DRAINAGE STUDY FOR MEADOWOOD VESTING TENTATIVE MAP

Job Number 15956
April 2, 2009
Revised: August 18, 2009

RICK ENGINEERING COMPANY

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DRAINAGE STUDY

FOR

MEADOWOOD VESTING TENTATIVE MAP

Job Number 15956

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REVISION PAGE FOR

DRAINAGE STUDY FOR

MEADOWOOD VESTING TENTATIVE MAP

J- 15956

DATE	REVISION/ CHANGES MADE TO PROJECT
April 1, 2009	Original submittal to County of San Diego.
August 18, 2009	Second submittal. Changes to report incorporate the July 16, 2009 County of San Diego's Plan Check Comments.

RESPONSE TO COUNTY'S COMMENTS FOR THE

DRAINAGE STUDY FOR

MEADOWOOD VESTING TENTATIVE MAP

August 18, 2009

Rick Engineering Company has reviewed July 16, 2009 County of San Diego's Department of Public Works plan check comments for the April 2, 2009 report titled "Drainage Study for Meadowood Vesting Tentative Map". The following text is the County's plan check comments, immediately followed by Rick Engineering Company's responses (in initialized lettering).

GENERAL:

1. The previous responses to comments state that the CLOMR processed for the section of the San Luis Rey River along the southern portion of the site has revised the floodplain. The floodplain in this area will only be revised if, and when a LOMR is approved. Permits cannot be issued for work done in the area covered by the current floodplain mapping, unless it is removed from the floodplain by the approval of a LOMR.

   Rick Engineering Company's Response: Comment Noted.

2. [This comment has been removed per the July 16, 2009 revision to the original June 22, 2009 comment letter]

3. An exhibit and discussion of current floodplain mapping should be included in the report.

   Rick Engineering Company's Response: A floodplain analysis has been performed on the portion of Horse Ranch Creek adjacent to the project. Please refer to updated report.

4. Where are the floodplain delineations for the Horse Ranch Creek that are shown on page 10 of the grading plans from? If the line work is included on the plans, the analysis that produced them should be included in the report.

   Rick Engineering Company's Response: A floodplain analysis has been performed on the portion of Horse Ranch Creek adjacent to the project. Please refer to updated report and plans for hydraulic analyses and floodplain delineation, respectively.

5. All exhibits and maps need to include a scale and north arrow.

Rick Engineering Company's Response: A north arrow has been added to the exhibit titled, Meadowood Pre-Project Drainage Map Basins 100, 200, and 300".

6. Storm drain is shown in the roadway north of node 7070. If this is part of this project, appropriate analyses should be included in this report.

   Rick Engineering Company's Response: Storm drain has been removed. Please refer to updated exhibit in revised report.

7. If the grading of the pad between nodes 5012 and 5000 is a part of this project, it should be included in the analyses.

   Rick Engineering Company's Response: The grading associated with the water tanks has been included in the hydrologic analysis for Drainage Basins 7000. See updated report for revised analysis and corresponding workmap.

8. If the flows from nodes 500, 600, and 700 are being combined at node 753 based upon the assertion that they all discharge directly to the floodplain, supporting floodplain analysis should be provided, and an explanation should be included in the text.

   Rick Engineering Company's Response: The flows associated with Nodes 500, 600, and 700 are combined and, for the purposes of this report, are referred to as Drainage Basin. The flows, in the pre-project condition, are conveyed immediately westerly to the Horse Ranch Creek Floodplain. Refer to the workmaps and analyses in the revised report.

9. The 7000A and 7000B flows discharge at exactly the same location. The flows should be combined and the comparison of flows should be made using the combined flows.

   Rick Engineering Company's Response: The pre (700A and 700B) and post project flows (7000A and 7000B) have been combined for comparison purposes. In addition, the detention analyses for 7000A and 7000B have been combined for comparison purposes.

10. Subbasin delineations should be shown on the soil type maps.

    Rick Engineering Company's Response: Due to the scale of the soil maps (600 scale), it was not appropriate to overlay the subbasin delineations. As a result, the soil information has been added to the Drainage Maps.

HYDROLOGY

11. Node 6090 on the 4000 5000 6000 map (also called out as node 5105 on the Basin 7000 map) appears to be an outlet. This is not reflected in the modeling. Please clarify the purpose of this apparent outlet.

    Rick Engineering Company's Response: This was a drafting error and has been correct on the updated exhibits. For purposes of review, Drainage Basin 7000A is comprised of Node Numbers 5000, 6000, and 7000. The text in the report has been updated to reflect this naming convention.

12. Many of the initial length values (such as 100-101, 205-206, 303-304, 750-751, 700-701) included in the AES modeling (code 21) do not match those shown on the maps. The models and maps should match.

    Rick Engineering Company's Response: Per discussions with the County, there are different approaches to this situation. It is our understanding that the County would like to exactly match the maximum initial length per Table 3-2 of the Hydrology Manual. By doing this, very small initial subbasin is sometimes achieved and as a result an extremely small flow rate is calculated that can cause problems with the computer model. The County has presented an example of the Modified Rational Method in the Hydrology Manual in Workbook 2. It appears, from this example, that the County understands that by using the small flow lengths (per Table 3-2) and as such the small corresponding areas, may cause problems in the Hydrology Model. The workbook presents and example utilizing an initial sub area of 0.4 acres with an actual flow length of 220 feet. However per Table 3-2, the maximum length allowable is 70 feet. The workbook explains "you can neglect the travel time for the remaining 150' across the pad since it will be small with respect to Ti". Rick Engineering Company feels that the approach to the initial subbasin that was utilized throughout the on-site analysis for the Meadowood project is per the County's criteria and as such not changes to the hydrologic model occurred as a result of this comment.

13. The use of terminology such as "basin 7000A" and "basin 7000B" should be supported by well defined delineations on the appropriate maps.

    Rick Engineering Company's Response: Drainage Basin 7000A and 7000B are combined into one Drainage Basin titled, "7000". However, Drainage Basin 7000 is proposing two detention facilities. Therefore, the area tributary to each Detention Facility has been identified as Drainage Basin 7000A or Drainage Basin 7000B. Drainage Basin 7000A (Node Numbers 5000, 6000, and 7000) and Drainage Basin 7000B (Node Numbers 7000) have been clearly defined on the updated workmaps. See revised workmaps in the revised report.

14. On the existing exhibit, node 401 appears to be called out as 402, and node 402 is missing.

Rick Engineering Company's Response: Workmap has been updated to reflect this drafting correction.

15. The flow path from 702-704-710 is shown improperly on the exhibit.

Rick Engineering Company's Response: Unfortunately an outdated workmap was inserted with the April 2009 submittal. The correct workmap was inserted into the revised report with a flow path for 702-704-710. No change to the rational method is necessary as a result of the comment.

16. A flow path needs to be shown for 706-708-710.

Rick Engineering Company's Response: Unfortunately an outdated workmap was inserted with the April 2009 submittal. The correct workmap was inserted into the revised report with a flow path for 706-708-710. No change to the rational method is necessary as a result of this comment.

17. Node 710 needs to be included on the map.

Rick Engineering Company's Response: Unfortunately an outdated workmap was inserted with the April 2009 submittal. The correct workmap was inserted into the revised repot with Node 710 properly delineated. No change to the rational method is necessary

18. The subbasin delineations extending from node 740 on the map to the north and west should match the background contours.

Rick Engineering Company's Response: Unfortunately an outdated workmap was inserted with the April 2009 submittal. The correct workmap was inserted into the revised repot and node 740 was removed. No change to the rational method is necessary

19. A flowpath needs to be included on the map from 710-712.

Rick Engineering Company's Response: Unfortunately an outdated workmap was inserted with the April 2009 submittal. The correct workmap was inserted into the revised repot with the flowpaths. No change to the rational method is necessary.

20. The flowpath from 750-752 should match the background contours.

Rick Engineering Company's Response: Unfortunately an outdated workmap was inserted with the April 2009 submittal. The correct workmap was

inserted into the revised repot and as a result no change to the rational method is necessary. So with the exception of Node 750 (see the response to Hydrology Comment Number 2) all of the elevations in the rational method match the workmap.

21. Nodes 800, 810, 820 and 830 in the model are shown as 800, 801, 802, and 803 on the map. The models and maps should match.

    Rick Engineering Company's Response: The workmap has been revised accordingly to match the node numbers to the Rational Method. Please see updated report.

22. Since there is no change in the basins 201-204 (2001-2004) between the pre and post, the two should match (currently they don't).

    Rick Engineering Company's Response: The pre-project drainage area in the rational method and on the workmap for the process from 201 to 204 was 10.8. The actual drainage area is 10.9. The rational method and workmap has been updated and is now in matching the post-project analysis.

23. Flowpaths need to be included for all areas on all proposed condition maps.

    Rick Engineering Company's Response: Flow paths and/or storm drain are shown on all workmaps.

24. The model routes flows from 3023 to 3027. On the map flow from 3023 is routed to the detention basin (which does not have a node number). The models and maps should match.

    Rick Engineering Company's Response: Rational Method analyses and workmap have been updated to be consistent with the current proposed storm drain alignment.

25. The model routes 3042.5 to 3043.5 in a pipe. The pipe and node 3043.5 are not shown on the map. The models and maps should match.

    Rick Engineering Company's Response: Rational Method analyses and workmap have been updated to be consistent with the current proposed storm drain alignment.

26. The flowpath from 505-506 should match the background contours.

    Rick Engineering Company's Response: This has been corrected and the elevation and flow path at Node 506 has been adjusted accordingly in the Rational Method. Please refer to updated report for the workmap and rational method analysis.

27. The model routes 4002-4003-4003.5. This does not match the map. The models and maps should match.

Rick Engineering Company's Response: Workmap and Rational Method have been updated to reflect the current proposed storm drain. Please refer to updated report for the workmap and rational method analysis.

28. The subbasin delineation between 7040 and 7045 should match the proposed contours.

Rick Engineering Company's Response: Workmap and Rational Method have been updated to reflect the current proposed storm drain. Please refer to updated report for the workmap and rational method analysis.

29. 6000-6010 is part of basin 7000A. It should be labeled and delineated as part of 7000A.

Rick Engineering Company's Response: Drainage Basin 7000A consists of Node Numbers corresponding to the 5000's, 6000's and 7000's. As a result 6000-6010 is apart of the Drainage Basin 7000A. Understanding that it is difficult to review analyses when the workmaps have divided the drainage basin, a revised workmap has been created that provides the information for all of Drainage Basin 7000A on one single exhibit. Please see the revised report for the updated exhibit.

30. 5102-5105 is part of basin 7000A. It should be labeled and delineated as part of 7000A.

Rick Engineering Company's Response: Drainage Basin 7000A consists of Node Numbers corresponding to the 5000's, 6000's and 7000's. As a result 5102-5105 is apart of the Drainage Basin 7000A Understanding that it is difficult to review analyses when the workmaps have divided the drainage basin, a revised workmap has been created that provides the information for all of Drainage Basin 7000A on one single exhibit. Please see the revised repot for the updated exhibit. .

31. In the model flow from node 7783 is routed to node 5081, but on the map the flow is intercepted at node 5077. The models and maps should match.

Rick Engineering Company's Response: Workmap and Rational Method have been updated to reflect the current proposed storm drain. Please refer to updated report for the workmap and rational method analysis.

32. The model routes 6066-6085 in a pipe, but there is no pipe shown on the map or plans. The models and maps should match.

Rick Engineering Company's Response: In the April 2009 report, 100-Year Post-Project Modified Rational Method Analyses, Drainage Basin 6000, Page 46 has a process from Node 6066 – 6085. This process is an initial sub area not a pipe flow. Please provide more information regarding this comment.

33. Node 8222 should be included on the map.

Rick Engineering Company's Response: Workmap has been updated to reflect Node Number 8222. Please refer to updated report for the workmap.

34. 9011-9010 is part of basin 8000. It should be labeled and delineated as part of 8000.

Rick Engineering Company's Response: Throughout the processing of this vesting tentative map, many changes have occurred. While Rick Engineering Company made every effort to match the Node Numbering system to the name of the Drainage Basin, this was not always possible. Specifically with Drainage Basin 7000A. However, since this plan check comment is only referring to two node *numbers* we will update the map and rational method analysis per your request, with the understanding that the time and effort would not be appropriate to update Drainage Basin 7000A especially since this has not net effect on the hydrologic results.

35. Node 710 should be included on the map.

Rick Engineering Company's Response: Unfortunately an outdated workmap was inserted with the April 2009 submittal. The correct workmap was inserted into the revised report with the flowpaths. No change to the rational method is necessary.

36. Node 506 should be located where the flowline downstream of node 505 leaves the site (the eastern boundary of the triangular out-parcel) as no additional flow is added downstream.

Rick Engineering Company's Response: This has been corrected and the elevation at Node 506 has been adjusted accordingly in the Rational Method. Please. Please refer to the updated report for the workmap and rational method analysis.

37. The flowpath 800-802 should match the flowpath for the proposed condition that originates in the same location.

Rick Engineering Company's response: Due to the proposed storm drain alignment and the available locations for a detention basin (DB8A and DB8B), Drainage Basin 8000 had to be divided into two sub drainage basins (Drainage Basin 8000A and 8000B) so that the tributary area to each

detention facility could be identified. In addition, the proposed grading along the easterly portion of the development and the proposed pickup points, also located along the easterly portion of the development, caused two separate and different flow paths within the natural area, east of Horse Ranch Creek Road. Both of these flowpaths and thus the initial sub areas differed from the pre-project analysis (Drainage Basin 800). Drainage basin 800 was not divided into two separate basins because in the post project condition, both Drainage basins (8000A and 8000B) confluence at the same location and thus are combined at the western perimeter of this project. As a result of this comment, no change was made to the pre- or post-project analyses.

38. The basin 7000 watershed boundary delineation should match the background contours in the area of node 7001 (there appears to be an area to the east that should be included).

    Rick Engineering Company's response: The workmap and hydrologic analysis for Drainage Basin 700 and 7000A has been updated accordingly. Please see the revised report for the hydrologic analyses and corresponding workmaps.

39. The subbasin delineation should be the same for the pre and post conditions for areas where no changes are proposed such as 704-750 and 5000-5003.

    Rick Engineering Company's Response: For clarification, I believe that you are referring to Node Numbers 500-503 rather than 704 –750. If this is the case, Drainage Basin 5000, specifically the processing between Node Numbers 5000-5002 have been updated to reflect the pre-project condition. Please see revised report for updated workmap.

40. Composite C value calculations need to be included for all areas (including basins 2000, 3000, 6000, 7000 and 8000) as several locations have land uses (such as school and multi family residential) not covered by the calculations included. The C values used should be clearly presented and explained in the report.

    Rick Engineering Company's Response: Appendix A has been supplemented with this additional information.

DETENTION ANALYSIS

1. Detention basin names should be included on all maps.

Rick Engineering Company's Response: All of the post-project Drainage Basin Workmaps have been updated to include the Detention Basin names. Please see updated report for the revised workmaps.

2. The detention analysis for the 4000 detention basin uses data from node 4009 which is downstream of the detention basin and includes flows that do not drain to the basin. The detention analysis should model the appropriate data

   Rick Engineering Company's Response: The detention basin analysis has been updated to not include the 1.1 acres along the western boundary. Please see revised report for updated analysis.

3. The detention analysis for the 8000A detention basin uses data from node 8149 which is downstream of the detention basin and includes flows that do not drain to the basin. The detention analysis should model the appropriate data.

   Rick Engineering Company's Response: At this point it is not known which direction the 0.4 acres along the western boundary of drainage basin 8000 (Immediately west of DB8A) so in order to calculate a conservative required volume for DB8A, this area was assumed to drain into DB8A. The 2.2 acres in the street tributary to node 8152 are not entering DB8A and so have been removed from the area tributary to DB8A. Please see revised report for updated analysis.

4. Note 2 in Table 2 states that the detention basin volumes include the water quality volume. Per the DDM Section 6.2.7 flood storage volume shall be provided in addition to the water quality volume.

   Rick Engineering Company's Response: It is understand that the volumes for flood control and water quality cannot be combined; however they are not additive. As such, in the detention analyses, it was assumed that the portion of the basin required for water quality not be utilized for detention. To do this the HEC-1 detention model was revised. You will notice that the third field of the "RS" card in the HEC-1 is not allowing the water quality volume to be utilized for 100-year detention. Please refer to Appendix E for the revised detention basin analyses.

5. Information supporting the detention basins stage-storage-discharge values needs to be included in this report. Several of the volumes shown appear to be in excess of those available on the plans.

   Rick Engineering Company's Response: Appendix D contains the backup information utilized in the detention basin rating curve. In addition, Rick Engineering Company has graded each detention basin per the volume calculations provided in this report. Each detention basin has an additional 2 to 3 feet of freeboard to account for an emergency spillway and freeboard.

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Appendix K: Digital Files

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MAP POCKETS

Map Pocket 1: "Meadowood Pre-Project Drainage Map Basins 100, 200, 300, and 400" (Sheet 1 of 3)

Map Pocket 2: "Meadowood Pre-Project Drainage Map Basin 700A" and "Meadowood Pre-Project Drainage Map Basin 700B, 800 and 900" (Sheets 2 of 3 and 3 of 3)

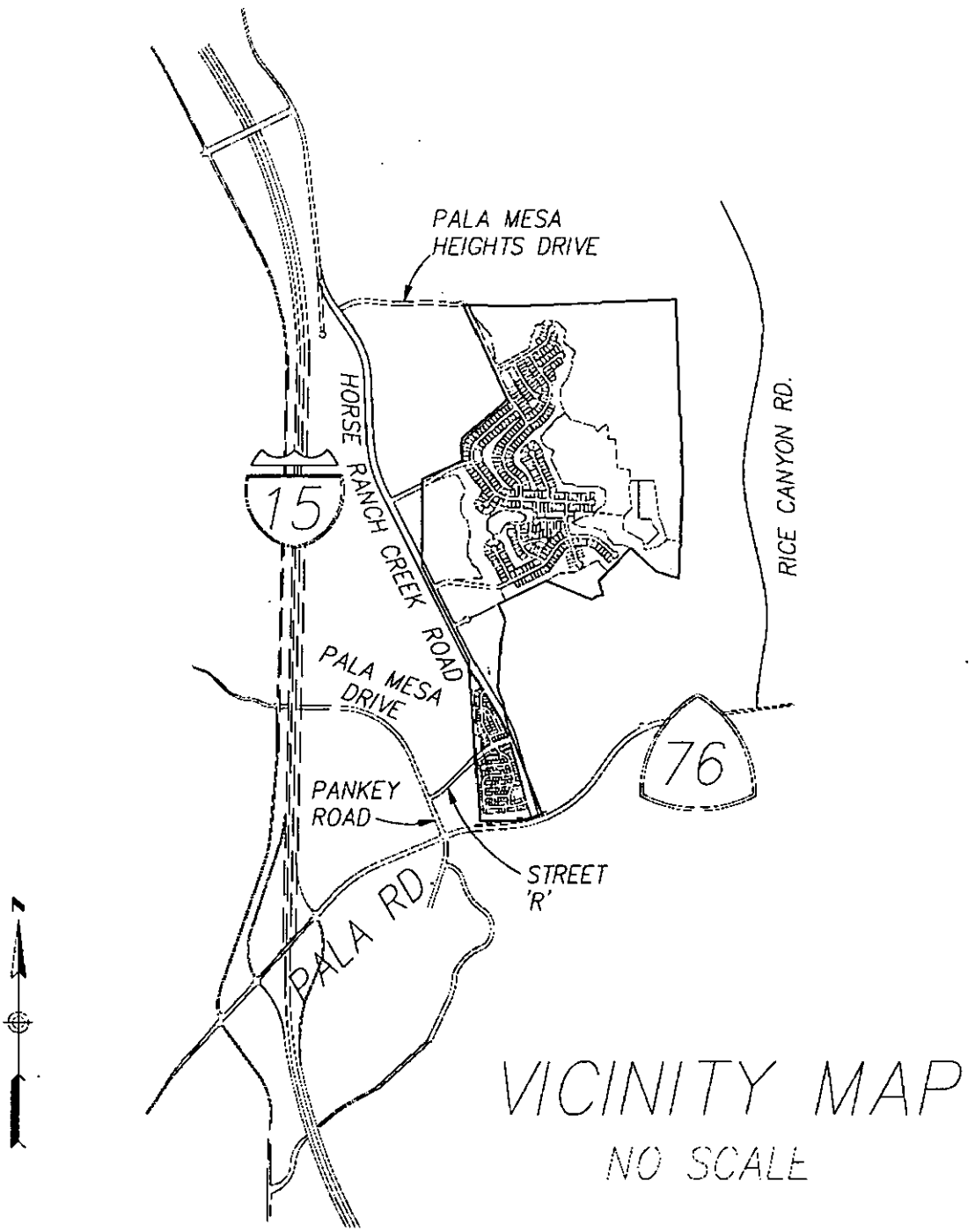
Map Pocket 3: "Meadowood Post-Project Drainage Map Basins 1000, 2000, 3000 and 4000" and (Sheet 1 of 3)

Map Pocket 4: "Meadowood Post-Project Drainage Map Basin 7000A" and "Meadowood Post-Project Drainage Map Basins 7000B, 8000A and 8000B" (Sheet 2 of 3 and 3 of 3)

Map Pocket 5: Meadowood VTM – Horse Ranch Creek Watershed – Drainage Basin Map (1 Sheet)

Map Pocket 6: "Meadowood Offsite Improvements Post-Project Drainage Map Basins 11000, 14000, 15000, and 16000" and "Meadowood Offsite Improvements Post-Project Drainage Map Basins 17000, 18000, 19000, 20000, and 21000" (2 Sheets)

VICINITY MAP



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PROJECT DESCRIPTION

The 389.5-acre Meadowood site is located North of the State Route 76 (SR-76), otherwise known as Pala Road, approximately one-quarter mile East of Interstate 15 in the Fallbrook Community Planning Area of San Diego County, California. Currently the project site consists of orchard/trees, native shrub, rural vegetation, and grassland. Pardee Homes proposes to develop approximately 218 acres (56 %) of the Meadowood site for residential and associated uses including parks, recreational trails, brush management, water tanks, sewer treatment plant (sewer treatment plant is apart of a separate Major Use Permit), emergency fire access road, a graded pad for an elementary school, and offsite improvements. The remainder of the site will be undeveloped. The offsite improvements are associated with Pala Mesa Heights Drive, Horse Ranch Creek Road, Pala Mesa Drive/Existing Pankey Road, and Street R. This Drainage Study supports the onsite and offsite improvements associated with the Meadowood Vested Tentative Map. Please refer to the Vicinity Map located on Page 1.

The existing project site consists primarily of natural terrain and orchards. A ridge exists on the eastern half of the site, which splits the existing runoff to the East and West. The proposed development footprint of this project is entirely within the western watershed, where the natural grade directs runoff in a westerly direction towards Horse Ranch Creek, which is adjacent to Highway 15, and drains North to South. Horse Ranch Creek conveys runoff in a southerly direction and crosses State Route 76 where it confluences with the San Luis Rey River and is ultimately discharged into the Pacific Ocean.

In San Diego County's General Plan Update Plan, this site is in a transit node that is part of a larger new planned community in this quadrant. This project will provide infrastructure to the proposed development including public and private streets, wet and dry utilities, public and private storm drain facilities and developable pads. The characteristics and density of this project are consistent with the Specific Plan Amendment and the General Plan Amendment proposed for this project. Onsite public infrastructure also includes recycled water and domestic water reservoirs, water and sewer mains, sewer treatment plant (sewer treatment plant is apart of a separate Major Use Permit).

The on-site post-project runoff from this project has been divided into seven major drainage basins. The on-site post-project runoff will be detained to pre-project levels prior to leaving the project site. This report presents the hydrologic and detention analyses for each on-site drainage basin. This report also presents hydrologic analyses for the offsite areas associated with the offsite improvements, as well as a hydrologic and hydraulic analysis for the floodplain associated with Horse Ranch Creek.

BACKGROUND AND CRITERIA

This drainage report has been prepared in accordance with the following:

- San Diego County "Hydrology Manual" dated June 2003, prepared by the County of San Diego, Department of Public Works, Flood Control Section.

- San Diego County "Drainage Design Manual" dated December 1969, revised April 1993, prepared by the Design Policy Committee for Flood Control and Drainage

This drainage report supports the Meadowood Vesting Tentative Map and presents information related to the project's drainage characteristics. Discussed in further detail in this text are the proposed detention basins. The project proposes 7 aboveground detention basins and 2 underground vaults. All 7 of the aboveground detention basins attenuate the 100-year post project storm event to pre project levels and they all incorporate volume for hydromodification management ("ponds"). In total, 6 of the 7 aboveground proposed detention basins also incorporate water quality ("settling basins"). The 2 proposed underground vaults have been sized for hydromodification management only. For information regarding the settling basins and/or water quality measures for Meadowood, please refer to the report titled, "Storm Water Management Plan for Priority Projects (Major SWMP) for Meadowood Vesting Tentative Map (VTM)", dated August 18, 2009, prepared by Rick Engineering Company, herein referred to as the project's SWMP. For information regarding the hydromodification management measures, please refer to the report titled, "Hydromodification Management Study for Meadowood Vesting Tentative Map (VTM)", dated August 18, 2009, prepared by Rick Engineering Company, herein referred to as the project's Hydromodification Management Study.

HYDROLOGIC METHODOLOGY & CRITERIA

The Advanced Engineering Software (AES) Modified Rational Method computer program, based on the 2003 County of San Diego Hydrology Manual, was used to determine on- and off-site 100-year, 6-hour peak flow rates. Pre- and post-project condition analyses were performed for the on-site portions of the project. In addition, post-project condition analyses were performed for the off-site portions. Both are explained in more detail within this report.

The hydrologic model is developed by creating independent node-link models of each interior drainage basin, and linking these sub-models together at confluence points. The program has the capability to perform calculations for 15 hydrologic processes. These processes are assigned code numbers that appear in the results. The code number and their significance are as follows:

Subarea Hydrologic Processes (Codes)

Code 1: Confluence analysis at node
Code 2: Initial subarea analysis
Code 3: Pipe flow travel time (computer-estimate pipe sizes)
Code 4: Pipe flow travel time (user-specified pipe size)
Code 5: Trapezoidal channel travel time
Code 6: Street flow analysis through a subarea
Code 7: User-specified information at a node
Code 8: Addition of the subarea runoff to mainline
Code 9: V-Gutter flow through subarea
Code 10: Copy mainstream data onto memory bank
Code 11: Confluence a memory bank with the mainstream memory
Code 12: Clear a memory bank
Code 13: Clear the mainstream memory
Code 14: Copy a memory bank onto the mainstream memory
Code 15: Hydrologic data bank storage functions

ONSITE:

In order to perform the on-site pre- and post-project hydrologic analysis, base information for the entire study area is required. This information includes the land uses, drainage facility locations, flow patterns, drainage basin boundaries, and topographic elevations. The rainfall data, runoff coefficient, and soils information was obtained from the June 2003, County of San Diego Hydrology Manual, and copies of these are included in Appendix A. The hydrologic conditions were analyzed using the following parameters:

Design Storm[1]:	100-year, P_6 = 3.6-inches
Runoff Coefficients[1]:	Based on the San Diego County Hydrology Manual
	Unpaved Pervious C = 0.25-0.35
	Paved Impervious C = 0.90
Soil Type[1]:	Soil Classifications "B", "C", & "D"
Rainfall Intensity:	Based on the San Diego County Hydrology Manual

(1) See Appendix A for the runoff coefficient calculation for offsite analyses and Map Pocket 1 – 4 for the soil classifications.

OFFSITE:

Hydrologic analyses for the 100-year post-project condition were performed for the offsite improvements. The offsite drainage basin delineations were based on existing topographic information and the grading associated with the off-site improvements. To be conservative, developed runoff coefficients were utilized based on the adjacent developments proposed/ultimate land uses. These adjacent developments are known as Campus Park and Campus Park West. Upon final design, this hydrologic analysis will be utilized to perform detailed hydraulics to size the storm drain improvements and culvert crossings associated with the off site improvements for the ultimate/buildout condition. In addition, the rainfall data and soils information was obtained from the June 2003, County of San Diego Hydrology Manual. Backup information for the runoff coefficients is located in Appendix L. The hydrologic conditions were analyzed using the following parameters:

Design Storm[1]:	100-year, P_6 = 3.6-inches

Runoff Coefficients[1]: Based on the San Diego County Hydrology Manual

Unpaved Pervious C = 0.25-0.35

Paved Impervious C = 0.90

Soil Type[2]: Soil Classifications "A, "B", "C", & "D"

Rainfall Intensity: Based on the San Diego County Hydrology Manual

(1) Utilized same information as onsite analysis

(2) See Appendix L for the runoff coefficient calculation for offsite analyses and Map Pocket 6 for the soil classifications.

HYDROLOGIC RESULTS

ON-SITE ANALYSES:

For the purpose of this drainage report seven drainage basins have been identified, herein referred to as Drainage Basins (pre-project/post-project) 100/1000, 200/2000A/2000B, 300/3000, 400/4000, 700A/7000A and 700B/7000B, 800/8000A/8000B, and 900/9000. Each drainage basin is tributary to Horse Ranch Creek, which confluences with the San Luis Rey River. Pre-project node numbers for the drainage basins have been utilized in the 100's, e.g. 100, 200, 300, 400, 700A and 700B, 800, and 900. Post-project node numbers have been utilized in the 1000's e.g. 1000, 2000, 3000, 4000, 7000A and 7000B, 8000A and 8000B, and 9000. Drainage basin 100 corresponds to 1000, 200 to 2000A and 2000B, 300 to 3000, 400 to 4000, 700A and 700B to 7000A and 7000B, 800 to 8000A and 8000B and 900 to 9000.

In the post-project condition, all seven major drainage basins associated with the project site generally drain in a westerly direction to points of interest that are very similar to the pre-project condition. In both the pre- and post-project condition, the site mainly consists of soil types C/D in the easterly and middle portions of the project, soil type B on the westerly portions of the project and soil type A in the southerly portions of the project. The soils information was obtained from the U.S. Department of Agriculture, Natural Resources Conservation Services, Dated January 4, 2007, Titled "Soil Survey Geographic (SSURGO) database for San Diego County, California". Refer to Meadowood Pre- and Post-project Soil Information Exhibits in Appendix A. In addition, soil information has been added to all of the drainage workmaps. The following summary describes the pre-project and post-project drainage basins in more detail.

Drainage basin 100 (pre-project) is located in the most northerly portion of the project. This pre-project drainage basin is 11.2 acres sloping northeast to southwest. It is comprised entirely of soil type C/D and the main ground cover is native shrub vegetation. Drainage basin 1000 (post-project) is 9.6 acres of undisturbed land without any development proposed. There is a proposed street (Street D) bisecting this drainage basin. The flows from the northern portion of the proposed Street D are conveyed southerly to drainage basin 3000; therefore, no developed flows commingle with the undeveloped/natural flows. The flows associated from Drainage Basin 1000 are discharged at the same location as in the pre-project condition and then conveyed overland to

Horse Ranch Creek. Due to the fact that the post-project flow rates are less than the pre-project flow rates, no detention has been proposed for this drainage basin.

Drainage Basin 200 (pre-project) is the second drainage basin North to South. This pre-project drainage basin is 62.1 acres. The existing ground cover is mainly native shrub with a small portion consisting of an orchard tree plantation in the southern parts of the drainage basin. The existing soil type is mainly C/D with soil type B in the middle regions and southwest boundary of the drainage basin. In post-project condition, this drainage basin is divided into two segments; 2000A (51.0 acres) and 2000B (8.5 acres). Only 9.4 acres within drainage basin 2000A is proposed residential development, the remainder 41.6 acres (approximately 82%) will remain undisturbed/natural. The residential development consists of single-family residential lots, roads, manufactured slopes, noncontiguous sidewalks, trails, and detention basin (DB2). Drainage basin 2000B conveys flows of undisturbed/natural land by means of a clean water system (i.e. A system dedicated for conveying flow from natural, undisturbed area without commingling with runoff from the developed areas). The runoff associated with drainage basin 2000B is combined with 2000A, downstream of the detention basin, and is discharged at the same location as in the pre-project condition. The detention basin will detain the 100-year post project flow rates to pre-project levels. The detained flows are then conveyed overland to Horse Ranch Creek.

Drainage basin 300 (pre-project) is 58.5 acres and is the third drainage basin North to South, sloping East to West. The existing ground cover consists of native shrub in the easterly portions and orchard tree plantation in the westerly regions. The soil types for this drainage basin consist of C/D in the eastern portion and soil type B in the western region. Drainage basin 3000 (post-project) is 61.6 acres, which includes the northern part of Street D (as discussed in the basin 1000 discussion). Approximately 41% of drainage basin 3000 is comprised of undisturbed/natural land in the easterly regions of this drainage basin. The developed area for this drainage basin is approximately 21.0 acres, comprised of single-family residential lots, roads, manufactured slopes, trails, noncontiguous sidewalks, and detention basin occupying the westerly regions. The runoff associated with drainage basin 3000 is conveyed to a detention basin (DB3) and ultimately be discharged at the same location as in the pre-project condition.

The detention basin will detain the 100-year post project flow rates to pre-project levels. The detained flows are then conveyed overland to Horse Ranch Creek.

Drainage basin 400 (pre-project) is 11.1 acres and is located southwest of drainage basin 300, sloping southeast to northwest. The ground cover comprises of orchard tree plantation. The soil types for this drainage basin consist of C/D in the southern region and soil type B in the northern regions. Drainage basin 4000 (post-project) is comprised of 11.2 acres and proposed single-family residential lots, roads, manufactured slopes, trails, noncontiguous sidewalks, and detention basin occupying the westerly regions. The runoff associated with drainage basin 4000 is conveyed to a detention basin (DB4) and ultimately be discharged at the same location as in the pre-project condition. The detention basin will detain the 100-year post project flow rates to pre-project levels. The detained flows are then conveyed overland to Horse Ranch Creek.

Drainage basin 700A and 700B is comprised of 235.8 acres and is located in the central portion of the project. The general slope trend of this drainage basin is northeast to southwest. The existing ground cover consists of small sections of shrub vegetation. The soil types for this drainage basin consist of C/D in the eastern and soil type B in the western regions. Drainage basin 7000A and 7000B is comprised of 239.8 acres. Approximately 48% of the drainage basins areas are comprised of undisturbed/natural land. The developed area for these drainage basins is comprised of a school site, single-family residential lots, multi-family, roads, manufactured slopes, noncontiguous sidewalks, trail, park, and a detention basin located within the park. The easterly regions of these drainage basins remain undisturbed/natural. The runoff associated with drainage basin 7000A and 7000B is conveyed to one of two detention basins (DB7A or DB7B). The detention basins will detain the 100-year post project flow rates to pre-project levels. The detained flows will be conveyed to a discharge point within the Horse Ranch Creek Floodplain. At this discharge point, the 100-year detained flows in the post-project condition will mimic the pre-project condition.

Drainage basin 800 (pre-project) is 50.7 acres and is the second drainage basin South to North sloping East to West. The ground cover consists of shrub vegetation and orchard tree plantation in the eastern regions and grassland in the western portions. The soil types for this drainage basin

consist of C/D in the eastern and soil type B in the western regions. In the post project condition, basin 8000 (post-project) is split into two major drainage basins 8000A and 8000B. Drainage basin 8000A is 26.8 acres from which 14.6 acre comprise of residential lots and roads, occupying the western regions of this drainage basin. Approximately 47% of drainage basin 8000A is comprised of undisturbed/natural land in the easterly regions of this drainage basin. Drainage basin 8000B (post-project) is 26.1 acres from which 11.0 acres comprise of residential lots and roads, occupying the western regions of this drainage basin. Approximately 53% of drainage basin 8000B is comprised of undisturbed/natural land in the easterly regions of this drainage basin. Each Drainage Basin has a detention basin (DB8A and DB8B) that will detain the 100-year post project flow rates to pre-project levels. The detained flows will ultimately discharge at the same location as in the pre-project condition (within the 100-year Horse Ranch Creek floodplain).

Drainage Basin 900 (pre-project) is 21.4 acres and consists of orchards, natural vegetation, and a portion of SR-76. The vegetation consists of shrub vegetation and orchard tree plantation in the eastern regions and grassland in the western portions. The soil types for this drainage basin consist of types A, C, and D in the eastern portion and soil type B in the western regions. The general drainage trends convey flow overland in a westerly direction. In the post-project condition a portion of Drainage Basin 9000 is developed, with approximately 57% of the drainage basin remaining undeveloped. The proposed development includes improvements to Horse Ranch Creek Road and a sewer treatment plant. The portion of area east of Horse Ranch Creek Road remains undisturbed. The sewer treatment plant has a total of four treatment basins that will be designed to capture and retain the 100-year storm, and thus do not contribute any runoff to the storm drain system. Drainage Basin 9000 consists of 18.3 acres, not including the area from the sewer treatment basins. The difference in acreage between the pre- (Drainage Basin 900) and post-project (Drainage Basin 9000) conditions is due in part to two reasons; the proposed improvements to Horse Ranch Creek Road direct a larger area to the drainage basin just north of the southern most drainage basin (Basin 900/9000). Also, the sewer treatment basins will be designed to capture and retain the 100-Year storm, and thus, the area associated with those treatment basins is not counted in the post-project condition.

In both the pre- (Drainage Basin 900) and post-project (Drainage Basin 9000) condition, the runoff is conveyed to existing improvements associated with the SR-76. In the pre-project condition, a trapezoidal channel that is aligned along the north side of the SR-76 captures the runoff associated with Drainage Basin 900. This trapezoidal channel conveys the storm flows to a dual 30-inch Reinforced Concrete Pipe (RCP) crossing that conveys the runoff from the north side of SR-76 to the south side of SR-76. The dual system outfalls into a concrete trapezoidal channel that conveys flows along the southern portion of SR-76 and ultimately outlets the flows into Horse Ranch Creek. In the post project condition, the trapezoidal channel that is aligned along the north side of SR-76 will be replaced with proposed storm drain and brow ditches. These proposed improvements will capture and convey the flows associated with Drainage Basin 9000 to the existing dual 30-inch RCP crossing at SR-76. At this point, the flow patterns are the same as the pre-project condition. The existing dual 30 inch RCP and trapezoidal channel were designed for the ultimate flowrate. Therefore, detention for the 100-year storm event is not proposed for this drainage basin. More discussion regarding this is included in the following sections of this report.

The following table summarizes the results of the Pre- and Post-Project Modified Rational Method analyses:

Table 1
Summary of Pre- and Post-Project Hydrologic Analyses for Meadowood

Drainage Basin		100-Year Flow Rate (cubic feet per second)			Detention Volume (Ac-ft)	Drainage Area (acres)	
Pre	Post	Pre	Post (undetained)	Post (detained)	Post	Pre	Post
100	1000	20.0	17.8	n/a	n/a	11.2	9.6
200	2000*	85.6	108.1	81.8	0.9	62.1	59.5
300	3000	79.1	131.19	79.1	3.94	58.5	61.6
400	4000	16.9	39.14	16.9	1.25	11.1	11.2
700A	7000A	299.9	505.8	298.8	18.8	235.8	194.5
700B	7000B		99.0		4.2		45.3
800	8000A	84.8	99.3	83.9	1.78	50.7	26.8
	8000B		80.3		2.81		26.1
900	9000	36.7	46.0	n/a	n/a	21.4	18.3

*Information provided is for the combination of Drainage Basin 2000A and 2000B

The total drainage areas for the pre- and post-project condition associated with the on-site hydrologic analyses for this project are 450.8 and 452.9 acres, respectively. The 2.1 acre discrepancy is due to a combination of the improvements associated with Horse Ranch Creek Road and the proposed water towers located in Drainage Basin 7000. It is important to note that while there is a slight increase in area, the peak flow exiting the project has not increased because where required, detention has been proposed so that the project does not adversely impact the downstream receiving waters

From the results, it was determined that Drainage Basins 2000, 3000, 4000, 7000A and 7000B, 8000A and 8000B, and 9000 experienced an increase when comparing the 100-year post-project flow rate to the pre-project flow rate. Therefore, for these drainage basins, with the exception of Drainage Basin 9000 it was determined that a detention basin would be constructed to detain post-project flow rates to pre-project levels. The detention analyses are addressed later in this report.

In both the pre- and post project conditions of Drainage Basin 900/9000, the runoff is conveyed under the SR-76 via dual 30-inch pipes to an existing concrete lined trapezoidal channel that eventually outlets into Horse Ranch Creek. These existing improvements were designed by URS. The design is included in a report titled, "*Drainage Report - State Route 76 Widening and Realignment from Interstate 15 to 2.2 KM East, San Diego County,*" dated December 21, 2007 (herein referred to as the URS Drainage Report). It is important to note that although the post-project condition flow rate is larger than the pre-project flow rate, the increase when comparing the post-project flow rate to the URS Drainage Report is only 0.7 cfs. It is further important to note that the URS Corporation utilized this flow rate to design the improvements that convey the flows associated with Drainage Basin 900/9000. Therefore, in order to determine if the post-project condition of Drainage Basin 9000 will have a negative impact on the downstream improvements associated with SR-76, hydraulic analyses were prepared to model this 100-year undetained flow rate in the existing improvements. It was determined that this slight increase did not have an impact on the existing system, therefore detention was not proposed. This hydraulic analysis is discussed later in this report.

The detailed hydrologic analyses for the 100-year Pre- and Post-Project conditions for Meadowood are located in Appendix B and C. The corresponding workmaps are located in Map Pockets 1 through 4. The hydraulic analyses associated with drainage basin 9000 are located in Appendix F and discussed later in this report.

OFFSITE ANALYSES:

100-year hydrologic analyses were performed for several off site improvements. The drainage basin delineations were based on existing topographic information and the grading associated with the off-site improvements. To be conservative, developed runoff coefficients were utilized based on the adjacent developments proposed land uses. These adjacent developments are known as Campus Park and Campus Park West. See Appendix L for backup information. Upon final design, this hydrologic analysis will be utilized to perform detailed hydraulics to size the storm drain improvements and culvert crossings associated with the off site improvements.

In total, nine offsite drainage basins were identified and analyzed. These basins are herein referred to as drainage basins 11000, 14000, 15000, 16000, 17000, 18000, 19000, 20000 and 21000. The following text describes each of the drainage basins in more detail.

Drainage Basin 11000 is located north and south of the proposed Pala Mesa Heights Drive and east of the proposed Horse Ranch Creek Road. The drainage basin slopes east to west. The existing soil type is mainly B with a small portion, located in the northeast portion of the drainage basin, consisting soil type C. The drainage basin total area is 45.4 acres. Of the 45.4 acres, 25.0 acres consist of proposed Residential Development, Roads and Professional Office use. The residential development consists of single-family residential lots, interior roads, manufactured slopes and sidewalks. The remainder 20.4 acres (approximately 45%) will remain undisturbed/natural. This drainage basin is proposing two points of discharge that will convey flows overland to Horse Ranch Creek. The two points are located immediately west of Horse Ranch Creek Road. The combined 100-year flow rate from these two points of discharge is 113.8 cubic feet per second (cfs).

Drainage Basin 14000 is 38.7 acres and is located immediately south of drainage basin 11000 and east of Horse Ranch Creek Road. The drainage basin slopes east to west. Drainage basin 14000 includes flows from the onsite portion of Meadowood project as well as offsite area. These onsite flows are from drainage basin 1000. The onsite hydrologic analysis determined that the 100-year post-project flow rate from the 9.6 ac drainage basin is 17.8 cfs. These flows are conveyed through drainage basin 14000. The following text discusses the remaining 29.1 ac associated with drainage basin 14000. The existing soil type is mainly type B with a small portion, located in the northeast portion of the drainage basin, comprised of soil type C. The proposed land use consists of Single Family Residential, Roads, Professional Office and a Sports Center. There is no area within this drainage basin that is undisturbed in the ultimate condition. This drainage basin has one proposed point of discharge located immediately west of Horse Ranch Creek Road that will convey the flows overland to Horse Ranch Creek. The 100-year flow rate at this point of discharge is 93.8 cfs.

Drainage Basin 15000 is 119.2 acres and is located south of drainage basin 14000 and east of Horse Ranch Creek Road. The drainage basin slopes east to west. Drainage basin 15000 includes flows from the onsite portion of Meadowood project as well as offsite area. These onsite flows are from drainage basin 2000. The onsite hydrologic analysis determined that the 100-year detained post-project flow rate from the 59.5 ac drainage basin is 81.8 cfs. These flows are conveyed through drainage basin 15000. The following text discusses the remaining 59.7 ac associated with drainage basin 15000. The existing soil type is mainly B with a small portion, located in the northeast portion of the drainage basin, comprised of soil type C. The proposed land use consists of Single Family Residential, Roads, Multi Family, Town Center and Sports Center. There is no area within this drainage basin that is undisturbed in the ultimate condition. This drainage basin has one point of discharge located immediately west of Horse Ranch Creek Road that will convey the flows overland to Horse Ranch Creek. The 100-year flow rate at this point of discharge is 206.1 cfs.

Drainage Basin 16000 is 91.1 acres and is located south of drainage basin 15000 and east of Horse Ranch Creek Road. The drainage basin slopes east to west. Drainage basin 16000 includes flows from the onsite portion of Meadowood project. These onsite flows are from drainage basin 3000 and 4000. The drainage areas for 3000 and 4000 are 91.1 acres and 11.2 acres, respectively. Both onsite drainage basins propose detention. The onsite hydrologic analysis determined that the 100-year detained post-project flow rate from the drainage basins are 74.1 cfs and 16.9 cfs, respectively. These flows are then conveyed through drainage basin 16000. The following text discusses the remaining 18.3 ac associated with drainage basin 16000. The existing soil type is mainly type B with a small portion, located in the northeast portion of the drainage basin, comprised of soil type D. The proposed land use consists of Single Family Residential, Roads and Multi Family. There is no area within this drainage basin that is undisturbed in the ultimate condition. This drainage basin has one point of discharge located immediately west of Horse Ranch Creek Road, and south of Street "B" that will convey the flows overland to Horse Ranch Creek. The 100-year flow rate at this point of discharge is 110.9 cfs.

Drainage Basin 17000 is 2.2 acres and is located south of Pala Mesa Drive. The drainage basin slopes south to north. The existing soil is comprised of type B only. The ultimate land use is

associated with Campus Park and consists of Light Industrial. This drainage basin has one point of discharge located north of Pala Mesa Drive that will convey the flows overland immediately to Horse Ranch Creek. The 100-year ultimate flow rate at this point of discharge is 3.1 cfs.

Drainage Basin 18000 is 1.3 acres located along Pala Mesa Drive northeast of drainage basin 17000. The drainage basin slopes west to east. The existing soil is comprised of type B only. The proposed land use consists of Road only. This drainage basin has one point of discharge, located north of Pala Mesa Drive that will convey the flows to Horse Ranch Creek. The 100-year ultimate flow rate at this point of discharge is 7.9 cfs.

Drainage Basin 19000 is 5.7 acres and is located southeast of drainage basin 18000 and south of Pala Mesa Drive. The drainage basin slopes south to north. The existing soil is comprised of type B only. The ultimate land use is associated with Campus Park and consists of Light Industrial along with the adjacent road. This drainage basin has one point of discharge located north of Pala Mesa Drive that will convey the flows immediately to Horse Ranch Creek. The 100-year ultimate flow rate at this point of discharge is 37.5 cfs.

Drainage Basin 20000 is 4.4 acres and is located at the intersection of the existing Pankey Road /Pala Mesa Drive and Street "R". The existing soil type is comprised of type B only. The ultimate land use is associated with Highway Commercial (Campus Park) and Road. This drainage basin has one point of discharge located west of Pala Mesa Drive/existing Pankey Road that will convey the flows immediately to Horse Ranch Creek. The 100-year ultimate flow rate at this point of discharge is 19.84 cfs.

Drainage Basin 21000 is 9.4 acres. The drainage basin is surrounded by Pala Road/SR 76 to the north, existing Pankey Road to the west, Street "R" to the north and proposed Meadowood Project to the east. The drainage basin slopes southeast to northeast. The existing soil is comprised of type B only. The ultimate land use consists of Highway Commercial (Campus Park) only. This drainage basin has one point of discharge located north of Street "R" that will convey the flows to Horse Ranch Creek. The 100-year ultimate flow rate at this point of discharge is 25.4 cfs.

The following table summarizes the hydrologic results for the offsite drainage basins:

Table 2

Summary of Post-Project Hydraulic Analyses For Meadowood Off Site Improvements

Drainage Basin	100-Year Post-Project Flow Rate (cubic feet per second)	Drainage Area (acres)
11000	113.8	45.4
14000	93.8	38.7
15000	206.1	119.2
16000	110.9	91.1
17000	3.1	2.2
18000	7.9	1.3
19000	37.5	5.7
20000	19.8	4.4
21000	25.4	9.40

All of the proposed offsite improvements we analyzed with an ultimate runoff coefficient. All of the offsite drainage basins have a point of discharge that conveys the flows to Horse Ranch Creek. Upon final design detailed hydraulics will be performed with this ultimate 100-year flow rate. Because a runoff coefficient was utilized based on the ultimate build out of the adjacent projects and pre-project drainage basins were maintained, no pre-project hydrologic analyses were preformed. Detailed output of the hydrologic analyses for each basin is located in Appendix L and the corresponding workmaps are located in Map Pocket 6.

DETENTION METHODOLOGY & CRITERIA

The detention basins have been designed to attenuate post-project peak flow rates to pre-project levels for the 100-year storm event. For the detention basin design, Modified Rational Method hydrologic analyses were performed to determine the 100-year 6-hour peak runoff for both the pre-and post-project conditions in order to provide peak flow rate reduction for these storms (please refer to previous section). Based on the rational method analyses, determination was made on a drainage basin by drainage basin basis as to whether detention was required or not. For the drainage basins where detention was determined to be appropriate, a Modified Rational Method hydrograph synthesizing procedure was used to generate inflow hydrographs for the detention basin based on the Modified Rational Method results. The United States Army Corps of Engineers' HEC-1 hydrologic model was used to analyze the detention volume requirements for the basin.

Modified Rational Method Hydrograph Synthesizing Procedure Methodology and Criteria

The sizing of a detention facility requires an inflow hydrograph to obtain the necessary storage volume. The Modified Rational Method only yields a peak discharge and time of concentration, and does not yield a hydrograph. In order to convert the peak discharge and time of concentration into a hydrograph, a Modified Rational Method hydrograph synthesizing procedure was used. Please refer to Section 6 of the June 2003 San Diego County Hydrology Manual for a detailed explanation of this procedure.

The Modified Rational Method hydrograph synthesizing procedure was performed for the post-project 100-year 6-hour storm events for all basins tributary to the detention basins.

HEC-1 Methodology and Criteria

The 100-year 6-hour storm event hydrographs were used in the HEC-1 hydrologic model in order to determine the volume required to attenuate post-project peak outflow rates to their pre-project peak flow rates. At this TM level of submittal volume calculations shall be performed for the 100-year event. Detailed outlet works, emergency spillways, and appropriate free board for each detention basin will be designed during final design.

DETENTION RESULTS

The Meadowood project has proposed seven aboveground detention basins, DB2, DB3, DB4, DB7A, DB7B, DB8A, and DB8B to attenuate the 100-year storm event and two underground vaults which are not designed for 100-year detention. This section only refers to the seven aboveground detention basins. For information regarding the design of the underground vaults, associated with Drainage Basin 9000, refer to the project's Hydromodification Management Study. DB2 is associated with drainage basin 2000A and 2000B (only developed flows associated with Drainage Basin 2000A will enter the detention basin), DB3 with drainage basin 3000, DB4 with drainage basin 4000, DB7A and DB7B with drainage basin 7000A and 7000B, DB8A and DB8B with drainage basin 8000A and 8000B. Drainage Basin 1000 and 9000 do not propose 100-year detention (discussed in more detail in the following text).

In addition to attenuating the 100-year storm event, all seven of the detention basins, with the exception of DB2 are sized to meet water quality ("settling basins") and hydromodification management requirements ("ponds"). DB2 is sized for hydromodification management requirements, but is not sized for water quality. For information regarding the settling basins and/or water quality measures for Meadowood, please refer to the report titled, "Storm Water Management Plan for Priority Projects (Major SWMP) for Meadowood Vesting Tentative Map (VTM)", dated April 1, 2009, prepared by Rick Engineering Company. For information regarding the ponds and/or hydromodification management measures (including the two underground vaults associated with drainage basin 9000) for Meadowood, please refer to the report titled, "Hydromodification Management Study for Meadowood Vesting Tentative Map (VTM)", dated April 1, 2009, prepared by Rick Engineering Company.

Drainage basin 1000 (post-project) is located in the most northerly portion of the project. This drainage basin conveys undisturbed/natural flows without introducing any post-project development flows by means of a clean water system. The clean water system conveys flows east of Street D in a storm drain that immediately outfalls west of Street D, thus maintaining pre-project drainage patterns. The flows from the northern portion of the proposed Street D are

conveyed southerly to drainage basin 3000. The 100-year pre-project peak flow rate (drainage basin 100) is 20.0 cfs and the 100-year post-project peak flow rate is 17.8 cfs. Since the 100-year post-project flow rate is less than the 100-year pre-project flow rate, no detention basin is proposed.

Drainage Basin 2000 (post-project) is the second drainage basin North to South. Drainage basin 2000 is divided into two segments, 2000A and 2000B. Drainage basin 2000B conveys flows from 8.5 acres of undisturbed/natural land by means of a clean water system (i.e. A system dedicated for conveying flow from natural, undisturbed area without commingling with runoff from the developed areas). The flows associated with Drainage Basin 2000B do not enter the proposed detention basin. Drainage basin 2000A (post-project) consists of post-developed and natural flows. A proposed storm drain system conveys these flows to DB2 located at the southwest corner of this drainage basin. Drainage basins 2000A and 2000B outfall at the same location and maintain pre-pre-project drainage patterns. The 100-year post-project flow rates are attenuated to 100-year pre-project flow rates. The 100-year pre-project flow rate is 85.6 cfs and the combined outfalls in the post-project condition for drainage basins 2000A (detained) and 2000B (undetained) are 82.0 cfs. Backup information and the detention analyses for DB2 are located in Appendix D and E, respectively.

Drainage basin 3000 (post-project) is the third drainage basin North to South. Drainage basin 3000 (post-project) is 61.6 acres, which includes the northern part of Street D. Approximately 41% of drainage basin 3000 is comprised of undisturbed/natural land in the easterly regions of this drainage basin. The developed area for this drainage basin is approximately 21.0 acres, comprised of single-family residential lots, roads, manufactured slopes, trails, noncontiguous sidewalks, and detention basin occupying the westerly regions. The 100-year post-project flow rates are attenuated to 100-year pre-project flow rates. The 100-year pre-project flow rate is 79.1 cfs and the 100-year detained post-project flow rate is 79.1 cfs. Backup information and the detention analyses for DB3 are located in Appendix D and E, respectively.

Drainage basin 4000 (post-project) is located at southwest corner of drainage basin 3000 (post-project). Drainage Basin 4000 consists of single family residential lots, roads, and manufactured

slopes. The 100-year post-project flow rates are attenuated to 100-year pre-project flow rates. The 100-year pre-project flow rate is 16.9 cfs and the 100-year detained post-project flow rate is 16.9 cfs. Backup information and the detention analyses for DB4 are located in Appendix D and E, respectively.

Drainage basin 7000 (post-project) is located south of Drainage Basin 4000. Drainage Basin 7000 drains to one of two detention basins, DB7A and DB7B. For the purposes of this report, the tributary area that drains to DB7A will be referred to as 7000A, and the tributary area that drains to DB7B will be referred to as 7000B. The soil types for 7000A consist of C/D in the eastern and soil type B in the western regions. 7000A is comprised of 194.5 acres. Approximately 45% of the drainage basin's area is comprised of undisturbed/natural land. The developed area for this drainage basin is comprised of single-family residential lots, multi-family, roads, manufactured slopes, noncontiguous sidewalks, trail, park, and a detention basin located within the park. The easterly regions of these drainage basins remain undisturbed/natural. The post project area that drains to DB7B (7000B) is 45.3 acres. Approximately 60% of 7000B is comprised of undisturbed/natural land in the easterly regions of this drainage basin. The developed portion of this drainage basin is approximately 17.9 acres of school site, roads, manufactured slopes, noncontiguous sidewalks, and trails. The 100-year post-project flow rates are attenuated to 100-year pre-project flow rates. As mentioned previously, these detained flows combine and outfall into the Horse Ranch Creek floodplain. This point of discharge will release detained flows that will mimic pre-project conditions. The 100-year combined (Drainage Basin 700A and 700B) pre-project flow rate is 299.9 cfs and the 100-year combined detained post-project flow rate is 298.8 cfs. Backup information and the detention analyses for DB7A and DB7B are located in Appendix D and E, respectively.

Like Drainage Basin 7000, Drainage Basins 8000 drains to one of two detention basins, DB8A, and DB8B. The tributary area that drains to DB8A will be referred to as 8000A and the tributary area that drains to DB8B will be referred to as 8000B. 8000A is 26.8 acres from which 14.6 acres is comprised of residential lots and roads, occupying the western regions of this drainage basin. Approximately 47% of 8000A is comprised of undisturbed/natural land in the easterly regions of this drainage basin. Drainage basin 8000B (post-project) is 26.1 acres from

which 11.0 acres is comprised of residential lots and roads, occupying the western regions of this drainage basin. Approximately 53% of 8000B is comprised of undisturbed/natural land in the easterly regions of this drainage basin. The detained flows from each detention basin have been combined and as a result the 100-year post-project flow rates are attenuated to 100-year pre-project flow rates. The 100-year pre-project flow rate is 84.8 cfs and the detained post-project flow rate is 83.9 cfs. Backup information and the detention analyses for DB8A and DB8B are located in Appendix D and E, respectively.

Drainage Basin 900/9000 (pre/post) is the most southerly on-site drainage basin. As stated previously, 100-year detention is not proposed for this drainage basin because the downstream exiting drainage, improvements were designed to convey the ultimate buildout condition. Hydraulic analyses were performed for the existing improvements utilizing the post-project (undetained) 100-year flow rate from Drainage Basin 9000. Based on the results of the hydraulic analysis it was determined that the post-project flows associated with Drainage Basin 9000 do not have an adverse impact of the hydraulics of the downstream existing storm drain improvements. Therefore, no detention is proposed for Drainage Basin 9000. Further discussion of this analysis is located in this section following Table 3.

Table 3
Summary of 100-Year Detention Analyses

Drainage Basin		100-Year Flow Rate (cubic feet per second)			Detention Volume (Ac-ft)
Pre	Post	Pre[1]	Post[1] (undetained)	Post (detained)	Post
100	1000	20.0	17.8	n/a	n/a
200	2000	85.6	108.1	82.0	0.9
300	3000	79.1	131.19	79.1	3.94
400	4000	16.9	39.14	16.9	1.25
700A	7000A	299.9	505.8	298.8	18.8
700B	7000B		99.0		4.2
800	8000A	84.8	99.3	83.9	1.78
	8000B		80.3		2.81
900	9000	36.7	46.0	n/a	n/a

(1) See Modified Rational Method
(2) Unless otherwise stated, this volume includes Hydromodification Management and Water Quality. Refer to project's SWMP and Hydromodification Management Studies.

At this TM level of submittal only volume calculations have been performed for the 100-year storm event. Detailed outlet works, emergency spillways, and the appropriate free board for each detention basin will be designed during final design. In addition, all outfalls will be protected as appropriate. The outfall analyses will be performed during final design. It is important to note that no downstream analyses have been performed for this project. All of the analyses have been concluded at or near the western property line. This is in part due to the fact that the project is mitigating for any increase in flow within the project footprint and mimicking pre-project characteristics once the flows exit the project site for the 100-year storm event. Thereby not requiring analyses further downstream.

Table 3 shows that the 100-year post-project flow rates do not exceed that of the 100-year pre-project flow rate for all of the drainage basins with the exception of 900/9000. While the post project flow rate is larger when compared to the pre-project flow rate, the flows are not significantly larger when compared to the design flows of the existing downstream improvements. As discussed previously, the existing downstream improvements, associated

with the realignment of SR 76, were designed for ultimate buildout. Therefore, when the post-project flow rate for Drainage Basin 9000 was compared to the flow rate in the URS Drainage report the flows were very similar. However, downstream hydraulic analyses were performed for the existing improvements comparing the flow rate from the URS Drainage Report to the 100-year flow rater from Drainage Basin 9000. The hydraulic analyses determined that there were no significant impacts, therefore, no detention is proposed for Drainage Basin 9000. The hydraulic analyses are discussed more thoroughly in the following text

HYDRAULIC ANALYSES FOR DRAINAGE BASIN 9000:

WSPGW

The County of Los Angeles Water Surface Pressure Gradient (WSPGW) program was used to perform the hydraulic analyses for the existing storm drain improvements located downstream of Drainage Basin 9000. The WSPGW program computes and plots uniform and non-uniform steady flow water surface profiles and pressure gradients in open channels or closed conduits with irregular or regular sections. The flow in a system may alternate between supercritical, sub-critical, or pressure flow in any sequence. The program uses basic mathematical and hydraulic principles to calculate data such as cross-sectional area, wetted perimeter, normal depth, critical depth, pressure, and momentum. The following text provides the information related to the input parameters:

Topographic Information:

The hydraulic modeling prepared for the pre-project condition analysis is based on the URS Drainage Plans for SR-76, signed 2-14-2008 (EA 231501, KM Post R28.0-30.1). However, the units were converted from Metric to English units and a datum shift of (–2.43) was used to convert the plans from NAVD 88 to NGVD 29.

The hydraulic modeling prepared for the post-project condition analysis is a combination of the URS Drainage Plans for SR-76, along with the proposed on-site storm drain alignment for the Meadowood Vesting Tentative Map. The proposed alignment can be found in Appendix F of this report.

Hydrologic Information:

Two hydraulic analyses were performed. The first analysis was performed utilizing URS' hydrologic information (pre-project) and the second analysis performed utilized the 100-year flow rate determined in this report from Drainage Basin 9000 (post-project). The flow rates incorporated into the post-project condition hydraulic analyses were taken from the Rational Method results for Drainage Basin 9000 for the Dual 30-Inch Culverts under SR-76 and incrementally added the extra flow, from the URS Drainage Report, at the specified locations, downstream of the culverts under SR-76.

Starting Water Surface Elevations:

The downstream boundary condition for the WSPGW analyses (i.e. starting water surface elevation) was based on normal depth, which is above the 100-year water surface elevation associated with Horse Ranch Creek.

WSPGW RESULTS:

In order to determine the impacts of the Meadowood project to the existing SR-76 improvements, WSPGW analyses were created for both the pre- and post-project conditions. The pre-project condition analysis begins at the location in which the existing trapezoidal channel outfalls into Horse Ranch Creek, and ends approximately 400 feet upstream of the dual 30-inch RCP crossing at SR-76. Downstream of the SR-76 crossing, this analysis models the existing concrete lined trapezoidal channel along the southern side of SR-76, as well as the dual 42-inch RCP crossing at Pankey Road. Upstream of the SR-76 crossing, the pre-project condition analysis models the existing vegetated trapezoidal channel. The post-project condition analysis models the same improvements downstream of the dual 30-inch RCP crossing at SR-76, and the tentative storm drain alignment upstream of the SR-76 crossing. The post-project condition analysis ends approximately 900 feet upstream of the dual 30-inch SR-76 crossing, where the runoff from the undeveloped portion of Drainage Basin 9000 enters the storm drain system.

When comparing the pre- and post-project WSPGW analyses it was determined that there is negligible impact to the existing downstream improvements as a result of the Meadowood

Project. The table below summarizes the results of the WSPGW analyses at key points along the WSPGW.

Table 4

Summary of Pre- and Post-Project WSPGW Analyses for the System Downstream of Drainage Basin 900/9000

WSPGW Station	Identifier	Pre-Project			Post-Project		
		Q (cfs)	WSEL (ft)	Velocity (fps)	Q* (cfs)	WSEL (ft)	Velocity (fps)
0.0	Horse Ranch Creek	62.2	258.2	7.5	62.8	258.2	7.5
475.7	D/S Dual 36" Pipes at Pankey Road	56.1	261.5	4.2	56.8	261.5	4.3
587.2	U/S Dual 36" Pipes at Pankey Road	56.1	262.8	1.4	56.8	262.8	1.4
1129.4	D/S Dual 30" Pipes at SR-76	45.3	264.5	4.7	46.0	264.6	4.8
1250.8	U/S Dual 30" Pipes at SR-76	45.3	264.8	5.3	46.0	264.8	5.3

*Differences in the *C* (Post-Project Q – Pre-Project Q) are due to rounding.

The WSPGW analyses summarized above show that the post-project condition would have negligible impact to the downstream system. Because there is negligible impact, including the impact on the overall watershed, detention for the 100-year storm event is not necessary and therefore has not been designed for the post-project condition of Drainage Basin 900/9000. The hydraulic analyses and corresponding workmaps are located in Appendix F.

HORSE RANCH CREEK HYDROLOGIC METHODOLOGY AND CRITERIA

Hydrologic analyses were preformed for the Horse Ranch Creek watershed to determine a 100-year flow rate so that a floodplain analysis could be performed for Horse Ranch Creek. According to the June 2003 *San Diego County Hydrology Manual,* the Natural Resources Conservation Service (NRCS) hydrologic method shall be used for watersheds that are approximately one square mile and greater in size. The watershed that is associated with the Meadowood VTM - Horse Ranch Creek is 11.97 square miles. Therefore, the NRCS hydrologic method was used to determine the 100-year existing condition peak discharge rate for the watershed.

A 24-hour storm event, that has a nested storm pattern with the two-thirds/one-thirds rainfall distribution, based on the United States Army Corps of Engineers (USACE) Hydrologic Engineering Center (HEC) Training Document Number 15 was utilized for these analyses. The nested 24-hour storm event utilized has the 6-hour and 24-hour duration storm events built into the model, eliminating the need to run two models (6-hour & 24-hour), as in the previous methodology outlined in the 1985 San Diego County Hydrology Manual. The HEC-1 program allows the engineer to simulate both natural and improved or developed watersheds. Parameters used to perform the NRCS hydrologic method calculations include basin area, lag time, runoff curve number, and rainfall distribution.

The major drainage basin boundary was delineated based on USGS topographic maps to determine the basin area. Please refer to the exhibit, titled "Meadowood VTM – Horse Ranch Creek Watershed Drainage Basin Map," in Map Pocket 5.

The precipitation data were transformed to rainfall distributions using the methodology outlined in the June 2003 *San Diego County Hydrology Manual.* The NRCS Synthetic unit hydrograph with curvilinear transformation was used to develop runoff hydrographs for the watershed. This unit hydrograph is dimensionless and is a function of the watershed area and lag time. Lag time for the watershed was calculated using criteria presented in the June 2003 *San Diego County Hydrology Manual.*

The runoff curve number was determined based on soil, land use, and ground cover maps. The soil data used to create the soil map, titled "Hydrologic Soil Group Information," was from the U.S. Department of Agriculture-Soil Survey Geographic (SSURGO) database for San Diego County, published in 2007. Because the project is proposing to attenuate the post-project flow rates to pre-project levels for the 100-year storm, prior to the runoff exiting the project site and entering Horse Ranch Creek, only an existing condition hydrologic analysis was performed for the watershed. Therefore, the land use data used to create the existing land use map, titled "Existing Hydrologic Land Use Information," was from the 2008 SanGIS Existing Land Use. For areas of "agricultural," "open space," and "vacant" land uses, ground cover data was used. The ground cover map, titled "Ground Cover – Vegetative & Man Made," was prepared by the United States Department of Agriculture, Soil Conservation Services and published by the San Diego Planning Department for the Comprehensive Planning Organization in 1969. An additional map, titled "Hydrologic Land Use and Soils Information for Curve Number Calculation," was created to show grids at ½-inch intervals with combinations of land use/ground cover and soil group data on an aerial photo. The map is titled "Hydrologic Land Use and Soils Information for Curve Number Calculation." The aerial photo was from the January 2008 Landiscor Aerial Photo. The runoff curve number was calculated based on the method as outlined in the June 2003 *San Diego County Hydrology Manual.* The HEC-1 was performed to determine the 100-year flow rate for the Horse Ranch Creek watershed. The discharge rate was used for Horse Ranch Creek floodplain analyses.

Support material for the NRCS hydrologic method parameters is provided in Appendix G of this report.

HORSE RANCH CREEK HYDROLOGIC RESULTS

The watershed that is associated with the Horse Ranch Creek is 11.97 square miles. The drainage basin has a general drainage pattern that conveys flows in a southerly direction to the point of interest at the southern end of the watershed.

Based on an aerial photo review in conjunction with a site visit, the estimated mean of the basin factor (i.e. "n-bar" – roughness values from Manning's formula) used in calculating Corps lag was 0.050. The calculated Corps lag was then used to calculate time to peak, T_p. In order to calculate lag as defined by the NRCS (i.e. NRCS lag), the period of effective rainfall (D) was determined. See Appendix G for this calculation.

For the drainage basin delineation, please refer to Map Pocket 5 for the workmap entitled "Meadowood VTM – Horse Ranch Creek Watershed Drainage Basin Map." A 100-year flow rate of 8,951 cubic feet per second (cfs) for the 11.97 square miles watershed was determined from the hydrologic analysis. The HEC-1 computer output is provided in Appendix H. This 100-year flow rate was utilized in the Horse Ranch Creek Floodplain analysis. See the next section for a summary of the hydraulic results.

HORSE RANCH CREEK HYDRAULIC METHODOLOGY AND CRITERIA

Horse Ranch Creek is an existing stream located east of the I-15 and west of the Meadowood Project, and ultimately discharges into the San Luis Rey River. Currently, Horse Ranch Creek is not a Federal Emergency Management Agency (FEMA) defined floodplain (in other words, no floodplain and/or floodway has been defined on a Flood Insurance Rate Map). Therefore, hydraulic analyses were created for Horse Ranch Creek to establish a base 100-year floodplain, as well to assess any impacts of the proposed project and associated improvements. In addition, these analyses determined the improvements at the Pankey Road crossing. The HEC-RAS analysis is approximately 1.8 miles in length. The downstream limits are located approximately 300 linear feet downstream of the SR-76 crossing and the upstream limits are located approximately 8,500 feet upstream of the northern Pankey Road crossing. It is important to note that although the SR-76 and northern Pankey Road crossings were analyzed in the HEC-RAS analyses, the southern Pankey Road Crossing was not analyzed because it is currently located in the San Luis Rey 100-year floodplain.

HEC-RAS

The US Army Corps of Engineers Hydraulic Engineering Center River Analysis System (HEC-RAS) v.4.0 was used to analyze the hydraulic characteristics of Horse Ranch Creek. HEC-RAS has the ability to perform one-dimensional hydraulic calculations for natural and engineered channels, by utilizing the energy equation and the momentum equation. For the purposes of this project, all HEC-RAS modeling was performed using a sub-critical flow regime.

Hydraulic Information

The hydraulic information for Horse Ranch Creek was taken from existing topography as well as a site visit to determine and confirm the existing Manning's Roughness Coefficients within Horse Ranch Creek. It was determined that Manning's Roughness Coefficients ranged from a 0.04 for the grass fields to a 0.075, reflecting the more dense vegetation in the low flow portion Horse Ranch Creek.

Topographic and Datum Information

The hydraulic modeling prepared for the Existing Condition and Proposed Condition analyses are based on the topographic information associated with the vesting tentative map, and Caltrans bridge plans for the SR-76 and Pankey Road crossing (refer to the plans located in Appendix I of this report). The hydraulic modeling for the Proposed Condition model was also based on proposed grading associated with the Meadowood development. The topography, bridge plans, as well as the hydraulic modeling performed for Horse Ranch Creek are all on the National Geodedic Vertical Datum (NGVD 29).

Starting Water Surface Elevation

The downstream boundary condition for the HEC-RAS analyses (i.e., starting water surface elevation) was based on the 100-year water surface elevation for the San Luis Rey River obtained from the "*Hydraulic and Scour Report – State Route 76 Widening And Realignment From Interstate 15 to 2.2 KM East, San Diego County*" prepared by URS Corporation, dated March 25, 2005.

Hydrologic Information

The 100-year flow rate for Horse Ranch Creek was taken from the 100-year hydrologic analysis for the Horse Ranch Creek watershed also included in this report. The hydrologic analyses can be found in Appendix H of this report.

Hydraulic Models

The following provides a description of the hydraulic analyses of Horse Ranch Creek included in this report.

Existing Condition Model:

Project File Name: 15956_Horse_Ranch_C.prj

15956_Horse_Ranch_Creek

File Type	*Description*	*Extension*
Plan	***Existing Condition***	***.p05***
Geometry	***Existing Condition***	***.g04***
Flow	***Existing Condition***	***.f02***

The Existing Condition HEC-RAS model is based on the current condition of Horse Ranch Creek, taken from the existing topographic information as well as a site visit to determine the Manning's Roughness Coefficients. The Existing Condition model reflects the current bridge crossings at Pankey Road (north crossing) and the SR-76. The cross-sections bounding these bridge crossings reflect Contraction/Expansion coefficients of 0.1/0.3, because a majority of the flow either flows over or around the bridges, and as such there is no significant constriction in the floodplain at either crossing. The HEC-RAS output for the Existing Condition Model is located in Appendix J of this report. The HEC-RAS workmaps and plans for the SR-76 and north Pankey Road crossing are located in Appendix I and J respectively. The digital files for this model can be found on the CD located in Appendix K.

Proposed Condition Model:

Project File Name: 15956_Horse_Ranch_C.prj

15956_Horse_Ranch_Creek

File Type	*Description*	*Extension*
Plan	***Proposed Condition***	***.p12***
Geometry	***Proposed Condition***	***.g09***
Flow	***Existing Condition***	***.f02***

The Proposed Condition HEC-RAS model is based on the current condition of Horse Ranch Creek as well as the proposed grading associated with the Meadowood Project. This proposed grading associated with the Meadowood Project that will affect the Horse Ranch Creek floodplain is related to PA1, 'Street R', Pankey Road, and Horse Ranch Creek Road. The Proposed Condition model reflects the current bridge crossing at the SR-76, along with a proposed culvert crossing at the northern Pankey Road crossing. The cross-sections bounding the SR-76 and Pankey Road crossings reflect Contraction/Expansion coefficients of 0.1/0.3 and 0.3/0.5 respectively; the SR-76 bridge crossing remains the same as the Existing Condition, while the proposed Pankey Road crossing proposes to convey the entire the entire flow through culverts. The proposed culvert crossing consists of five 22 x 13 (feet) concrete box-culverts designed to convey the 100-year flow rate under Pankey Road. Along with the five box-culverts, it is proposed to maintain the channel, at least fifty feet upstream and downstream of the north Pankey Road crossing with light grass and scattered brush, corresponding to a Manning's roughness coefficient of 0.04. The HEC-RAS output for the Proposed Condition Model and the HEC-RAS workmaps are located in Appendix J of this report. The digital files for this model can be found on the CD located in Appendix K.

Proposed Condition (Capacity) Model:

Project File Name: 15956 Horse Ranch C.prj

15956_Horse_Ranch_Creek

File Type	*Description*	*Extension*
Plan	***Proposed Condition (Capacity)***	***.p13***
Geometry	***Proposed Condition (Capacity)***	***.g10***
Flow	***Existing Condition***	***.f02***

The Proposed Condition (Capacity) HEC-RAS model reflects the same geometry as the Proposed Condition model. However, the Proposed Condition (Capacity) model is reflective of an extremely densely vegetated condition (0.075 for overbanks, 0.15 within the channel), in order to set the elevation of proposed streets and pads. The HEC-RAS output for the Proposed

Condition (Capacity) Model and the HEC-RAS workmaps are located in Appendix J of this report. The digital files for this model can be found on the CD located in Appendix K.

HORSE RANCH CREEK HYDRAULIC RESULTS

In order to determine the 100-year Base Flood Elevations (BFEs) and the impacts of the Meadowood Project and the associated improvements, as well as to set pad elevations, Existing Condition, Proposed Condition, and Proposed Condition (Capacity) models were created, along with their respective CAD files and HEC-RAS workmaps. The HEC-RAS analyses extend from approximately 300 linear feet downstream of the SR-76 crossing (HEC-RAS cross-section 167.56) to approximately 8500 feet upstream of the northern Pankey Road crossing at Horse Ranch Creek (HEC-RAS cross-section 9880.09).

In the post-project condition, the project is proposing a culvert crossing consists of five 22 x 13 (feet) concrete box-culverts designed to convey the 100-year flow rate under Pankey Road (immediately north of the Street R intersection). Along with the five box-culverts, it is proposed to maintain the channel, at least fifty feet upstream and downstream of the north Pankey Road crossing with light grass and scattered brush, corresponding to a Manning's roughness coefficient of 0.04.

Comparing the Proposed Condition and Existing Condition models, it is apparent that there is an increase in WSEL upstream of the north Pankey Road crossing. In both the pre- and post-project condition, flows overtop the SR-76. In addition, the Existing Condition model shows the 100-year flow overtopping Pankey Road, north of the SR-76. However, the Proposed Condition model reflects a design that will safely convey the 100-year flow rate through the proposed culvert at the north Pankey Road crossing. No improvement are proposed at SR-76 and the project is detaining to pre-project condition flow rates therefore there is no adverse impact as a result of the project. In ensuring the safe conveyance of storm water under Pankey Road and including the proposed improvements associated with Street R, there are increases in WSELs upstream of the north Pankey Road crossing when comparing the Existing and Proposed Conditions. However, these increases are limited to an area that extends from Pankey Road to approximately 2,100 feet upstream, and do not negatively impact any existing structures. The proposed improvements are set above these WSELs, and are designed to be out of the 100-year floodplain, with the pads having a minimum of 1-foot of freeboard. Table 5 summarizes the

results of the Existing and Proposed Condition models for Horse Ranch Creek. Table 6 summarizes the results of the Proposed Condition (Capacity) model for Horse Ranch Creek, comparing the WSELs and the governing proposed grading elevations.

Table 5

WSEL Comparison of Existing and Proposed Conditions for Horse Ranch Creek

X-Section (Existing)	Existing WSEL (ft)	X-Section (Proposed)	Proposed WSEL (ft)	*C* WSEL (Proposed - Existing)
167.5697	262.3	**167.5697**	262.3	0.0
472.6398	265.6	**472.6398**	265.6	0.0
561.3247 SR-76	0.0	**561.3247 SR-76**	0.0	0.0
627.7707	270.1	**627.7707**	270.0	-0.1
988.7041	270.4	**930.4035**	270.3	-0.1
1434.036	270.5	**1394.093**	270.5	0.0
1463.580 Pankey Road	0.0	**1466.171 Pankey Road**	0.0	0.0
1535.785	270.7	**1517.721**	271.1	0.5
1717.589	270.8	**1717.589**	271.7	0.9
1864.806	270.8	**1864.806**	271.9	1.0
2033.954	270.8	**2033.954**	271.9	1.1
2614.242	270.9	**2614.242**	272.0	1.1
3038.374	271.1	**3038.374**	272.2	1.1
3351.951	272.4	**3351.951**	272.7	0.3
3642.177	274.2	**3642.177**	274.1	0.0
3976.927	276.9	**3976.927**	276.9	0.0
4342.055	280.0	**4342.055**	280.0	0.0
4634.388	282.4	**4634.388**	282.4	0.0
5000.613	286.1	**5000.613**	286.1	0.0
5608.249	290.1	**5608.249**	290.1	0.0
6075.362	294.7	**6075.362**	294.7	0.0
6396.299	298.4	**6396.299**	298.4	0.0
6807.731	302.9	**6807.731**	302.9	0.0
7291.709	308.5	**7291.709**	308.5	0.0
7786.663	313.3	**7786.663**	313.3	0.0
8202.584	317.6	**8202.584**	317.6	0.0
8613.92	321.9	**8613.92**	321.9	0.0
9011.299	326.1	**9011.299**	326.1	0.0
9520.172	330.8	**9520.172**	330.8	0.0
9880.091	335.1	**9880.091**	335.1	0.0

Table 6

Proposed (Capacity) Model WSELs and Governing Proposed Grading Elevations

Cross-Section	WSEL (Capacity)	Governing Street Elevation		Governing Pad Elevation
167.5697	262.3	N/A	N/A	N/A
472.6398	266.8	N/A		N/A
561.3247 SR-76				
627.7707	271.0	273	Pankey Rd.	N/A
930.4035	271.5	273		N/A
1394.093	271.8	272		N/A
1466.171 Pankey Road				
1517.721	272.5	273	Street R	N/A
1717.589	273.0	274		279.2
1864.806	273.2	274		277.04
2033.954	273.3	273.5	Lot C	274.65
2614.242	273.5	278.5		279.6
3038.374	273.9	287	Horse Ranch Creek Road	N/A
3351.951	274.6	290		N/A
3642.177	275.5	292		N/A
3976.927	277.7	296		N/A
4342.055	281.4	300		N/A
4634.388	283.8	302		N/A
5000.613	287.4	306		N/A
5608.249	292.0	309		N/A
6075.362	296.4	312		N/A
6396.299	300.0	311		N/A
6807.731	304.4	308.8		N/A
7291.709	310.4	312		N/A
7786.663	315.4	318		N/A
8202.584	319.8	326		N/A
8613.92	325.3	344		N/A
9011.299	329.7	352		N/A
9520.172	335.5	356		N/A
9880.091	340.4	359		N/A

SUMMARY

The 389.5-acre Meadowood site is located North of the State Route 76 (SR-76), otherwise known as Pala Road, approximately one-quarter mile East of Interstate 15 in the Fallbrook Community Planning Area of San Diego County, California. Currently the project site consists of orchard/trees, native shrub, rural vegetation, and grassland. Pardee Homes proposes to develop approximately 218 acres (56 %) of the Meadowood site for residential and associated uses including parks, recreational trails, brush management, water tanks, sewer treatment plant (sewer treatment plant is apart of a separate major use permit), emergency fire access road, and an elementary school. The remainder of the site will be undeveloped. In addition, the project is proposing offsite improvements associated with Pala Mesa Heights Drive, Horse Ranch Creek Road, Pala Mesa Drive/Existing Pankey Road, and Street R. This Drainage Study supports the Vested Tentative Map for the Meadowood project.

In the pre-project condition, the site drains westerly towards Horse Ranch Creek. In the post-project condition, the pre-project drainage characteristics have been maintained. Additionally, the project proposes to detain the post-project 100-year storm event to at or below pre-project levels. Detention is proposed for all post-project drainage basins with the exception of the most northerly and southerly drainage basins. The most northerly drainage basin (Drainage Basin 1000) is not proposing detention, because the 100-year post-project flow does not exceed the 100-year pre-project flow rate. The most southerly drainage basin (Drainage Basin 9000) is not proposing 100-year detention because the runoff from it flows directly into an existing drainage system that has been designed for its ultimate buildout. However Drainage Basin 9000 is proposing two underground vaults for hydromodification management. For the purposes of the Vesting Tentative Map phase, only volume calculations have been performed for all of the detention facilities. Upon final design, detailed outlet works, emergency spillways, and energy dissipaters (at all outfalls) will be designed.

All of the aboveground detention basins also incorporate hydromodification management ("ponds") and all but DB2 incorporate water quality ("settling basins"). For information

regarding the settling basins and/or water quality measures for Meadowood, please refer to the report titled, "Storm Water Management Plan for Priority Projects (Major SWMP) for Meadowood Vesting Tentative Map (VTM)", dated August 18, 2009, prepared by Rick Engineering Company. For information regarding the hydromodification management measures, please refer to the report titled, "Hydromodification Management Study for Meadowood Vesting Tentative Map (VTM)", dated August 18, 2009, prepared by Rick Engineering Company.

Additionally, 100-year hydrologic analyses were performed for the off site improvements associated with Pala Mesa Heights Road, Horse Ranch Creek Road, Pala Mesa Drive/existing Pankey Road, and Street R. To be conservative, developed runoff coefficients were utilized based on the adjacent developments proposed land uses. These adjacent developments are known as Campus Park and Campus Park West. See Appendix L for backup information. Upon final design, this hydrologic analysis will be utilized to perform detailed hydraulics to size the storm drain improvements and culvert crossings associated with the off site improvements.

The project is bounded by two floodplains. Horse Ranch Creek is located along the westerly boundary and San Luis Rey River is located along the southern boundary. Horse Ranch Creek not a Federal Emergency Management Agency (FEMA) defined floodplain, however San Luis Rey is defined as a Zone A floodplain.

Hydrologic and Hydrologic analysis were performed for the 11.97 square mile Horse Ranch Creek watershed. As a result a 100-year flow rate was determined and pre- and post-project floodplain analyses were performed. The project is proposing improvements for the Pankey Road Crossing (immediately north of the Street R intersection). The proposed crossing will consist of five 22 x 13 (feet) concrete box-culverts designed to convey the 100-year flow rate under Pankey Road.

Currently CalTrans is under construction and re-aligning a portion of the State Route (SR) 76. The new SR 76 alignment is shown on the proposed workmaps located in this report. As a result

of the SR 76 re-alignment project, a Conditional Letter of Map Revision (CLOMR) was submitted to the County and FEMA. The CLOMR proposed to update and revise the 100-year floodplain based on the work associated with the SR 76 project. The CLOMR was approved and issued on November 22, 2005 (Case Number 05-09-1045R). Based on this new alignment and recent hydraulic analyses performed by CalTrans, the northern limits of the San Luis Rey floodplain has been revised and is no longer impacting the southern portion of the Meadowood project or the new SR 76 alignment. In fact, the northern floodplain limits have been revised and is located immediately south of the new SR 76 alignment. Upon completion of this SR 76 project, CalTrans (or a repetitive of CalTrans) will submit a Letter of Map Revision and formally update the floodplain and the Flood Insurance Rate Map (FIRM) for this portion of the San Luis Rey. Therefore no additional floodplain analyses, associated with this project, have been performed for the San Luis Rey River