Ladera Drive Improvements
Gavin Road to Coors Boulevard
City of Albuquerque Project No. 6588.92

Drainage Analysis Memo

August 10, 2015

Prepared for:

Prepared by:

PARSONS BRINCKERHOFF

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Introduction

Parsons Brinckerhoff (PB) was selected by the City of Albuquerque (CoA) to design improvements to Ladera Drive from Gavin Road to Coors Boulevard as part of City of Albuquerque project 6588.92. A vicinity map for the project area can been seen in Exhibit 1 which has been included as an attachment to this memo. The purpose of the project is to provide continuous on-street bicycle lanes within the project limits as well as new segments of off-street multi-use trail to improve the connectivity of the adjacent trail system.

Major design improvements that will be constructed as part of this project include:

- Roadway and intersection improvements
- Bicycle and pedestrian improvements
- Storm drainage improvements
- Intersection lighting improvements
- Traffic signal improvements
- Landscaping improvements (to be designed by others)

Based on project funding, the project is scheduled to be constructed in two phases. Phase 1 will construct the proposed improvements from Ouray Road to Coors Boulevard. Phase 2 will construct the proposed improvements from Gavin Road to Ouray Road.

The following provides a summary of the analysis of existing drainage conditions and the proposed drainage facilities for Ladera Drive within the project limits. The primary goal is to safely accommodate drainage in the corridor, while avoiding adverse impacts to water quality and the surrounding environment; the drainage design addresses cost effectiveness, maintenance, and aesthetics.

Literature Review

The following related approved drainage reports for the project area were obtained from the CoA and were used for the development of this drainage memo.

- Master Drainage Plan for Altura West and Archdiocese of Santa Fe Properties Near St. Pius High School, Bohannan Huston Inc. – October 1997
- Master Drainage Plan for the Oxbow Town Center Tracts X-1-A-2 & X-2-A, GND, LLC – October 2007

Existing Conditions

Gavin Road to Unser Boulevard

Ladera Drive between Gavin Road and Unser Boulevard consists of a normally crowned roadway typical section with drainage inlets along eastbound and westbound Ladera Drive curb lines capturing onsite runoff. An existing storm drain system within Ladera Drive, between Marapi Street and Gunnison Place, conveys flows into the Parkway Drive storm drain system which runs southeast to Unser Boulevard and then east into a series of detention ponds and storm drain until it reaches the Rio Grande. There is an

existing pond located in the southwest quadrant of the Ladera Drive/Gunnison Place intersection which was constructed as part of the Parkway - Unit 7 improvements project to detain runoff from offsite drainage basins adjacent to Ladera Drive and outfall into the Parkway Drive storm drain system. As part of the development adjacent to Ladera Drive, a drainage system was built to intercept flows and outfall directly to the Parkway Drive storm drain system. The pond is no longer required and has been abandoned in place. As-built plans for the detention pond indicate that the pond was constructed to store the required 3.4 acre-feet of water.

Unser Boulevard to Ouray Road

Ladera Drive between Unser Boulevard and Ouray Road consists of a normally crowned roadway typical section with drainage inlets along eastbound and westbound Ladera Drive curb lines capturing onsite runoff and conveying it into an existing storm drain system within Ladera Drive. The outfalls for this storm drain system are the existing detention basins located in the southwest quadrant of the Ladera Drive/Ouray Road intersection. These detention basins are part of the Ladera Diversion and Detention Facility (LDDF) which outfall to the San Antonio Arroyo just south of the Coors Boulevard/Seville Avenue intersection via the Oxbow and Coors Boulevard storm drain networks.

Ouray Road to Sequoia Road

There is currently no median curb and gutter along eastbound lanes of Ladera Drive between Ouray Road and Sequoia Road and onsite runoff drains into the median where it is captured by a series of bee-hive grate median drop inlets. Westbound Ladera Drive is crowned to drain to the west curb line where runoff is captured by drainage inlets. An existing storm drain system within Ladera Drive conveys flows west into the existing LDDF detention pond located in the northwest quadrant of the Ouray Road/Ladera Drive intersection.

Sequoia Road to Artrisco Drive

Ladera Drive between Sequoia Road and Atrisco Drive consists of a normally crowned roadway typical section with drainage inlets along eastbound and westbound Ladera Drive curb lines that capture both onsite and offsite runoff and convey it to two outfall locations. Runoff from contributing drainage basins extending from the Ladera Drive/Sequoia Road intersection to an existing roadway high point located approximately 1200' north of the intersection are conveyed into the previously discussed drainage system located between Ouray Road and Sequoia Road. Runoff from contributing drainage basins north of the roadway high point and extending to the Ladera Drive/Atrisco Road intersection are captured by a series of inlets located at a roadway low point approximately 575' west of the Ladera Drive/Atrisco Drive intersection. These drainage inlets outfall directly to the 60" Oxbow storm drain network that serves as the outfall for the LDDF. This 60" line conveys flows east into the Coors Boulevard drainage network which ultimately outfalls to the San Antonio Arroyo.

Atrisco Drive to Coors Boulevard

St. Joseph's Drive between Atrisco Drive and Coors Boulevard consists of a normally crowned temporary roadway typical section with two travel lanes (one lane in each direction). There is an existing inlet located approximately 100' east of the St. Joseph's Drive/Atrisco Drive intersection that collects runoff from the majority of the eastbound and westbound lanes of St Joseph's Drive. The inlet outfalls into a

detention pond located east of Atrisco Drive, within St. Joseph's Drive roadway right-of-way which outfalls to the Oxbow storm drain via a 24" reinforced concrete pipe. The detention pond also captures runoff from eastbound lanes of St Joseph's Drive, in the vicinity of the St. Joseph's Drive/Atrisco Drive intersection, in addition to the 1050' segment of Atrisco Drive north of St. Joseph's Drive, and the 950' segment of Atrisco Drive south of St Joseph's Drive. Additional runoff contributing to the detention pond is generated from 40% of the vacant property located in the southeast quadrant of the St. Joseph's Drive/Atrisco Drive intersection. This vacant property is part of the proposed Oxbow Town Center, a planned 48-acre development which will be comprised of office buildings and commercial properties. A conceptual grading and drainage plan for the Oxbow Town Center has been included as an attachment to this memo. The detention pond also serves as the outfall for the St. Joseph's on the Rio Grande onsite detention pond which is located just north of St. Joseph's Drive. The main purpose of the detention pond is to attenuate flows reaching the existing Oxbow storm drain network which conveys flows to the Coors Boulevard storm drain trunk line.

Offsite Drainage Facilities

Offsite drainage facilities that have been identified near the project include the Rio Grande storm sewer which was constructed as part of phase one of the Master Drainage Plan for the Oxbow Town Center. The storm sewer was designed and constructed to accept runoff from the proposed Oxbow Town Center as well as developed properties east of Coors Boulevard. The Rio Grande storm sewer begins as a 36" storm drain approximately 560' south of the St. Joseph's Drive/Coors Boulevard intersection and continues east, ultimately discharging to the Rio Grande.

Existing Drainage Issues

Maintenance personnel from the CoA who are responsible for maintaining the Ladera Drive storm drain system were contacted to discuss drainage issues within the project limits. No known drainage issues were reported.

The CoA's 311 citizen complaint database was also queried to determine if any drainage related complaints or issues had been reported within the project area. No incidents were noted.

In a meeting with personnel from AMAFCA, it was mentioned that the Coors Boulevard storm drain trunk line is at capacity.

Hydrology

Criteria and Methodology

The design flood for this assessment is the 100-year recurrence interval storm based on the *CoA's Development Process Manual* (DPM). Drop inlet spacing and allowable spread were also evaluated for the 10-year recurrence interval storm.

The Rational Method was used to perform peak flow rate calculations for offsite and onsite drainage basins based on the 6-hour storm duration per the DPM. The 24-hour duration storm was used for runoff volume computations. The 100-year rainfall data for Bernalillo County precipitation Zone 1 was

obtained from the DPM. The 100-year, 24 hour duration precipitation for Zone 1, which is defined as the area west of the Rio Grande, is 2.66 inches.

The following assumptions were also considered for this assessment:

- Drainage design elements for the section of Ladera Drive from Gavin Road to Atrisco Drive consider the existing storm drain system to be adequate for widening into the median as additional runoff generated by the construction of bike lanes is minimal (see Results Section of this report for flow rate estimates). The analysis for this area was performed based on topographic survey to determine if the existing inlet spacing meets the CoA's spread criteria.
- Pond at Northwest Corner of the Ladera Drive/Gunnison Place Intersection – It is anticipated that the widened typical section of Ladera Drive required to accommodate new segments of off-street multi-use trail will impact the existing pond and spillway. The analysis determined the function and capacity of the pond.
- Pond South of St Joseph's, approximately 400' east of Atrisco Drive – In a report entitled *Master Drainage Plan for Altura West and Archdiocese of Santa Fe Properties Near St. Pius High School,* the proposed drainage conditions for the vacant property currently contributing to the detention pond (Basin 5) are identified. The report indicates that flows from the future development of the property will be carried by the proposed internal local streets and discharged to proposed onsite detention ponds which will control the discharge to the Rio Grande storm sewer. The report also indicates that curb and gutter will be installed on Ladera Drive and Atrisco Drive so that onsite flows will be contained within the roadway right-of-way and drain to the Oxbow storm drain via inlets. Since it is likely that the construction of this project will take place before the development of Basin 5, a replacement pond will need to be constructed to continue to attenuate offsite flow discharging to the Oxbow and Coors Boulevard storm drain systems. The analysis determined the capacities of the existing and the required replacement ponds. The analysis also addressed onsite drainage on St. Joseph's Drive between Atrisco Drive and Coors Boulevard.

Peak flow rate estimates for drainage basins as well as a summary of runoff volume estimates for detention ponds can be found in the Results Section of this drainage memo.

Drainage Basin and Land Use Maps

ArcGIS, version 10.1 was used to prepare the drainage basin maps for this assessment. Resources used to define basin areas include existing drainage reports, aerial photos, and Bernalillo County's 2010 Light Detection and Ranging (LiDAR) mapping data. A field investigation was conducted to verify drainage patterns and basin boundaries. Future developed land use estimates are based on the land use designations from the CoA GIS Data website. Drainage basin maps and a Land Use Map have been included as an attachment to this memo.

Results

Gavin Road to Atrisco Drive

Peak flow rate estimates for eastbound and westbound Ladera Drive are shown in Tables 1 and 2. Detailed peak flow rate calculations have been included as an attachment to this memo.

Table 1: Estimated Discharge Rates –Eastbound Ladera Drive

Basin ID	Basin Area (acres)	Existing Peak Discharge 10-yr (cfs)	Existing Peak Discharge 100-yr (cfs)	Additional Flow Generated By Improvements 10-yr (cfs)	Additional Flow Generated By Improvements 100-yr (cfs)	Total Flow 10-yr (cfs)	Total Flow 100-yr (cfs)
100	2.93	7.25	11.51	0.39	0.39	7.65	11.90
101	0.88	2.07	3.34	0.12	0.12	2.19	3.45
102.1	0.38	0.88	1.43	0.05	0.05	0.93	1.48
102.2	0.58	1.41	2.25	0.08	0.08	1.49	2.33
103	1.39	3.34	5.35	0.14	0.14	3.48	5.49
104	5.50	13.16	21.10	0.64	0.64	13.81	21.75
105.1	4.21	10.77	16.90	0.23	0.23	11.00	17.13
105.2	0.12	0.32	0.50	0.02	0.02	0.34	0.52
106	0.97	2.65	4.08	0.35	0.51	3.00	4.58
107	0.29	0.81	1.23	0.09	0.13	0.89	1.36
108	0.45	1.24	1.91	0.16	0.24	1.40	2.14
109	0.14	0.38	0.59	0.05	0.08	0.43	0.67
110	0.40	1.10	1.69	0.14	0.21	1.25	1.90
111	0.42	1.13	1.74	0.15	0.22	1.28	1.96
112	0.27	0.72	1.11	0.08	0.12	0.80	1.23
113	0.18	0.45	0.71	0.07	0.10	0.52	0.81
114	0.33	0.88	1.36	0.10	0.15	0.98	1.51
115.1	0.34	0.85	1.34	0.11	0.16	0.96	1.50
115.2	0.28	0.78	1.20	0.06	0.08	0.84	1.28
116	0.43	1.02	1.64	0.06	0.06	1.07	1.69
117	3.00	7.41	11.75	0.11	0.11	7.52	11.87
118.1	13.97	30.12	50.07	0.22	0.22	30.34	50.29
118.2	9.40	23.25	36.88	0.08	0.08	23.33	36.96

Table 2: Estimated Discharge Rates –Westbound Ladera Drive

Basin ID	Basin Area (acres)	Existing Peak Discharge 10-yr (cfs)	Existing Peak Discharge 100-yr (cfs)	Additional Flow Generated By Improvements 10-yr (cfs)	Additional Flow Generated By Improvements 100-yr (cfs)	Total Flow 10-yr (cfs)	Total Flow 100-yr (cfs)
200	6.28	12.36	21.25	0.28	0.28	12.64	21.53
201	2.27	4.56	7.78	0.10	0.10	4.66	7.88
202.1	3.02	6.28	10.57	0.16	0.16	6.45	10.74
202.2	3.31	5.52	10.13	0.08	0.08	5.60	10.21
203	3.49	6.28	11.17	0.15	0.15	6.43	11.33
204	8.15	15.67	27.18	0.22	0.22	15.89	27.40
205	1.60	3.89	6.20	0.08	0.08	3.97	6.28
206	0.69	1.82	2.83	0.06	0.06	1.89	2.89
207	0.43	1.12	1.75	0.06	0.06	1.18	1.81
208	0.47	1.08	1.75	0.05	0.05	1.13	1.80
209	0.55	1.22	2.01	0.06	0.06	1.28	2.07
210	2.89	6.77	10.94	0.05	0.05	6.83	10.99
211	0.23	0.63	0.97	0.03	0.03	0.66	1.00
212.1	2.77	5.63	9.55	0.21	0.21	5.83	9.76
212.2	0.18	0.37	0.63	0.01	0.01	0.39	0.64
213	0.62	1.52	2.41	0.12	0.18	1.64	2.59
214	1.13	2.52	4.13	0.25	0.36	2.77	4.49
215.1	0.41	0.85	1.43	0.08	0.11	0.93	1.55
215.2	0.57	1.34	2.16	0.09	0.13	1.43	2.29
216	1.11	2.53	4.13	0.23	0.34	2.77	4.47
217.1	0.28	0.63	1.03	0.06	0.09	0.69	1.12
217.2	1.16	2.75	4.42	0.25	0.36	3.00	4.79
218	0.34	0.77	1.26	0.03	0.03	0.80	1.29
219	1.84	3.84	6.45	0.14	0.14	3.98	6.59
220.1	3.12	6.93	11.40	0.24	0.24	7.17	11.64
220.2	3.75	7.14	12.43	0.08	0.08	7.23	12.52

Pond West of Gunnison Place

An analysis of the existing pond topography was conducted and it was determined that the abandoned pond has a capacity of 3.4 acre-ft with an emergency freeboard depth of 0.80 feet.

Pond East of Atrisco Drive

A summary of the runoff volume estimates for drainage basins currently contributing to the detention pond east of Atrisco Drive are shown in Table 3. Detailed runoff volume calculations have been included as an attachment to this memo.

Table 3: Estimated Existing Runoff Volumes for Pond East of Atrisco Drive

Basin ID	Basin Area (acres)	Peak Discharge (100-yr)	Vol 100-yr, 24-hr (acre-ft)
5	12.19	35.43	1.04
1.1	0.76	3.32	0.15
1.2	1.61	6.71	0.30
1.3	1.49	6.29	0.28
8.1	0.49	1.61	0.06
8.2	1.47	4.65	0.16
		Total	1.99

It can be seen from the table that the total volume of water currently contributing to the detention pond is approximately 2 acre-ft. Based on the existing pond topography, the existing pond capacity was found to be approximately 1 acre-ft.

Because the existing detention pond is located adjacent to St. Joseph's Drive, within existing roadway right-of-way, the detention pond will need to be removed and relocated to accommodate the construction of the full build out typical section of St. Joseph's Drive. A hydrologic analysis was completed to determine the estimated required detention pond volume after the construction of roadway improvements on St. Joseph's Drive. The results of the analysis are shown in Table 4.

Table 4: Estimated Post Construction Runoff Volumes for Pond East of Atrisco Drive

Basin ID	Peak Discharge (100-yr)	Vol 100-yr, 24-hr (acre-ft)
*5	32.12	0.92
1.1	3.32	0.15
**1.2A-EB St Josephs East of Low Point	4.95	0.22
**1.2B-EB St Josephs West of Low Point	1.17	0.05
**1.2C-WB St Josephs East of Low Point	4.93	0.22
**1.2D-WB St Josephs West of Low Poin	0.99	0.04
1.3	6.29	0.28
8.1	1.61	0.06
8.2	4.65	0.16
	Total	2.11

*Adjusted Basin 5 to account for the widening of St. Joseph's Drive
**Adjusted Basin 1.2 to include roadway improvements

It can be seen from the table that the required replacement pond volume is 2.11 acre-ft.

Hydraulics

Gavin Road to Atrisco Drive

A spreadsheet was developed to verify whether the spacing of the existing inlets meet the CoA's 10-year storm spread criterion with the proposed bicycle lane improvements. Inlet spacing analysis results can be found in an attachment to this memo. In general, the existing inlet spacing on Ladera Drive meets the CoA 10-year storm spread criterion with the proposed bicycle lane improvements. Specific areas where the criterion was not met are discussed below.

- The roadway low point just east of the Ladera Drive/Gunnison Place intersection.
- The roadway low point on eastbound and westbound Ladera Drive, near the Ladera Drive/Ouray Road intersection. Flows reaching the eastbound inlet total 18.5 cfs and flows reaching the westbound inlet total 5.9 cfs.
- The roadway low point at the intersection of Ladera Drive and Los Tretos Street.
- The existing median inlet located at the roadway low point on eastbound Ladera Drive, near the Sequoia Road intersection, fails to meet the spread criterion. Flows reaching the inlet total 3.6 cfs which is only slightly higher than the allowable flow rate for this inlet.
- The existing inlets located on eastbound and westbound Ladera Drive, at the roadway low point just west of the Ladera Drive/Sunbird Drive intersection, fail to meet the spread criterion. Flows reaching the eastbound inlets total 53.7 cfs. The majority of flow reaching these inlets is generated from offsite drainage basins 118.1 and 118.2 which outfall into Ladera Drive and ultimately to these inlets. Flows reaching the westbound inlets total 14.4 cfs.

Pond East of Atrisco Drive

A hydraulic analysis (using StormCAD) was conducted on the existing detention pond located east of Atrisco Drive, within existing St. Joseph's Drive roadway right-of-way, to determine the existing pond outflow rate into the Oxbow storm drain system. It was determined that the Oxbow and Coors Boulevard storm drains are currently functioning at capacity and the existing pond is acting as a surge pond during large storm events.

Recommendations

Gavin Road to Atrisco Drive

Based on the results of the hydraulic analysis, the following recommendations for improvement to the existing roadway drainage infrastructure have been identified:

- Gavin Road to Unser Boulevard – Additional inlets should be constructed along westbound Ladera Drive, south of the Ladera Drive/Gunnison Place intersection to reduce flows reaching the inlets at the roadway low point. No drainage improvements are required for eastbound Ladera Drive as existing inlets meet CoA spread criterion. Existing inlets on eastbound and westbound Ladera Drive are currently located along the outer curb lines and will not be affected by the construction of the proposed bicycle lane improvements.
- Unser Boulevard to Ouray Road – Additional inlets should be constructed along eastbound and westbound Ladera Drive to decrease the existing inlet spacing and to reduce flows reaching the

inlets at the roadway low point. Existing inlets on eastbound and westbound Ladera Drive are currently located along the outer curb lines and will not be affected by the construction of the proposed bicycle lane improvements.

- Ouray Road to Sequoia Road – Curb cuts should be constructed along proposed median curb lines and spaced to meet CoA spread criterion. Water harvesting swales should be constructed within the existing median at proposed curb cuts. Existing beehive and median drop inlets should be cleaned and, if needed, grate elevations adjusted to facilitate positive drainage in medians. Curb inlets should be constructed along westbound Ladera Drive to reduce flow reaching the inlet at the roadway low point.
- Sequoia Road to Atrisco Drive - Additional inlets should be added along eastbound and westbound Ladera Drive to reduce flows reaching the existing inlets at the Ladera Drive roadway low point, just west of the Ladera Drive/Sunbird Drive intersection. Existing inlets on eastbound and westbound Ladera Drive are currently located along the outer curb lines and will not be affected by the construction of the proposed bicycle lane improvements.

Pond West of Gunnison Place

Considering the existing pond serves no function since the construction of the upstream drainage network, the outfall pipe in the pond should be capped and the existing pond filled to accommodate the new sections of multi-use trail that are proposed to be constructed as part of this project.

St. Joseph's Drive/Pond East of Atrisco Drive

As St. Joseph's Drive will be built out to its ultimate roadway section with the construction of this project, curb drainage inlets should be constructed along eastbound and westbound St Joseph's Drive to capture onsite drainage and accommodate the CoA spread criterion. Considering that the Oxbow and Coors Boulevard drainage networks are currently at capacity, new inlets on St. Joseph's drive should not be connected directly to the Oxbow storm drain. Onsite runoff should be conveyed into an offsite detention facility, similar to the existing condition, to attenuate flow to the Oxbow storm drain system. Several alternatives were considered to control the estimated 0.96 acre-feet volume of water that is generated from onsite drainage basins 1.1, 1.2, and 1.3. The alternatives have been summarized in Table 5 below.

Table 5: Onsite Runoff Storage Alternatives

	Alternative	Issues/Concerns
1	Store the estimated 100-year runoff volumes from St. Joseph's Drive and Atrisco Drive in underground storage facilities.	▪ Possible right-of-way acquisition ▪ Possible utility conflicts ▪ Maintenance issues
2	Construct a replacement detention pond, south of St. Joseph's Drive, sized to store the estimated 100-year runoff volumes from St. Joseph's Drive and Atrisco Drive as well as offsite flows from Basin 5.	▪ An agreement to construct a detention pond outside of City right-of-way would have to be coordinated with the developer of Oxbow Town Center, which could delay the project.

3	Increase the storage capacity of the existing detention pond located in the northeast quadrant of the Ladera Drive/Atrisco Drive intersection (on the St. Joseph's on the Rio Grande Church property) to handle the 100-year runoff volumes from St. Joseph's Drive and Atrisco Drive.	▪ An agreement to store the additional volume of runoff would have to be coordinated with the church, which could delay the project.

Initial property owner meetings were conducted on July 31, 2015 with St. Joseph's on the Rio Grande Church staff as well as Thomas Keleher, a member of the board that presides over the lands of Oxbow Town Center, to determine the feasibility of Alternatives 2 and 3. It was determined during the meetings that the church is planning to extend its existing parking lot to the south. This will not allow for the expansion of the existing pond required to store the full volume of runoff from St. Joseph's Drive and Atrisco Drive. Based on the initial property owner meetings and a review of the proposed alternatives, Alternative 2 (construct a replacement pond) is recommended. The pond should be sized to accommodate the volume of runoff generated from onsite basin 1.1, 1.2, and 1.3 (approximately 0.96 acre-feet) and offsite flows from basin's 5, 8.1, and 8.2 (approximately 1.14 acre-feet). The proposed pond should outfall to the existing Oxbow storm drain network as it does today and maintain the existing hydraulic conditions. Final design of the replacement pond should continue to be coordinated with the board that presides over the lands of Oxbow Town Center.

Conclusion

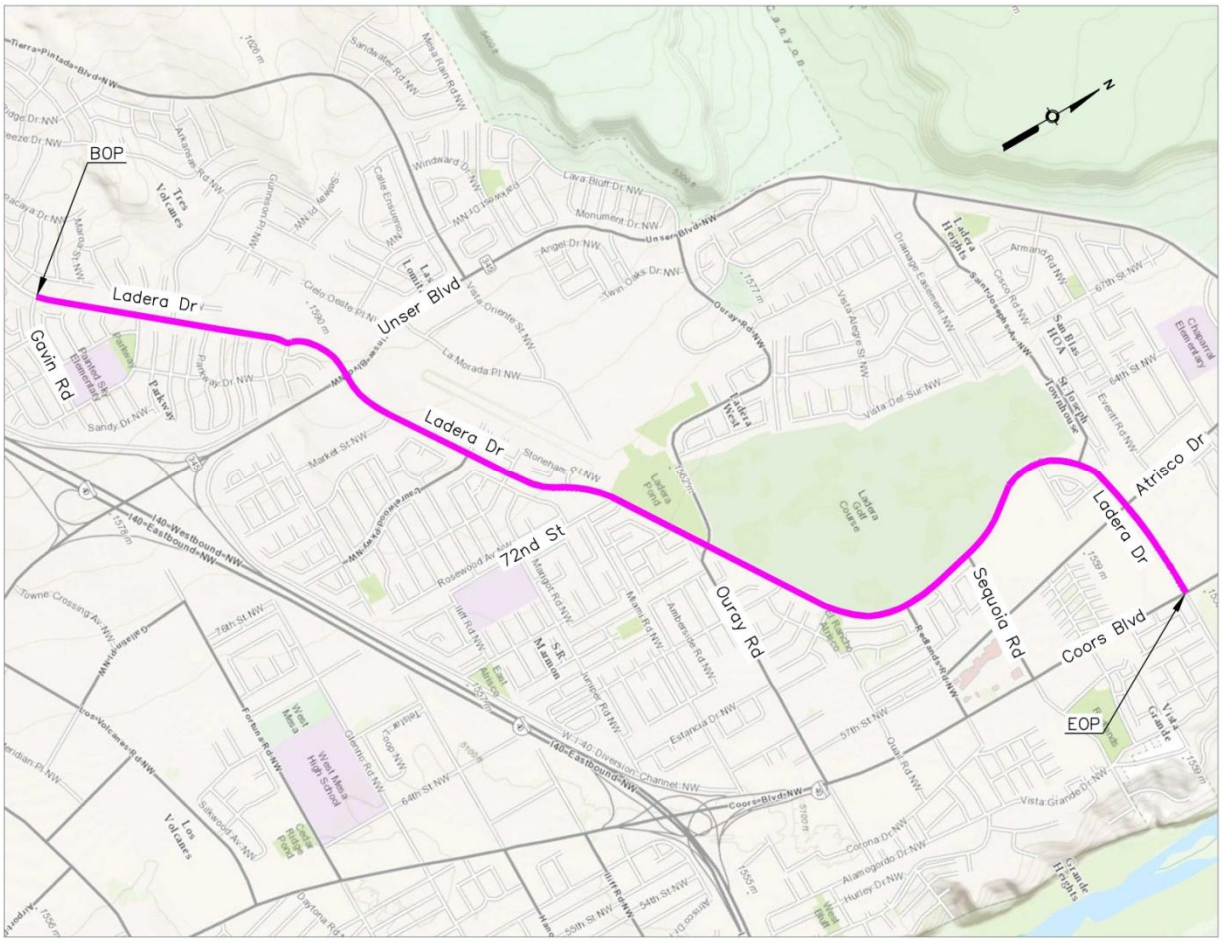
This drainage memo summarizes the analysis of the existing drainage conditions and the proposed preliminary drainage recommendation for Ladera Drive between Gavin Road and Coors Boulevard. The proposed preliminary drainage recommendations meet the CoA drainage design criteria. Recommendations were proposed to construct additional inlets along Ladera Drive. Recommendations were made to fill the abandoned detention pond located in the southwest quadrant of the Ladera Drive/Gunnison Place intersection to allow for construction of a proposed multi-use trail in that area. Finally, recommendations were made to construct a replacement detention pond south of St. Joseph's Drive to maintain the existing hydraulic conditions of the St. Joseph's Drive drainage system. Final design plans for the replacement pond should be coordinated with property owners of lands adjacent to the project site.

Attachments

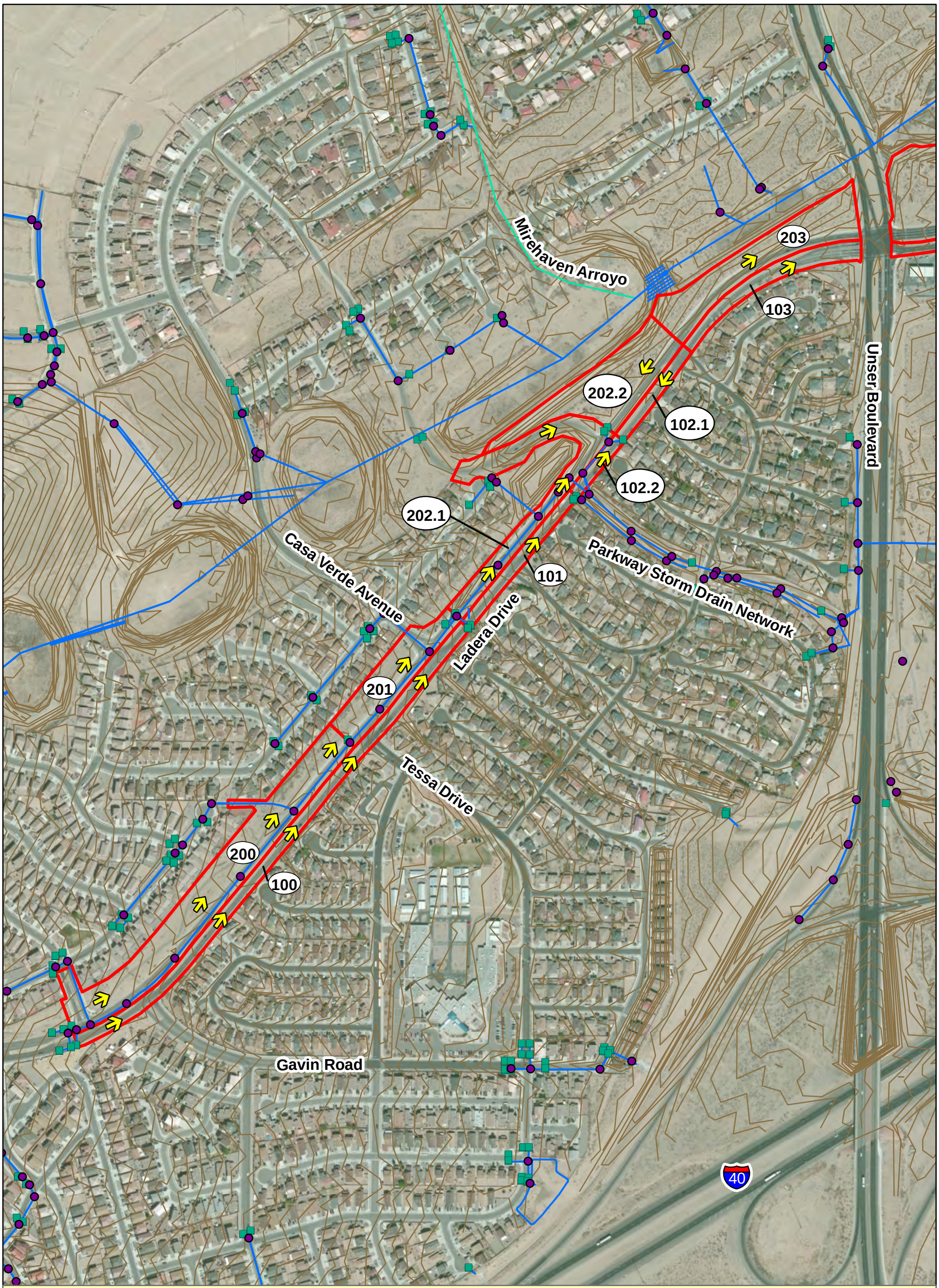
Attachment 1:	Vicinity Map
Attachment 2:	Drainage Basin Maps
Attachment 3:	Existing Land Use Map
Attachment 4:	Runoff Calculations
Attachment 5:	Existing and Proposed Pond Volume Calculations
Attachment 6:	Inlet Spacing Analysis
Attachment 7:	Hand Calculations
Attachment 8:	Oxbow Town Center Conceptual Grading and Drainage Plan

Attachment 1: Vicinity Map

Exhibit 1: Vicinity Map



Attachment 2: Drainage Basin Maps



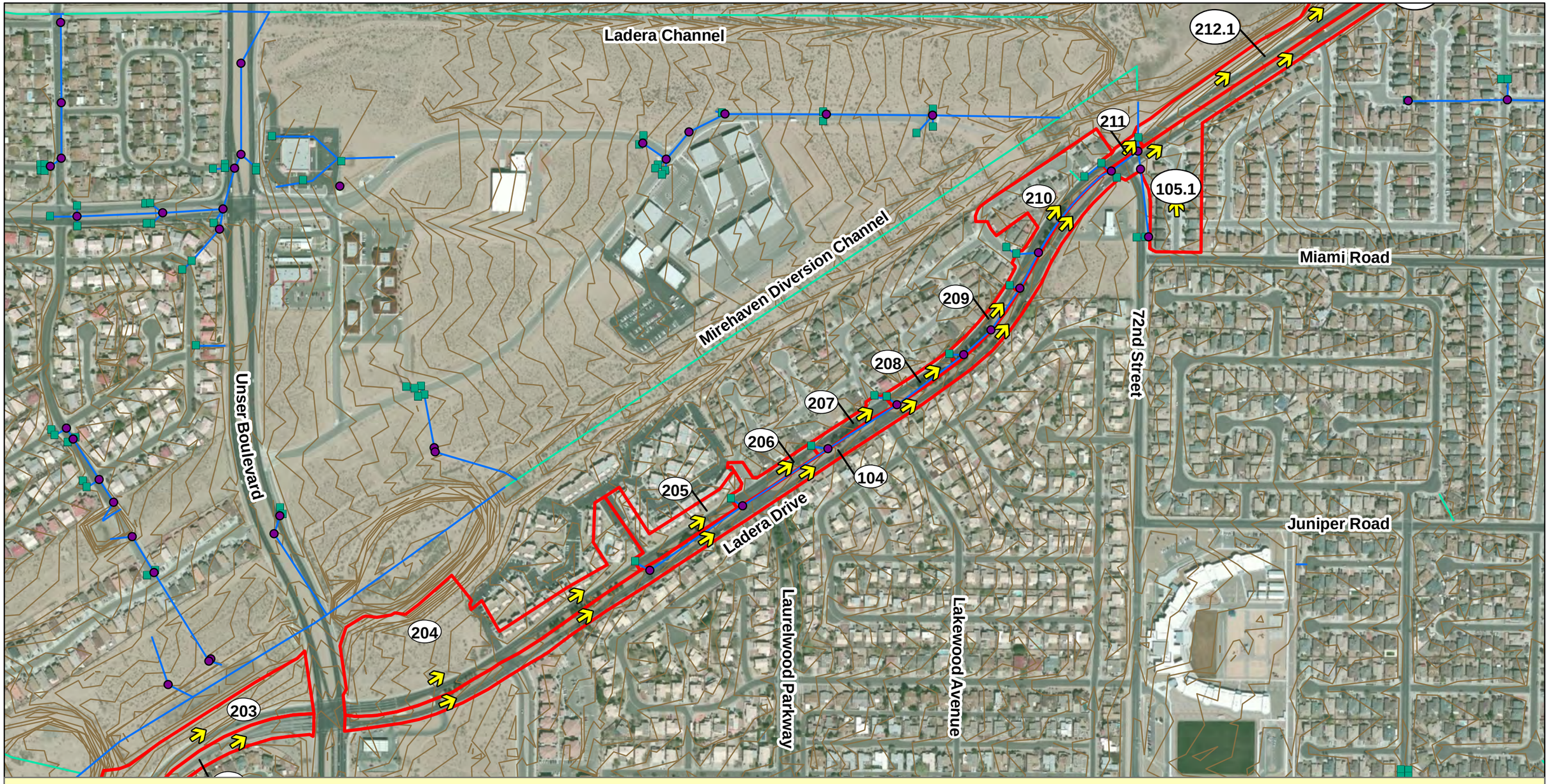
Legend

- Flow Direction
- Existing Manhole
- Existing Inlet
- Existing Storm Drain
- Basin Boundary
- Arroyo
- 2' Contour
- XXX — Basin ID

N
W E
S

Exhibit 2
Drainage Basin Map
(Gavin Rd. to Unser Blvd.)
Ladera Drive Improvements

500 250 0 500 Feet



Legend

- Flow Direction
- Existing Manhole
- Existing Inlet
- Existing Storm Drain
- Basin Boundary
- Arroyo
- 2' Contour
- XXX Basin ID

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W E
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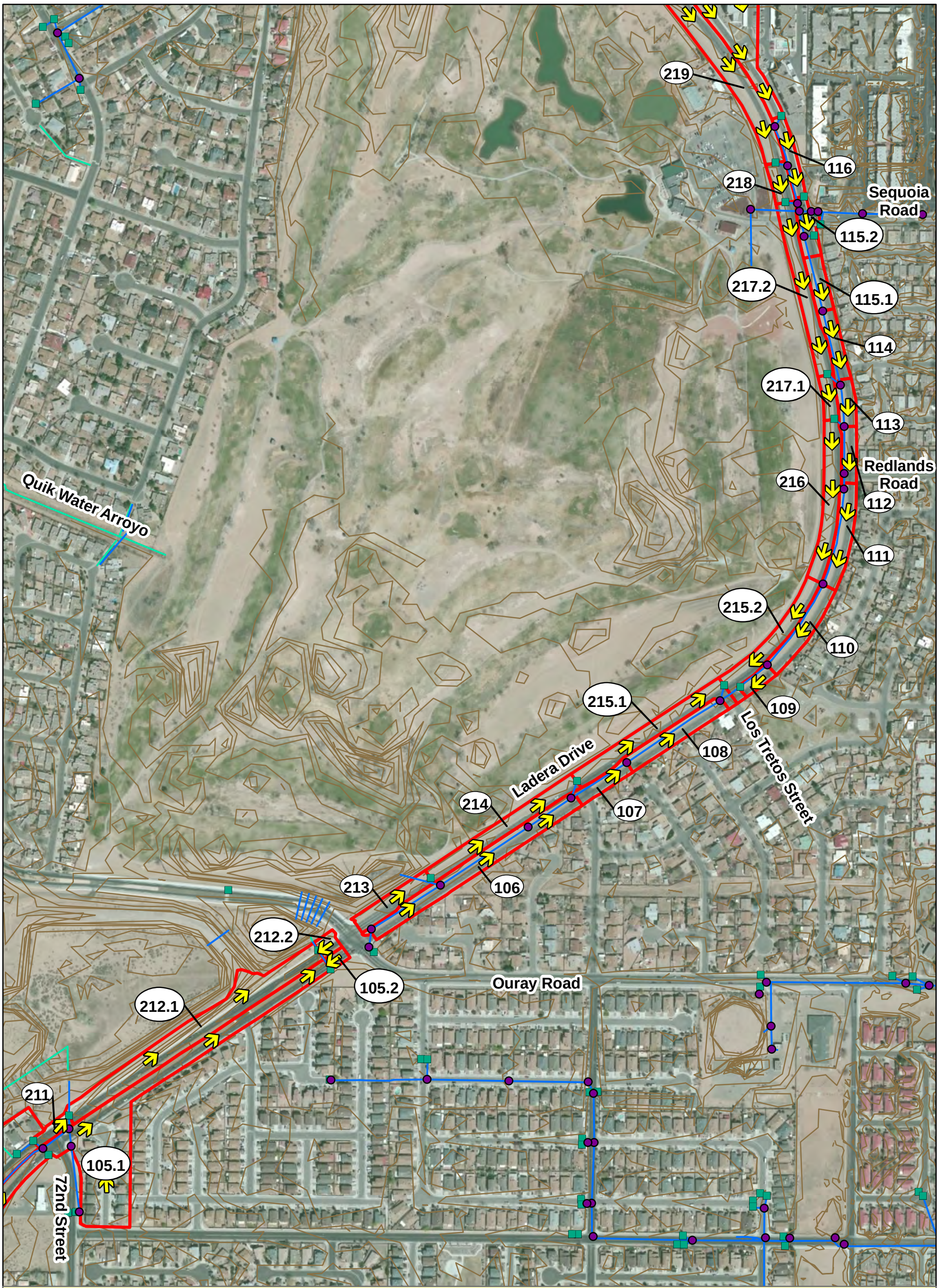
1,000 500 0 1,000 Feet

Exhibit 3
Drainage Basin Map
(Unser Blvd. to 72nd St.)
Ladera Drive
Improvements



Legend

- Flow Direction
- Existing Manhole
- Existing Inlet
- Existing Storm Drain
- Basin Boundary
- Arroyo
- 2' Contour
- XXX — Basin ID

N
W E
S

Exhibit 4
Drainage Basin Map
(72nd St. to Sequoia Rd.)
Ladera Drive Improvements

500 250 0 500 Feet

Legend

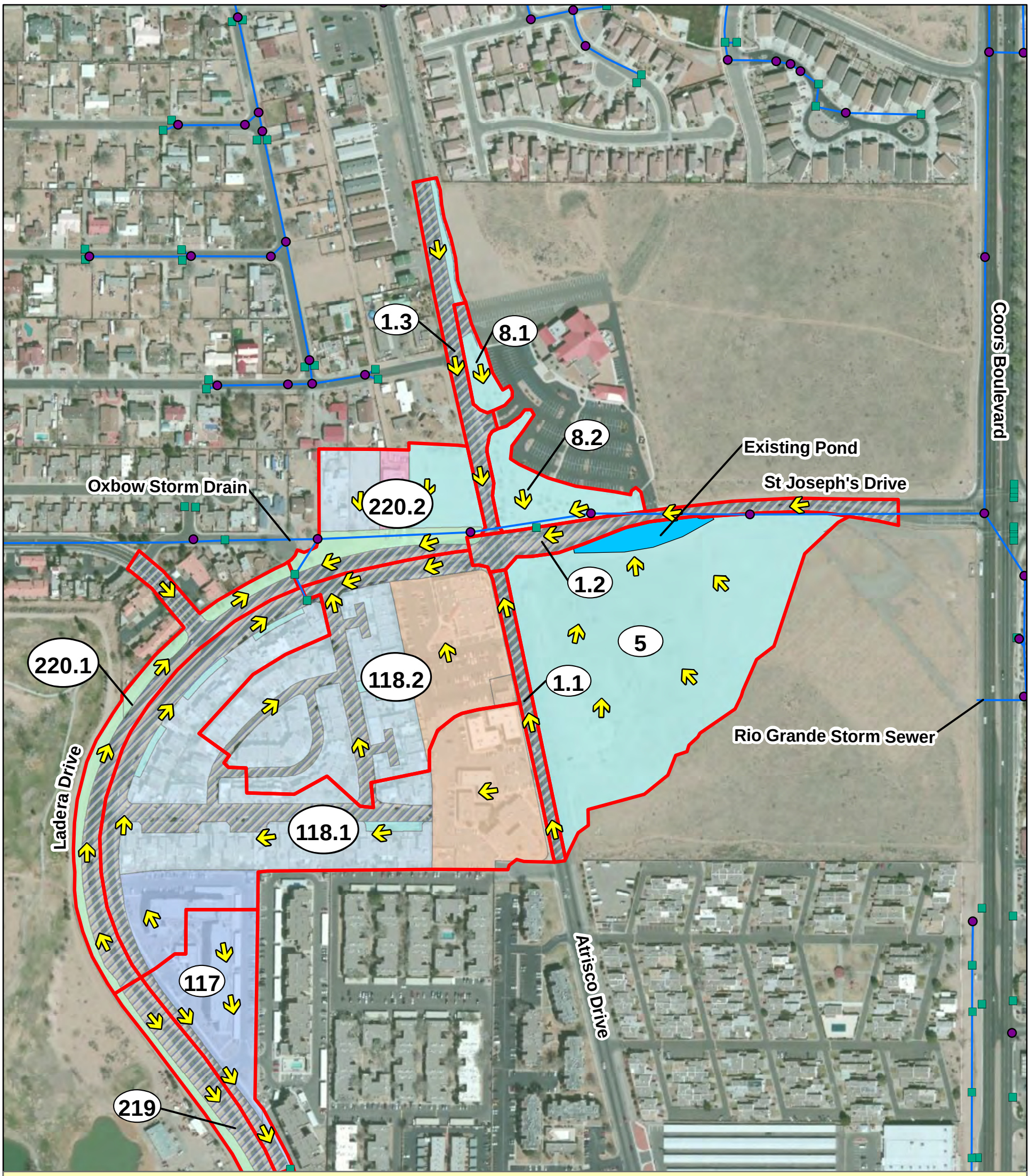
- Flow Direction
- Existing Manhole
- Existing Inlet
- Existing Storm Drain
- Existing Pond
- Basin Boundary
- Arroyo
- 2' Contours
- XXX Basin ID

N W E S

Exhibit 5
Drainage Basin Map
(Sequoia Rd. to Coors Blvd.)
Ladera Drive
Improvements

400 200 0 400 Feet

Attachment 3: Existing Land Use Map



Legend

- Flow Direction
- Existing Manhole
- Existing Inlet
- Existing Storm Drain
- Basin Boundary
- Existing Pond

Land Use

- ARTERIAL
- COMMERCIAL RETAIL
- COMMERCIAL SERVICE
- DRAINAGE / FLOOD CONTROL
- MULTI FAMILY
- PARKS / RECREATION
- PUBLIC / INSTITUTIONAL
- SINGLE FAMILY
- TRANSPORTATION / UTILITIES
- VACANT / OTHER
- Arroyo
- XXX Basin ID

N
W E
S

Exhibit 6
Existing Land Use Map
Ladera Drive Improvements

400 200 0 400 Feet

Attachment 4: Runoff Calculations

	cfs/100', 10-yr	cfs/100', 100-yr
Additional flow generated from going from 5' of "Type C" to 5' of "Type D" land treatment.	0.016	0.016
Additional flow generated from 5' of median not contributing before(land treatment "Type D").	0.033	0.048

								Peak Discharge, 10-yr					Peak Discharge, 100-yr								
Land Use	**Basin ID**	**Roadway Length**	**Basin Area (acres)**	**A (%)**	**B (%)**	**C (%)**	**D (%)**	**A (cfs/acre)**	**B (cfs/acre)**	**C (cfs/acre)**	**D (cfs/acre)**	**Existing Peak Discharge 10-yr (cfs)**	**A (cfs/acre)**	**B (cfs/acre)**	**C (cfs/acre)**	**D (cfs/acre)**	**Existing Peak Discharge 100-yr (cfs)**	**Additional Flow Generated By Improvements 10-yr (cfs)**	**Additional Flow Generated By Improvements 100-yr (cfs)**	**Total Flow 10-yr (cfs)**	**Total Flow 100-yr (cfs)**
Eastbound																					
Additional flow generated from going from 5' of "Type C" to 5' of "Type D" land treatment.																					
Mixed	100	2460	2.93	0	0	0.30	0.70	0.24	0.76	1.49	2.89	7.25	1.29	2.03	2.87	4.37	11.51	0.39	0.39	7.65	11.90
Arterial			2.06																		
Median/Landscaped Area			0.88																		
Mixed	101	732	0.88	0	0	0.38	0.62	0.24	0.76	1.49	2.89	2.07	1.29	2.03	2.87	4.37	3.34	0.12	0.12	2.19	3.45
Arterial			0.54																		
Median/Landscaped Area			0.34																		
Mixed	102.1	312	0.38	0	0	0.39	0.61	0.24	0.76	1.49	2.89	0.88	1.29	2.03	2.87	4.37	1.43	0.05	0.05	0.93	1.48
Arterial			0.23																		
Median/Landscaped Area			0.15																		
Mixed	102.2	480	0.58	0	0	0.33	0.67	0.24	0.76	1.49	2.89	1.41	1.29	2.03	2.87	4.37	2.25	0.08	0.08	1.49	2.33
Arterial			0.39																		
Median/Landscaped Area			0.19																		
Mixed	103	895	1.39	0	0	0.35	0.65	0.24	0.76	1.49	2.89	3.34	1.29	2.03	2.87	4.37	5.35	0.14	0.14	3.48	5.49
Arterial			0.90																		
Median/Landscaped Area			0.49																		
Mixed	104	4030	5.50	0	0	0.35	0.65	0.24	0.76	1.49	2.89	13.16	1.29	2.03	2.87	4.37	21.10	0.64	0.64	13.81	21.75
Arterial			3.55																		
Median/Landscaped Area			1.95																		
Mixed	105.1	1450	4.21	0	0	0.24	0.76	0.24	0.76	1.49	2.89	10.77	1.29	2.03	2.87	4.37	16.90	0.23	0.23	11.00	17.13
Arterial			1.75																		
Median/Landscaped Area			0.60																		
Residential 9			1.86																		
Mixed	105.2	96	0.12	0	0	0.22	0.78	0.24	0.76	1.49	2.89	0.32	1.29	2.03	2.87	4.37	0.50	0.02	0.02	0.34	0.52
Arterial			0.10																		
Median/Landscaped Area			0.03																		
Additional flow generated from 5' of type D land treatment.																					
Mixed	106	1054	0.97	0	0	0.11	0.89	0.24	0.76	1.49	2.89	2.65	1.29	2.03	2.87	4.37	4.08	0.35	0.51	3.00	4.58
Arterial			0.86																		
Median/Landscaped Area			0.11																		
Mixed	107	265	0.29	0	0	0.08	0.92	0.24	0.76	1.49	2.89	0.81	1.29	2.03	2.87	4.37	1.23	0.09	0.13	0.89	1.36
Arterial			0.27																		
Median/Landscaped Area			0.02																		
Mixed	108	492	0.45	0	0	0.12	0.88	0.24	0.76	1.49	2.89	1.24	1.29	2.03	2.87	4.37	1.91	0.16	0.24	1.40	2.14
Arterial			0.40																		
Median/Landscaped Area			0.05																		
Mixed	109	158	0.14	0	0	0.16	0.84	0.24	0.76	1.49	2.89	0.38	1.29	2.03	2.87	4.37	0.59	0.05	0.08	0.43	0.67
Arterial			0.12																		
Median/Landscaped Area			0.02																		
Mixed	110	439	0.40	0	0	0.11	0.89	0.24	0.76	1.49	2.89	1.10	1.29	2.03	2.87	4.37	1.69	0.14	0.21	1.25	1.90
Arterial			0.36																		
Median/Landscaped Area			0.05																		
Mixed	111	465	0.42	0	0	0.13	0.87	0.24	0.76	1.49	2.89	1.13	1.29	2.03	2.87	4.37	1.74	0.15	0.22	1.28	1.96
Arterial			0.36																		
Median/Landscaped Area			0.05																		
Mixed	112	242	0.27	0	0	0.15	0.85	0.24	0.76	1.49	2.89	0.72	1.29	2.03	2.87	4.37	1.11	0.08	0.12	0.80	1.23
Arterial			0.23																		
Median/Landscaped Area			0.04																		

	cfs/100', 10-yr	cfs/100', 100-yr
Additional flow generated from going from 5' of "Type C" to 5' of "Type D" land treatment.	0.016	0.016
Additional flow generated from 5' of median not contributing before(land treatment "Type D").	0.033	0.048

								Peak Discharge, 10-yr					Peak Discharge, 100-yr								
Land Use	**Basin ID**	**Roadway Length**	**Basin Area (acres)**	**A (%)**	**B (%)**	**C (%)**	**D (%)**	**A (cfs/acre)**	**B (cfs/acre)**	**C (cfs/acre)**	**D (cfs/acre)**	**Existing Peak Discharge 10-yr (cfs)**	**A (cfs/acre)**	**B (cfs/acre)**	**C (cfs/acre)**	**D (cfs/acre)**	**Existing Peak Discharge 100-yr (cfs)**	**Additional Flow Generated By Improvements 10-yr (cfs)**	**Additional Flow Generated By Improvements 100-yr (cfs)**	**Total Flow 10-yr (cfs)**	**Total Flow 100-yr (cfs)**
Eastbound																					
Additional flow generated from 5' of "Type D" land treatment.																					
Mixed	113	205	0.18	0	0	0.30	0.70	0.24	0.76	1.49	2.89	0.45	1.29	2.03	2.87	4.37	0.71	0.07	0.10	0.52	0.81
Arterial			0.13																		
Median/Landscaped Area			0.05																		
Mixed	114	306	0.33	0	0	0.16	0.84	0.24	0.76	1.49	2.89	0.88	1.29	2.03	2.87	4.37	1.36	0.10	0.15	0.98	1.51
Arterial			0.28																		
Median/Landscaped Area			0.05																		
Mixed	115.1	327	0.34	0	0	0.26	0.74	0.24	0.76	1.49	2.89	0.85	1.29	2.03	2.87	4.37	1.34	0.11	0.16	0.96	1.50
Arterial			0.25																		
Median/Landscaped Area			0.09																		
Mixed	115.2	168	0.28	0	0	0.08	0.92	0.24	0.76	1.49	2.89	0.78	1.29	2.03	2.87	4.37	1.20	0.06	0.08	0.84	1.28
Arterial			0.26																		
Median/Landscaped Area			0.02																		
Additional flow generated from going from 5' of "Type C" to 5' of "Type D" land treatment.																					
Mixed	116	353	0.43	0	0	0.37	0.63	0.24	0.76	1.49	2.89	1.02	1.29	2.03	2.87	4.37	1.64	0.06	0.06	1.07	1.69
Arterial			0.27																		
Median/Landscaped Area			0.16																		
Mixed	117	709	3.00	0	0	0.30	0.70	0.24	0.76	1.49	2.89	7.41	1.29	2.03	2.87	4.37	11.75	0.11	0.11	7.52	11.87
Arterial			0.56																		
Median/Landscaped Area			0.23																		
Multiple Unit Residential Attached			2.21																		
Mixed	118.1	1376	13.97	0	0	0.52	0.48	0.24	0.76	1.49	2.89	30.12	1.29	2.03	2.87	4.37	50.07	0.22	0.22	30.34	50.29
Arterial			0.93																		
Median/Landscaped Area			3.75																		
Multiple Unit Residential Attached			1.46																		
Multiple Unit Residential Detached			7.83																		
Mixed	118.2	504	9.40	0	0	0.30	0.70	0.24	0.76	1.49	2.89	23.25	1.29	2.03	2.87	4.37	36.88	0.08	0.08	23.33	36.96
Arterial			0.34																		
Median/Landscaped Area			0.14																		
Multiple Unit Residential Detached			5.89																		
Commercial			3.03																		

	cfs/100', 10-yr	cfs/100', 100-yr
Additional flow generated from going from 5' of "Type C" to 5' of "Type D" land treatment.	0.016	0.016
Additional flow generated from 5' of median not contributing before(land treatment "Type D").	0.033	0.048

								Peak Discharge, 10-yr					Peak Discharge, 100-yr								
Land Use	**Basin ID**	**Roadway Length**	**Basin Area (acres)**	**A (%)**	**B (%)**	**C (%)**	**D (%)**	**A (cfs/acre)**	**B (cfs/acre)**	**C (cfs/acre)**	**D (cfs/acre)**	**Existing Peak Discharge 10-yr (cfs)**	**A (cfs/acre)**	**B (cfs/acre)**	**C (cfs/acre)**	**D (cfs/acre)**	**Existing Peak Discharge 100-yr (cfs)**	**Additional Flow Generated By Improvements 10-yr (cfs)**	**Additional Flow Generated By Improvements 100-yr (cfs)**	**Total Flow 10-yr (cfs)**	**Total Flow 100-yr (cfs)**
Westbound																					
Additional flow generated from going from 5' of "Type C" to 5' of "Type D" land treatment.																					
Mixed	200	1732	6.28	0	0	0.66	0.34	0.24	0.76	1.49	2.89	12.36	1.29	2.03	2.87	4.37	21.25	0.28	0.28	12.64	21.53
Arterial			2.14																		
Median/Landscaped Area			4.14																		
Mixed	201	648	2.27	0	0	0.63	0.37	0.24	0.76	1.49	2.89	4.56	1.29	2.03	2.87	4.37	7.78	0.10	0.10	4.66	7.88
Arterial			0.84																		
Median/Landscaped Area			1.43																		
Mixed	202.1	1029	3.02	0	0	0.58	0.42	0.24	0.76	1.49	2.89	6.28	1.29	2.03	2.87	4.37	10.57	0.16	0.16	6.45	10.74
Arterial			1.28																		
Median/Landscaped Area			1.74																		
Mixed	202.2	483	3.31	0	0	0.87	0.13	0.24	0.76	1.49	2.89	5.52	1.29	2.03	2.87	4.37	10.13	0.08	0.08	5.60	10.21
Arterial			0.42																		
Median/Landscaped Area			2.89																		
Mixed	203	943	3.49	0	0	0.78	0.22	0.24	0.76	1.49	2.89	6.28	1.29	2.03	2.87	4.37	11.17	0.15	0.15	6.43	11.33
Arterial			0.77																		
Median/Landscaped Area			2.71																		
Mixed	204	1375	8.15	0	0	0.69	0.31	0.24	0.76	1.49	2.89	15.67	1.29	2.03	2.87	4.37	27.18	0.22	0.22	15.89	27.40
Arterial			1.34																		
Median/Landscaped Area			5.13																		
Multiple Unit Residential Attached			1.68																		
Mixed	205	477	1.60	0	0	0.33	0.67	0.24	0.76	1.49	2.89	3.89	1.29	2.03	2.87	4.37	6.20	0.08	0.08	3.97	6.28
Arterial			0.41																		
Median/Landscaped Area			0.24																		
Multiple Unit Residential Attached			0.95																		
Mixed	206	402	0.69	0	0	0.17	0.83	0.24	0.76	1.49	2.89	1.82	1.29	2.03	2.87	4.37	2.83	0.06	0.06	1.89	2.89
Arterial			0.57																		
Median/Landscaped Area			0.12																		
Mixed	207	369	0.43	0	0	0.18	0.82	0.24	0.76	1.49	2.89	1.12	1.29	2.03	2.87	4.37	1.75	0.06	0.06	1.18	1.81
Arterial			0.35																		
Median/Landscaped Area			0.08																		
Mixed	208	320	0.47	0	0	0.42	0.58	0.24	0.76	1.49	2.89	1.08	1.29	2.03	2.87	4.37	1.75	0.05	0.05	1.13	1.80
Arterial			0.27																		
Median/Landscaped Area			0.19																		
Mixed	209	386	0.55	0	0	0.48	0.52	0.24	0.76	1.49	2.89	1.22	1.29	2.03	2.87	4.37	2.01	0.06	0.06	1.28	2.07
Arterial			0.29																		
Median/Landscaped Area			0.26																		
Mixed	210	340	2.89	0	0	0.39	0.61	0.24	0.76	1.49	2.89	6.77	1.29	2.03	2.87	4.37	10.94	0.05	0.05	6.83	10.99
Arterial			0.59																		
Median/Landscaped Area			0.81																		
Residential 9			1.49																		
Mixed	211	185	0.23	0	0	0.16	0.84	0.24	0.76	1.49	2.89	0.63	1.29	2.03	2.87	4.37	0.97	0.03	0.03	0.66	1.00
Arterial			0.20																		
Median/Landscaped Area			0.04																		

	cfs/100', 10-yr	cfs/100', 100-yr
Additional flow generated from going from 5' of "Type C" to 5' of "Type D" land treatment.	0.016	0.016
Additional flow generated from 5' of median not contributing before(land treatment "Type D").	0.033	0.048

								Peak Discharge, 10-yr					Peak Discharge, 100-yr								
Land Use	**Basin ID**	**Roadway Length**	**Basin Area (acres)**	**A (%)**	**B (%)**	**C (%)**	**D (%)**	**A (cfs/acre)**	**B (cfs/acre)**	**C (cfs/acre)**	**D (cfs/acre)**	**Existing Peak Discharge 10-yr (cfs)**	**A (cfs/acre)**	**B (cfs/acre)**	**C (cfs/acre)**	**D (cfs/acre)**	**Existing Peak Discharge 100-yr (cfs)**	**Additional Flow Generated By Improvements 10-yr (cfs)**	**Additional Flow Generated By Improvements 100-yr (cfs)**	**Total Flow 10-yr (cfs)**	**Total Flow 100-yr (cfs)**
Westbound																					
Additional flow generated from going from 5' of "Type C" to 5' of "Type D" land treatment.																					
Mixed	212.1	1286	2.77	0	0	0.61	0.39	0.24	0.76	1.49	2.89	5.63	1.29	2.03	2.87	4.37	9.55	0.21	0.21	5.83	9.76
Arterial			1.07																		
Median/Landscaped Area			1.70																		
Mixed	212.2	93	0.18	0	0	0.59	0.41	0.24	0.76	1.49	2.89	0.37	1.29	2.03	2.87	4.37	0.63	0.01	0.01	0.39	0.64
Arterial			0.07																		
Median/Landscaped Area			0.11																		
Additional flow generated from 5' of "Type D" land treatment.																					
Mixed	213	374	0.62	0	0	0.30	0.70	0.24	0.76	1.49	2.89	1.52	1.29	2.03	2.87	4.37	2.41	0.12	0.18	1.64	2.59
Arterial			0.43																		
Median/Landscaped Area			0.19																		
Mixed	214	753	1.13	0	0	0.47	0.53	0.24	0.76	1.49	2.89	2.52	1.29	2.03	2.87	4.37	4.13	0.25	0.36	2.77	4.49
Arterial			0.60																		
Median/Landscaped Area			0.52																		
Mixed	215.1	239	0.41	0	0	0.59	0.41	0.24	0.76	1.49	2.89	0.85	1.29	2.03	2.87	4.37	1.43	0.08	0.11	0.93	1.55
Arterial			0.17																		
Median/Landscaped Area			0.24																		
Mixed	215.2	262	0.57	0	0	0.39	0.61	0.24	0.76	1.49	2.89	1.34	1.29	2.03	2.87	4.37	2.16	0.09	0.13	1.43	2.29
Arterial			0.35																		
Median/Landscaped Area			0.22																		
Mixed	216	711	1.11	0	0	0.44	0.56	0.24	0.76	1.49	2.89	2.53	1.29	2.03	2.87	4.37	4.13	0.23	0.34	2.77	4.47
Arterial			0.62																		
Median/Landscaped Area			0.49																		
Mixed	217.1	195	0.28	0	0	0.43	0.57	0.24	0.76	1.49	2.89	0.63	1.29	2.03	2.87	4.37	1.03	0.06	0.09	0.69	1.12
Arterial			0.16																		
Median/Landscaped Area			0.12																		
Mixed	217.2	760	1.16	0	0	0.37	0.63	0.24	0.76	1.49	2.89	2.75	1.29	2.03	2.87	4.37	4.42	0.25	0.36	3.00	4.79
Arterial			0.73																		
Median/Landscaped Area			0.43																		
Additional flow generated from going from 5' of "Type C" to 5' of "Type D" land treatment.																					
Mixed	218	177	0.34	0	0	0.44	0.56	0.24	0.76	1.49	2.89	0.77	1.29	2.03	2.87	4.37	1.26	0.03	0.03	0.80	1.29
Arterial			0.19																		
Median/Landscaped Area			0.15																		
Mixed	219	879	1.84	0	0	0.57	0.43	0.24	0.76	1.49	2.89	3.84	1.29	2.03	2.87	4.37	6.45	0.14	0.14	3.98	6.59
Arterial			0.79																		
Median/Landscaped Area			1.05																		
Mixed	220.1	1476	3.12	0	0	0.48	0.52	0.24	0.76	1.49	2.89	6.93	1.29	2.03	2.87	4.37	11.40	0.24	0.24	7.17	11.64
Arterial			1.63																		
Median/Landscaped Area			1.49																		
Mixed	220.2	521	3.75	0	0	0.70	0.30	0.24	0.76	1.49	2.89	7.14	1.29	2.03	2.87	4.37	12.43	0.08	0.08	7.23	12.52
Arterial			0.39																		
Median/Landscaped Area			0.52																		
Residential 1			0.99																		
Commercial			0.61																		
Vacant Land			1.24																		

Attachment 5: Existing and Proposed Pond Volume Calculations

Existing Pond Volume Calculations

								Peak Discharge						Excess Precipitation					
Land Use	Basin ID	Basin Area (acres)	Area ($mile^2$)	A (%)	B (%)	C (%)	D (%)	A (cfs/acre)	B (cfs/acre)	C (cfs/acre)	D (cfs/acre)	Peak Discharge (100-yr)	Calc cfs/acre)	A (inches)	B (inches)	C (inches)	D (inches)	Vol 100yr-6hr (acre-ft)	Vol 100-yr, 24-hr (acre-ft)
Mixed	5	12.19	0.01905	0	0	0.98	0.02	1.29	2.03	2.87	4.37	35.43	2.91	0.44	0.67	0.99	1.97	1.03	1.04
Vacant Land		11.89	0.01859																
Pond		0.30	0.00046																
Mixed	1.1	0.76	0.00119	0	0	0.00	1.00	1.29	2.03	2.87	4.37	3.32	4.37	0.44	0.67	0.99	1.97	0.12	0.15
Vacant Land		0.00	0.00000																
Arterial		0.76	0.00119																
Mixed	1.2	1.61	0.00252	0	0	0.14	0.86	1.29	2.03	2.87	4.37	6.71	4.17	0.44	0.67	0.99	1.97	0.25	0.30
Vacant Land		0.22	0.00034																
Arterial		1.39	0.00217																
Mixed	1.3	1.49	0.00233	0	0	0.10	0.90	1.29	2.03	2.87	4.37	6.29	4.22	0.44	0.67	0.99	1.97	0.23	0.28
Vacant Land		0.15	0.00024																
Arterial		1.34	0.00209																
Mixed	8.1	0.49	0.00076	0	0	0.72	0.28	1.29	2.03	2.87	4.37	1.61	3.29	0.44	0.67	0.99	1.97	0.05	0.06
Vacant Land		0.35	0.00055																
Arterial		0.14	0.00022																
Mixed	8.2	1.47	0.00229	0	0	0.80	0.20	1.29	2.03	2.87	4.37	4.65	3.17	0.44	0.67	0.99	1.97	0.14	0.16
Vacant Land		1.18	0.00184																
Arterial		0.20	0.00032																
Pond		0.09	0.00014																
																		Total	1.99

Proposed Pond Volume Calculations

Land Use	Basin ID	Basin Area (acres)	Area (mile^2)	A (%)	B (%)	C (%)	D (%)	Peak Discharge A (cfs/acre)	Peak Discharge B (cfs/acre)	Peak Discharge C (cfs/acre)	Peak Discharge D (cfs/acre)	Peak Discharge (10-yr)	Peak Discharge A (cfs/acre)	Peak Discharge B (cfs/acre)	Peak Discharge C (cfs/acre)	Peak Discharge D (cfs/acre)	Peak Discharge (100-yr)	Calc cfs/acre	Excess Precipitation A (inches)	Excess Precipitation B (inches)	Excess Precipitation C (inches)	Excess Precipitation D (inches)	Vol 100yr-6hr (acre-ft)	Vol 100-yr, 24-hr (acre-ft)
Mixed	*5	11.19	0.01748	0	0	1.00	0.00	0.24	0.76	1.49	2.89	16.67	1.29	2.03	2.87	4.37	32.12	2.87	0.44	0.67	0.99	1.97	0.92	0.92
Vacant Land		11.19	0.01748																					
Mixed	1.1	0.76	0.00119	0	0	0.00	1.00	0.24	0.76	1.49	2.89	2.20	1.29	2.03	2.87	4.37	3.32	4.37	0.44	0.67	0.99	1.97	0.12	0.15
Vacant Land		0.00	0.00000																					
Arterial		0.76	0.00119																					
Mixed	**1.2A-EB St Josephs East of Low Point	1.20	0.00187	0	0	0.15	0.85	0.24	0.76	1.49	2.89	3.20	1.29	2.03	2.87	4.37	4.95	4.14	0.44	0.67	0.99	1.97	0.18	0.22
Arterial		1.01	0.00158																					
Median/Landscaped Area		0.18	0.00029																					
Mixed	**1.2B-EB St Josephs West of Low Point	0.27	0.00043	0	0	0.06	0.94	0.24	0.76	1.49	2.89	0.77	1.29	2.03	2.87	4.37	1.17	4.28	0.44	0.67	0.99	1.97	0.04	0.05
Arterial		0.26	0.00040																					
Median/Landscaped Area		0.02	0.00003																					
Mixed	**1.2C-WB St Josephs East of Low Point	1.20	0.00187	0	0	0.16	0.84	0.24	0.76	1.49	2.89	3.18	1.29	2.03	2.87	4.37	4.93	4.12	0.44	0.67	0.99	1.97	0.18	0.22
Arterial		1.00	0.00156																					
Median/Landscaped Area		0.20	0.00031																					
Mixed	**1.2D-WB St Josephs West of Low Point	0.24	0.00037	0	0	0.11	0.89	0.24	0.76	1.49	2.89	0.65	1.29	2.03	2.87	4.37	0.99	4.21	0.44	0.67	0.99	1.97	0.04	0.04
Arterial		0.21	0.00033																					
Median/Landscaped Area		0.03	0.00004																					
Mixed	1.3	1.49	0.00233	0	0	0.10	0.90	0.24	0.76	1.49	2.89	4.10	1.29	2.03	2.87	4.37	6.29	4.22	0.44	0.67	0.99	1.97	0.23	0.28
Vacant Land		0.15	0.00024																					
Arterial		1.34	0.00209																					
Mixed	8.1	0.49	0.00076	0	0	0.72	0.28	0.24	0.76	1.49	2.89	0.92	1.29	2.03	2.87	4.37	1.61	3.29	0.44	0.67	0.99	1.97	0.05	0.06
Vacant Land		0.35	0.00055																					
Arterial		0.14	0.00022																					
Mixed	8.2	1.47	0.00229	0	0	0.80	0.20	0.24	0.76	1.49	2.89	2.59	1.29	2.03	2.87	4.37	4.65	3.17	0.44	0.67	0.99	1.97	0.14	0.16
Vacant Land		1.18	0.00184																					
Arterial		0.20	0.00032																					
Pond		0.09	0.00014																					
																						Total	2.11	

Attachment 6: Inlet Spacing Analysis

Pavement Drainage
Ladera Drive Eastbound 10yr

JOB: Ladera Drive Improvements																					
Inlet Number:	**0**	**On Grade**	**On Grade**	**On Grade**	**On Grade**	**On Grade**	**On Grade**	**Low Point**	**Low Point**	**On Grade**	**On Grade**	**On Grade**	**On Grade**	**Low Point**	**On Grade**	**On Grade**	**On Grade**	**On Grade**	**On Grade**	**On Grade**	**On Grade**
Temporary Inlet Number:	(Input Data)																				
Return Period:		10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
Allowable Spread:		18	18	18	18	18	18	18	18	18	18	18	18	18	12	12	12	12	12	12	12
RATIONAL METHOD HYDROLOGY COMPUTATION:		⇒	⇒	⇒	⇒	⇒	⇒	⇓	⇓	⇐	⇒	⇒	⇒	⇓	⇒	⇒	⇒	⇒	⇒	⇐	
Basin ID		**100**	**100**	**100**	**101**	**101**	**102.1**	**102.1**	**102.2**	**102.2**	**104**	**104**	**105**	**105**	**106**	**106**	**107**	**107**	**108**	**108**	**109**
Location:		**NB**	**NB**	**NB**	**NB**	**NB**	**NB**	**NB**	**NB**	**NB**	**NB**	**NB**	**NB**	**NB**	**NB**	**NB**	**NB**	**NB**	**NB**	**NB**	**NB**
Location Description:		Curb Opng	grate	grate	Curb Opng	grate	Curb Opng	grate	grate	Curb Opng	Curb Opng	grate	Curb Opng	grate	Curb Opng	grate	Curb Opng	grate	Curb Opng	grate	grate
Pavement Area (ac):																					
Sideslope Area (ac):																					
Contributing watershed area (acres):		**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**
Previous by-pass flow (cfs):			6.4	3.2	1.2	2.5	0.8	0.5	0.4		0.0	11.9	7.5	13.7	0.0	1.6	0.6	0.6	0.1	0.6	0.0
Discharge added by operator:		7.7	0.0	0.0	2.2		0.9			1.5	13.8	0.0	11.0	0.3	3.0	0.0	0.9	0.0	1.4	0.0	0.0
Total discharge Q (cfs):		**7.7**	**6.4**	**3.2**	**3.4**	**2.5**	**1.8**	**0.5**	**0.4**	**1.5**	**13.8**	**11.9**	**18.5**	**14.1**	**3.0**	**1.6**	**1.5**	**0.6**	**1.5**	**0.6**	**0.0**
CA	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SHOULDER AND GUTTER CONFIGURATION:																					
Manning's n:		0.017	0.017	0.017	0.017	0.017	0.017	0.017	0.017	0.017	0.017	0.017	0.017	0.017	0.017	0.017	0.017	0.017	0.017	0.017	0.017
Longitudinal slope S (ft/ft):		0.0316	0.0316	0.0316	0.0252	0.0252	0.0010	0.0010	0.0010	0.0010	0.0212	0.0212	0.0010	0.0010	0.0030	0.0030	0.0030	0.0030	0.0030	0.0030	0.0030
Inlet type (1=grate, 2=curb opening, 3=slotted):		2	1	1	2	1	2	1	1	2	2	1	2	1	2	1	2	1	2	1	1
Longitudinal profile (1=on-grade, 2=sag):		1	1	1	1	1	1	2	2	1	1	1	1	2	1	1	1	1	1	1	1
Gutter Configuration (NMDOT curb, 1=Type A, 2=Type B vertical):		2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Capture Ratio Used:		100%	50%	50%	100%	50%	100%	50%	50%	100%	100%	50%	100%	50%	100%	50%	100%	50%	100%	50%	50%
Inlet Std:		Single A	Single A	Single C	Single A	Single A	Single A	Single A	Single A	Single A	Single A	Single A	Single A	Single A	Single A	Single A	Single A	Single A	Single A	Single A	Single A
Grate width:		0	2	2	0	2	0	2	2	0	0	2	0	2	0	2	0	2	0	2	2
Grate length:		0.0	3.3	3.3	0.0	3.3	0.0	3.3	3.3	0.0	0.0	3.3	0.0	3.3	0.0	3.3	0.0	3.3	0.0	3.3	3.3
Pavement cross-slope (Sx):		0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020
Width of gutter from flowline (ft):		2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Gutter depression from horizontal (ft):		0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12
Gutter cross-slope Sw: (S'w=Sw-Sx)		0.060	0.060	0.060	0.060	0.060	0.060	0.060	0.060	0.060	0.060	0.060	0.060	0.060	0.060	0.060	0.060	0.060	0.060	0.060	0.060
Flooded Width from flowline (ft): before inlet		**12.2**	**11.3**	**8.4**	**9.1**	**7.9**	**13.6**	**NA**	**NA**	**12.7**	**16.7**	**15.8**	**33.7**	**NA**	**13.5**	**10.5**	**10.2**	**6.7**	**10.2**	**6.6**	**1.1**
Depth at flowline (ft): before inlet		0.32	0.31	0.25	0.26	0.24	0.35	0.00	0.00	0.33	0.41	0.40	0.75	0.00	0.35	0.29	0.28	0.21	0.28	0.21	0.07
Water cross-area (sq.ft): before inlet		1.57	1.36	0.79	0.90	0.71	1.92	0.00	0.00	1.68	2.88	2.57	11.46	0.00	1.89	1.18	1.12	0.53	1.11	0.52	0.04
Velocity V for total discharge (fps): before inlet		4.88	4.68	4.06	3.75	3.52	0.92	0.00	0.00	0.89	4.79	4.63	1.62	0.00	1.59	1.39	1.37	1.14	1.37	1.14	0.60
Ratio of gutter depression flow to total Q (Eod):		44.8%	48.0%	61.4%	58.0%	64.7%	40.6%	100.0%	100.0%	43.3%	33.1%	35.1%	16.4%	100.0%	40.9%	51.3%	52.6%	72.8%	52.7%	73.1%	100.0%
Equivalent cross-slope (Se):		0.038	0.039	0.045	0.043	0.046	0.036	0.060	0.060	0.037	0.033	0.034	0.027	0.060	0.036	0.041	0.041	0.049	0.041	0.049	0.060
GRATE INLETS ON-GRADE:																					
Ratio of grate frontal flow to total flow:		-----	48.0%	61.4%	-----	64.7%	-----	-----	-----	-----	-----	35.1%	-----	-----	-----	51.3%	-----	72.8%	-----	73.1%	100.0%
Inlet frontal flow in cfs (Qw):		-----	3.05	1.98	-----	1.61	-----	-----	-----	-----	-----	4.17	-----	-----	-----	0.84	-----	0.44	-----	0.43	0.02
Vo for effective length (P-1-7/8, Chart 7 HEC 12):		-----	7.23	7.23	-----	7.20	-----	-----	-----	-----	-----	7.23	-----	-----	-----	7.23	-----	7.23	-----	7.23	7.23
Fraction of frontal flow intercepted (Rf):		-----	100.0%	100.0%	-----	100.0%	-----	-----	-----	-----	-----	100.0%	-----	-----	-----	100.0%	-----	100.0%	-----	100.0%	100.0%
Side flow in cfs (Qs):		-----	3.31	1.24	-----	0.88	-----	-----	-----	-----	-----	7.73	-----	-----	-----	0.80	-----	0.16	-----	0.16	0.00
Effective grate length w/clogging:		-----	1.67	1.67	-----	1.65	-----	-----	-----	-----	-----	1.67	-----	-----	-----	1.67	-----	1.67	-----	1.67	1.67
Fraction of side flow interception (Rs):		-----	2.6%	3.3%	-----	4.2%	-----	-----	-----	-----	-----	2.7%	-----	-----	-----	19.3%	-----	25.4%	-----	25.5%	0.0%
Grate Efficiency (E):		-----	49.4%	62.7%	-----	66.1%	-----	-----	-----	-----	-----	36.8%	-----	-----	-----	60.7%	-----	79.7%	-----	80.0%	100.0%
Total flow intercepted (cfs):		-----	3.14	2.02	-----	1.64	-----	-----	-----	-----	-----	4.38	-----	-----	-----	1.00	-----	0.48	-----	0.47	0.02
Grate flow-by (cfs):		**-----**	**3.22**	**1.20**	**-----**	**0.84**	**-----**	**-----**	**-----**	**-----**	**-----**	**7.52**	**-----**	**-----**	**-----**	**0.64**	**-----**	**0.12**	**-----**	**0.12**	**0.00**
SLOTTED DRAINS AND CURB OPENING INLETS ON-GRADE:																					
Length required for total interception (ft): w/clogging		41.1	-----	-----	25.2	-----	8.1	-----	-----	7.4	50.5	-----	26.2	-----	14.0	-----	9.8	-----	9.8	-----	-----
Length of inlet provided L (ft):		4	4	4	4	4	4	0	0	4	4	4	4	0	4	4	4	4	4	4	4
Interception for length L (cfs):		1.29	-----	-----	0.91	-----	1.25	-----	-----	1.12	1.90	-----	4.78	-----	1.36	-----	0.93	-----	0.93	-----	-----
Efficiency for length L:		0.17	-----	-----	0.27	-----	0.71	-----	-----	0.75	0.14	-----	0.26	-----	0.45	-----	0.61	-----	0.61	-----	-----
Slotted drain or curb opening flow-by (cfs):		**6.36**	**-----**	**-----**	**2.48**	**-----**	**0.52**	**-----**	**-----**	**0.37**	**11.91**	**-----**	**13.74**	**-----**	**1.64**	**-----**	**0.60**	**-----**	**0.59**	**-----**	**-----**
INTERCEPTION CAPACITY OF INLETS IN SAG LOCATION:																					
Head available for weir flow at sag (ft):		0	0	0	0	0	0	0.42	0.42	0	0	0	0	0.42	0	0	0	0	0	0	0
Capacity of grate in a sag (3-sided weir):		-----	Head Available?	Head Available?	-----	Head Available?	-----	2.98	2.98	-----	-----	Head Available?	-----	2.99	-----	Head Available?	-----	Head Available?	-----	Head Available?	Head Available?
Capacity of grate in a sag (4-sided weir):		-----	Head Available?	Head Available?	-----	Head Available?	-----	4.3	4.3	-----	-----	Head Available?	-----	4.4	-----	Head Available?	-----	Head Available?	-----	Head Available?	Head Available?
Length provided of curb-opening or slotted drain at sag:		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Capacity of curb-opening or slotted drain in a sag (weir):		-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Length of the vertical curve (ft x 100):																					
approach grade #1 (%):																					
approach grade #2 (%):																					
ABS (algebraic diff. in approach grades) (%):		-----	-----	-----	-----	-----	-----	0.00	0.00	-----	-----	-----	-----	0.00	-----	-----	-----	-----	-----	-----	-----
K = Min(Lc/A,167) (Table 5, HEC-12):		-----	-----	-----	-----	-----	-----	#DIV/0!	#DIV/0!	-----	-----	-----	-----	#DIV/0!	-----	-----	-----	-----	-----	-----	-----
Flanking inlets maximum distance (ft):		-----	-----	-----	-----	-----	-----	#DIV/0!	#DIV/0!	-----	-----	-----	-----	#DIV/0!	-----	-----	-----	-----	-----	-----	-----
TRIANGULAR MEDIAN HYDRAULICS:																					
Manning's n for median finish:																					
Cross-slope of median sides:																					
Depth of flow at center of median (ft):		-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Flooded width in the median (ft):		-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Water velocity in the median (fps):		-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

Design by: BPB

Pavement Drainage
Ladera Drive Eastbound 10yr

JOB: Ladera Drive Improvements																	
Inlet Number:	**On Grade**	**On Grade**	**On Grade**	**On Grade**	**On Grade**	**On Grade**	**On Grade**	**On Grade**	**On Grade**	**On Grade**	**On Grade**	**Low Point**	**On Grade**	**On Grade**	**On Grade**	**On Grade**	**Low Point**
Temporary Inlet Number:																	
Return Period:	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
Allowable Spread:	12	12	12	12	12	12	12	12	12	12	12	12	18	18	18	18	18
RATIONAL METHOD HYDROLOGY COMPUTATION:	⇐	⇐	⇐	⇒	⇒	⇒	⇒	⇒	⇒	⇒	⇒	⇓	⇐	⇐	⇐	⇐	⇓
Basin ID	**109**	**110**	**110**	**111**	**111**	**112**	**112**	**113**	**113**	**114**	**114**	**115**	**116**	**116**	**117**	**117**	**118**
Location:	**NB**	**NB**	**NB**	**NB**	**NB**	**NB**	**NB**	**NB**	**NB**	**NB**	**NB**	**NB**	**NB**	**NB**	**NB**	**NB**	**NB**
Location Description:	Curb Opng	grate	Curb Opng	Curb Opng	grate	Curb Opng	grate	Curb Opng	grate	Curb Opng	grate	grate	grate	Curb Opng	grate	Curb Opng	grate
Pavement Area (ac):																	
Sideslope Area (ac):																	
Contributing watershed area (acres):	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**
Previous by-pass flow (cfs):		0.4			0.4	0.1	0.2	0.0	0.1	0.0	0.3	1.2	2.5	3.1	5.3		-----
Discharge added by operator:	0.4	0.0	1.3	1.3	0.0	0.8	0.0	0.5	0.0	1.0	0.0	2.4		1.1		7.5	53.7
Total discharge Q (cfs):	**0.4**	**0.4**	**1.3**	**1.3**	**0.4**	**0.9**	**0.2**	**0.5**	**0.1**	**1.0**	**0.3**	**3.6**	**2.5**	**4.2**	**5.3**	**7.5**	**53.7**
CA	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SHOULDER AND GUTTER CONFIGURATION:																	
Manning's n:	0.017	0.017	0.017	0.017	0.017	0.017	0.017	0.017	0.017	0.017	0.017	0.017	0.017	0.017	0.017	0.017	0.017
Longitudinal slope S (ft/ft):	0.0030	0.0030	0.0030	0.0030	0.0030	0.0030	0.0030	0.0030	0.0030	0.0030	0.0030	0.0010	0.0030	0.0030	0.0030	0.0030	0.0010
Inlet type (1=grate, 2=curb opening, 3=slotted):	2	1	2	2	1	2	1	2	1	2	1	1	1	2	1	2	1
Longitudinal profile (1=on-grade, 2=sag):	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1	2
Gutter Configuration (NMDOT curb, 1=Type A, 2=Type B vertical):	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Capture Ratio Used:	100%	50%	100%	100%	50%	100%	50%	100%	50%	100%	50%	50%	50%	100%	50%	100%	50%
Inlet Std:	Single A	Single A	Single A	Single A	Single A	Single A	Single A	Single A	Single A	Single A	Single A	Single A	Single A	Single A	Single A	Single A	Double C
Grate width:	0	2	0	0	2	0	2	0	2	0	2	2	2	0	2	0	2
Grate length:	0.0	3.3	0.0	0.0	3.3	0.0	3.3	0.0	3.3	0.0	3.3	3.3	3.3	0.0	3.3	0.0	6.6
Pavement cross-slope (Sx):	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020
Width of gutter from flowline (ft):	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Gutter depression from horizontal (ft):	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12
Gutter cross-slope Sw: (S'w=Sw-Sx)	0.060	0.060	0.060	0.060	0.060	0.060	0.060	0.060	0.060	0.060	0.060	0.060	0.060	0.060	0.060	0.060	0.060
Flooded Width from flowline (ft): before inlet	**5.6**	**5.6**	**9.3**	**9.4**	**5.7**	**7.9**	**3.6**	**6.3**	**1.5**	**8.4**	**4.3**	**NA**	**12.6**	**15.3**	**16.9**	**19.3**	**NA**
Depth at flowline (ft): before inlet	0.19	0.19	0.27	0.27	0.19	0.24	0.15	0.21	0.09	0.25	0.17	0.00	0.33	0.39	0.42	0.47	0.00
Water cross-area (sq.ft): before inlet	0.40	0.39	0.95	0.97	0.41	0.71	0.21	0.47	0.07	0.78	0.26	0.00	1.66	2.43	2.92	3.82	0.00
Velocity V for total discharge (fps): before inlet	1.08	1.08	1.31	1.32	1.08	1.22	0.98	1.11	0.74	1.25	1.01	0.00	1.53	1.71	1.81	1.97	0.00
Ratio of gutter depression flow to total Q (Eod):	80.6%	81.0%	56.7%	56.2%	80.0%	64.5%	95.6%	75.9%	100.0%	61.8%	91.0%	100.0%	43.6%	36.1%	32.9%	28.7%	100.0%
Equivalent cross-slope (Se):	0.052	0.052	0.043	0.042	0.052	0.046	0.058	0.050	0.060	0.045	0.056	0.060	0.037	0.034	0.033	0.031	0.060
GRATE INLETS ON-GRADE:																	
Ratio of grate frontal flow to total flow:	-----	81.0%	-----	-----	80.0%	-----	95.6%	-----	100.0%	-----	91.0%	-----	43.6%	-----	32.9%	-----	-----
Inlet frontal flow in cfs (Qw):	-----	0.34	-----	-----	0.35	-----	0.19	-----	0.05	-----	0.24	-----	1.11	-----	1.74	-----	-----
Vo for effective length (P-1-7/8, Chart 7 HEC 12):	-----	7.23	-----	-----	7.23	-----	7.23	-----	7.23	-----	7.23	-----	7.23	-----	7.23	-----	-----
Fraction of frontal flow intercepted (Rf):	-----	100.0%	-----	-----	100.0%	-----	100.0%	-----	100.0%	-----	100.0%	-----	100.0%	-----	100.0%	-----	-----
Side flow in cfs (Qs):	-----	0.08	-----	-----	0.09	-----	0.01	-----	0.00	-----	0.02	-----	1.43	-----	3.55	-----	-----
Effective grate length w/clogging:	-----	1.67	-----	-----	1.67	-----	1.67	-----	1.67	-----	1.67	-----	1.67	-----	1.67	-----	-----
Fraction of side flow interception (Rs):	-----	27.4%	-----	-----	27.2%	-----	31.0%	-----	0.0%	-----	29.8%	-----	16.7%	-----	12.9%	-----	-----
Grate Efficiency (E):	-----	86.2%	-----	-----	85.5%	-----	97.0%	-----	100.0%	-----	93.7%	-----	53.0%	-----	41.6%	-----	-----
Total flow intercepted (cfs):	-----	0.36	-----	-----	0.38	-----	0.20	-----	0.05	-----	0.25	-----	1.34	-----	2.20	-----	-----
Grate flow-by (cfs):	**-----**	**0.06**	**-----**	**-----**	**0.06**	**-----**	**0.01**	**-----**	**0.00**	**-----**	**0.02**	**-----**	**1.19**	**-----**	**3.09**	**-----**	**-----**
SLOTTED DRAINS AND CURB OPENING INLETS ON-GRADE:																	
Length required for total interception (ft): w/clogging	5.0	-----	8.8	8.9	-----	7.2	-----	5.6	-----	7.7	-----	-----	-----	16.6	-----	22.5	-----
Length of inlet provided L (ft):	4	4	4	4	4	4	4	4	4	4	4	0	4	4	4	4	4
Interception for length L (cfs):	0.41	-----	0.83	0.84	-----	0.66	-----	0.47	-----	0.71	-----	-----	-----	1.62	-----	2.23	-----
Efficiency for length L:	0.95	-----	0.66	0.66	-----	0.76	-----	0.90	-----	0.73	-----	-----	-----	0.39	-----	0.30	-----
Slotted drain or curb opening flow-by (cfs):	**0.02**	**-----**	**0.42**	**0.44**	**-----**	**0.20**	**-----**	**0.05**	**-----**	**0.27**	**-----**	**-----**	**-----**	**2.53**	**-----**	**5.29**	**-----**
INTERCEPTION CAPACITY OF INLETS IN SAG LOCATION:																	
Head available for weir flow at sag (ft):	0	0	0	0	0	0	0	0	0	0	0	0.42	0	0	0	0	0.42
Capacity of grate in a sag (3-sided weir):	-----	Head Available?	-----	-----	Head Available?	-----	Head Available?	-----	Head Available?	-----	Head Available?	2.98	Head Available?	-----	Head Available?	-----	4.33
Capacity of grate in a sag (4-sided weir):	-----	Head Available?	-----	-----	Head Available?	-----	Head Available?	-----	Head Available?	-----	Head Available?	4.3	Head Available?	-----	Head Available?	-----	7.0
Length provided of curb-opening or slotted drain at sag:	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Capacity of curb-opening or slotted drain in a sag (weir):	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Length of the vertical curve (ft x 100):																	
approach grade #1 (%):																	
approach grade #2 (%):																	
ABS (algebraic diff. in approach grades) (%):	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	0.00	-----	-----	-----	-----	0.00
K = Min(Lc/A,167) (Table 5, HEC-12):	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	#DIV/0!	-----	-----	-----	-----	#DIV/0!
Flanking inlets maximum distance (ft):	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	#DIV/0!	-----	-----	-----	-----	#DIV/0!
TRIANGULAR MEDIAN HYDRAULICS:																	
Manning's n for median finish:																	
Cross-slope of median sides:																	
Depth of flow at center of median (ft):	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Flooded width in the median (ft):	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Water velocity in the median (fps):	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

Design by: BPB

Pavement Drainage
Ladera Drive Westbound-10yr

JOB: Ladera Drive Improvements

Inlet Number:	##	On Grade	On Grade	On Grade	On Grade	On Grade	On Grade	Low Point	Low Point	On Grade	On Grade	On Grade	On Grade	On Grade	On Grade	On Grade	On Grade	On Grade	On Grade	On Grade	On Grade	On Grade
Temporary Inlet Number:		(Input Data)																				
Return Period:		10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
Allowable Spread:		18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18
RATIONAL METHOD HYDROLOGY COMPUTATION:		⇒	⇒	⇒	⇒	⇒	⇒	⇓	⇓	⇒	⇒	⇒	⇒	⇒	⇒	⇒	⇒	⇒	⇒	⇒	⇒	⇒
Basin ID		**200**	**200**	**201**	**201**	**201**	**202.1**	**202.1**	**202.2**	**204**	**204**	**205**	**205**	**206**	**206**	**207**	**207**	**208**	**208**	**209**	**209**	**210**
Location:		**SB**	**SB**	**SB**	**SB**	**SB**	**SB**	**SB**	**SB**	**SB**	**SB**	**SB**	**SB**	**SB**	**SB**	**SB**	**SB**	**SB**	**SB**	**SB**	**SB**	**SB**
Location Description:		Curb Opng	grate	Curb Opng	grate	grate	Curb Opng	grate	grate	Curb Opng	grate	Curb Opng	grate	Curb Opng	grate	Curb Opng	grate	Curb Opng	grate	Curb Opng	grate	Curb Opng
Pavement Area (ac):																						
Sideslope Area (ac):																						
Contributing watershed area (acres):		**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**
Previous by-pass flow (cfs):			10.9	6.6	9.7	5.7	2.8	4.6			13.5	8.0	10.1	6.3	6.6	3.7	3.7	1.7	2.0	0.6	1.0	0.2
Discharge added by operator:		12.6	0.0	4.7	0.0	0.0	4.7		5.6	15.9	0.0	4.0	0.0	1.9	0.0	1.2	0.0	1.1	0.0	1.3	0.0	6.8
Total discharge Q (cfs):		**12.6**	**10.9**	**11.3**	**9.7**	**5.7**	**7.5**	**4.6**	**5.6**	**15.9**	**13.5**	**12.0**	**10.1**	**8.2**	**6.6**	**4.9**	**3.7**	**2.8**	**2.0**	**1.9**	**1.0**	**7.1**
CA		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SHOULDER AND GUTTER CONFIGURATION:																						
Manning's n:		0.017	0.017	0.017	0.017	0.017	0.017	0.017	0.017	0.017	0.017	0.017	0.017	0.017	0.017	0.017	0.017	0.017	0.017	0.017	0.017	0.017
Longitudinal slope S (ft/ft):		0.0273	0.0273	0.0273	0.0273	0.0273	0.0010	0.0010	0.0010	0.0123	0.0123	0.0171	0.0171	0.0171	0.0171	0.0171	0.0171	0.0221	0.0221	0.0073	0.0073	0.0198
Inlet type (1=grate, 2=curb opening, 3=slotted):		2	1	2	1	1	2	1	1	2	1	2	1	2	1	2	1	2	1	2	1	2
Longitudinal profile (1=on-grade, 2=sag):		1	1	1	1	1	1	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1
Gutter Configuration (NMDOT curb, 1=Type A, 2=Type B vertical):		2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Capture Ratio Used:		100%	50%	100%	50%	50%	100%	50%	50%	100%	50%	100%	50%	100%	50%	100%	50%	100%	50%	100%	50%	100%
Inlet Std:		Single A	Single A	Single A	Single A	Single C	Single A	Single A	Double C	Single A	Single A	Single A	Single A	Single A	Single A	Single A	Single A	Single A	Single A	Single A	Single A	Single A
Grate width:		0	2	0	2	2	0	2	2	0	2	0	2	0	2	0	2	0	2	0	2	0
Grate length:		0.0	3.3	0.0	3.3	3.3	0.0	3.3	6.6	0.0	6.6	0.0	3.3	0.0	3.3	0.0	3.3	0.0	3.3	0.0	3.3	0.0
Pavement cross-slope (Sx):		0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020
Width of gutter from flowline (ft):		2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Gutter depression from horizontal (ft):		0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12
Gutter cross-slope Sw: (S'w=Sw-Sx)		0.060	0.060	0.060	0.060	0.060	0.060	0.060	0.060	0.060	0.060	0.060	0.060	0.060	0.060	0.060	0.060	0.060	0.060	0.060	0.060	0.060
Flooded Width from flowline (ft): before inlet		**15.4**	**14.5**	**14.7**	**13.8**	**11.1**	**23.9**	**NA**	**NA**	**19.7**	**18.5**	**16.5**	**15.5**	**14.2**	**13.0**	**11.5**	**10.2**	**8.6**	**7.3**	**9.2**	**6.9**	**13.0**
Depth at flowline (ft): before inlet		0.39	0.37	0.37	0.36	0.30	0.56	0.00	0.00	0.47	0.45	0.41	0.39	0.36	0.34	0.31	0.28	0.25	0.23	0.26	0.22	0.34
Water cross-area (sq.ft): before inlet		2.45	2.19	2.24	1.99	1.31	5.77	0.00	0.00	3.95	3.50	2.81	2.47	2.09	1.78	1.40	1.13	0.82	0.61	0.92	0.55	1.77
Velocity V for total discharge (fps): before inlet		5.17	5.00	5.03	4.86	4.31	1.29	0.00	0.00	4.02	3.87	4.27	4.10	3.90	3.72	3.48	3.27	3.42	3.19	2.03	1.80	4.00
Ratio of gutter depression flow to total Q (Eod):		36.0%	38.0%	37.6%	39.9%	48.8%	23.3%	100.0%	100.0%	28.2%	30.0%	33.6%	35.8%	38.9%	42.1%	47.3%	52.4%	60.6%	68.6%	57.6%	71.4%	42.2%
Equivalent cross-slope (Se):		0.034	0.035	0.035	0.036	0.040	0.029	0.060	0.060	0.031	0.032	0.033	0.034	0.036	0.037	0.039	0.041	0.044	0.047	0.043	0.049	0.037
GRATE INLETS ON-GRADE:																						
Ratio of grate frontal flow to total flow:		-----	38.0%	-----	39.9%	48.8%	-----	-----	-----	-----	30.0%	-----	35.8%	-----	42.1%	-----	52.4%	-----	68.6%	-----	71.4%	-----
Inlet frontal flow in cfs (Qw):		-----	4.16	-----	3.85	2.76	-----	-----	-----	-----	4.07	-----	3.63	-----	2.79	-----	1.93	-----	1.34	-----	0.71	-----
Vo for effective length (P-1-7/8, Chart 7 HEC 12):		-----	7.23	-----	7.23	7.23	-----	-----	-----	-----	10.45	-----	7.20	-----	7.20	-----	7.20	-----	7.20	-----	7.20	-----
Fraction of frontal flow intercepted (Rf):		-----	100.0%	-----	100.0%	100.0%	-----	-----	-----	-----	100.0%	-----	100.0%	-----	100.0%	-----	100.0%	-----	100.0%	-----	100.0%	-----
Side flow in cfs (Qs):		-----	6.77	-----	5.80	2.90	-----	-----	-----	-----	9.48	-----	6.50	-----	3.84	-----	1.76	-----	0.61	-----	0.28	-----
Effective grate length w/clogging:		-----	1.67	-----	1.67	1.67	-----	-----	-----	-----	3.30	-----	1.65	-----	1.65	-----	1.65	-----	1.65	-----	1.65	-----
Fraction of side flow interception (Rs):		-----	2.3%	-----	2.4%	3.0%	-----	-----	-----	-----	15.4%	-----	3.2%	-----	3.8%	-----	4.8%	-----	5.0%	-----	12.8%	-----
Grate Efficiency (E):		-----	39.5%	-----	41.4%	50.3%	-----	-----	-----	-----	40.8%	-----	37.9%	-----	44.3%	-----	54.7%	-----	70.1%	-----	75.1%	-----
Total flow intercepted (cfs):		-----	4.31	-----	3.99	2.85	-----	-----	-----	-----	5.53	-----	3.83	-----	2.94	-----	2.02	-----	1.37	-----	0.75	-----
Grate flow-by (cfs):		-----	**6.61**	-----	**5.66**	**2.81**	-----	-----	-----	-----	**8.02**	-----	**6.29**	-----	**3.70**	-----	**1.67**	-----	**0.58**	-----	**0.25**	-----
SLOTTED DRAINS AND CURB OPENING INLETS ON-GRADE:																						
Length required for total interception (ft): w/clogging		51.5	-----	48.5	-----	-----	16.8	-----	-----	47.2	-----	44.5	-----	36.5	-----	27.9	-----	22.1	-----	13.6	-----	35.1
Length of inlet provided L (ft):		4	4	4	4	4	4	0	0	4	4	4	4	4	4	4	4	4	4	4	4	4
Interception for length L (cfs):		1.71	-----	1.62	-----	-----	2.89	-----	-----	2.34	-----	1.87	-----	1.54	-----	1.19	-----	0.85	-----	0.87	-----	1.38
Efficiency for length L:		0.14	-----	0.14	-----	-----	0.39	-----	-----	0.15	-----	0.16	-----	0.19	-----	0.24	-----	0.30	-----	0.47	-----	0.20
Slotted drain or curb opening flow-by (cfs):		**10.93**	-----	**9.66**	-----	-----	**4.59**	-----	-----	**13.55**	-----	**10.12**	-----	**6.64**	-----	**3.69**	-----	**1.95**	-----	**0.99**	-----	**5.69**
INTERCEPTION CAPACITY OF INLETS IN SAG LOCATION:																						
Head available for weir flow at sag (ft):		0	0	0	0	0	0	0.42	0.42	0	0	0	0	0	0	0	0	0	0	0	0	0
Capacity of grate in a sag (3-sided weir):		-----	Head Available?	-----	Head Available?	Head Available?	-----	2.98	4.33	-----	Head Available?	-----	Head Available?	-----	Head Available?	-----	Head Available?	-----	Head Available?	-----	Head Available?	-----
Capacity of grate in a sag (4-sided weir):		-----	Head Available?	-----	Head Available?	Head Available?	-----	4.3	7.0	-----	Head Available?	-----	Head Available?	-----	Head Available?	-----	Head Available?	-----	Head Available?	-----	Head Available?	-----
Length provided of curb-opening or slotted drain at sag:		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Capacity of curb-opening or slotted drain in a sag (weir):		-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Length of the vertical curve (ft x 100):																						
approach grade #1 (%):																						
approach grade #2 (%):																						
ABS (algebraic diff. in approach grades) (%):		-----	-----	-----	-----	-----	-----	0.00	0.00	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
K = Min(Lc/A,167) (Table 5, HEC-12):		-----	-----	-----	-----	-----	-----	#DIV/0!	#DIV/0!	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Flanking inlets maximum distance (ft):		-----	-----	-----	-----	-----	-----	#DIV/0!	#DIV/0!	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
TRIANGULAR MEDIAN HYDRAULICS:																						
Manning's n for median finish:																						
Cross-slope of median sides:																						
Depth of flow at center of median (ft):		-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Flooded width in the median (ft):		-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Water velocity in the median (fps):		-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

Design by: BPB

Pavement Drainage
Ladera Drive Westbound-10yr

JOB: Ladera Drive Improvements																					
Inlet Number:	**On Grade**	**On Grade**	**On Grade**	**On Grade**	**On Grade**	**On Grade**	**Low Point**	**On Grade**	**On Grade**	**On Grade**	**On Grade**	**On Grade**	**Low Point**	**On Grade**	**On Grade**	**On Grade**	**On Grade**	**On Grade**	**On Grade**	**On Grade**	**On Grade**
Temporary Inlet Number:																					
Return Period:	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
Allowable Spread:	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18
RATIONAL METHOD HYDROLOGY COMPUTATION:	⇒	⇒	⇒	⇒	⇒	⇒	⇓	⇒	⇒	⇒	⇒	⇒	⇓	⇒	⇒	⇓	⇐	⇐	⇐	⇐	⇐
Basin ID	**210**	**210**	**210**	**211**	**211**	**212.1**	**212.2**	**213**	**213**	**214**	**214**	**215.1**	**215.2**	**216**	**216**	**217.1**	**217.2**	**218**	**218**	**219**	**219**
Location:	**SB**	**SB**	**SB**	**SB**	**SB**	**SB**	**SB**	**SB**	**SB**	**SB**	**SB**	**SB**	**SB**	**SB**	**SB**	**SB**	**SB**	**SB**	**SB**	**SB**	**SB**
Location Description:	grate	Curb Opng	grate	Curb Opng	grate	Curb Opng	grate	Curb Opng	grate	Curb Opng	grate	Curb Opng	grate	Curb Opng	grate	grate	Curb Opng	grate	Curb Opng	grate	Curb Opng
Pavement Area (ac):																					
Sideslope Area (ac):																					
Contributing watershed area (acres):	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**
Previous by-pass flow (cfs):	5.7	3.0	2.1	0.7	0.8	0.1	3.4		0.6	0.1	1.6	0.6	2.0		1.5	2.0	0.2	0.8	1.1	2.4	
Discharge added by operator:	0.0		0.0	0.7	0.0	5.8	0.4	1.5	0.0	2.8	0.0	3.2	2.5	2.8	0.0	0.7	3.0		0.8		4.0
Total discharge Q (cfs):	**5.7**	**3.0**	**2.1**	**1.3**	**0.8**	**5.9**	**3.8**	**1.5**	**0.6**	**2.9**	**1.6**	**3.8**	**4.5**	**2.8**	**1.5**	**2.7**	**3.2**	**0.8**	**1.9**	**2.4**	**4.0**
CA	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SHOULDER AND GUTTER CONFIGURATION:																					
Manning's n:	0.017	0.017	0.017	0.017	0.017	0.017	0.017	0.017	0.017	0.017	0.017	0.017	0.017	0.017	0.017	0.017	0.017	0.017	0.017	0.017	0.017
Longitudinal slope S (ft/ft):	0.0198	0.0198	0.0198	0.0336	0.0336	0.0010	0.0010	0.0030	0.0030	0.0030	0.0030	0.0010	0.0010	0.0030	0.0030	0.0010	0.0010	0.0030	0.0030	0.0030	0.0030
Inlet type (1=grate, 2=curb opening, 3=slotted):	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	1	2	1	2	1	2
Longitudinal profile (1=on-grade, 2=sag):	1	1	1	1	1	1	2	1	1	1	1	1	2	1	1	2	1	1	1	1	1
Gutter Configuration (NMDOT curb, 1=Type A, 2=Type B vertical):	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Capture Ratio Used:	50%	100%	50%	100%	50%	100%	50%	100%	50%	100%	50%	100%	50%	100%	50%	50%	100%	50%	100%	50%	100%
Inlet Std:	Single A	Single A	Single A	Single A	Single A	Single A	Single A	Single A	Single A	Single A	Single A	Single A	Single A	Single A	Single A	Single A	Single A	Single A	Single A	Single A	Single A
Grate width:	2	0	2	0	2	0	2	0	2	0	2	0	2	0	2	2	0	2	0	2	0
Grate length:	3.3	0.0	3.3	0.0	3.3	0.0	3.3	0.0	3.3	0.0	3.3	0.0	3.3	0.0	3.3	3.3	0.0	3.3	0.0	3.3	0.0
Pavement cross-slope (Sx):	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020
Width of gutter from flowline (ft):	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Gutter depression from horizontal (ft):	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12
Gutter cross-slope Sw: (S'w=Sw-Sx)	0.060	0.060	0.060	0.060	0.060	0.060	0.060	0.060	0.060	0.060	0.060	0.060	0.060	0.060	0.060	0.060	0.060	0.060	0.060	0.060	0.060
Flooded Width from flowline (ft): before inlet	**11.9**	**9.0**	**7.7**	**5.4**	**4.0**	**21.8**	**NA**	**10.2**	**6.7**	**13.3**	**10.3**	**18.4**	**NA**	**13.0**	**10.0**	**NA**	**17.2**	**7.9**	**11.2**	**12.3**	**15.1**
Depth at flowline (ft): before inlet	0.32	0.26	0.23	0.19	0.16	0.52	0.00	0.28	0.21	0.35	0.29	0.45	0.00	0.34	0.28	0.00	0.42	0.24	0.30	0.33	0.38
Water cross-area (sq.ft): before inlet	1.50	0.90	0.67	0.37	0.24	4.82	0.00	1.12	0.53	1.84	1.14	3.45	0.00	1.78	1.08	0.00	3.05	0.70	1.33	1.59	2.35
Velocity V for total discharge (fps): before inlet	3.81	3.31	3.09	3.56	3.33	1.22	0.00	1.37	1.14	1.57	1.37	1.10	0.00	1.56	1.36	0.00	1.06	1.21	1.43	1.51	1.69
Ratio of gutter depression flow to total Q (Eod):	45.8%	58.2%	66.0%	82.3%	92.8%	25.5%	100.0%	52.5%	72.7%	41.5%	52.3%	30.2%	100.0%	42.2%	53.4%	100.0%	32.2%	65.0%	48.5%	44.6%	36.7%
Equivalent cross-slope (Se):	0.038	0.043	0.046	0.053	0.057	0.030	0.060	0.041	0.049	0.037	0.041	0.032	0.060	0.037	0.041	0.060	0.033	0.046	0.039	0.038	0.035
GRATE INLETS ON-GRADE:																					
Ratio of grate frontal flow to total flow:	45.8%	-----	66.0%	-----	92.8%	-----	-----	-----	72.7%	-----	52.3%	-----	-----	-----	53.4%	-----	-----	65.0%	-----	44.6%	-----
Inlet frontal flow in cfs (Qw):	2.61	-----	1.37	-----	0.75	-----	-----	-----	0.44	-----	0.82	-----	-----	-----	0.78	-----	-----	0.55	-----	1.07	-----
Vo for effective length (P-1-7/8, Chart 7 HEC 12):	7.20	-----	7.20	-----	7.20	-----	-----	-----	7.20	-----	7.20	-----	-----	-----	7.20	-----	-----	7.20	-----	7.20	-----
Fraction of frontal flow intercepted (Rf):	100.0%	-----	100.0%	-----	100.0%	-----	-----	-----	100.0%	-----	100.0%	-----	-----	-----	100.0%	-----	-----	100.0%	-----	100.0%	-----
Side flow in cfs (Qs):	3.08	-----	0.71	-----	0.06	-----	-----	-----	0.17	-----	0.74	-----	-----	-----	0.68	-----	-----	0.30	-----	1.33	-----
Effective grate length w/clogging:	1.65	-----	1.65	-----	1.65	-----	-----	-----	1.65	-----	1.65	-----	-----	-----	1.65	-----	-----	1.65	-----	1.65	-----
Fraction of side flow interception (Rs):	3.7%	-----	5.2%	-----	4.6%	-----	-----	-----	25.0%	-----	19.2%	-----	-----	-----	19.6%	-----	-----	22.9%	-----	16.8%	-----
Grate Efficiency (E):	47.8%	-----	67.8%	-----	93.1%	-----	-----	-----	79.5%	-----	61.4%	-----	-----	-----	62.6%	-----	-----	73.0%	-----	53.8%	-----
Total flow intercepted (cfs):	2.72	-----	1.41	-----	0.75	-----	-----	-----	0.48	-----	0.96	-----	-----	-----	0.92	-----	-----	0.62	-----	1.29	-----
Grate flow-by (cfs):	**2.97**	**-----**	**0.67**	**-----**	**0.06**	**-----**	**-----**	**-----**	**0.12**	**-----**	**0.60**	**-----**	**-----**	**-----**	**0.55**	**-----**	**-----**	**0.23**	**-----**	**1.10**	**-----**
SLOTTED DRAINS AND CURB OPENING INLETS ON-GRADE:																					
Length required for total interception (ft): w/clogging	-----	22.2	-----	16.4	-----	15.0	-----	9.9	-----	13.8	-----	12.0	-----	13.5	-----	-----	11.1	-----	11.0	-----	16.3
Length of inlet provided L (ft):	4	4	4	4	4	4	0	4	4	4	4	4	0	4	4	4	4	4	4	4	4
Interception for length L (cfs):	-----	0.89	-----	0.52	-----	2.52	-----	0.94	-----	1.33	-----	1.97	-----	1.30	-----	-----	1.79	-----	1.06	-----	1.59
Efficiency for length L:	-----	0.30	-----	0.39	-----	0.43	-----	0.61	-----	0.46	-----	0.52	-----	0.47	-----	-----	0.55	-----	0.55	-----	0.40
Slotted drain or curb opening flow-by (cfs):	**-----**	**2.08**	**-----**	**0.80**	**-----**	**3.36**	**-----**	**0.60**	**-----**	**1.56**	**-----**	**1.83**	**-----**	**1.47**	**-----**	**-----**	**1.44**	**-----**	**0.85**	**-----**	**2.39**
INTERCEPTION CAPACITY OF INLETS IN SAG LOCATION:																					
Head available for weir flow at sag (ft):	0	0	0	0	0	0	0.42	0	0	0	0	0	0.42	0	0	0	0	0	0	0	0
Capacity of grate in a sag (3-sided weir):	Head Available?	-----	Head Available?	-----	Head Available?	-----	2.98	-----	Head Available?	-----	Head Available?	-----	2.98	-----	Head Available?	Head Available?	-----	Head Available?	-----	Head Available?	-----
Capacity of grate in a sag (4-sided weir):	Head Available?	-----	Head Available?	-----	Head Available?	-----	4.3	-----	Head Available?	-----	Head Available?	-----	4.3	-----	Head Available?	Head Available?	-----	Head Available?	-----	Head Available?	-----
Length provided of curb-opening or slotted drain at sag:	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Capacity of curb-opening or slotted drain in a sag (weir):	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Length of the vertical curve (ft x 100):																					
approach grade #1 (%):																					
approach grade #2 (%):																					
ABS (algebraic diff. in approach grades) (%):	-----	-----	-----	-----	-----	-----	0.00	-----	-----	-----	-----	-----	0.00	-----	-----	-----	-----	-----	-----	-----	-----
K = Min(Lc/A,167) (Table 5, HEC-12):	-----	-----	-----	-----	-----	-----	#DIV/0!	-----	-----	-----	-----	-----	#DIV/0!	-----	-----	-----	-----	-----	-----	-----	-----
Flanking inlets maximum distance (ft):	-----	-----	-----	-----	-----	-----	#DIV/0!	-----	-----	-----	-----	-----	#DIV/0!	-----	-----	-----	-----	-----	-----	-----	-----
TRIANGULAR MEDIAN HYDRAULICS:																					
Manning's n for median finish:																					
Cross-slope of median sides:																					
Depth of flow at center of median (ft):	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Flooded width in the median (ft):	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Water velocity in the median (fps):	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

Design by: BPB

Pavement Drainage
Ladera Drive Westbound-10yr

JOB: Ladera Drive Improvements	
Inlet Number:	**Low Point**
Temporary Inlet Number:	
Return Period:	10
Allowable Spread:	18
RATIONAL METHOD HYDROLOGY COMPUTATION:	⇓
Basin ID	**220**
Location:	**SB**
Location Description:	grate
Pavement Area (ac):	
Sideslope Area (ac):	
Contributing watershed area (acres):	**0.000**
Previous by-pass flow (cfs):	
Discharge added by operator:	14.4
Total discharge Q (cfs):	**14.4**
CA	-
SHOULDER AND GUTTER CONFIGURATION:	
Manning's n:	0.017
Longitudinal slope S (ft/ft):	0.0010
Inlet type (1=grate, 2=curb opening, 3=slotted):	1
Longitudinal profile (1=on-grade, 2=sag):	2
Gutter Configuration (NMDOT curb, 1=Type A, 2=Type B vertical):	2
Capture Ratio Used:	50%
Inlet Std:	Double C
Grate width:	2
Grate length:	6.6
Pavement cross-slope (Sx):	0.020
Width of gutter from flowline (ft):	2.00
Gutter depression from horizontal (ft):	0.12
Gutter cross-slope Sw: (S'w=Sw-Sx)	0.060
Flooded Width from flowline (ft): before inlet	**NA**
Depth at flowline (ft): before inlet	0.00
Water cross-area (sq.ft): before inlet	0.00
Velocity V for total discharge (fps): before inlet	0.00
Ratio of gutter depression flow to total Q (Eod):	100.0%
Equivalent cross-slope (Se):	0.060
GRATE INLETS ON-GRADE:	
Ratio of grate frontal flow to total flow:	-----
Inlet frontal flow in cfs (Qw):	-----
Vo for effective length (P-1-7/8, Chart 7 HEC 12):	-----
Fraction of frontal flow intercepted (Rf):	-----
Side flow in cfs (Qs):	-----
Effective grate length w/clogging:	-----
Fraction of side flow interception (Rs):	-----
Grate Efficiency (E):	-----
Total flow intercepted (cfs):	-----
Grate flow-by (cfs):	**-----**
SLOTTED DRAINS AND CURB OPENING INLETS ON-GRADE:	
Length required for total interception (ft): w/clogging	-----
Length of inlet provided L (ft):	4
Interception for length L (cfs):	-----
Efficiency for length L:	-----
Slotted drain or curb opening flow-by (cfs):	**-----**
INTERCEPTION CAPACITY OF INLETS IN SAG LOCATION:	
Head available for weir flow at sag (ft):	0.42
Capacity of grate in a sag (3-sided weir):	4.33
Capacity of grate in a sag (4-sided weir):	7.0
Length provided of curb-opening or slotted drain at sag:	0.0
Capacity of curb-opening or slotted drain in a sag (weir):	-----
Length of the vertical curve (ft x 100):	
approach grade #1 (%):	
approach grade #2 (%):	
ABS (algebraic diff. in approach grades) (%):	0.00
K = Min(Lc/A,167) (Table 5, HEC-12):	#DIV/0!
Flanking inlets maximum distance (ft):	#DIV/0!
TRIANGULAR MEDIAN HYDRAULICS:	
Manning's n for median finish:	
Cross-slope of median sides:	
Depth of flow at center of median (ft):	-----
Flooded width in the median (ft):	-----
Water velocity in the median (fps):	-----

Design by: BPB

Attachment 7: Hand Calculations

PARSONS BRINCKERHOFF COMPUTATION SHEET

Subject: Ladera Drive Runoff Calculations

Page 1 of 1 | 4588.92

Made by: KVC

Date: 2/15

Checked by: FHO

Date: 2/15

$Q_{10/100}$ for 5' Type "C" $= \frac{5'(100)}{43560} = 0.011 \frac{\text{acres}}{100'}\left(\frac{1.49\text{cfs}}{\text{acre}}\right) = 0.016\text{cfs}/100'$

$Q_{10/100}$ for 5' Type "D" $= 0.011 \frac{\text{acres}}{100'}\left(\frac{2.89\text{cfs}}{\text{acre}}\right) = 0.032\text{cfs}/100'$

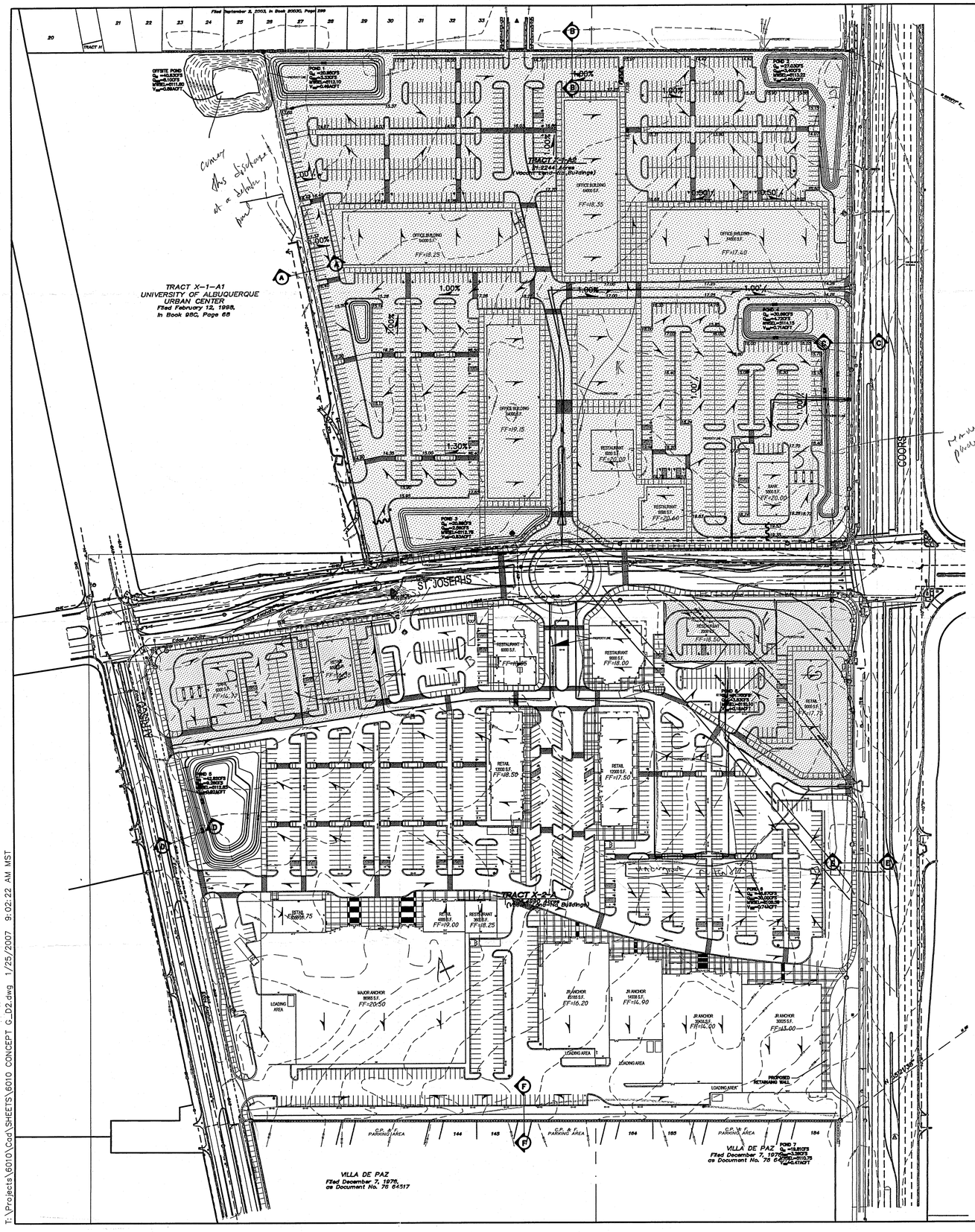
$\Delta Q_{10/100} = 0.032 - 0.016 = 0.016\text{cfs}/100'$

$Q_{100/100}$ for 5' Type "C" $= \frac{5'(100)}{43560} = \frac{0.011\text{acres}}{100'}\left(\frac{2.87\text{cfs}}{\text{acre}}\right) = 0.032\text{cfs}/100'$

$Q_{100/100}$ for 5' Type "D" $= \frac{0.011\text{ acres}}{100'}\left(\frac{4.37\text{cfs}}{\text{acre}}\right) = \frac{0.048\text{cfs}}{100'}$

$\Delta Q_{100/100} = 0.048 - 0.032 = 0.016\text{ cfs}/100'$

Attachment 8: Oxbow Town Center Conceptual Grading and Drainage Plan



EROSION CONTROL NOTES

1. CONTRACTOR IS RESPONSIBLE FOR OBTAINING A TOPSOIL DISTURBANCE PERMIT PRIOR TO BEGINNING WORK.

2. CONTRACTOR IS RESPONSIBLE FOR MAINTAINING RUN-OFF ON SITE DURING CONSTRUCTION.

3. CONTRACTOR IS RESPONSIBLE FOR CLEANING ALL SEDIMENT THAT GETS INTO EXISTING RIGHT-OF-WAY.

4. REPAIR OF DAMAGED FACILITIES AND CLEANUP OF SEDIMENT ACCUMULATIONS ON ADJACENT PROPERTIES AND IN PUBLIC FACILITES IS THE RESPONSIBILITY OF THE CONTRACTOR.

5. ALL EXPOSED EARTH SURFACES MUST BE PROTECTED FROM WIND AND WATER EROASIN PRIOR TO FINAL (CITY) ACCEPTANCE OF ANY PROJECT.

EXISTING CONDITIONS

THE EXISTING SITE IS PREDOMINATELY UNDISTURBED SILTY SAND AND CLAYEY SAND TYP SOILS MODERATELY VEGITATED WITH VARIOUS GRASSSES AND SHRUBS. ONSITE SLOPES ARE VERY MILD AND DRAIN IN VARIOUS DIRECTIONS. THE PORTION OF THE PROJECT NORTH OF ST. JOSEPHS DRIVE PREDOMINATELY DRAINS TO THE NW CORNER OF THE TRACT AND INTO AN EXISTING RETENTION POND OFFSITE. THE REMAINDER OF THE NORTHERN PORTION DRAINS TO A DEPRESSION ADJACENT TO COORS BLVD. THE PORTION OF THE PROJECT SOUTH OF ST. JOSEPHS DRAINS IN TWO DIRECTIONS. APPROXIMATELY 60% DRAINS INTO COORS BLVD AND THE EXISTING STORM DRAIN. THE REMAINING 40% DRAINS TO AN EXISTING DETENTION POND WITHIN THE ST. JOSEPHS RIGHT OF WAY. THIS POND THEN DISCHARGES INTO THE EXISTING 60" LADERA STORM DRAIN SYSTEM.

PROPOSED CONDITIONS

THE PROPOSED SITE IMPROVEMENTS WILL INCLUDE THE CONSTRUCTION OF MULTIPLE RETAIL AND OFFICE DEVELOPMENTS WITH ASSOCIATED INFRASTRUCTURE. ONSITE DRAINAGE WILL BE ROUTED THROUGH A SERIES OF BOTH ABOVE-GROUND AND UNDERGROUND DETENTION PONDS INTENDED TO DISCHARGE TO THE EXISTING OUTFALL WITHIN COORS BLVD. THE EXISTING OUTFALL DIRECTS RUNOFF THROUGH THE ENCLAVE AT OXBOW AND ULTIMATELY TO THE RIO GRANDE RIVER.

NOTES

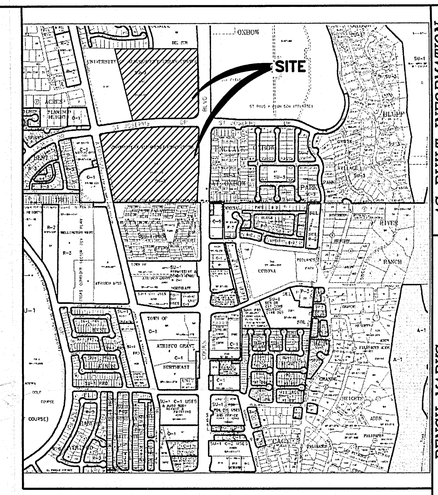
1. SEE SHEET 15 OF 15 FOR GRADING TYPICAL SECTIONS
2. SEE SHEET 15 OF 15 FOR RETAINING WALL DETAILS
3. SEE SHEETS 6-9 OF 15 FOR STORM DRAIN PLANS

LEGEND

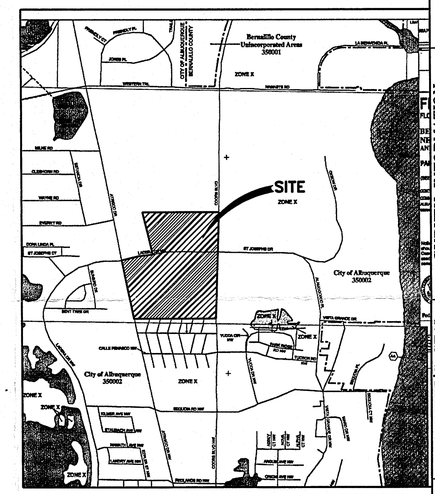
DIRECTION OF FLOW

HIGH POINT

FUTURE PHASE



VICINITY MAP G-11-Z



FIRM MAP 35001C0114E
35001C0327E

LEGAL DESCRIPTION Tracts X-1-A2 and X-2-A University of Albuquerque Urban Center Projected Sec. 2, T10N, R2E

GRAPHIC SCALE
100 0 50 100 200
SCALE 1"=100'

GND, LLC
CONSULTING ENGINEERS
5643 Paradise Blvd. NW
Albuquerque, NM 87114
Phone: (505)-899-6182
Fax: (505)-899-6184

AS BUILT INFORMATION

CONTRACTOR
WORK STARTED ON DATE
ACCEPTANCE BY DATE
VERIFICATION BY DATE
DRAWINGS CORRECTED BY DATE
MICRO-FILM INFORMATION
RECORDED BY DATE
No.

BENCH MARKS
NGS/Albuquerque Control Survey Monument
"JOSEPH 1969"
NM State Plane Coordinates (Central Zone -NAD27)
X=366,686.82 Y=1,502,246.75
Delta Alpha=-00°15'24"
Ground to Grid Factor=0.99967551
Elevation=5116.61 (NAV088)

SURVEY INFORMATION
FIELD NOTES
NO. BY DATE

ENGINEER'S SEAL
JEREMY R. WOOLSTENHULME
NEW MEXICO
11178
REGISTERED PROFESSIONAL ENGINEER
10-2-07

NO.	DATE	REMARKS	BY
		REVISIONS	
		DESIGN	DATE: MAR 2007
		DESIGNED BY: JRW	DATE: MAR 2007
		DRAWN BY: JRW PMT	DATE: MAR 2007
		CHECKED BY: SEG	

CITY OF ALBUQUERQUE
MUNICIPAL DEVELOPMENT DEPARTMENT
ENGINEERING DIVISION

OXBOW TOWN CENTER

CONCEPTUAL GRADING & DRAINAGE PLAN

LATEST DESIGN UPDATE	MONTH/DAY/YEAR	USER DEPARTMENT

CITY PROJECT No.	ZONE MAP No.	SHEET
6010	G-11	1 OF 15

PLATE 3

T:\Projects\6010\Cad\SHEETS\6010 CONCEPT G_D2.dwg 1/25/2007 9:02:22 AM MST