal point data used.)
                    UPSTREAM RUN                    DOWNSTREAM RUN
  NODE     MODEL    PRESSURE      PRESSURE+         FLOW        PRESSURE+
 NUMBER   PROCESS   HEAD(FT)   MOMENTUM(POUNDS)   DEPTH(FT)   MOMENTUM(POUNDS)
5506.00-                2.66*          214.57         0.44           21.20
       } FRICTION
5512.10-                1.90*          130.31         0.52 Dc        20.18
       } JUNCTION
5512.10-                1.60*           98.02         0.43           21.40
       } FRICTION
5505.00-                1.25*           60.66         0.52 Dc        20.18
       } JUNCTION
5505.00-                1.06*           40.31         0.28            7.13
       } FRICTION          } HYDRAULIC JUMP
5504.10-                0.33*Dc          6.73         0.33*Dc         6.73
       } JUNCTION
5504.10-                0.33 Dc          6.73         0.23*           8.34
       } FRICTION
5504.20-                0.33 Dc          6.73         0.17*          11.77
       } JUNCTION
5504.20-                0.33 Dc          6.73         0.15*          13.94
       } FRICTION
5504.30-                0.33*Dc          6.73         0.33*Dc         6.73
       } CATCH BASIN
5504.30-                0.47*            3.56         0.33 Dc         2.47
--------------------------------------------------------------------------
 MAXIMUM NUMBER OF ENERGY BALANCES USED IN EACH PROFILE =  25
--------------------------------------------------------------------------
 NOTE: STEADY FLOW HYDRAULIC HEAD-LOSS COMPUTATIONS BASED ON THE MOST
 CONSERVATIVE FORMULAE FROM THE CURRENT LACRD,LACFCD, AND OCEMA
 DESIGN MANUALS.
**************************************************************************
 DOWNSTREAM PIPE FLOW CONTROL DATA:
 NODE NUMBER =  5506.00          FLOWLINE ELEVATION =   592.71
 PIPE FLOW =       1.90 CFS      PIPE DIAMETER =  18.00 INCHES
 ASSUMED DOWNSTREAM CONTROL HGL =   595.370 FEET
--------------------------------------------------------------------------
```



```
 NODE  5506.00 : HGL = <  595.370>;EGL= <  595.388>;FLOWLINE= <  592.710>

**************************************************************************
 FLOW PROCESS FROM NODE  5506.00 TO NODE  5512.10 IS CODE =  1
 UPSTREAM NODE  5512.10     ELEVATION =   593.50  (FLOW IS UNDER PRESSURE)
--------------------------------------------------------------------------
 CALCULATE FRICTION LOSSES(LACFCD):
 PIPE FLOW   =       1.90 CFS      PIPE DIAMETER =  18.00 INCHES
 PIPE LENGTH =      79.00 FEET          MANNING'S N  =  0.01300
 SF=(Q/K)**2 = ((      1.90)/(   104.977))**2 = 0.00033
 HF=L*SF = (     79.00)*(0.00033) =      0.026
--------------------------------------------------------------------------
 NODE  5512.10 : HGL = <  595.396>;EGL= <  595.414>;FLOWLINE= <  593.500>

**************************************************************************
 FLOW PROCESS FROM NODE  5512.10 TO NODE  5512.10 IS CODE =  5
 UPSTREAM NODE  5512.10     ELEVATION =   593.83  (FLOW IS UNDER PRESSURE)
--------------------------------------------------------------------------
 CALCULATE JUNCTION LOSSES:
      PIPE        FLOW     DIAMETER    ANGLE     FLOWLINE    CRITICAL    VELOCITY
                  (CFS)    (INCHES)  (DEGREES) ELEVATION  DEPTH(FT.)  (FT/SEC)
   UPSTREAM        1.90       18.00      90.00     593.83       0.52        1.075
  DOWNSTREAM       1.90       18.00          -     593.50       0.52        1.077
  LATERAL #1       0.00        0.00       0.00       0.00       0.00        0.000
  LATERAL #2       0.00        0.00       0.00       0.00       0.00        0.000
     Q5            0.00===Q5 EQUALS BASIN INPUT===

 LACFCD AND OCEMA FLOW JUNCTION FORMULAE USED:
 DY={Q2*V2-Q1*V1*COS(DELTA1)-Q3*V3*COS(DELTA3)-
     Q4*V4*COS(DELTA4)}/((A1+A2)*16.1)+FRICTION LOSSES
 UPSTREAM:    MANNING'S N = 0.01300;  FRICTION SLOPE = 0.00033
 DOWNSTREAM:  MANNING'S N = 0.01300;  FRICTION SLOPE = 0.00033
 AVERAGED FRICTION SLOPE IN JUNCTION ASSUMED AS 0.00033
 JUNCTION LENGTH =   4.00 FEET
 FRICTION LOSSES =  0.001 FEET          ENTRANCE LOSSES =  0.000 FEET
 JUNCTION LOSSES = (DY+HV1-HV2)+(ENTRANCE LOSSES)
 JUNCTION LOSSES = ( 0.037)+( 0.000) =   0.037
--------------------------------------------------------------------------
 NODE  5512.10 : HGL = <  595.433>;EGL= <  595.451>;FLOWLINE= <  593.830>

**************************************************************************
 FLOW PROCESS FROM NODE  5512.10 TO NODE  5505.00 IS CODE =  1
 UPSTREAM NODE  5505.00     ELEVATION =   594.19  (FLOW SEALS IN REACH)
--------------------------------------------------------------------------
 CALCULATE FRICTION LOSSES(LACFCD):
 PIPE FLOW   =       1.90 CFS      PIPE DIAMETER =  18.00 INCHES
 PIPE LENGTH =      33.50 FEET          MANNING'S N  =  0.01300
==========================================================================
 DOWNSTREAM CONTROL ASSUMED PRESSURE HEAD(FT) =      1.60
==========================================================================
 PRESSURE FLOW PROFILE COMPUTED INFORMATION:
--------------------------------------------------------------------------
 DISTANCE FROM     PRESSURE   VELOCITY     SPECIFIC      PRESSURE+
  CONTROL(FT)      HEAD(FT)   (FT/SEC)    ENERGY(FT)   MOMENTUM(POUNDS)
        0.000         1.603      1.075         1.621          98.02
        9.889         1.500      1.075         1.518          86.66
--------------------------------------------------------------------------
 NORMAL DEPTH(FT) =      0.42          CRITICAL DEPTH(FT) =      0.52
==========================================================================
 ASSUMED DOWNSTREAM PRESSURE HEAD(FT) =     1.50
==========================================================================
 GRADUALLY VARIED FLOW PROFILE COMPUTED INFORMATION:
--------------------------------------------------------------------------
```

DISTANCE FROM CONTROL(FT)	FLOW DEPTH (FT)	VELOCITY (FT/SEC)	SPECIFIC ENERGY(FT)	PRESSURE+ MOMENTUM(POUNDS)
9.889	1.500	1.075	1.518	86.66
13.622	1.461	1.083	1.479	82.38
17.327	1.422	1.097	1.440	78.16
21.015	1.382	1.115	1.402	74.02
24.690	1.343	1.138	1.363	69.98
28.353	1.304	1.165	1.325	66.04
32.005	1.265	1.195	1.287	62.20
33.500	1.248	1.208	1.271	60.66

NODE 5505.00 : HGL = < 595.438>;EGL= < 595.461>;FLOWLINE= < 594.190>

FLOW PROCESS FROM NODE 5505.00 TO NODE 5505.00 IS CODE = 5
UPSTREAM NODE 5505.00 ELEVATION = 594.42 (FLOW IS SUBCRITICAL)

CALCULATE JUNCTION LOSSES:

PIPE	FLOW (CFS)	DIAMETER (INCHES)	ANGLE (DEGREES)	FLOWLINE ELEVATION	CRITICAL DEPTH(FT.)	VELOCITY (FT/SEC)
UPSTREAM	0.80	18.00	0.00	594.42	0.33	0.595
DOWNSTREAM	1.90	18.00	-	594.19	0.52	1.209
LATERAL #1	0.00	0.00	0.00	0.00	0.00	0.000
LATERAL #2	0.00	0.00	0.00	0.00	0.00	0.000
Q5	1.10===Q5 EQUALS BASIN INPUT===					

LACFCD AND OCEMA FLOW JUNCTION FORMULAE USED:
DY=(Q2*V2-Q1*V1*COS(DELTA1)-Q3*V3*COS(DELTA3)-
Q4*V4*COS(DELTA4))/((A1+A2)*16.1)+FRICTION LOSSES
UPSTREAM: MANNING'S N = 0.01300; FRICTION SLOPE = 0.00008
DOWNSTREAM: MANNING'S N = 0.01300; FRICTION SLOPE = 0.00032
AVERAGED FRICTION SLOPE IN JUNCTION ASSUMED AS 0.00020
JUNCTION LENGTH = 4.00 FEET
FRICTION LOSSES = 0.001 FEET ENTRANCE LOSSES = 0.005 FEET
JUNCTION LOSSES = (DY+HV1-HV2)+(ENTRANCE LOSSES)
JUNCTION LOSSES = (0.023)+(0.005) = 0.028

NODE 5505.00 : HGL = < 595.484>;EGL= < 595.489>;FLOWLINE= < 594.420>

FLOW PROCESS FROM NODE 5505.00 TO NODE 5504.10 IS CODE = 1
UPSTREAM NODE 5504.10 ELEVATION = 595.89 (HYDRAULIC JUMP OCCURS)

CALCULATE FRICTION LOSSES(LACFCD):
PIPE FLOW = 0.80 CFS PIPE DIAMETER = 18.00 INCHES
PIPE LENGTH = 135.37 FEET MANNING'S N = 0.01300

HYDRAULIC JUMP: DOWNSTREAM RUN ANALYSIS RESULTS

NORMAL DEPTH(FT) = 0.27 CRITICAL DEPTH(FT) = 0.33

UPSTREAM CONTROL ASSUMED FLOWDEPTH(FT) = 0.33

GRADUALLY VARIED FLOW PROFILE COMPUTED INFORMATION:

DISTANCE FROM CONTROL(FT)	FLOW DEPTH (FT)	VELOCITY (FT/SEC)	SPECIFIC ENERGY(FT)	PRESSURE+ MOMENTUM(POUNDS)
0.000	0.331	2.767	0.450	6.73
0.015	0.328	2.794	0.450	6.73
0.042	0.326	2.821	0.450	6.73
0.081	0.324	2.849	0.450	6.74
0.135	0.322	2.878	0.450	6.74
0.204	0.319	2.907	0.451	6.75

Hydraulic Analysis of line from Sediment Trap in Lot 74 to Node 5505

0.290	0.317	2.936	0.451	6.75
0.396	0.315	2.966	0.452	6.76
0.522	0.313	2.997	0.452	6.77
0.673	0.310	3.028	0.453	6.78
0.850	0.308	3.059	0.454	6.80
1.058	0.306	3.091	0.454	6.81
1.301	0.304	3.124	0.455	6.82
1.586	0.301	3.157	0.456	6.84
1.918	0.299	3.191	0.457	6.86
2.309	0.297	3.226	0.459	6.88
2.768	0.295	3.261	0.460	6.90
3.314	0.292	3.297	0.461	6.92
3.969	0.290	3.334	0.463	6.94
4.768	0.288	3.371	0.465	6.96
5.762	0.286	3.409	0.466	6.99
7.040	0.283	3.448	0.468	7.02
8.767	0.281	3.488	0.470	7.05
11.314	0.279	3.528	0.472	7.08
15.871	0.277	3.569	0.475	7.11
135.370	0.276	3.590	0.476	7.13

HYDRAULIC JUMP: UPSTREAM RUN ANALYSIS RESULTS

DOWNSTREAM CONTROL ASSUMED FLOWDEPTH(FT) = 1.06

GRADUALLY VARIED FLOW PROFILE COMPUTED INFORMATION:

DISTANCE FROM CONTROL(FT)	FLOW DEPTH (FT)	VELOCITY (FT/SEC)	SPECIFIC ENERGY(FT)	PRESSURE+ MOMENTUM(POUNDS)
0.000	1.064	0.597	1.069	40.31
2.681	1.034	0.615	1.040	37.93
5.361	1.005	0.635	1.011	35.62
8.037	0.976	0.657	0.983	33.40
10.711	0.947	0.680	0.954	31.25
13.382	0.917	0.706	0.925	29.19
16.049	0.888	0.734	0.897	27.20
18.711	0.859	0.764	0.868	25.30
21.369	0.830	0.797	0.840	23.48
24.020	0.801	0.834	0.811	21.75
26.664	0.771	0.874	0.783	20.10
29.299	0.742	0.918	0.755	18.54
31.923	0.713	0.966	0.727	17.06
34.534	0.684	1.020	0.700	15.67
37.129	0.654	1.080	0.672	14.38
39.704	0.625	1.147	0.646	13.17
42.253	0.596	1.223	0.619	12.05
44.769	0.567	1.309	0.593	11.03
47.243	0.537	1.406	0.568	10.11
49.660	0.508	1.517	0.544	9.28
51.999	0.479	1.646	0.521	8.56
54.230	0.450	1.796	0.500	7.94
56.303	0.420	1.972	0.481	7.44
58.131	0.391	2.182	0.465	7.06
59.551	0.362	2.435	0.454	6.81
60.191	0.333	2.744	0.450	6.73
135.370	0.333	2.744	0.450	6.73

----------END OF HYDRAULIC JUMP ANALYSIS----------
| PRESSURE+MOMENTUM BALANCE OCCURS AT 57.83 FEET UPSTREAM OF NODE 5505.00 |
| DOWNSTREAM DEPTH = 0.396 FEET, UPSTREAM CONJUGATE DEPTH = 0.276 FEET |

NODE 5504.10 : HGL = < 596.221>;EGL= < 596.340>;FLOWLINE= < 595.890>

```
 FLOW PROCESS FROM NODE  5504.10 TO NODE  5504.10 IS CODE =  5
 UPSTREAM NODE  5504.10     ELEVATION =   596.22  (FLOW IS AT CRITICAL DEPTH)
 (NOTE: POSSIBLE JUMP IN OR UPSTREAM OF STRUCTURE)
-------------------------------------------------------------------------------
 CALCULATE JUNCTION LOSSES:
      PIPE        FLOW    DIAMETER   ANGLE    FLOWLINE   CRITICAL   VELOCITY
                  (CFS)   (INCHES) (DEGREES) ELEVATION  DEPTH(FT.) (FT/SEC)
   UPSTREAM        0.80    18.00     90.00    596.22      0.33       4.756
  DOWNSTREAM       0.80    18.00       -      595.89      0.33       2.768
  LATERAL #1       0.00     0.00      0.00      0.00      0.00       0.000
  LATERAL #2       0.00     0.00      0.00      0.00      0.00       0.000
     Q5            0.00===Q5 EQUALS BASIN INPUT===

 LACFCD AND OCEMA FLOW JUNCTION FORMULAE USED:
 DY=(Q2*V2-Q1*V1*COS(DELTA1)-Q3*V3*COS(DELTA3)-
    Q4*V4*COS(DELTA4))/((A1+A2)*16.1)+FRICTION LOSSES
 UPSTREAM:    MANNING'S N = 0.01300;  FRICTION SLOPE = 0.02374
 DOWNSTREAM:  MANNING'S N = 0.01300;  FRICTION SLOPE = 0.00511
 AVERAGED FRICTION SLOPE IN JUNCTION ASSUMED AS 0.01442
 JUNCTION LENGTH =   4.00 FEET
 FRICTION LOSSES =  0.058 FEET         ENTRANCE LOSSES =  0.000 FEET
 JUNCTION LOSSES = (DY+HV1-HV2)+(ENTRANCE LOSSES)
 JUNCTION LOSSES = ( 0.458)+( 0.000) =   0.458
-------------------------------------------------------------------------------
 NODE  5504.10 : HGL = <  596.447>;EGL= <  596.798>;FLOWLINE= <  596.220>

*******************************************************************************
 FLOW PROCESS FROM NODE  5504.10 TO NODE  5504.20 IS CODE =  1
 UPSTREAM NODE  5504.20     ELEVATION =   596.67  (FLOW IS SUPERCRITICAL)
-------------------------------------------------------------------------------
 CALCULATE FRICTION LOSSES(LACFCD):
 PIPE FLOW    =      0.80 CFS     PIPE DIAMETER =  18.00 INCHES
 PIPE LENGTH  =     22.12 FEET          MANNING'S N  =  0.01300
-------------------------------------------------------------------------------
 NORMAL DEPTH(FT) =      0.24          CRITICAL DEPTH(FT) =      0.33
===============================================================================
 UPSTREAM CONTROL ASSUMED FLOWDEPTH(FT) =     0.17
===============================================================================
 GRADUALLY VARIED FLOW PROFILE COMPUTED INFORMATION:
-------------------------------------------------------------------------------
 DISTANCE FROM    FLOW DEPTH  VELOCITY     SPECIFIC      PRESSURE+
  CONTROL(FT)        (FT)    (FT/SEC)   ENERGY(FT)   MOMENTUM(POUNDS)
        0.000        0.169      7.285       0.994          11.77
        0.593        0.172      7.121       0.960          11.53
        1.200        0.175      6.964       0.928          11.30
        1.822        0.177      6.812       0.898          11.09
        2.460        0.180      6.666       0.870          10.88
        3.115        0.183      6.525       0.844          10.68
        3.790        0.185      6.389       0.819          10.49
        4.487        0.188      6.258       0.796          10.31
        5.209        0.190      6.132       0.775          10.14
        5.957        0.193      6.009       0.754           9.97
        6.737        0.196      5.891       0.735           9.81
        7.552        0.198      5.777       0.717           9.65
        8.408        0.201      5.666       0.700           9.50
        9.311        0.204      5.559       0.684           9.36
       10.269        0.206      5.456       0.669           9.23
       11.294        0.209      5.356       0.655           9.09
       12.399        0.212      5.259       0.641           8.97
       13.605        0.214      5.164       0.629           8.85
       14.936        0.217      5.073       0.617           8.73
       16.434        0.220      4.984       0.606           8.62
       18.158        0.222      4.898       0.595           8.51
```



```
       20.212        0.225      4.815       0.585           8.41
       22.120        0.227      4.755       0.578           8.34
-------------------------------------------------------------------------------
 NODE  5504.20 : HGL = <  596.839>;EGL= <  597.664>;FLOWLINE= <  596.670>

*******************************************************************************
 FLOW PROCESS FROM NODE  5504.20 TO NODE  5504.20 IS CODE =  5
 UPSTREAM NODE  5504.20     ELEVATION =   597.00  (FLOW IS SUPERCRITICAL)
-------------------------------------------------------------------------------
 CALCULATE JUNCTION LOSSES:
      PIPE        FLOW    DIAMETER   ANGLE    FLOWLINE   CRITICAL   VELOCITY
                  (CFS)   (INCHES) (DEGREES) ELEVATION  DEPTH(FT.) (FT/SEC)
   UPSTREAM        0.80    18.00      0.00    597.00      0.33       8.771
  DOWNSTREAM       0.80    18.00       -      596.67      0.33       7.287
  LATERAL #1       0.00     0.00      0.00      0.00      0.00       0.000
  LATERAL #2       0.00     0.00      0.00      0.00      0.00       0.000
     Q5            0.00===Q5 EQUALS BASIN INPUT===

 LACFCD AND OCEMA FLOW JUNCTION FORMULAE USED:
 DY=(Q2*V2-Q1*V1*COS(DELTA1)-Q3*V3*COS(DELTA3)-
    Q4*V4*COS(DELTA4))/((A1+A2)*16.1)+FRICTION LOSSES
 UPSTREAM:    MANNING'S N = 0.01300;  FRICTION SLOPE = 0.13627
 DOWNSTREAM:  MANNING'S N = 0.01300;  FRICTION SLOPE = 0.08019
 AVERAGED FRICTION SLOPE IN JUNCTION ASSUMED AS 0.10823
 JUNCTION LENGTH =   4.00 FEET
 FRICTION LOSSES =  0.433 FEET         ENTRANCE LOSSES =  0.000 FEET
 JUNCTION LOSSES = (DY+HV1-HV2)+(ENTRANCE LOSSES)
 JUNCTION LOSSES = ( 0.680)+( 0.000) =   0.680
-------------------------------------------------------------------------------
 NODE  5504.20 : HGL = <  597.149>;EGL= <  598.344>;FLOWLINE= <  597.000>

*******************************************************************************
 FLOW PROCESS FROM NODE  5504.20 TO NODE  5504.30 IS CODE =  1
 UPSTREAM NODE  5504.30     ELEVATION =   600.70  (FLOW IS SUPERCRITICAL)
-------------------------------------------------------------------------------
 CALCULATE FRICTION LOSSES(LACFCD):
 PIPE FLOW    =      0.80 CFS     PIPE DIAMETER =  18.00 INCHES
 PIPE LENGTH  =     22.05 FEET          MANNING'S N  =  0.01300
-------------------------------------------------------------------------------
 NORMAL DEPTH(FT) =      0.14          CRITICAL DEPTH(FT) =      0.33
===============================================================================
 UPSTREAM CONTROL ASSUMED FLOWDEPTH(FT) =     0.33
===============================================================================
 GRADUALLY VARIED FLOW PROFILE COMPUTED INFORMATION:
-------------------------------------------------------------------------------
 DISTANCE FROM    FLOW DEPTH  VELOCITY     SPECIFIC      PRESSURE+
  CONTROL(FT)        (FT)    (FT/SEC)   ENERGY(FT)   MOMENTUM(POUNDS)
        0.000        0.333      2.744       0.450           6.73
        0.002        0.325      2.836       0.450           6.73
        0.009        0.317      2.933       0.451           6.75
        0.021        0.310      3.037       0.453           6.79
        0.040        0.302      3.147       0.456           6.83
        0.065        0.294      3.264       0.460           6.90
        0.099        0.287      3.389       0.465           6.98
        0.141        0.279      3.523       0.472           7.07
        0.194        0.272      3.666       0.480           7.19
        0.260        0.264      3.820       0.491           7.33
        0.340        0.256      3.984       0.503           7.48
        0.437        0.249      4.162       0.518           7.67
        0.555        0.241      4.353       0.536           7.87
        0.697        0.233      4.561       0.557           8.11
        0.870        0.226      4.786       0.582           8.38
        1.079        0.218      5.030       0.611           8.68
```

```
          1.335          0.211          5.297          0.647          9.02
          1.649          0.203          5.589          0.688          9.40
          2.040          0.195          5.909          0.738          9.83
          2.535          0.188          6.263          0.797         10.32
          3.174          0.180          6.654          0.868         10.86
          4.028          0.172          7.088          0.953         11.48
          5.228          0.165          7.573          1.056         12.18
          7.068          0.157          8.118          1.181         12.98
         10.499          0.150          8.732          1.334         13.89
         22.050          0.149          8.768          1.344         13.94
--------------------------------------------------------------------------------
  NODE  5504.30 : HGL = <  601.033>;EGL= <  601.150>;FLOWLINE= <  600.700>

********************************************************************************
  FLOW PROCESS FROM NODE  5504.30 TO NODE  5504.30 IS CODE =  8
  UPSTREAM NODE  5504.30     ELEVATION =   600.70  (FLOW IS AT CRITICAL DEPTH)
--------------------------------------------------------------------------------
  CALCULATE CATCH BASIN ENTRANCE LOSSES(LACFCD):
  PIPE FLOW =       0.80 CFS          PIPE DIAMETER =  18.00 INCHES
  FLOW VELOCITY =   2.74 FEET/SEC.    VELOCITY HEAD =  0.117 FEET
  CATCH BASIN ENERGY LOSS = .2*(VELOCITY HEAD) = .2*(  0.117) =  0.023
--------------------------------------------------------------------------------
  NODE  5504.30 : HGL = <  601.173>;EGL= <  601.173>;FLOWLINE= <  600.700>

********************************************************************************
  UPSTREAM PIPE FLOW CONTROL DATA:
  NODE NUMBER =  5504.30          FLOWLINE ELEVATION =   600.70
  ASSUMED UPSTREAM CONTROL HGL =    601.03 FOR DOWNSTREAM RUN ANALYSIS

================================================================================
  END OF GRADUALLY VARIED FLOW ANALYSIS
```

PRE-PROJECT FLOW THROUGH EXISTING SYSTEM
(LATERAL NODES 4892-4870)

```
**************************************************************************
                PIPE-FLOW HYDRAULICS COMPUTER PROGRAM PACKAGE
          (Reference: LACFCD,LACRD, AND OCEMA HYDRAULICS CRITERION)
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                           Analysis prepared by:

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  ************************* DESCRIPTION OF STUDY *************************
 * HARMONY GROVE VILLAGE, J-16412                                       *
 * SYSTEM L (BASIN 4000B) - 100-YR LATERAL LINE NODES 4892-4870         *
 * H:\16412\HYDRO\HYDRAULICS\PIPEFLOW\...                               *
  ************************************************************************

   FILE NAME: 4892L.LAT
   TIME/DATE OF STUDY: 10:15 07/23/2012

**************************************************************************
               GRADUALLY VARIED FLOW ANALYSIS FOR PIPE SYSTEM
                         NODAL POINT STATUS TABLE
                (Note: "*" indicates nodal point data used.)
                      UPSTREAM RUN                  DOWNSTREAM RUN
    NODE     MODEL    PRESSURE      PRESSURE+         FLOW         PRESSURE+
   NUMBER  PROCESS   HEAD(FT)   MOMENTUM(POUNDS)   DEPTH(FT)   MOMENTUM(POUNDS)
  4892.00-              3.45*            307.60        0.47              42.67
         } FRICTION
  4885.00-              3.23*            283.27        0.48              41.79
         } JUNCTION
  4885.00-              2.95*            248.15        0.26              46.08
         } FRICTION         } HYDRAULIC JUMP
  4870.00-             0.56*Dc            24.34        0.56*Dc           24.34
         } CATCH BASIN
  4870.00-              0.81*             12.99        0.56 Dc            8.76
--------------------------------------------------------------------------
  MAXIMUM NUMBER OF ENERGY BALANCES USED IN EACH PROFILE =  25
--------------------------------------------------------------------------
  NOTE: STEADY FLOW HYDRAULIC HEAD-LOSS COMPUTATIONS BASED ON THE MOST
  CONSERVATIVE FORMULAE FROM THE CURRENT LACRD,LACFCD, AND OCEMA
  DESIGN MANUALS.
**************************************************************************
  DOWNSTREAM PIPE FLOW CONTROL DATA:
  NODE NUMBER =  4892.00            FLOWLINE ELEVATION =   597.68
  PIPE FLOW =       3.00 CFS        PIPE DIAMETER =  18.00 INCHES
  ASSUMED DOWNSTREAM CONTROL HGL =   601.130 FEET
--------------------------------------------------------------------------
  NODE  4892.00 : HGL = <  601.130>;EGL= <  601.175>;FLOWLINE= <  597.680>

**************************************************************************
  FLOW PROCESS FROM NODE  4892.00 TO NODE  4885.00 IS CODE =  1
  UPSTREAM NODE  4885.00     ELEVATION =   597.91  (FLOW IS UNDER PRESSURE)
--------------------------------------------------------------------------
  CALCULATE FRICTION LOSSES(LACFCD):
  PIPE FLOW   =       3.00 CFS     PIPE DIAMETER =  18.00 INCHES
  PIPE LENGTH =      11.50 FEET          MANNING'S N  =  0.01300
  SF=(Q/K)**2 = ((      3.00)/(   104.935))**2 = 0.00082
  HF=L*SF = (     11.50)*(0.00082) =      0.009
--------------------------------------------------------------------------
```

```
  NODE  4885.00 : HGL = <  601.139>;EGL= <  601.184>;FLOWLINE= <  597.910>

****************************************************************************
  FLOW PROCESS FROM NODE  4885.00 TO NODE  4885.00 IS CODE =  5
  UPSTREAM NODE  4885.00     ELEVATION =   598.24  (FLOW IS UNDER PRESSURE)
----------------------------------------------------------------------------
  CALCULATE JUNCTION LOSSES:
       PIPE       FLOW    DIAMETER   ANGLE    FLOWLINE   CRITICAL   VELOCITY
                  (CFS)   (INCHES) (DEGREES) ELEVATION  DEPTH(FT.)  (FT/SEC)
     UPSTREAM       2.20    18.00      0.00    598.24      0.56        1.246
    DOWNSTREAM      3.00    18.00       -      597.91      0.66        1.697
    LATERAL #1      0.00     0.00      0.00      0.00      0.00        0.000
    LATERAL #2      0.00     0.00      0.00      0.00      0.00        0.000
       Q5           0.80===Q5 EQUALS BASIN INPUT===

  LACFCD AND OCEMA FLOW JUNCTION FORMULAE USED:
  DY=(Q2*V2-Q1*V1*COS(DELTA1)-Q3*V3*COS(DELTA3)-
      Q4*V4*COS(DELTA4))/((A1+A2)*16.1)+FRICTION LOSSES
  UPSTREAM:    MANNING'S N = 0.01300;  FRICTION SLOPE = 0.00044
  DOWNSTREAM:  MANNING'S N = 0.01300;  FRICTION SLOPE = 0.00082
  AVERAGED FRICTION SLOPE IN JUNCTION ASSUMED AS 0.00063
  JUNCTION LENGTH =   4.00 FEET
  FRICTION LOSSES =  0.003 FEET         ENTRANCE LOSSES =  0.009 FEET
  JUNCTION LOSSES = (DY+HV1-HV2)+(ENTRANCE LOSSES)
  JUNCTION LOSSES = ( 0.023)+( 0.009) =   0.032
----------------------------------------------------------------------------
  NODE  4885.00 : HGL = <  601.192>;EGL= <  601.216>;FLOWLINE= <  598.240>

****************************************************************************
  FLOW PROCESS FROM NODE  4885.00 TO NODE  4870.00 IS CODE =  1
  UPSTREAM NODE  4870.00     ELEVATION =   603.00  (HYDRAULIC JUMP OCCURS)
----------------------------------------------------------------------------
  CALCULATE FRICTION LOSSES(LACFCD):
  PIPE FLOW   =       2.20 CFS     PIPE DIAMETER =  18.00 INCHES
  PIPE LENGTH =      41.38 FEET          MANNING'S N  =  0.01300
----------------------------------------------------------------------------
  HYDRAULIC JUMP: DOWNSTREAM RUN ANALYSIS RESULTS
----------------------------------------------------------------------------
  NORMAL DEPTH(FT) =      0.25          CRITICAL DEPTH(FT) =      0.56
============================================================================
  UPSTREAM CONTROL ASSUMED FLOWDEPTH(FT) =     0.56
============================================================================
  GRADUALLY VARIED FLOW PROFILE COMPUTED INFORMATION:
----------------------------------------------------------------------------
  DISTANCE FROM      FLOW DEPTH  VELOCITY      SPECIFIC        PRESSURE+
   CONTROL(FT)          (FT)    (FT/SEC)     ENERGY(FT)    MOMENTUM(POUNDS)
         0.000          0.560      3.654          0.768           24.34
         0.005          0.548      3.765          0.768           24.36
         0.020          0.536      3.883          0.770           24.42
         0.048          0.523      4.007          0.773           24.53
         0.089          0.511      4.140          0.777           24.68
         0.145          0.499      4.280          0.783           24.88
         0.220          0.486      4.430          0.791           25.13
         0.314          0.474      4.589          0.801           25.43
         0.431          0.462      4.758          0.814           25.79
         0.575          0.450      4.940          0.829           26.22
         0.751          0.437      5.134          0.847           26.71
         0.964          0.425      5.342          0.868           27.28
         1.221          0.413      5.566          0.894           27.92
         1.530          0.400      5.807          0.924           28.65
         1.902          0.388      6.067          0.960           29.48
         2.353          0.376      6.348          1.002           30.40
         2.901          0.363      6.654          1.051           31.45
```

```
         3.571          0.351      6.986          1.109            32.62
         4.403          0.339      7.348          1.178            33.93
         5.449          0.327      7.745          1.259            35.39
         6.794          0.314      8.181          1.354            37.04
         8.582          0.302      8.661          1.467            38.89
        11.082          0.290      9.192          1.603            40.96
        14.897          0.277      9.783          1.764            43.31
        21.969          0.265     10.443          1.959            45.95
        41.380          0.264     10.473          1.969            46.08
--------------------------------------------------------------------------------
  HYDRAULIC JUMP: UPSTREAM RUN ANALYSIS RESULTS
================================================================================
  DOWNSTREAM CONTROL ASSUMED PRESSURE HEAD(FT) =     2.95
================================================================================
  PRESSURE FLOW PROFILE COMPUTED INFORMATION:
--------------------------------------------------------------------------------
  DISTANCE FROM       PRESSURE   VELOCITY      SPECIFIC        PRESSURE+
   CONTROL(FT)        HEAD(FT)   (FT/SEC)     ENERGY(FT)    MOMENTUM(POUNDS)
         0.000          2.952      1.245          2.976           248.15
        12.673          1.500      1.245          1.524            88.01
================================================================================
  ASSUMED DOWNSTREAM PRESSURE HEAD(FT) =     1.50
================================================================================
  GRADUALLY VARIED FLOW PROFILE COMPUTED INFORMATION:
--------------------------------------------------------------------------------
  DISTANCE FROM      FLOW DEPTH  VELOCITY      SPECIFIC        PRESSURE+
   CONTROL(FT)          (FT)    (FT/SEC)     ENERGY(FT)    MOMENTUM(POUNDS)
        12.673          1.500      1.245          1.524            88.01
        12.998          1.462      1.253          1.487            83.91
        13.321          1.425      1.268          1.450            79.88
        13.642          1.387      1.289          1.413            75.93
        13.961          1.350      1.313          1.376            72.07
        14.278          1.312      1.342          1.340            68.31
        14.594          1.274      1.374          1.304            64.64
        14.909          1.237      1.411          1.268            61.10
        15.221          1.199      1.452          1.232            57.67
        15.531          1.162      1.498          1.197            54.36
        15.838          1.124      1.548          1.161            51.19
        16.142          1.086      1.604          1.126            48.15
        16.443          1.049      1.666          1.092            45.26
        16.740          1.011      1.735          1.058            42.52
        17.032          0.974      1.811          1.025            39.94
        17.319          0.936      1.896          0.992            37.51
        17.598          0.899      1.990          0.960            35.26
        17.869          0.861      2.096          0.929            33.18
        18.130          0.823      2.214          0.900            31.29
        18.378          0.786      2.347          0.871            29.59
        18.610          0.748      2.497          0.845            28.10
        18.821          0.711      2.668          0.821            26.83
        19.006          0.673      2.863          0.800            25.79
        19.156          0.635      3.087          0.784            25.01
        19.259          0.598      3.348          0.772            24.52
        19.298          0.560      3.654          0.768            24.34
        41.380          0.560      3.654          0.768            24.34
------------------------END OF HYDRAULIC JUMP ANALYSIS------------------------
| PRESSURE+MOMENTUM BALANCE OCCURS AT    16.37 FEET UPSTREAM OF NODE 4885.00 |
|       DOWNSTREAM DEPTH = 1.058 FEET, UPSTREAM CONJUGATE DEPTH = 0.265 FEET |
--------------------------------------------------------------------------------
  NODE  4870.00 : HGL = <  603.560>;EGL= <  603.768>;FLOWLINE= <  603.000>

****************************************************************************
  FLOW PROCESS FROM NODE  4870.00 TO NODE  4870.00 IS CODE =  8
  UPSTREAM NODE  4870.00     ELEVATION =   603.00  (FLOW IS AT CRITICAL DEPTH)
```

```
--------------------------------------------------------------------------------
  CALCULATE CATCH BASIN ENTRANCE LOSSES(LACFCD):
  PIPE FLOW =       2.20 CFS          PIPE DIAMETER =  18.00 INCHES
  FLOW VELOCITY =   3.65 FEET/SEC.    VELOCITY HEAD =  0.207 FEET
  CATCH BASIN ENERGY LOSS = .2*(VELOCITY HEAD) = .2*(  0.207) =  0.041
--------------------------------------------------------------------------------
  NODE  4870.00 : HGL = <  603.809>;EGL= <  603.809>;FLOWLINE= <  603.000>

********************************************************************************
  UPSTREAM PIPE FLOW CONTROL DATA:
  NODE NUMBER =  4870.00           FLOWLINE ELEVATION =   603.00
  ASSUMED UPSTREAM CONTROL HGL =    603.56 FOR DOWNSTREAM RUN ANALYSIS

================================================================================
  END OF GRADUALLY VARIED FLOW ANALYSIS
```

POST-PROJECT FLOW THROUGH EXISTING SYSTEM
DRAINAGE BASIN 2
(LATERAL NODES 4892-4870)

```
**************************************************************************
                PIPE-FLOW HYDRAULICS COMPUTER PROGRAM PACKAGE
          (Reference: LACFCD,LACRD, AND OCEMA HYDRAULICS CRITERION)
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                           Analysis prepared by:

                         RICK ENGINEERING COMPANY
                             5620 Friars Road
                        San Diego, California 92110
                       619-291-0707   Fax 619-291-4165

 ************************* DESCRIPTION OF STUDY *************************
* HARMONY GROVE VILLAGE, J-17164-D                                      *
* SYSTEM L (BASIN 4000B) - 100-YR LATERAL LINE NODES 4892-4870          *
* H:\17164\WATERRESOURCES\HYDRAULICS\PIPEFLOW\...                       *
 ************************************************************************

  FILE NAME: 4892L.LAT
  TIME/DATE OF STUDY: 16:16 07/31/2025

**************************************************************************
               GRADUALLY VARIED FLOW ANALYSIS FOR PIPE SYSTEM
                         NODAL POINT STATUS TABLE
                (Note: "*" indicates nodal point data used.)
                      UPSTREAM RUN                  DOWNSTREAM RUN
   NODE     MODEL    PRESSURE      PRESSURE+         FLOW         PRESSURE+
  NUMBER   PROCESS  HEAD(FT)   MOMENTUM(POUNDS)   DEPTH(FT)   MOMENTUM(POUNDS)
 4892.00-             3.45*           329.71        0.57             100.54
       } FRICTION
 4885.00-             3.25*           307.70        0.55             104.79
       } JUNCTION
 4885.00-             3.04*           275.51        0.38             119.01
       } FRICTION        } HYDRAULIC JUMP
 4870.00-            0.82*Dc           63.12        0.82*Dc           63.12
       } CATCH BASIN
 4870.00-             1.22*            34.60        0.82 Dc           21.85
--------------------------------------------------------------------------
  MAXIMUM NUMBER OF ENERGY BALANCES USED IN EACH PROFILE =  25
--------------------------------------------------------------------------
  NOTE: STEADY FLOW HYDRAULIC HEAD-LOSS COMPUTATIONS BASED ON THE MOST
  CONSERVATIVE FORMULAE FROM THE CURRENT LACRD,LACFCD, AND OCEMA
  DESIGN MANUALS.
**************************************************************************
  DOWNSTREAM PIPE FLOW CONTROL DATA:
  NODE NUMBER =  4892.00           FLOWLINE ELEVATION =   597.68
  PIPE FLOW =       5.40 CFS       PIPE DIAMETER =  18.00 INCHES
  ASSUMED DOWNSTREAM CONTROL HGL =   601.130 FEET
```

NOTE: THE ANALYSIS FLOW INCLUDES THE EXISTING 0.8 CFS ENTERING THE EXISTING CURB INLET ON COUNTRY LIVING WAY AND THE UPDATED POST-PROJECT PEAK FLOW OF 4.6 CFS FROM BASIN 2.

```
------------------------------------------------------------------------------
  NODE  4892.00 : HGL = <  601.130>;EGL= <  601.275>;FLOWLINE= <  597.680>

******************************************************************************
  FLOW PROCESS FROM NODE  4892.00 TO NODE  4885.00 IS CODE =  1
  UPSTREAM NODE  4885.00     ELEVATION =   597.91  (FLOW IS UNDER PRESSURE)
------------------------------------------------------------------------------
  CALCULATE FRICTION LOSSES(LACFCD):
  PIPE FLOW   =       5.40 CFS     PIPE DIAMETER =  18.00 INCHES
  PIPE LENGTH =      11.50 FEET          MANNING'S N  =  0.01300
  SF=(Q/K)**2 = ((      5.40)/(   105.036))**2 = 0.00264
  HF=L*SF = (     11.50)*(0.00264) =      0.030
------------------------------------------------------------------------------
  NODE  4885.00 : HGL = <  601.160>;EGL= <  601.305>;FLOWLINE= <  597.910>

******************************************************************************
  FLOW PROCESS FROM NODE  4885.00 TO NODE  4885.00 IS CODE =  5
  UPSTREAM NODE  4885.00     ELEVATION =   598.24  (FLOW IS UNDER PRESSURE)
------------------------------------------------------------------------------
  CALCULATE JUNCTION LOSSES:
       PIPE       FLOW    DIAMETER   ANGLE    FLOWLINE   CRITICAL   VELOCITY
                  (CFS)   (INCHES) (DEGREES) ELEVATION  DEPTH(FT.)  (FT/SEC)
     UPSTREAM       4.60    18.00      0.00    598.24      0.82        2.603
    DOWNSTREAM      5.40    18.00       -      597.91      0.90        3.056
    LATERAL #1      0.00     0.00      0.00      0.00      0.00        0.000
    LATERAL #2      0.00     0.00      0.00      0.00      0.00        0.000
       Q5           0.80===Q5 EQUALS BASIN INPUT===

  LACFCD AND OCEMA FLOW JUNCTION FORMULAE USED:
  DY=(Q2*V2-Q1*V1*COS(DELTA1)-Q3*V3*COS(DELTA3)-
      Q4*V4*COS(DELTA4))/((A1+A2)*16.1)+FRICTION LOSSES
  UPSTREAM:    MANNING'S N = 0.01300;  FRICTION SLOPE = 0.00192
  DOWNSTREAM:  MANNING'S N = 0.01300;  FRICTION SLOPE = 0.00264
  AVERAGED FRICTION SLOPE IN JUNCTION ASSUMED AS 0.00228
  JUNCTION LENGTH =   4.00 FEET
  FRICTION LOSSES =  0.009 FEET         ENTRANCE LOSSES =  0.029 FEET
  JUNCTION LOSSES = (DY+HV1-HV2)+(ENTRANCE LOSSES)
  JUNCTION LOSSES = ( 0.049)+( 0.029) =   0.078
------------------------------------------------------------------------------
  NODE  4885.00 : HGL = <  601.278>;EGL= <  601.383>;FLOWLINE= <  598.240>

******************************************************************************
  FLOW PROCESS FROM NODE  4885.00 TO NODE  4870.00 IS CODE =  1
  UPSTREAM NODE  4870.00     ELEVATION =   603.00  (HYDRAULIC JUMP OCCURS)
------------------------------------------------------------------------------
  CALCULATE FRICTION LOSSES(LACFCD):
  PIPE FLOW   =       4.60 CFS     PIPE DIAMETER =  18.00 INCHES
  PIPE LENGTH =      41.38 FEET          MANNING'S N  =  0.01300
------------------------------------------------------------------------------
  HYDRAULIC JUMP: DOWNSTREAM RUN ANALYSIS RESULTS
```

NORMAL DEPTH(FT) = 0.36 CRITICAL DEPTH(FT) = 0.82

UPSTREAM CONTROL ASSUMED FLOWDEPTH(FT) = 0.82

GRADUALLY VARIED FLOW PROFILE COMPUTED INFORMATION:

DISTANCE FROM CONTROL(FT)	FLOW DEPTH (FT)	VELOCITY (FT/SEC)	SPECIFIC ENERGY(FT)	PRESSURE+ MOMENTUM(POUNDS)
0.000	0.823	4.628	1.156	63.12
0.007	0.805	4.760	1.157	63.17
0.031	0.787	4.899	1.160	63.32
0.073	0.768	5.047	1.164	63.58
0.135	0.750	5.205	1.171	63.96
0.221	0.732	5.372	1.180	64.46
0.333	0.713	5.551	1.192	65.08
0.476	0.695	5.742	1.207	65.85
0.655	0.676	5.946	1.226	66.77
0.874	0.658	6.164	1.248	67.84
1.141	0.640	6.398	1.276	69.09
1.465	0.621	6.650	1.308	70.53
1.856	0.603	6.922	1.347	72.17
2.328	0.585	7.214	1.393	74.03
2.896	0.566	7.531	1.447	76.14
3.585	0.548	7.875	1.511	78.52
4.423	0.529	8.248	1.586	81.20
5.451	0.511	8.656	1.675	84.21
6.726	0.493	9.101	1.780	87.59
8.333	0.474	9.590	1.903	91.38
10.405	0.456	10.129	2.050	95.65
13.164	0.438	10.725	2.225	100.46
17.028	0.419	11.386	2.433	105.88
22.939	0.401	12.124	2.685	112.01
33.923	0.382	12.951	2.988	118.96
41.380	0.382	12.957	2.991	119.01

HYDRAULIC JUMP: UPSTREAM RUN ANALYSIS RESULTS

DOWNSTREAM CONTROL ASSUMED PRESSURE HEAD(FT) = 3.04

PRESSURE FLOW PROFILE COMPUTED INFORMATION:

DISTANCE FROM CONTROL(FT)	PRESSURE HEAD(FT)	VELOCITY (FT/SEC)	SPECIFIC ENERGY(FT)	PRESSURE+ MOMENTUM(POUNDS)
0.000	3.038	2.603	3.143	275.51
13.598	1.500	2.603	1.605	105.91

ASSUMED DOWNSTREAM PRESSURE HEAD(FT) = 1.50

GRADUALLY VARIED FLOW PROFILE COMPUTED INFORMATION:

```
--------------------------------------------------------------------------
  DISTANCE FROM      FLOW DEPTH  VELOCITY      SPECIFIC        PRESSURE+
   CONTROL(FT)          (FT)    (FT/SEC)     ENERGY(FT)    MOMENTUM(POUNDS)
        13.598          1.500      2.602          1.605           105.91
        13.829          1.473      2.613          1.579           103.02
        14.054          1.446      2.633          1.554           100.24
        14.274          1.419      2.658          1.529            97.53
        14.490          1.392      2.689          1.504            94.90
        14.703          1.365      2.724          1.480            92.34
        14.912          1.338      2.764          1.456            89.87
        15.117          1.311      2.808          1.433            87.47
        15.318          1.284      2.856          1.410            85.16
        15.515          1.256      2.909          1.388            82.94
        15.708          1.229      2.967          1.366            80.81
        15.896          1.202      3.029          1.345            78.77
        16.079          1.175      3.096          1.324            76.83
        16.257          1.148      3.168          1.304            75.00
        16.428          1.121      3.246          1.285            73.27
        16.592          1.094      3.330          1.266            71.66
        16.748          1.067      3.420          1.249            70.16
        16.896          1.040      3.517          1.232            68.79
        17.034          1.013      3.622          1.217            67.54
        17.161          0.986      3.734          1.203            66.43
        17.275          0.959      3.856          1.190            65.47
        17.375          0.932      3.987          1.179            64.66
        17.458          0.905      4.128          1.169            64.01
        17.521          0.878      4.282          1.162            63.52
        17.562          0.851      4.448          1.158            63.23
        17.577          0.823      4.628          1.156            63.12
        41.380          0.823      4.628          1.156            63.12
------------------------END OF HYDRAULIC JUMP ANALYSIS------------------------
| PRESSURE+MOMENTUM BALANCE OCCURS AT    12.82 FEET UPSTREAM OF NODE 4885.00 |
|       DOWNSTREAM DEPTH = 1.588 FEET, UPSTREAM CONJUGATE DEPTH = 0.391 FEET |
--------------------------------------------------------------------------
  NODE  4870.00 : HGL = <  603.823>;EGL= <  604.156>;FLOWLINE= <  603.000>

**************************************************************************
  FLOW PROCESS FROM NODE  4870.00 TO NODE  4870.00 IS CODE =  8
  UPSTREAM NODE  4870.00     ELEVATION =   603.00  (FLOW IS SUBCRITICAL)
--------------------------------------------------------------------------
  CALCULATE CATCH BASIN ENTRANCE LOSSES(LACFCD):
  PIPE FLOW =       4.60 CFS          PIPE DIAMETER =  18.00 INCHES
  FLOW VELOCITY =   4.63 FEET/SEC.    VELOCITY HEAD =  0.333 FEET
  CATCH BASIN ENERGY LOSS = .2*(VELOCITY HEAD) = .2*(  0.333) =  0.067
--------------------------------------------------------------------------
  NODE  4870.00 : HGL = <  604.223>;EGL= <  604.223>;FLOWLINE= <  603.000>

**************************************************************************
  UPSTREAM PIPE FLOW CONTROL DATA:
  NODE NUMBER =  4870.00            FLOWLINE ELEVATION =   603.00
```

```
  ASSUMED UPSTREAM CONTROL HGL =    603.82 FOR DOWNSTREAM RUN ANALYSIS

================================================================================
  END OF GRADUALLY VARIED FLOW ANALYSIS
 ↟
```

PHASE 1 (PRE-PROJECT) FLOW THROUGH EXISTING SYSTEM
(LATERAL NODES 4945-4937)

```
**************************************************************************
                PIPE-FLOW HYDRAULICS COMPUTER PROGRAM PACKAGE
          (Reference: LACFCD,LACRD, AND OCEMA HYDRAULICS CRITERION)
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                           Analysis prepared by:

                              RICK ENGINEERING COMPANY
                         1223 University Avenue, Suite 240
                          Riverside, California 92507-3418
                         (909) 782-0707  Fax (909) 782-0723

  ************************* DESCRIPTION OF STUDY *************************
 * HARMONY GROVE VILLAGE, J-16412                                       *
 * SYSTEM L (BASIN 4000B) - 100-YR LATERAL LINE NODES 4945-4937         *
 * H:\16412\HYDRO\HYDRAULICS\PIPEFLOW\...                               *
  ************************************************************************

   FILE NAME: 4945R.LAT
   TIME/DATE OF STUDY: 11:04 07/20/2012

**************************************************************************
               GRADUALLY VARIED FLOW ANALYSIS FOR PIPE SYSTEM
                         NODAL POINT STATUS TABLE
                (Note: "*" indicates nodal point data used.)
                      UPSTREAM RUN                  DOWNSTREAM RUN
    NODE     MODEL    PRESSURE      PRESSURE+         FLOW         PRESSURE+
   NUMBER  PROCESS   HEAD(FT)   MOMENTUM(POUNDS)   DEPTH(FT)   MOMENTUM(POUNDS)
  4945.00-              6.22*            688.10        0.51              288.37
         } FRICTION
  4943.00-              1.82*            202.94        1.15 Dc           150.14
         } JUNCTION
  4943.00-              2.25*            166.79        0.17               14.22
         } FRICTION
  4940.00-              0.59*             12.36        0.27                8.74
         } JUNCTION
  4940.00-              0.35 Dc           7.81         0.19*              12.50
         } FRICTION
  4937.00-              0.35*Dc           7.81         0.35*Dc             7.81
         } CATCH BASIN
  4937.00-              0.50*             4.13         0.35 Dc             2.87
--------------------------------------------------------------------------
  MAXIMUM NUMBER OF ENERGY BALANCES USED IN EACH PROFILE =  25
--------------------------------------------------------------------------
  NOTE: STEADY FLOW HYDRAULIC HEAD-LOSS COMPUTATIONS BASED ON THE MOST
  CONSERVATIVE FORMULAE FROM THE CURRENT LACRD,LACFCD, AND OCEMA
  DESIGN MANUALS.
**************************************************************************
  DOWNSTREAM PIPE FLOW CONTROL DATA:
  NODE NUMBER =  4945.00           FLOWLINE ELEVATION =   594.00
  PIPE FLOW =       8.80 CFS       PIPE DIAMETER =  18.00 INCHES
  ASSUMED DOWNSTREAM CONTROL HGL =   600.220 FEET
--------------------------------------------------------------------------
  NODE  4945.00 : HGL = <  600.220>;EGL= <  600.605>;FLOWLINE= <  594.000>

**************************************************************************
  FLOW PROCESS FROM NODE  4945.00 TO NODE  4943.00 IS CODE =  1
  UPSTREAM NODE  4943.00     ELEVATION =   598.56  (FLOW IS UNDER PRESSURE)
--------------------------------------------------------------------------
  CALCULATE FRICTION LOSSES(LACFCD):
  PIPE FLOW   =       8.80 CFS     PIPE DIAMETER =  18.00 INCHES
```

```
  PIPE LENGTH =      22.84 FEET          MANNING'S N  =  0.01300
  SF=(Q/K)**2 = ((      8.80)/(   105.049))**2 = 0.00702
  HF=L*SF = (     22.84)*(0.00702) =      0.160
--------------------------------------------------------------------------------
  NODE  4943.00 : HGL = <  600.380>;EGL= <  600.765>;FLOWLINE= <  598.560>

********************************************************************************
  FLOW PROCESS FROM NODE  4943.00 TO NODE  4943.00 IS CODE =  5
  UPSTREAM NODE  4943.00     ELEVATION =   598.98  (FLOW IS UNDER PRESSURE)
--------------------------------------------------------------------------------
  CALCULATE JUNCTION LOSSES:
       PIPE       FLOW    DIAMETER   ANGLE    FLOWLINE   CRITICAL   VELOCITY
                  (CFS)   (INCHES) (DEGREES) ELEVATION  DEPTH(FT.)  (FT/SEC)
     UPSTREAM       0.90    18.00     27.80    598.98      0.35        0.509
    DOWNSTREAM      8.80    18.00       -      598.56      1.15        4.980
    LATERAL #1      0.00     0.00      0.00      0.00      0.00        0.000
    LATERAL #2      0.00     0.00      0.00      0.00      0.00        0.000
       Q5           7.90===Q5 EQUALS BASIN INPUT===

  LACFCD AND OCEMA FLOW JUNCTION FORMULAE USED:
  DY=(Q2*V2-Q1*V1*COS(DELTA1)-Q3*V3*COS(DELTA3)-
      Q4*V4*COS(DELTA4))/((A1+A2)*16.1)+FRICTION LOSSES
  UPSTREAM:    MANNING'S N = 0.01300;  FRICTION SLOPE = 0.00007
  DOWNSTREAM:  MANNING'S N = 0.01300;  FRICTION SLOPE = 0.00702
  AVERAGED FRICTION SLOPE IN JUNCTION ASSUMED AS 0.00355
  JUNCTION LENGTH =   4.00 FEET
  FRICTION LOSSES =  0.014 FEET         ENTRANCE LOSSES =  0.077 FEET
  JUNCTION LOSSES = (DY+HV1-HV2)+(ENTRANCE LOSSES)
  JUNCTION LOSSES = ( 0.396)+( 0.077) =   0.473
--------------------------------------------------------------------------------
  NODE  4943.00 : HGL = <  601.234>;EGL= <  601.239>;FLOWLINE= <  598.980>

********************************************************************************
  FLOW PROCESS FROM NODE  4943.00 TO NODE  4940.00 IS CODE =  1
  UPSTREAM NODE  4940.00     ELEVATION =   600.62  (FLOW SEALS IN REACH)
--------------------------------------------------------------------------------
  CALCULATE FRICTION LOSSES(LACFCD):
  PIPE FLOW   =       0.90 CFS     PIPE DIAMETER =  18.00 INCHES
  PIPE LENGTH =      16.38 FEET          MANNING'S N  =  0.01300
================================================================================
  DOWNSTREAM CONTROL ASSUMED PRESSURE HEAD(FT) =     2.25
================================================================================
  PRESSURE FLOW PROFILE COMPUTED INFORMATION:
--------------------------------------------------------------------------------
  DISTANCE FROM       PRESSURE   VELOCITY      SPECIFIC        PRESSURE+
   CONTROL(FT)        HEAD(FT)   (FT/SEC)     ENERGY(FT)    MOMENTUM(POUNDS)
         0.000          2.254      0.509          2.259           166.79
         7.541          1.500      0.509          1.504            83.59
--------------------------------------------------------------------------------
  NORMAL DEPTH(FT) =      0.17           CRITICAL DEPTH(FT) =      0.35
================================================================================
  ASSUMED DOWNSTREAM PRESSURE HEAD(FT) =     1.50
================================================================================
  GRADUALLY VARIED FLOW PROFILE COMPUTED INFORMATION:
--------------------------------------------------------------------------------
  DISTANCE FROM      FLOW DEPTH  VELOCITY      SPECIFIC        PRESSURE+
   CONTROL(FT)          (FT)    (FT/SEC)     ENERGY(FT)    MOMENTUM(POUNDS)
         7.541          1.500      0.509          1.504            83.59
         7.999          1.454      0.514          1.458            78.56
         8.456          1.408      0.522          1.413            73.60
         8.912          1.362      0.534          1.367            68.74
         9.369          1.317      0.547          1.321            64.00
         9.824          1.271      0.564          1.276            59.39
```

```
        10.279          1.225      0.582          1.230            54.93
        10.734          1.179      0.604          1.185            50.62
        11.188          1.133      0.628          1.139            46.48
        11.641          1.087      0.656          1.094            42.51
        12.093          1.041      0.687          1.049            38.73
        12.544          0.995      0.723          1.004            35.14
        12.993          0.950      0.763          0.959            31.74
        13.441          0.904      0.809          0.914            28.54
        13.886          0.858      0.861          0.869            25.54
        14.328          0.812      0.921          0.825            22.75
        14.767          0.766      0.991          0.781            20.18
        15.200          0.720      1.072          0.738            17.82
        15.627          0.674      1.168          0.696            15.69
        16.044          0.628      1.281          0.654            13.78
        16.380          0.590      1.393          0.620            12.36
--------------------------------------------------------------------------------
  NODE  4940.00 : HGL = <  601.210>;EGL= <  601.240>;FLOWLINE= <  600.620>

********************************************************************************
  FLOW PROCESS FROM NODE  4940.00 TO NODE  4940.00 IS CODE =  5
  UPSTREAM NODE  4940.00     ELEVATION =   600.95  (FLOW IS SUBCRITICAL)
  (NOTE: POSSIBLE JUMP IN OR UPSTREAM OF STRUCTURE)
--------------------------------------------------------------------------------
  CALCULATE JUNCTION LOSSES:
       PIPE       FLOW    DIAMETER   ANGLE    FLOWLINE   CRITICAL   VELOCITY
                  (CFS)   (INCHES) (DEGREES) ELEVATION  DEPTH(FT.)  (FT/SEC)
     UPSTREAM       0.90    18.00     56.10    600.95      0.35        6.797
    DOWNSTREAM      0.90    18.00       -      600.62      0.35        1.393
    LATERAL #1      0.00     0.00      0.00      0.00      0.00        0.000
    LATERAL #2      0.00     0.00      0.00      0.00      0.00        0.000
       Q5           0.00===Q5 EQUALS BASIN INPUT===

  LACFCD AND OCEMA FLOW JUNCTION FORMULAE USED:
  DY=(Q2*V2-Q1*V1*COS(DELTA1)-Q3*V3*COS(DELTA3)-
      Q4*V4*COS(DELTA4))/((A1+A2)*16.1)+FRICTION LOSSES
  UPSTREAM:    MANNING'S N = 0.01300;  FRICTION SLOPE = 0.05942
  DOWNSTREAM:  MANNING'S N = 0.01300;  FRICTION SLOPE = 0.00069
  AVERAGED FRICTION SLOPE IN JUNCTION ASSUMED AS 0.03005
  JUNCTION LENGTH =   4.00 FEET
  FRICTION LOSSES =  0.120 FEET         ENTRANCE LOSSES =  0.000 FEET
  JUNCTION LOSSES = (DY+HV1-HV2)+(ENTRANCE LOSSES)
  JUNCTION LOSSES = ( 0.619)+( 0.000) =   0.619
--------------------------------------------------------------------------------
  NODE  4940.00 : HGL = <  601.142>;EGL= <  601.860>;FLOWLINE= <  600.950>

********************************************************************************
  FLOW PROCESS FROM NODE  4940.00 TO NODE  4937.00 IS CODE =  1
  UPSTREAM NODE  4937.00     ELEVATION =   602.30  (FLOW IS SUPERCRITICAL)
--------------------------------------------------------------------------------
  CALCULATE FRICTION LOSSES(LACFCD):
  PIPE FLOW   =       0.90 CFS     PIPE DIAMETER =  18.00 INCHES
  PIPE LENGTH =      19.64 FEET          MANNING'S N  =  0.01300
--------------------------------------------------------------------------------
  NORMAL DEPTH(FT) =      0.19           CRITICAL DEPTH(FT) =      0.35
================================================================================
  UPSTREAM CONTROL ASSUMED FLOWDEPTH(FT) =     0.35
================================================================================
  GRADUALLY VARIED FLOW PROFILE COMPUTED INFORMATION:
--------------------------------------------------------------------------------
  DISTANCE FROM      FLOW DEPTH  VELOCITY      SPECIFIC        PRESSURE+
   CONTROL(FT)           (FT)    (FT/SEC)     ENERGY(FT)    MOMENTUM(POUNDS)
          0.000          0.353      2.833          0.478             7.81
          0.004          0.347      2.911          0.478             7.81
```

```
          0.017          0.340      2.993          0.479             7.83
          0.039          0.333      3.079          0.480             7.85
          0.072          0.326      3.169          0.483             7.89
          0.118          0.320      3.264          0.485             7.94
          0.177          0.313      3.364          0.489             8.00
          0.252          0.306      3.470          0.493             8.08
          0.344          0.300      3.581          0.499             8.16
          0.457          0.293      3.699          0.506             8.27
          0.594          0.286      3.824          0.513             8.38
          0.758          0.280      3.956          0.523             8.52
          0.954          0.273      4.096          0.534             8.67
          1.188          0.266      4.245          0.546             8.84
          1.468          0.259      4.404          0.561             9.03
          1.803          0.253      4.573          0.578             9.24
          2.206          0.246      4.754          0.597             9.47
          2.695          0.239      4.948          0.620             9.74
          3.295          0.233      5.155          0.646            10.02
          4.040          0.226      5.378          0.675            10.34
          4.988          0.219      5.618          0.710            10.69
          6.232          0.213      5.877          0.749            11.08
          7.950          0.206      6.157          0.795            11.50
         10.537          0.199      6.461          0.848            11.97
         15.268          0.193      6.791          0.909            12.49
         19.640          0.192      6.795          0.910            12.50
--------------------------------------------------------------------------------
  NODE  4937.00 : HGL = <  602.653>;EGL= <  602.778>;FLOWLINE= <  602.300>

********************************************************************************
  FLOW PROCESS FROM NODE  4937.00 TO NODE  4937.00 IS CODE =  8
  UPSTREAM NODE  4937.00     ELEVATION =   602.30  (FLOW IS AT CRITICAL DEPTH)
--------------------------------------------------------------------------------
  CALCULATE CATCH BASIN ENTRANCE LOSSES(LACFCD):
  PIPE FLOW =       0.90 CFS          PIPE DIAMETER =  18.00 INCHES
  FLOW VELOCITY =   2.84 FEET/SEC.    VELOCITY HEAD =  0.125 FEET
  CATCH BASIN ENERGY LOSS = .2*(VELOCITY HEAD) = .2*(  0.125) =  0.025
--------------------------------------------------------------------------------
  NODE  4937.00 : HGL = <  602.803>;EGL= <  602.803>;FLOWLINE= <  602.300>

********************************************************************************
  UPSTREAM PIPE FLOW CONTROL DATA:
  NODE NUMBER =  4937.00            FLOWLINE ELEVATION =   602.30
  ASSUMED UPSTREAM CONTROL HGL =    602.65 FOR DOWNSTREAM RUN ANALYSIS

================================================================================
  END OF GRADUALLY VARIED FLOW ANALYSIS
```

POST-PROJECT FLOW THROUGH EXISTING SYSTEM
DRAINAGE BASIN 3
(LATERAL NODES 4945-4937)

```
**************************************************************************
                PIPE-FLOW HYDRAULICS COMPUTER PROGRAM PACKAGE
          (Reference: LACFCD,LACRD, AND OCEMA HYDRAULICS CRITERION)
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                           Analysis prepared by:

                         RICK ENGINEERING COMPANY
                             5620 Friars Road
                        San Diego, California 92110
                       619-291-0707   Fax 619-291-4165

  ************************* DESCRIPTION OF STUDY *************************
 * HARMONY GROVE VILLAGE CENTER, J-17164-D                                *
 * SYSTEM L (BASIN 4000B) - 100-YR LATERAL LINE NODES 4945-4937           *
 * H:\17164\WATERRESOURCES\HYDRAULICS\PIPEFLOW\...                        *
  ************************************************************************

   FILE NAME: 4945R.LAT
   TIME/DATE OF STUDY: 11:32 03/20/2025

**************************************************************************
               GRADUALLY VARIED FLOW ANALYSIS FOR PIPE SYSTEM
                         NODAL POINT STATUS TABLE
                (Note: "*" indicates nodal point data used.)
                      UPSTREAM RUN                  DOWNSTREAM RUN
    NODE     MODEL    PRESSURE      PRESSURE+         FLOW         PRESSURE+
   NUMBER  PROCESS  HEAD(FT)    MOMENTUM(POUNDS)   DEPTH(FT)   MOMENTUM(POUNDS)
  4945.00-             6.22*            688.10        0.51              288.37
         } FRICTION
  4943.00-             1.82*            202.94        1.15 Dc           150.14
         } JUNCTION
  4943.00-             2.25*            166.79        0.17               14.22
         } FRICTION
  4940.00-             0.59*             12.36        0.27                8.74
         } JUNCTION
  4940.00-             0.35 Dc            7.81        0.19*              12.50
         } FRICTION
  4937.00-             0.35*Dc            7.81        0.35*Dc             7.81
         } CATCH BASIN
  4937.00-             0.50*              4.13        0.35 Dc             2.87
--------------------------------------------------------------------------
  MAXIMUM NUMBER OF ENERGY BALANCES USED IN EACH PROFILE =  25
--------------------------------------------------------------------------
  NOTE: STEADY FLOW HYDRAULIC HEAD-LOSS COMPUTATIONS BASED ON THE MOST
  CONSERVATIVE FORMULAE FROM THE CURRENT LACRD,LACFCD, AND OCEMA
  DESIGN MANUALS.
**************************************************************************
```

NOTE: THERE IS NO CHANGE IN FLOW IN THE EXISTING LATERAL. THERE WAS MORE AREA TRIBUTARY TO THE LATERAL IN PHASE 1 (PRE-PROJECT CONDITION) SO THE POST-PROJECT CONDITION RESULTS IN THE SAME FLOW.

```
  DOWNSTREAM PIPE FLOW CONTROL DATA:
  NODE NUMBER =  4945.00            FLOWLINE ELEVATION =   594.00
  PIPE FLOW =       8.80 CFS        PIPE DIAMETER =  18.00 INCHES
  ASSUMED DOWNSTREAM CONTROL HGL =   600.220 FEET
---------------------------------------------------------------------------
  NODE  4945.00 : HGL = <  600.220>;EGL= <  600.605>;FLOWLINE= <  594.000>

***************************************************************************
  FLOW PROCESS FROM NODE  4945.00 TO NODE  4943.00 IS CODE =  1
  UPSTREAM NODE  4943.00     ELEVATION =   598.56  (FLOW IS UNDER PRESSURE)
---------------------------------------------------------------------------
  CALCULATE FRICTION LOSSES(LACFCD):
  PIPE FLOW   =       8.80 CFS     PIPE DIAMETER =  18.00 INCHES
  PIPE LENGTH =      22.84 FEET          MANNING'S N  =  0.01300
  SF=(Q/K)**2 = ((      8.80)/(   105.049))**2 = 0.00702
  HF=L*SF = (     22.84)*(0.00702) =      0.160
---------------------------------------------------------------------------
  NODE  4943.00 : HGL = <  600.380>;EGL= <  600.765>;FLOWLINE= <  598.560>

***************************************************************************
  FLOW PROCESS FROM NODE  4943.00 TO NODE  4943.00 IS CODE =  5
  UPSTREAM NODE  4943.00     ELEVATION =   598.98  (FLOW IS UNDER PRESSURE)
---------------------------------------------------------------------------
  CALCULATE JUNCTION LOSSES:
       PIPE       FLOW    DIAMETER   ANGLE    FLOWLINE   CRITICAL   VELOCITY
                  (CFS)   (INCHES) (DEGREES) ELEVATION  DEPTH(FT.)  (FT/SEC)
     UPSTREAM       0.90    18.00     27.80    598.98      0.35        0.509
    DOWNSTREAM      8.80    18.00       -      598.56      1.15        4.980
    LATERAL #1      0.00     0.00      0.00      0.00      0.00        0.000
    LATERAL #2      0.00     0.00      0.00      0.00      0.00        0.000
       Q5           7.90===Q5 EQUALS BASIN INPUT===

  LACFCD AND OCEMA FLOW JUNCTION FORMULAE USED:
  DY=(Q2*V2-Q1*V1*COS(DELTA1)-Q3*V3*COS(DELTA3)-
      Q4*V4*COS(DELTA4))/((A1+A2)*16.1)+FRICTION LOSSES
  UPSTREAM:    MANNING'S N = 0.01300;  FRICTION SLOPE = 0.00007
  DOWNSTREAM:  MANNING'S N = 0.01300;  FRICTION SLOPE = 0.00702
  AVERAGED FRICTION SLOPE IN JUNCTION ASSUMED AS 0.00355
  JUNCTION LENGTH =   4.00 FEET
  FRICTION LOSSES =  0.014 FEET         ENTRANCE LOSSES =  0.077 FEET
  JUNCTION LOSSES = (DY+HV1-HV2)+(ENTRANCE LOSSES)
  JUNCTION LOSSES = ( 0.396)+( 0.077) =   0.473
---------------------------------------------------------------------------
  NODE  4943.00 : HGL = <  601.234>;EGL= <  601.239>;FLOWLINE= <  598.980>

***************************************************************************
  FLOW PROCESS FROM NODE  4943.00 TO NODE  4940.00 IS CODE =  1
  UPSTREAM NODE  4940.00     ELEVATION =   600.62  (FLOW SEALS IN REACH)
---------------------------------------------------------------------------
  CALCULATE FRICTION LOSSES(LACFCD):
```

```
  PIPE FLOW    =       0.90 CFS     PIPE DIAMETER =  18.00 INCHES
  PIPE LENGTH =      16.38 FEET          MANNING'S N  =  0.01300
================================================================================
  DOWNSTREAM CONTROL ASSUMED PRESSURE HEAD(FT) =     2.25
================================================================================
  PRESSURE FLOW PROFILE COMPUTED INFORMATION:
--------------------------------------------------------------------------------
  DISTANCE FROM       PRESSURE   VELOCITY      SPECIFIC        PRESSURE+
   CONTROL(FT)        HEAD(FT)   (FT/SEC)     ENERGY(FT)    MOMENTUM(POUNDS)
         0.000          2.254      0.509          2.259           166.79
         7.541          1.500      0.509          1.504            83.59
--------------------------------------------------------------------------------
  NORMAL DEPTH(FT) =      0.17           CRITICAL DEPTH(FT) =      0.35
================================================================================
  ASSUMED DOWNSTREAM PRESSURE HEAD(FT) =     1.50
================================================================================
  GRADUALLY VARIED FLOW PROFILE COMPUTED INFORMATION:
--------------------------------------------------------------------------------
  DISTANCE FROM      FLOW DEPTH  VELOCITY      SPECIFIC        PRESSURE+
   CONTROL(FT)           (FT)    (FT/SEC)     ENERGY(FT)    MOMENTUM(POUNDS)
         7.541          1.500      0.509          1.504            83.59
         7.999          1.454      0.514          1.458            78.56
         8.456          1.408      0.522          1.413            73.60
         8.912          1.362      0.534          1.367            68.74
         9.369          1.317      0.547          1.321            64.00
         9.824          1.271      0.564          1.276            59.39
        10.279          1.225      0.582          1.230            54.93
        10.734          1.179      0.604          1.185            50.62
        11.188          1.133      0.628          1.139            46.48
        11.641          1.087      0.656          1.094            42.51
        12.093          1.041      0.687          1.049            38.73
        12.544          0.995      0.723          1.004            35.14
        12.993          0.950      0.763          0.959            31.74
        13.441          0.904      0.809          0.914            28.54
        13.886          0.858      0.861          0.869            25.54
        14.328          0.812      0.921          0.825            22.75
        14.767          0.766      0.991          0.781            20.18
        15.200          0.720      1.072          0.738            17.82
        15.627          0.674      1.168          0.696            15.69
        16.044          0.628      1.281          0.654            13.78
        16.380          0.590      1.393          0.620            12.36
--------------------------------------------------------------------------------
  NODE  4940.00 : HGL = <  601.210>;EGL= <  601.240>;FLOWLINE= <  600.620>

********************************************************************************
  FLOW PROCESS FROM NODE  4940.00 TO NODE  4940.00 IS CODE =  5
  UPSTREAM NODE  4940.00     ELEVATION =   600.95  (FLOW IS SUBCRITICAL)
  (NOTE: POSSIBLE JUMP IN OR UPSTREAM OF STRUCTURE)
--------------------------------------------------------------------------------
  CALCULATE JUNCTION LOSSES:
```

PIPE	FLOW (CFS)	DIAMETER (INCHES)	ANGLE (DEGREES)	FLOWLINE ELEVATION	CRITICAL DEPTH(FT.)	VELOCITY (FT/SEC)
UPSTREAM	0.90	18.00	56.10	600.95	0.35	6.797
DOWNSTREAM	0.90	18.00	-	600.62	0.35	1.393
LATERAL #1	0.00	0.00	0.00	0.00	0.00	0.000
LATERAL #2	0.00	0.00	0.00	0.00	0.00	0.000
Q5	0.00===Q5 EQUALS BASIN INPUT===					

LACFCD AND OCEMA FLOW JUNCTION FORMULAE USED:
DY=(Q2*V2-Q1*V1*COS(DELTA1)-Q3*V3*COS(DELTA3)-
Q4*V4*COS(DELTA4))/((A1+A2)*16.1)+FRICTION LOSSES
UPSTREAM: MANNING'S N = 0.01300; FRICTION SLOPE = 0.05942
DOWNSTREAM: MANNING'S N = 0.01300; FRICTION SLOPE = 0.00069
AVERAGED FRICTION SLOPE IN JUNCTION ASSUMED AS 0.03005
JUNCTION LENGTH = 4.00 FEET
FRICTION LOSSES = 0.120 FEET ENTRANCE LOSSES = 0.000 FEET
JUNCTION LOSSES = (DY+HV1-HV2)+(ENTRANCE LOSSES)
JUNCTION LOSSES = (0.619)+(0.000) = 0.619

NODE 4940.00 : HGL = < 601.142>;EGL= < 601.860>;FLOWLINE= < 600.950>

****

FLOW PROCESS FROM NODE 4940.00 TO NODE 4937.00 IS CODE = 1
UPSTREAM NODE 4937.00 ELEVATION = 602.30 (FLOW IS SUPERCRITICAL)

CALCULATE FRICTION LOSSES(LACFCD):
PIPE FLOW = 0.90 CFS PIPE DIAMETER = 18.00 INCHES
PIPE LENGTH = 19.64 FEET MANNING'S N = 0.01300

NORMAL DEPTH(FT) = 0.19 CRITICAL DEPTH(FT) = 0.35

==========

UPSTREAM CONTROL ASSUMED FLOWDEPTH(FT) = 0.35

==========

GRADUALLY VARIED FLOW PROFILE COMPUTED INFORMATION:

DISTANCE FROM CONTROL(FT)	FLOW DEPTH (FT)	VELOCITY (FT/SEC)	SPECIFIC ENERGY(FT)	PRESSURE+ MOMENTUM(POUNDS)
0.000	0.353	2.833	0.478	7.81
0.004	0.347	2.911	0.478	7.81
0.017	0.340	2.993	0.479	7.83
0.039	0.333	3.079	0.480	7.85
0.072	0.326	3.169	0.483	7.89
0.118	0.320	3.264	0.485	7.94
0.177	0.313	3.364	0.489	8.00
0.252	0.306	3.470	0.493	8.08
0.344	0.300	3.581	0.499	8.16
0.457	0.293	3.699	0.506	8.27
0.594	0.286	3.824	0.513	8.38
0.758	0.280	3.956	0.523	8.52
0.954	0.273	4.096	0.534	8.67

```
         1.188          0.266      4.245          0.546           8.84
         1.468          0.259      4.404          0.561           9.03
         1.803          0.253      4.573          0.578           9.24
         2.206          0.246      4.754          0.597           9.47
         2.695          0.239      4.948          0.620           9.74
         3.295          0.233      5.155          0.646          10.02
         4.040          0.226      5.378          0.675          10.34
         4.988          0.219      5.618          0.710          10.69
         6.232          0.213      5.877          0.749          11.08
         7.950          0.206      6.157          0.795          11.50
        10.537          0.199      6.461          0.848          11.97
        15.268          0.193      6.791          0.909          12.49
        19.640          0.192      6.795          0.910          12.50
--------------------------------------------------------------------------------
  NODE  4937.00 : HGL = <  602.653>;EGL= <  602.778>;FLOWLINE= <  602.300>

********************************************************************************
  FLOW PROCESS FROM NODE  4937.00 TO NODE  4937.00 IS CODE =  8
  UPSTREAM NODE  4937.00     ELEVATION =   602.30  (FLOW IS SUBCRITICAL)
--------------------------------------------------------------------------------
  CALCULATE CATCH BASIN ENTRANCE LOSSES(LACFCD):
  PIPE FLOW =       0.90 CFS          PIPE DIAMETER =  18.00 INCHES
  FLOW VELOCITY =   2.84 FEET/SEC.    VELOCITY HEAD =  0.125 FEET
  CATCH BASIN ENERGY LOSS = .2*(VELOCITY HEAD) = .2*(  0.125) =  0.025
--------------------------------------------------------------------------------
  NODE  4937.00 : HGL = <  602.803>;EGL= <  602.803>;FLOWLINE= <  602.300>

********************************************************************************
  UPSTREAM PIPE FLOW CONTROL DATA:
  NODE NUMBER =  4937.00            FLOWLINE ELEVATION =   602.30
  ASSUMED UPSTREAM CONTROL HGL =    602.65 FOR DOWNSTREAM RUN ANALYSIS

================================================================================
  END OF GRADUALLY VARIED FLOW ANALYSIS
```

PHASE 1 (PRE-PROJECT) FLOW THROUGH EXISTING SYSTEM
(LATERAL NODES 4892-4889)

```
**************************************************************************
                PIPE-FLOW HYDRAULICS COMPUTER PROGRAM PACKAGE
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                           Analysis prepared by:

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                     1223 University Avenue, Suite 240
                      Riverside, California 92507-3418
                     (909) 782-0707  Fax (909) 782-0723

  ************************* DESCRIPTION OF STUDY *************************
 * HARMONY GROVE VILLAGE, J-16412                                       *
 * SYSTEM L (BASIN 4000B) - 100-YR LATERAL LINE NODES 4892-4889         *
 * H:\16412\HYDRO\HYDRAULICS\PIPEFLOW\...                               *
  ************************************************************************

   FILE NAME: 4892R.LAT
   TIME/DATE OF STUDY: 10:12 07/23/2012

**************************************************************************
               GRADUALLY VARIED FLOW ANALYSIS FOR PIPE SYSTEM
                         NODAL POINT STATUS TABLE
                (Note: "*" indicates nodal point data used.)
                      UPSTREAM RUN                  DOWNSTREAM RUN
    NODE     MODEL    PRESSURE      PRESSURE+         FLOW         PRESSURE+
   NUMBER  PROCESS   HEAD(FT)   MOMENTUM(POUNDS)   DEPTH(FT)   MOMENTUM(POUNDS)
  4892.00-              3.48*            303.84        0.34              19.20
         } FRICTION
  4889.00-              2.86*            235.18        0.48 Dc           16.21
         } CATCH BASIN
  4889.00-              2.87*            234.05        0.48 Dc            5.89
--------------------------------------------------------------------------
  MAXIMUM NUMBER OF ENERGY BALANCES USED IN EACH PROFILE =  25
--------------------------------------------------------------------------
  NOTE: STEADY FLOW HYDRAULIC HEAD-LOSS COMPUTATIONS BASED ON THE MOST
  CONSERVATIVE FORMULAE FROM THE CURRENT LACRD,LACFCD, AND OCEMA
  DESIGN MANUALS.
**************************************************************************
  DOWNSTREAM PIPE FLOW CONTROL DATA:
  NODE NUMBER =  4892.00           FLOWLINE ELEVATION =   597.68
  PIPE FLOW =       1.60 CFS       PIPE DIAMETER =  18.00 INCHES
  ASSUMED DOWNSTREAM CONTROL HGL =   601.160 FEET
--------------------------------------------------------------------------
  NODE  4892.00 : HGL = <  601.160>;EGL= <  601.173>;FLOWLINE= <  597.680>

**************************************************************************
  FLOW PROCESS FROM NODE  4892.00 TO NODE  4889.00 IS CODE =  1
  UPSTREAM NODE  4889.00     ELEVATION =   598.31  (FLOW IS UNDER PRESSURE)
--------------------------------------------------------------------------
  CALCULATE FRICTION LOSSES(LACFCD):
  PIPE FLOW   =       1.60 CFS     PIPE DIAMETER =  18.00 INCHES
  PIPE LENGTH =      31.50 FEET          MANNING'S N  =  0.01300
  SF=(Q/K)**2 = ((      1.60)/(   105.369))**2 = 0.00023
  HF=L*SF = (     31.50)*(0.00023) =      0.007
--------------------------------------------------------------------------
  NODE  4889.00 : HGL = <  601.167>;EGL= <  601.180>;FLOWLINE= <  598.310>

**************************************************************************
  FLOW PROCESS FROM NODE  4889.00 TO NODE  4889.00 IS CODE =  8
```

```
  UPSTREAM NODE  4889.00     ELEVATION =   598.31  (FLOW IS UNDER PRESSURE)
--------------------------------------------------------------------------------
  CALCULATE CATCH BASIN ENTRANCE LOSSES(LACFCD):
  PIPE FLOW =       1.60 CFS          PIPE DIAMETER =  18.00 INCHES
  FLOW VELOCITY =   0.91 FEET/SEC.    VELOCITY HEAD =  0.013 FEET
  CATCH BASIN ENERGY LOSS = .2*(VELOCITY HEAD) = .2*(  0.013) =  0.003
--------------------------------------------------------------------------------
  NODE  4889.00 : HGL = <  601.183>;EGL= <  601.183>;FLOWLINE= <  598.310>

********************************************************************************
  UPSTREAM PIPE FLOW CONTROL DATA:
  NODE NUMBER =  4889.00            FLOWLINE ELEVATION =   598.31
  ASSUMED UPSTREAM CONTROL HGL =    598.78 FOR DOWNSTREAM RUN ANALYSIS

================================================================================
  END OF GRADUALLY VARIED FLOW ANALYSIS
```

POST-PROJECT FLOW THROUGH EXISTING SYSTEM
DRAINAGE BASIN 4
(LATERAL NODES 4892 - 4889)

```
**************************************************************************
                PIPE-FLOW HYDRAULICS COMPUTER PROGRAM PACKAGE
          (Reference: LACFCD,LACRD, AND OCEMA HYDRAULICS CRITERION)
         (c) Copyright 1982-2014 Advanced Engineering Software (aes)
             Ver. 21.0  Release Date: 06/01/2014  License ID 1261

                           Analysis prepared by:

                         RICK ENGINEERING COMPANY
                             5620 Friars Road
                        San Diego, California 92110
                       619-291-0707   Fax 619-291-4165

  ************************* DESCRIPTION OF STUDY *************************
 * HARMONY GROVE VILLAGE, J-17164                                        *
 * SYSTEM L (BASIN 4000B) - 100-YR LATERAL LINE NODES 4892-4889          *
 * H:\17164\WATERRESOURCES\HYDRAULICS\PIPEFLOW\...                       *
  ************************************************************************

   FILE NAME: 4892R.LAT
   TIME/DATE OF STUDY: 10:49 03/20/2025

**************************************************************************
               GRADUALLY VARIED FLOW ANALYSIS FOR PIPE SYSTEM
                         NODAL POINT STATUS TABLE
                (Note: "*" indicates nodal point data used.)
                      UPSTREAM RUN                 DOWNSTREAM RUN
    NODE     MODEL    PRESSURE      PRESSURE+         FLOW         PRESSURE+
   NUMBER   PROCESS  HEAD(FT)   MOMENTUM(POUNDS)   DEPTH(FT)   MOMENTUM(POUNDS)
  4892.00-             3.48*           309.63        0.45              38.96
         } FRICTION
  4889.00-             2.87*           242.63        0.64 Dc           33.17
         } CATCH BASIN
  4889.00-             2.92*           239.19        0.64 Dc           11.83
--------------------------------------------------------------------------
  MAXIMUM NUMBER OF ENERGY BALANCES USED IN EACH PROFILE =  25
--------------------------------------------------------------------------
  NOTE: STEADY FLOW HYDRAULIC HEAD-LOSS COMPUTATIONS BASED ON THE MOST
  CONSERVATIVE FORMULAE FROM THE CURRENT LACRD,LACFCD, AND OCEMA
  DESIGN MANUALS.
**************************************************************************
  DOWNSTREAM PIPE FLOW CONTROL DATA:
  NODE NUMBER =  4892.00           FLOWLINE ELEVATION =   597.68
  PIPE FLOW =       2.80 CFS       PIPE DIAMETER =  18.00 INCHES
  ASSUMED DOWNSTREAM CONTROL HGL =   601.160 FEET
--------------------------------------------------------------------------
  NODE  4892.00 : HGL = <  601.160>;EGL= <  601.199>;FLOWLINE= <  597.680>

**************************************************************************
```

NOTE: THE ANALYSIS FLOW COMBINES THE EXISTING 1.6 CFS ENTERING THE EXISTING CURB INLET ON COUNTRY LIVING WAY AND THE UPDATED POST-PROJECT PEAK FLOW OF 1.2 CFS FROM BASIN 4.

```
  FLOW PROCESS FROM NODE  4892.00 TO NODE  4889.00 IS CODE =  1
  UPSTREAM NODE  4889.00     ELEVATION =   598.31  (FLOW IS UNDER PRESSURE)
------------------------------------------------------------------------------
  CALCULATE FRICTION LOSSES(LACFCD):
  PIPE FLOW   =       2.80 CFS     PIPE DIAMETER =  18.00 INCHES
  PIPE LENGTH =      31.50 FEET          MANNING'S N  =  0.01300
  SF=(Q/K)**2 = ((      2.80)/(   105.144))**2 = 0.00071
  HF=L*SF = (     31.50)*(0.00071) =      0.022
------------------------------------------------------------------------------
  NODE  4889.00 : HGL = <  601.182>;EGL= <  601.221>;FLOWLINE= <  598.310>

******************************************************************************
  FLOW PROCESS FROM NODE  4889.00 TO NODE  4889.00 IS CODE =  8
  UPSTREAM NODE  4889.00     ELEVATION =   598.31  (FLOW IS UNDER PRESSURE)
------------------------------------------------------------------------------
  CALCULATE CATCH BASIN ENTRANCE LOSSES(LACFCD):
  PIPE FLOW =       2.80 CFS          PIPE DIAMETER =  18.00 INCHES
  FLOW VELOCITY =   1.59 FEET/SEC.    VELOCITY HEAD =  0.039 FEET
  CATCH BASIN ENERGY LOSS = .2*(VELOCITY HEAD) = .2*(  0.039) =  0.008
------------------------------------------------------------------------------
  NODE  4889.00 : HGL = <  601.229>;EGL= <  601.229>;FLOWLINE= <  598.310>

******************************************************************************
  UPSTREAM PIPE FLOW CONTROL DATA:
  NODE NUMBER =  4889.00            FLOWLINE ELEVATION =   598.31
  ASSUMED UPSTREAM CONTROL HGL =    598.95 FOR DOWNSTREAM RUN ANALYSIS

==============================================================================
  END OF GRADUALLY VARIED FLOW ANALYSIS
```

PHASE 1 (PRE-PROJECT) FLOW THROUGH EXISTING SYSTEM
(LATERAL NODES 5506 - 5504.3)

```
**************************************************************************
               PIPE-FLOW HYDRAULICS COMPUTER PROGRAM PACKAGE
          (Reference: LACFCD,LACRD, AND OCEMA HYDRAULICS CRITERION)
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             Ver. 8.0  Release Date: 01/01/2000  License ID 1261

                          Analysis prepared by:

                         Rick Engineering Company
                             5620 Friars Road
                           San Diego, CA  92110
                              (619) 291-0707

 ************************* DESCRIPTION OF STUDY *************************
* HARMONY GROVE J-16412-W                                                *
* SYSTEM C (BASIN 5000B)- NODE 5506 PROP COND 100-YR 6-HR                *
* DATE: 20120319                                                         *
 ************************************************************************

  FILE NAME: 5506.LAT
  TIME/DATE OF STUDY: 13:35 07/25/2012

**************************************************************************
              GRADUALLY VARIED FLOW ANALYSIS FOR PIPE SYSTEM
                        NODAL POINT STATUS TABLE
               (Note: "*" indicates nodal point data used.)
                     UPSTREAM RUN                  DOWNSTREAM RUN
   NODE     MODEL    PRESSURE      PRESSURE+        FLOW         PRESSURE+
  NUMBER  PROCESS   HEAD(FT)   MOMENTUM(POUNDS)   DEPTH(FT)   MOMENTUM(POUNDS)
 5506.00-              2.66*          214.57        0.44              21.20
        } FRICTION
 5512.10-              1.90*          130.31        0.52 Dc           20.18
        } JUNCTION
 5512.10-              1.60*           98.02        0.43              21.40
        } FRICTION
 5505.00-              1.25*           60.66        0.52 Dc           20.18
        } JUNCTION
 5505.00-              1.06*           40.31        0.28               7.13
        } FRICTION        } HYDRAULIC JUMP
 5504.10-              0.33*Dc          6.73        0.33*Dc            6.73
        } JUNCTION
 5504.10-              0.33 Dc          6.73        0.23*              8.34
        } FRICTION
 5504.20-              0.33 Dc          6.73        0.17*             11.77
        } JUNCTION
 5504.20-              0.33 Dc          6.73        0.15*             13.94
        } FRICTION
 5504.30-              0.33*Dc          6.73        0.33*Dc            6.73
        } CATCH BASIN
 5504.30-              0.47*            3.56        0.33 Dc            2.47
--------------------------------------------------------------------------
  MAXIMUM NUMBER OF ENERGY BALANCES USED IN EACH PROFILE =  25
--------------------------------------------------------------------------
  NOTE: STEADY FLOW HYDRAULIC HEAD-LOSS COMPUTATIONS BASED ON THE MOST
  CONSERVATIVE FORMULAE FROM THE CURRENT LACRD,LACFCD, AND OCEMA
  DESIGN MANUALS.
**************************************************************************
  DOWNSTREAM PIPE FLOW CONTROL DATA:
  NODE NUMBER =  5506.00            FLOWLINE ELEVATION =   592.71
  PIPE FLOW =       1.90 CFS        PIPE DIAMETER =  18.00 INCHES
  ASSUMED DOWNSTREAM CONTROL HGL =   595.370 FEET
--------------------------------------------------------------------------
```

```
  NODE  5506.00 : HGL = <  595.370>;EGL= <  595.388>;FLOWLINE= <  592.710>

****************************************************************************
  FLOW PROCESS FROM NODE  5506.00 TO NODE  5512.10 IS CODE =  1
  UPSTREAM NODE  5512.10     ELEVATION =   593.50  (FLOW IS UNDER PRESSURE)
----------------------------------------------------------------------------
  CALCULATE FRICTION LOSSES(LACFCD):
  PIPE FLOW   =       1.90 CFS     PIPE DIAMETER =  18.00 INCHES
  PIPE LENGTH =      79.00 FEET          MANNING'S N  =  0.01300
  SF=(Q/K)**2 = ((      1.90)/(   104.977))**2 = 0.00033
  HF=L*SF = (     79.00)*(0.00033) =      0.026
----------------------------------------------------------------------------
  NODE  5512.10 : HGL = <  595.396>;EGL= <  595.414>;FLOWLINE= <  593.500>

****************************************************************************
  FLOW PROCESS FROM NODE  5512.10 TO NODE  5512.10 IS CODE =  5
  UPSTREAM NODE  5512.10     ELEVATION =   593.83  (FLOW IS UNDER PRESSURE)
----------------------------------------------------------------------------
  CALCULATE JUNCTION LOSSES:
       PIPE       FLOW    DIAMETER   ANGLE    FLOWLINE   CRITICAL   VELOCITY
                  (CFS)   (INCHES) (DEGREES) ELEVATION  DEPTH(FT.)  (FT/SEC)
     UPSTREAM       1.90    18.00     90.00    593.83      0.52        1.075
    DOWNSTREAM      1.90    18.00       -      593.50      0.52        1.077
    LATERAL #1      0.00     0.00      0.00      0.00      0.00        0.000
    LATERAL #2      0.00     0.00      0.00      0.00      0.00        0.000
       Q5           0.00===Q5 EQUALS BASIN INPUT===

  LACFCD AND OCEMA FLOW JUNCTION FORMULAE USED:
  DY=(Q2*V2-Q1*V1*COS(DELTA1)-Q3*V3*COS(DELTA3)-
      Q4*V4*COS(DELTA4))/((A1+A2)*16.1)+FRICTION LOSSES
  UPSTREAM:    MANNING'S N = 0.01300;  FRICTION SLOPE = 0.00033
  DOWNSTREAM:  MANNING'S N = 0.01300;  FRICTION SLOPE = 0.00033
  AVERAGED FRICTION SLOPE IN JUNCTION ASSUMED AS 0.00033
  JUNCTION LENGTH =   4.00 FEET
  FRICTION LOSSES =  0.001 FEET         ENTRANCE LOSSES =  0.000 FEET
  JUNCTION LOSSES = (DY+HV1-HV2)+(ENTRANCE LOSSES)
  JUNCTION LOSSES = ( 0.037)+( 0.000) =   0.037
----------------------------------------------------------------------------
  NODE  5512.10 : HGL = <  595.433>;EGL= <  595.451>;FLOWLINE= <  593.830>

****************************************************************************
  FLOW PROCESS FROM NODE  5512.10 TO NODE  5505.00 IS CODE =  1
  UPSTREAM NODE  5505.00     ELEVATION =   594.19  (FLOW SEALS IN REACH)
----------------------------------------------------------------------------
  CALCULATE FRICTION LOSSES(LACFCD):
  PIPE FLOW   =       1.90 CFS     PIPE DIAMETER =  18.00 INCHES
  PIPE LENGTH =      33.50 FEET          MANNING'S N  =  0.01300
============================================================================
  DOWNSTREAM CONTROL ASSUMED PRESSURE HEAD(FT) =     1.60
============================================================================
  PRESSURE FLOW PROFILE COMPUTED INFORMATION:
----------------------------------------------------------------------------
  DISTANCE FROM       PRESSURE   VELOCITY      SPECIFIC        PRESSURE+
   CONTROL(FT)        HEAD(FT)   (FT/SEC)     ENERGY(FT)    MOMENTUM(POUNDS)
          0.000          1.603      1.075          1.621            98.02
          9.889          1.500      1.075          1.518            86.66
----------------------------------------------------------------------------
  NORMAL DEPTH(FT) =      0.42           CRITICAL DEPTH(FT) =      0.52
============================================================================
  ASSUMED DOWNSTREAM PRESSURE HEAD(FT) =     1.50
============================================================================
  GRADUALLY VARIED FLOW PROFILE COMPUTED INFORMATION:
----------------------------------------------------------------------------
```

```
  DISTANCE FROM      FLOW DEPTH  VELOCITY      SPECIFIC        PRESSURE+
   CONTROL(FT)          (FT)    (FT/SEC)     ENERGY(FT)    MOMENTUM(POUNDS)
         9.889          1.500      1.075          1.518            86.66
        13.622          1.461      1.083          1.479            82.38
        17.327          1.422      1.097          1.440            78.16
        21.015          1.382      1.115          1.402            74.02
        24.690          1.343      1.138          1.363            69.98
        28.353          1.304      1.165          1.325            66.04
        32.005          1.265      1.195          1.287            62.20
        33.500          1.248      1.208          1.271            60.66
--------------------------------------------------------------------------------
  NODE  5505.00 : HGL = <  595.438>;EGL= <  595.461>;FLOWLINE= <  594.190>

********************************************************************************
  FLOW PROCESS FROM NODE  5505.00 TO NODE  5505.00 IS CODE =  5
  UPSTREAM NODE  5505.00     ELEVATION =   594.42  (FLOW IS SUBCRITICAL)
--------------------------------------------------------------------------------
  CALCULATE JUNCTION LOSSES:
       PIPE       FLOW    DIAMETER   ANGLE    FLOWLINE   CRITICAL   VELOCITY
                  (CFS)   (INCHES) (DEGREES) ELEVATION  DEPTH(FT.)  (FT/SEC)
     UPSTREAM       0.80    18.00      0.00    594.42      0.33        0.595
    DOWNSTREAM      1.90    18.00       -      594.19      0.52        1.209
    LATERAL #1      0.00     0.00      0.00      0.00      0.00        0.000
    LATERAL #2      0.00     0.00      0.00      0.00      0.00        0.000
       Q5           1.10===Q5 EQUALS BASIN INPUT===

  LACFCD AND OCEMA FLOW JUNCTION FORMULAE USED:
  DY=(Q2*V2-Q1*V1*COS(DELTA1)-Q3*V3*COS(DELTA3)-
      Q4*V4*COS(DELTA4))/((A1+A2)*16.1)+FRICTION LOSSES
  UPSTREAM:    MANNING'S N = 0.01300;  FRICTION SLOPE = 0.00008
  DOWNSTREAM:  MANNING'S N = 0.01300;  FRICTION SLOPE = 0.00032
  AVERAGED FRICTION SLOPE IN JUNCTION ASSUMED AS 0.00020
  JUNCTION LENGTH =   4.00 FEET
  FRICTION LOSSES =  0.001 FEET         ENTRANCE LOSSES =  0.005 FEET
  JUNCTION LOSSES = (DY+HV1-HV2)+(ENTRANCE LOSSES)
  JUNCTION LOSSES = ( 0.023)+( 0.005) =   0.028
--------------------------------------------------------------------------------
  NODE  5505.00 : HGL = <  595.484>;EGL= <  595.489>;FLOWLINE= <  594.420>

********************************************************************************
  FLOW PROCESS FROM NODE  5505.00 TO NODE  5504.10 IS CODE =  1
  UPSTREAM NODE  5504.10     ELEVATION =   595.89  (HYDRAULIC JUMP OCCURS)
--------------------------------------------------------------------------------
  CALCULATE FRICTION LOSSES(LACFCD):
  PIPE FLOW   =       0.80 CFS     PIPE DIAMETER =  18.00 INCHES
  PIPE LENGTH =     135.37 FEET          MANNING'S N  =  0.01300
--------------------------------------------------------------------------------
  HYDRAULIC JUMP: DOWNSTREAM RUN ANALYSIS RESULTS
--------------------------------------------------------------------------------
  NORMAL DEPTH(FT) =      0.27           CRITICAL DEPTH(FT) =      0.33
================================================================================
  UPSTREAM CONTROL ASSUMED FLOWDEPTH(FT) =     0.33
================================================================================
  GRADUALLY VARIED FLOW PROFILE COMPUTED INFORMATION:
--------------------------------------------------------------------------------
  DISTANCE FROM      FLOW DEPTH  VELOCITY      SPECIFIC        PRESSURE+
   CONTROL(FT)          (FT)    (FT/SEC)     ENERGY(FT)    MOMENTUM(POUNDS)
         0.000          0.331      2.767          0.450             6.73
         0.015          0.328      2.794          0.450             6.73
         0.042          0.326      2.821          0.450             6.73
         0.081          0.324      2.849          0.450             6.74
         0.135          0.322      2.878          0.450             6.74
         0.204          0.319      2.907          0.451             6.75
```

0.290	0.317	2.936	0.451	6.75
0.396	0.315	2.966	0.452	6.76
0.522	0.313	2.997	0.452	6.77
0.673	0.310	3.028	0.453	6.78
0.850	0.308	3.059	0.454	6.80
1.058	0.306	3.091	0.454	6.81
1.301	0.304	3.124	0.455	6.82
1.586	0.301	3.157	0.456	6.84
1.918	0.299	3.191	0.457	6.86
2.309	0.297	3.226	0.459	6.88
2.768	0.295	3.261	0.460	6.90
3.314	0.292	3.297	0.461	6.92
3.969	0.290	3.334	0.463	6.94
4.768	0.288	3.371	0.465	6.96
5.762	0.286	3.409	0.466	6.99
7.040	0.283	3.448	0.468	7.02
8.767	0.281	3.488	0.470	7.05
11.314	0.279	3.528	0.472	7.08
15.871	0.277	3.569	0.475	7.11
135.370	0.276	3.590	0.476	7.13

HYDRAULIC JUMP: UPSTREAM RUN ANALYSIS RESULTS

DOWNSTREAM CONTROL ASSUMED FLOWDEPTH(FT) = 1.06

GRADUALLY VARIED FLOW PROFILE COMPUTED INFORMATION:

DISTANCE FROM CONTROL(FT)	FLOW DEPTH (FT)	VELOCITY (FT/SEC)	SPECIFIC ENERGY(FT)	PRESSURE+ MOMENTUM(POUNDS)
0.000	1.064	0.597	1.069	40.31
2.681	1.034	0.615	1.040	37.93
5.361	1.005	0.635	1.011	35.62
8.037	0.976	0.657	0.983	33.40
10.711	0.947	0.680	0.954	31.25
13.382	0.917	0.706	0.925	29.19
16.049	0.888	0.734	0.897	27.20
18.711	0.859	0.764	0.868	25.30
21.369	0.830	0.797	0.840	23.48
24.020	0.801	0.834	0.811	21.75
26.664	0.771	0.874	0.783	20.10
29.299	0.742	0.918	0.755	18.54
31.923	0.713	0.966	0.727	17.06
34.534	0.684	1.020	0.700	15.67
37.129	0.654	1.080	0.672	14.38
39.704	0.625	1.147	0.646	13.17
42.253	0.596	1.223	0.619	12.05
44.769	0.567	1.309	0.593	11.03
47.243	0.537	1.406	0.568	10.11
49.660	0.508	1.517	0.544	9.28
51.999	0.479	1.646	0.521	8.56
54.230	0.450	1.796	0.500	7.94
56.303	0.420	1.972	0.481	7.44
58.131	0.391	2.182	0.465	7.06
59.551	0.362	2.435	0.454	6.81
60.191	0.333	2.744	0.450	6.73
135.370	0.333	2.744	0.450	6.73

END OF HYDRAULIC JUMP ANALYSIS

PRESSURE+MOMENTUM BALANCE OCCURS AT 57.83 FEET UPSTREAM OF NODE 5505.00
DOWNSTREAM DEPTH = 0.396 FEET, UPSTREAM CONJUGATE DEPTH = 0.276 FEET

NODE 5504.10 : HGL = < 596.221>;EGL= < 596.340>;FLOWLINE= < 595.890>

```
 FLOW PROCESS FROM NODE  5504.10 TO NODE  5504.10 IS CODE =  5
 UPSTREAM NODE  5504.10     ELEVATION =   596.22  (FLOW IS AT CRITICAL DEPTH)
 (NOTE: POSSIBLE JUMP IN OR UPSTREAM OF STRUCTURE)
------------------------------------------------------------------------------
 CALCULATE JUNCTION LOSSES:
      PIPE       FLOW    DIAMETER   ANGLE    FLOWLINE   CRITICAL   VELOCITY
                 (CFS)   (INCHES) (DEGREES) ELEVATION  DEPTH(FT.)  (FT/SEC)
    UPSTREAM       0.80    18.00     90.00    596.22      0.33        4.756
   DOWNSTREAM      0.80    18.00       -      595.89      0.33        2.768
   LATERAL #1      0.00     0.00      0.00      0.00      0.00        0.000
   LATERAL #2      0.00     0.00      0.00      0.00      0.00        0.000
      Q5           0.00===Q5 EQUALS BASIN INPUT===

 LACFCD AND OCEMA FLOW JUNCTION FORMULAE USED:
 DY=(Q2*V2-Q1*V1*COS(DELTA1)-Q3*V3*COS(DELTA3)-
     Q4*V4*COS(DELTA4))/((A1+A2)*16.1)+FRICTION LOSSES
 UPSTREAM:    MANNING'S N = 0.01300;  FRICTION SLOPE = 0.02374
 DOWNSTREAM:  MANNING'S N = 0.01300;  FRICTION SLOPE = 0.00511
 AVERAGED FRICTION SLOPE IN JUNCTION ASSUMED AS 0.01442
 JUNCTION LENGTH =   4.00 FEET
 FRICTION LOSSES =  0.058 FEET         ENTRANCE LOSSES =  0.000 FEET
 JUNCTION LOSSES = (DY+HV1-HV2)+(ENTRANCE LOSSES)
 JUNCTION LOSSES = ( 0.458)+( 0.000) =   0.458
------------------------------------------------------------------------------
 NODE  5504.10 : HGL = <  596.447>;EGL= <  596.798>;FLOWLINE= <  596.220>

******************************************************************************
 FLOW PROCESS FROM NODE  5504.10 TO NODE  5504.20 IS CODE =  1
 UPSTREAM NODE  5504.20     ELEVATION =   596.67  (FLOW IS SUPERCRITICAL)
------------------------------------------------------------------------------
 CALCULATE FRICTION LOSSES(LACFCD):
 PIPE FLOW   =       0.80 CFS     PIPE DIAMETER =  18.00 INCHES
 PIPE LENGTH =      22.12 FEET          MANNING'S N  =  0.01300
------------------------------------------------------------------------------
 NORMAL DEPTH(FT) =      0.24           CRITICAL DEPTH(FT) =      0.33
==============================================================================
 UPSTREAM CONTROL ASSUMED FLOWDEPTH(FT) =     0.17
==============================================================================
 GRADUALLY VARIED FLOW PROFILE COMPUTED INFORMATION:
------------------------------------------------------------------------------
 DISTANCE FROM      FLOW DEPTH  VELOCITY      SPECIFIC        PRESSURE+
  CONTROL(FT)          (FT)    (FT/SEC)     ENERGY(FT)    MOMENTUM(POUNDS)
        0.000          0.169      7.285          0.994           11.77
        0.593          0.172      7.121          0.960           11.53
        1.200          0.175      6.964          0.928           11.30
        1.822          0.177      6.812          0.898           11.09
        2.460          0.180      6.666          0.870           10.88
        3.115          0.183      6.525          0.844           10.68
        3.790          0.185      6.389          0.819           10.49
        4.487          0.188      6.258          0.796           10.31
        5.209          0.190      6.132          0.775           10.14
        5.957          0.193      6.009          0.754            9.97
        6.737          0.196      5.891          0.735            9.81
        7.552          0.198      5.777          0.717            9.65
        8.408          0.201      5.666          0.700            9.50
        9.311          0.204      5.559          0.684            9.36
       10.269          0.206      5.456          0.669            9.23
       11.294          0.209      5.356          0.655            9.09
       12.399          0.212      5.259          0.641            8.97
       13.605          0.214      5.164          0.629            8.85
       14.936          0.217      5.073          0.617            8.73
       16.434          0.220      4.984          0.606            8.62
       18.158          0.222      4.898          0.595            8.51
```

```
        20.212          0.225      4.815          0.585             8.41
        22.120          0.227      4.755          0.578             8.34
--------------------------------------------------------------------------------
  NODE  5504.20 : HGL = <  596.839>;EGL= <  597.664>;FLOWLINE= <  596.670>

********************************************************************************
  FLOW PROCESS FROM NODE  5504.20 TO NODE  5504.20 IS CODE =  5
  UPSTREAM NODE  5504.20     ELEVATION =   597.00  (FLOW IS SUPERCRITICAL)
--------------------------------------------------------------------------------
  CALCULATE JUNCTION LOSSES:
       PIPE       FLOW    DIAMETER   ANGLE    FLOWLINE   CRITICAL   VELOCITY
                  (CFS)   (INCHES) (DEGREES) ELEVATION  DEPTH(FT.)  (FT/SEC)
     UPSTREAM       0.80    18.00      0.00    597.00      0.33        8.771
    DOWNSTREAM      0.80    18.00       -      596.67      0.33        7.287
    LATERAL #1      0.00     0.00      0.00      0.00      0.00        0.000
    LATERAL #2      0.00     0.00      0.00      0.00      0.00        0.000
       Q5           0.00===Q5 EQUALS BASIN INPUT===

  LACFCD AND OCEMA FLOW JUNCTION FORMULAE USED:
  DY=(Q2*V2-Q1*V1*COS(DELTA1)-Q3*V3*COS(DELTA3)-
      Q4*V4*COS(DELTA4))/((A1+A2)*16.1)+FRICTION LOSSES
  UPSTREAM:    MANNING'S N = 0.01300;  FRICTION SLOPE = 0.13627
  DOWNSTREAM:  MANNING'S N = 0.01300;  FRICTION SLOPE = 0.08019
  AVERAGED FRICTION SLOPE IN JUNCTION ASSUMED AS 0.10823
  JUNCTION LENGTH =   4.00 FEET
  FRICTION LOSSES =  0.433 FEET         ENTRANCE LOSSES =  0.000 FEET
  JUNCTION LOSSES = (DY+HV1-HV2)+(ENTRANCE LOSSES)
  JUNCTION LOSSES = ( 0.680)+( 0.000) =   0.680
--------------------------------------------------------------------------------
  NODE  5504.20 : HGL = <  597.149>;EGL= <  598.344>;FLOWLINE= <  597.000>

********************************************************************************
  FLOW PROCESS FROM NODE  5504.20 TO NODE  5504.30 IS CODE =  1
  UPSTREAM NODE  5504.30     ELEVATION =   600.70  (FLOW IS SUPERCRITICAL)
--------------------------------------------------------------------------------
  CALCULATE FRICTION LOSSES(LACFCD):
  PIPE FLOW   =       0.80 CFS     PIPE DIAMETER =  18.00 INCHES
  PIPE LENGTH =      22.05 FEET          MANNING'S N  =  0.01300
--------------------------------------------------------------------------------
  NORMAL DEPTH(FT) =      0.14           CRITICAL DEPTH(FT) =      0.33
================================================================================
  UPSTREAM CONTROL ASSUMED FLOWDEPTH(FT) =     0.33
================================================================================
  GRADUALLY VARIED FLOW PROFILE COMPUTED INFORMATION:
--------------------------------------------------------------------------------
  DISTANCE FROM      FLOW DEPTH  VELOCITY      SPECIFIC        PRESSURE+
   CONTROL(FT)           (FT)    (FT/SEC)     ENERGY(FT)    MOMENTUM(POUNDS)
         0.000          0.333      2.744          0.450             6.73
         0.002          0.325      2.836          0.450             6.73
         0.009          0.317      2.933          0.451             6.75
         0.021          0.310      3.037          0.453             6.79
         0.040          0.302      3.147          0.456             6.83
         0.065          0.294      3.264          0.460             6.90
         0.099          0.287      3.389          0.465             6.98
         0.141          0.279      3.523          0.472             7.07
         0.194          0.272      3.666          0.480             7.19
         0.260          0.264      3.820          0.491             7.33
         0.340          0.256      3.984          0.503             7.48
         0.437          0.249      4.162          0.518             7.67
         0.555          0.241      4.353          0.536             7.87
         0.697          0.233      4.561          0.557             8.11
         0.870          0.226      4.786          0.582             8.38
         1.079          0.218      5.030          0.611             8.68
```

```
         1.335          0.211      5.297          0.647            9.02
         1.649          0.203      5.589          0.688            9.40
         2.040          0.195      5.909          0.738            9.83
         2.535          0.188      6.263          0.797           10.32
         3.174          0.180      6.654          0.868           10.86
         4.028          0.172      7.088          0.953           11.48
         5.228          0.165      7.573          1.056           12.18
         7.068          0.157      8.118          1.181           12.98
        10.499          0.150      8.732          1.334           13.89
        22.050          0.149      8.768          1.344           13.94
--------------------------------------------------------------------------------
  NODE  5504.30 : HGL = <  601.033>;EGL= <  601.150>;FLOWLINE= <  600.700>

********************************************************************************
  FLOW PROCESS FROM NODE  5504.30 TO NODE  5504.30 IS CODE =  8
  UPSTREAM NODE  5504.30     ELEVATION =   600.70  (FLOW IS AT CRITICAL DEPTH)
--------------------------------------------------------------------------------
  CALCULATE CATCH BASIN ENTRANCE LOSSES(LACFCD):
  PIPE FLOW =       0.80 CFS          PIPE DIAMETER =  18.00 INCHES
  FLOW VELOCITY =   2.74 FEET/SEC.    VELOCITY HEAD =  0.117 FEET
  CATCH BASIN ENERGY LOSS = .2*(VELOCITY HEAD) = .2*(  0.117) =  0.023
--------------------------------------------------------------------------------
  NODE  5504.30 : HGL = <  601.173>;EGL= <  601.173>;FLOWLINE= <  600.700>

********************************************************************************
  UPSTREAM PIPE FLOW CONTROL DATA:
  NODE NUMBER =  5504.30           FLOWLINE ELEVATION =   600.70
  ASSUMED UPSTREAM CONTROL HGL =    601.03 FOR DOWNSTREAM RUN ANALYSIS

================================================================================
  END OF GRADUALLY VARIED FLOW ANALYSIS
```

POST-PROJECT FLOW THROUGH EXISTING SYSTEM
DRAINAGE BASIN 5
(LATERAL NODES 5506 - 5504.3)

```
**************************************************************************
                PIPE-FLOW HYDRAULICS COMPUTER PROGRAM PACKAGE
          (Reference: LACFCD,LACRD, AND OCEMA HYDRAULICS CRITERION)
         (c) Copyright 1982-2014 Advanced Engineering Software (aes)
             Ver. 21.0  Release Date: 06/01/2014  License ID 1261

                           Analysis prepared by:

                         RICK ENGINEERING COMPANY
                             5620 Friars Road
                        San Diego, California 92110
                       619-291-0707   Fax 619-291-4165

 ************************* DESCRIPTION OF STUDY *************************
* HARMONY GROVE VILLAGE CENTER, J-17164                                  *
* SYSTEM C (BASIN 5000B)- NODE 5506 PROP COND 100-YR 6-HR                *
* H;\17164\WATERRESOURCES\HYDRAULICS\PIPEFLOW\...                        *
 ************************************************************************

  FILE NAME: 5506.LAT
  TIME/DATE OF STUDY: 18:33 07/31/2025

**************************************************************************
              GRADUALLY VARIED FLOW ANALYSIS FOR PIPE SYSTEM
                        NODAL POINT STATUS TABLE
               (Note: "*" indicates nodal point data used.)
                     UPSTREAM RUN                  DOWNSTREAM RUN
   NODE     MODEL    PRESSURE      PRESSURE+         FLOW         PRESSURE+
  NUMBER  PROCESS  HEAD(FT)    MOMENTUM(POUNDS)   DEPTH(FT)   MOMENTUM(POUNDS)
 5506.00-             2.66*            225.63        0.62              49.68
       } FRICTION
 5512.10-             1.97*            149.32        0.73 Dc           47.54
       } JUNCTION
 5512.10-             1.78*            128.49        0.61              50.04
       } FRICTION
 5505.00-             1.46*             93.34        0.73 Dc           47.54
       } JUNCTION
 5505.00-             1.32*             71.11        0.50              32.02
       } FRICTION        } HYDRAULIC JUMP
 5504.10-             0.61*Dc           30.16        0.61*Dc           30.16
       } JUNCTION
 5504.10-             0.72              31.59        0.36*             42.95
       } FRICTION
 5504.20-             0.61 Dc           30.16        0.28*             57.77
       } JUNCTION
 5504.20-             0.61 Dc           30.16        0.26*             63.78
       } FRICTION
 5504.30-             0.61*Dc           30.16        0.61*Dc           30.16
       } CATCH BASIN
```

```
  5504.30-            0.89*            16.14        0.61 Dc           10.79
--------------------------------------------------------------------------------
  MAXIMUM NUMBER OF ENERGY BALANCES USED IN EACH PROFILE =  25
--------------------------------------------------------------------------------
  NOTE: STEADY FLOW HYDRAULIC HEAD-LOSS COMPUTATIONS BASED ON THE MOST
  CONSERVATIVE FORMULAE FROM THE CURRENT LACRD,LACFCD, AND OCEMA
  DESIGN MANUALS.
********************************************************************************
  DOWNSTREAM PIPE FLOW CONTROL DATA:
  NODE NUMBER =  5506.00           FLOWLINE ELEVATION =   592.71
  PIPE FLOW =       3.70 CFS       PIPE DIAMETER =  18.00 INCHES
  ASSUMED DOWNSTREAM CONTROL HGL =   595.370 FEET
--------------------------------------------------------------------------------
  NODE  5506.00 : HGL = <  595.370>;EGL= <  595.438>;FLOWLINE= <  592.710>

********************************************************************************
  FLOW PROCESS FROM NODE  5506.00 TO NODE  5512.10 IS CODE =  1
  UPSTREAM NODE  5512.10     ELEVATION =   593.50  (FLOW IS UNDER PRESSURE)
--------------------------------------------------------------------------------
  CALCULATE FRICTION LOSSES(LACFCD):
  PIPE FLOW    =       3.70 CFS     PIPE DIAMETER =  18.00 INCHES
  PIPE LENGTH =      79.00 FEET          MANNING'S N  =  0.01300
  SF=(Q/K)**2 = ((      3.70)/(   105.039))**2 = 0.00124
  HF=L*SF = (     79.00)*(0.00124) =      0.098
--------------------------------------------------------------------------------
  NODE  5512.10 : HGL = <  595.468>;EGL= <  595.536>;FLOWLINE= <  593.500>

********************************************************************************
  FLOW PROCESS FROM NODE  5512.10 TO NODE  5512.10 IS CODE =  5
  UPSTREAM NODE  5512.10     ELEVATION =   593.83  (FLOW IS UNDER PRESSURE)
--------------------------------------------------------------------------------
  CALCULATE JUNCTION LOSSES:
       PIPE       FLOW    DIAMETER   ANGLE    FLOWLINE   CRITICAL   VELOCITY
                  (CFS)   (INCHES) (DEGREES) ELEVATION  DEPTH(FT.)  (FT/SEC)
     UPSTREAM       3.70    18.00     90.00    593.83      0.73        2.093
    DOWNSTREAM      3.70    18.00       -      593.50      0.73        2.093
    LATERAL #1      0.00     0.00      0.00      0.00      0.00        0.000
    LATERAL #2      0.00     0.00      0.00      0.00      0.00        0.000
       Q5           0.00===Q5 EQUALS BASIN INPUT===

  LACFCD AND OCEMA FLOW JUNCTION FORMULAE USED:
  DY=(Q2*V2-Q1*V1*COS(DELTA1)-Q3*V3*COS(DELTA3)-
      Q4*V4*COS(DELTA4))/((A1+A2)*16.1)+FRICTION LOSSES
  UPSTREAM:    MANNING'S N = 0.01300;  FRICTION SLOPE = 0.00124
  DOWNSTREAM:  MANNING'S N = 0.01300;  FRICTION SLOPE = 0.00124
  AVERAGED FRICTION SLOPE IN JUNCTION ASSUMED AS 0.00124
  JUNCTION LENGTH =   4.00 FEET
  FRICTION LOSSES =  0.005 FEET         ENTRANCE LOSSES =  0.000 FEET
  JUNCTION LOSSES = (DY+HV1-HV2)+(ENTRANCE LOSSES)
  JUNCTION LOSSES = ( 0.141)+( 0.000) =   0.141
```

NOTE: THE ANALYSIS FLOW COMBINES THE 1.1 CFS ENTERING THE EXISTING GRATE INLETS IN THE ALLEY CONNECTING TO TRAIL BLAZER WAY (EXISTING CONDITION NODE 5505) AND THE UPDATED POST-PROJECT PEAK FLOW OF 2.6 CFS FROM BASIN 5.

```
------------------------------------------------------------------------------
  NODE  5512.10 : HGL = <  595.609>;EGL= <  595.677>;FLOWLINE= <  593.830>

******************************************************************************
  FLOW PROCESS FROM NODE  5512.10 TO NODE  5505.00 IS CODE =  1
  UPSTREAM NODE  5505.00     ELEVATION =   594.19  (FLOW SEALS IN REACH)
------------------------------------------------------------------------------
  CALCULATE FRICTION LOSSES(LACFCD):
  PIPE FLOW   =       3.70 CFS     PIPE DIAMETER =  18.00 INCHES
  PIPE LENGTH =      33.50 FEET          MANNING'S N  =  0.01300
==============================================================================
  DOWNSTREAM CONTROL ASSUMED PRESSURE HEAD(FT) =     1.78
==============================================================================
  PRESSURE FLOW PROFILE COMPUTED INFORMATION:
------------------------------------------------------------------------------
  DISTANCE FROM       PRESSURE   VELOCITY      SPECIFIC        PRESSURE+
   CONTROL(FT)        HEAD(FT)   (FT/SEC)     ENERGY(FT)    MOMENTUM(POUNDS)
         0.000          1.779      2.094          1.847           128.49
        29.363          1.500      2.094          1.568            97.72
------------------------------------------------------------------------------
  NORMAL DEPTH(FT) =      0.60           CRITICAL DEPTH(FT) =      0.73
==============================================================================
  ASSUMED DOWNSTREAM PRESSURE HEAD(FT) =     1.50
==============================================================================
  GRADUALLY VARIED FLOW PROFILE COMPUTED INFORMATION:
------------------------------------------------------------------------------
  DISTANCE FROM      FLOW DEPTH  VELOCITY      SPECIFIC        PRESSURE+
   CONTROL(FT)           (FT)    (FT/SEC)     ENERGY(FT)    MOMENTUM(POUNDS)
        29.363          1.500      2.093          1.568            97.72
        32.487          1.469      2.103          1.538            94.42
        33.500          1.459      2.109          1.528            93.34
------------------------------------------------------------------------------
  NODE  5505.00 : HGL = <  595.649>;EGL= <  595.718>;FLOWLINE= <  594.190>

******************************************************************************
  FLOW PROCESS FROM NODE  5505.00 TO NODE  5505.00 IS CODE =  5
  UPSTREAM NODE  5505.00     ELEVATION =   594.42  (FLOW IS SUBCRITICAL)
------------------------------------------------------------------------------
  CALCULATE JUNCTION LOSSES:
       PIPE       FLOW    DIAMETER   ANGLE    FLOWLINE   CRITICAL   VELOCITY
                  (CFS)   (INCHES) (DEGREES) ELEVATION  DEPTH(FT.)  (FT/SEC)
     UPSTREAM       2.60    18.00      0.00    594.42      0.61        1.580
    DOWNSTREAM      3.70    18.00       -      594.19      0.73        2.110
    LATERAL #1      0.00     0.00      0.00      0.00      0.00        0.000
    LATERAL #2      0.00     0.00      0.00      0.00      0.00        0.000
       Q5           1.10===Q5 EQUALS BASIN INPUT===

  LACFCD AND OCEMA FLOW JUNCTION FORMULAE USED:
  DY=(Q2*V2-Q1*V1*COS(DELTA1)-Q3*V3*COS(DELTA3)-
      Q4*V4*COS(DELTA4))/((A1+A2)*16.1)+FRICTION LOSSES
```

```
  UPSTREAM:    MANNING'S N = 0.01300;  FRICTION SLOPE = 0.00055
  DOWNSTREAM:  MANNING'S N = 0.01300;  FRICTION SLOPE = 0.00110
  AVERAGED FRICTION SLOPE IN JUNCTION ASSUMED AS 0.00082
  JUNCTION LENGTH =   4.00 FEET
  FRICTION LOSSES =  0.003 FEET         ENTRANCE LOSSES =  0.014 FEET
  JUNCTION LOSSES = (DY+HV1-HV2)+(ENTRANCE LOSSES)
  JUNCTION LOSSES = ( 0.044)+( 0.014) =   0.058
--------------------------------------------------------------------------------
  NODE  5505.00 : HGL = <  595.738>;EGL= <  595.776>;FLOWLINE= <  594.420>

********************************************************************************
  FLOW PROCESS FROM NODE  5505.00 TO NODE  5504.10 IS CODE =  1
  UPSTREAM NODE  5504.10     ELEVATION =   595.89  (HYDRAULIC JUMP OCCURS)
--------------------------------------------------------------------------------
  CALCULATE FRICTION LOSSES(LACFCD):
  PIPE FLOW   =       2.60 CFS     PIPE DIAMETER =  18.00 INCHES
  PIPE LENGTH =     135.37 FEET          MANNING'S N  =  0.01300
--------------------------------------------------------------------------------
  HYDRAULIC JUMP: DOWNSTREAM RUN ANALYSIS RESULTS
--------------------------------------------------------------------------------
  NORMAL DEPTH(FT) =      0.50           CRITICAL DEPTH(FT) =      0.61
================================================================================
  UPSTREAM CONTROL ASSUMED FLOWDEPTH(FT) =     0.61
================================================================================
  GRADUALLY VARIED FLOW PROFILE COMPUTED INFORMATION:
--------------------------------------------------------------------------------
  DISTANCE FROM      FLOW DEPTH  VELOCITY      SPECIFIC        PRESSURE+
   CONTROL(FT)           (FT)    (FT/SEC)     ENERGY(FT)    MOMENTUM(POUNDS)
         0.000          0.611      3.843          0.841            30.16
         0.011          0.607      3.881          0.841            30.16
         0.047          0.602      3.920          0.841            30.17
         0.109          0.597      3.960          0.841            30.18
         0.201          0.593      4.001          0.842            30.20
         0.324          0.588      4.042          0.842            30.23
         0.483          0.584      4.084          0.843            30.26
         0.681          0.579      4.127          0.844            30.30
         0.922          0.575      4.171          0.845            30.34
         1.214          0.570      4.216          0.846            30.39
         1.561          0.566      4.262          0.848            30.45
         1.971          0.561      4.308          0.850            30.51
         2.455          0.557      4.356          0.851            30.58
         3.024          0.552      4.404          0.853            30.66
         3.694          0.548      4.454          0.856            30.74
         4.482          0.543      4.504          0.858            30.83
         5.416          0.538      4.556          0.861            30.93
         6.529          0.534      4.609          0.864            31.03
         7.869          0.529      4.663          0.867            31.15
         9.508          0.525      4.718          0.871            31.27
        11.555          0.520      4.774          0.874            31.40
        14.194          0.516      4.831          0.878            31.53
```

```
        17.768          0.511      4.890          0.883            31.68
        23.053          0.507      4.950          0.887            31.83
        32.531          0.502      5.012          0.892            31.99
       135.370          0.501      5.024          0.893            32.02
--------------------------------------------------------------------------------
  HYDRAULIC JUMP: UPSTREAM RUN ANALYSIS RESULTS
================================================================================
  DOWNSTREAM CONTROL ASSUMED FLOWDEPTH(FT) =     1.32
================================================================================
  GRADUALLY VARIED FLOW PROFILE COMPUTED INFORMATION:
--------------------------------------------------------------------------------
  DISTANCE FROM      FLOW DEPTH  VELOCITY      SPECIFIC        PRESSURE+
   CONTROL(FT)           (FT)    (FT/SEC)     ENERGY(FT)    MOMENTUM(POUNDS)
          0.000          1.318      1.580          1.356            71.11
          2.609          1.289      1.608          1.329            68.38
          5.207          1.261      1.639          1.303            65.71
          7.793          1.233      1.673          1.276            63.11
         10.366          1.205      1.709          1.250            60.58
         12.927          1.176      1.748          1.224            58.13
         15.474          1.148      1.791          1.198            55.75
         18.006          1.120      1.837          1.172            53.46
         20.521          1.091      1.887          1.147            51.25
         23.017          1.063      1.941          1.122            49.12
         25.492          1.035      1.999          1.097            47.09
         27.943          1.007      2.061          1.073            45.15
         30.366          0.978      2.129          1.049            43.30
         32.758          0.950      2.202          1.026            41.55
         35.113          0.922      2.282          1.003            39.91
         37.423          0.894      2.368          0.981            38.37
         39.682          0.865      2.461          0.960            36.94
         41.878          0.837      2.563          0.939            35.63
         43.998          0.809      2.675          0.920            34.44
         46.024          0.781      2.796          0.902            33.38
         47.932          0.752      2.930          0.886            32.45
         49.689          0.724      3.077          0.871            31.66
         51.250          0.696      3.239          0.859            31.03
         52.544          0.668      3.419          0.849            30.56
         53.466          0.639      3.619          0.843            30.26
         53.835          0.611      3.843          0.841            30.16
        135.370          0.611      3.843          0.841            30.16
------------------------END OF HYDRAULIC JUMP ANALYSIS------------------------
| PRESSURE+MOMENTUM BALANCE OCCURS AT    48.91 FEET UPSTREAM OF NODE 5505.00 |
|       DOWNSTREAM DEPTH = 0.737 FEET, UPSTREAM CONJUGATE DEPTH = 0.502 FEET |
--------------------------------------------------------------------------------
  NODE  5504.10 : HGL = <  596.501>;EGL= <  596.731>;FLOWLINE= <  595.890>

********************************************************************************
  FLOW PROCESS FROM NODE  5504.10 TO NODE  5504.10 IS CODE =  5
  UPSTREAM NODE  5504.10     ELEVATION =   596.22  (FLOW IS SUBCRITICAL)
  (NOTE: POSSIBLE JUMP IN OR UPSTREAM OF STRUCTURE)
```

```
--------------------------------------------------------------------------
  CALCULATE JUNCTION LOSSES:
       PIPE       FLOW    DIAMETER   ANGLE    FLOWLINE   CRITICAL   VELOCITY
                  (CFS)   (INCHES) (DEGREES) ELEVATION  DEPTH(FT.)  (FT/SEC)
     UPSTREAM       2.60    18.00     90.00    596.22      0.61        7.922
    DOWNSTREAM      2.60    18.00       -      595.89      0.61        3.844
    LATERAL #1      0.00     0.00      0.00      0.00      0.00        0.000
    LATERAL #2      0.00     0.00      0.00      0.00      0.00        0.000
       Q5           0.00===Q5 EQUALS BASIN INPUT===

  LACFCD AND OCEMA FLOW JUNCTION FORMULAE USED:
  DY=(Q2*V2-Q1*V1*COS(DELTA1)-Q3*V3*COS(DELTA3)-
      Q4*V4*COS(DELTA4))/((A1+A2)*16.1)+FRICTION LOSSES
  UPSTREAM:    MANNING'S N = 0.01300;  FRICTION SLOPE = 0.03772
  DOWNSTREAM:  MANNING'S N = 0.01300;  FRICTION SLOPE = 0.00505
  AVERAGED FRICTION SLOPE IN JUNCTION ASSUMED AS 0.02138
  JUNCTION LENGTH =   4.00 FEET
  FRICTION LOSSES =  0.086 FEET         ENTRANCE LOSSES =  0.000 FEET
  JUNCTION LOSSES = (DY+HV1-HV2)+(ENTRANCE LOSSES)
  JUNCTION LOSSES = ( 0.826)+( 0.000) =   0.826
--------------------------------------------------------------------------
  NODE  5504.10 : HGL = <  596.582>;EGL= <  597.556>;FLOWLINE= <  596.220>

**************************************************************************
  FLOW PROCESS FROM NODE  5504.10 TO NODE  5504.20 IS CODE =  1
  UPSTREAM NODE  5504.20     ELEVATION =   596.67  (FLOW IS SUPERCRITICAL)
--------------------------------------------------------------------------
  CALCULATE FRICTION LOSSES(LACFCD):
  PIPE FLOW   =       2.60 CFS     PIPE DIAMETER =  18.00 INCHES
  PIPE LENGTH =      22.12 FEET          MANNING'S N  =  0.01300
--------------------------------------------------------------------------
  NORMAL DEPTH(FT) =      0.42           CRITICAL DEPTH(FT) =      0.61
==========================================================================
  UPSTREAM CONTROL ASSUMED FLOWDEPTH(FT) =     0.28
==========================================================================
  GRADUALLY VARIED FLOW PROFILE COMPUTED INFORMATION:
--------------------------------------------------------------------------
  DISTANCE FROM      FLOW DEPTH  VELOCITY      SPECIFIC        PRESSURE+
   CONTROL(FT)           (FT)    (FT/SEC)     ENERGY(FT)    MOMENTUM(POUNDS)
         0.000          0.285     11.127          2.209            57.77
         1.310          0.290     10.825          2.111            56.33
         2.647          0.296     10.537          2.021            54.96
         4.013          0.301     10.262          1.938            53.66
         5.412          0.307      9.999          1.860            52.43
         6.847          0.312      9.747          1.789            51.25
         8.321          0.318      9.507          1.722            50.13
         9.840          0.323      9.276          1.661            49.06
        11.408          0.329      9.056          1.603            48.05
        13.031          0.335      8.844          1.550            47.08
        14.718          0.340      8.640          1.500            46.16
```

```
        16.476          0.346      8.445          1.454            45.28
        18.318          0.351      8.258          1.411            44.44
        20.257          0.357      8.077          1.370            43.64
        22.120          0.362      7.919          1.336            42.95
--------------------------------------------------------------------------------
  NODE  5504.20 : HGL = <  596.955>;EGL= <  598.879>;FLOWLINE= <  596.670>

********************************************************************************
  FLOW PROCESS FROM NODE  5504.20 TO NODE  5504.20 IS CODE =  5
  UPSTREAM NODE  5504.20     ELEVATION =   597.00  (FLOW IS SUPERCRITICAL)
--------------------------------------------------------------------------------
  CALCULATE JUNCTION LOSSES:
       PIPE       FLOW    DIAMETER   ANGLE    FLOWLINE   CRITICAL   VELOCITY
                  (CFS)   (INCHES) (DEGREES) ELEVATION  DEPTH(FT.)  (FT/SEC)
     UPSTREAM       2.60    18.00      0.00    597.00      0.61       12.378
    DOWNSTREAM      2.60    18.00       -      596.67      0.61       11.131
    LATERAL #1      0.00     0.00      0.00      0.00      0.00        0.000
    LATERAL #2      0.00     0.00      0.00      0.00      0.00        0.000
       Q5           0.00===Q5 EQUALS BASIN INPUT===

  LACFCD AND OCEMA FLOW JUNCTION FORMULAE USED:
  DY=(Q2*V2-Q1*V1*COS(DELTA1)-Q3*V3*COS(DELTA3)-
      Q4*V4*COS(DELTA4))/((A1+A2)*16.1)+FRICTION LOSSES
  UPSTREAM:    MANNING'S N = 0.01300;  FRICTION SLOPE = 0.13328
  DOWNSTREAM:  MANNING'S N = 0.01300;  FRICTION SLOPE = 0.09862
  AVERAGED FRICTION SLOPE IN JUNCTION ASSUMED AS 0.11595
  JUNCTION LENGTH =   4.00 FEET
  FRICTION LOSSES =  0.464 FEET         ENTRANCE LOSSES =  0.000 FEET
  JUNCTION LOSSES = (DY+HV1-HV2)+(ENTRANCE LOSSES)
  JUNCTION LOSSES = ( 0.765)+( 0.000) =   0.765
--------------------------------------------------------------------------------
  NODE  5504.20 : HGL = <  597.265>;EGL= <  599.644>;FLOWLINE= <  597.000>

********************************************************************************
  FLOW PROCESS FROM NODE  5504.20 TO NODE  5504.30 IS CODE =  1
  UPSTREAM NODE  5504.30     ELEVATION =   600.70  (FLOW IS SUPERCRITICAL)
--------------------------------------------------------------------------------
  CALCULATE FRICTION LOSSES(LACFCD):
  PIPE FLOW   =       2.60 CFS     PIPE DIAMETER =  18.00 INCHES
  PIPE LENGTH =      22.05 FEET          MANNING'S N  =  0.01300
--------------------------------------------------------------------------------
  NORMAL DEPTH(FT) =      0.25           CRITICAL DEPTH(FT) =      0.61
================================================================================
  UPSTREAM CONTROL ASSUMED FLOWDEPTH(FT) =     0.61
================================================================================
  GRADUALLY VARIED FLOW PROFILE COMPUTED INFORMATION:
--------------------------------------------------------------------------------
  DISTANCE FROM      FLOW DEPTH  VELOCITY      SPECIFIC        PRESSURE+
   CONTROL(FT)           (FT)    (FT/SEC)     ENERGY(FT)    MOMENTUM(POUNDS)
          0.000          0.611      3.843          0.841            30.16
```

```
         0.004          0.597       3.967          0.841            30.19
         0.017          0.582       4.100          0.843            30.27
         0.041          0.568       4.241          0.847            30.42
         0.077          0.553       4.391          0.853            30.64
         0.125          0.539       4.551          0.861            30.92
         0.190          0.524       4.722          0.871            31.28
         0.272          0.510       4.906          0.884            31.72
         0.375          0.496       5.103          0.900            32.24
         0.502          0.481       5.315          0.920            32.86
         0.657          0.467       5.543          0.944            33.58
         0.847          0.452       5.789          0.973            34.41
         1.076          0.438       6.056          1.008            35.36
         1.355          0.423       6.346          1.049            36.44
         1.692          0.409       6.661          1.098            37.67
         2.103          0.394       7.006          1.157            39.06
         2.606          0.380       7.383          1.227            40.64
         3.227          0.366       7.798          1.310            42.42
         4.003          0.351       8.255          1.410            44.43
         4.987          0.337       8.762          1.530            46.71
         6.264          0.322       9.326          1.674            49.29
         7.977          0.308       9.956          1.848            52.23
        10.394          0.293      10.665          2.061            55.57
        14.120          0.279      11.465          2.321            59.39
        21.099          0.265      12.376          2.644            63.79
        22.050          0.265      12.374          2.644            63.78
--------------------------------------------------------------------------------
  NODE  5504.30 : HGL = <  601.311>;EGL= <  601.541>;FLOWLINE= <  600.700>

********************************************************************************
  FLOW PROCESS FROM NODE  5504.30 TO NODE  5504.30 IS CODE =  8
  UPSTREAM NODE  5504.30     ELEVATION =   600.70  (FLOW IS SUBCRITICAL)
--------------------------------------------------------------------------------
  CALCULATE CATCH BASIN ENTRANCE LOSSES(LACFCD):
  PIPE FLOW =       2.60 CFS          PIPE DIAMETER =  18.00 INCHES
  FLOW VELOCITY =   3.84 FEET/SEC.    VELOCITY HEAD =  0.229 FEET
  CATCH BASIN ENERGY LOSS = .2*(VELOCITY HEAD) = .2*(  0.229) =  0.046
--------------------------------------------------------------------------------
  NODE  5504.30 : HGL = <  601.586>;EGL= <  601.586>;FLOWLINE= <  600.700>

********************************************************************************
  UPSTREAM PIPE FLOW CONTROL DATA:
  NODE NUMBER =  5504.30            FLOWLINE ELEVATION =   600.70
  ASSUMED UPSTREAM CONTROL HGL =    601.31 FOR DOWNSTREAM RUN ANALYSIS

================================================================================
  END OF GRADUALLY VARIED FLOW ANALYSIS
```

```
******************************************************************************
                PIPE-FLOW HYDRAULICS COMPUTER PROGRAM PACKAGE
          (Reference: LACFCD,LACRD, AND OCEMA HYDRAULICS CRITERION)
         (c) Copyright 1982-2014 Advanced Engineering Software (aes)
             Ver. 21.0  Release Date: 06/01/2014  License ID 1261

                              Analysis prepared by:

                            RICK ENGINEERING COMPANY
                                5620 Friars Road
                              San Diego, California 92110
                            619-291-0707   Fax 619-291-4165

 ************************* DESCRIPTION OF STUDY *************************
* HARMONY GROVE VILLAGE, J-16412                                        *
* SYSTEM L (BASIN 4000B) - 100 YEAR MAIN LINE                           *
* H:\16412\HYDRO\HYDRAULICS\PIPEFLOW\...                                *
 ************************************************************************

  FILE NAME: 4966PH1.PIP
  TIME/DATE OF STUDY: 10:15 03/21/2025
```

```
******************************************************************************
              GRADUALLY VARIED FLOW ANALYSIS FOR PIPE SYSTEM
                        NODAL POINT STATUS TABLE
               (Note: "*" indicates nodal point data used.)
                     UPSTREAM RUN                  DOWNSTREAM RUN
   NODE     MODEL    PRESSURE      PRESSURE+         FLOW         PRESSURE+
  NUMBER  PROCESS  HEAD(FT)   MOMENTUM(POUNDS)   DEPTH(FT)   MOMENTUM(POUNDS)
 4966.00-            10.59*          10626.83        2.33             2116.55
       } FRICTION
 4964.00-            10.45*          10452.79        2.29             2127.20
       } JUNCTION
 4964.00-            10.35*          10335.50        2.42             2092.30
       } FRICTION
 4960.00-            10.10*          10027.17        2.62 Dc          2072.96
       } JUNCTION
 4960.00-            10.14*           9912.75        2.22             1781.50
       } FRICTION
 4945.00-             9.55*           9186.62        2.24             1776.85
       } FRICTION+BEND
 4945.00-             9.31*           8896.73        2.39             1757.57
       } FRICTION
 4945.00-             9.29*           8876.91        2.44 Dc          1756.07
       } JUNCTION
 4945.00-             9.26*           7441.20        1.65             1697.08
       } FRICTION
 4895.00-             8.80*           6983.73        1.66             1687.26
       } FRICTION+BEND
```

```
4895.00-            8.37*          6561.65        1.68           1670.51
      } FRICTION+BEND
4895.00-            7.94*          6139.56        1.71           1644.65
      } FRICTION
4895.00-            6.77*          4977.29        2.01           1491.23
      } JUNCTION
4895.00-            6.68*          4882.18        2.12           1464.85
      } FRICTION
4892.00-            5.81*          4023.80        2.03           1485.79
      } JUNCTION
4892.00-            5.62*          3413.89        2.27           1427.65
      } FRICTION
4730.00-            5.59*          3386.03        2.23           1430.48
      } FRICTION+BEND
4730.00-            5.46*          3290.17        2.26           1428.37
      } FRICTION
4730.00-            5.41*          3249.26        2.35 Dc        1424.68
      } JUNCTION
4730.00-            5.23*          2995.62        1.91           1274.02
      } FRICTION
4720.00-            4.42*          2354.53        1.22           1886.28
      } JUNCTION
4720.00-            3.10           1368.18        1.28*          1727.24
      } FRICTION
4677.00-            2.28 Dc        1181.86        1.30*          1703.12
      } JUNCTION
4677.00-            2.59           1071.09        1.09*          1697.07
      } FRICTION
4675.00-            2.17 Dc        1020.92        1.28*          1407.00
      } JUNCTION
4675.00-            2.09 Dc         931.38        1.16*          1390.04
      } FRICTION
4670.00-            2.09*Dc         931.38        2.09*Dc         931.38
      } JUNCTION
4670.00-            3.50*          1310.93        1.51           1122.26
      } FRICTION
4660.00-            3.04*          1222.08        1.56           1099.47
      } JUNCTION
4660.00-            3.79*          1175.40        1.18           1086.34
      } FRICTION        } HYDRAULIC JUMP
4650.00-            1.89*Dc         816.18        1.89*Dc         816.18
      } JUNCTION
4650.00-            4.92*           965.27        1.34            359.17
      } FRICTION
4645.00-            4.63*           909.94        1.52 Dc         351.42
      } JUNCTION
4645.00-            4.75*           548.84        1.16            177.39
      } FRICTION
4635.00-            4.72*           545.69        1.21 Dc         176.83
      } JUNCTION
```

```
  4635.00-             4.82*            512.41        0.95             125.38
        } FRICTION
  4630.00-             4.64*            492.05        1.06 Dc          122.91
        } JUNCTION
  4630.00-             4.64*            457.33        0.55              93.62
        } FRICTION
  4625.00-             2.02*            168.40        0.87 Dc           72.26
        } JUNCTION
  4625.00-             1.89*            132.67        0.46              33.78
        } FRICTION
  4615.00-             1.29*             68.77        0.61 Dc           30.16
        } JUNCTION
  4615.00-             1.06*             48.58        0.50              32.06
        } FRICTION        } HYDRAULIC JUMP
  4604.00-             0.61*Dc           30.16        0.61*Dc           30.16
        } CATCH BASIN
  4604.00-             0.89*             16.14        0.61 Dc           10.79
--------------------------------------------------------------------------------
  MAXIMUM NUMBER OF ENERGY BALANCES USED IN EACH PROFILE =  25
--------------------------------------------------------------------------------
  NOTE: STEADY FLOW HYDRAULIC HEAD-LOSS COMPUTATIONS BASED ON THE MOST
  CONSERVATIVE FORMULAE FROM THE CURRENT LACRD,LACFCD, AND OCEMA
  DESIGN MANUALS.
********************************************************************************
  DOWNSTREAM PIPE FLOW CONTROL DATA:
  NODE NUMBER =  4966.00            FLOWLINE ELEVATION =   589.22
  PIPE FLOW =      85.10 CFS        PIPE DIAMETER =  60.00 INCHES
  ASSUMED DOWNSTREAM CONTROL HGL =   599.810 FEET
--------------------------------------------------------------------------------
  NODE  4966.00 : HGL = <  599.810>;EGL= <  600.102>;FLOWLINE= <  589.220>

********************************************************************************
  FLOW PROCESS FROM NODE  4966.00 TO NODE  4964.00 IS CODE =  1
  UPSTREAM NODE  4964.00     ELEVATION =   589.40  (FLOW IS UNDER PRESSURE)
--------------------------------------------------------------------------------
  CALCULATE FRICTION LOSSES(LACFCD):
  PIPE FLOW   =      85.10 CFS     PIPE DIAMETER =  60.00 INCHES
  PIPE LENGTH =      35.58 FEET          MANNING'S N  =  0.01300
  SF=(Q/K)**2 = ((     85.10)/(  2605.238))**2 = 0.00107
  HF=L*SF = (     35.58)*(0.00107) =      0.038
--------------------------------------------------------------------------------
  NODE  4964.00 : HGL = <  599.848>;EGL= <  600.140>;FLOWLINE= <  589.400>

********************************************************************************
  FLOW PROCESS FROM NODE  4964.00 TO NODE  4964.00 IS CODE =  5
  UPSTREAM NODE  4964.00     ELEVATION =   589.50  (FLOW IS UNDER PRESSURE)
--------------------------------------------------------------------------------
  CALCULATE JUNCTION LOSSES:
       PIPE       FLOW    DIAMETER   ANGLE    FLOWLINE   CRITICAL   VELOCITY
                  (CFS)   (INCHES) (DEGREES) ELEVATION  DEPTH(FT.)  (FT/SEC)
```

```
    UPSTREAM      85.10    60.00      0.00    589.50      2.62        4.334
   DOWNSTREAM     85.10    60.00       -      589.40      2.62        4.334
   LATERAL #1      0.00     0.00      0.00      0.00      0.00        0.000
   LATERAL #2      0.00     0.00      0.00      0.00      0.00        0.000
      Q5           0.00===Q5 EQUALS BASIN INPUT===

  LACFCD AND OCEMA FLOW JUNCTION FORMULAE USED:
  DY=(Q2*V2-Q1*V1*COS(DELTA1)-Q3*V3*COS(DELTA3)-
      Q4*V4*COS(DELTA4))/((A1+A2)*16.1)+FRICTION LOSSES
  UPSTREAM:    MANNING'S N = 0.01300;  FRICTION SLOPE = 0.00107
  DOWNSTREAM:  MANNING'S N = 0.01300;  FRICTION SLOPE = 0.00107
  AVERAGED FRICTION SLOPE IN JUNCTION ASSUMED AS 0.00107
  JUNCTION LENGTH =   4.00 FEET
  FRICTION LOSSES =  0.004 FEET         ENTRANCE LOSSES =  0.000 FEET
  JUNCTION LOSSES = (DY+HV1-HV2)+(ENTRANCE LOSSES)
  JUNCTION LOSSES = ( 0.004)+( 0.000) =   0.004
--------------------------------------------------------------------------------
  NODE  4964.00 : HGL = <  599.852>;EGL= <  600.144>;FLOWLINE= <  589.500>

********************************************************************************
  FLOW PROCESS FROM NODE  4964.00 TO NODE  4960.00 IS CODE =  1
  UPSTREAM NODE  4960.00     ELEVATION =   589.82  (FLOW IS UNDER PRESSURE)
--------------------------------------------------------------------------------
  CALCULATE FRICTION LOSSES(LACFCD):
  PIPE FLOW   =      85.10 CFS     PIPE DIAMETER =  60.00 INCHES
  PIPE LENGTH =      64.00 FEET          MANNING'S N  =  0.01300
  SF=(Q/K)**2 = ((     85.10)/(  2603.877))**2 = 0.00107
  HF=L*SF = (     64.00)*(0.00107) =      0.068
--------------------------------------------------------------------------------
  NODE  4960.00 : HGL = <  599.921>;EGL= <  600.212>;FLOWLINE= <  589.820>

********************************************************************************
  FLOW PROCESS FROM NODE  4960.00 TO NODE  4960.00 IS CODE =  5
  UPSTREAM NODE  4960.00     ELEVATION =   589.92  (FLOW IS UNDER PRESSURE)
--------------------------------------------------------------------------------
  CALCULATE JUNCTION LOSSES:
       PIPE       FLOW    DIAMETER   ANGLE    FLOWLINE   CRITICAL   VELOCITY
                  (CFS)   (INCHES) (DEGREES) ELEVATION  DEPTH(FT.)  (FT/SEC)
     UPSTREAM      74.90    60.00      6.40    589.92      2.45        3.815
    DOWNSTREAM     85.10    60.00       -      589.82      2.62        4.334
    LATERAL #1      7.20    18.00     90.00    593.42      1.04        4.074
    LATERAL #2      3.00    18.00     90.00    593.42      0.66        1.698
       Q5           0.00===Q5 EQUALS BASIN INPUT===

  LACFCD AND OCEMA FLOW JUNCTION FORMULAE USED:
  DY=(Q2*V2-Q1*V1*COS(DELTA1)-Q3*V3*COS(DELTA3)-
      Q4*V4*COS(DELTA4))/((A1+A2)*16.1)+FRICTION LOSSES
  UPSTREAM:    MANNING'S N = 0.01300;  FRICTION SLOPE = 0.00083
  DOWNSTREAM:  MANNING'S N = 0.01300;  FRICTION SLOPE = 0.00107
  AVERAGED FRICTION SLOPE IN JUNCTION ASSUMED AS 0.00095
```

```
  JUNCTION LENGTH =   4.00 FEET
  FRICTION LOSSES =  0.004 FEET         ENTRANCE LOSSES =  0.000 FEET
  JUNCTION LOSSES = (DY+HV1-HV2)+(ENTRANCE LOSSES)
  JUNCTION LOSSES = ( 0.072)+( 0.000) =   0.072
------------------------------------------------------------------------------
  NODE  4960.00 : HGL = <  600.059>;EGL= <  600.285>;FLOWLINE= <  589.920>

******************************************************************************
  FLOW PROCESS FROM NODE  4960.00 TO NODE  4945.00 IS CODE =  1
  UPSTREAM NODE  4945.00     ELEVATION =   590.63  (FLOW IS UNDER PRESSURE)
------------------------------------------------------------------------------
  CALCULATE FRICTION LOSSES(LACFCD):
  PIPE FLOW   =      74.90 CFS     PIPE DIAMETER =  60.00 INCHES
  PIPE LENGTH =     141.92 FEET          MANNING'S N  =  0.01300
  SF=(Q/K)**2 = ((     74.90)/(  2604.498))**2 = 0.00083
  HF=L*SF = (    141.92)*(0.00083) =      0.117
------------------------------------------------------------------------------
  NODE  4945.00 : HGL = <  600.176>;EGL= <  600.402>;FLOWLINE= <  590.630>

******************************************************************************
  FLOW PROCESS FROM NODE  4960.00 TO NODE  4945.00 IS CODE =  3
  UPSTREAM NODE  4945.00     ELEVATION =   590.98  (FLOW IS UNDER PRESSURE)
------------------------------------------------------------------------------
  CALCULATE PIPE-BEND LOSSES(OCEMA):
  PIPE FLOW =      74.90 CFS             PIPE DIAMETER =  60.00 INCHES
  CENTRAL ANGLE = 88.400 DEGREES         MANNING'S N = 0.01300
  PIPE LENGTH =      69.39 FEET          BEND COEFFICIENT(KB) = 0.24777
  FLOW VELOCITY =   3.81 FEET/SEC.       VELOCITY HEAD =  0.226 FEET
  HB=KB*(VELOCITY HEAD) = ( 0.248)*( 0.226) =   0.056
  SF=(Q/K)**2 = ((     74.90)/(  2603.754))**2 = 0.00083
  HF=L*SF = (     69.39)*(0.00083) =  0.057
  TOTAL HEAD LOSSES = HB + HF = ( 0.056)+( 0.057) =  0.113
------------------------------------------------------------------------------
  NODE  4945.00 : HGL = <  600.289>;EGL= <  600.515>;FLOWLINE= <  590.980>

******************************************************************************
  FLOW PROCESS FROM NODE  4960.00 TO NODE  4945.00 IS CODE =  1
  UPSTREAM NODE  4945.00     ELEVATION =   591.00  (FLOW IS UNDER PRESSURE)
------------------------------------------------------------------------------
  CALCULATE FRICTION LOSSES(LACFCD):
  PIPE FLOW   =      74.90 CFS     PIPE DIAMETER =  60.00 INCHES
  PIPE LENGTH =       4.63 FEET          MANNING'S N  =  0.01300
  SF=(Q/K)**2 = ((     74.90)/(  2619.910))**2 = 0.00082
  HF=L*SF = (      4.63)*(0.00082) =      0.004
------------------------------------------------------------------------------
  NODE  4945.00 : HGL = <  600.293>;EGL= <  600.519>;FLOWLINE= <  591.000>

******************************************************************************
  FLOW PROCESS FROM NODE  4945.00 TO NODE  4945.00 IS CODE =  5
  UPSTREAM NODE  4945.00     ELEVATION =   591.10  (FLOW IS UNDER PRESSURE)
```

```
------------------------------------------------------------------------
  CALCULATE JUNCTION LOSSES:
       PIPE       FLOW    DIAMETER   ANGLE    FLOWLINE   CRITICAL   VELOCITY
                  (CFS)   (INCHES) (DEGREES) ELEVATION  DEPTH(FT.)  (FT/SEC)
     UPSTREAM      63.30    54.00      0.00    591.10      2.31        3.980
    DOWNSTREAM     74.90    60.00       -      591.00      2.45        3.815
    LATERAL #1      4.40    18.00     90.00    594.00      0.80        2.490
    LATERAL #2      7.20    18.00     90.00    594.00      1.04        4.074
       Q5           0.00===Q5 EQUALS BASIN INPUT===

  LACFCD AND OCEMA FLOW JUNCTION FORMULAE USED:
  DY=(Q2*V2-Q1*V1*COS(DELTA1)-Q3*V3*COS(DELTA3)-
      Q4*V4*COS(DELTA4))/((A1+A2)*16.1)+FRICTION LOSSES
  UPSTREAM:    MANNING'S N = 0.01300;  FRICTION SLOPE = 0.00104
  DOWNSTREAM:  MANNING'S N = 0.01300;  FRICTION SLOPE = 0.00083
  AVERAGED FRICTION SLOPE IN JUNCTION ASSUMED AS 0.00093
  JUNCTION LENGTH =   4.00 FEET
  FRICTION LOSSES =  0.004 FEET         ENTRANCE LOSSES =  0.000 FEET
  JUNCTION LOSSES = (DY+HV1-HV2)+(ENTRANCE LOSSES)
  JUNCTION LOSSES = ( 0.083)+( 0.000) =   0.083
------------------------------------------------------------------------
  NODE  4945.00 : HGL = <  600.356>;EGL= <  600.602>;FLOWLINE= <  591.100>

************************************************************************
  FLOW PROCESS FROM NODE  4945.00 TO NODE  4895.00 IS CODE =  1
  UPSTREAM NODE  4895.00     ELEVATION =   591.60  (FLOW IS UNDER PRESSURE)
------------------------------------------------------------------------
  CALCULATE FRICTION LOSSES(LACFCD):
  PIPE FLOW   =      63.30 CFS     PIPE DIAMETER =  54.00 INCHES
  PIPE LENGTH =      37.68 FEET          MANNING'S N  =  0.01300
  SF=(Q/K)**2 = ((     63.30)/(  1967.518))**2 = 0.00104
  HF=L*SF = (     37.68)*(0.00104) =      0.039
------------------------------------------------------------------------
  NODE  4895.00 : HGL = <  600.395>;EGL= <  600.641>;FLOWLINE= <  591.600>

************************************************************************
  FLOW PROCESS FROM NODE  4945.00 TO NODE  4895.00 IS CODE =  3
  UPSTREAM NODE  4895.00     ELEVATION =   592.11  (FLOW IS UNDER PRESSURE)
------------------------------------------------------------------------
  CALCULATE PIPE-BEND LOSSES(OCEMA):
  PIPE FLOW =      63.30 CFS             PIPE DIAMETER =  54.00 INCHES
  CENTRAL ANGLE = 48.600 DEGREES         MANNING'S N = 0.01300
  PIPE LENGTH =      38.14 FEET          BEND COEFFICIENT(KB) = 0.18371
  FLOW VELOCITY =   3.98 FEET/SEC.       VELOCITY HEAD =  0.246 FEET
  HB=KB*(VELOCITY HEAD) = ( 0.184)*( 0.246) =   0.045
  SF=(Q/K)**2 = ((     63.30)/(  1966.240))**2 = 0.00104
  HF=L*SF = (     38.14)*(0.00104) =  0.040
  TOTAL HEAD LOSSES = HB + HF = ( 0.045)+( 0.040) =  0.085
------------------------------------------------------------------------
  NODE  4895.00 : HGL = <  600.480>;EGL= <  600.726>;FLOWLINE= <  592.110>
```

```
****************************************************************************
  FLOW PROCESS FROM NODE  4945.00 TO NODE  4895.00 IS CODE =  3
  UPSTREAM NODE  4895.00     ELEVATION =   592.62  (FLOW IS UNDER PRESSURE)
----------------------------------------------------------------------------
  CALCULATE PIPE-BEND LOSSES(OCEMA):
  PIPE FLOW =      63.30 CFS             PIPE DIAMETER =  54.00 INCHES
  CENTRAL ANGLE = 48.600 DEGREES         MANNING'S N = 0.01300
  PIPE LENGTH =      38.13 FEET          BEND COEFFICIENT(KB) = 0.18371
  FLOW VELOCITY =   3.98 FEET/SEC.       VELOCITY HEAD =  0.246 FEET
  HB=KB*(VELOCITY HEAD) = ( 0.184)*( 0.246) =   0.045
  SF=(Q/K)**2 = ((     63.30)/(  1965.983))**2 = 0.00104
  HF=L*SF = (     38.13)*(0.00104) =  0.040
  TOTAL HEAD LOSSES = HB + HF = ( 0.045)+( 0.040) =  0.085
----------------------------------------------------------------------------
  NODE  4895.00 : HGL = <  600.564>;EGL= <  600.810>;FLOWLINE= <  592.620>

****************************************************************************
  FLOW PROCESS FROM NODE  4945.00 TO NODE  4895.00 IS CODE =  1
  UPSTREAM NODE  4895.00     ELEVATION =   593.89  (FLOW IS UNDER PRESSURE)
----------------------------------------------------------------------------
  CALCULATE FRICTION LOSSES(LACFCD):
  PIPE FLOW   =      63.30 CFS     PIPE DIAMETER =  54.00 INCHES
  PIPE LENGTH =      95.43 FEET          MANNING'S N  =  0.01300
  SF=(Q/K)**2 = ((     63.30)/(  1966.521))**2 = 0.00104
  HF=L*SF = (     95.43)*(0.00104) =      0.099
----------------------------------------------------------------------------
  NODE  4895.00 : HGL = <  600.663>;EGL= <  600.909>;FLOWLINE= <  593.890>

****************************************************************************
  FLOW PROCESS FROM NODE  4895.00 TO NODE  4895.00 IS CODE =  5
  UPSTREAM NODE  4895.00     ELEVATION =   593.99  (FLOW IS UNDER PRESSURE)
----------------------------------------------------------------------------
  CALCULATE JUNCTION LOSSES:
       PIPE       FLOW    DIAMETER   ANGLE    FLOWLINE   CRITICAL   VELOCITY
                  (CFS)   (INCHES) (DEGREES) ELEVATION  DEPTH(FT.)  (FT/SEC)
     UPSTREAM      63.30    54.00      0.00    593.99      2.31        3.980
    DOWNSTREAM     63.30    54.00       -      593.89      2.31        3.980
    LATERAL #1      0.00     0.00      0.00      0.00      0.00        0.000
    LATERAL #2      0.00     0.00      0.00      0.00      0.00        0.000
       Q5           0.00===Q5 EQUALS BASIN INPUT===

  LACFCD AND OCEMA FLOW JUNCTION FORMULAE USED:
  DY=(Q2*V2-Q1*V1*COS(DELTA1)-Q3*V3*COS(DELTA3)-
      Q4*V4*COS(DELTA4))/((A1+A2)*16.1)+FRICTION LOSSES
  UPSTREAM:    MANNING'S N = 0.01300;  FRICTION SLOPE = 0.00104
  DOWNSTREAM:  MANNING'S N = 0.01300;  FRICTION SLOPE = 0.00104
  AVERAGED FRICTION SLOPE IN JUNCTION ASSUMED AS 0.00104
  JUNCTION LENGTH =   4.00 FEET
  FRICTION LOSSES =  0.004 FEET         ENTRANCE LOSSES =  0.000 FEET
```

```
  JUNCTION LOSSES = (DY+HV1-HV2)+(ENTRANCE LOSSES)
  JUNCTION LOSSES = ( 0.004)+( 0.000) =   0.004
------------------------------------------------------------------------------
  NODE  4895.00 : HGL = <  600.667>;EGL= <  600.913>;FLOWLINE= <  593.990>

******************************************************************************
  FLOW PROCESS FROM NODE  4895.00 TO NODE  4892.00 IS CODE =  1
  UPSTREAM NODE  4892.00     ELEVATION =   595.08  (FLOW IS UNDER PRESSURE)
------------------------------------------------------------------------------
  CALCULATE FRICTION LOSSES(LACFCD):
  PIPE FLOW   =      63.30 CFS     PIPE DIAMETER =  54.00 INCHES
  PIPE LENGTH =     217.24 FEET          MANNING'S N  =  0.01300
  SF=(Q/K)**2 = ((     63.30)/(  1966.474))**2 = 0.00104
  HF=L*SF = (    217.24)*(0.00104) =      0.225
------------------------------------------------------------------------------
  NODE  4892.00 : HGL = <  600.893>;EGL= <  601.139>;FLOWLINE= <  595.080>

******************************************************************************
  FLOW PROCESS FROM NODE  4892.00 TO NODE  4892.00 IS CODE =  5
  UPSTREAM NODE  4892.00     ELEVATION =   595.18  (FLOW IS UNDER PRESSURE)
------------------------------------------------------------------------------
  CALCULATE JUNCTION LOSSES:
       PIPE       FLOW    DIAMETER   ANGLE    FLOWLINE   CRITICAL   VELOCITY
                  (CFS)   (INCHES) (DEGREES) ELEVATION  DEPTH(FT.)  (FT/SEC)
     UPSTREAM      61.00    48.00      0.00    595.18      2.35        4.854
    DOWNSTREAM     63.30    54.00       -      595.08      2.31        3.980
    LATERAL #1      1.50    18.00     90.00    597.67      0.46        0.849
    LATERAL #2      0.80    18.00     90.00    597.67      0.33        0.453
       Q5           0.00===Q5 EQUALS BASIN INPUT===

  LACFCD AND OCEMA FLOW JUNCTION FORMULAE USED:
  DY=(Q2*V2-Q1*V1*COS(DELTA1)-Q3*V3*COS(DELTA3)-
      Q4*V4*COS(DELTA4))/((A1+A2)*16.1)+FRICTION LOSSES
  UPSTREAM:    MANNING'S N = 0.01300;  FRICTION SLOPE = 0.00180
  DOWNSTREAM:  MANNING'S N = 0.01300;  FRICTION SLOPE = 0.00104
  AVERAGED FRICTION SLOPE IN JUNCTION ASSUMED AS 0.00142
  JUNCTION LENGTH =   4.00 FEET
  FRICTION LOSSES =  0.006 FEET         ENTRANCE LOSSES =  0.000 FEET
  JUNCTION LOSSES = (DY+HV1-HV2)+(ENTRANCE LOSSES)
  JUNCTION LOSSES = ( 0.029)+( 0.000) =   0.029
------------------------------------------------------------------------------
  NODE  4892.00 : HGL = <  600.802>;EGL= <  601.168>;FLOWLINE= <  595.180>

******************************************************************************
  FLOW PROCESS FROM NODE  4892.00 TO NODE  4730.00 IS CODE =  1
  UPSTREAM NODE  4730.00     ELEVATION =   595.24  (FLOW IS UNDER PRESSURE)
------------------------------------------------------------------------------
  CALCULATE FRICTION LOSSES(LACFCD):
  PIPE FLOW   =      61.00 CFS     PIPE DIAMETER =  48.00 INCHES
  PIPE LENGTH =      13.57 FEET          MANNING'S N  =  0.01300
```

```
  SF=(Q/K)**2 = ((     61.00)/(  1436.341))**2 = 0.00180
  HF=L*SF = (     13.57)*(0.00180) =      0.024
--------------------------------------------------------------------------------
  NODE  4730.00 : HGL = <  600.826>;EGL= <  601.192>;FLOWLINE= <  595.240>

********************************************************************************
  FLOW PROCESS FROM NODE  4892.00 TO NODE  4730.00 IS CODE =  3
  UPSTREAM NODE  4730.00     ELEVATION =   595.57  (FLOW IS UNDER PRESSURE)
--------------------------------------------------------------------------------
  CALCULATE PIPE-BEND LOSSES(OCEMA):
  PIPE FLOW =      61.00 CFS             PIPE DIAMETER =  48.00 INCHES
  CENTRAL ANGLE = 85.600 DEGREES         MANNING'S N = 0.01300
  PIPE LENGTH =      65.74 FEET          BEND COEFFICIENT(KB) = 0.24381
  FLOW VELOCITY =   4.85 FEET/SEC.       VELOCITY HEAD =  0.366 FEET
  HB=KB*(VELOCITY HEAD) = ( 0.244)*( 0.366) =   0.089
  SF=(Q/K)**2 = ((     61.00)/(  1436.453))**2 = 0.00180
  HF=L*SF = (     65.74)*(0.00180) =  0.119
  TOTAL HEAD LOSSES = HB + HF = ( 0.089)+( 0.119) =  0.208
--------------------------------------------------------------------------------
  NODE  4730.00 : HGL = <  601.034>;EGL= <  601.400>;FLOWLINE= <  595.570>

********************************************************************************
  FLOW PROCESS FROM NODE  4892.00 TO NODE  4730.00 IS CODE =  1
  UPSTREAM NODE  4730.00     ELEVATION =   595.65  (FLOW IS UNDER PRESSURE)
--------------------------------------------------------------------------------
  CALCULATE FRICTION LOSSES(LACFCD):
  PIPE FLOW   =      61.00 CFS     PIPE DIAMETER =  48.00 INCHES
  PIPE LENGTH =      15.44 FEET          MANNING'S N  =  0.01300
  SF=(Q/K)**2 = ((     61.00)/(  1436.749))**2 = 0.00180
  HF=L*SF = (     15.44)*(0.00180) =      0.028
--------------------------------------------------------------------------------
  NODE  4730.00 : HGL = <  601.062>;EGL= <  601.428>;FLOWLINE= <  595.650>

********************************************************************************
  FLOW PROCESS FROM NODE  4730.00 TO NODE  4730.00 IS CODE =  5
  UPSTREAM NODE  4730.00     ELEVATION =   595.98  (FLOW IS UNDER PRESSURE)
--------------------------------------------------------------------------------
  CALCULATE JUNCTION LOSSES:
       PIPE       FLOW    DIAMETER   ANGLE    FLOWLINE   CRITICAL   VELOCITY
                  (CFS)   (INCHES) (DEGREES) ELEVATION  DEPTH(FT.)  (FT/SEC)
     UPSTREAM      54.60    48.00      0.00    595.98      2.22        4.345
    DOWNSTREAM     61.00    48.00       -      595.65      2.35        4.854
    LATERAL #1      6.40    18.00     90.00    598.15      0.98        3.622
    LATERAL #2      0.00     0.00      0.00      0.00      0.00        0.000
       Q5           0.00===Q5 EQUALS BASIN INPUT===

  LACFCD AND OCEMA FLOW JUNCTION FORMULAE USED:
  DY=(Q2*V2-Q1*V1*COS(DELTA1)-Q3*V3*COS(DELTA3)-
      Q4*V4*COS(DELTA4))/((A1+A2)*16.1)+FRICTION LOSSES
  UPSTREAM:    MANNING'S N = 0.01300;  FRICTION SLOPE = 0.00144
```

```
  DOWNSTREAM:  MANNING'S N = 0.01300;  FRICTION SLOPE = 0.00180
  AVERAGED FRICTION SLOPE IN JUNCTION ASSUMED AS 0.00162
  JUNCTION LENGTH =   4.00 FEET
  FRICTION LOSSES =  0.006 FEET         ENTRANCE LOSSES =  0.000 FEET
  JUNCTION LOSSES = (DY+HV1-HV2)+(ENTRANCE LOSSES)
  JUNCTION LOSSES = ( 0.079)+( 0.000) =   0.079
--------------------------------------------------------------------------------
  NODE  4730.00 : HGL = <  601.214>;EGL= <  601.507>;FLOWLINE= <  595.980>

********************************************************************************
  FLOW PROCESS FROM NODE  4730.00 TO NODE  4720.00 IS CODE =  1
  UPSTREAM NODE  4720.00     ELEVATION =   597.13  (FLOW IS UNDER PRESSURE)
--------------------------------------------------------------------------------
  CALCULATE FRICTION LOSSES(LACFCD):
  PIPE FLOW   =      54.60 CFS     PIPE DIAMETER =  48.00 INCHES
  PIPE LENGTH =     230.10 FEET          MANNING'S N  =  0.01300
  SF=(Q/K)**2 = ((     54.60)/(  1436.423))**2 = 0.00144
  HF=L*SF = (    230.10)*(0.00144) =      0.332
--------------------------------------------------------------------------------
  NODE  4720.00 : HGL = <  601.546>;EGL= <  601.840>;FLOWLINE= <  597.130>

********************************************************************************
  FLOW PROCESS FROM NODE  4720.00 TO NODE  4720.00 IS CODE =  5
  UPSTREAM NODE  4720.00     ELEVATION =   598.13  (FLOW IS UNDER PRESSURE)
  (NOTE: POSSIBLE JUMP IN OR UPSTREAM OF STRUCTURE)
--------------------------------------------------------------------------------
  CALCULATE JUNCTION LOSSES:
       PIPE       FLOW    DIAMETER   ANGLE    FLOWLINE   CRITICAL   VELOCITY
                  (CFS)   (INCHES) (DEGREES) ELEVATION  DEPTH(FT.)  (FT/SEC)
     UPSTREAM      49.20    36.00      0.00    598.13      2.28       17.105
    DOWNSTREAM     54.60    48.00       -      597.13      2.22        4.345
    LATERAL #1      5.40    18.00     90.00    599.63      0.90        4.907
    LATERAL #2      0.00     0.00      0.00      0.00      0.00        0.000
       Q5           0.00===Q5 EQUALS BASIN INPUT===

  LACFCD AND OCEMA FLOW JUNCTION FORMULAE USED:
  DY=(Q2*V2-Q1*V1*COS(DELTA1)-Q3*V3*COS(DELTA3)-
      Q4*V4*COS(DELTA4))/((A1+A2)*16.1)+FRICTION LOSSES
  UPSTREAM:    MANNING'S N = 0.01300;  FRICTION SLOPE = 0.03793
  DOWNSTREAM:  MANNING'S N = 0.01300;  FRICTION SLOPE = 0.00144
  AVERAGED FRICTION SLOPE IN JUNCTION ASSUMED AS 0.01969
  JUNCTION LENGTH =   4.00 FEET
  FRICTION LOSSES =  0.079 FEET         ENTRANCE LOSSES =  0.000 FEET
  JUNCTION LOSSES = (DY+HV1-HV2)+(ENTRANCE LOSSES)
  JUNCTION LOSSES = ( 2.114)+( 0.000) =   2.114
--------------------------------------------------------------------------------
  NODE  4720.00 : HGL = <  599.410>;EGL= <  603.953>;FLOWLINE= <  598.130>

********************************************************************************
  FLOW PROCESS FROM NODE  4720.00 TO NODE  4677.00 IS CODE =  1
```

```
  UPSTREAM NODE  4677.00     ELEVATION =   600.17  (FLOW IS SUPERCRITICAL)
---------------------------------------------------------------------------
  CALCULATE FRICTION LOSSES(LACFCD):
  PIPE FLOW   =      49.20 CFS     PIPE DIAMETER =  36.00 INCHES
  PIPE LENGTH =      51.29 FEET          MANNING'S N  =  0.01300
---------------------------------------------------------------------------
  NORMAL DEPTH(FT) =      1.26           CRITICAL DEPTH(FT) =      2.28
===========================================================================
  UPSTREAM CONTROL ASSUMED FLOWDEPTH(FT) =     1.30
===========================================================================
  GRADUALLY VARIED FLOW PROFILE COMPUTED INFORMATION:
---------------------------------------------------------------------------
  DISTANCE FROM      FLOW DEPTH  VELOCITY      SPECIFIC        PRESSURE+
   CONTROL(FT)           (FT)    (FT/SEC)     ENERGY(FT)    MOMENTUM(POUNDS)
         0.000          1.296     16.816          5.690          1703.12
         3.038          1.295     16.838          5.700          1705.04
         6.211          1.294     16.861          5.711          1706.96
         9.531          1.292     16.884          5.722          1708.90
        13.013          1.291     16.907          5.732          1710.84
        16.672          1.290     16.930          5.743          1712.78
        20.525          1.288     16.953          5.754          1714.73
        24.596          1.287     16.976          5.764          1716.69
        28.907          1.286     16.999          5.775          1718.66
        33.488          1.284     17.022          5.786          1720.62
        38.375          1.283     17.045          5.797          1722.60
        43.609          1.282     17.068          5.808          1724.58
        49.242          1.280     17.092          5.819          1726.57
        51.290          1.280     17.100          5.823          1727.24
---------------------------------------------------------------------------
  NODE  4677.00 : HGL = <  601.466>;EGL= <  605.860>;FLOWLINE= <  600.170>

***************************************************************************
  FLOW PROCESS FROM NODE  4677.00 TO NODE  4677.00 IS CODE =  5
  UPSTREAM NODE  4677.00     ELEVATION =   600.50  (FLOW IS SUPERCRITICAL)
---------------------------------------------------------------------------
  CALCULATE JUNCTION LOSSES:
       PIPE       FLOW    DIAMETER   ANGLE    FLOWLINE   CRITICAL   VELOCITY
                  (CFS)   (INCHES) (DEGREES) ELEVATION  DEPTH(FT.)  (FT/SEC)
     UPSTREAM      44.20    36.00      0.00    600.50      2.17       19.046
    DOWNSTREAM     49.20    36.00       -      600.17      2.28       16.821
    LATERAL #1      5.00    18.00     90.00    602.00      0.86        4.770
    LATERAL #2      0.00     0.00      0.00      0.00      0.00        0.000
       Q5           0.00===Q5 EQUALS BASIN INPUT===

  LACFCD AND OCEMA FLOW JUNCTION FORMULAE USED:
  DY=(Q2*V2-Q1*V1*COS(DELTA1)-Q3*V3*COS(DELTA3)-
      Q4*V4*COS(DELTA4))/((A1+A2)*16.1)+FRICTION LOSSES
  UPSTREAM:    MANNING'S N = 0.01300;  FRICTION SLOPE = 0.05514
  DOWNSTREAM:  MANNING'S N = 0.01300;  FRICTION SLOPE = 0.03624
  AVERAGED FRICTION SLOPE IN JUNCTION ASSUMED AS 0.04569
```

```
  JUNCTION LENGTH =   4.00 FEET
  FRICTION LOSSES =  0.183 FEET         ENTRANCE LOSSES =  0.000 FEET
  JUNCTION LOSSES = (DY+HV1-HV2)+(ENTRANCE LOSSES)
  JUNCTION LOSSES = ( 1.364)+( 0.000) =   1.364
--------------------------------------------------------------------------------
  NODE  4677.00 : HGL = <  601.590>;EGL= <  607.223>;FLOWLINE= <  600.500>

********************************************************************************
  FLOW PROCESS FROM NODE  4677.00 TO NODE  4675.00 IS CODE =  1
  UPSTREAM NODE  4675.00     ELEVATION =   621.11  (FLOW IS SUPERCRITICAL)
--------------------------------------------------------------------------------
  CALCULATE FRICTION LOSSES(LACFCD):
  PIPE FLOW   =      44.20 CFS     PIPE DIAMETER =  36.00 INCHES
  PIPE LENGTH =     364.16 FEET          MANNING'S N  =  0.01300
--------------------------------------------------------------------------------
  NORMAL DEPTH(FT) =      1.08           CRITICAL DEPTH(FT) =      2.17
================================================================================
  UPSTREAM CONTROL ASSUMED FLOWDEPTH(FT) =     1.28
================================================================================
  GRADUALLY VARIED FLOW PROFILE COMPUTED INFORMATION:
--------------------------------------------------------------------------------
  DISTANCE FROM      FLOW DEPTH  VELOCITY      SPECIFIC        PRESSURE+
   CONTROL(FT)           (FT)    (FT/SEC)     ENERGY(FT)    MOMENTUM(POUNDS)
         0.000          1.285     15.286          4.915          1407.00
         2.031          1.277     15.414          4.968          1416.50
         4.178          1.269     15.544          5.023          1426.19
         6.450          1.260     15.676          5.079          1436.08
         8.861          1.252     15.810          5.136          1446.15
        11.423          1.244     15.947          5.195          1456.43
        14.154          1.236     16.085          5.256          1466.91
        17.070          1.228     16.226          5.319          1477.60
        20.194          1.220     16.369          5.383          1488.50
        23.552          1.212     16.515          5.450          1499.62
        27.174          1.204     16.663          5.518          1510.96
        31.097          1.196     16.813          5.588          1522.53
        35.366          1.188     16.966          5.660          1534.33
        40.037          1.180     17.122          5.735          1546.37
        45.181          1.172     17.281          5.811          1558.65
        50.889          1.164     17.442          5.890          1571.18
        57.281          1.155     17.606          5.972          1583.96
        64.518          1.147     17.773          6.055          1597.00
        72.828          1.139     17.943          6.141          1610.31
        82.545          1.131     18.115          6.230          1623.89
        94.185          1.123     18.292          6.322          1637.75
       108.612          1.115     18.471          6.416          1651.89
       127.449          1.107     18.653          6.513          1666.33
       154.342          1.099     18.839          6.613          1681.07
       200.985          1.091     19.028          6.717          1696.11
       364.160          1.090     19.040          6.723          1697.07
--------------------------------------------------------------------------------
```

```
  NODE  4675.00 : HGL = <  622.395>;EGL= <  626.025>;FLOWLINE= <  621.110>

****************************************************************************
  FLOW PROCESS FROM NODE  4675.00 TO NODE  4675.00 IS CODE =  5
  UPSTREAM NODE  4675.00     ELEVATION =   621.44  (FLOW IS SUPERCRITICAL)
----------------------------------------------------------------------------
  CALCULATE JUNCTION LOSSES:
       PIPE       FLOW    DIAMETER   ANGLE    FLOWLINE   CRITICAL   VELOCITY
                  (CFS)   (INCHES) (DEGREES) ELEVATION  DEPTH(FT.)  (FT/SEC)
     UPSTREAM      41.30    36.00      0.00    621.44      2.09       16.421
    DOWNSTREAM     44.20    36.00       -      621.11      2.17       15.291
    LATERAL #1      2.90    18.00     90.00    622.61      0.65        3.976
    LATERAL #2      0.00     0.00      0.00      0.00      0.00        0.000
       Q5           0.00===Q5 EQUALS BASIN INPUT===

  LACFCD AND OCEMA FLOW JUNCTION FORMULAE USED:
  DY=(Q2*V2-Q1*V1*COS(DELTA1)-Q3*V3*COS(DELTA3)-
      Q4*V4*COS(DELTA4))/((A1+A2)*16.1)+FRICTION LOSSES
  UPSTREAM:    MANNING'S N = 0.01300;  FRICTION SLOPE = 0.03858
  DOWNSTREAM:  MANNING'S N = 0.01300;  FRICTION SLOPE = 0.03020
  AVERAGED FRICTION SLOPE IN JUNCTION ASSUMED AS 0.03439
  JUNCTION LENGTH =   4.00 FEET
  FRICTION LOSSES =  0.138 FEET         ENTRANCE LOSSES =  0.000 FEET
  JUNCTION LOSSES = (DY+HV1-HV2)+(ENTRANCE LOSSES)
  JUNCTION LOSSES = ( 0.759)+( 0.000) =   0.759
----------------------------------------------------------------------------
  NODE  4675.00 : HGL = <  622.597>;EGL= <  626.785>;FLOWLINE= <  621.440>

****************************************************************************
  FLOW PROCESS FROM NODE  4675.00 TO NODE  4670.00 IS CODE =  1
  UPSTREAM NODE  4670.00     ELEVATION =   626.86  (FLOW IS SUPERCRITICAL)
----------------------------------------------------------------------------
  CALCULATE FRICTION LOSSES(LACFCD):
  PIPE FLOW   =      41.30 CFS     PIPE DIAMETER =  36.00 INCHES
  PIPE LENGTH =     114.14 FEET          MANNING'S N  =  0.01300
----------------------------------------------------------------------------
  NORMAL DEPTH(FT) =      1.09           CRITICAL DEPTH(FT) =      2.09
============================================================================
  UPSTREAM CONTROL ASSUMED FLOWDEPTH(FT) =     2.09
============================================================================
  GRADUALLY VARIED FLOW PROFILE COMPUTED INFORMATION:
----------------------------------------------------------------------------
  DISTANCE FROM      FLOW DEPTH  VELOCITY      SPECIFIC        PRESSURE+
   CONTROL(FT)           (FT)    (FT/SEC)     ENERGY(FT)    MOMENTUM(POUNDS)
         0.000          2.093      7.841          3.048           931.38
         0.037          2.053      8.010          3.050           931.88
         0.153          2.013      8.188          3.055           933.41
         0.358          1.973      8.376          3.063           936.03
         0.662          1.933      8.574          3.075           939.80
         1.076          1.893      8.784          3.092           944.76
```

```
         1.615          1.853      9.007          3.114           951.00
         2.296          1.813      9.242          3.140           958.58
         3.138          1.773      9.492          3.173           967.58
         4.165          1.733      9.757          3.213           978.09
         5.405          1.693     10.038          3.259           990.22
         6.894          1.653     10.337          3.314          1004.07
         8.673          1.614     10.656          3.378          1019.75
        10.797          1.574     10.995          3.452          1037.41
        13.334          1.534     11.357          3.538          1057.20
        16.373          1.494     11.744          3.637          1079.28
        20.029          1.454     12.159          3.751          1103.84
        24.463          1.414     12.603          3.882          1131.09
        29.898          1.374     13.080          4.032          1161.29
        36.665          1.334     13.594          4.205          1194.68
        45.275          1.294     14.148          4.404          1231.60
        56.588          1.254     14.746          4.633          1272.40
        72.221          1.214     15.395          4.897          1317.48
        95.805          1.174     16.099          5.201          1367.31
       114.140          1.157     16.416          5.345          1390.04
--------------------------------------------------------------------------------
  NODE  4670.00 : HGL = <  628.953>;EGL= <  629.908>;FLOWLINE= <  626.860>

********************************************************************************
  FLOW PROCESS FROM NODE  4670.00 TO NODE  4670.00 IS CODE =  5
  UPSTREAM NODE  4670.00     ELEVATION =   627.86  (FLOW UNSEALS IN REACH)
--------------------------------------------------------------------------------
  CALCULATE JUNCTION LOSSES:
       PIPE       FLOW    DIAMETER   ANGLE    FLOWLINE   CRITICAL   VELOCITY
                  (CFS)   (INCHES) (DEGREES) ELEVATION  DEPTH(FT.)  (FT/SEC)
     UPSTREAM      36.50    24.00     90.00    627.86      1.93       11.618
    DOWNSTREAM     41.30    36.00       -      626.86      2.09        7.844
    LATERAL #1      4.80    24.00      0.00    627.86      0.77        1.528
    LATERAL #2      0.00     0.00      0.00      0.00      0.00        0.000
       Q5           0.00===Q5 EQUALS BASIN INPUT===

  LACFCD AND OCEMA FLOW JUNCTION FORMULAE USED:
  DY=(Q2*V2-Q1*V1*COS(DELTA1)-Q3*V3*COS(DELTA3)-
      Q4*V4*COS(DELTA4))/((A1+A2)*16.1)+FRICTION LOSSES
  UPSTREAM:    MANNING'S N = 0.01300;  FRICTION SLOPE = 0.02603
  DOWNSTREAM:  MANNING'S N = 0.01300;  FRICTION SLOPE = 0.00552
  AVERAGED FRICTION SLOPE IN JUNCTION ASSUMED AS 0.01577
  JUNCTION LENGTH =   4.00 FEET
  FRICTION LOSSES =  0.063 FEET         ENTRANCE LOSSES =  0.000 FEET
  JUNCTION LOSSES = (DY+HV1-HV2)+(ENTRANCE LOSSES)
  JUNCTION LOSSES = ( 3.543)+( 0.000) =   3.543
--------------------------------------------------------------------------------
  NODE  4670.00 : HGL = <  631.355>;EGL= <  633.451>;FLOWLINE= <  627.860>

********************************************************************************
  FLOW PROCESS FROM NODE  4670.00 TO NODE  4660.00 IS CODE =  1
```

```
  UPSTREAM NODE  4660.00     ELEVATION =   630.34  (FLOW IS UNDER PRESSURE)
--------------------------------------------------------------------------------
  CALCULATE FRICTION LOSSES(LACFCD):
  PIPE FLOW   =      36.50 CFS     PIPE DIAMETER =  24.00 INCHES
  PIPE LENGTH =      77.86 FEET          MANNING'S N  =  0.01300
  SF=(Q/K)**2 = ((     36.50)/(   226.224))**2 = 0.02603
  HF=L*SF = (     77.86)*(0.02603) =      2.027
--------------------------------------------------------------------------------
  NODE  4660.00 : HGL = <  633.382>;EGL= <  635.478>;FLOWLINE= <  630.340>

********************************************************************************
  FLOW PROCESS FROM NODE  4660.00 TO NODE  4660.00 IS CODE =  5
  UPSTREAM NODE  4660.00     ELEVATION =   630.67  (FLOW IS UNDER PRESSURE)
--------------------------------------------------------------------------------
  CALCULATE JUNCTION LOSSES:
       PIPE       FLOW    DIAMETER   ANGLE    FLOWLINE   CRITICAL   VELOCITY
                  (CFS)   (INCHES) (DEGREES) ELEVATION  DEPTH(FT.)  (FT/SEC)
     UPSTREAM      31.90    24.00      0.00    630.67      1.89       10.154
    DOWNSTREAM     36.50    24.00       -      630.34      1.93       11.618
    LATERAL #1      3.50    18.00     90.00    630.84      0.71        1.981
    LATERAL #2      1.10    18.00     90.00    630.84      0.39        0.622
       Q5           0.00===Q5 EQUALS BASIN INPUT===

  LACFCD AND OCEMA FLOW JUNCTION FORMULAE USED:
  DY=(Q2*V2-Q1*V1*COS(DELTA1)-Q3*V3*COS(DELTA3)-
      Q4*V4*COS(DELTA4))/((A1+A2)*16.1)+FRICTION LOSSES
  UPSTREAM:    MANNING'S N = 0.01300;  FRICTION SLOPE = 0.01988
  DOWNSTREAM:  MANNING'S N = 0.01300;  FRICTION SLOPE = 0.02603
  AVERAGED FRICTION SLOPE IN JUNCTION ASSUMED AS 0.02296
  JUNCTION LENGTH =   4.00 FEET
  FRICTION LOSSES =  0.092 FEET         ENTRANCE LOSSES =  0.000 FEET
  JUNCTION LOSSES = (DY+HV1-HV2)+(ENTRANCE LOSSES)
  JUNCTION LOSSES = ( 0.587)+( 0.000) =   0.587
--------------------------------------------------------------------------------
  NODE  4660.00 : HGL = <  634.464>;EGL= <  636.065>;FLOWLINE= <  630.670>

********************************************************************************
  FLOW PROCESS FROM NODE  4660.00 TO NODE  4650.00 IS CODE =  1
  UPSTREAM NODE  4650.00     ELEVATION =   637.04  (HYDRAULIC JUMP OCCURS)
--------------------------------------------------------------------------------
  CALCULATE FRICTION LOSSES(LACFCD):
  PIPE FLOW   =      31.90 CFS     PIPE DIAMETER =  24.00 INCHES
  PIPE LENGTH =     121.88 FEET          MANNING'S N  =  0.01300
--------------------------------------------------------------------------------
  HYDRAULIC JUMP: DOWNSTREAM RUN ANALYSIS RESULTS
--------------------------------------------------------------------------------
  NORMAL DEPTH(FT) =      1.14           CRITICAL DEPTH(FT) =      1.89
================================================================================
  UPSTREAM CONTROL ASSUMED FLOWDEPTH(FT) =     1.89
================================================================================
```

GRADUALLY VARIED FLOW PROFILE COMPUTED INFORMATION:

DISTANCE FROM CONTROL(FT)	FLOW DEPTH (FT)	VELOCITY (FT/SEC)	SPECIFIC ENERGY(FT)	PRESSURE+ MOMENTUM(POUNDS)
0.000	1.888	10.379	3.562	816.18
0.065	1.858	10.479	3.565	816.62
0.258	1.828	10.591	3.571	817.89
0.578	1.798	10.716	3.582	819.97
1.030	1.768	10.853	3.598	822.86
1.620	1.738	11.001	3.618	826.54
2.359	1.708	11.161	3.643	831.04
3.259	1.678	11.333	3.673	836.36
4.337	1.648	11.518	3.709	842.52
5.612	1.618	11.715	3.750	849.56
7.110	1.587	11.925	3.797	857.51
8.862	1.557	12.149	3.851	866.40
10.906	1.527	12.388	3.912	876.27
13.291	1.497	12.642	3.980	887.18
16.078	1.467	12.912	4.057	899.19
19.349	1.437	13.199	4.144	912.34
23.208	1.407	13.504	4.240	926.72
27.801	1.377	13.828	4.348	942.38
33.331	1.347	14.173	4.468	959.43
40.096	1.317	14.540	4.601	977.95
48.562	1.287	14.930	4.750	998.04
59.507	1.256	15.347	4.916	1019.82
74.392	1.226	15.791	5.101	1043.43
96.506	1.196	16.264	5.306	1068.99
121.880	1.177	16.583	5.450	1086.34

HYDRAULIC JUMP: UPSTREAM RUN ANALYSIS RESULTS

DOWNSTREAM CONTROL ASSUMED PRESSURE HEAD(FT) = 3.79

PRESSURE FLOW PROFILE COMPUTED INFORMATION:

DISTANCE FROM CONTROL(FT)	PRESSURE HEAD(FT)	VELOCITY (FT/SEC)	SPECIFIC ENERGY(FT)	PRESSURE+ MOMENTUM(POUNDS)
0.000	3.794	10.154	5.395	1175.40
55.399	2.000	10.154	3.601	823.75

ASSUMED DOWNSTREAM PRESSURE HEAD(FT) = 2.00

GRADUALLY VARIED FLOW PROFILE COMPUTED INFORMATION:

DISTANCE FROM CONTROL(FT)	FLOW DEPTH (FT)	VELOCITY (FT/SEC)	SPECIFIC ENERGY(FT)	PRESSURE+ MOMENTUM(POUNDS)
55.399	2.000	10.151	3.601	823.75
55.518	1.996	10.153	3.597	822.98
55.621	1.991	10.156	3.594	822.32

```
        55.713          1.987     10.160          3.591           821.71
        55.798          1.982     10.165          3.588           821.15
        55.875          1.978     10.171          3.585           820.63
        55.947          1.973     10.178          3.583           820.15
        56.013          1.969     10.185          3.580           819.71
        56.075          1.964     10.192          3.578           819.30
        56.131          1.960     10.200          3.576           818.92
        56.183          1.955     10.208          3.575           818.57
        56.231          1.951     10.217          3.573           818.24
        56.275          1.946     10.226          3.571           817.95
        56.316          1.942     10.236          3.570           817.68
        56.352          1.938     10.246          3.569           817.43
        56.385          1.933     10.256          3.568           817.21
        56.415          1.929     10.267          3.567           817.01
        56.441          1.924     10.278          3.566           816.83
        56.464          1.920     10.290          3.565           816.68
        56.483          1.915     10.302          3.564           816.54
        56.500          1.911     10.314          3.564           816.43
        56.513          1.906     10.326          3.563           816.34
        56.524          1.902     10.339          3.563           816.27
        56.531          1.897     10.352          3.562           816.22
        56.535          1.893     10.365          3.562           816.19
        56.537          1.888     10.379          3.562           816.18
       121.880          1.888     10.379          3.562           816.18
-------------------------END OF HYDRAULIC JUMP ANALYSIS-------------------------
| PRESSURE+MOMENTUM BALANCE OCCURS AT    15.73 FEET UPSTREAM OF NODE 4660.00 |
|       DOWNSTREAM DEPTH = 3.285 FEET, UPSTREAM CONJUGATE DEPTH = 1.189 FEET |
------------------------------------------------------------------------------
  NODE  4650.00 : HGL = <  638.928>;EGL= <  640.602>;FLOWLINE= <  637.040>

******************************************************************************
  FLOW PROCESS FROM NODE  4650.00 TO NODE  4650.00 IS CODE =  5
  UPSTREAM NODE  4650.00     ELEVATION =   637.37  (FLOW UNSEALS IN REACH)
------------------------------------------------------------------------------
  CALCULATE JUNCTION LOSSES:
       PIPE       FLOW    DIAMETER   ANGLE    FLOWLINE   CRITICAL   VELOCITY
                  (CFS)   (INCHES) (DEGREES) ELEVATION  DEPTH(FT.)  (FT/SEC)
     UPSTREAM      17.90    24.00     90.00    637.37      1.52        5.698
    DOWNSTREAM     31.90    24.00       -      637.04      1.89       10.382
    LATERAL #1     14.00    18.00     90.00    637.54      1.38        7.922
    LATERAL #2      0.00     0.00      0.00      0.00      0.00        0.000
       Q5           0.00===Q5 EQUALS BASIN INPUT===

  LACFCD AND OCEMA FLOW JUNCTION FORMULAE USED:
  DY=(Q2*V2-Q1*V1*COS(DELTA1)-Q3*V3*COS(DELTA3)-
      Q4*V4*COS(DELTA4))/((A1+A2)*16.1)+FRICTION LOSSES
  UPSTREAM:    MANNING'S N = 0.01300;  FRICTION SLOPE = 0.00626
  DOWNSTREAM:  MANNING'S N = 0.01300;  FRICTION SLOPE = 0.01719
  AVERAGED FRICTION SLOPE IN JUNCTION ASSUMED AS 0.01173
  JUNCTION LENGTH =   4.00 FEET
```

```
  FRICTION LOSSES =  0.047 FEET         ENTRANCE LOSSES =  0.000 FEET
  JUNCTION LOSSES = (DY+HV1-HV2)+(ENTRANCE LOSSES)
  JUNCTION LOSSES = ( 2.188)+( 0.000) =   2.188
------------------------------------------------------------------------------
  NODE  4650.00 : HGL = <  642.286>;EGL= <  642.790>;FLOWLINE= <  637.370>

******************************************************************************
  FLOW PROCESS FROM NODE  4650.00 TO NODE  4645.00 IS CODE =  1
  UPSTREAM NODE  4645.00     ELEVATION =   638.11  (FLOW IS UNDER PRESSURE)
------------------------------------------------------------------------------
  CALCULATE FRICTION LOSSES(LACFCD):
  PIPE FLOW   =      17.90 CFS     PIPE DIAMETER =  24.00 INCHES
  PIPE LENGTH =      73.12 FEET          MANNING'S N  =  0.01300
  SF=(Q/K)**2 = ((     17.90)/(   226.215))**2 = 0.00626
  HF=L*SF = (     73.12)*(0.00626) =      0.458
------------------------------------------------------------------------------
  NODE  4645.00 : HGL = <  642.744>;EGL= <  643.248>;FLOWLINE= <  638.110>

******************************************************************************
  FLOW PROCESS FROM NODE  4645.00 TO NODE  4645.00 IS CODE =  5
  UPSTREAM NODE  4645.00     ELEVATION =   638.61  (FLOW IS UNDER PRESSURE)
------------------------------------------------------------------------------
  CALCULATE JUNCTION LOSSES:
       PIPE       FLOW    DIAMETER   ANGLE    FLOWLINE   CRITICAL   VELOCITY
                  (CFS)   (INCHES) (DEGREES) ELEVATION  DEPTH(FT.)  (FT/SEC)
     UPSTREAM       9.90    18.00      0.00    638.61      1.21        5.602
    DOWNSTREAM     17.90    24.00       -      638.11      1.52        5.698
    LATERAL #1      6.50    18.00     90.00    638.61      0.99        3.678
    LATERAL #2      1.50    18.00     90.00    638.61      0.46        0.849
       Q5           0.00===Q5 EQUALS BASIN INPUT===

  LACFCD AND OCEMA FLOW JUNCTION FORMULAE USED:
  DY=(Q2*V2-Q1*V1*COS(DELTA1)-Q3*V3*COS(DELTA3)-
      Q4*V4*COS(DELTA4))/((A1+A2)*16.1)+FRICTION LOSSES
  UPSTREAM:    MANNING'S N = 0.01300;  FRICTION SLOPE = 0.00888
  DOWNSTREAM:  MANNING'S N = 0.01300;  FRICTION SLOPE = 0.00626
  AVERAGED FRICTION SLOPE IN JUNCTION ASSUMED AS 0.00757
  JUNCTION LENGTH =   4.00 FEET
  FRICTION LOSSES =  0.030 FEET         ENTRANCE LOSSES =  0.000 FEET
  JUNCTION LOSSES = (DY+HV1-HV2)+(ENTRANCE LOSSES)
  JUNCTION LOSSES = ( 0.602)+( 0.000) =   0.602
------------------------------------------------------------------------------
  NODE  4645.00 : HGL = <  643.363>;EGL= <  643.850>;FLOWLINE= <  638.610>

******************************************************************************
  FLOW PROCESS FROM NODE  4645.00 TO NODE  4635.00 IS CODE =  1
  UPSTREAM NODE  4635.00     ELEVATION =   638.85  (FLOW IS UNDER PRESSURE)
------------------------------------------------------------------------------
  CALCULATE FRICTION LOSSES(LACFCD):
  PIPE FLOW   =       9.90 CFS     PIPE DIAMETER =  18.00 INCHES
```

```
  PIPE LENGTH =      23.80 FEET          MANNING'S N  =  0.01300
  SF=(Q/K)**2 = ((      9.90)/(   105.038))**2 = 0.00888
  HF=L*SF = (     23.80)*(0.00888) =      0.211
--------------------------------------------------------------------------------
  NODE  4635.00 : HGL = <  643.574>;EGL= <  644.061>;FLOWLINE= <  638.850>

********************************************************************************
  FLOW PROCESS FROM NODE  4635.00 TO NODE  4635.00 IS CODE =  5
  UPSTREAM NODE  4635.00     ELEVATION =   639.18  (FLOW IS UNDER PRESSURE)
--------------------------------------------------------------------------------
  CALCULATE JUNCTION LOSSES:
       PIPE       FLOW    DIAMETER   ANGLE    FLOWLINE   CRITICAL   VELOCITY
                  (CFS)   (INCHES) (DEGREES) ELEVATION  DEPTH(FT.)  (FT/SEC)
     UPSTREAM       7.60    18.00      0.00    639.18      1.07        4.301
    DOWNSTREAM      9.90    18.00       -      638.85      1.21        5.602
    LATERAL #1      2.30    18.00     90.00    639.18      0.57        1.302
    LATERAL #2      0.00     0.00      0.00      0.00      0.00        0.000
       Q5           0.00===Q5 EQUALS BASIN INPUT===

  LACFCD AND OCEMA FLOW JUNCTION FORMULAE USED:
  DY=(Q2*V2-Q1*V1*COS(DELTA1)-Q3*V3*COS(DELTA3)-
      Q4*V4*COS(DELTA4))/((A1+A2)*16.1)+FRICTION LOSSES
  UPSTREAM:    MANNING'S N = 0.01300;  FRICTION SLOPE = 0.00523
  DOWNSTREAM:  MANNING'S N = 0.01300;  FRICTION SLOPE = 0.00888
  AVERAGED FRICTION SLOPE IN JUNCTION ASSUMED AS 0.00706
  JUNCTION LENGTH =   4.00 FEET
  FRICTION LOSSES =  0.028 FEET         ENTRANCE LOSSES =  0.000 FEET
  JUNCTION LOSSES = (DY+HV1-HV2)+(ENTRANCE LOSSES)
  JUNCTION LOSSES = ( 0.228)+( 0.000) =   0.228
--------------------------------------------------------------------------------
  NODE  4635.00 : HGL = <  644.002>;EGL= <  644.290>;FLOWLINE= <  639.180>

********************************************************************************
  FLOW PROCESS FROM NODE  4635.00 TO NODE  4630.00 IS CODE =  1
  UPSTREAM NODE  4630.00     ELEVATION =   639.56  (FLOW IS UNDER PRESSURE)
--------------------------------------------------------------------------------
  CALCULATE FRICTION LOSSES(LACFCD):
  PIPE FLOW   =       7.60 CFS     PIPE DIAMETER =  18.00 INCHES
  PIPE LENGTH =      37.32 FEET          MANNING'S N  =  0.01300
  SF=(Q/K)**2 = ((      7.60)/(   105.056))**2 = 0.00523
  HF=L*SF = (     37.32)*(0.00523) =      0.195
--------------------------------------------------------------------------------
  NODE  4630.00 : HGL = <  644.198>;EGL= <  644.485>;FLOWLINE= <  639.560>

********************************************************************************
  FLOW PROCESS FROM NODE  4630.00 TO NODE  4630.00 IS CODE =  5
  UPSTREAM NODE  4630.00     ELEVATION =   639.89  (FLOW IS UNDER PRESSURE)
--------------------------------------------------------------------------------
  CALCULATE JUNCTION LOSSES:
       PIPE       FLOW    DIAMETER   ANGLE    FLOWLINE   CRITICAL   VELOCITY
```

```
                (CFS)   (INCHES) (DEGREES) ELEVATION  DEPTH(FT.)  (FT/SEC)
    UPSTREAM      5.10    18.00      0.00    639.89      0.87        2.886
   DOWNSTREAM     7.60    18.00       -      639.56      1.07        4.300
   LATERAL #1     2.50    18.00     90.00    639.89      0.60        1.415
   LATERAL #2     0.00     0.00      0.00      0.00      0.00        0.000
      Q5          0.00===Q5 EQUALS BASIN INPUT===

  LACFCD AND OCEMA FLOW JUNCTION FORMULAE USED:
  DY=(Q2*V2-Q1*V1*COS(DELTA1)-Q3*V3*COS(DELTA3)-
      Q4*V4*COS(DELTA4))/((A1+A2)*16.1)+FRICTION LOSSES
  UPSTREAM:    MANNING'S N = 0.01300;  FRICTION SLOPE = 0.00236
  DOWNSTREAM:  MANNING'S N = 0.01300;  FRICTION SLOPE = 0.00523
  AVERAGED FRICTION SLOPE IN JUNCTION ASSUMED AS 0.00380
  JUNCTION LENGTH =   4.00 FEET
  FRICTION LOSSES =  0.015 FEET         ENTRANCE LOSSES =  0.000 FEET
  JUNCTION LOSSES = (DY+HV1-HV2)+(ENTRANCE LOSSES)
  JUNCTION LOSSES = ( 0.173)+( 0.000) =   0.173
-------------------------------------------------------------------------------
  NODE  4630.00 : HGL = <  644.529>;EGL= <  644.658>;FLOWLINE= <  639.890>

*******************************************************************************
  FLOW PROCESS FROM NODE  4630.00 TO NODE  4625.00 IS CODE =  1
  UPSTREAM NODE  4625.00     ELEVATION =   642.73  (FLOW IS UNDER PRESSURE)
-------------------------------------------------------------------------------
  CALCULATE FRICTION LOSSES(LACFCD):
  PIPE FLOW   =       5.10 CFS     PIPE DIAMETER =  18.00 INCHES
  PIPE LENGTH =      93.23 FEET          MANNING'S N  =  0.01300
  SF=(Q/K)**2 = ((      5.10)/(   105.053))**2 = 0.00236
  HF=L*SF = (     93.23)*(0.00236) =      0.220
-------------------------------------------------------------------------------
  NODE  4625.00 : HGL = <  644.748>;EGL= <  644.878>;FLOWLINE= <  642.730>

*******************************************************************************
  FLOW PROCESS FROM NODE  4625.00 TO NODE  4625.00 IS CODE =  5
  UPSTREAM NODE  4625.00     ELEVATION =   643.06  (FLOW IS UNDER PRESSURE)
-------------------------------------------------------------------------------
  CALCULATE JUNCTION LOSSES:
       PIPE       FLOW    DIAMETER   ANGLE    FLOWLINE   CRITICAL   VELOCITY
                  (CFS)   (INCHES) (DEGREES) ELEVATION  DEPTH(FT.)  (FT/SEC)
     UPSTREAM      2.60    18.00      0.00    643.06      0.61        1.472
    DOWNSTREAM     5.10    18.00       -      642.73      0.87        2.886
    LATERAL #1     2.50    18.00     90.00    643.06      0.60        1.415
    LATERAL #2     0.00     0.00      0.00      0.00      0.00        0.000
       Q5          0.00===Q5 EQUALS BASIN INPUT===

  LACFCD AND OCEMA FLOW JUNCTION FORMULAE USED:
  DY=(Q2*V2-Q1*V1*COS(DELTA1)-Q3*V3*COS(DELTA3)-
      Q4*V4*COS(DELTA4))/((A1+A2)*16.1)+FRICTION LOSSES
  UPSTREAM:    MANNING'S N = 0.01300;  FRICTION SLOPE = 0.00061
  DOWNSTREAM:  MANNING'S N = 0.01300;  FRICTION SLOPE = 0.00236
```

```
  AVERAGED FRICTION SLOPE IN JUNCTION ASSUMED AS 0.00148
  JUNCTION LENGTH =   4.00 FEET
  FRICTION LOSSES =  0.006 FEET         ENTRANCE LOSSES =  0.000 FEET
  JUNCTION LOSSES = (DY+HV1-HV2)+(ENTRANCE LOSSES)
  JUNCTION LOSSES = ( 0.102)+( 0.000) =   0.102
--------------------------------------------------------------------------------
  NODE  4625.00 : HGL = <  644.946>;EGL= <  644.979>;FLOWLINE= <  643.060>

********************************************************************************
  FLOW PROCESS FROM NODE  4625.00 TO NODE  4615.00 IS CODE =  1
  UPSTREAM NODE  4615.00     ELEVATION =   643.67  (FLOW SEALS IN REACH)
--------------------------------------------------------------------------------
  CALCULATE FRICTION LOSSES(LACFCD):
  PIPE FLOW   =       2.60 CFS     PIPE DIAMETER =  18.00 INCHES
  PIPE LENGTH =      40.44 FEET          MANNING'S N  =  0.01300
================================================================================
  DOWNSTREAM CONTROL ASSUMED PRESSURE HEAD(FT) =     1.89
================================================================================
  PRESSURE FLOW PROFILE COMPUTED INFORMATION:
--------------------------------------------------------------------------------
  DISTANCE FROM       PRESSURE   VELOCITY      SPECIFIC        PRESSURE+
   CONTROL(FT)        HEAD(FT)   (FT/SEC)     ENERGY(FT)    MOMENTUM(POUNDS)
         0.000          1.886      1.471          1.919           132.67
        26.665          1.500      1.471          1.534            90.12
--------------------------------------------------------------------------------
  NORMAL DEPTH(FT) =      0.46           CRITICAL DEPTH(FT) =      0.61
================================================================================
  ASSUMED DOWNSTREAM PRESSURE HEAD(FT) =     1.50
================================================================================
  GRADUALLY VARIED FLOW PROFILE COMPUTED INFORMATION:
--------------------------------------------------------------------------------
  DISTANCE FROM      FLOW DEPTH  VELOCITY      SPECIFIC        PRESSURE+
   CONTROL(FT)           (FT)    (FT/SEC)     ENERGY(FT)    MOMENTUM(POUNDS)
        26.665          1.500      1.471          1.534            90.12
        29.087          1.464      1.480          1.498            86.25
        31.478          1.429      1.497          1.464            82.46
        33.850          1.393      1.519          1.429            78.74
        36.207          1.358      1.545          1.395            75.11
        38.550          1.322      1.576          1.361            71.57
        40.440          1.293      1.604          1.333            68.77
--------------------------------------------------------------------------------
  NODE  4615.00 : HGL = <  644.963>;EGL= <  645.003>;FLOWLINE= <  643.670>

********************************************************************************
  FLOW PROCESS FROM NODE  4615.00 TO NODE  4615.00 IS CODE =  5
  UPSTREAM NODE  4615.00     ELEVATION =   644.00  (FLOW IS SUBCRITICAL)
--------------------------------------------------------------------------------
  CALCULATE JUNCTION LOSSES:
       PIPE       FLOW    DIAMETER   ANGLE    FLOWLINE   CRITICAL   VELOCITY
                  (CFS)   (INCHES) (DEGREES) ELEVATION  DEPTH(FT.)  (FT/SEC)
```

```
    UPSTREAM       2.60    18.00     90.00    644.00      0.61        1.956
   DOWNSTREAM      2.60    18.00       -      643.67      0.61        1.605
   LATERAL #1      0.00     0.00      0.00      0.00      0.00        0.000
   LATERAL #2      0.00     0.00      0.00      0.00      0.00        0.000
      Q5           0.00===Q5 EQUALS BASIN INPUT===

  LACFCD AND OCEMA FLOW JUNCTION FORMULAE USED:
  DY=(Q2*V2-Q1*V1*COS(DELTA1)-Q3*V3*COS(DELTA3)-
      Q4*V4*COS(DELTA4))/((A1+A2)*16.1)+FRICTION LOSSES
  UPSTREAM:    MANNING'S N = 0.01300;  FRICTION SLOPE = 0.00086
  DOWNSTREAM:  MANNING'S N = 0.01300;  FRICTION SLOPE = 0.00057
  AVERAGED FRICTION SLOPE IN JUNCTION ASSUMED AS 0.00071
  JUNCTION LENGTH =   4.00 FEET
  FRICTION LOSSES =  0.003 FEET         ENTRANCE LOSSES =  0.000 FEET
  JUNCTION LOSSES = (DY+HV1-HV2)+(ENTRANCE LOSSES)
  JUNCTION LOSSES = ( 0.112)+( 0.000) =   0.112
--------------------------------------------------------------------------------
  NODE  4615.00 : HGL = <  645.056>;EGL= <  645.115>;FLOWLINE= <  644.000>

********************************************************************************
  FLOW PROCESS FROM NODE  4615.00 TO NODE  4604.00 IS CODE =  1
  UPSTREAM NODE  4604.00     ELEVATION =   644.38  (HYDRAULIC JUMP OCCURS)
--------------------------------------------------------------------------------
  CALCULATE FRICTION LOSSES(LACFCD):
  PIPE FLOW   =       2.60 CFS     PIPE DIAMETER =  18.00 INCHES
  PIPE LENGTH =      34.50 FEET          MANNING'S N  =  0.01300
--------------------------------------------------------------------------------
  HYDRAULIC JUMP: DOWNSTREAM RUN ANALYSIS RESULTS
--------------------------------------------------------------------------------
  NORMAL DEPTH(FT) =      0.50           CRITICAL DEPTH(FT) =      0.61
================================================================================
  UPSTREAM CONTROL ASSUMED FLOWDEPTH(FT) =     0.61
================================================================================
  GRADUALLY VARIED FLOW PROFILE COMPUTED INFORMATION:
--------------------------------------------------------------------------------
  DISTANCE FROM      FLOW DEPTH  VELOCITY      SPECIFIC        PRESSURE+
   CONTROL(FT)           (FT)    (FT/SEC)     ENERGY(FT)    MOMENTUM(POUNDS)
         0.000          0.611      3.843          0.841            30.16
         0.012          0.606      3.882          0.841            30.16
         0.047          0.602      3.921          0.841            30.17
         0.110          0.597      3.962          0.841            30.18
         0.202          0.593      4.003          0.842            30.21
         0.326          0.588      4.045          0.842            30.23
         0.486          0.583      4.088          0.843            30.26
         0.685          0.579      4.132          0.844            30.30
         0.928          0.574      4.177          0.845            30.35
         1.221          0.570      4.223          0.847            30.40
         1.571          0.565      4.269          0.848            30.46
         1.984          0.560      4.317          0.850            30.52
         2.471          0.556      4.365          0.852            30.60
```

3.044	0.551	4.415	0.854	30.67
3.718	0.546	4.465	0.856	30.76
4.512	0.542	4.517	0.859	30.85
5.452	0.537	4.570	0.862	30.96
6.573	0.533	4.624	0.865	31.06
7.923	0.528	4.679	0.868	31.18
9.574	0.523	4.735	0.872	31.31
11.635	0.519	4.793	0.876	31.44
14.293	0.514	4.851	0.880	31.58
17.894	0.510	4.912	0.884	31.73
23.218	0.505	4.973	0.889	31.89
32.767	0.500	5.036	0.894	32.06
34.500	0.500	5.036	0.894	32.06

HYDRAULIC JUMP: UPSTREAM RUN ANALYSIS RESULTS

DOWNSTREAM CONTROL ASSUMED FLOWDEPTH(FT) = 1.06

GRADUALLY VARIED FLOW PROFILE COMPUTED INFORMATION:

DISTANCE FROM CONTROL(FT)	FLOW DEPTH (FT)	VELOCITY (FT/SEC)	SPECIFIC ENERGY(FT)	PRESSURE+ MOMENTUM(POUNDS)
0.000	1.056	1.956	1.115	48.58
1.533	1.038	1.992	1.100	47.30
3.057	1.020	2.031	1.084	46.06
4.570	1.002	2.071	1.069	44.86
6.073	0.985	2.114	1.054	43.69
7.563	0.967	2.158	1.039	42.57
9.040	0.949	2.205	1.025	41.48
10.502	0.931	2.255	1.010	40.44
11.948	0.913	2.307	0.996	39.43
13.376	0.896	2.361	0.982	38.47
14.784	0.878	2.419	0.969	37.56
16.169	0.860	2.480	0.956	36.69
17.528	0.842	2.544	0.943	35.86
18.859	0.825	2.612	0.931	35.08
20.157	0.807	2.683	0.919	34.35
21.417	0.789	2.759	0.907	33.68
22.635	0.771	2.840	0.896	33.05
23.802	0.753	2.925	0.886	32.48
24.912	0.736	3.015	0.877	31.96
25.952	0.718	3.112	0.868	31.51
26.911	0.700	3.214	0.861	31.11
27.772	0.682	3.324	0.854	30.78
28.512	0.664	3.440	0.848	30.51
29.102	0.647	3.565	0.844	30.32
29.501	0.629	3.699	0.841	30.20
29.652	0.611	3.843	0.841	30.16
34.500	0.611	3.843	0.841	30.16

END OF HYDRAULIC JUMP ANALYSIS

```
| PRESSURE+MOMENTUM BALANCE OCCURS AT    26.78 FEET UPSTREAM OF NODE 4615.00 |
|       DOWNSTREAM DEPTH = 0.702 FEET, UPSTREAM CONJUGATE DEPTH = 0.529 FEET |
------------------------------------------------------------------------------
  NODE  4604.00 : HGL = <  644.991>;EGL= <  645.221>;FLOWLINE= <  644.380>

******************************************************************************
  FLOW PROCESS FROM NODE  4604.00 TO NODE  4604.00 IS CODE =  8
  UPSTREAM NODE  4604.00     ELEVATION =   644.38  (FLOW IS SUBCRITICAL)
------------------------------------------------------------------------------
  CALCULATE CATCH BASIN ENTRANCE LOSSES(LACFCD):
  PIPE FLOW =       2.60 CFS          PIPE DIAMETER =  18.00 INCHES
  FLOW VELOCITY =   3.84 FEET/SEC.    VELOCITY HEAD =  0.229 FEET
  CATCH BASIN ENERGY LOSS = .2*(VELOCITY HEAD) = .2*(  0.229) =  0.046
------------------------------------------------------------------------------
  NODE  4604.00 : HGL = <  645.266>;EGL= <  645.266>;FLOWLINE= <  644.380>

******************************************************************************
  UPSTREAM PIPE FLOW CONTROL DATA:
  NODE NUMBER =  4604.00            FLOWLINE ELEVATION =   644.38
  ASSUMED UPSTREAM CONTROL HGL =    644.99 FOR DOWNSTREAM RUN ANALYSIS

==============================================================================
  END OF GRADUALLY VARIED FLOW ANALYSIS
```

```
**************************************************************************
                PIPE-FLOW HYDRAULICS COMPUTER PROGRAM PACKAGE
          (Reference: LACFCD,LACRD, AND OCEMA HYDRAULICS CRITERION)
         (c) Copyright 1982-2014 Advanced Engineering Software (aes)
             Ver. 21.0  Release Date: 06/01/2014  License ID 1261

                            Analysis prepared by:

                          RICK ENGINEERING COMPANY
                              5620 Friars Road
                         San Diego, California 92110
                        619-291-0707   Fax 619-291-4165

 ************************* DESCRIPTION OF STUDY *************************
* HARMONY GROVE VILLAGE CENTER                                          *
* SYSTEM L (BASIN 4000) - 100 YEAR MAIN LINE (POST-PROJECT CONDITION)   *
* H:\17164\WATERRESOURCES\HYDRAULICS\PIPEFLOW\...                       *
 ************************************************************************

  FILE NAME: 4966.PIP
  TIME/DATE OF STUDY: 10:50 03/21/2025
```

```
**************************************************************************
              GRADUALLY VARIED FLOW ANALYSIS FOR PIPE SYSTEM
                       NODAL POINT STATUS TABLE
               (Note: "*" indicates nodal point data used.)
                     UPSTREAM RUN                  DOWNSTREAM RUN
   NODE    MODEL   PRESSURE      PRESSURE+         FLOW         PRESSURE+
  NUMBER  PROCESS  HEAD(FT)   MOMENTUM(POUNDS)   DEPTH(FT)   MOMENTUM(POUNDS)
 4966.00-            10.59*          10762.21        2.44            2366.14
       } FRICTION
 4964.00-            10.46*          10596.98        2.41            2377.58
       } JUNCTION
 4964.00-            10.36*          10480.69        2.54            2340.40
       } FRICTION
 4960.00-            10.12*          10188.21        2.74 Dc         2321.34
       } JUNCTION
 4960.00-            10.17*          10075.47        2.35            2020.40
       } FRICTION
 4945.00-             9.61*           9380.48        2.37            2015.56
       } FRICTION+BEND
 4945.00-             9.39*           9120.66        2.52            1995.78
       } FRICTION
 4945.00-             9.38*           9101.85        2.58 Dc         1994.35
       } JUNCTION
 4945.00-             9.39*           7702.26        1.76            1957.96
       } FRICTION
 4895.00-             8.94*           7254.80        1.78            1944.20
       } FRICTION+BEND
```

```
4895.00-            8.54*          6854.41        1.80           1921.72
      } FRICTION+BEND
4895.00-            8.13*          6454.01        1.84           1887.63
      } FRICTION
4895.00-            6.99*          5317.07        2.45 Dc        1682.40
      } JUNCTION
4895.00-            7.51*          5804.89        2.25           1644.15
      } FRICTION
4892.00-            6.69*          4990.87        2.43 Dc        1629.96
      } JUNCTION
4892.00-            6.61*          4187.29        2.27           1427.65
      } FRICTION
4730.00-            6.57*          4159.44        2.23           1430.48
      } FRICTION+BEND
4730.00-            6.45*          4063.57        2.26           1428.37
      } FRICTION
4730.00-            6.40*          4022.67        2.35 Dc        1424.68
      } JUNCTION
4730.00-            6.22*          3769.02        1.91           1274.02
      } FRICTION
4720.00-            5.40*          3127.94        1.22           1886.28
      } JUNCTION
4720.00-            4.08*          1803.22        1.28           1727.24
      } FRICTION        } HYDRAULIC JUMP
4677.00-            2.28 Dc        1181.86        1.30*          1703.12
      } JUNCTION
4677.00-            2.59           1071.09        1.09*          1697.07
      } FRICTION
4675.00-            2.17 Dc        1020.92        1.28*          1407.00
      } JUNCTION
4675.00-            2.09 Dc         931.38        1.16*          1390.04
      } FRICTION
4670.00-            2.09*Dc         931.38        2.09*Dc         931.38
      } JUNCTION
4670.00-            3.50*          1310.93        1.51           1122.26
      } FRICTION
4660.00-            3.04*          1222.08        1.56           1099.47
      } JUNCTION
4660.00-            3.79*          1175.40        1.18           1086.34
      } FRICTION        } HYDRAULIC JUMP
4650.00-            1.89*Dc         816.18        1.89*Dc         816.18
      } JUNCTION
4650.00-            4.92*           965.27        1.34            359.17
      } FRICTION
4645.00-            4.63*           909.94        1.52 Dc         351.42
      } JUNCTION
4645.00-            4.75*           548.84        1.16            177.39
      } FRICTION
4635.00-            4.72*           545.69        1.21 Dc         176.83
      } JUNCTION
```

```
  4635.00-             4.82*           512.41        0.95            125.38
        } FRICTION
  4630.00-             4.64*           492.05        1.06 Dc         122.91
        } JUNCTION
  4630.00-             4.64*           457.33        0.55             93.62
        } FRICTION
  4625.00-             2.02*           168.40        0.87 Dc          72.26
        } JUNCTION
  4625.00-             1.89*           132.67        0.46             33.78
        } FRICTION
  4615.00-             1.29*            68.77        0.61 Dc          30.16
        } JUNCTION
  4615.00-             1.06*            48.58        0.50             32.06
        } FRICTION        } HYDRAULIC JUMP
  4604.00-             0.61*Dc          30.16        0.61*Dc          30.16
        } CATCH BASIN
  4604.00-             0.89*            16.14        0.61 Dc          10.79
-------------------------------------------------------------------------------
  MAXIMUM NUMBER OF ENERGY BALANCES USED IN EACH PROFILE =  25
-------------------------------------------------------------------------------
  NOTE: STEADY FLOW HYDRAULIC HEAD-LOSS COMPUTATIONS BASED ON THE MOST
  CONSERVATIVE FORMULAE FROM THE CURRENT LACRD,LACFCD, AND OCEMA
  DESIGN MANUALS.
*******************************************************************************
  DOWNSTREAM PIPE FLOW CONTROL DATA:
  NODE NUMBER =  4966.00           FLOWLINE ELEVATION =   589.22
  PIPE FLOW =      92.81 CFS       PIPE DIAMETER =  60.00 INCHES
  ASSUMED DOWNSTREAM CONTROL HGL =   599.810 FEET
-------------------------------------------------------------------------------
  NODE  4966.00 : HGL = <  599.810>;EGL= <  600.157>;FLOWLINE= <  589.220>

*******************************************************************************
  FLOW PROCESS FROM NODE  4966.00 TO NODE  4964.00 IS CODE =  1
  UPSTREAM NODE  4964.00     ELEVATION =   589.40  (FLOW IS UNDER PRESSURE)
-------------------------------------------------------------------------------
  CALCULATE FRICTION LOSSES(LACFCD):
  PIPE FLOW   =      92.81 CFS     PIPE DIAMETER =  60.00 INCHES
  PIPE LENGTH =      35.58 FEET          MANNING'S N  =  0.01300
  SF=(Q/K)**2 = ((     92.81)/(  2604.905))**2 = 0.00127
  HF=L*SF = (     35.58)*(0.00127) =      0.045
-------------------------------------------------------------------------------
  NODE  4964.00 : HGL = <  599.855>;EGL= <  600.202>;FLOWLINE= <  589.400>

************************ HGL +0.007' ****************************************
  FLOW PROCESS FROM NODE  4964.00 TO NODE  4964.00 IS CODE =  5
  UPSTREAM NODE  4964.00     ELEVATION =   589.50  (FLOW IS UNDER PRESSURE)
-------------------------------------------------------------------------------
  CALCULATE JUNCTION LOSSES:
       PIPE       FLOW    DIAMETER   ANGLE    FLOWLINE   CRITICAL   VELOCITY
                  (CFS)   (INCHES) (DEGREES) ELEVATION  DEPTH(FT.)  (FT/SEC)
```

```
    UPSTREAM      92.81    60.00      0.00    589.50      2.74        4.727
   DOWNSTREAM     92.81    60.00       -      589.40      2.74        4.727
   LATERAL #1      0.00     0.00      0.00      0.00      0.00        0.000
   LATERAL #2      0.00     0.00      0.00      0.00      0.00        0.000
      Q5           0.00===Q5 EQUALS BASIN INPUT===

  LACFCD AND OCEMA FLOW JUNCTION FORMULAE USED:
  DY=(Q2*V2-Q1*V1*COS(DELTA1)-Q3*V3*COS(DELTA3)-
      Q4*V4*COS(DELTA4))/((A1+A2)*16.1)+FRICTION LOSSES
  UPSTREAM:    MANNING'S N = 0.01300;  FRICTION SLOPE = 0.00127
  DOWNSTREAM:  MANNING'S N = 0.01300;  FRICTION SLOPE = 0.00127
  AVERAGED FRICTION SLOPE IN JUNCTION ASSUMED AS 0.00127
  JUNCTION LENGTH =   4.00 FEET
  FRICTION LOSSES =  0.005 FEET         ENTRANCE LOSSES =  0.000 FEET
  JUNCTION LOSSES = (DY+HV1-HV2)+(ENTRANCE LOSSES)
  JUNCTION LOSSES = ( 0.005)+( 0.000) =   0.005
--------------------------------------------------------------------------------
  NODE  4964.00 : HGL = <  599.860>;EGL= <  600.207>;FLOWLINE= <  589.500>

**************************                                    ***************************************
  FLOW PROCESS FROM NODE  4964.00 TO NODE  4960.00 IS CODE =  1
  UPSTREAM NODE  4960.00     ELEVATION =   589.82  (FLOW IS UNDER PRESSURE)
--------------------------------------------------------------------------------
  CALCULATE FRICTION LOSSES(LACFCD):
  PIPE FLOW    =      92.81 CFS     PIPE DIAMETER =  60.00 INCHES
  PIPE LENGTH =      64.00 FEET          MANNING'S N  =  0.01300
  SF=(Q/K)**2 = ((     92.81)/(  2604.988))**2 = 0.00127
  HF=L*SF = (     64.00)*(0.00127) =      0.081
--------------------------------------------------------------------------------
  NODE  4960.00 : HGL = <  599.942>;EGL= <  600.288>;FLOWLINE= <  589.820>

**************************                                    ***************************************
  FLOW PROCESS FROM NODE  4960.00 TO NODE  4960.00 IS CODE =  5
  UPSTREAM NODE  4960.00     ELEVATION =   589.92  (FLOW IS UNDER PRESSURE)
--------------------------------------------------------------------------------
  CALCULATE JUNCTION LOSSES:
       PIPE       FLOW    DIAMETER   ANGLE    FLOWLINE   CRITICAL   VELOCITY
                  (CFS)   (INCHES) (DEGREES) ELEVATION  DEPTH(FT.)  (FT/SEC)
     UPSTREAM      82.61    60.00      6.40    589.92      2.58        4.208
    DOWNSTREAM     92.81    60.00       -      589.82      2.74        4.727
    LATERAL #1      7.20    18.00     90.00    593.42      1.04        4.074
    LATERAL #2      3.00    18.00     90.00    593.42      0.66        1.698
       Q5           0.00===Q5 EQUALS BASIN INPUT===

  LACFCD AND OCEMA FLOW JUNCTION FORMULAE USED:
  DY=(Q2*V2-Q1*V1*COS(DELTA1)-Q3*V3*COS(DELTA3)-
      Q4*V4*COS(DELTA4))/((A1+A2)*16.1)+FRICTION LOSSES
  UPSTREAM:    MANNING'S N = 0.01300;  FRICTION SLOPE = 0.00101
  DOWNSTREAM:  MANNING'S N = 0.01300;  FRICTION SLOPE = 0.00127
  AVERAGED FRICTION SLOPE IN JUNCTION ASSUMED AS 0.00114
```

HGL +0.012'

HGL +0.091'

```
  JUNCTION LENGTH =   4.00 FEET
  FRICTION LOSSES =  0.005 FEET         ENTRANCE LOSSES =  0.000 FEET
  JUNCTION LOSSES = (DY+HV1-HV2)+(ENTRANCE LOSSES)
  JUNCTION LOSSES = ( 0.080)+( 0.000) =   0.080
--------------------------------------------------------------------------------
  NODE  4960.00 : HGL = <  600.094>;EGL= <  600.369>;FLOWLINE= <  589.920>
                        HGL +0.035'
****************************************************************************
  FLOW PROCESS FROM NODE  4960.00 TO NODE  4945.00 IS CODE =  1
  UPSTREAM NODE  4945.00     ELEVATION =   590.63  (FLOW IS UNDER PRESSURE)
--------------------------------------------------------------------------------
  CALCULATE FRICTION LOSSES(LACFCD):
  PIPE FLOW   =      82.61 CFS     PIPE DIAMETER =  60.00 INCHES
  PIPE LENGTH =     141.92 FEET          MANNING'S N  =  0.01300
  SF=(Q/K)**2 = ((     82.61)/(  2604.649))**2 = 0.00101
  HF=L*SF = (    141.92)*(0.00101) =      0.143
--------------------------------------------------------------------------------
  NODE  4945.00 : HGL = <  600.236>;EGL= <  600.511>;FLOWLINE= <  590.630>
                        HGL +0.060'
****************************************************************************
  FLOW PROCESS FROM NODE  4960.00 TO NODE  4945.00 IS CODE =  3
  UPSTREAM NODE  4945.00     ELEVATION =   590.98  (FLOW IS UNDER PRESSURE)
--------------------------------------------------------------------------------
  CALCULATE PIPE-BEND LOSSES(OCEMA):
  PIPE FLOW =      82.61 CFS             PIPE DIAMETER =  60.00 INCHES
  CENTRAL ANGLE = 88.400 DEGREES         MANNING'S N = 0.01300
  PIPE LENGTH =      69.39 FEET          BEND COEFFICIENT(KB) = 0.24777
  FLOW VELOCITY =   4.21 FEET/SEC.       VELOCITY HEAD =  0.275 FEET
  HB=KB*(VELOCITY HEAD) = ( 0.248)*( 0.275) =   0.068
  SF=(Q/K)**2 = ((     82.61)/(  2604.161))**2 = 0.00101
  HF=L*SF = (     69.39)*(0.00101) =  0.070
  TOTAL HEAD LOSSES = HB + HF = ( 0.068)+( 0.070) =  0.138
--------------------------------------------------------------------------------
  NODE  4945.00 : HGL = <  600.374>;EGL= <  600.649>;FLOWLINE= <  590.980>
                        HGL +0.076'
****************************************************************************
  FLOW PROCESS FROM NODE  4960.00 TO NODE  4945.00 IS CODE =  1
  UPSTREAM NODE  4945.00     ELEVATION =   591.00  (FLOW IS UNDER PRESSURE)
--------------------------------------------------------------------------------
  CALCULATE FRICTION LOSSES(LACFCD):
  PIPE FLOW   =      82.61 CFS     PIPE DIAMETER =  60.00 INCHES
  PIPE LENGTH =       4.63 FEET          MANNING'S N  =  0.01300
  SF=(Q/K)**2 = ((     82.61)/(  2609.915))**2 = 0.00100
  HF=L*SF = (      4.63)*(0.00100) =      0.005
--------------------------------------------------------------------------------
  NODE  4945.00 : HGL = <  600.379>;EGL= <  600.654>;FLOWLINE= <  591.000>
                        HGL +0.086'
****************************************************************************
  FLOW PROCESS FROM NODE  4945.00 TO NODE  4945.00 IS CODE =  5
  UPSTREAM NODE  4945.00     ELEVATION =   591.10  (FLOW IS UNDER PRESSURE)
```

```
------------------------------------------------------------------------
  CALCULATE JUNCTION LOSSES:
       PIPE        FLOW    DIAMETER   ANGLE    FLOWLINE   CRITICAL   VELOCITY
                   (CFS)   (INCHES) (DEGREES) ELEVATION  DEPTH(FT.)  (FT/SEC)
     UPSTREAM      71.00    54.00      0.00    591.10      2.46        4.464
    DOWNSTREAM     82.61    60.00       -      591.00      2.58        4.207
    LATERAL #1      4.40    18.00     90.00    594.00      0.80        2.490
    LATERAL #2      7.20    18.00     90.00    594.00      1.04        4.074
       Q5           0.01===Q5 EQUALS BASIN INPUT===

  LACFCD AND OCEMA FLOW JUNCTION FORMULAE USED:
  DY=(Q2*V2-Q1*V1*COS(DELTA1)-Q3*V3*COS(DELTA3)-
      Q4*V4*COS(DELTA4))/((A1+A2)*16.1)+FRICTION LOSSES
  UPSTREAM:    MANNING'S N = 0.01300;  FRICTION SLOPE = 0.00130
  DOWNSTREAM:  MANNING'S N = 0.01300;  FRICTION SLOPE = 0.00101
  AVERAGED FRICTION SLOPE IN JUNCTION ASSUMED AS 0.00115
  JUNCTION LENGTH =   4.00 FEET
  FRICTION LOSSES =  0.005 FEET         ENTRANCE LOSSES =  0.055 FEET
  JUNCTION LOSSES = (DY+HV1-HV2)+(ENTRANCE LOSSES)
  JUNCTION LOSSES = ( 0.093)+( 0.055) =   0.148
------------------------------------------------------------------------
  NODE  4945.00 : HGL = <  600.492>;EGL= <  600.802>;FLOWLINE= <  591.100>
                        HGL +0.073'
**************************************************************************
  FLOW PROCESS FROM NODE  4945.00 TO NODE  4895.00 IS CODE =  1
  UPSTREAM NODE  4895.00     ELEVATION =   591.60  (FLOW IS UNDER PRESSURE)
------------------------------------------------------------------------
  CALCULATE FRICTION LOSSES(LACFCD):
  PIPE FLOW    =      71.00 CFS     PIPE DIAMETER =  54.00 INCHES
  PIPE LENGTH =       37.68 FEET          MANNING'S N  =  0.01300
  SF=(Q/K)**2 = ((     71.00)/(  1966.192))**2 = 0.00130
  HF=L*SF = (     37.68)*(0.00130) =      0.049
------------------------------------------------------------------------
  NODE  4895.00 : HGL = <  600.541>;EGL= <  600.851>;FLOWLINE= <  591.600>
                        HGL +0.146'
**************************************************************************
  FLOW PROCESS FROM NODE  4945.00 TO NODE  4895.00 IS CODE =  3
  UPSTREAM NODE  4895.00     ELEVATION =   592.11  (FLOW IS UNDER PRESSURE)
------------------------------------------------------------------------
  CALCULATE PIPE-BEND LOSSES(OCEMA):
  PIPE FLOW =       71.00 CFS             PIPE DIAMETER =  54.00 INCHES
  CENTRAL ANGLE = 48.600 DEGREES          MANNING'S N = 0.01300
  PIPE LENGTH =       38.14 FEET          BEND COEFFICIENT(KB) = 0.18371
  FLOW VELOCITY =   4.46 FEET/SEC.        VELOCITY HEAD =  0.309 FEET
  HB=KB*(VELOCITY HEAD) = ( 0.184)*( 0.309) =   0.057
  SF=(Q/K)**2 = ((     71.00)/(  1966.488))**2 = 0.00130
  HF=L*SF = (     38.14)*(0.00130) =  0.050
  TOTAL HEAD LOSSES = HB + HF = ( 0.057)+( 0.050) =  0.107
------------------------------------------------------------------------
  NODE  4895.00 : HGL = <  600.648>;EGL= <  600.957>;FLOWLINE= <  592.110>
                        HGL +0.168'
```

```
****************************************************************************
  FLOW PROCESS FROM NODE  4945.00 TO NODE  4895.00 IS CODE =  3
  UPSTREAM NODE  4895.00     ELEVATION =   592.62  (FLOW IS UNDER PRESSURE)
----------------------------------------------------------------------------
  CALCULATE PIPE-BEND LOSSES(OCEMA):
  PIPE FLOW =      71.00 CFS             PIPE DIAMETER =  54.00 INCHES
  CENTRAL ANGLE = 48.600 DEGREES         MANNING'S N = 0.01300
  PIPE LENGTH =      38.13 FEET          BEND COEFFICIENT(KB) = 0.18371
  FLOW VELOCITY =   4.46 FEET/SEC.       VELOCITY HEAD =  0.309 FEET
  HB=KB*(VELOCITY HEAD) = ( 0.184)*( 0.309) =   0.057
  SF=(Q/K)**2 = ((     71.00)/(  1966.231))**2 = 0.00130
  HF=L*SF = (     38.13)*(0.00130) =  0.050
  TOTAL HEAD LOSSES = HB + HF = ( 0.057)+( 0.050) =  0.107
----------------------------------------------------------------------------
  NODE  4895.00 : HGL = <  600.754>;EGL= <  601.064>;FLOWLINE= <  592.620>
                          HGL +0.190'
****************************************************************************
  FLOW PROCESS FROM NODE  4945.00 TO NODE  4895.00 IS CODE =  1
  UPSTREAM NODE  4895.00     ELEVATION =   593.89  (FLOW IS UNDER PRESSURE)
----------------------------------------------------------------------------
  CALCULATE FRICTION LOSSES(LACFCD):
  PIPE FLOW    =      71.00 CFS     PIPE DIAMETER =  54.00 INCHES
  PIPE LENGTH =      95.43 FEET          MANNING'S N  =  0.01300
  SF=(Q/K)**2 = ((     71.00)/(  1966.567))**2 = 0.00130
  HF=L*SF = (     95.43)*(0.00130) =      0.124
----------------------------------------------------------------------------
  NODE  4895.00 : HGL = <  600.879>;EGL= <  601.188>;FLOWLINE= <  593.890>
                          HGL +0.216'
****************************************************************************
  FLOW PROCESS FROM NODE  4895.00 TO NODE  4895.00 IS CODE =  5
  UPSTREAM NODE  4895.00     ELEVATION =   593.99  (FLOW IS UNDER PRESSURE)
----------------------------------------------------------------------------
  CALCULATE JUNCTION LOSSES:
       PIPE       FLOW    DIAMETER   ANGLE    FLOWLINE   CRITICAL   VELOCITY
                  (CFS)   (INCHES) (DEGREES) ELEVATION  DEPTH(FT.)  (FT/SEC)
     UPSTREAM      69.30    54.00     90.00    593.99      2.43        4.358
    DOWNSTREAM     71.00    54.00       -      593.89      2.46        4.464
    LATERAL #1      1.70    18.00      0.00    595.00      0.49        0.962
    LATERAL #2      0.00     0.00      0.00      0.00      0.00        0.000
       Q5           0.00===Q5 EQUALS BASIN INPUT===

  LACFCD AND OCEMA FLOW JUNCTION FORMULAE USED:
  DY=(Q2*V2-Q1*V1*COS(DELTA1)-Q3*V3*COS(DELTA3)-
      Q4*V4*COS(DELTA4))/((A1+A2)*16.1)+FRICTION LOSSES
  UPSTREAM:    MANNING'S N = 0.01300;  FRICTION SLOPE = 0.00124
  DOWNSTREAM:  MANNING'S N = 0.01300;  FRICTION SLOPE = 0.00130
  AVERAGED FRICTION SLOPE IN JUNCTION ASSUMED AS 0.00127
  JUNCTION LENGTH =   4.00 FEET
  FRICTION LOSSES =  0.005 FEET         ENTRANCE LOSSES =  0.000 FEET
```

```
  JUNCTION LOSSES = (DY+HV1-HV2)+(ENTRANCE LOSSES)
  JUNCTION LOSSES = ( 0.606)+( 0.000) =   0.606
------------------------------------------------------------------------------
  NODE  4895.00 : HGL = <  601.500>;EGL= <  601.794>;FLOWLINE= <  593.990>
```

HGL +0.833'

```
****************************************************************************
  FLOW PROCESS FROM NODE  4895.00 TO NODE  4892.00 IS CODE =  1
  UPSTREAM NODE  4892.00     ELEVATION =   595.08  (FLOW IS UNDER PRESSURE)
------------------------------------------------------------------------------
  CALCULATE FRICTION LOSSES(LACFCD):
  PIPE FLOW    =      69.30 CFS     PIPE DIAMETER =  54.00 INCHES
  PIPE LENGTH =     217.24 FEET          MANNING'S N  =  0.01300
  SF=(Q/K)**2 = ((     69.30)/(  1966.536))**2 = 0.00124
  HF=L*SF = (    217.24)*(0.00124) =      0.270
------------------------------------------------------------------------------
  NODE  4892.00 : HGL = <  601.769>;EGL= <  602.064>;FLOWLINE= <  595.080>
```

HGL +0.876'

```
****************************************************************************
  FLOW PROCESS FROM NODE  4892.00 TO NODE  4892.00 IS CODE =  5
  UPSTREAM NODE  4892.00     ELEVATION =   595.18  (FLOW IS UNDER PRESSURE)
------------------------------------------------------------------------------
  CALCULATE JUNCTION LOSSES:
       PIPE        FLOW    DIAMETER   ANGLE    FLOWLINE   CRITICAL   VELOCITY
                   (CFS)   (INCHES) (DEGREES) ELEVATION  DEPTH(FT.)  (FT/SEC)
     UPSTREAM      61.00    48.00      0.00    595.18      2.35        4.854
    DOWNSTREAM     69.30    54.00       -      595.08      2.43        4.357
    LATERAL #1      2.80    18.00     90.00    597.67      0.64        1.584
    LATERAL #2      5.50    18.00     90.00    597.67      0.90        3.112
       Q5           0.00===Q5 EQUALS BASIN INPUT===

  LACFCD AND OCEMA FLOW JUNCTION FORMULAE USED:
  DY=(Q2*V2-Q1*V1*COS(DELTA1)-Q3*V3*COS(DELTA3)-
      Q4*V4*COS(DELTA4))/((A1+A2)*16.1)+FRICTION LOSSES
  UPSTREAM:    MANNING'S N = 0.01300;  FRICTION SLOPE = 0.00180
  DOWNSTREAM:  MANNING'S N = 0.01300;  FRICTION SLOPE = 0.00124
  AVERAGED FRICTION SLOPE IN JUNCTION ASSUMED AS 0.00152
  JUNCTION LENGTH =   4.00 FEET
  FRICTION LOSSES =  0.006 FEET         ENTRANCE LOSSES =  0.000 FEET
  JUNCTION LOSSES = (DY+HV1-HV2)+(ENTRANCE LOSSES)
  JUNCTION LOSSES = ( 0.090)+( 0.000) =   0.090
------------------------------------------------------------------------------
  NODE  4892.00 : HGL = <  601.788>;EGL= <  602.154>;FLOWLINE= <  595.180>
```

HGL +0.986'

```
****************************************************************************
  FLOW PROCESS FROM NODE  4892.00 TO NODE  4730.00 IS CODE =  1
  UPSTREAM NODE  4730.00     ELEVATION =   595.24  (FLOW IS UNDER PRESSURE)
------------------------------------------------------------------------------
  CALCULATE FRICTION LOSSES(LACFCD):
  PIPE FLOW    =      61.00 CFS     PIPE DIAMETER =  48.00 INCHES
  PIPE LENGTH =      13.57 FEET          MANNING'S N  =  0.01300
```

```
  SF=(Q/K)**2 = ((     61.00)/(  1436.341))**2 = 0.00180
  HF=L*SF = (     13.57)*(0.00180) =      0.024
------------------------------------------------------------------------------
  NODE  4730.00 : HGL = <  601.813>;EGL= <  602.179>;FLOWLINE= <  595.240>
```

HGL +0.987'

```
**************************************************************************
  FLOW PROCESS FROM NODE  4892.00 TO NODE  4730.00 IS CODE =  3
  UPSTREAM NODE  4730.00     ELEVATION =   595.57  (FLOW IS UNDER PRESSURE)
------------------------------------------------------------------------------
  CALCULATE PIPE-BEND LOSSES(OCEMA):
  PIPE FLOW =      61.00 CFS             PIPE DIAMETER =  48.00 INCHES
  CENTRAL ANGLE = 85.600 DEGREES         MANNING'S N = 0.01300
  PIPE LENGTH =      65.74 FEET          BEND COEFFICIENT(KB) = 0.24381
  FLOW VELOCITY =   4.85 FEET/SEC.       VELOCITY HEAD =  0.366 FEET
  HB=KB*(VELOCITY HEAD) = ( 0.244)*( 0.366) =   0.089
  SF=(Q/K)**2 = ((     61.00)/(  1436.453))**2 = 0.00180
  HF=L*SF = (     65.74)*(0.00180) =  0.119
  TOTAL HEAD LOSSES = HB + HF = ( 0.089)+( 0.119) =  0.208
------------------------------------------------------------------------------
  NODE  4730.00 : HGL = <  602.020>;EGL= <  602.386>;FLOWLINE= <  595.570>
```

HGL +0.986'

```
**************************************************************************
  FLOW PROCESS FROM NODE  4892.00 TO NODE  4730.00 IS CODE =  1
  UPSTREAM NODE  4730.00     ELEVATION =   595.65  (FLOW IS UNDER PRESSURE)
------------------------------------------------------------------------------
  CALCULATE FRICTION LOSSES(LACFCD):
  PIPE FLOW    =      61.00 CFS     PIPE DIAMETER =  48.00 INCHES
  PIPE LENGTH =      15.44 FEET          MANNING'S N  =  0.01300
  SF=(Q/K)**2 = ((     61.00)/(  1436.749))**2 = 0.00180
  HF=L*SF = (     15.44)*(0.00180) =      0.028
------------------------------------------------------------------------------
  NODE  4730.00 : HGL = <  602.048>;EGL= <  602.414>;FLOWLINE= <  595.650>
```

HGL +0.986'

```
**************************************************************************
  FLOW PROCESS FROM NODE  4730.00 TO NODE  4730.00 IS CODE =  5
  UPSTREAM NODE  4730.00     ELEVATION =   595.98  (FLOW IS UNDER PRESSURE)
------------------------------------------------------------------------------
  CALCULATE JUNCTION LOSSES:
       PIPE       FLOW    DIAMETER   ANGLE    FLOWLINE   CRITICAL   VELOCITY
                  (CFS)   (INCHES) (DEGREES) ELEVATION  DEPTH(FT.)  (FT/SEC)
     UPSTREAM      54.60    48.00      0.00    595.98      2.22        4.345
    DOWNSTREAM     61.00    48.00       -      595.65      2.35        4.854
    LATERAL #1      6.40    18.00     90.00    598.15      0.98        3.622
    LATERAL #2      0.00     0.00      0.00      0.00      0.00        0.000
       Q5           0.00===Q5 EQUALS BASIN INPUT===

  LACFCD AND OCEMA FLOW JUNCTION FORMULAE USED:
  DY=(Q2*V2-Q1*V1*COS(DELTA1)-Q3*V3*COS(DELTA3)-
      Q4*V4*COS(DELTA4))/((A1+A2)*16.1)+FRICTION LOSSES
  UPSTREAM:    MANNING'S N = 0.01300;  FRICTION SLOPE = 0.00144
```

```
  DOWNSTREAM:  MANNING'S N = 0.01300;  FRICTION SLOPE = 0.00180
  AVERAGED FRICTION SLOPE IN JUNCTION ASSUMED AS 0.00162
  JUNCTION LENGTH =   4.00 FEET
  FRICTION LOSSES =  0.006 FEET         ENTRANCE LOSSES =  0.000 FEET
  JUNCTION LOSSES = (DY+HV1-HV2)+(ENTRANCE LOSSES)
  JUNCTION LOSSES = ( 0.079)+( 0.000) =   0.079
--------------------------------------------------------------------------------
  NODE  4730.00 : HGL = <  602.200>;EGL= <  602.493>;FLOWLINE= <  595.980>
                        HGL +0.986'
****************************************************************************
  FLOW PROCESS FROM NODE  4730.00 TO NODE  4720.00 IS CODE =  1
  UPSTREAM NODE  4720.00     ELEVATION =   597.13  (FLOW IS UNDER PRESSURE)
--------------------------------------------------------------------------------
  CALCULATE FRICTION LOSSES(LACFCD):
  PIPE FLOW    =      54.60 CFS     PIPE DIAMETER =  48.00 INCHES
  PIPE LENGTH =     230.10 FEET          MANNING'S N  =  0.01300
  SF=(Q/K)**2 = ((     54.60)/(  1436.423))**2 = 0.00144
  HF=L*SF = (    230.10)*(0.00144) =      0.332
--------------------------------------------------------------------------------
  NODE  4720.00 : HGL = <  602.533>;EGL= <  602.826>;FLOWLINE= <  597.130>
                        HGL +0.987'
****************************************************************************
  FLOW PROCESS FROM NODE  4720.00 TO NODE  4720.00 IS CODE =  5
  UPSTREAM NODE  4720.00     ELEVATION =   598.13  (FLOW IS UNDER PRESSURE)
--------------------------------------------------------------------------------
  CALCULATE JUNCTION LOSSES:
       PIPE       FLOW    DIAMETER   ANGLE    FLOWLINE   CRITICAL   VELOCITY
                  (CFS)   (INCHES) (DEGREES) ELEVATION  DEPTH(FT.)  (FT/SEC)
     UPSTREAM      49.20    36.00      0.00    598.13      2.28        6.961
    DOWNSTREAM     54.60    48.00       -      597.13      2.22        4.345
    LATERAL #1      5.40    18.00     90.00    599.63      0.90        3.056
    LATERAL #2      0.00     0.00      0.00      0.00      0.00        0.000
       Q5           0.00===Q5 EQUALS BASIN INPUT===

  LACFCD AND OCEMA FLOW JUNCTION FORMULAE USED:
  DY=(Q2*V2-Q1*V1*COS(DELTA1)-Q3*V3*COS(DELTA3)-
      Q4*V4*COS(DELTA4))/((A1+A2)*16.1)+FRICTION LOSSES
  UPSTREAM:    MANNING'S N = 0.01300;  FRICTION SLOPE = 0.00544
  DOWNSTREAM:  MANNING'S N = 0.01300;  FRICTION SLOPE = 0.00144
  AVERAGED FRICTION SLOPE IN JUNCTION ASSUMED AS 0.00344
  JUNCTION LENGTH =   4.00 FEET
  FRICTION LOSSES =  0.014 FEET         ENTRANCE LOSSES =  0.000 FEET
  JUNCTION LOSSES = (DY+HV1-HV2)+(ENTRANCE LOSSES)
  JUNCTION LOSSES = ( 0.140)+( 0.000) =   0.140
--------------------------------------------------------------------------------
  NODE  4720.00 : HGL = <  602.214>;EGL= <  602.966>;FLOWLINE= <  598.130>
                        HGL +2.804'
****************************************************************************
  FLOW PROCESS FROM NODE  4720.00 TO NODE  4677.00 IS CODE =  1
  UPSTREAM NODE  4677.00     ELEVATION =   600.17  (HYDRAULIC JUMP OCCURS)
```

```
--------------------------------------------------------------------------------
  CALCULATE FRICTION LOSSES(LACFCD):
  PIPE FLOW   =      49.20 CFS     PIPE DIAMETER =  36.00 INCHES
  PIPE LENGTH =      51.29 FEET          MANNING'S N  =  0.01300
--------------------------------------------------------------------------------
  HYDRAULIC JUMP: DOWNSTREAM RUN ANALYSIS RESULTS
--------------------------------------------------------------------------------
  NORMAL DEPTH(FT) =      1.26           CRITICAL DEPTH(FT) =      2.28
================================================================================
  UPSTREAM CONTROL ASSUMED FLOWDEPTH(FT) =     1.30
================================================================================
  GRADUALLY VARIED FLOW PROFILE COMPUTED INFORMATION:
--------------------------------------------------------------------------------
  DISTANCE FROM      FLOW DEPTH  VELOCITY      SPECIFIC        PRESSURE+
   CONTROL(FT)           (FT)    (FT/SEC)     ENERGY(FT)    MOMENTUM(POUNDS)
         0.000          1.296     16.816          5.690          1703.12
         3.038          1.295     16.838          5.700          1705.04
         6.211          1.294     16.861          5.711          1706.96
         9.531          1.292     16.884          5.722          1708.90
        13.013          1.291     16.907          5.732          1710.84
        16.672          1.290     16.930          5.743          1712.78
        20.525          1.288     16.953          5.754          1714.73
        24.596          1.287     16.976          5.764          1716.69
        28.907          1.286     16.999          5.775          1718.66
        33.488          1.284     17.022          5.786          1720.62
        38.375          1.283     17.045          5.797          1722.60
        43.609          1.282     17.068          5.808          1724.58
        49.242          1.280     17.092          5.819          1726.57
        51.290          1.280     17.100          5.823          1727.24
--------------------------------------------------------------------------------
  HYDRAULIC JUMP: UPSTREAM RUN ANALYSIS RESULTS
================================================================================
  DOWNSTREAM CONTROL ASSUMED PRESSURE HEAD(FT) =     4.08
================================================================================
  PRESSURE FLOW PROFILE COMPUTED INFORMATION:
--------------------------------------------------------------------------------
  DISTANCE FROM       PRESSURE   VELOCITY      SPECIFIC        PRESSURE+
   CONTROL(FT)        HEAD(FT)   (FT/SEC)     ENERGY(FT)    MOMENTUM(POUNDS)
         0.000          4.084      6.960          4.836          1803.22
        31.563          3.000      6.960          3.752          1325.25
================================================================================
  ASSUMED DOWNSTREAM PRESSURE HEAD(FT) =     3.00
================================================================================
  GRADUALLY VARIED FLOW PROFILE COMPUTED INFORMATION:
--------------------------------------------------------------------------------
  DISTANCE FROM      FLOW DEPTH  VELOCITY      SPECIFIC        PRESSURE+
   CONTROL(FT)           (FT)    (FT/SEC)     ENERGY(FT)    MOMENTUM(POUNDS)
        31.563          3.000      6.958          3.752          1325.25
        32.326          2.971      6.969          3.726          1313.66
        33.024          2.943      6.989          3.702          1302.98
```

```
        33.681          2.914       7.016          3.679          1292.90
        34.307          2.885       7.047          3.657          1283.35
        34.903          2.857       7.082          3.636          1274.27
        35.473          2.828       7.121          3.616          1265.63
        36.018          2.799       7.164          3.597          1257.42
        36.539          2.771       7.211          3.579          1249.62
        37.036          2.742       7.261          3.561          1242.23
        37.510          2.713       7.314          3.545          1235.24
        37.960          2.685       7.371          3.529          1228.66
        38.386          2.656       7.431          3.514          1222.49
        38.788          2.627       7.494          3.500          1216.72
        39.165          2.599       7.561          3.487          1211.36
        39.517          2.570       7.630          3.475          1206.43
        39.842          2.541       7.703          3.463          1201.91
        40.140          2.513       7.780          3.453          1197.83
        40.409          2.484       7.859          3.444          1194.19
        40.648          2.455       7.943          3.435          1190.99
        40.856          2.427       8.030          3.428          1188.26
        41.030          2.398       8.120          3.422          1185.99
        41.170          2.369       8.214          3.418          1184.21
        41.273          2.341       8.312          3.414          1182.92
        41.336          2.312       8.415          3.412          1182.13
        41.358          2.283       8.521          3.411          1181.86
        51.290          2.283       8.521          3.411          1181.86
-------------------------END OF HYDRAULIC JUMP ANALYSIS-------------------------
| PRESSURE+MOMENTUM BALANCE OCCURS AT     5.13 FEET UPSTREAM OF NODE 4720.00 |
|       DOWNSTREAM DEPTH = 3.907 FEET, UPSTREAM CONJUGATE DEPTH = 1.281 FEET |
-----------------------------------------------------------------------------
  NODE  4677.00 : HGL = <  601.466>;EGL= <  605.860>;FLOWLINE= <  600.170>
                          HGL +0.000'
**************************************************************************
  FLOW PROCESS FROM NODE  4677.00 TO NODE  4677.00 IS CODE =  5
  UPSTREAM NODE  4677.00     ELEVATION =   600.50  (FLOW IS SUPERCRITICAL)
-----------------------------------------------------------------------------
  CALCULATE JUNCTION LOSSES:
       PIPE        FLOW    DIAMETER   ANGLE    FLOWLINE   CRITICAL   VELOCITY
                   (CFS)   (INCHES) (DEGREES) ELEVATION  DEPTH(FT.)  (FT/SEC)
     UPSTREAM      44.20     36.00      0.00    600.50      2.17       19.046
    DOWNSTREAM     49.20     36.00       -      600.17      2.28       16.821
    LATERAL #1      5.00     18.00     90.00    602.00      0.86        4.770
    LATERAL #2      0.00      0.00      0.00      0.00      0.00        0.000
       Q5           0.00===Q5 EQUALS BASIN INPUT===

  LACFCD AND OCEMA FLOW JUNCTION FORMULAE USED:
  DY=(Q2*V2-Q1*V1*COS(DELTA1)-Q3*V3*COS(DELTA3)-
      Q4*V4*COS(DELTA4))/((A1+A2)*16.1)+FRICTION LOSSES
  UPSTREAM:    MANNING'S N = 0.01300;  FRICTION SLOPE = 0.05514
  DOWNSTREAM:  MANNING'S N = 0.01300;  FRICTION SLOPE = 0.03624
  AVERAGED FRICTION SLOPE IN JUNCTION ASSUMED AS 0.04569
  JUNCTION LENGTH =   4.00 FEET
```

```
  FRICTION LOSSES =  0.183 FEET         ENTRANCE LOSSES =  0.000 FEET
  JUNCTION LOSSES = (DY+HV1-HV2)+(ENTRANCE LOSSES)
  JUNCTION LOSSES = ( 1.364)+( 0.000) =   1.364
------------------------------------------------------------------------------
  NODE  4677.00 : HGL = <  601.590>;EGL= <  607.223>;FLOWLINE= <  600.500>
**************************                                    ***************************************
  FLOW PROCESS FROM NODE  4677.00 TO NODE  4675.00 IS CODE =  1
  UPSTREAM NODE  4675.00     ELEVATION =   621.11  (FLOW IS SUPERCRITICAL)
------------------------------------------------------------------------------
  CALCULATE FRICTION LOSSES(LACFCD):
  PIPE FLOW    =      44.20 CFS     PIPE DIAMETER =  36.00 INCHES
  PIPE LENGTH =     364.16 FEET          MANNING'S N  =  0.01300
------------------------------------------------------------------------------
  NORMAL DEPTH(FT) =      1.08           CRITICAL DEPTH(FT) =      2.17
==============================================================================
  UPSTREAM CONTROL ASSUMED FLOWDEPTH(FT) =     1.28
==============================================================================
  GRADUALLY VARIED FLOW PROFILE COMPUTED INFORMATION:
------------------------------------------------------------------------------
  DISTANCE FROM      FLOW DEPTH  VELOCITY      SPECIFIC        PRESSURE+
   CONTROL(FT)           (FT)    (FT/SEC)     ENERGY(FT)    MOMENTUM(POUNDS)
         0.000          1.285     15.286          4.915          1407.00
         2.031          1.277     15.414          4.968          1416.50
         4.178          1.269     15.544          5.023          1426.19
         6.450          1.260     15.676          5.079          1436.08
         8.861          1.252     15.810          5.136          1446.15
        11.423          1.244     15.947          5.195          1456.43
        14.154          1.236     16.085          5.256          1466.91
        17.070          1.228     16.226          5.319          1477.60
        20.194          1.220     16.369          5.383          1488.50
        23.552          1.212     16.515          5.450          1499.62
        27.174          1.204     16.663          5.518          1510.96
        31.097          1.196     16.813          5.588          1522.53
        35.366          1.188     16.966          5.660          1534.33
        40.037          1.180     17.122          5.735          1546.37
        45.181          1.172     17.281          5.811          1558.65
        50.889          1.164     17.442          5.890          1571.18
        57.281          1.155     17.606          5.972          1583.96
        64.518          1.147     17.773          6.055          1597.00
        72.828          1.139     17.943          6.141          1610.31
        82.545          1.131     18.115          6.230          1623.89
        94.185          1.123     18.292          6.322          1637.75
       108.612          1.115     18.471          6.416          1651.89
       127.449          1.107     18.653          6.513          1666.33
       154.342          1.099     18.839          6.613          1681.07
       200.985          1.091     19.028          6.717          1696.11
       364.160          1.090     19.040          6.723          1697.07
------------------------------------------------------------------------------
  NODE  4675.00 : HGL = <  622.395>;EGL= <  626.025>;FLOWLINE= <  621.110>
```

HGL +0.000'

HGL +0.000'

```
****************************************************************************
  FLOW PROCESS FROM NODE  4675.00 TO NODE  4675.00 IS CODE =  5
  UPSTREAM NODE  4675.00     ELEVATION =   621.44  (FLOW IS SUPERCRITICAL)
----------------------------------------------------------------------------
  CALCULATE JUNCTION LOSSES:
       PIPE       FLOW    DIAMETER   ANGLE    FLOWLINE   CRITICAL   VELOCITY
                  (CFS)   (INCHES) (DEGREES) ELEVATION  DEPTH(FT.)  (FT/SEC)
     UPSTREAM      41.30    36.00      0.00    621.44      2.09       16.421
    DOWNSTREAM     44.20    36.00       -      621.11      2.17       15.291
    LATERAL #1      2.90    18.00     90.00    622.61      0.65        3.976
    LATERAL #2      0.00     0.00      0.00      0.00      0.00        0.000
       Q5           0.00===Q5 EQUALS BASIN INPUT===

  LACFCD AND OCEMA FLOW JUNCTION FORMULAE USED:
  DY=(Q2*V2-Q1*V1*COS(DELTA1)-Q3*V3*COS(DELTA3)-
      Q4*V4*COS(DELTA4))/((A1+A2)*16.1)+FRICTION LOSSES
  UPSTREAM:    MANNING'S N = 0.01300;  FRICTION SLOPE = 0.03858
  DOWNSTREAM:  MANNING'S N = 0.01300;  FRICTION SLOPE = 0.03020
  AVERAGED FRICTION SLOPE IN JUNCTION ASSUMED AS 0.03439
  JUNCTION LENGTH =   4.00 FEET
  FRICTION LOSSES =  0.138 FEET         ENTRANCE LOSSES =  0.000 FEET
  JUNCTION LOSSES = (DY+HV1-HV2)+(ENTRANCE LOSSES)
  JUNCTION LOSSES = ( 0.759)+( 0.000) =   0.759
----------------------------------------------------------------------------
  NODE  4675.00 : HGL = <  622.597>;EGL= <  626.785>;FLOWLINE= <  621.440>

**************************>                                    HGL +0.000'
****************************************
  FLOW PROCESS FROM NODE  4675.00 TO NODE  4670.00 IS CODE =  1
  UPSTREAM NODE  4670.00     ELEVATION =   626.86  (FLOW IS SUPERCRITICAL)
----------------------------------------------------------------------------
  CALCULATE FRICTION LOSSES(LACFCD):
  PIPE FLOW    =      41.30 CFS     PIPE DIAMETER =  36.00 INCHES
  PIPE LENGTH =     114.14 FEET          MANNING'S N  =  0.01300
----------------------------------------------------------------------------
  NORMAL DEPTH(FT) =      1.09           CRITICAL DEPTH(FT) =      2.09
============================================================================
  UPSTREAM CONTROL ASSUMED FLOWDEPTH(FT) =     2.09
============================================================================
  GRADUALLY VARIED FLOW PROFILE COMPUTED INFORMATION:
----------------------------------------------------------------------------
  DISTANCE FROM      FLOW DEPTH  VELOCITY      SPECIFIC        PRESSURE+
   CONTROL(FT)           (FT)    (FT/SEC)     ENERGY(FT)    MOMENTUM(POUNDS)
         0.000          2.093      7.841          3.048           931.38
         0.037          2.053      8.010          3.050           931.88
         0.153          2.013      8.188          3.055           933.41
         0.358          1.973      8.376          3.063           936.03
         0.662          1.933      8.574          3.075           939.80
         1.076          1.893      8.784          3.092           944.76
         1.615          1.853      9.007          3.114           951.00
```

```
         2.296          1.813      9.242          3.140           958.58
         3.138          1.773      9.492          3.173           967.58
         4.165          1.733      9.757          3.213           978.09
         5.405          1.693     10.038          3.259           990.22
         6.894          1.653     10.337          3.314          1004.07
         8.673          1.614     10.656          3.378          1019.75
        10.797          1.574     10.995          3.452          1037.41
        13.334          1.534     11.357          3.538          1057.20
        16.373          1.494     11.744          3.637          1079.28
        20.029          1.454     12.159          3.751          1103.84
        24.463          1.414     12.603          3.882          1131.09
        29.898          1.374     13.080          4.032          1161.29
        36.665          1.334     13.594          4.205          1194.68
        45.275          1.294     14.148          4.404          1231.60
        56.588          1.254     14.746          4.633          1272.40
        72.221          1.214     15.395          4.897          1317.48
        95.805          1.174     16.099          5.201          1367.31
       114.140          1.157     16.416          5.345          1390.04
--------------------------------------------------------------------------------
  NODE  4670.00 : HGL = <  628.953>;EGL= <  629.908>;FLOWLINE= <  626.860>

********************************************************************************
  FLOW PROCESS FROM NODE  4670.00 TO NODE  4670.00 IS CODE =  5
  UPSTREAM NODE  4670.00     ELEVATION =   627.86  (FLOW UNSEALS IN REACH)
--------------------------------------------------------------------------------
  CALCULATE JUNCTION LOSSES:
       PIPE       FLOW    DIAMETER   ANGLE    FLOWLINE   CRITICAL   VELOCITY
                  (CFS)   (INCHES) (DEGREES) ELEVATION  DEPTH(FT.)  (FT/SEC)
     UPSTREAM      36.50    24.00     90.00    627.86      1.93       11.618
    DOWNSTREAM     41.30    36.00       -      626.86      2.09        7.844
    LATERAL #1      4.80    24.00      0.00    627.86      0.77        1.528
    LATERAL #2      0.00     0.00      0.00      0.00      0.00        0.000
       Q5           0.00===Q5 EQUALS BASIN INPUT===

  LACFCD AND OCEMA FLOW JUNCTION FORMULAE USED:
  DY=(Q2*V2-Q1*V1*COS(DELTA1)-Q3*V3*COS(DELTA3)-
      Q4*V4*COS(DELTA4))/((A1+A2)*16.1)+FRICTION LOSSES
  UPSTREAM:    MANNING'S N = 0.01300;  FRICTION SLOPE = 0.02603
  DOWNSTREAM:  MANNING'S N = 0.01300;  FRICTION SLOPE = 0.00552
  AVERAGED FRICTION SLOPE IN JUNCTION ASSUMED AS 0.01577
  JUNCTION LENGTH =   4.00 FEET
  FRICTION LOSSES =  0.063 FEET         ENTRANCE LOSSES =  0.000 FEET
  JUNCTION LOSSES = (DY+HV1-HV2)+(ENTRANCE LOSSES)
  JUNCTION LOSSES = ( 3.543)+( 0.000) =   3.543
--------------------------------------------------------------------------------
  NODE  4670.00 : HGL = <  631.355>;EGL= <  633.451>;FLOWLINE= <  627.860>

********************************************************************************
  FLOW PROCESS FROM NODE  4670.00 TO NODE  4660.00 IS CODE =  1
  UPSTREAM NODE  4660.00     ELEVATION =   630.34  (FLOW IS UNDER PRESSURE)
```

```
------------------------------------------------------------------------
  CALCULATE FRICTION LOSSES(LACFCD):
  PIPE FLOW   =      36.50 CFS     PIPE DIAMETER =  24.00 INCHES
  PIPE LENGTH =      77.86 FEET          MANNING'S N  =  0.01300
  SF=(Q/K)**2 = ((     36.50)/(   226.224))**2 = 0.02603
  HF=L*SF = (     77.86)*(0.02603) =      2.027
------------------------------------------------------------------------
  NODE  4660.00 : HGL = <  633.382>;EGL= <  635.478>;FLOWLINE= <  630.340>

************************************************************************
  FLOW PROCESS FROM NODE  4660.00 TO NODE  4660.00 IS CODE =  5
  UPSTREAM NODE  4660.00     ELEVATION =   630.67  (FLOW IS UNDER PRESSURE)
------------------------------------------------------------------------
  CALCULATE JUNCTION LOSSES:
       PIPE       FLOW    DIAMETER   ANGLE    FLOWLINE   CRITICAL   VELOCITY
                  (CFS)   (INCHES) (DEGREES) ELEVATION  DEPTH(FT.)  (FT/SEC)
     UPSTREAM      31.90    24.00      0.00    630.67      1.89       10.154
    DOWNSTREAM     36.50    24.00       -      630.34      1.93       11.618
    LATERAL #1      3.50    18.00     90.00    630.84      0.71        1.981
    LATERAL #2      1.10    18.00     90.00    630.84      0.39        0.622
       Q5           0.00===Q5 EQUALS BASIN INPUT===

  LACFCD AND OCEMA FLOW JUNCTION FORMULAE USED:
  DY=(Q2*V2-Q1*V1*COS(DELTA1)-Q3*V3*COS(DELTA3)-
      Q4*V4*COS(DELTA4))/((A1+A2)*16.1)+FRICTION LOSSES
  UPSTREAM:    MANNING'S N = 0.01300;  FRICTION SLOPE = 0.01988
  DOWNSTREAM:  MANNING'S N = 0.01300;  FRICTION SLOPE = 0.02603
  AVERAGED FRICTION SLOPE IN JUNCTION ASSUMED AS 0.02296
  JUNCTION LENGTH =   4.00 FEET
  FRICTION LOSSES =  0.092 FEET         ENTRANCE LOSSES =  0.000 FEET
  JUNCTION LOSSES = (DY+HV1-HV2)+(ENTRANCE LOSSES)
  JUNCTION LOSSES = ( 0.587)+( 0.000) =   0.587
------------------------------------------------------------------------
  NODE  4660.00 : HGL = <  634.464>;EGL= <  636.065>;FLOWLINE= <  630.670>

************************************************************************
  FLOW PROCESS FROM NODE  4660.00 TO NODE  4650.00 IS CODE =  1
  UPSTREAM NODE  4650.00     ELEVATION =   637.04  (HYDRAULIC JUMP OCCURS)
------------------------------------------------------------------------
  CALCULATE FRICTION LOSSES(LACFCD):
  PIPE FLOW   =      31.90 CFS     PIPE DIAMETER =  24.00 INCHES
  PIPE LENGTH =     121.88 FEET          MANNING'S N  =  0.01300
------------------------------------------------------------------------
  HYDRAULIC JUMP: DOWNSTREAM RUN ANALYSIS RESULTS
------------------------------------------------------------------------
  NORMAL DEPTH(FT) =      1.14           CRITICAL DEPTH(FT) =      1.89
========================================================================
  UPSTREAM CONTROL ASSUMED FLOWDEPTH(FT) =     1.89
========================================================================
  GRADUALLY VARIED FLOW PROFILE COMPUTED INFORMATION:
```

DISTANCE FROM CONTROL(FT)	FLOW DEPTH (FT)	VELOCITY (FT/SEC)	SPECIFIC ENERGY(FT)	PRESSURE+ MOMENTUM(POUNDS)
0.000	1.888	10.379	3.562	816.18
0.065	1.858	10.479	3.565	816.62
0.258	1.828	10.591	3.571	817.89
0.578	1.798	10.716	3.582	819.97
1.030	1.768	10.853	3.598	822.86
1.620	1.738	11.001	3.618	826.54
2.359	1.708	11.161	3.643	831.04
3.259	1.678	11.333	3.673	836.36
4.337	1.648	11.518	3.709	842.52
5.612	1.618	11.715	3.750	849.56
7.110	1.587	11.925	3.797	857.51
8.862	1.557	12.149	3.851	866.40
10.906	1.527	12.388	3.912	876.27
13.291	1.497	12.642	3.980	887.18
16.078	1.467	12.912	4.057	899.19
19.349	1.437	13.199	4.144	912.34
23.208	1.407	13.504	4.240	926.72
27.801	1.377	13.828	4.348	942.38
33.331	1.347	14.173	4.468	959.43
40.096	1.317	14.540	4.601	977.95
48.562	1.287	14.930	4.750	998.04
59.507	1.256	15.347	4.916	1019.82
74.392	1.226	15.791	5.101	1043.43
96.506	1.196	16.264	5.306	1068.99
121.880	1.177	16.583	5.450	1086.34

HYDRAULIC JUMP: UPSTREAM RUN ANALYSIS RESULTS

DOWNSTREAM CONTROL ASSUMED PRESSURE HEAD(FT) = 3.79

PRESSURE FLOW PROFILE COMPUTED INFORMATION:

DISTANCE FROM CONTROL(FT)	PRESSURE HEAD(FT)	VELOCITY (FT/SEC)	SPECIFIC ENERGY(FT)	PRESSURE+ MOMENTUM(POUNDS)
0.000	3.794	10.154	5.395	1175.40
55.399	2.000	10.154	3.601	823.75

ASSUMED DOWNSTREAM PRESSURE HEAD(FT) = 2.00

GRADUALLY VARIED FLOW PROFILE COMPUTED INFORMATION:

DISTANCE FROM CONTROL(FT)	FLOW DEPTH (FT)	VELOCITY (FT/SEC)	SPECIFIC ENERGY(FT)	PRESSURE+ MOMENTUM(POUNDS)
55.399	2.000	10.151	3.601	823.75
55.518	1.996	10.153	3.597	822.98
55.621	1.991	10.156	3.594	822.32
55.713	1.987	10.160	3.591	821.71

```
        55.798          1.982     10.165          3.588           821.15
        55.875          1.978     10.171          3.585           820.63
        55.947          1.973     10.178          3.583           820.15
        56.013          1.969     10.185          3.580           819.71
        56.075          1.964     10.192          3.578           819.30
        56.131          1.960     10.200          3.576           818.92
        56.183          1.955     10.208          3.575           818.57
        56.231          1.951     10.217          3.573           818.24
        56.275          1.946     10.226          3.571           817.95
        56.316          1.942     10.236          3.570           817.68
        56.352          1.938     10.246          3.569           817.43
        56.385          1.933     10.256          3.568           817.21
        56.415          1.929     10.267          3.567           817.01
        56.441          1.924     10.278          3.566           816.83
        56.464          1.920     10.290          3.565           816.68
        56.483          1.915     10.302          3.564           816.54
        56.500          1.911     10.314          3.564           816.43
        56.513          1.906     10.326          3.563           816.34
        56.524          1.902     10.339          3.563           816.27
        56.531          1.897     10.352          3.562           816.22
        56.535          1.893     10.365          3.562           816.19
        56.537          1.888     10.379          3.562           816.18
       121.880          1.888     10.379          3.562           816.18
-----------------------END OF HYDRAULIC JUMP ANALYSIS-----------------------
| PRESSURE+MOMENTUM BALANCE OCCURS AT    15.73 FEET UPSTREAM OF NODE 4660.00 |
|       DOWNSTREAM DEPTH = 3.285 FEET, UPSTREAM CONJUGATE DEPTH = 1.189 FEET |
-------------------------------------------------------------------------------
  NODE  4650.00 : HGL = <  638.928>;EGL= <  640.602>;FLOWLINE= <  637.040>

*******************************************************************************
  FLOW PROCESS FROM NODE  4650.00 TO NODE  4650.00 IS CODE =  5
  UPSTREAM NODE  4650.00     ELEVATION =   637.37  (FLOW UNSEALS IN REACH)
-------------------------------------------------------------------------------
  CALCULATE JUNCTION LOSSES:
       PIPE       FLOW    DIAMETER   ANGLE    FLOWLINE   CRITICAL   VELOCITY
                  (CFS)   (INCHES) (DEGREES) ELEVATION  DEPTH(FT.)  (FT/SEC)
     UPSTREAM      17.90    24.00     90.00    637.37      1.52        5.698
    DOWNSTREAM     31.90    24.00       -      637.04      1.89       10.382
    LATERAL #1     14.00    18.00     90.00    637.54      1.38        7.922
    LATERAL #2      0.00     0.00      0.00      0.00      0.00        0.000
       Q5           0.00===Q5 EQUALS BASIN INPUT===

  LACFCD AND OCEMA FLOW JUNCTION FORMULAE USED:
  DY=(Q2*V2-Q1*V1*COS(DELTA1)-Q3*V3*COS(DELTA3)-
      Q4*V4*COS(DELTA4))/((A1+A2)*16.1)+FRICTION LOSSES
  UPSTREAM:    MANNING'S N = 0.01300;  FRICTION SLOPE = 0.00626
  DOWNSTREAM:  MANNING'S N = 0.01300;  FRICTION SLOPE = 0.01719
  AVERAGED FRICTION SLOPE IN JUNCTION ASSUMED AS 0.01173
  JUNCTION LENGTH =   4.00 FEET
  FRICTION LOSSES =  0.047 FEET         ENTRANCE LOSSES =  0.000 FEET
```

```
  JUNCTION LOSSES = (DY+HV1-HV2)+(ENTRANCE LOSSES)
  JUNCTION LOSSES = ( 2.188)+( 0.000) =   2.188
------------------------------------------------------------------------------
  NODE  4650.00 : HGL = <  642.286>;EGL= <  642.790>;FLOWLINE= <  637.370>

******************************************************************************
  FLOW PROCESS FROM NODE  4650.00 TO NODE  4645.00 IS CODE =  1
  UPSTREAM NODE  4645.00     ELEVATION =   638.11  (FLOW IS UNDER PRESSURE)
------------------------------------------------------------------------------
  CALCULATE FRICTION LOSSES(LACFCD):
  PIPE FLOW   =      17.90 CFS     PIPE DIAMETER =  24.00 INCHES
  PIPE LENGTH =      73.12 FEET          MANNING'S N  =  0.01300
  SF=(Q/K)**2 = ((     17.90)/(   226.215))**2 = 0.00626
  HF=L*SF = (     73.12)*(0.00626) =      0.458
------------------------------------------------------------------------------
  NODE  4645.00 : HGL = <  642.744>;EGL= <  643.248>;FLOWLINE= <  638.110>

******************************************************************************
  FLOW PROCESS FROM NODE  4645.00 TO NODE  4645.00 IS CODE =  5
  UPSTREAM NODE  4645.00     ELEVATION =   638.61  (FLOW IS UNDER PRESSURE)
------------------------------------------------------------------------------
  CALCULATE JUNCTION LOSSES:
       PIPE       FLOW    DIAMETER   ANGLE    FLOWLINE   CRITICAL   VELOCITY
                  (CFS)   (INCHES) (DEGREES) ELEVATION  DEPTH(FT.)  (FT/SEC)
     UPSTREAM       9.90    18.00      0.00    638.61      1.21        5.602
    DOWNSTREAM     17.90    24.00       -      638.11      1.52        5.698
    LATERAL #1      6.50    18.00     90.00    638.61      0.99        3.678
    LATERAL #2      1.50    18.00     90.00    638.61      0.46        0.849
       Q5           0.00===Q5 EQUALS BASIN INPUT===

  LACFCD AND OCEMA FLOW JUNCTION FORMULAE USED:
  DY=(Q2*V2-Q1*V1*COS(DELTA1)-Q3*V3*COS(DELTA3)-
      Q4*V4*COS(DELTA4))/((A1+A2)*16.1)+FRICTION LOSSES
  UPSTREAM:    MANNING'S N = 0.01300;  FRICTION SLOPE = 0.00888
  DOWNSTREAM:  MANNING'S N = 0.01300;  FRICTION SLOPE = 0.00626
  AVERAGED FRICTION SLOPE IN JUNCTION ASSUMED AS 0.00757
  JUNCTION LENGTH =   4.00 FEET
  FRICTION LOSSES =  0.030 FEET         ENTRANCE LOSSES =  0.000 FEET
  JUNCTION LOSSES = (DY+HV1-HV2)+(ENTRANCE LOSSES)
  JUNCTION LOSSES = ( 0.602)+( 0.000) =   0.602
------------------------------------------------------------------------------
  NODE  4645.00 : HGL = <  643.363>;EGL= <  643.850>;FLOWLINE= <  638.610>

******************************************************************************
  FLOW PROCESS FROM NODE  4645.00 TO NODE  4635.00 IS CODE =  1
  UPSTREAM NODE  4635.00     ELEVATION =   638.85  (FLOW IS UNDER PRESSURE)
------------------------------------------------------------------------------
  CALCULATE FRICTION LOSSES(LACFCD):
  PIPE FLOW   =       9.90 CFS     PIPE DIAMETER =  18.00 INCHES
  PIPE LENGTH =      23.80 FEET          MANNING'S N  =  0.01300
```

```
  SF=(Q/K)**2 = ((      9.90)/(   105.038))**2 = 0.00888
  HF=L*SF = (     23.80)*(0.00888) =      0.211
--------------------------------------------------------------------------------
  NODE  4635.00 : HGL = <  643.574>;EGL= <  644.061>;FLOWLINE= <  638.850>

********************************************************************************
  FLOW PROCESS FROM NODE  4635.00 TO NODE  4635.00 IS CODE =  5
  UPSTREAM NODE  4635.00     ELEVATION =   639.18  (FLOW IS UNDER PRESSURE)
--------------------------------------------------------------------------------
  CALCULATE JUNCTION LOSSES:
       PIPE       FLOW    DIAMETER   ANGLE    FLOWLINE   CRITICAL   VELOCITY
                  (CFS)   (INCHES) (DEGREES) ELEVATION  DEPTH(FT.)  (FT/SEC)
     UPSTREAM       7.60    18.00      0.00    639.18      1.07        4.301
    DOWNSTREAM      9.90    18.00       -      638.85      1.21        5.602
    LATERAL #1      2.30    18.00     90.00    639.18      0.57        1.302
    LATERAL #2      0.00     0.00      0.00      0.00      0.00        0.000
       Q5           0.00===Q5 EQUALS BASIN INPUT===

  LACFCD AND OCEMA FLOW JUNCTION FORMULAE USED:
  DY=(Q2*V2-Q1*V1*COS(DELTA1)-Q3*V3*COS(DELTA3)-
      Q4*V4*COS(DELTA4))/((A1+A2)*16.1)+FRICTION LOSSES
  UPSTREAM:    MANNING'S N = 0.01300;  FRICTION SLOPE = 0.00523
  DOWNSTREAM:  MANNING'S N = 0.01300;  FRICTION SLOPE = 0.00888
  AVERAGED FRICTION SLOPE IN JUNCTION ASSUMED AS 0.00706
  JUNCTION LENGTH =   4.00 FEET
  FRICTION LOSSES =  0.028 FEET         ENTRANCE LOSSES =  0.000 FEET
  JUNCTION LOSSES = (DY+HV1-HV2)+(ENTRANCE LOSSES)
  JUNCTION LOSSES = ( 0.228)+( 0.000) =   0.228
--------------------------------------------------------------------------------
  NODE  4635.00 : HGL = <  644.002>;EGL= <  644.290>;FLOWLINE= <  639.180>

********************************************************************************
  FLOW PROCESS FROM NODE  4635.00 TO NODE  4630.00 IS CODE =  1
  UPSTREAM NODE  4630.00     ELEVATION =   639.56  (FLOW IS UNDER PRESSURE)
--------------------------------------------------------------------------------
  CALCULATE FRICTION LOSSES(LACFCD):
  PIPE FLOW   =       7.60 CFS     PIPE DIAMETER =  18.00 INCHES
  PIPE LENGTH =      37.32 FEET          MANNING'S N  =  0.01300
  SF=(Q/K)**2 = ((      7.60)/(   105.056))**2 = 0.00523
  HF=L*SF = (     37.32)*(0.00523) =      0.195
--------------------------------------------------------------------------------
  NODE  4630.00 : HGL = <  644.198>;EGL= <  644.485>;FLOWLINE= <  639.560>

********************************************************************************
  FLOW PROCESS FROM NODE  4630.00 TO NODE  4630.00 IS CODE =  5
  UPSTREAM NODE  4630.00     ELEVATION =   639.89  (FLOW IS UNDER PRESSURE)
--------------------------------------------------------------------------------
  CALCULATE JUNCTION LOSSES:
       PIPE       FLOW    DIAMETER   ANGLE    FLOWLINE   CRITICAL   VELOCITY
                  (CFS)   (INCHES) (DEGREES) ELEVATION  DEPTH(FT.)  (FT/SEC)
```

```
     UPSTREAM       5.10    18.00      0.00    639.89      0.87        2.886
    DOWNSTREAM      7.60    18.00       -      639.56      1.07        4.300
    LATERAL #1      2.50    18.00     90.00    639.89      0.60        1.415
    LATERAL #2      0.00     0.00      0.00      0.00      0.00        0.000
       Q5           0.00===Q5 EQUALS BASIN INPUT===

  LACFCD AND OCEMA FLOW JUNCTION FORMULAE USED:
  DY=(Q2*V2-Q1*V1*COS(DELTA1)-Q3*V3*COS(DELTA3)-
      Q4*V4*COS(DELTA4))/((A1+A2)*16.1)+FRICTION LOSSES
  UPSTREAM:    MANNING'S N = 0.01300;  FRICTION SLOPE = 0.00236
  DOWNSTREAM:  MANNING'S N = 0.01300;  FRICTION SLOPE = 0.00523
  AVERAGED FRICTION SLOPE IN JUNCTION ASSUMED AS 0.00380
  JUNCTION LENGTH =   4.00 FEET
  FRICTION LOSSES =  0.015 FEET         ENTRANCE LOSSES =  0.000 FEET
  JUNCTION LOSSES = (DY+HV1-HV2)+(ENTRANCE LOSSES)
  JUNCTION LOSSES = ( 0.173)+( 0.000) =   0.173
------------------------------------------------------------------------------
  NODE  4630.00 : HGL = <  644.529>;EGL= <  644.658>;FLOWLINE= <  639.890>

******************************************************************************
  FLOW PROCESS FROM NODE  4630.00 TO NODE  4625.00 IS CODE =  1
  UPSTREAM NODE  4625.00     ELEVATION =   642.73  (FLOW IS UNDER PRESSURE)
------------------------------------------------------------------------------
  CALCULATE FRICTION LOSSES(LACFCD):
  PIPE FLOW   =       5.10 CFS     PIPE DIAMETER =  18.00 INCHES
  PIPE LENGTH =      93.23 FEET          MANNING'S N  =  0.01300
  SF=(Q/K)**2 = ((      5.10)/(   105.053))**2 = 0.00236
  HF=L*SF = (     93.23)*(0.00236) =      0.220
------------------------------------------------------------------------------
  NODE  4625.00 : HGL = <  644.748>;EGL= <  644.878>;FLOWLINE= <  642.730>

******************************************************************************
  FLOW PROCESS FROM NODE  4625.00 TO NODE  4625.00 IS CODE =  5
  UPSTREAM NODE  4625.00     ELEVATION =   643.06  (FLOW IS UNDER PRESSURE)
------------------------------------------------------------------------------
  CALCULATE JUNCTION LOSSES:
       PIPE       FLOW    DIAMETER   ANGLE    FLOWLINE   CRITICAL   VELOCITY
                  (CFS)   (INCHES) (DEGREES) ELEVATION  DEPTH(FT.)  (FT/SEC)
     UPSTREAM       2.60    18.00      0.00    643.06      0.61        1.472
    DOWNSTREAM      5.10    18.00       -      642.73      0.87        2.886
    LATERAL #1      2.50    18.00     90.00    643.06      0.60        1.415
    LATERAL #2      0.00     0.00      0.00      0.00      0.00        0.000
       Q5           0.00===Q5 EQUALS BASIN INPUT===

  LACFCD AND OCEMA FLOW JUNCTION FORMULAE USED:
  DY=(Q2*V2-Q1*V1*COS(DELTA1)-Q3*V3*COS(DELTA3)-
      Q4*V4*COS(DELTA4))/((A1+A2)*16.1)+FRICTION LOSSES
  UPSTREAM:    MANNING'S N = 0.01300;  FRICTION SLOPE = 0.00061
  DOWNSTREAM:  MANNING'S N = 0.01300;  FRICTION SLOPE = 0.00236
  AVERAGED FRICTION SLOPE IN JUNCTION ASSUMED AS 0.00148
```

```
  JUNCTION LENGTH =   4.00 FEET
  FRICTION LOSSES =  0.006 FEET         ENTRANCE LOSSES =  0.000 FEET
  JUNCTION LOSSES = (DY+HV1-HV2)+(ENTRANCE LOSSES)
  JUNCTION LOSSES = ( 0.102)+( 0.000) =   0.102
--------------------------------------------------------------------------------
  NODE  4625.00 : HGL = <  644.946>;EGL= <  644.979>;FLOWLINE= <  643.060>

********************************************************************************
  FLOW PROCESS FROM NODE  4625.00 TO NODE  4615.00 IS CODE =  1
  UPSTREAM NODE  4615.00     ELEVATION =   643.67  (FLOW SEALS IN REACH)
--------------------------------------------------------------------------------
  CALCULATE FRICTION LOSSES(LACFCD):
  PIPE FLOW   =       2.60 CFS     PIPE DIAMETER =  18.00 INCHES
  PIPE LENGTH =      40.44 FEET          MANNING'S N  =  0.01300
================================================================================
  DOWNSTREAM CONTROL ASSUMED PRESSURE HEAD(FT) =     1.89
================================================================================
  PRESSURE FLOW PROFILE COMPUTED INFORMATION:
--------------------------------------------------------------------------------
  DISTANCE FROM       PRESSURE   VELOCITY      SPECIFIC        PRESSURE+
   CONTROL(FT)        HEAD(FT)   (FT/SEC)     ENERGY(FT)    MOMENTUM(POUNDS)
         0.000          1.886      1.471          1.919           132.67
        26.665          1.500      1.471          1.534            90.12
--------------------------------------------------------------------------------
  NORMAL DEPTH(FT) =      0.46           CRITICAL DEPTH(FT) =      0.61
================================================================================
  ASSUMED DOWNSTREAM PRESSURE HEAD(FT) =     1.50
================================================================================
  GRADUALLY VARIED FLOW PROFILE COMPUTED INFORMATION:
--------------------------------------------------------------------------------
  DISTANCE FROM      FLOW DEPTH  VELOCITY      SPECIFIC        PRESSURE+
   CONTROL(FT)           (FT)    (FT/SEC)     ENERGY(FT)    MOMENTUM(POUNDS)
        26.665          1.500      1.471          1.534            90.12
        29.087          1.464      1.480          1.498            86.25
        31.478          1.429      1.497          1.464            82.46
        33.850          1.393      1.519          1.429            78.74
        36.207          1.358      1.545          1.395            75.11
        38.550          1.322      1.576          1.361            71.57
        40.440          1.293      1.604          1.333            68.77
--------------------------------------------------------------------------------
  NODE  4615.00 : HGL = <  644.963>;EGL= <  645.003>;FLOWLINE= <  643.670>

********************************************************************************
  FLOW PROCESS FROM NODE  4615.00 TO NODE  4615.00 IS CODE =  5
  UPSTREAM NODE  4615.00     ELEVATION =   644.00  (FLOW IS SUBCRITICAL)
--------------------------------------------------------------------------------
  CALCULATE JUNCTION LOSSES:
       PIPE        FLOW    DIAMETER   ANGLE    FLOWLINE   CRITICAL   VELOCITY
                   (CFS)   (INCHES) (DEGREES) ELEVATION  DEPTH(FT.)  (FT/SEC)
     UPSTREAM       2.60    18.00     90.00    644.00      0.61        1.956
```

```
    DOWNSTREAM      2.60    18.00        -      643.67      0.61        1.605
    LATERAL #1      0.00     0.00     0.00       0.00      0.00        0.000
    LATERAL #2      0.00     0.00     0.00       0.00      0.00        0.000
       Q5           0.00===Q5 EQUALS BASIN INPUT===

  LACFCD AND OCEMA FLOW JUNCTION FORMULAE USED:
  DY=(Q2*V2-Q1*V1*COS(DELTA1)-Q3*V3*COS(DELTA3)-
      Q4*V4*COS(DELTA4))/((A1+A2)*16.1)+FRICTION LOSSES
  UPSTREAM:    MANNING'S N = 0.01300;  FRICTION SLOPE = 0.00086
  DOWNSTREAM:  MANNING'S N = 0.01300;  FRICTION SLOPE = 0.00057
  AVERAGED FRICTION SLOPE IN JUNCTION ASSUMED AS 0.00071
  JUNCTION LENGTH =   4.00 FEET
  FRICTION LOSSES =  0.003 FEET         ENTRANCE LOSSES =  0.000 FEET
  JUNCTION LOSSES = (DY+HV1-HV2)+(ENTRANCE LOSSES)
  JUNCTION LOSSES = ( 0.112)+( 0.000) =   0.112
--------------------------------------------------------------------------------
  NODE  4615.00 : HGL = <  645.056>;EGL= <  645.115>;FLOWLINE= <  644.000>

********************************************************************************
  FLOW PROCESS FROM NODE  4615.00 TO NODE  4604.00 IS CODE =  1
  UPSTREAM NODE  4604.00     ELEVATION =   644.38  (HYDRAULIC JUMP OCCURS)
--------------------------------------------------------------------------------
  CALCULATE FRICTION LOSSES(LACFCD):
  PIPE FLOW   =       2.60 CFS     PIPE DIAMETER =  18.00 INCHES
  PIPE LENGTH =      34.50 FEET          MANNING'S N  =  0.01300
--------------------------------------------------------------------------------
  HYDRAULIC JUMP: DOWNSTREAM RUN ANALYSIS RESULTS
--------------------------------------------------------------------------------
  NORMAL DEPTH(FT) =      0.50           CRITICAL DEPTH(FT) =      0.61
================================================================================
  UPSTREAM CONTROL ASSUMED FLOWDEPTH(FT) =     0.61
================================================================================
  GRADUALLY VARIED FLOW PROFILE COMPUTED INFORMATION:
--------------------------------------------------------------------------------
  DISTANCE FROM      FLOW DEPTH  VELOCITY      SPECIFIC        PRESSURE+
   CONTROL(FT)           (FT)    (FT/SEC)     ENERGY(FT)    MOMENTUM(POUNDS)
         0.000          0.611      3.843          0.841            30.16
         0.012          0.606      3.882          0.841            30.16
         0.047          0.602      3.921          0.841            30.17
         0.110          0.597      3.962          0.841            30.18
         0.202          0.593      4.003          0.842            30.21
         0.326          0.588      4.045          0.842            30.23
         0.486          0.583      4.088          0.843            30.26
         0.685          0.579      4.132          0.844            30.30
         0.928          0.574      4.177          0.845            30.35
         1.221          0.570      4.223          0.847            30.40
         1.571          0.565      4.269          0.848            30.46
         1.984          0.560      4.317          0.850            30.52
         2.471          0.556      4.365          0.852            30.60
         3.044          0.551      4.415          0.854            30.67
```

3.718	0.546	4.465	0.856	30.76
4.512	0.542	4.517	0.859	30.85
5.452	0.537	4.570	0.862	30.96
6.573	0.533	4.624	0.865	31.06
7.923	0.528	4.679	0.868	31.18
9.574	0.523	4.735	0.872	31.31
11.635	0.519	4.793	0.876	31.44
14.293	0.514	4.851	0.880	31.58
17.894	0.510	4.912	0.884	31.73
23.218	0.505	4.973	0.889	31.89
32.767	0.500	5.036	0.894	32.06
34.500	0.500	5.036	0.894	32.06

HYDRAULIC JUMP: UPSTREAM RUN ANALYSIS RESULTS

DOWNSTREAM CONTROL ASSUMED FLOWDEPTH(FT) = 1.06

GRADUALLY VARIED FLOW PROFILE COMPUTED INFORMATION:

DISTANCE FROM CONTROL(FT)	FLOW DEPTH (FT)	VELOCITY (FT/SEC)	SPECIFIC ENERGY(FT)	PRESSURE+ MOMENTUM(POUNDS)
0.000	1.056	1.956	1.115	48.58
1.533	1.038	1.992	1.100	47.30
3.057	1.020	2.031	1.084	46.06
4.570	1.002	2.071	1.069	44.86
6.073	0.985	2.114	1.054	43.69
7.563	0.967	2.158	1.039	42.57
9.040	0.949	2.205	1.025	41.48
10.502	0.931	2.255	1.010	40.44
11.948	0.913	2.307	0.996	39.43
13.376	0.896	2.361	0.982	38.47
14.784	0.878	2.419	0.969	37.56
16.169	0.860	2.480	0.956	36.69
17.528	0.842	2.544	0.943	35.86
18.859	0.825	2.612	0.931	35.08
20.157	0.807	2.683	0.919	34.35
21.417	0.789	2.759	0.907	33.68
22.635	0.771	2.840	0.896	33.05
23.802	0.753	2.925	0.886	32.48
24.912	0.736	3.015	0.877	31.96
25.952	0.718	3.112	0.868	31.51
26.911	0.700	3.214	0.861	31.11
27.772	0.682	3.324	0.854	30.78
28.512	0.664	3.440	0.848	30.51
29.102	0.647	3.565	0.844	30.32
29.501	0.629	3.699	0.841	30.20
29.652	0.611	3.843	0.841	30.16
34.500	0.611	3.843	0.841	30.16

END OF HYDRAULIC JUMP ANALYSIS

PRESSURE+MOMENTUM BALANCE OCCURS AT 26.78 FEET UPSTREAM OF NODE 4615.00

```
|       DOWNSTREAM DEPTH = 0.702 FEET, UPSTREAM CONJUGATE DEPTH = 0.529 FEET |
--------------------------------------------------------------------------------
  NODE  4604.00 : HGL = <  644.991>;EGL= <  645.221>;FLOWLINE= <  644.380>

********************************************************************************
  FLOW PROCESS FROM NODE  4604.00 TO NODE  4604.00 IS CODE =  8
  UPSTREAM NODE  4604.00     ELEVATION =   644.38  (FLOW IS SUBCRITICAL)
--------------------------------------------------------------------------------
  CALCULATE CATCH BASIN ENTRANCE LOSSES(LACFCD):
  PIPE FLOW =       2.60 CFS          PIPE DIAMETER =  18.00 INCHES
  FLOW VELOCITY =   3.84 FEET/SEC.    VELOCITY HEAD =  0.229 FEET
  CATCH BASIN ENERGY LOSS = .2*(VELOCITY HEAD) = .2*(  0.229) =  0.046
--------------------------------------------------------------------------------
  NODE  4604.00 : HGL = <  645.266>;EGL= <  645.266>;FLOWLINE= <  644.380>

********************************************************************************
  UPSTREAM PIPE FLOW CONTROL DATA:
  NODE NUMBER =  4604.00            FLOWLINE ELEVATION =   644.38
  ASSUMED UPSTREAM CONTROL HGL =    644.99 FOR DOWNSTREAM RUN ANALYSIS

================================================================================
  END OF GRADUALLY VARIED FLOW ANALYSIS
```

GRADING PLANS FOR:
HARMONY GROVE VILLAGE-PHASE 1

GENERAL GRADING NOTES

1. APPROVAL OF THIS GRADING PLAN DOES NOT CONSTITUTE APPROVAL OF VERTICAL OR HORIZONTAL ALIGNMENT OF ANY PRIVATE ROAD SHOWN HEREON FOR COUNTY ROAD PURPOSES.
2. FINAL APPROVAL OF THESE GRADING PLANS SUBJECT TO FINAL APPROVAL OF THE ASSOCIATED IMPROVEMENT PLANS WHERE APPLICABLE. FINAL CURB ELEVATIONS MAY REQUIRE CHANGES IN THESE PLANS.
3. IMPORT MATERIAL SHALL BE OBTAINED FROM A LEGAL SITE.
4. A CONSTRUCTION, EXCAVATION OR ENCROACHMENT PERMIT FROM THE DEPARTMENT OF PUBLIC WORKS WILL BE REQUIRED FOR ANY WORK IN THE COUNTY RIGHT-OF-WAY.
5. ALL SLOPES OVER THREE FEET IN HEIGHT WILL BE PLANTED IN ACCORDANCE WITH SAN DIEGO COUNTY SPECIFICATIONS.
6. THE CONTRACTOR SHALL VERIFY THE EXISTENCE AND LOCATION OF ALL UTILITIES BEFORE COMMENCING WORK. NOTICE OF PROPOSED WORK SHALL BE GIVEN TO THE FOLLOWING AGENCIES:

UNDERGROUND SERVICE ALERT:	TELEPHONE NO.1-800-422-4133
SAN DIEGO GAS & ELECTRIC:	TELEPHONE NO.1-800-227-2600
PACIFIC TELEPHONE:	TELEPHONE NO:(619)266-4683
COX CATV:	TELEPHONE NO:(619) 263-5793 EXT. 5198
SEWER:	COUNTY OF SAN DIEGO-HHSA
RINCON DEL DIABLO MUNICIPAL WATER DISTRICT:	TELEPHONE NO:(760)745-5522

7. A SOILS REPORT MAY BE REQUIRED PRIOR TO THE ISSUANCE OF A BUILDING PERMIT.
8. APPROVAL OF THESE PLANS BY THE DIRECTOR OF PUBLIC WORKS DOES NOT AUTHORIZE ANY WORK OR GRADING TO BE PERFORMED UNTIL THE PROPERTY OWNER'S PERMISSION HAS BEEN OBTAINED AND VALID GRADING PERMIT HAS BEEN ISSUED.
9. THE DIRECTOR OF PUBLIC WORKS' APPROVAL OF THESE PLANS DOES NOT CONSTITUTE COUNTY BUILDING OFFICIAL APPROVAL OF ANY FOUNDATION FOR STRUCTURES TO BE PLACED ON THE ITEMS COVERED BY THESE PLANS. NO WAIVER OF THE GRADING ORDINANCE REQUIREMENTS CONCERNING MINIMUM COVER EXPANSIVE SOIL IS MADE OR IMPLIED (SECTIONS 87.403 & 87.410). ANY SUCH WAIVER MUST BE OBTAINED FROM THE DIRECTOR OF PLANNING AND LAND USE.
10. ALL OPERATIONS CONDUCTED ON THE PREMISES, INCLUDING THE WARMING UP, REPAIR, ARRIVAL, DEPARTURE OR RUNNING OF TRUCKS, EARTHMOVING EQUIPMENT AND ANY OTHER ASSOCIATED GRADING EQUIPMENT SHALL BE LIMITED TO THE PERIOD BETWEEN 7:00 AM AND 6:00 PM EACH DAY. MONDAY THRU SATURDAY, AND NO EARTHMOVING OR GRADING OPERATIONS SHALL BE CONDUCTED ON THE PREMISES ON SUNDAYS OR HOLIDAYS.
11. ALL MAJOR SLOPES SHALL BE ROUNDED INTO EXISTING TERRAIN TO PRODUCE A CONTOURED TRANSITION FROM CUT OR FILL FACES TO NATURAL GROUND AND ABUTTING CUT OR FILL SURFACES.
12. NOTWITHSTANDING THE MINIMUM STANDARDS SET FORTH IN THE GRADING ORDINANCE AND NOTWITHSTANDING THE APPROVAL OF THESE GRADING PLANS, THE PERMITTEE IS RESPONIBLE FOR THE PREVENTION OF DAMAGE TO ADJACENT PROPERTY. NO PERSON SHALL EXCAVATE ON LAND SO CLOSE TO THE PROPERTY LINE AS TO ENDANGER ANY ADJOINING PUBLIC STREET, SIDEWALK ALLEY, FUNCTION OF ANY SEWAGE DISPOSAL SYSTEM, OR ANY OTHER PUBLIC OR PRIVATE PROPERTY WITHOUT SUPPORTING AND PROTECTING SUCH PROPERTY FROM SETTLING, CRACKING, EROSION SILTING, SCOUR OR OTHER DAMAGE WHICH MIGHT RESULT FROM THE GRADING DESCRIBED ON THIS PLAN. THE COUNTY WILL HOLD THE PERMITTEE RESPONSIBLE FOR CORRECTION OF NON-DEPICTED IMPROVEMENTS WHICH DAMAGE ADJACENT PROPERTY.
13. MAXIMUM SLOPE RATIOS:
    CUT-1.5:1 FOR MINOR SLOPES UNDER 15' HIGH OR IN ROCK 2:1 FOR MAJOR SLOPES. CUT SLOPES MAY BE 1:1 OR STEEPER IN ROCK WITH THE APPROVAL OF THE GEOTECHNICAL ENGINEER.
    FILL-2:1
    EXCAVATION: 2,920,000
    FILL: 2,920,000
    WASTE/IMPORT: 0

    (NOTE: A SEPARATE VALID PERMIT MUST EXIST FOR EITHER WASTE OR IMPORT AREAS.)

    NOTE: EARTHWORK QUANTITIES DO NOT REFLECT ANY SPECIAL CONDITIONS THAT MAY BE SPECIFIED IN THE PRELIMINARY SOILS REPORT AND ARE FOR REFERENCE ONLY. SINCE THE ENGINEER CANNOT CONTROL THE EXACT METHOD OR MEANS USED BY THE CONTRACTOR DURING GRADING OPERATIONS, NOR CAN THE ENGINEER GUARANTEE THE EXACT SOILS CONDITION OVER THE ENTIRE SITE. THE ENGINEER ASSUMES NO RESPONSIBILITY FOR FINAL EARTHWORK QUANTITIES. THE CONTRACTOR SHALL BE RESPONSIBLE FOR DETERMINING HIS OWN EARTHWORK QUANTITIES FOR BIDDING, CONTRACT AND CONSTRUCTION PURPOSES.
14. SPECIAL CONDITION: IF ANY ARCHAEOLOGICAL RESOURCES ARE DISCOVERED ON THE SITE OF THIS GRADING DURING GRADING OPERATIONS, THE PERMITTEE WILL NOTIFY THE PROJECT ARCHEOLOGIST OF THE DISCOVERY.
15. ALL GRADING DETAILS WILL BE IN ACCORDANCE WITH SAN DIEGO COUNTY STANDARD DRAWINGS DS-8, DS-10, DS-11 AND D-75
16. THE CONSTRUCTION OF ONE PCC STANDARD RESIDENTIAL DRIVEWAY PER LOT, LOCATION TO BE DETERMINED IN THE FIELD BY THE ENGINEER OF WORK. PCC SURFACING OF DRIVEWAY TO EXTEND FROM CURB TO PROPERTY LINE. USE STANDARD DRAWINGS G-14A, G-14B, G-14C, G-15 AND G-16
17. FINISHED GRADING SHALL BE CERTIFIED BY A REGISTERED CIVIL ENGINEER AND INSPECTED BY THE COUNTY ENGINEER FOR DRAINAGE CLEARANCE. (APPROVAL OF ROUGH GRADING DOES NOT CERTIFY FINISH BECAUSE OF POTENTIAL SURFACE DRAINAGE PROBLEMS THAT MAY BE CREATED BY LANDSCAPING ACCOMPLISHED AFTER ROUGH GRADING CERTIFICATION.
18. FINAL ACCEPTANCE OF THE TO-BE PUBLICLY MAINTAINED STORM DRAIN LINES WILL BE SUBJECT TO INTERNAL CLOSED CIRCUIT TELEVISION (CCTV) INSPECTION BY A CCTV CONTRACTOR. THE PERMITEE/CONTRACTOR WILL BE RESPONSIBLE TO SCHEDULE AND PAY FOR THE COSTS OF INSPECTION. ONCE CCTV INSPECTION IS COMPLETED, IT SHALL BE SUBMITTED TO THE DPW INSPECTOR FOR REVIEW AND FINAL APPROVAL. CCTV INSPECTION SHALL MEET THE REQUIREMENTS SET FORTH IN DLI-LD-H
19. THE ACTIVE DISTURBED AREA OF A PROJECT SITE SHALL BE NO MORE THAN 50 ACRES FOR AN INDIVIDUAL GRADING PERMIT/IMPROVEMENT PLAN OR COMBINATION OF GRADING PERMITS UNDER ASSOCIATED TENTATIVE OR FINAL MAPS, UNLESS OTHERWISE APPROVED BY THE COUNTY OFFICIAL. 125% OF THE REQUIRED STORMWATER BMP MATERIALS SHALL BE MAINTAINED ON SITE TO PROTECT DISTURBED SOILS.
    REQUIREMENTS FOR EXCEPTION TO FIFTY (50) ACRE ACTIVE SOIL DISTURBANCE LIMITATIONS IS SET FORTH IN THE DIRECTOR'S LETTER OF DIRECTION (DLI-LD-1, PAGE 2) AND COUNTY CODE SECTION 87.414.d.

ENGINEER'S NOTE

1. UNAUTHORIZED CHANGES & USES: THE ENGINEER OF WORK PREPARING THESE PLANS WILL NOT BE RESPONSIBLE FOR, OR LIABLE FOR, UNAUTHORIZED CHANGES TO OR USES OF THESE PLANS. ALL CHANGES TO THE PLANS MUST BE IN WRITING AND MUST BE APPROVED BY THE PREPARER OF THESE PLANS.
2. GRADING TOLERANCES:
   PADS: 0.1'
   STREETS: 0.2'
   CHANNEL: 0.1'
   SHEET GRADED PADS: 0.2'
   CUT & FILL SLOPES: 0.5'

APN'S

235-010-16, 235-010-17, 235-010-21, 235-011-01, 235-031-05, 235-031-10, 235-031-11, 235-031-14, 235-031-35, 235-031-36, 235-031-37

REGISTERED PROFESSIONAL ENGINEER TIMOTHY J. MURPHY NO. 35171 CIVIL STATE OF CALIFORNIA

RICK ENGINEERING COMPANY San Diego
5620 FRIARS ROAD
SAN DIEGO, CA 92110
619.291.0707
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rickengineering.com
Riverside - Orange - San Luis Obispo - Bakersfield - Sacramento - Phoenix - Tucson

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30-AUG-2012 08:29

SPECIAL NOTES

1. NEITHER THE OWNER NOR THE ENGINEER OF WORK WILL ENFORCE SAFETY MEASURES OR REGULATIONS. THE CONTRACTOR SHALL DESIGN, CONSTRUCT AND MAINTAIN ALL SAFETY DEVICES, INCLUDING SHORING, AND SHALL BE SOLELY RESPONSIBLE FOR CONFORMING TO ALL LOCAL, STATE AND FEDERAL SAFETY AND HEALTH STANDARDS, LAWS AND REGULATIONS.
2. THE EXISTING UTILITIES OR STRUCTURES REPORTED BY THE OWNER OR OTHERS, AND THOSE SHOWN ON THE RECORDS EXAMINED, ARE INDICATED WITH THEIR APPROXIMATE LOCATION. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO NOTIFY THE OWNERS OF THE UTILITIES PRIOR TO STARTING WORK, AND UNCOVER AND LOCATE ALL UNDERGROUND UTILITIES AND INSTALLATIONS, WHETHER SHOWN ON THESE PLANS OR NOT, AND TO PROTECT SUCH FACILITIES FROM DAMAGE.
3. THE CONTRACTOR SHALL BE RESPONSIBLE THAT ALL SLOPES, PAD SIZES, STREETS, UTILITIES, AND STORM DRAINS ARE BUILT IN ACCORDANCE WITH THESE PLANS. IF THERE IS ANY MISUNDERSTANDING REGARDING THESE PLANS OR FIELD STAKES, THE CONTRACTOR SHALL REQUEST AN INTERPRETATION BEFORE DOING ANY WORK BY CALLING THE "ENGINEER OF WORK" AT 291-0707. THE CONTRACTOR SHALL ALSO PROTECT FACILITIES HE CONSTRUCTS FROM EROSIVE ACTION OF WATER BY WHATEVER MEANS NECESSARY, (SANDBAGS, DIKES, SHORING, ETC.), UNTIL SUCH TIME AS THE TOTAL PROJECT IS COMPLETED AND ACCEPTED FOR MAINTENANCE BY THE RESPECTIVE GOVERNMENT AGENCY INVOLVED.
4. ALL SIGNS TO BE ALUMINUM WITH 3 FEET HIGH INTENSITY TYPE REFLECTIVE FACE OR EQUIVALENT.
5. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ALL NEW STRIPING, THE SANDBLASTING OF REDUNDANT STRIPING AND THE REPLACEMENT OF ANY STRIPING, PAVEMENT MARKERS, OR LEGENDS OBLITERATED BY NEW PAVEMENT.

SOILS ENGINEER'S CERTIFICATE

THIS PLAN HAS BEEN REVIEWED BY GEOCON INCORPORATED AND APPEARS TO BE IN GENERAL CONFORMANCE WITH THE INTENTIONS OF THE SPECIFIC SOIL RELATED SPECIFICATIONS AND RECOMMENDATIONS WHICH CAN BE VERIFIED ON THE PLAN, AND WHICH ARE FOUND IN THE REPORTS TITLED "UPDATE GEOTECHNICAL INVESTIGATION AND CHANGE OF GEOTECHNICAL ENGINEER OF RECORD, HARMONY GROVE VILLAGE, UNITS 1 TROUGH 11, SAN DIEGO COUNTY,CALIFORNIA" AND "GEOLOGIC RECONNAISSANCE HARMONY GROVE VILLAGE OFF-SITE IMPROVEMENTS FOR HARMONY GROVE ROAD (STATION 34+70 THROUGH 53+54) SAN DIEGO COUNTY, CALIFORNIA"

BY: *Troy K. Reist* DATE: 8/30/12
TROY K. REIST CEG NO. 2408

BY: *Trev Myers* DATE: 8/30/12
TREVOR MYERS RCE NO. 63773

PROFESSIONAL GEOLOGIST TROY K. REIST CERTIFIED ENGINEERING GEOLOGIST STATE OF CALIFORNIA

REGISTERED PROFESSIONAL ENGINEER TREVOR E. MYERS No. RCE63773 Exp. 6/30/14 CIVIL STATE OF CALIFORNIA

SOLAR CERTIFICATE

THIS IS A SOLAR SUBDIVISION AS REQUIRED BY SECTION 81.401 (n), OF THE SUBDIVISION ORDINANCE. ALL LOTS HAVE AT LEAST 100 SQ. FT. OF UNOBSTRUCTED ACCESS TO SUNLIGHT ON THE BUILDABLE PORTION OF THE LOT.

BY: *[signature]* DATE: 10/24/12
TIMOTHY J. MURPHY R.C.E. 35171

DECLARATION OF RESPONSIBLE CHARGE

I HEREBY DECLARE THAT I AM THE ENGINEER OF WORK FOR THIS PROJECT, THAT I HAVE EXERCISED RESPONSIBLE CHARGE OVER THE DESIGN OF THE PROJECT AS DEFINED IN SECTION 6703 OF THE BUSINESS AND PROFESSIONS CODE, AND THAT THE DESIGN IS CONSISTENT WITH CURRENT STANDARDS.

I UNDERSTAND THAT THE CHECK OF PROJECT DRAWINGS AND SPECIFICATIONS BY THE COUNTY OF SAN DIEGO IS CONFINED TO A REVIEW ONLY AND DOES NOT RELIEVE ME, AS ENGINEER OF WORK, OF MY RESPONSIBILITIES FOR PROJECT DESIGN.

TIMOTHY J. MURPHY
5620 FRIARS ROAD
SAN DIEGO, CA 92110
PHONE: 619/291-0707

BY: *[signature]* DATE: 8/30/12
TIMOTHY J. MURPHY R.C.E. 035171

ARCHAEOLOGICAL MONITORING NOTES (VTM COA 17.L.2)

1) THE COUNTY CERTIFIED ARCHAEOLOGIST/HISTORIAN AND NATIVE AMERICAN MONITOR SHALL ATTEND THE PRE-CONSTRUCTION MEETING WITH THE CONTRACTORS TO EXPLAIN AND COORDINATE THE REQUIREMENTS OF THE MONITORING PROGRAM.

2) THE CONSULTING ARCHAEOLOGIST SHALL MONITOR ALL AREAS IDENTIFIED FOR DEVELOPMENT.

3) DURING THE ORIGINAL CUTTING OF PREVIOUSLY UNDISTURBED DEPOSITS, THE ARCHAEOLOGICAL MONITOR(S) AND NATIVE AMERICAN MONITOR(S) SHALL BE ON-SITE FULL-TIME TO PERFORM INSPECTIONS OF THE EXCAVATIONS. INSPECTIONS WILL VARY BASED ON THE RATE OF EXCAVATION, THE MATERIALS EXCAVATED, AND THE PRESENCE AND ABUNDANCE OF ARTIFACTS AND FEATURES. THE FREQUENCY AND LOCATION OF INSPECTIONS WILL BE DETERMINED BY THE PRINCIPAL INVESTIGATOR IN CONSULTATION WITH THE NATIVE AMERICAN MONITOR.

ARCHAEOLOGICAL MONITORING NOTES (CON'T)

4) MONITORING OF PREVIOUSLY DISTURBED AREAS, GRADED AREAS, OR AREAS THAT CONTAIN NON-CULTURAL AND GEOLOGICALLY STERILE MATERIAL, SHALL BE MONITORED AT THE DISCRETION OF THE PRINCIPAL INVESTIGATOR AS DICTATED BY THE POTENTIAL, OR ABSENCE OF POTENTIAL, TO ENCOUNTER CULTURAL MATERIALS.

5) IN THE EVENT THAT PREVIOUSLY UNIDENTIFIED POTENTIALLY SIGNIFICANT CULTURAL RESOURCES ARE DISCOVERED, THE ARCHAEOLOGICAL MONITOR(S) SHALL HAVE THE AUTHORITY TO DIVERT OR TEMPORARILY HALT GROUND DISTURBANCE OPERATION IN THE AREA OF DISCOVERY TO ALLOW EVALUATION OF POTENTIALLY SIGNIFICANT CULTURAL RESOURCES. THE PRINCIPLE INVESTIGATOR SHALL CONTACT THE COUNTY ARCHAEOLOGIST AT THE TIME OF DISCOVERY. THE PRINCIPAL INVESTIGATOR, IN CONSULTATION WITH COUNTY STAFF ARCHAEOLOGIST, SHALL DETERMINE THE SIGNIFICANCE OF THE DISCOVERED RESOURCES. THE COUNTY ARCHAEOLOGIST MUST CONCUR WITH THE EVALUATION BEFORE CONSTRUCTION ACTIVITIES WILL BE ALLOWED TO RESUME IN THE AFFECTED AREA. FOR SIGNIFICANT CULTURAL RESOURCES, A RESEARCH DESIGN AND DATA RECOVERY PROGRAM TO MITIGATE IMPACTS SHALL BE PREPARED BY THE CONSULTING ARCHAEOLOGIST AND APPROVED BY THE COUNTY ARCHAEOLOGIST, THEN CARRIED OUT USING PROFESSIONAL ARCHAEOLOGICAL METHODS.

6) IF ANY HUMAN BONES ARE DISCOVERED, THE PRINCIPAL INVESTIGATOR SHALL CONTACT THE COUNTY CORONER. IN THE EVENT THAT THE REMAINS ARE DETERMINED TO BE OF NATIVE AMERICAN ORIGIN, THE MOST LIKELY DESCENDANT, AS IDENTIFIED BY THE NATIVE AMERICAN HERITAGE COMMISSION, SHALL BE CONTACTED IN ORDER TO DETERMINE PROPER TREATMENT AND DISPOSITION OF THE REMAINS.

7) PRIOR TO ROUGH GRADING INSPECTION SIGN-OFF, PROVIDE EVIDENCE THAT THE FIELD GRADING MONITORING ACTIVITIES HAVE BEEN COMPLETED TO THE SATISFACTION OF THE DIRECTOR OF PLANNING AND LAND USE. EVIDENCE SHALL BE IN THE FORM OF A LETTER FROM THE PROJECT ARCHAEOLOGIST.

8) PRIOR TO FINAL GRADING RELEASE, SUBMIT TO THE SATISFACTION OF THE DIRECTOR OF PLANNING AND LAND USE, A FINAL REPORT THAT DOCUMENTS THE RESULTS, ANALYSIS, AND CONCLUSIONS OF ALL PHASES OF THE ARCHAEOLOGICAL MONITORING PROGRAM. THE REPORT SHALL ALSO INCLUDE THE FOLLOWING:

A) DEPARTMENT OF PARKS AND RECREATION PRIMARY AND ARCHAEOLOGICAL SITE FORMS.

B) EVIDENCE THAT ALL CULTURAL COLLECTED DURING THE GRADING MONITORING PROGRAM HAS BEEN CURATED AT A SAN DIEGO FACILITY THAT MEETS FEDERAL STANDARDS PER 36 CFR PART 79, AND THEREFORE WOULD BE PROFESSIONALLY CURATED AND MADE AVAILABLE TO OTHER ARCHAEOLOGISTS/RESEARCHERS FOR FURTHER STUDY. THE COLLECTIONS AND ASSOCIATED RECORDS SHALL BE TRANSFERRED, INCLUDING TITLE, TO AN APPROPRIATE CURATION FACILITY WITHIN SAN DIEGO COUNTY, TO BE ACCOMPANIED BY PAYMENT OF THE FEES NECESSARY FOR PERMANENT CURATION. EVIDENCE SHALL BE IN THE FORM OF A LETTER FROM THE CURATION FACILITY IDENTIFYING THAT ARCHAEOLOGICAL MATERIALS HAVE BEEN RECEIVED AND THAT ALL FEES HAVE BEEN PAID.

IN THE EVENT THAT NO CULTURAL RESOURCES ARE DISCOVERED, A BRIEF LETTER TO THAT EFFECT SHALL BE SENT TO THE DIRECTOR OF PLANNING AND LAND USE BY THE CONSULTING ARCHAEOLOGIST THAT THE GRADING MONITORING ACTIVITIES HAVE BEEN COMPLETED.

OR

ENTER INTO A SECURED AGREEMENT WITH THE COUNTY OF SAN DIEGO, DEPARTMENT OF PLANNING AND LAND USE, SECURED BY A LETTER OF CREDIT, BOND, OR CASH FOR 150 PERCENT OF THE ESTIMATED COSTS ASSOCIATED WITH THE PREPARATION OF THE FINAL REPORT THAT DOCUMENTS THE RESULTS, ANALYSIS, AND CONCLUSIONS OF ALL PHASES OF THE ARCHAEOLOGICAL MONITORING PROGRAM, AND A 10 PERCENT CASH DEPOSIT NOT TO EXCEED $30,000. A COST ESTIMATE SHALL BE SUBMITTED AND APPROVED BY THE DIRECTOR OF PLANNING AND LAND USE FOR THE COST OF PREPARING THE FINAL GRADING MONITORING THAT INCLUDES ARTIFACT ANALYSIS, AND SPECIALIZED STUDIES SUCH AS LITHICS ANALYSIS, CERAMICS ANALYSIS, FAUNAL ANALYSIS, FLORAL ANALYSIS, ASSEMBLAGE ANALYSIS, RADIOCARBON DATING, AND CURATION AS DETERMINED BY THE PROJECT ARCHAEOLOGIST IN CONSULTATION WITH COUNTY STAFF ARCHAEOLOGIST. (CR-M)

SAN DIEGO GAS & ELECTRIC CO.

FOR PERMISSION TO GRADE WITHIN ALL EXISTING SDG&E DISTRIBUTION EASEMENTS WITHIN THE WORK LIMITS OF THIS PLAN SET (SPECIFICALY EXCLUDING THE 150' AND 50' WIDE TRANSMISSION EASEMENTS) UNLESS OTHERWISE NOTED.

REVIEWED BY: *Jeff Sykes* 9/20/2012
JEFF SYKES DATE
LAND SERVICES SUPERVISOR

OWNER/PERMITEE

BY: *[signature]* DATE: 10/24/12
PETER J. KIESECKER, SENIOR VICE PRESIDENT

STANDARD PACIFIC CORP.
15360 BARRANCA PARKWAY
IRVINE, CA 92618
PHONE: (949) 789-1600
FAX: (949) 789-1609

OWNER'S CERTIFICATE

IT IS AGREED THAT FIELD CONDITIONS MAY REQUIRE CHANGES TO THESE PLANS.

IT IS FURTHER AGREED THAT THE OWNER (DEVELOPER) SHALL HAVE A REGISTERED CIVIL ENGINEER MAKE SUCH CHANGES, ALTERATIONS OR ADDITIONS TO THESE PLANS WHICH THE DIRECTOR OF PUBLIC WORKS DETERMINES ARE NECESSARY AND DESIRABLE FOR THE PROPER COMPLETIONS OF THE IMPROVEMENTS.

I HEREBY AGREE TO COMMENCE WORK ON ANY IMPROVEMENTS SHOWN ON THESE PLANS WITHIN EXISTING COUNTY RIGHT-OF-WAY WITHIN 60 DAYS AFTER ISSUANCE OF THE CONSTRUCTION PERMIT AND TO PURSUE SUCH WORK ACTIVELY ON EVERY NORMAL WORKING DAY UNTIL COMPLETED. IRRESPECTIVE AND INDEPENDENT OF ANY OTHER WORK ASSOCIATED WITH THIS PROJECT OR UNDER MY CONTROL.

ASSESSOR'S PARCEL NO. SEE BELOW

BY: *[signature]* DATE: 10/24/12
PETER J. KIESECKER, SENIOR VICE PRESIDENT

STANDARD PACIFIC CORP.
15360 BARRANCA PARKWAY
IRVINE, CA 92618
PHONE: (949) 789-1600
FAX: (949) 789-1609

SITE ADDRESS

N/A

PURPOSE OF IMPROVEMENTS

TO MAKE IMPROVEMENTS IN ACCORDANCE WITH THE CONDITIONS OF TM-4365 IN THE COUNTY OF SAN DIEGO, CALIFORNIA

LEGAL DESCRIPTION

BEING A PORTION OF SECTION 30, A PORTION OF THE SOUTHEAST QUARTER OF SECTION 24, AND A PORTION OF THE SOUTHWEST QUARTER OF SECTION 19, ALL IN TOWNSHIP 12 SOUTH, RANGE 2 WEST, SAN BERNARDINO MERIDIAN, IN THE COUNTY OF SAN DIEGO, STATE OF CALIFORNIA, ACCORDING TO THE UNITED STATES GOVERNMENT SURVEY THEREOF.

DIGALERT 811
CALL 811 BEFORE YOU DIG

WORK TO BE DONE

GRADING AND DRAINAGE WORK CONSIST OF THE FOLLOWING WORK TO BE DONE ACCORDING TO THESE PLANS, THE CURRENT SAN DIEGO AREA REGIONAL STANDARD DRAWINGS. THE SPECIFICATIONS FOR PUBLIC WORK CONSTRUCTION AND THE SAN DIEGO COUNTY GRADING ORDINANCE AND CALTRANS STANDARD PLANS.

STANDARD SPECIFICATIONS:

1. STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION, 2012 EDITION (GREENBOOK) AND SUPPLEMENTS.

STANDARD DRAWINGS:

1. SAN DIEGO REGIONAL STANDARD DRAWINGS (2006).

LEGEND

LEGEND	STANDARD DWGS.	SYMBOL
PROPERTY BOUNDARY		
EXISTING LOT LINE		
EXISTING EASEMENT		
EXISTING STORM DRAIN		
EXISTING MANHOLE/CLEANOUT		S
EXISTING SEWER		S
EXISTING WATER MAIN		W
EXISTING FIRE HYDRANT		
EXISTING GATE VALVES		
EXISTING ELECTRIC		E
EXISTING CURB		
EXISTING 5' CONTOUR		650
EXISTING ELEVATION		X 650.0
EXISTING POWER POLE		
EXISTING OVERHEAD LINES		OHE
EXISTING SIGN		
EXISTING WATER WELLS		
EXISTING 100YR FLOODPLAIN		
EXISTING 100YR FLOODWAY		
PROPOSED 100YR FLOODPLAIN		
PROPOSED 100YR FLOODWAY		
LOT LINE		
UNIT BOUNDARY		
PROPOSED EASEMENT		
CONTOUR		650
SPOT ELEVATION		FG 650.0
CUT SLOPE	(2:1 OR AS OTHERWISE SHOWN)	
FILL SLOPE	(2:1 OR AS OTHERWISE SHOWN)	
DAYLIGHT LINE		F C
BROW DITCH	SEE DETAIL SHT. 2	
TRAIL DITCH	SEE DETAIL SHT. 6	
BLADED SWALE	SEE DETAIL SHT. 2	
LIMIT OF SLOPE TRANSITION		
TRM (MACMAT N10)	SEE DETAIL SHTS. 5 & 125	
TRM (MACMAT N20)	SEE DETAIL SHTS. 5 & 125	
FINISH GRADE		X 573.85
FLOW LINE		FL 573.85
LOT NUMBER		610
PAD ELEVATION		601.9
SUBDRAIN	SEE DETAIL SHT. 6	
OPEN SPACE EASEMENT FENCE	SEE DETAIL SHT. 2	
ORANGE CONSTRUCTION FENCE		
STORM DRAIN	D-60	
TYPE A CLEANOUT	SDRSD D-9,D-11	
CURB INLET A, B, B-1, B-2	SDRSD D-1, D-2, D-11, D-12, D-45	
TYPE "F" CATCH BASIN	SDRSD D-7, D-11	
CDS UNIT	SEE SHT. 122	
WING TYPE HEADWALL	SDRSD D-34	
RIP RAP ENERGY DISSIPATOR	SDRSD D-40 (SPECS PER PLAN)	
STORM DRAIN RISER	SEE SHT. 6	
CONCRETE LUG	SDRSD D-63	
CONCRETE CUT-OFF WALLS	SDRSD S-10	
MASONRY RETAINING WALL	SDRSD C-1, C-4 (TYPE PER PLAN)	
CHAIN LINK FENCE	SDRSD M-6	

CONTRACTOR'S NOTE

CONSTRUCTION CONTRACTOR AGREES THAT IN ACCORDANCE WITH GENERALLY ACCEPTED CONSTRUCTION PRACTICES, CONSTRUCTION CONTRACTOR WILL BE REQUIRED TO ASSUME SOLE AND COMPLETE RESPONSIBILITY FOR JOB SITE CONDITIONS DURING THE COURSE OF CONSTRUCTION OF THE PROJECT, INCLUDING SAFETY OF ALL PERSONS AND PROPERTY; THAT THIS REQUIREMENT SHALL BE MADE TO APPLY CONTINUOUSLY AND NOT BE LIMITED TO NORMAL WORKING HOURS, AND CONSTRUCTION CONTRACTOR FURTHER AGREES TO DEFEND, INDEMNIFY AND HOLD COUNTY OF SAN DIEGO HARMLESS FROM ANY LIABILITY, REAL OR ALLEGED, IN CONNECTION WITH THE PERFORMANCE OF WORK ON THIS PROJECT, EXCEPTING LIABILITY ARISING FROM THE SOLE NEGLIGENCE OF COUNTY OF SAN DIEGO PROFESSIONALS.

SHEET INDEX

ABBREVIATIONS

APN	ASSESSOR'S PARCEL NUMBER
BVC	BEGIN VERTICAL CURVE
C.B.	CATCH BASIN
CL	CENTERLINE
C.O.	CLEANOUT
DWY	DRIVEWAY
EC	END OF CURVE
EVC	END VERTICAL CURVE
EX.	EXISTING
FG	FINISHED GRADE
FL	FLOW LINE
HP	HIGH POINT
LP	LOW POINT
LT	LEFT
MAX	MAXIMUM
M.H.	MANHOLE
MIN	MINUMUM
MOD.	MODIFIED
OS	OPEN SPACE
POA	PRIVATE OWNERS ASSOCIATION
P/L	PROPERTY LINE
PVC	POLYVINYL CHLORIDE
R	RADIUS
RCP	REINFORCED CONCRETE PIPE
RSD	REGIONAL STANDARD DRAWING
RT	RIGHT
R/W	RIGHT OF WAY
SD	STORM DRAIN
SDCDS	SAN DIEGO COUNTY DESIGN STANDARDS
SDRSD	SAN DIEGO REGIONAL STANDARD DRAWINGS
TC	TOP OF CURB
TEMP.	TEMPORARY
VC	VERTICAL CURVE
W/	WITH

J - 16412

DISTURBED AREA CALCS

SLOPES:	76 AC
PADS:	93 AC
ROADS:	52 AC
OTHER:	11 AC
TOTAL:	232 AC

STORMWATER TREATMENT CONTROL AND LID BMP 'S

DESCRIPTION / TYPE	SHEET	MAINT. CATEGORY	REVISIONS
1000A CDS UNIT	36	CAT. 4	
1000B CDS UNIT	36	CAT. 4	
2000A CDS UNIT	40	CAT. 4	
2000B CDS UNIT	40	CAT. 4	
3000 CDS UNIT	39	CAT. 4	
3000A CDS UNIT	44	CAT. 4	
4000A CDS UNIT	44	CAT. 4	
4000B CDS UNIT	49	CAT. 4	
5000A CDS UNIT	49	CAT. 4	
5000B CDS UNIT	49	CAT. 4	
6000A CDS UNIT	49	CAT. 4	

* BMP's APPROVED AS PART OF STORM WATER MANAGEMENT PLAN (SWMP) DATED / / ON FILE WITH DPW. ANY CHANGES TO THE ABOVE BMP's WILL REQUIRE SWMP REVISION AND PLAN CHANGE APPROVAL.

STORMWATER TREATMENT CONTROL AND LID BMP 'S

DESCRIPTION / TYPE	SHEET	MAINT. CATEGORY	REVISIONS
6000B CDS UNIT	43	CAT. 4	
7000 CDS UNIT	14	CAT. 4	
WATER QUALITY BASIN A	25	CAT. 2	
WATER QUALITY BASIN B	25	CAT. 2	
9000A BIOSWALE	27&28	CAT. 2	
EQ1 BIOSWALE	24&25	CAT. 4	
EQ2 BIOSWALE	26	CAT. 4	
9000B WATER QUALITY BASIN	29	CAT. 2	
1700 CLEARWATER BMP FILTRATION SYSTEM	34	CAT. 4	
1700 CLEARWATER BMP FILTRATION SYSTEM	34	CAT. 4	
1800 CLEARWATER BMP FILTRATION SYSTEM	37	CAT. 4	
1800 CLEARWATER BMP FILTRATION SYSTEM	37	CAT. 4	

SAN DIEGO-COUNTY SANITATION DISTRICT HARMONY GROVE SERVICE AREA

REVIEWED BY: DATE:

PLANS SHALL BE VALID TWO YEARS FROM THE DATE APPROVED

RECORD PLAN

BY: ______ DATE: ______
NAME
R.C.E. ______
EXPIRES: ______

SAN DIEGO COUNTY FIRE AUTHORITY

APPROVED BY: ______

DATE: ______

DEPT. OF PLANNING AND LAND USE

APPROVED FOR COMPLIANCE WITH THE ENVIRONMENTAL REVIEW.

APPROVED BY: ______

DATE: ______

COUNTY APPROVED CHANGES

NO.	DESCRIPTION:	APPROVED BY:	DATE:

PERMITS

REZONE PERMIT NO.	N/A
MAJOR USE PERMIT NO.	P04-012
TENTATIVE MAP NO.	5365
LANDSCAPE & IRRIGATION LP #	9360-12-008
NOTICE OF INTENT	WDID#

BENCH MARK

DESCRIPTION: THE BENCH MARK FOR THIS SURVEY IS THE 3.5" USGS STANDARD BRASS DISK STAMPED "GWM 85" 1946" ON WEST END OF NORTH HEADWALL BOX CULVERT, LOCATED ON THE NORTH SIDE OF HARMONY GROVE RD., 300 FEET WEST OF COUNTRY CLUB RD. BENCH MARK DESIGNATION GWM 0085 PER COUNTY OF SAN DIEGO VERTICAL CONTROL.

RECORD FROM: SAN DIEGO COUNTY VERTICAL BENCHMARK CONTROL

ELEVATION: 569.909 DATUM: NGVD 29

PRIVATE CONTRACT

SHEET 1 | COUNTY OF SAN DIEGO DEPARTMENT OF PUBLIC WORKS | 133 SHEETS

GRADING PLANS FOR:

HARMONY GROVE VILLAGE PHASE 1

CALIFORNIA COORDINATE INDEX 334-1785

APPROVED FOR
MOHAMAD K. FAKHRRIDDINE
COUNTY ENGINEER

BY: DATE:

ENGINEER OF WORK *[signature]* DATE 8/30/12

L-15656
GRADING PERMIT NO:

RICK ENGINEERING CO. - (619) 291-0707

STORM DRAIN DATA

NO.	DELTA OR BRG.	RADIUS	LENGTH	REMARKS	SYSTEM/ PROFILE SHT. NO.
1	N65°24'38"W		3.25'	18" RCP (1350-D)	I-16, SHT.69
2	Δ=03°23'44"	998.00'	59.12'	18" RCP (1350-D)	I-17, SHT.69
3	N68°26'15"W		17.71'	48" RCP (1350-D)	I-2, SHT.68
4	N65°18'51"W		41.60'	48" RCP (1350-D)	I-1, SHT.68
5	Δ=04°19'31"	998.00'	75.34'	18" RCP (1350-D)	I-53, SHT.69
6	N68°26'15"W		22.82'	48" RCP (1350-D)	H-1, SHT.65
7	Δ=04°04'37"	560.00'	39.85'	48" RCP (1350-D)	H-1, SHT.65
8	Δ=07°07'05"	560.00'	69.57'	42" RCP (1350-D)	H-2, SHT.65
9	Δ=02°37'43"	560.00'	25.69'	42" RCP (1350-D)	H-89, SHT.65
10	Δ=09°49'07"	560.00'	95.96'	42" RCP (1350-D)	H-3, SHT.65
11	Δ=75°19'24"	50.00'	65.73'	42" RCP (1350-D)**	H-3, SHT.65
12	Δ=00°48'39"	1740.00'	24.62'	42" RCP (1350-D)	H-3, SHT.65
13	Δ=03°20'13"	1740.00'	101.34	42" RCP (1350-D)	H-4, SHT.65
14	N41°51'02"W		35.86'	18" RCP (1350-D)	H-85, SHT.65
15	Δ=02°36'51"	1740.00'	79.39'	42" RCP (1350-D)	H-5, SHT.65
16	Δ=01°52'21"	1740.00'	56.86'	42" RCP (1350-D)	H-6, SHT.65
17	Δ=00°49'15"	1740.00'	24.93'	42" RCP (1350-D)	H-7, SHT.65
18	N71°11'36"E		73.24'	42" RCP (1350-D)	H-7, SHT.65
19	N50°14'52"W		25.50'	18" RCP (1350-D)	L-97, SHT.73
20	N21°31'58"W		13.02'	18" RCP (1350-D)	H-54, SHT.80
21	N22°59'08"W		13.02'	18" RCP (1350-D)	H-55, SHT.80
22	N54°29'37"E		26.25'	18" RCP (1350-D)	H-26, SHT.65
23	N54°29'37"E		6.25'	18" RCP (1350-D)	H-25, SHT.65
24	Δ=05°54'57"	875.00'	90.35'	18" RCP (1350-D)	H-24, SHT.65
25	N18°19'18"E		135.93'	42" RCP (1350-D)	H-32, SHT.66
26	Δ=02°12'41"	2001.00'	77.23'	42" RCP (1350-D)	H-32, SHT.66
27	Δ=01°42'12"	2001.00'	59.49'	42" RCP (1350-D)	H-31, SHT.66
28	N69°24'34"W		3.75'	18" RCP (1350-D)	H-43, SHT.66
29	Δ=07°58'19"	460.00'	64.00'	18" RCP (1350-D)	H-47, SHT.66
30	N41°54'30"E		6.18'	18" RCP (1350-D)	H-49, SHT.66
31	N41°54'30"E		26.32'	18" RCP (1350-D)	H-48, SHT.66
32	N33°28'25"E		5.75'	18" RCP (1350-D)	H-30, SHT.65
33	N33°28'25"E		25.75'	18" RCP (1350-D)	H-29, SHT.65
34	N50°55'06"E		10.25'	18" RCP (1350-D)	L-17, SHT.74
35	N50°55'06"E		22.25'	18" RCP (1350-D)	L-16, SHT.74
36	N39°04'54"W		54.47'	18" RCP (1350-D)	L-15, SHT.74
37	Δ=11°46'27"	660.00'	135.62'	48" RCP (1350-D)	L-7, SHT.73
38	Δ=22°46'23"	660.00'	158.47'	36" RCP (1350-D)	L-8, SHT.73
39	Δ=97°06'26"	45.00'	76.27'	54" RCP (1350-D)**	L-4, SHT.73
40	Δ=03°52'41"	1410.00'	95.43'	54" RCP (1350-D)	L-4, SHT.73
41	Δ=04°27'09"	660.00'	51.29'	36" RCP (1350-D)	L-66, SHT.73
42	N24°41'09"E		89.60'	8'X10' DBL BOX CULVERT	P-9, SHT.83
43	Δ=06°53'09"	415.00'	49.87'	18" RCP (1350-D)	N-10, SHT.79
44	N28°22'00"E		70.34'	18" RCP (1350-D)	N-11, SHT.79
45	Δ=01°42'22"	409.00'	12.18'	18" RCP (1350-D)	N-11, SHT.79
46	N30°04'21"E		85.78'	18" RCP (1350-D)	N-11, SHT.79
47	N39°50'50"E		74.18'	18" RCP (1350-D)	N-12, SHT.80
48	Δ=12°06'58"	200.00'	42.29'	18" RCP (1350-D)*	N-12, SHT.80
49	Δ=04°53'53"	1996.00'	170.63'	18" RCP (1350-D)	N-12, SHT.80
50	Δ=04°23'47"	1996.00	153.15'	18" RCP (1350-D)	N-13, SHT.80
51	N18°19'18"E		98.00'	18" RCP (1350-D)	N-13, SHT.80
52	N32°08'52"E		75.62'	24" RCP (1350-D)	O-12, SHT.82
53	Δ=10°03'21"	1004.00'	176.21'	24" RCP (1350-D)	O-12, SHT.82
54	Δ=02°13'44"	1004.00'	39.06'	24" RCP (1350-D)	O-14, SHT.82
55	N81°08'14"E		13.32'	18" RCP (1350-D)	O-13, SHT.82
56	N21°33'45"E		4.50'	18" RCP (1350-D)	O-20, SHT.82
57	Δ=40°16'48"	290.00'	203.88'	24" RCP (1350-D)*	O-11, SHT.82
58	N85°25'23"E		2.19'	18" RCP (1350-D)	N-60, SHT.80
59	N07°25'11"W		5.52'	18" RCP (1350-D)	N-61, SHT.80
60	N47°14'59"W		377.76'	8'X12' DBL BOX CULVERT	P-5, SHT.83
61	NOT USED				
62	N60°51'20"W		10.50'	18" RCP (1350-D)	I-44, SHT.69
63	NOT USED				
64	N22°12'51"W		21.51'	18" RCP (1350-D)	H-81, SHT.80
65	N22°12'51"W		21.50'	18" RCP (1350-D)	H-82, SHT.80
66	N36°30'41"W		13.00'	18" RCP (1350-D)	H-70, SHT.65
67	N13°25'07"E		36.08'	18" RCP (1350-D)	H-71, SHT.65
68	Δ=03°52'09"	660.00'	48.56'	36" RCP (1350-D)	L-8, SHT.73
69	N34°48'10"W		35.25'	18" RCP (1350-D)	L-48, SHT.74

* PIPE REQUIRES 8' LENGTHS W/ 5° BEVEL ONE END
** PIPE REQUIRES 8' LENGTHS W/ 5° BEVEL BOTH ENDS

NOTE: ALL EXISTING EASEMENTS ARE TO BE VACATED UNLESS OTHERWISE NOTED.

NOTE: ALL EXISTING STRUCTURES ARE TO BE REMOVED UNLESS OTHERWISE NOTED.

J - 16412

SEE SHEET NO. 45

(A) STORM DRAIN TO CULVERT CONNECTION PER SHEET 90, SHEET "A"

(B) 100-YR WATER SURFACE ELEVATION IS 1' BELOW TURF REINFORCEMENT MAT

(C) UNGROUTED RIP RAP TO BE FILLED WITH SOIL.

WINGWALL NOTES

(1) H=9.6'
M=20.7', 23.1'
ELEV. "a"=599.5
ANGLE OF FLARE=34.30°, 42.90°

(2) H=14.6'
M=20.9', 22.1'
ELEV. "a"=598.4
ANGLE OF FLARE=28.22°, 34.19°

(3) H=10.2'
M=20.3', 17.1'
ELEV. "a"=596.1
ANGLE OF FLARE=34.88°, 7.03°

40 20 0 40 80 120

GRAPHIC SCALE 1"= 40'

N

RECORD PLAN

BY: ______ NAME ______ DATE: ______
R.C.E. ______
EXPIRES: ______

REGISTERED PROFESSIONAL ENGINEER
TIMOTHY J. MURPHY
NO. 35171
CIVIL
STATE OF CALIFORNIA

RICK ENGINEERING COMPANY
San Diego
5620 FRIARS ROAD
SAN DIEGO, CA 92110
619.291.0707
(FAX)619.291.4165
rickengineering.com
Riverside - Orange - San Luis Obispo - Bakersfield - Sacramento - Phoenix - Tucson

COUNTY APPROVED CHANGES

NO.	DESCRIPTION:	APPROVED BY:	DATE:

BENCH MARK

DESCRIPTION: THE BENCH MARK FOR THIS SURVEY IS THE 3.5" USGS STANDARD BRASS DISK STAMPED "GWM 85" 1946" ON WEST END OF NORTH HEADWALL BOX CULVERT, LOCATED ON THE NORTH SIDE OF HARMONY GROVE RD., 300 FEET WEST OF COUNTRY CLUB RD. BENCH MARK DESIGNATION GWM 0085 PER COUNTY OF SAN DIEGO VERTICAL CONTROL.

RECORD FROM: SAN DIEGO COUNTY VERTICAL BENCHMARK CONTROL

ELEVATION: 569.909 DATUM: NGVD 29

PRIVATE CONTRACT

SHEET 40 | COUNTY OF SAN DIEGO DEPARTMENT OF PUBLIC WORKS | 133 SHEETS

STORM DRAIN PLAN FOR:

HARMONY GROVE VILLAGE PHASE 1

CALIFORNIA COORDINATE INDEX 334-1785

APPROVED FOR MOHAMAD K. FAKHRRIDDINE COUNTY ENGINEER

BY: DATE:

ENGINEER OF WORK
R.C.E. 35171 DATE 10/24/12

L-15656
GRADING PERMIT NO:

RICK ENGINEERING CO. - (619) 291-0707

h:\16412\civil\Plan_Sets\Grading_Ph1\16412sd_40.dgn
\\srv_rib1\RickStandards\Bentley_2006\workspace\projects\CorpStds_2005_SD\iplot\CorpStds_2005_SD.pen
11-OCT-2012 10:00

SEE SHEET NO. 40

SEE SHEET NO. 44

SEE SHEET NO. 46

SEE SHEET NO. 49

SEE SHEET NO. 50

Nodes 4945 - 4937
(Basin 3 connection to existing system)
See Pipeflow Results in Appendix B and HGL Callouts on Sheet 74.

Nodes 4892 - 4870
(Basin 2 connection to existing system)
See Pipeflow Results in Appendix B and HGL Callouts on Sheet 73.

Nodes 4892 - 4889
(Basin 4 connection to existing system)
See Pipeflow Results in Appendix B and HGL Callouts on Sheet 73.

Nodes 5506 - 5504.3
(Basin 5 connection to existing system)
See Pipeflow Results in Appendix B and HGL Callouts on Sheet 73.

STORM DRAIN DATA

NO.	DELTA OR BRG.	RADIUS	LENGTH	REMARKS	SYSTEM/ PROFILE SHT. NO.
1	N83°34'52"W		29.04'	60" RCP (1350-D)	L-3, SHT. 73
2	Δ=06°25'08"	200.00'	22.41'	60" RCP (1350-D) *	L-3, SHT. 73
3	N90°00'00"E		90.41'	60" RCP (1350-D)	L-3, SHT. 73
4	Δ=85°21'22"	45.00'	69.39'	60" RCP (1350-D) ***	L-3, SHT. 73
5	Δ=00°39'02"	407.50'	4.63'	60" RCP (1350-D)	L-3, SHT. 73
6	Δ=05°17'54"	407.50'	37.68'	54" RCP (1350-D) *	L-4, SHT. 73
7	N00°00'00"W		199.00'	18" RCP (2000-D)	N-8, SHT. 79
8	N00°00'00"W		41.29'	18" RCP (1350-D)	N-9, SHT. 79
9	Δ=05°09'51"	415.00'	37.41'	18" RCP (1350-D)	N-9, SHT. 79
10	Δ=05°27'12"	415.00'	39.50'	18" RCP (1350-D)	N-10, SHT. 79
11	N06°02'53"E		39.75'	18" RCP (1350-D)	L-30, SHT. 74
12	N00°00'00"W		3.75'	18" RCP (1350-D)	L-29, SHT. 74
13	N00°00'00"W		30.75'	18" RCP (1350-D)	L-28, SHT. 74
14	N7°51'22"W		9.97'	18" RCP (1350-D)	L-24, SHT. 74
15	N87°25'29"W		22.84'	18" RCP (1350-D)	L-25, SHT. 74
16	N64°46'11"E		16.38'	18" RCP (1350-D)	L-26, SHT. 74
17	N59°10'30"W		19.64'	18" RCP (1350-D)	L-27, SHT. 74
18	Δ=04°51'33"	1410.00'	119.58'	48" RCP (1350-D)	L-5, SHT. 73
19	N65°50'17"W		97.66'	48" RCP (1350-D)	L-5, SHT. 73
20	N65°50'17"W		13.57'	48" RCP (1350-D)	L-6, SHT. 73
21	Δ=04°51'33"	44.00'	65.74'	48" RCP (1350-D) ***	L-6, SHT. 73
22	Δ=08°12'03"	660.00'	94.47'	48" RCP (1350-D)	L-7, SHT. 73
23	Δ=01°20'26"	660.00'	15.44'	48" RCP (1350-D)	L-6, SHT. 73
24	N90°00'00"E		34.75'	18" RCP (1350-D)	L-18, SHT. 73
25	N45°43'27"W		34.50'	18" RCP (1350-D)	M-33, SHT. 78
26	N76°05'23"E		127.2'	24" RCP (1350-D)	M-8, SHT. 78
27	Δ=66°04'00"	45.00'	51.89'	24" RCP (1350-D) ***	M-8, SHT. 78
28	N90°00'00"E		33.50'	18" RCP (1350-D)	C-30, SHT. 59
29	N30°12'36"E		15.24'	18" RCP (1350-D)	M-87, SHT. 78
30	NOT USED				
31	N00°00'00"E		162.00'	18" RCP (1350-D)	C-8, SHT. 58
32	N00°00'00"E		49.00'	18" RCP (1350-D)	C-9, SHT. 58
33	N00°00'00"E		77.00'	18" RCP (1350-D)	C-10, SHT. 58
34	N90°00'00"E		135.37'	18" RCP (1350-D)	C-11, SHT. 59
35	N00°00'00"E		24.12'	18" RCP (1350-D)	C-12, SHT. 59
36	N38°52'36"E		22.05'	18" RCP (1350-D)	C-13, SHT. 59
37	N90°00'00"E		6.25'	18" RCP (1350-D)	C-29, SHT. 58
38	N90°00'00"E		26.25'	18" RCP (1350-D)	C-28, SHT. 58
39	N90°00'00"E		85.57'	18" RCP (1350-D)	C-25, SHT. 59
40	N00°00'00"E		6.25'	18" RCP (1350-D)	C-26, SHT. 59
41	N00°00'00"W		26.25'	18" RCP (1350-D)	C-27, SHT. 59
42	N19°02'14"W		21.00'	30" RCP (1350-D)	M-5, SHT. 77
43	N19°02'14"W		22.83'	24" RCP (1350-D)	M-39, SHT. 77
44	Δ=04°05'19"	662.00'	47.24'	24" RCP (1350-D)	M-39, SHT. 77
45	N7°45'35"E		35.50'	18" RCP (1350-D)	M-47, SHT. 78
46	N76°05'23"E		37.25'	24" RCP (1350-D)	M-6, SHT. 78
47	N76°05'23"E		133.03'	24" RCP (1350-D)	M-7, SHT. 78
48	N76°05'23"E		68.72'	24" RCP (1350-D)	M-46, SHT. 78
49	N10°01'24"E		27.42'	24" RCP (1350-D)	M-8, SHT. 78
50	Δ=09°44'21"	311.00'	52.86'	24" RCP (1350-D)	M-8, SHT. 78
51	N19°45'45"E		11.03'	24" RCP (1350-D)	M-8, SHT. 78
52	N19°45'45"E		58.82'	24" RCP (1350-D)	M-9, SHT. 78
53	N06°39'41"W		50.72'	24" RCP (1350-D)	M-10, SHT. 78
54	Δ=65°13'53"	22.50'	25.62'	24" RCP (1350-D) ***	M-10, SHT. 78
55	N71°53'34"W		16.69'	24" RCP (1350-D)	M-10, SHT. 78
56	Δ=15°49'16"	361.00'	124.89'	18" RCP (1350-D)	M-11, SHT. 78
57	Δ=05°04'40"	361.00'	31.99'	18" RCP (1350-D)	M-12, SHT. 78
58	Δ=14°08'01"	361.00'	89.05'	18" RCP (1350-D)	M-13, SHT. 78
59	N30°57'21"W		12.50'	18" RCP (1350-D)	M-34, SHT. 78
60	N51°26'12"W		12.50'	18" RCP (1350-D)	M-32, SHT. 78
61	N71°53'34"W		12.50'	18" RCP (1350-D)	M-31, SHT. 78
62	N70°00'51"E		26.69'	18" RCP (1350-D)	M-26, SHT. 78
63	N63°42'46"E		101.66'	18" RCP (1350-D)	M-27, SHT. 78
64	N70°20'05"W		35.07'	18" RCP (1350-D)	M-25, SHT. 78
65	N70°57'46"E		41.77'	24" RCP (1350-D)	M-40, SHT. 77
66	N79°10'16"W		23.76'	24" RCP (1350-D)	M-41, SHT. 77
67	Δ= 26°35'09"	242.00'	112.29'	24" RCP (1350-D)	M-41, SHT. 77
68	N89°07'36"E		111.90'	24" RCP (1350-D)	M-42, SHT. 77
69	N03°51'19"E		51.30'	18" RCP (1350-D)	L-22, SHT. 73
70	N24°09'43"E		11.50'	18" RCP (1350-D)	L-21, SHT. 73
71	N24°09'43"E		31.50'	18" RCP (1350-D)	L-20, SHT. 73
72	NOT USED				
73	N90°00'00"E		33.50'	18" RCP (1350-D)	C-52, SHT. 59

* PIPE REQUIRES 8' LENGTHS W/ 5' BEVEL ONE END
** PIPE REQUIRES 8' LENGTHS W/ 5' BEVEL BOTH ENDS
*** PIPE REQUIRES 4' LENGTHS W/ 5' BEVEL BOTH ENDS

NOTE: ALL EXISTING EASEMENTS ARE TO BE VACATED UNLESS OTHERWISE NOTED.

NOTE: ALL EXISTING STRUCTURES ARE TO BE REMOVED UNLESS OTHERWISE NOTED.

J - 16412

GRAPHIC SCALE 1"= 40'

RECORD PLAN

BY: _____ DATE: _____
NAME
R.C.E. _____
EXPIRES: _____

COUNTY APPROVED CHANGES

NO.	DESCRIPTION:	APPROVED BY:	DATE:

BENCH MARK

DESCRIPTION: THE BENCH MARK FOR THIS SURVEY IS THE 3.5" USGS STANDARD BRASS DISK STAMPED "GWM 85" 1946" ON WEST END OF NORTH HEADWALL BOX CULVERT, LOCATED ON THE NORTH SIDE OF HARMONY GROVE RD., 300 FEET WEST OF COUNTRY CLUB RD. BENCH MARK DESIGNATION GWM 0085 PER COUNTY OF SAN DIEGO VERTICAL CONTROL.
RECORD FROM: SAN DIEGO COUNTY VERTICAL BENCHMARK CONTROL
ELEVATION: 569.909 DATUM: NGVD 29

PRIVATE CONTRACT

SHEET	COUNTY OF SAN DIEGO DEPARTMENT OF PUBLIC WORKS	SHEETS
45		133

STORM DRAIN PLAN FOR:
HARMONY GROVE VILLAGE PHASE 1

CALIFORNIA COORDINATE INDEX 334-1785

APPROVED FOR
MOHAMAD K. FAKHRRIDDINE
COUNTY ENGINEER
BY: DATE:

ENGINEER OF WORK
R.C.E. 35171 DATE 10/31/12

L-15656
GRADING PERMIT NO:

REGISTERED PROFESSIONAL ENGINEER
TIMOTHY J. MURPHY
NO. 35171
CIVIL
STATE OF CALIFORNIA

RICK ENGINEERING COMPANY
San Diego
5620 FRIARS ROAD
SAN DIEGO, CA 92110
619.291.0707
(FAX)619.291.4165
rickengineering.com
Riverside · Orange · San Luis Obispo · Bakersfield · Sacramento · Phoenix · Tucson

RICK ENGINEERING CO. - (619) 291-0707

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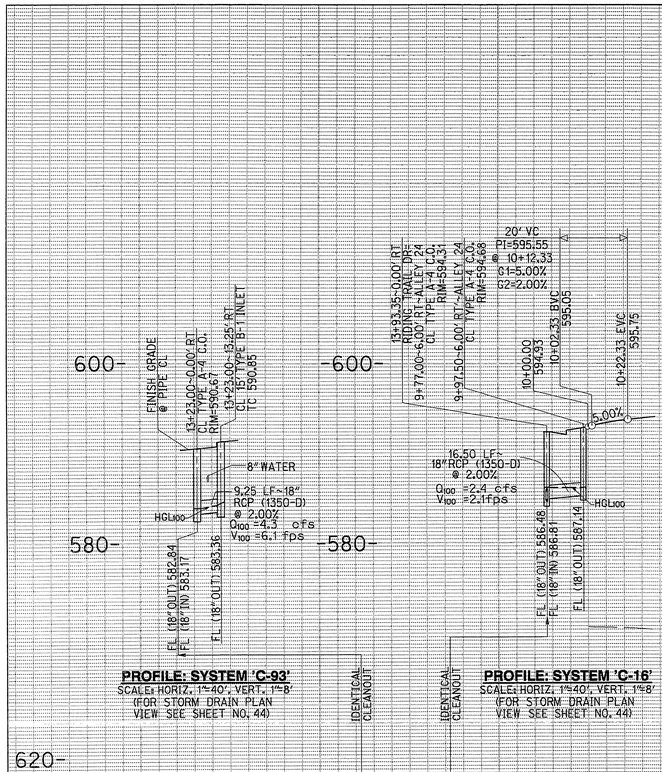
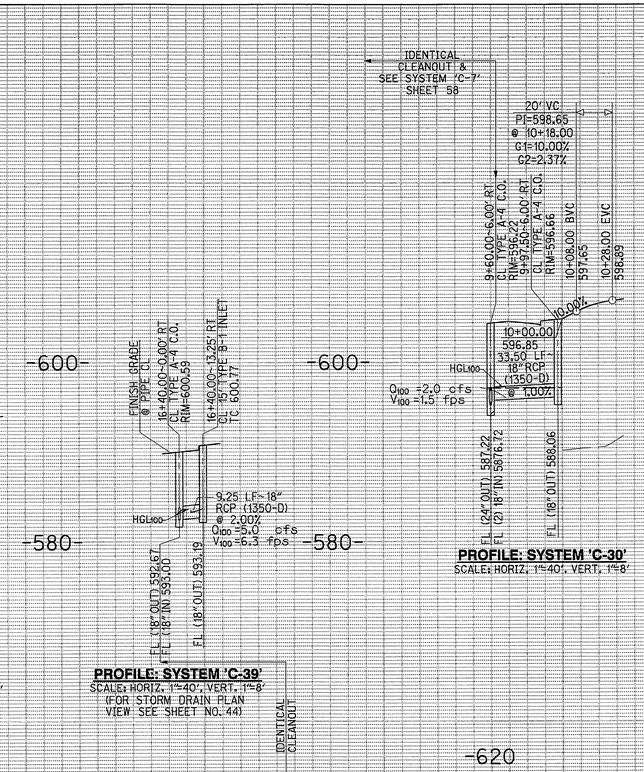


PROFILE: SYSTEM 'C-93'
SCALE: HORIZ. 1"=40', VERT. 1"=8'
(FOR STORM DRAIN PLAN VIEW SEE SHEET NO. 44)

PROFILE: SYSTEM 'C-16'
SCALE: HORIZ. 1"=40', VERT. 1"=8'
(FOR STORM DRAIN PLAN VIEW SEE SHEET NO. 44)



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SCALE: HORIZ. 1"=40', VERT. 1"=8'

PROFILE: SYSTEM 'C-39'
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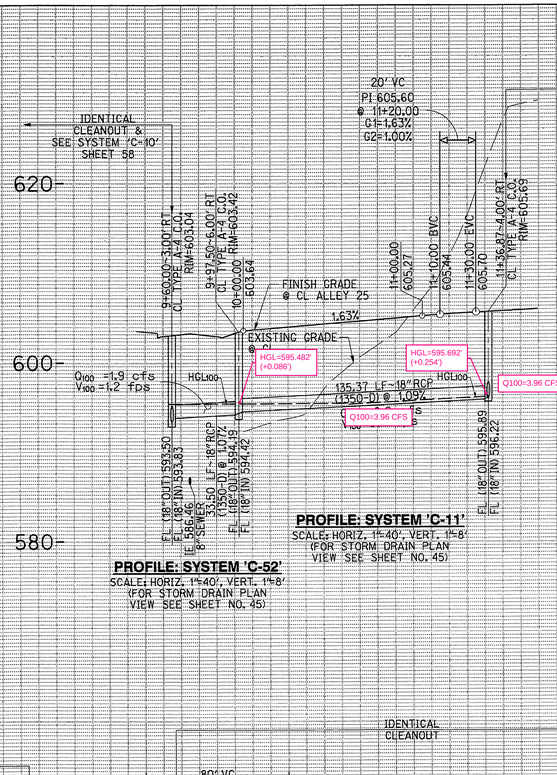
(FOR STORM DRAIN PLAN VIEW SEE SHEET NO. 44)



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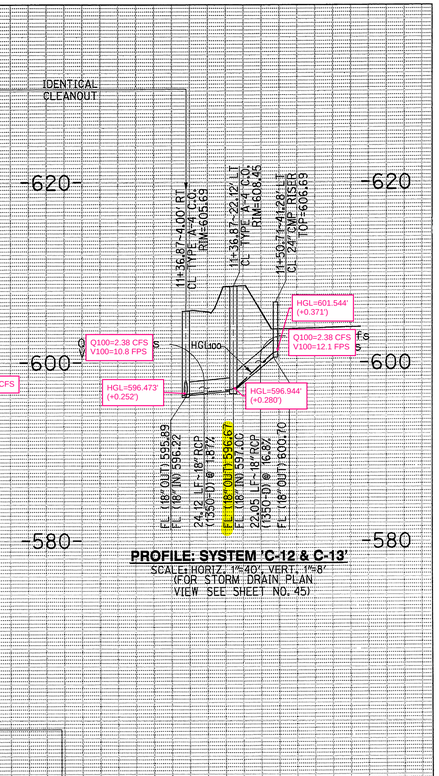
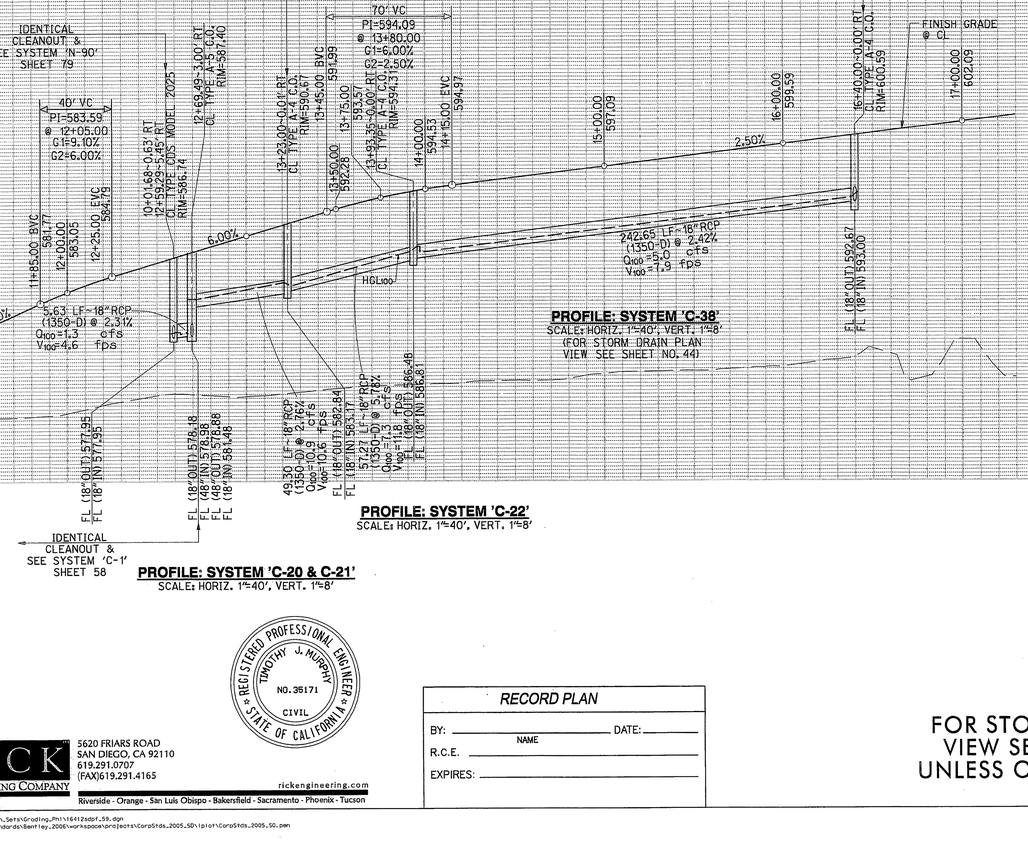
(FOR STORM DRAIN PLAN VIEW SEE SHEET NO. 45)



PROFILE: SYSTEM 'C-11'
SCALE: HORIZ. 1"=40', VERT. 1"=8'
(FOR STORM DRAIN PLAN VIEW SEE SHEET NO. 45)

PROFILE: SYSTEM 'C-12 & C-13'
SCALE: HORIZ. 1"=40', VERT. 1"=8'
(FOR STORM DRAIN PLAN VIEW SEE SHEET NO. 45)

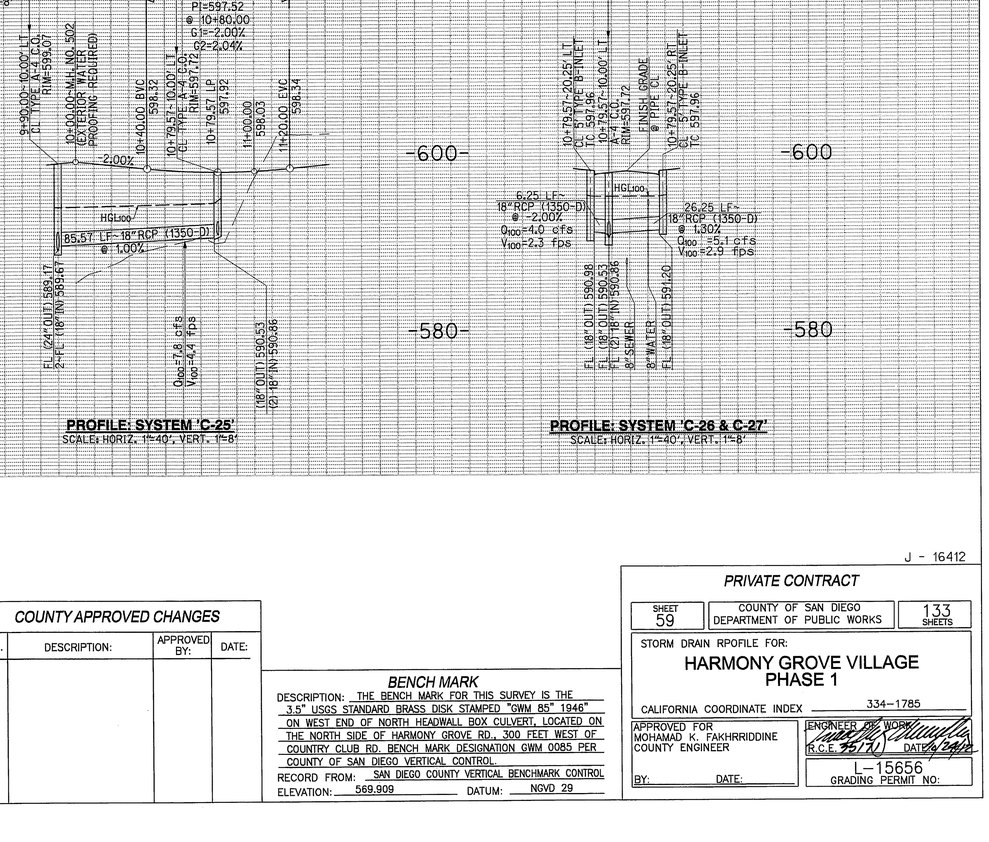


PROFILE: SYSTEM 'C-38'
SCALE: HORIZ. 1"=40', VERT. 1"=8'
(FOR STORM DRAIN PLAN VIEW SEE SHEET NO. 44)

PROFILE: SYSTEM 'C-22'
SCALE: HORIZ. 1"=40', VERT. 1"=8'

IDENTICAL CLEANOUT & SEE SYSTEM 'C-1' SHEET 58

PROFILE: SYSTEM 'C-20 & C-21'
SCALE: HORIZ. 1"=40', VERT. 1"=8'



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SCALE: HORIZ. 1"=40', VERT. 1"=8'

PROFILE: SYSTEM 'C-26 & C-27'
SCALE: HORIZ. 1"=40', VERT. 1"=8'

J - 16412

PRIVATE CONTRACT

SHEET	COUNTY OF SAN DIEGO DEPARTMENT OF PUBLIC WORKS	133 SHEETS
59		

STORM DRAIN RPROFILE FOR:
HARMONY GROVE VILLAGE PHASE 1

CALIFORNIA COORDINATE INDEX 334-1785

APPROVED FOR MOHAMAD K. FAKHRRIDDINE COUNTY ENGINEER
BY: DATE:

ENGINEER OF WORK: TIMOTHY J. MURPHY R.C.E. 35171 DATE: 9/4/12

L-15656 GRADING PERMIT NO:

COUNTY APPROVED CHANGES

NO.	DESCRIPTION:	APPROVED BY:	DATE:

BENCH MARK

DESCRIPTION: THE BENCH MARK FOR THIS SURVEY IS THE 3.5" USGS STANDARD BRASS DISK STAMPED "GWM 85" 1946" ON WEST END OF NORTH HEADWALL BOX CULVERT, LOCATED ON THE NORTH SIDE OF HARMONY GROVE RD., 300 FEET WEST OF COUNTRY CLUB RD. BENCH MARK DESIGNATION GWM 0085 PER COUNTY OF SAN DIEGO VERTICAL CONTROL.
RECORD FROM: SAN DIEGO COUNTY VERTICAL BENCHMARK CONTROL
ELEVATION: 569.909 DATUM: NGVD 29

RECORD PLAN

BY: _____ DATE: _____
NAME
R.C.E. _____
EXPIRES: _____

REGISTERED PROFESSIONAL ENGINEER — TIMOTHY J. MURPHY — NO. 35171 — CIVIL — STATE OF CALIFORNIA

RICK ENGINEERING COMPANY
5620 FRIARS ROAD
SAN DIEGO, CA 92110
619.291.0707
(FAX)619.291.4165
rickengineering.com
San Diego
Riverside - Orange - San Luis Obispo - Bakersfield - Sacramento - Phoenix - Tucson

FOR STORM DRAIN PLAN
VIEW SEE SHEET NO.49
UNLESS OTHERWISE NOTED

RICK ENGINEERING CO. - (619) 291-0707

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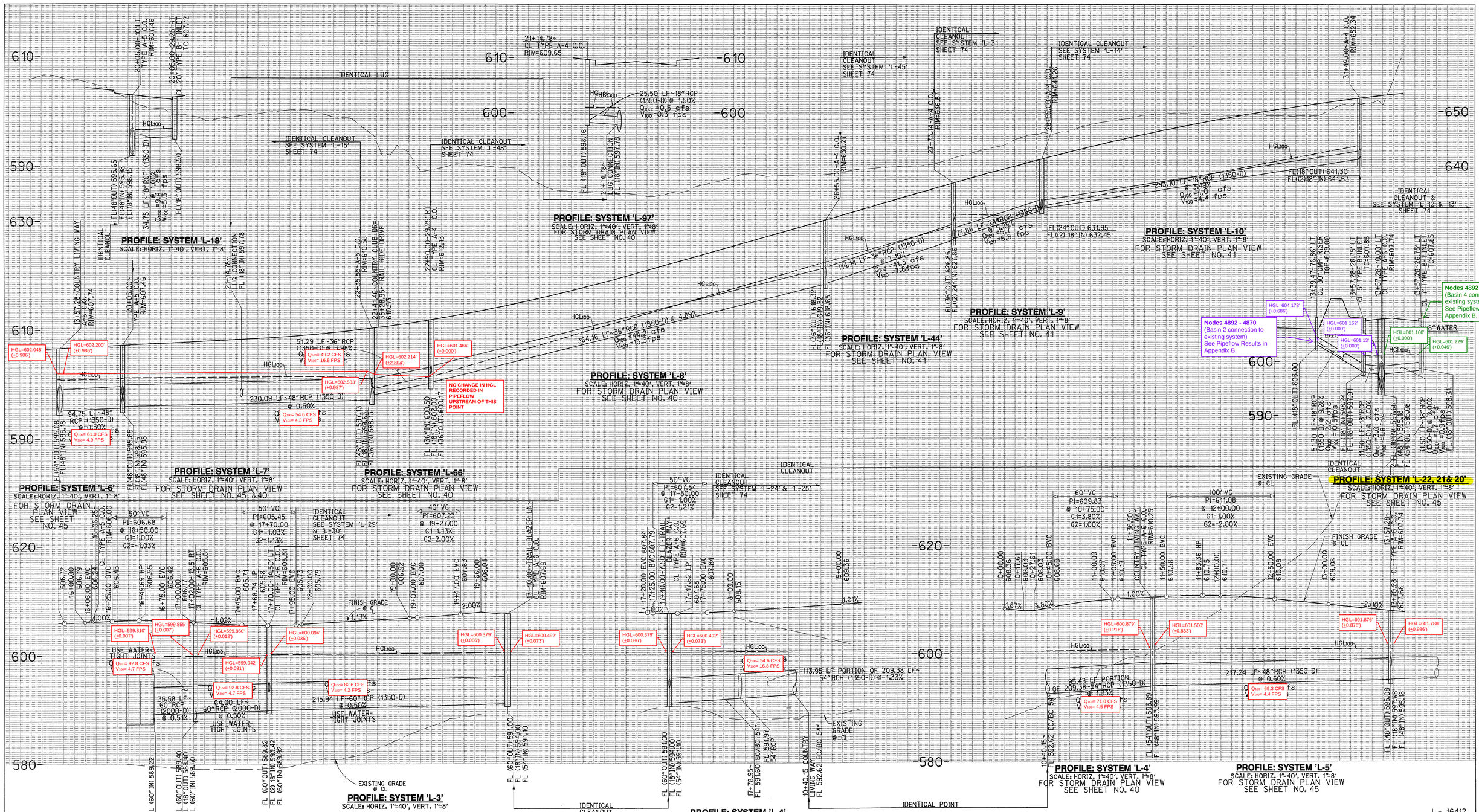

RICK ENGINEERING CO. - (619) 291-0707

J - 16412

PRIVATE CONTRACT

SHEET	COUNTY OF SAN DIEGO DEPARTMENT OF PUBLIC WORKS	SHEETS
73		133

STORM DRAIN RPOFILE FOR:

HARMONY GROVE VILLAGE PHASE 1

CALIFORNIA COORDINATE INDEX 334-1785

APPROVED FOR MOHAMAD K. FAKHRRIDDINE COUNTY ENGINEER

BY: DATE:

ENGINEER OF WORK: R.C.E. 35710 DATE 10-22-12

L-15656 GRADING PERMIT NO:

COUNTY APPROVED CHANGES

NO.	DESCRIPTION:	APPROVED BY:	DATE:

BENCH MARK

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RECORD FROM: SAN DIEGO COUNTY VERTICAL BENCHMARK CONTROL

ELEVATION: 569.909 DATUM: NGVD 29

RECORD PLAN

BY: _____ NAME _____ DATE: _____

R.C.E. _____

EXPIRES: _____

REGISTERED PROFESSIONAL ENGINEER
TIMOTHY J. MURPHY
NO. 35171
CIVIL
STATE OF CALIFORNIA

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(FAX)619.291.4165
rickengineering.com
Riverside - Orange - San Luis Obispo - Bakersfield - Sacramento - Phoenix - Tucson

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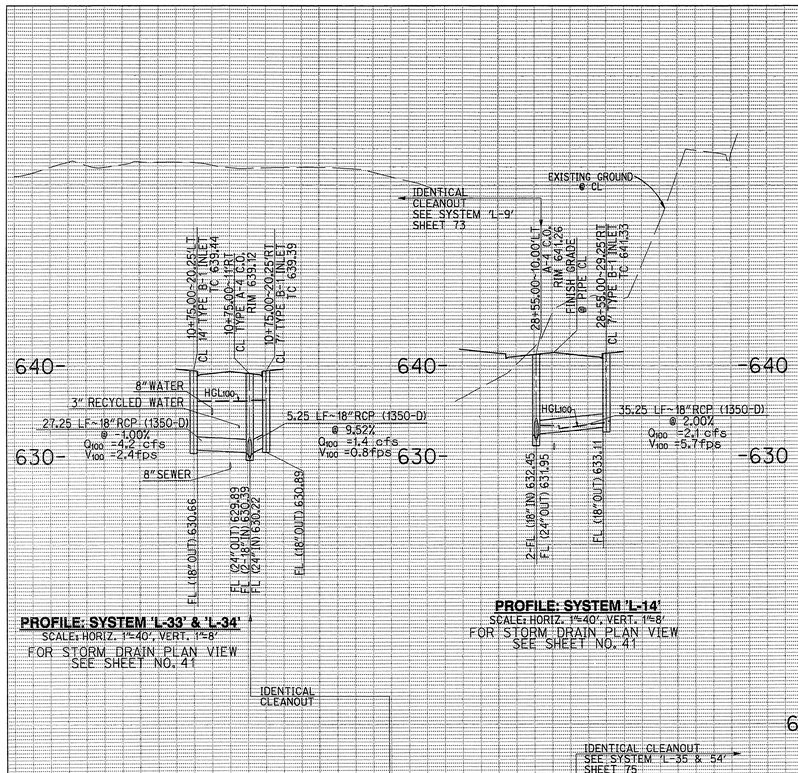
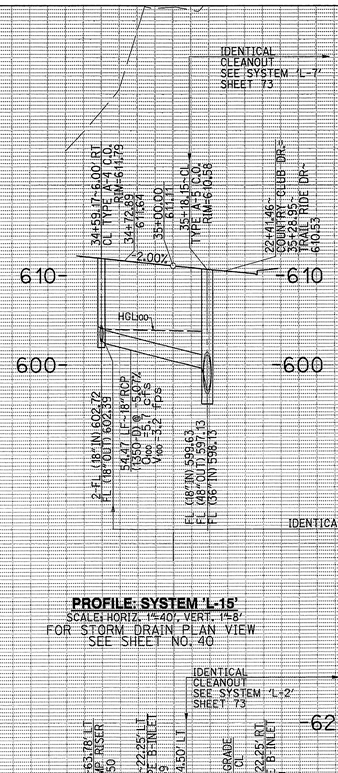


PROFILE: SYSTEM 'L-33' & 'L-34'
SCALE: HORIZ. 1"=40', VERT. 1"=8'
FOR STORM DRAIN PLAN VIEW
SEE SHEET NO. 41

PROFILE: SYSTEM 'L-32'
SCALE: HORIZ. 1"=40', VERT. 1"=8'
FOR STORM DRAIN PLAN VIEW
SEE SHEET NO. 41



PROFILE: SYSTEM 'L-15'
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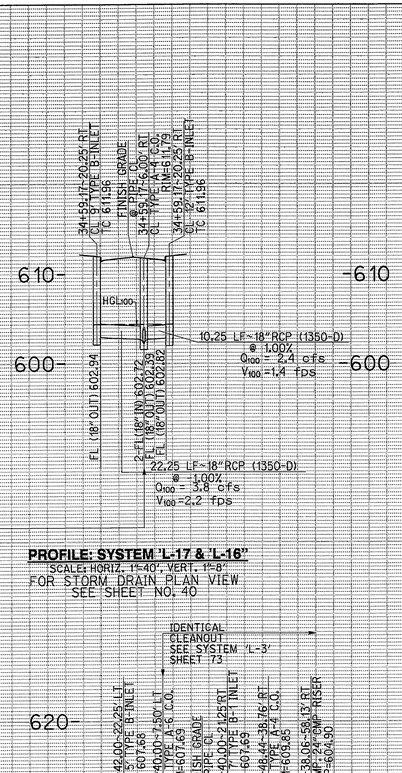
FOR STORM DRAIN PLAN VIEW
SEE SHEET NO. 40



PROFILE: SYSTEM 'L-17' & 'L-16'
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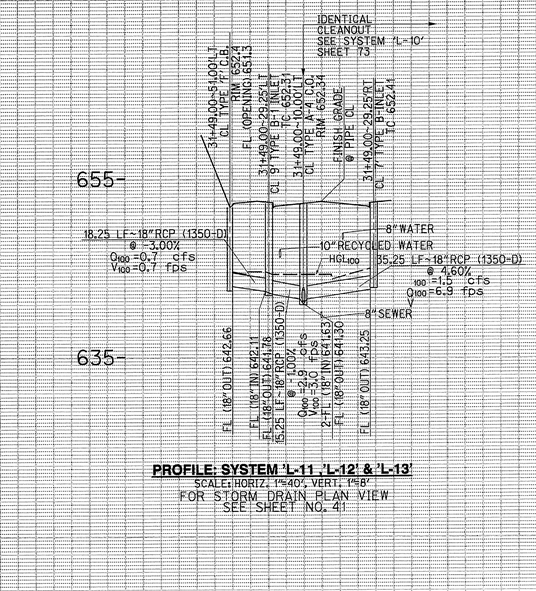
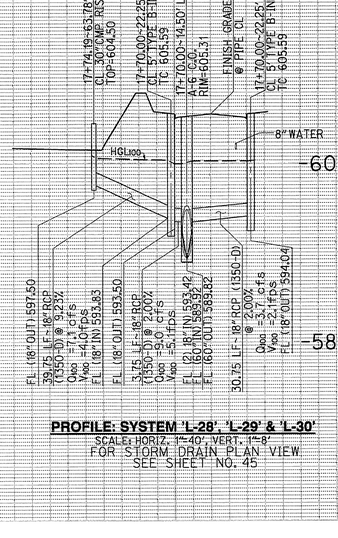
FOR STORM DRAIN PLAN VIEW
SEE SHEET NO. 40



PROFILE: SYSTEM 'L-11 ,'L-12' & 'L-13'
SCALE: HORIZ. 1"=40', VERT. 1"=8'
FOR STORM DRAIN PLAN VIEW
SEE SHEET NO. 41



PROFILE: SYSTEM 'L-28', 'L-29' & 'L-30'
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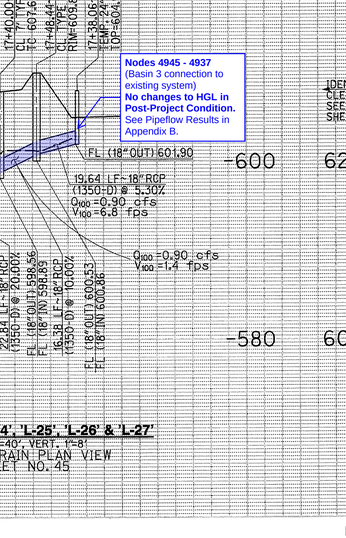
FOR STORM DRAIN PLAN VIEW
SEE SHEET NO. 45



PROFILE: SYSTEM 'L-24', 'L-25', 'L-26' & 'L-27'
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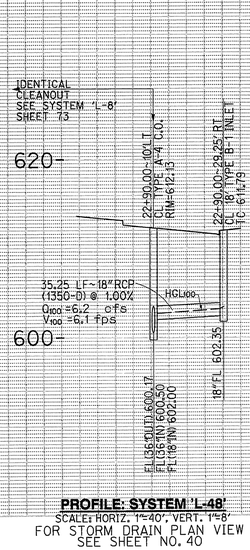
FOR STORM DRAIN PLAN VIEW
SEE SHEET NO. 45



PROFILE: SYSTEM 'L-48'
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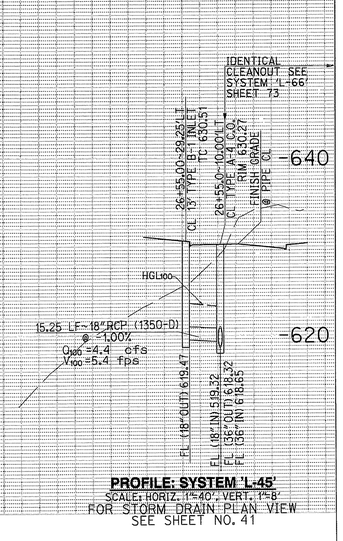
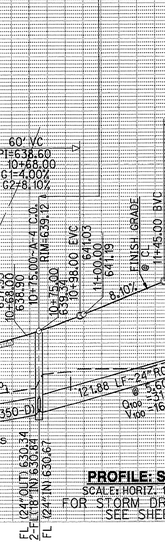
FOR STORM DRAIN PLAN VIEW
SEE SHEET NO. 40



PROFILE: SYSTEM 'L-45'
SCALE: HORIZ. 1"=40', VERT. 1"=8'
FOR STORM DRAIN PLAN VIEW
SEE SHEET NO. 41



PROFILE: SYSTEM 'L-31'
SCALE: HORIZ. 1"=40', VERT. 1"=8'
FOR STORM DRAIN PLAN VIEW
SEE SHEET NO. 41

REGISTERED PROFESSIONAL ENGINEER
TIMOTHY J. MURPHY
NO. 35171
CIVIL
STATE OF CALIFORNIA

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Riverside - Orange - San Luis Obispo - Bakersfield - Sacramento - Phoenix - Tucson

RECORD PLAN

BY: _____ DATE: _____
NAME
R.C.E. _____
EXPIRES: _____

COUNTY APPROVED CHANGES

NO.	DESCRIPTION:	APPROVED BY:	DATE:

BENCH MARK

DESCRIPTION: THE BENCH MARK FOR THIS SURVEY IS THE 3.5" USGS STANDARD BRASS DISK STAMPED "GWM 85" 1946" ON WEST END OF NORTH HEADWALL BOX CULVERT, LOCATED ON THE NORTH SIDE OF HARMONY GROVE RD., 300 FEET WEST OF COUNTRY CLUB RD. BENCH MARK DESIGNATION GWM 0085 PER COUNTY OF SAN DIEGO VERTICAL CONTROL.
RECORD FROM: SAN DIEGO COUNTY VERTICAL BENCHMARK CONTROL
ELEVATION: 569.909 DATUM: NGVD 29

J - 16412

PRIVATE CONTRACT

SHEET 74	COUNTY OF SAN DIEGO DEPARTMENT OF PUBLIC WORKS	133 SHEETS

STORM DRAIN RPOFILE FOR:
HARMONY GROVE VILLAGE PHASE 1
CALIFORNIA COORDINATE INDEX 334-1785

APPROVED FOR MOHAMAD K. FAKHRRIDDINE COUNTY ENGINEER
BY: DATE:

ENGINEER OF WORK:
R.C.E. 35171 DATE 10/24/12
L-15656
GRADING PERMIT NO:

RICK ENGINEERING CO. - (619) 291-0707

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23-OCT-2012 13:22

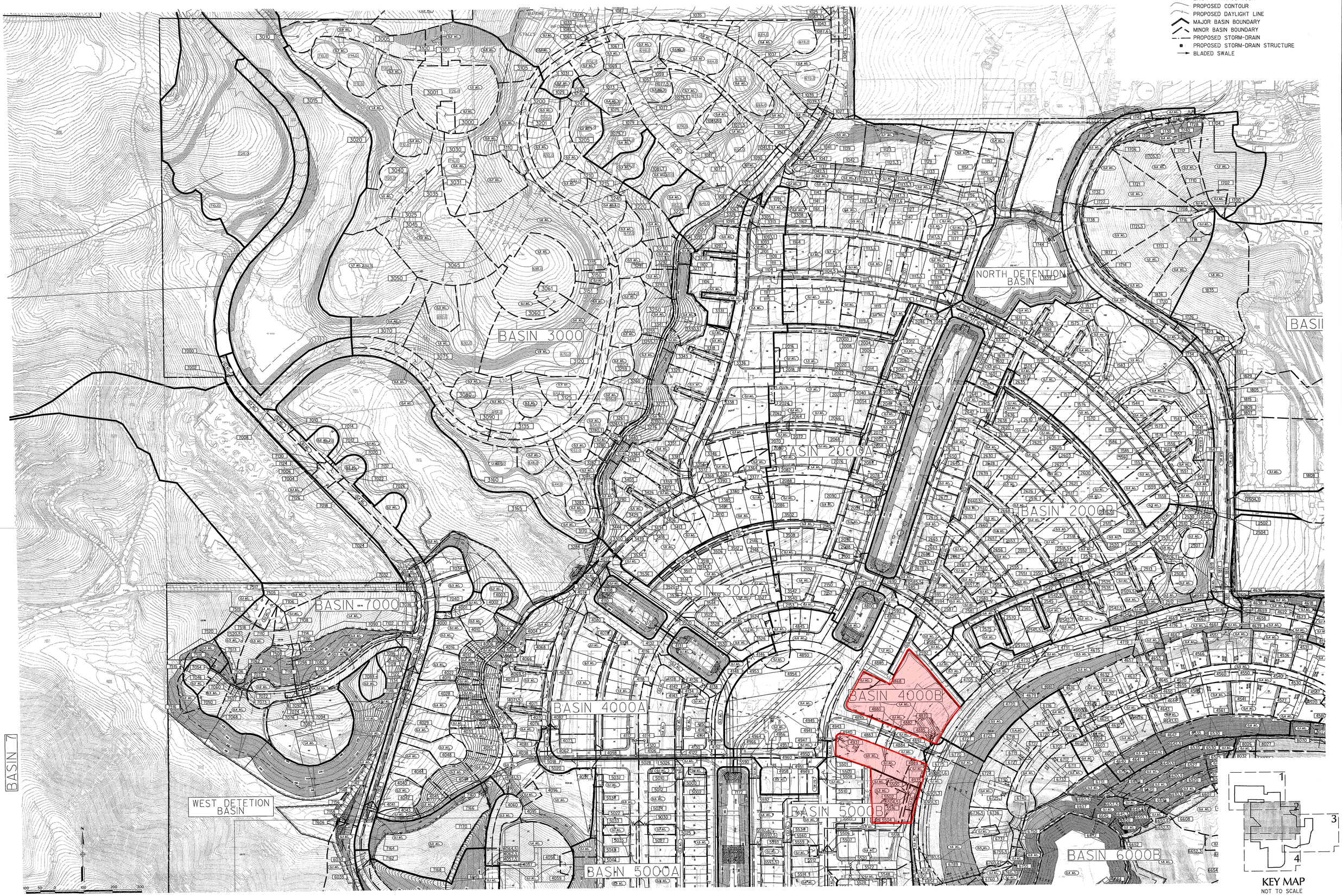
MAP POCKET 1

Drainage Study Map

for

Harmony Grove Village Center

[Post-project Assumed]



HARMONY GROVE VILLAGE

San Diego County CA.

ON-SITE DRAINAGE STUDY MAP
FOR HARMONY GROVE VILLAGE
(POST-PROJECT CONDITION)

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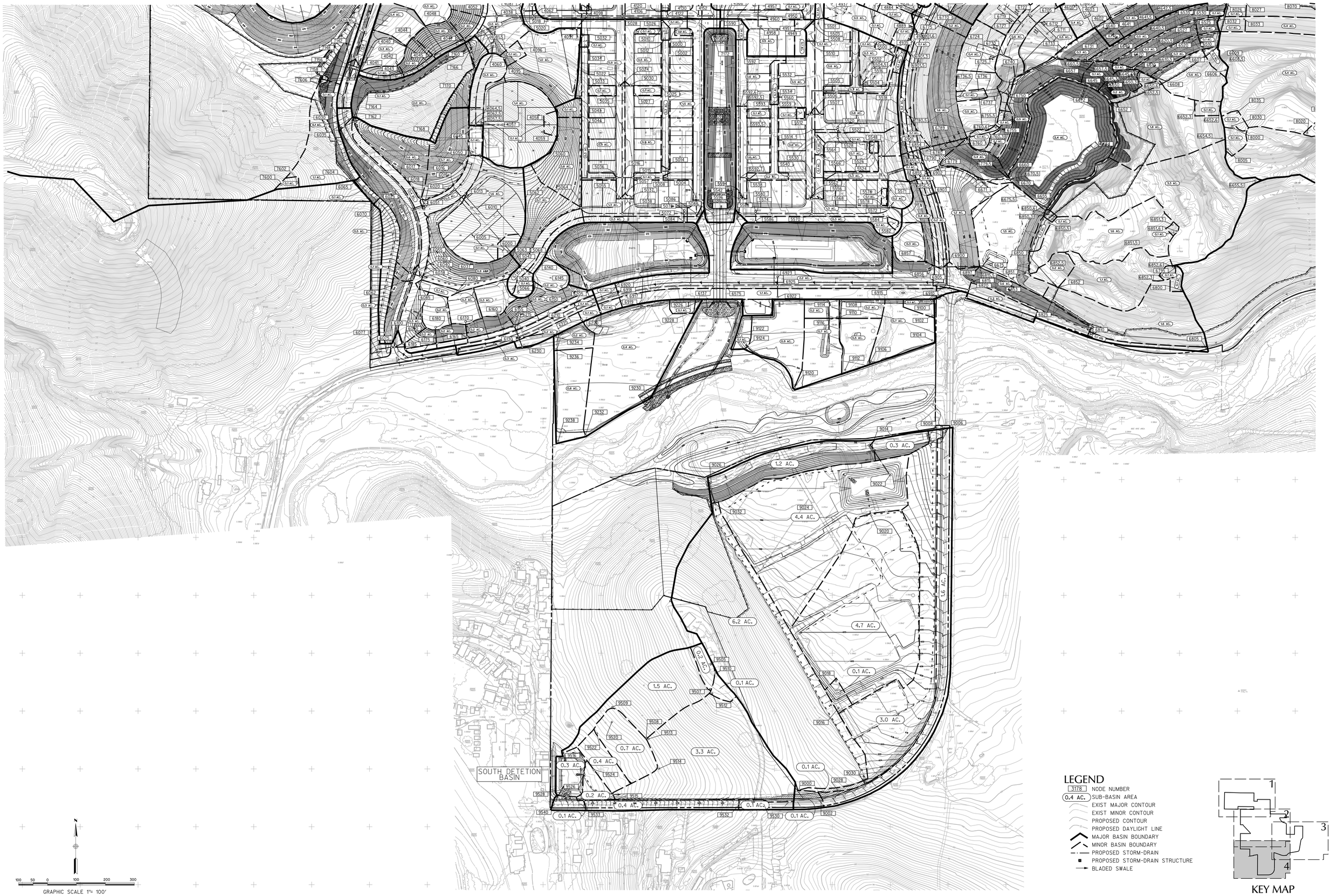

100 50 0 100 200 300

GRAPHIC SCALE 1"= 100'

LEGEND

- 3178 NODE NUMBER
- 0.4 AC. SUB-BASIN AREA
- EXIST MAJOR CONTOUR
- EXIST MINOR CONTOUR
- PROPOSED CONTOUR
- PROPOSED DAYLIGHT LINE
- MAJOR BASIN BOUNDARY
- MINOR BASIN BOUNDARY
- PROPOSED STORM-DRAIN
- PROPOSED STORM-DRAIN STRUCTURE
- BLADED SWALE

KEY MAP
NOT TO SCALE

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HARMONY GROVE VILLAGE
San Diego County CA.

ON-SITE DRAINAGE STUDY MAP
FOR HARMONY GROVE VILLAGE
(POST-PROJECT CONDITION)

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MAP POCKET 2

Drainage Study Map

for

Harmony Grove Village Center

[Post-project Actual]

NOTES:

1. DEPTH TO GROUNDWATER IS APPROXIMATELY 9FT BGS
2. NO PCCSYAS ON SITE
3. HYDROLOGIC SOIL GROUP D

30 15 0 30 60 90

GRAPHIC SCALE 1" = 30'

LEGEND:

- FLOW PATH
- EXISTING STORM DRAIN
- PROPOSED STORM DRAIN
- EXISTING CONTOUR
- PROPOSED CONTOUR
- DRAINAGE BASIN BOUNDARY
- XX.X AC — DRAINAGE BASIN AREA
- BASIN X — DRAINAGE BASIN ID
- POINT OF INTEREST (POI)

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RICK

SAN DIEGO ORANGE RIVERSIDE SACRAMENTO SAN LUIS OBISPO
SANTA CLARITA PHOENIX TUCSON LAS VEGAS DENVER

POST-PROJECT DRAINAGE STUDY MAP HARMONY GROVE VILLAGE CENTER

J-17164-D

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NOT FOR CONSTRUCTION - EXHIBIT FOR DRAINAGE STUDY REPORT ONLY