CITY OF ALBUQUERQUE

Planning Department
David Campbell, Director

Mayor Timothy M. Keller

June 19, 2018

Eric Froberg, P E
TyLin International
500 4th St NW, Suite 403F
Albuquerque, NM 87102

RE: **University Blvd Bikeways- Phase 2**
George Rd to Gibson Blvd
Drainage Report
Engineer's Stamp Date 5/8/18- For Review Only
Hydrology File: M15D045

Dear Mr. Froberg:

Based on the submittal received on 5/25/18, this Drainage Report is accepted for Information Only in support of the University Blvd Bikeways- Phase 2 Work Order.

If you have any questions, please contact me at 924-3695 or dpeterson@cabq.gov.

Sincerely,

Dana Peterson, P.E.
Senior Engineer, Planning Dept.
Development Review Services

PO Box 1293
Albuquerque
NM 87103
www.cabq.gov

Subject: *Final Drainage Memo for University Boulevard Bikeways– Phase 2 (*George Road to Gibson Boulevard*), Albuquerque, New Mexico* *Albuquerque Project No. 7956.92* *May 8, 2018*

This memo documents the drainage improvements for Phase 2 of the University Boulevard Bikeways project (George Road to Gibson Boulevard). Included are the onsite hydrologic and hydraulic calculations for the proposed drainage infrastructure based on trail improvements and roadway narrowing. A Pre-vs. Post-design analysis was performed to determine the extent of drainage improvements required.

SITE DESCRIPTION

The University Boulevard Bikeways Phase 2 project is located in Albuquerque, New Mexico and consists of four improvement corridors: University Boulevard north and south of the Kirtland Channel, the Sunport Boulevard Trail and the Kirtland Channel Trail. University Boulevard is an existing 4-lane roadway with curb and gutter traveling north and south from George Road to Flightway Avenue and passes underneath Sunport Boulevard. At Flightway Avenue, University Boulevard transitions to a 2-lane roadway with curb and gutter until it curves east and becomes Randolph Road. North of the Kirtland Channel, University Boulevard continues, from San Jose Avenue to Gibson Boulevard, as a 2-lane roadway.

South of the Kirtland Channel, University Boulevard is bounded to the east by moderately developed industrial areas and the Albuquerque International Sunport Airport. University Boulevard is bounded to the west with moderately developed industrial and commercial properties interspersed with undeveloped parcels. North of the Kirtland Channel, University Boulevard is bounded by a medium density residential development to the east and west. Roadway slopes vary greatly and have a longitudinal slope of between 1.0% and 4.0% with an average cross-slope of 2%.

A new 14-foot trail is proposed adjacent to Sunport Boulevard, west of University Boulevard, where an existing native desert area (approximately 55-feet wide) separates Sunport Boulevard and an airport parking facility. Sunport Boulevard is elevated above the natural ground with a continuous retaining wall. The existing slope from east to west varies between 4.0% and 8.0%. An existing drainage swale collects stormwater and conveys it west to Transport Street.

A new 14-foot wide trail is proposed west of Kirkland Park connecting Mulberry Street and San Jose Avenue. The new trail will span the Kirtland Channel with a pedestrian bridge to connect the residential development (Kirtland Community) to the recently constructed multi-specialty clinic (Davita) and residential community along Transport Street. This area generally slopes to the north. Existing conditions include native desert east, west and south of the proposed trail.

PROPOSED IMPROVEMENTS

Roadway improvements are proposed along University Boulevard from approximately George Road to Randolph Road (Station 90+00 to 124+50) and north of Kirtland Park from approximately San Jose Avenue to Gibson Avenue (Station 18+35 to 33+47). Proposed improvements include new multi-modal facilities (widths vary from 5 to 14 feet) along the eastern and western curbs (northbound and southbound lane). From San Jose Avenue to Gibson Boulevard, the roadway is being narrowed slightly to accommodate the addition of a wider 5-foot sidewalk. New 14-foot multi-use trails are proposed south of Sunport Boulevard (connecting University Boulevard and Transport Street) and along the Kirkland Channel. The Kirtland Channel Trail spans the existing Kirtland Channel, which provides a connection between Transport Street (via Mulberry Street with the multi-specialty clinic development trail) and University Boulevard (via San Jose Avenue). Curb and gutter will not be constructed on either the Sunport or the Kirtland Channel trails. **Table 1** below details the limits of the proposed improvements.

Table 1: Limits of Proposed Improvements

University Boulevard South of Sunport Boulevard		
From Sta	**To Sta**	**Improvements**
90+00	98+60	6-foot sidewalk along west curb
99+65	107+15	Detached 14-foot trail w/ 4-foot buffer along eastern and western curbs
University Boulevard Through Sunport Boulevard Interchange		
From Sta	**To Sta**	**Improvements**
107+15	110+10	10-foot trail attached to curb along eastern and western curbs
University Boulevard North of Sunport Boulevard		
From Sta	**To Sta**	**Improvements**
110+10	119+80	Detached trails w/ 4-foot buffer along eastern (14' trail) and western (10' trail) curbs
119+80	122+05	Detached 14-foot trail w/ 2-foot buffer along west curb only
122+05	124+50	Depressed 14-foot trail w/ retaining wall below 4-foot sidewalk. The trail terminates at Kirtland Park while the 4-foot sidewalk ties into existing sidewalk along Randolph Road
University Boulevard North of the Kirtland Channel		
From Sta	**To Sta**	**Improvements**
18+35	33+47	Detached 5-foot sidewalk with 2-foot buffer along new curb and gutter on eastern and western curbs. Reduction of existing paved roadway width to accommodate widened sidewalk.
Sunport Boulevard Trail to Transport Street		
From Sta	**To Sta**	**Improvements**
10+15	24+45	14-foot trail with retaining wall along the south side from stations 10+60 to 15+14 and 21+06 to 23+80
Kirtland Channel Trail across Kirtland Channel		
From Sta	**To Sta**	**Improvements**
100+15	104+33	14-foot trail beginning at Mulberry Street along the southern edge of Kirkland Channel and north to San Jose Avenue. The trail spans the Kirtland Channel connecting Transport Street (via Mulberry Street with the multi-specialty clinic development trail) and University Boulevard (via San Jose Avenue)

Existing onsite stormwater runoff flows to University Boulevard and travels to existing catch basins, which conveys flow through existing storm drains. Existing catch basins requiring relocation will be replaced in kind except as noted in this report. There does not appear to be major utility conflicts with existing catch basins being relocated due to the trail or roadway improvements.

For the proposed Sunport Trail, stormwater runoff from the contributing watershed and multi-use trail will flow west along the northern edge of the trail. An existing drainage swale currently collecting stormwater within this drainage boundary will be removed due to the proposed trail. The existing drainage swale will be replaced with a 2-foot concrete alley gutter and will direct runoff to two catch basins which are proposed to collect the contributing runoff at stations 10+47 and 16+34 and route the stormwater to the existing storm drain system.

For the Kirtland Channel Trail from Mulberry Street to San Jose Avenue, stormwater generally sheet flows west and northwest to undeveloped parcels and the Kirkland Channel per existing conditions. At station 100+90, a modified sidewalk culvert and existing concrete apron conveys contributory stormwater flow from the south and drains into the channel.

Catch basins and storm drain infrastructure exist within University Boulevard. Detailed evaluations of existing catch basins and storm drain calculations are beyond the scope of this project. It is assumed that existing drainage infrastructure meets or exceeds municipality requirements and are operating as constructed. However, as detailed below, a Pre- vs. Post-analysis was performed to determine where potential capacity impacts based on proposed improvements may occur.

Exhibit 1 in **Appendix C** displays the University Boulevard corridor as well as the Sunport Boulevard Trail and Kirtland Channel Trail improvement areas and hydrologic results. **Exhibit 2** in **Appendix C** depicts the University Boulevard improvement areas and hydrologic results.

OFFSITE HYDROLOGY

South of the Kirkland Channel, the contributing offsite watershed to University Boulevard consists of both developed industrial and commercial areas as well as undeveloped properties flowing west from the Albuquerque International Sunport Airport. The existing Airport Storm Drainage Master Plan (Project No. 4255.01) encompasses the contributing watershed along University Boulevard to the Kirtland Channel and documents the major concentration points and drainage infrastructure. North of the Kirtland Channel to Gibson Boulevard is an existing residential development where larger offsite flows are generally cut-off to the east of the residential development due to airport development. Smaller localized flow generated within the residential development flow across University Boulevard at the intersections. Re-evaluating the offsite hydrology is beyond the scope of this project; however, review of the Airport Storm Drainage Master Plan and field verification of flow patterns, existing concentration points and drainage infrastructure along University Boulevard were evaluated to determine if offsite flows would contribute to the Phase 2 improvements. Based on our review, the Phase 2 improvements will not significantly alter or affect offsite stormwater runoff flow patterns or concentration points.

Excerpts from the Albuquerque Airport Storm Drain Master Plan are provided in **Appendix B**.

HYDROLOGIC CALCULATIONS

A Pre-vs. Post-hydrologic evaluation was performed for the Phase 2 improvements using the methodology from Chapter 22 of the City Development Process Manual (DPM), Volume 2. The peak discharges for the 2-year, 10-year, and 100-year frequency design storms were calculated for the existing and proposed conditions of the new improvements. As specified in the DPM, the 6-hour storm duration for these events was used. Only the improvement areas were calculated.

The existing areas consist of both soil type C (unpaved trails, desert landscaping) and soil type D (impervious areas) as specified in the DPM. Pre-development (Pre-) stormwater runoff was calculated and compared to the corresponding Post-development (Post-) area to determine the amount of additional runoff. In most instances, the additional runoff was minimal. It was determined that if the stormwater runoff for the 10-year design storm increased by 0.5 cfs or more, the receiving downstream catch basin inlet would be modified, as needed, to capture the additional runoff.

Based on evaluating the Pre-vs. Post-runoff results, stormwater runoff increases along the University Boulevard project corridor were minimal and do not require any upsizing of the existing drainage facilities. However, the existing drainage swale conveying flows along the proposed Sunport Boulevard Trail was replaced with a 2-foot concrete alley gutter. Flows concentrate along the northern edge of Sunport Trail, requiring drainage improvements in order to dewater the trail and for erosion prevention. The Kirtland Channel Trail will also require drainage improvements. Onsite hydrologic calculations are provided in **Appendix A**.

Along the Sunport Trail, the eastern catch basin, at STA 16+34, is proposed to be a single area drain, depressed 0.5 feet, with a 2-foot concrete apron. This eastern catch basin will be constructed directly over an existing 18-inch storm drain which will provide the outlet for this drainage area. The western catch basin, at STA 10+47, is proposed to be a double area drain, depressed 0.5 feet, with a 2-foot concrete apron. Similarly to the eastern catch basin, the western catch basin will be constructed over an existing 48-inch storm drain mainline which will serve as the catch basin outlet.

Along the Kirkland Channel Trail at STA 100+90 a sidewalk culvert is proposed to allow the runoff from the undeveloped land south of the Kirkland Channel Trail to flow under the trail into the Kirkland Channel. This will be a four-barrel sidewalk culvert, each barrel with a 2-foot opening. The culverts will safely pass the 10-year storm event without overtopping and is designed for future development.

All other existing catch basins along University Boulevard will be protected in place, with some receiving slight modifications. A list of existing catch basin locations are provided in **Table 2.**

Table 2: Existing Catch Basins to be Protect in Place within University Boulevard

Station	Type	Station	Type
92+39 Lt	Single	**120+00 Rt**	Single
107+72 Rt	Single	**121+75 Lt**	Single
107+72 Ct	Single	**121+75 Rt**	Single
108+00 Rt	Single	**123+00 Rt**	Single
108+00 Ct	Single	**124+00 Rt**	Double
108+16 Rt	Single	**25+00 Lt**	Single *
109+68 Lt	Single	**27+50 Lt**	Single *
111+00 Rt	Single	**28+63 Lt**	Single *

* Sidewalk culverts added to allow for sidewalk expansion.

SUMMARY

This memo documents the Pre-vs. Post-drainage analysis of the Phase 2 University Boulevard roadway improvements. Two catch basins are proposed along the Sunport Boulevard Trail to capture stormwater runoff traveling along the northern edge of the trail. A sidewalk culvert is proposed along Kirkland Channel Trail to convey stormwater runoff traveling from the undeveloped land south of the trail and into the Kirkland Channel. Other drainage structures and catch basins affected by the improvements will be protected in place, with some receiving slight modifications.

Sincerely,

Eric Froberg, P.E.
Sr. Project Manager
T.Y. Lin International

ERIC J. FROBERG
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18855
PROFESSIONAL ENGINEER
FOR REVIEW PURPOSES ONLY

T·Y·LIN INTERNATIONAL
engineers | planners | scientists

APPENDIX A

Hydrologic and Hydraulic Calculations

Existing On-Site Subbasin Summary

Project: University Bikeways Phase 2 **Proj. Number:** 221790.10
Location: Albuquerque, NM **Proj. Engineer:** A. Herting
Date: July 20, 2017 **Checker:** L. Vick / E. Froberg

Subbasin ID	Alignment	From STA	To STA	Subbasin (Acres)	Subbasin Runoff (cfs) (2-yr 6-Hr)	Subbasin Runoff (cfs) (10-yr 6-Hr)	Subbasin Runoff (cfs) (100-yr 6-Hr)	Notes
West Curb								
EX-10	University Blvd (George Rd to Randolph Rd)	90+00	94+50	0.09	0.1	0.2	0.3	
EX-11	University Blvd (George Rd to Randolph Rd)	94+50	98+64	0.09	0.1	0.2	0.3	
EX-12	University Blvd (George Rd to Randolph Rd)	99+68	106+00	0.26	0.2	0.5	0.9	
EX-13	Sunport Trail (University Blvd to Transport St)	10+20	23+00	0.44	0.3	0.8	1.4	
EX-14	University Blvd (George Rd to Randolph Rd)	107+00	109+29	0.06	0.1	0.2	0.3	
EX-15	University Blvd (George Rd to Randolph Rd)	110+50	114+50	0.13	0.1	0.3	0.5	
EX-16	University Blvd (George Rd to Randolph Rd)	114+87	119+00	0.14	0.2	0.3	0.5	
EX-17	University Blvd (George Rd to Randolph Rd)	119+74	124+50	0.23	0.1	0.4	0.7	
EX-18	University Blvd (San Jose Ave to Gibson Blvd)	17+00	18+00	0.08	0.1	0.2	0.4	
EX-100	University Blvd (San Jose Ave to Gibson Blvd)	18+45	20+17	0.04	0.1	0.1	0.2	
EX-101	University Blvd (San Jose Ave to Gibson Blvd)	20+93	22+67	0.03	0.1	0.1	0.1	
EX-102	University Blvd (San Jose Ave to Gibson Blvd)	23+44	25+15	0.03	0.1	0.1	0.1	
EX-103	University Blvd (San Jose Ave to Gibson Blvd)	25+93	27+67	0.03	0.1	0.1	0.1	
EX-104	University Blvd (San Jose Ave to Gibson Blvd)	28+50	33+50	0.07	0.1	0.2	0.3	
EX-200	Kirtland Channel Trail (Mulberry St to San Jose Ave)	100+15	104+33	0.13	0.1	0.3	0.4	
EX-201	Kirtland Channel Trail - South	-	-	1.57	2.9	4.9	7.4	Area calculated to correctly size sidewalk culvert for 10-year storm.
East Curb								
Subbasin ID	**Alignment**	**From STA**	**To STA**	**Subbasin Acres**	**Subbasin Runoff (cfs) (2-yr 6-Hr)**	**Subbasin Runoff (cfs) (10-yr 6-Hr)**	**Subbasin Runoff (cfs) (100-yr 6-Hr)**	**Notes**
EX-50	University Blvd (George Rd to Randolph Rd)	99+68	106+50	0.27	0.3	0.6	1.0	
EX-51	University Blvd (George Rd to Randolph Rd)	107+00	110+20	0.07	0.1	0.2	0.3	
EX-52	University Blvd (George Rd to Randolph Rd)	110+50	114+35	0.15	0.1	0.3	0.5	
EX-53	University Blvd (George Rd to Randolph Rd)	114+35	119+74	0.23	0.2	0.5	0.8	
EX-150	University Blvd (San Jose Ave to Gibson Blvd)	18+45	20+17	0.04	0.1	0.1	0.2	
EX-151	University Blvd (San Jose Ave to Gibson Blvd)	20+93	22+67	0.03	0.1	0.1	0.1	
EX-152	University Blvd (San Jose Ave to Gibson Blvd)	23+44	25+15	0.03	0.0	0.1	0.1	
EX-153	University Blvd (San Jose Ave to Gibson Blvd)	25+93	27+67	0.03	0.1	0.1	0.1	
EX-154	University Blvd (San Jose Ave to Gibson Blvd)	28+50	33+50	0.08	0.2	0.3	0.4	

Notes:

1) Existing subbasin calculations provided separately.

2) The peak intensity time of concentration (t_c) is assumed to be 0.2 hrs (12 minutes) due to relatively steep slopes (1.0%>) throughout the project and due to the total contributing watershed being less than 40 acres.

Proposed On-Site Subbasin Summary

Project: University Bikeways Phase 2
Location: Albuquerque, NM
Date: July 20, 2017

Proj. Number: 221790.10
Proj. Engineer: A. Herting
Checker: L. Vick / E. Froberg

West Curb								
Subbasin ID	Alignment	From STA	To STA	Subbasin Acres	Subbasin Runoff (cfs) (2-yr 6-Hr)	Subbasin Runoff (cfs) (10-yr 6-Hr)	Subbasin Runoff (cfs) (100-yr 6-Hr)	Notes
PR-10	University Blvd (George Rd to Randolph Rd)	90+00	94+50	0.09	0.2	0.3	0.4	
PR-11	University Blvd (George Rd to Randolph Rd)	94+50	98+64	0.09	0.2	0.3	0.4	
PR-12	University Blvd (George Rd to Randolph Rd)	99+68	106+00	0.26	0.5	0.8	1.2	
PR-13	Sunport Trail (University Blvd to Transport St)	10+20	23+00	0.44	0.8	1.4	2.1	No curb, trail slopes north to alley gutter.
PR-14	University Blvd (George Rd to Randolph Rd)	107+00	109+29	0.06	0.1	0.2	0.3	
PR-15	University Blvd (George Rd to Randolph Rd)	110+50	114+50	0.13	0.2	0.4	0.6	
PR-16	University Blvd (George Rd to Randolph Rd)	114+87	119+00	0.14	0.3	0.4	0.6	
PR-17	University Blvd (George Rd to Randolph Rd)	119+74	124+50	0.23	0.4	0.7	1.1	
PR-18	University Blvd (San Jose Ave to Gibson Blvd)	17+00	18+00	0.08	0.1	0.2	0.4	
PR-100	University Blvd (San Jose Ave to Gibson Blvd)	18+45	20+17	0.04	0.1	0.1	0.2	
PR-101	University Blvd (San Jose Ave to Gibson Blvd)	20+93	22+67	0.03	0.1	0.1	0.1	
PR-102	University Blvd (San Jose Ave to Gibson Blvd)	23+44	25+15	0.03	0.1	0.1	0.1	
PR-103	University Blvd (San Jose Ave to Gibson Blvd)	25+93	27+67	0.03	0.1	0.1	0.1	
PR-104	University Blvd (San Jose Ave to Gibson Blvd)	28+50	33+50	0.07	0.1	0.2	0.3	
PR-200	Kirtland Channel Trail (Mulberry St to San Jose Ave)	100+15	104+33	0.13	0.2	0.4	0.6	No curb, sheet flow off both edges
East Curb								
Subbasin ID	Alignment	From STA	To STA	Subbasin Acres	Subbasin Runoff (cfs) (2-yr 6-Hr)	Subbasin Runoff (cfs) (10-yr 6-Hr)	Subbasin Runoff (cfs) (100-yr 6-Hr)	Notes
PR-50	University Blvd (George Rd to Randolph Rd)	99+68	106+50	0.27	0.5	0.8	1.3	
PR-51	University Blvd (George Rd to Randolph Rd)	107+00	110+20	0.07	0.1	0.2	0.3	
PR-52	University Blvd (George Rd to Randolph Rd)	110+50	114+35	0.15	0.3	0.5	0.7	
PR-53	University Blvd (George Rd to Randolph Rd)	114+35	119+74	0.22	0.4	0.7	1.1	
PR-150	University Blvd (San Jose Ave to Gibson Blvd)	18+45	20+17	0.04	0.1	0.1	0.2	
PR-151	University Blvd (San Jose Ave to Gibson Blvd)	20+93	22+67	0.03	0.1	0.1	0.1	
PR-152	University Blvd (San Jose Ave to Gibson Blvd)	23+44	25+15	0.03	0.0	0.1	0.1	
PR-153	University Blvd (San Jose Ave to Gibson Blvd)	25+93	27+67	0.03	0.1	0.1	0.1	
PR-154	University Blvd (San Jose Ave to Gibson Blvd)	28+50	33+50	0.08	0.2	0.3	0.4	

Notes:

1) Proposed subbasin calculations provided separately.

2) The peak intensity time of concentration (t_c) is assumed to be 0.2 hrs (12 minutes) due to relatively steep slopes (1.0%>) throughout the project and due to the total contributing watershed being less than 40 acres.

Pre vs. Post On-Site Subbasin Summary

Project: University Bikeways Phase 2
Location: Albuquerque, NM
Date: July 20, 2017

Proj. Number: 221790.10
Proj. Engineer: A. Herting
Checker: L. Vick / E. Froberg

West Curb

Subbasin ID	Alignment	From STA	To STA	Existing Subbasin Runoff (cfs) (2-yr 6-Hr)	Existing Subbasin Runoff (cfs) (10-yr 6-Hr)	Existing Subbasin Runoff (cfs) (100-yr 6-Hr)	Proposed Subbasin Runoff (cfs) (2-yr 6-Hr)	Proposed Subbasin Runoff (cfs) (10-yr 6-Hr)	Proposed Subbasin Runoff (cfs) (100-yr 6-Hr)	Difference (cfs) (Post - Pre) (2-yr 6-Hr)	Difference (cfs) (Post - Pre) (10-yr 6-Hr)	Difference (cfs) (Post - Pre) (100-yr 6-Hr)	Notes
PR-10	University Blvd (George Rd to Randolph Rd)	90+00	94+50	0.1	0.2	0.3	0.2	0.3	0.4	0.1	0.1	0.1	
PR-11	University Blvd (George Rd to Randolph Rd)	94+50	98+64	0.1	0.2	0.3	0.2	0.3	0.4	0.1	0.1	0.1	
PR-12	University Blvd (George Rd to Randolph Rd)	99+68	106+00	0.2	0.5	0.9	0.5	0.8	1.2	0.3	0.3	0.3	
PR-13	Sunport Trail (University Blvd to Transport St)	10+20	23+00	0.3	0.8	1.4	0.8	1.4	2.1	0.6	0.6	0.7	Two new catch basins to mitigate excess flow and velocity
PR-14	University Blvd (George Rd to Randolph Rd)	107+00	109+29	0.1	0.2	0.3	0.1	0.2	0.3	0.0	0.0	0.0	
PR-15	University Blvd (George Rd to Randolph Rd)	110+50	114+50	0.1	0.3	0.5	0.2	0.4	0.6	0.1	0.1	0.1	
PR-16	University Blvd (George Rd to Randolph Rd)	114+87	119+00	0.2	0.3	0.5	0.3	0.4	0.6	0.1	0.1	0.1	
PR-17	University Blvd (George Rd to Randolph Rd)	119+74	124+50	0.1	0.4	0.7	0.4	0.7	1.1	0.3	0.3	0.4	
PR-18	University Blvd (San Jose Ave to Gibson Blvd)	17+00	18+00	0.1	0.2	0.4	0.1	0.2	0.4	0.0	0.0	0.0	
PR-100	University Blvd (San Jose Ave to Gibson Blvd)	18+45	20+17	0.1	0.1	0.2	0.1	0.1	0.2	0.0	0.0	0.0	
PR-101	University Blvd (San Jose Ave to Gibson Blvd)	20+93	22+67	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	
PR-102	University Blvd (San Jose Ave to Gibson Blvd)	23+44	25+15	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	
PR-103	University Blvd (San Jose Ave to Gibson Blvd)	25+93	27+67	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	
PR-104	University Blvd (San Jose Ave to Gibson Blvd)	28+50	33+50	0.1	0.2	0.3	0.1	0.2	0.3	0.0	0.0	0.0	
PR-200	Kirtland Channel Trail (Mulberry St to San Jose Ave)	100+15	104+33	0.1	0.3	0.4	0.2	0.4	0.6	0.1	0.2	0.2	
EX-201	Kirtland Channel Trail - South	-	-	2.9	4.9	7.4	-	-	-	0.0	0.0	0.0	Area calculated to correctly size sidewalk culvert for 10-year storm.

East Curb

Subbasin ID	Alignment	From STA	To STA	Existing Subbasin Runoff (cfs) (2-yr 6-Hr)	Existing Subbasin Runoff (cfs) (10-yr 6-Hr)	Existing Subbasin Runoff (cfs) (100-yr 6-Hr)	Proposed Subbasin Runoff (cfs) (2-yr 6-Hr)	Proposed Subbasin Runoff (cfs) (10-yr 6-Hr)	Proposed Subbasin Runoff (cfs) (100-yr 6-Hr)	Difference (cfs) (Post - Pre) (2-yr 6-Hr)	Difference (cfs) (Post - Pre) (10-yr 6-Hr)	Difference (cfs) (Post - Pre) (100-yr 6-Hr)	Notes
PR-50	University Blvd (George Rd to Randolph Rd)	99+68	106+50	0.3	0.6	1.0	0.5	0.8	1.3	0.2	0.2	0.2	
PR-51	University Blvd (George Rd to Randolph Rd)	107+00	110+20	0.1	0.2	0.3	0.1	0.2	0.3	0.0	0.0	0.0	
PR-52	University Blvd (George Rd to Randolph Rd)	110+50	114+35	0.1	0.3	0.5	0.3	0.5	0.7	0.1	0.1	0.2	
PR-53	University Blvd (George Rd to Randolph Rd)	114+35	119+74	0.2	0.5	0.8	0.4	0.7	1.1	0.2	0.2	0.2	
PR-150	University Blvd (San Jose Ave to Gibson Blvd)	18+45	20+17	0.1	0.1	0.2	0.1	0.1	0.2	0.0	0.0	0.0	
PR-151	University Blvd (San Jose Ave to Gibson Blvd)	20+93	22+67	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	
PR-152	University Blvd (San Jose Ave to Gibson Blvd)	23+44	25+15	0.0	0.1	0.1	0.0	0.1	0.1	0.0	0.0	0.0	
PR-153	University Blvd (San Jose Ave to Gibson Blvd)	25+93	27+67	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	
PR-154	University Blvd (San Jose Ave to Gibson Blvd)	28+50	33+50	0.2	0.3	0.4	0.2	0.3	0.4	0.0	0.0	0.0	

Notes:
1) Drainage improvements are proposed when the Post minus Pre 10-year flows exceed 0.5 cfs.
2) Improvements are proposed as noted.

Sunport Trail Total Runoff							
Subbasin ID	**Alignment**	**From STA**	**To STA**	**Proposed Subbasin Runoff (cfs)**	**Proposed Subbasin Runoff (cfs)**	**Proposed Subbasin Runoff (cfs)**	**Notes**
				(2-yr 6-Hr)	**(10-yr 6-Hr)**	**(100-yr 6-Hr)**	
Sunport Trail East	Sunport Trail (University Blvd to Transport St)	16+34	23+00	0.6	1.4	2.3	Single grate area drain at Station 16+34
Sunport Trail West	Sunport Trail (University Blvd to Transport St)	10+26	16+34	0.5	1.0	1.7	Double grate area drain at station 10+47

Notes:

1) Sunport Trail drainage basin calculations required due to removal of existing channel conveyance.
2) Improvements are proposed as noted.
3) New catch basins are proposed to tie into existing storm drains.

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On-Site Subbasin Calculations

Project: University Bikeways Phase 2
Location: Albuquerque, NM
Date: January 28, 2015

Proj. Number: 221790.10
Proj. Engineer: A. Herting
Checker: L. Vick / E. Froberg

Reference: Chapter 22, Drainage, Flood Control and Erosion Control

Precipitation Zone: 2

Intensity	
2-yr, 6-hr=	2.04
10-yr, 6-hr=	3.41
100-yr, 6-hr=	5.05

Basin ID: **PR-10** (Onsite Calculation for Pre vs. Post Analysis)

1. Land Treatment Areas

A:	0	sq.ft.	0.00	acres
B:	0	sq.ft.	0.00	acres
C:	0	sq.ft.	0.00	acres
D:	4020	sq.ft.	0.09	acres
Total:	4020	sq.ft.	0.09	acres

2. Weighted C*A, Rational Coefficient*Acre

$C*A_2=$ 0.1

$C*A_{10}=$ 0.1

$C*A_{100}=$ 0.1

3. Peak Discharge, Q

$Q_2=$ **0.2** cfs

$Q_{10}=$ **0.3** cfs

$Q_{100}=$ **0.4** cfs

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On-Site Subbasin Calculations

Project: University Bikeways Phase 2
Location: Albuquerque, NM
Date: January 28, 2015

Proj. Number: 221790.10
Proj. Engineer: A. Herting
Checker: L. Vick / E. Froberg

Reference: Chapter 22, Drainage, Flood Control and Erosion Control

Precipitation Zone: 2

Intensity	
2-yr, 6-hr=	2.04
10-yr, 6-hr=	3.41
100-yr, 6-hr=	5.05

Basin ID: **PR-11** (Onsite Calculation for Pre vs. Post Analysis)

1. Land Treatment Areas

A:	0	sq.ft.	0.00	acres
B:	0	sq.ft.	0.00	acres
C:	0	sq.ft.	0.00	acres
D:	3902	sq.ft.	0.09	acres
Total:	3902	sq.ft.	0.09	acres

2. Weighted C*A, Rational Coefficient*Acre

$C*A_2=$ 0.1

$C*A_{10}=$ 0.1

$C*A_{100}=$ 0.1

3. Peak Discharge, Q

$Q_2=$ **0.2** cfs

$Q_{10}=$ **0.3** cfs

$Q_{100}=$ **0.4** cfs

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On-Site Subbasin Calculations

Project:	University Bikeways Phase 2	**Proj. Number:**	221790.10
Location:	Albuquerque, NM	**Proj. Engineer:**	A. Herting
Date:	January 28, 2015	**Checker:**	L. Vick / E. Froberg

Reference: Chapter 22, Drainage, Flood Control and Erosion Control

Precipitation Zone: 2

Intensity	
2-yr, 6-hr=	2.04
10-yr, 6-hr=	3.41
100-yr, 6-hr=	5.05

Basin ID: **PR-12** (Onsite Calculation for Pre vs. Post Analysis)

1. Land Treatment Areas

A:	0	sq.ft.	0.00	acres
B:	0	sq.ft.	0.00	acres
C:	0	sq.ft.	0.00	acres
D:	11473	sq.ft.	0.26	acres
Total:	11473	sq.ft.	0.26	acres

2. Weighted C*A, Rational Coefficient*Acre

$C*A_2=$ 0.2

$C*A_{10}=$ 0.2

$C*A_{100}=$ 0.2

3. Peak Discharge, Q

$Q_2=$ **0.5** cfs

$Q_{10}=$ **0.8** cfs

$Q_{100}=$ **1.2** cfs

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On-Site Subbasin Calculations

Project:	University Bikeways Phase 2	**Proj. Number:**	221790.10
Location:	Albuquerque, NM	**Proj. Engineer:**	A. Herting
Date:	January 28, 2015	**Checker:**	L. Vick / E. Froberg

Reference: Chapter 22, Drainage, Flood Control and Erosion Control

Precipitation Zone: 2

Intensity	
2-yr, 6-hr=	2.04
10-yr, 6-hr=	3.41
100-yr, 6-hr=	5.05

Basin ID: **PR-50** (Onsite Calculation for Pre vs. Post Analysis)

1. Land Treatment Areas

A:	0	sq.ft.	0.00	acres
B:	0	sq.ft.	0.00	acres
C:	0	sq.ft.	0.00	acres
D:	11629	sq.ft.	0.27	acres
Total:	11629	sq.ft.	0.27	acres

2. Weighted C*A, Rational Coefficient*Acre

$C*A_2$=	0.2
$C*A_{10}$=	0.2
$C*A_{100}$=	0.2

3. Peak Discharge, Q

Q_2=	**0.5**	cfs
Q_{10}=	**0.8**	cfs
Q_{100}=	**1.3**	cfs

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On-Site Subbasin Calculations

Project: University Bikeways Phase 2 **Proj. Number:** 221790.10
Location: Albuquerque, NM **Proj. Engineer:** A. Herting
Date: January 28, 2015 **Checker:** L. Vick / E. Froberg

Reference: Chapter 22, Drainage, Flood Control and Erosion Control

Precipitation Zone: 2

Intensity	
2-yr, 6-hr=	2.04
10-yr, 6-hr=	3.41
100-yr, 6-hr=	5.05

Basin ID: **PR-13** (Onsite Calculation for Pre vs. Post Analysis)

1. Land Treatment Areas

A:	0	sq.ft.	0.00	acres
B:	0	sq.ft.	0.00	acres
C:	0	sq.ft.	0.00	acres
D:	19184	sq.ft.	0.44	acres
Total:	19184	sq.ft.	0.44	acres

2. Weighted C*A, Rational Coefficient*Acre

$C*A_2$=	0.4
$C*A_{10}$=	0.4
$C*A_{100}$=	0.4

3. Peak Discharge, Q

Q_2=	**0.8**	cfs
Q_{10}=	**1.4**	cfs
Q_{100}=	**2.1**	cfs

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On-Site Subbasin Calculations

Project: University Bikeways Phase 2 | **Proj. Number:** 221790.10
Location: Albuquerque, NM | **Proj. Engineer:** A. Herting
Date: January 28, 2015 | **Checker:** L. Vick / E. Froberg

Reference: Chapter 22, Drainage, Flood Control and Erosion Control

Precipitation Zone: 2

Intensity	
2-yr, 6-hr=	2.04
10-yr, 6-hr=	3.41
100-yr, 6-hr=	5.05

Basin ID: **PR-14** (Onsite Calculation for Pre vs. Post Analysis)

1. Land Treatment Areas

A:	0	sq.ft.	0.00	acres
B:	0	sq.ft.	0.00	acres
C:	0	sq.ft.	0.00	acres
D:	2779	sq.ft.	0.06	acres
Total:	2779	sq.ft.	0.06	acres

2. Weighted C*A, Rational Coefficient*Acre

$C*A_2=$ 0.1

$C*A_{10}=$ 0.1

$C*A_{100}=$ 0.1

3. Peak Discharge, Q

$Q_2=$ **0.1** cfs

$Q_{10}=$ **0.2** cfs

$Q_{100}=$ **0.3** cfs

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On-Site Subbasin Calculations

Project: University Bikeways Phase 2
Location: Albuquerque, NM
Date: January 28, 2015

Proj. Number: 221790.10
Proj. Engineer: A. Herting
Checker: L. Vick / E. Froberg

Reference: Chapter 22, Drainage, Flood Control and Erosion Control

Precipitation Zone: 2

Intensity	
2-yr, 6-hr=	2.04
10-yr, 6-hr=	3.41
100-yr, 6-hr=	5.05

Basin ID: PR-51 (Onsite Calculation for Pre vs. Post Analysis)

1. Land Treatment Areas

A:	0	sq.ft.	0.00	acres
B:	0	sq.ft.	0.00	acres
C:	0	sq.ft.	0.00	acres
D:	3132	sq.ft.	0.07	acres
Total:	3132	sq.ft.	0.07	acres

2. Weighted C*A, Rational Coefficient*Acre

$C*A_{2}=$ 0.1

$C*A_{10}=$ 0.1

$C*A_{100}=$ 0.1

3. Peak Discharge, Q

$Q_{2}=$ **0.1** cfs

$Q_{10}=$ **0.2** cfs

$Q_{100}=$ **0.3** cfs

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On-Site Subbasin Calculations

Project: University Bikeways Phase 2
Location: Albuquerque, NM
Date: January 28, 2015

Proj. Number: 221790.10
Proj. Engineer: A. Herting
Checker: L. Vick / E. Froberg

Reference: Chapter 22, Drainage, Flood Control and Erosion Control

Precipitation Zone: 2

Intensity	
2-yr, 6-hr=	2.04
10-yr, 6-hr=	3.41
100-yr, 6-hr=	5.05

Basin ID: **PR-15** (Onsite Calculation for Pre vs. Post Analysis)

1. Land Treatment Areas

A:	0	sq.ft.	0.00	acres
B:	0	sq.ft.	0.00	acres
C:	0	sq.ft.	0.00	acres
D:	5539	sq.ft.	0.13	acres
Total:	5539	sq.ft.	0.13	acres

2. Weighted C*A, Rational Coefficient*Acre

$C*A_{2}$=	0.1
$C*A_{10}$=	0.1
$C*A_{100}$=	0.1

3. Peak Discharge, Q

Q_{2}=	**0.2**	cfs
Q_{10}=	**0.4**	cfs
Q_{100}=	**0.6**	cfs

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On-Site Subbasin Calculations

Project:	University Bikeways Phase 2	**Proj. Number:**	221790.10
Location:	Albuquerque, NM	**Proj. Engineer:**	A. Herting
Date:	January 28, 2015	**Checker:**	L. Vick / E. Froberg

Reference: Chapter 22, Drainage, Flood Control and Erosion Control

Precipitation Zone: 2

Intensity	
2-yr, 6-hr=	2.04
10-yr, 6-hr=	3.41
100-yr, 6-hr=	5.05

Basin ID: **PR-52** (Onsite Calculation for Pre vs. Post Analysis)

1. Land Treatment Areas

A:	0	sq.ft.	0.00	acres
B:	0	sq.ft.	0.00	acres
C:	0	sq.ft.	0.00	acres
D:	6414	sq.ft.	0.15	acres
Total:	6414	sq.ft.	0.15	acres

2. Weighted C*A, Rational Coefficient*Acre

$C*A_2=$	0.1
$C*A_{10}=$	0.1
$C*A_{100}=$	0.1

3. Peak Discharge, Q

$Q_2=$	**0.3**	cfs
$Q_{10}=$	**0.5**	cfs
$Q_{100}=$	**0.7**	cfs

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On-Site Subbasin Calculations

Project: University Bikeways Phase 2
Location: Albuquerque, NM
Date: January 28, 2015

Proj. Number: 221790.10
Proj. Engineer: A. Herting
Checker: L. Vick / E. Froberg

Reference: Chapter 22, Drainage, Flood Control and Erosion Control

Precipitation Zone: 2

Intensity	
2-yr, 6-hr=	2.04
10-yr, 6-hr=	3.41
100-yr, 6-hr=	5.05

Basin ID: **PR-16** (Onsite Calculation for Pre vs. Post Analysis)

1. Land Treatment Areas

A:	0	sq.ft.	0.00	acres
B:	0	sq.ft.	0.00	acres
C:	0	sq.ft.	0.00	acres
D:	5914	sq.ft.	0.14	acres
Total:	5914	sq.ft.	0.14	acres

2. Weighted C*A, Rational Coefficient*Acre

$C*A_2=$	0.1
$C*A_{10}=$	0.1
$C*A_{100}=$	0.1

3. Peak Discharge, Q

$Q_2=$	**0.3**	cfs
$Q_{10}=$	**0.4**	cfs
$Q_{100}=$	**0.6**	cfs

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On-Site Subbasin Calculations

Project:	University Bikeways Phase 2	**Proj. Number:**	221790.10
Location:	Albuquerque, NM	**Proj. Engineer:**	A. Herting
Date:	January 28, 2015	**Checker:**	L. Vick / E. Froberg

Reference: Chapter 22, Drainage, Flood Control and Erosion Control

Precipitation Zone: 2

Intensity	
2-yr, 6-hr=	2.04
10-yr, 6-hr=	3.41
100-yr, 6-hr=	5.05

Basin ID: **PR-53** (Onsite Calculation for Pre vs. Post Analysis)

1. Land Treatment Areas

A:	0	sq.ft.	0.00	acres
B:	0	sq.ft.	0.00	acres
C:	0	sq.ft.	0.00	acres
D:	9744	sq.ft.	0.22	acres
Total:	9744	sq.ft.	0.22	acres

2. Weighted C*A, Rational Coefficient*Acre

$C*A_2$=	0.2
$C*A_{10}$=	0.2
$C*A_{100}$=	0.2

3. Peak Discharge, Q

Q_2=	**0.4**	cfs
Q_{10}=	**0.7**	cfs
Q_{100}=	**1.1**	cfs

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On-Site Subbasin Calculations

Project:	University Bikeways Phase 2	**Proj. Number:**	221790.10
Location:	Albuquerque, NM	**Proj. Engineer:**	A. Herting
Date:	January 28, 2015	**Checker:**	L. Vick / E. Froberg

Reference: Chapter 22, Drainage, Flood Control and Erosion Control

Precipitation Zone: 2

Intensity	
2-yr, 6-hr=	2.04
10-yr, 6-hr=	3.41
100-yr, 6-hr=	5.05

Basin ID: **PR-17** (Onsite Calculation for Pre vs. Post Analysis)

1. Land Treatment Areas

A:	0	sq.ft.	0.00	acres
B:	0	sq.ft.	0.00	acres
C:	0	sq.ft.	0.00	acres
D:	9850	sq.ft.	0.23	acres
Total:	9850	sq.ft.	0.23	acres

2. Weighted C*A, Rational Coefficient*Acre

$C*A_2$=	0.2
$C*A_{10}$=	0.2
$C*A_{100}$=	0.2

3. Peak Discharge, Q

Q_2=	**0.4**	cfs
Q_{10}=	**0.7**	cfs
Q_{100}=	**1.1**	cfs

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On-Site Subbasin Calculations

Project:	University Bikeways Phase 2	**Proj. Number:**	221790.10
Location:	Albuquerque, NM	**Proj. Engineer:**	A. Herting
Date:	January 28, 2015	**Checker:**	L. Vick / E. Froberg

Reference: Chapter 22, Drainage, Flood Control and Erosion Control

Precipitation Zone: 2

Intensity	
2-yr, 6-hr=	2.04
10-yr, 6-hr=	3.41
100-yr, 6-hr=	5.05

Basin ID: **PR-18** (Onsite Calculation for Pre vs. Post Analysis)

1. Land Treatment Areas

A:	0	sq.ft.	0.00	acres
B:	0	sq.ft.	0.00	acres
C:	0	sq.ft.	0.00	acres
D:	3458	sq.ft.	0.08	acres
Total:	3458	sq.ft.	0.08	acres

2. Weighted C*A, Rational Coefficient*Acre

$C*A_2$=	0.1
$C*A_{10}$=	0.1
$C*A_{100}$=	0.1

3. Peak Discharge, Q

Q_2=	**0.1**	cfs
Q_{10}=	**0.2**	cfs
Q_{100}=	**0.4**	cfs

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On-Site Subbasin Calculations

Project:	University Bikeways Phase 2	**Proj. Number:**	221790.10
Location:	Albuquerque, NM	**Proj. Engineer:**	A. Herting
Date:	January 28, 2015	**Checker:**	L. Vick / E. Froberg

Reference: Chapter 22, Drainage, Flood Control and Erosion Control

Precipitation Zone: 2

Intensity	
2-yr, 6-hr=	2.04
10-yr, 6-hr=	3.41
100-yr, 6-hr=	5.05

Basin ID: **PR-100** (Onsite Calculation for Pre vs. Post Analysis)

1. Land Treatment Areas

A:	0	sq.ft.	0.00	acres
B:	0	sq.ft.	0.00	acres
C:	0	sq.ft.	0.00	acres
D:	1622	sq.ft.	0.04	acres
Total:	1622	sq.ft.	0.04	acres

2. Weighted C*A, Rational Coefficient*Acre

$C*A_2$=	0.0
$C*A_{10}$=	0.0
$C*A_{100}$=	0.0

3. Peak Discharge, Q

Q_2=	**0.1**	cfs
Q_{10}=	**0.1**	cfs
Q_{100}=	**0.2**	cfs

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On-Site Subbasin Calculations

Project:	University Bikeways Phase 2	**Proj. Number:**	221790.10
Location:	Albuquerque, NM	**Proj. Engineer:**	A. Herting
Date:	January 28, 2015	**Checker:**	L. Vick / E. Froberg

Reference: Chapter 22, Drainage, Flood Control and Erosion Control

Precipitation Zone: 2

Intensity	
2-yr, 6-hr=	2.04
10-yr, 6-hr=	3.41
100-yr, 6-hr=	5.05

Basin ID: **PR-150** (Onsite Calculation for Pre vs. Post Analysis)

1. Land Treatment Areas

A:	0	sq.ft.	0.00	acres
B:	0	sq.ft.	0.00	acres
C:	0	sq.ft.	0.00	acres
D:	1657	sq.ft.	0.04	acres
Total:	1657	sq.ft.	0.04	acres

2. Weighted C*A, Rational Coefficient*Acre

$C*A_2$=	0.0
$C*A_{10}$=	0.0
$C*A_{100}$=	0.0

3. Peak Discharge, Q

Q_2=	**0.1**	cfs
Q_{10}=	**0.1**	cfs
Q_{100}=	**0.2**	cfs

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On-Site Subbasin Calculations

Project: University Bikeways Phase 2
Location: Albuquerque, NM
Date: January 28, 2015

Proj. Number: 221790.10
Proj. Engineer: A. Herting
Checker: L. Vick / E. Froberg

Reference: Chapter 22, Drainage, Flood Control and Erosion Control

Precipitation Zone: 2

Intensity	
2-yr, 6-hr=	2.04
10-yr, 6-hr=	3.41
100-yr, 6-hr=	5.05

Basin ID: **PR-101** (Onsite Calculation for Pre vs. Post Analysis)

1. Land Treatment Areas

A:	0	sq.ft.	0.00	acres
B:	0	sq.ft.	0.00	acres
C:	0	sq.ft.	0.00	acres
D:	1279	sq.ft.	0.03	acres
Total:	1279	sq.ft.	0.03	acres

2. Weighted C*A, Rational Coefficient*Acre

$C*A_2=$ 0.0

$C*A_{10}=$ 0.0

$C*A_{100}=$ 0.0

3. Peak Discharge, Q

$Q_2=$ **0.1** cfs

$Q_{10}=$ **0.1** cfs

$Q_{100}=$ **0.1** cfs

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On-Site Subbasin Calculations

Project:	University Bikeways Phase 2	**Proj. Number:**	221790.10
Location:	Albuquerque, NM	**Proj. Engineer:**	A. Herting
Date:	January 28, 2015	**Checker:**	L. Vick / E. Froberg

Reference: Chapter 22, Drainage, Flood Control and Erosion Control

Precipitation Zone: 2

Intensity	
2-yr, 6-hr=	2.04
10-yr, 6-hr=	3.41
100-yr, 6-hr=	5.05

Basin ID: **PR-151** (Onsite Calculation for Pre vs. Post Analysis)

1. Land Treatment Areas

A:	0	sq.ft.	0.00	acres
B:	0	sq.ft.	0.00	acres
C:	0	sq.ft.	0.00	acres
D:	1279	sq.ft.	0.03	acres
Total:	1279	sq.ft.	0.03	acres

2. Weighted C*A, Rational Coefficient*Acre

$C*A_2$=	0.0
$C*A_{10}$=	0.0
$C*A_{100}$=	0.0

3. Peak Discharge, Q

Q_2=	**0.1**	cfs
Q_{10}=	**0.1**	cfs
Q_{100}=	**0.1**	cfs

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On-Site Subbasin Calculations

Project: University Bikeways Phase 2
Location: Albuquerque, NM
Date: January 28, 2015

Proj. Number: 221790.10
Proj. Engineer: A. Herting
Checker: L. Vick / E. Froberg

Reference: Chapter 22, Drainage, Flood Control and Erosion Control

Precipitation Zone: 2

Intensity	
2-yr, 6-hr=	2.04
10-yr, 6-hr=	3.41
100-yr, 6-hr=	5.05

Basin ID: **PR-102** (Onsite Calculation for Pre vs. Post Analysis)

1. Land Treatment Areas

A:	0	sq.ft.	0.00	acres
B:	0	sq.ft.	0.00	acres
C:	0	sq.ft.	0.00	acres
D:	1278	sq.ft.	0.03	acres
Total:	1278	sq.ft.	0.03	acres

2. Weighted C*A, Rational Coefficient*Acre

$C*A_2=$ 0.0

$C*A_{10}=$ 0.0

$C*A_{100}=$ 0.0

3. Peak Discharge, Q

$Q_2=$ **0.1** cfs

$Q_{10}=$ **0.1** cfs

$Q_{100}=$ **0.1** cfs

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On-Site Subbasin Calculations

Project:	University Bikeways Phase 2	**Proj. Number:**	221790.10
Location:	Albuquerque, NM	**Proj. Engineer:**	A. Herting
Date:	January 28, 2015	**Checker:**	L. Vick / E. Froberg

Reference: Chapter 22, Drainage, Flood Control and Erosion Control

Precipitation Zone: 2

Intensity	
2-yr, 6-hr=	2.04
10-yr, 6-hr=	3.41
100-yr, 6-hr=	5.05

Basin ID: **PR-152** (Onsite Calculation for Pre vs. Post Analysis)

1. Land Treatment Areas

A:	0	sq.ft.	0.00	acres
B:	0	sq.ft.	0.00	acres
C:	0	sq.ft.	0.00	acres
D:	1106	sq.ft.	0.03	acres
Total:	1106	sq.ft.	0.03	acres

2. Weighted C*A, Rational Coefficient*Acre

$C*A_2$=	0.0
$C*A_{10}$=	0.0
$C*A_{100}$=	0.0

3. Peak Discharge, Q

Q_2=	**0.0**	cfs
Q_{10}=	**0.1**	cfs
Q_{100}=	**0.1**	cfs

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On-Site Subbasin Calculations

Project:	University Bikeways Phase 2		**Proj. Number:**	221790.10
Location:	Albuquerque, NM		**Proj. Engineer:**	A. Herting
Date:	January 28, 2015		**Checker:**	L. Vick / E. Froberg

Reference: Chapter 22, Drainage, Flood Control and Erosion Control

Precipitation Zone: 2

Intensity	
2-yr, 6-hr=	2.04
10-yr, 6-hr=	3.41
100-yr, 6-hr=	5.05

Basin ID: **PR-103** (Onsite Calculation for Pre vs. Post Analysis)

1. Land Treatment Areas

A:	0	sq.ft.	0.00	acres
B:	0	sq.ft.	0.00	acres
C:	0	sq.ft.	0.00	acres
D:	1280	sq.ft.	0.03	acres
Total:	1280	sq.ft.	0.03	acres

2. Weighted C*A, Rational Coefficient*Acre

$C*A_{2}$=	0.0
$C*A_{10}$=	0.0
$C*A_{100}$=	0.0

3. Peak Discharge, Q

Q_{2}=	**0.1**	cfs
Q_{10}=	**0.1**	cfs
Q_{100}=	**0.1**	cfs

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On-Site Subbasin Calculations

Project:	University Bikeways Phase 2	**Proj. Number:**	221790.10
Location:	Albuquerque, NM	**Proj. Engineer:**	A. Herting
Date:	January 28, 2015	**Checker:**	L. Vick / E. Froberg

Reference: Chapter 22, Drainage, Flood Control and Erosion Control

Precipitation Zone: 2

Intensity	
2-yr, 6-hr=	2.04
10-yr, 6-hr=	3.41
100-yr, 6-hr=	5.05

Basin ID: **PR-153** (Onsite Calculation for Pre vs. Post Analysis)

1. Land Treatment Areas

A:	0	sq.ft.	0.00	acres
B:	0	sq.ft.	0.00	acres
C:	0	sq.ft.	0.00	acres
D:	1290	sq.ft.	0.03	acres
Total:	1290	sq.ft.	0.03	acres

2. Weighted C*A, Rational Coefficient*Acre

$C*A_{2}$=	0.0
$C*A_{10}$=	0.0
$C*A_{100}$=	0.0

3. Peak Discharge, Q

Q_{2}=	**0.1**	cfs
Q_{10}=	**0.1**	cfs
Q_{100}=	**0.1**	cfs

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On-Site Subbasin Calculations

Project: University Bikeways Phase 2
Location: Albuquerque, NM
Date: January 28, 2015

Proj. Number: 221790.10
Proj. Engineer: A. Herting
Checker: L. Vick / E. Froberg

Reference: Chapter 22, Drainage, Flood Control and Erosion Control

Precipitation Zone: 2

Intensity	
2-yr, 6-hr=	2.04
10-yr, 6-hr=	3.41
100-yr, 6-hr=	5.05

Basin ID: **PR-104** (Onsite Calculation for Pre vs. Post Analysis)

1. Land Treatment Areas

A:	0	sq.ft.	0.00	acres
B:	0	sq.ft.	0.00	acres
C:	0	sq.ft.	0.00	acres
D:	3019	sq.ft.	0.07	acres
Total:	3019	sq.ft.	0.07	acres

2. Weighted C*A, Rational Coefficient*Acre

$C*A_2$=	0.1
$C*A_{10}$=	0.1
$C*A_{100}$=	0.1

3. Peak Discharge, Q

Q_2=	**0.1**	cfs
Q_{10}=	**0.2**	cfs
Q_{100}=	**0.3**	cfs

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On-Site Subbasin Calculations

Project:	University Bikeways Phase 2	**Proj. Number:**	221790.10
Location:	Albuquerque, NM	**Proj. Engineer:**	A. Herting
Date:	January 28, 2015	**Checker:**	L. Vick / E. Froberg

Reference: Chapter 22, Drainage, Flood Control and Erosion Control

Precipitation Zone: 2

Intensity	
2-yr, 6-hr=	2.04
10-yr, 6-hr=	3.41
100-yr, 6-hr=	5.05

Basin ID: **PR-154** (Onsite Calculation for Pre vs. Post Analysis)

1. Land Treatment Areas

A:	0	sq.ft.	0.00	acres
B:	0	sq.ft.	0.00	acres
C:	0	sq.ft.	0.00	acres
D:	3585	sq.ft.	0.08	acres
Total:	3585	sq.ft.	0.08	acres

2. Weighted C*A, Rational Coefficient*Acre

$C*A_2$=	0.1
$C*A_{10}$=	0.1
$C*A_{100}$=	0.1

3. Peak Discharge, Q

Q_2=	**0.2**	cfs
Q_{10}=	**0.3**	cfs
Q_{100}=	**0.4**	cfs

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On-Site Subbasin Calculations

Project: University Bikeways Phase 2
Location: Albuquerque, NM
Date: September 26, 2016

Proj. Number: 221790.10
Proj. Engineer: A. Herting
Checker: L. Vick / E. Froberg

Reference: Chapter 22, Drainage, Flood Control and Erosion Control

Precipitation Zone: 2

Intensity	
2-yr, 6-hr=	2.04
10-yr, 6-hr=	3.41
100-yr, 6-hr=	5.05

Basin ID: **PR-200** (Onsite Calculation for Pre vs. Post Analysis)

1. Land Treatment Areas

A:	0	sq.ft.	0.00	acres
B:	0	sq.ft.	0.00	acres
C:	0	sq.ft.	0.00	acres
D:	5850	sq.ft.	0.13	acres
Total:	5850	sq.ft.	0.13	acres

2. Weighted C*A, Rational Coefficient*Acre

$C*A_2=$ 0.1

$C*A_{10}=$ 0.1

$C*A_{100}=$ 0.1

3. Peak Discharge, Q

$Q_2=$ **0.2** cfs

$Q_{10}=$ **0.4** cfs

$Q_{100}=$ **0.6** cfs

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On-Site Subbasin Calculations

Project: University Bikeways Phase 2 **Proj. Number:** 221790.10
Location: Albuquerque, NM **Proj. Engineer:** A. Herting
Date: January 28, 2015 **Checker:** L. Vick / E. Froberg

Reference: Chapter 22, Drainage, Flood Control and Erosion Control

Precipitation Zone: 2

Intensity	
2-yr, 6-hr=	2.04
10-yr, 6-hr=	3.41
100-yr, 6-hr=	5.05

Basin ID: **EX-10** (Onsite Calculation for Pre vs. Post Analysis)

1. Land Treatment Areas

A:	0	sq.ft.	0.00	acres
B:	0	sq.ft.	0.00	acres
C:	4020	sq.ft.	0.09	acres
D:	0	sq.ft.	0.00	acres
Total:	4020	sq.ft.	0.09	acres

2. Weighted C*A, Rational Coefficient*Acre

$C*A_2=$ 0.0

$C*A_{10}=$ 0.0

$C*A_{100}=$ 0.1

3. Peak Discharge, Q

$Q_2=$ **0.1** cfs

$Q_{10}=$ **0.2** cfs

$Q_{100}=$ **0.3** cfs

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On-Site Subbasin Calculations

Project: University Bikeways Phase 2
Location: Albuquerque, NM
Date: January 28, 2015

Proj. Number: 221790.10
Proj. Engineer: A. Herting
Checker: L. Vick / E. Froberg

Reference: Chapter 22, Drainage, Flood Control and Erosion Control

Precipitation Zone: 2

Intensity	
2-yr, 6-hr=	2.04
10-yr, 6-hr=	3.41
100-yr, 6-hr=	5.05

Basin ID: **EX-11** (Onsite Calculation for Pre vs. Post Analysis)

1. Land Treatment Areas

A:	0	sq.ft.	0.00	acres
B:	0	sq.ft.	0.00	acres
C:	3902	sq.ft.	0.09	acres
D:	0	sq.ft.	0.00	acres
Total:	3902	sq.ft.	0.09	acres

2. Weighted C*A, Rational Coefficient*Acre

$C*A_2=$ 0.0

$C*A_{10}=$ 0.0

$C*A_{100}=$ 0.1

3. Peak Discharge, Q

$Q_2=$ **0.1** cfs

$Q_{10}=$ **0.2** cfs

$Q_{100}=$ **0.3** cfs

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On-Site Subbasin Calculations

Project: University Bikeways Phase 2
Location: Albuquerque, NM
Date: January 28, 2015

Proj. Number: 221790.10
Proj. Engineer: A. Herting
Checker: L. Vick / E. Froberg

Reference: Chapter 22, Drainage, Flood Control and Erosion Control

Precipitation Zone: 2

Intensity	
2-yr, 6-hr=	2.04
10-yr, 6-hr=	3.41
100-yr, 6-hr=	5.05

Basin ID: **EX-12** (Onsite Calculation for Pre vs. Post Analysis)

1. Land Treatment Areas

A:	0	sq.ft.	0.00	acres
B:	0	sq.ft.	0.00	acres
C:	9301	sq.ft.	0.21	acres
D:	2172	sq.ft.	0.05	acres
Total:	11473	sq.ft.	0.26	acres

2. Weighted C*A, Rational Coefficient*Acre

$C*A_2$=	0.1
$C*A_{10}$=	0.2
$C*A_{100}$=	0.2

3. Peak Discharge, Q

Q_2=	**0.2**	cfs
Q_{10}=	**0.5**	cfs
Q_{100}=	**0.9**	cfs

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On-Site Subbasin Calculations

Project:	University Bikeways Phase 2	**Proj. Number:**	221790.10
Location:	Albuquerque, NM	**Proj. Engineer:**	A. Herting
Date:	January 28, 2015	**Checker:**	L. Vick / E. Froberg

Reference: Chapter 22, Drainage, Flood Control and Erosion Control

Precipitation Zone: 2

Intensity	
2-yr, 6-hr=	2.04
10-yr, 6-hr=	3.41
100-yr, 6-hr=	5.05

Basin ID: **EX-50** (Onsite Calculation for Pre vs. Post Analysis)

1. Land Treatment Areas

A:	0	sq.ft.	0.00	acres
B:	0	sq.ft.	0.00	acres
C:	6265	sq.ft.	0.14	acres
D:	5466	sq.ft.	0.13	acres
Total:	11731	sq.ft.	0.27	acres

2. Weighted C*A, Rational Coefficient*Acre

$C*A_2=$ 0.2

$C*A_{10}=$ 0.2

$C*A_{100}=$ 0.2

3. Peak Discharge, Q

$Q_2=$ **0.3** cfs

$Q_{10}=$ **0.6** cfs

$Q_{100}=$ **1.0** cfs

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On-Site Subbasin Calculations

Project: University Bikeways Phase 2
Location: Albuquerque, NM
Date: January 28, 2015

Proj. Number: 221790.10
Proj. Engineer: A. Herting
Checker: L. Vick / E. Froberg

Reference: Chapter 22, Drainage, Flood Control and Erosion Control

Precipitation Zone: 2

Intensity	
2-yr, 6-hr=	2.04
10-yr, 6-hr=	3.41
100-yr, 6-hr=	5.05

Basin ID: **EX-13** (Onsite Calculation for Pre vs. Post Analysis)

1. Land Treatment Areas

A:	0	sq.ft.	0.00	acres
B:	0	sq.ft.	0.00	acres
C:	19184	sq.ft.	0.44	acres
D:	0	sq.ft.	0.00	acres
Total:	19184	sq.ft.	0.44	acres

2. Weighted C*A, Rational Coefficient*Acre

$C*A_2$=	0.1
$C*A_{10}$=	0.2
$C*A_{100}$=	0.3

3. Peak Discharge, Q

Q_2=	**0.3**	cfs
Q_{10}=	**0.8**	cfs
Q_{100}=	**1.4**	cfs

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On-Site Subbasin Calculations

Project:	University Bikeways Phase 2	**Proj. Number:**	221790.10
Location:	Albuquerque, NM	**Proj. Engineer:**	A. Herting
Date:	January 28, 2015	**Checker:**	L. Vick / E. Froberg

Reference: Chapter 22, Drainage, Flood Control and Erosion Control

Precipitation Zone: 2

Intensity	
2-yr, 6-hr=	2.04
10-yr, 6-hr=	3.41
100-yr, 6-hr=	5.05

Basin ID: **EX-14** (Onsite Calculation for Pre vs. Post Analysis)

1. Land Treatment Areas

A:	0	sq.ft.	0.00	acres
B:	0	sq.ft.	0.00	acres
C:	0	sq.ft.	0.00	acres
D:	2779	sq.ft.	0.06	acres
Total:	2779	sq.ft.	0.06	acres

2. Weighted C*A, Rational Coefficient*Acre

$C*A_2=$ 0.1

$C*A_{10}=$ 0.1

$C*A_{100}=$ 0.1

3. Peak Discharge, Q

$Q_2=$ **0.1** cfs

$Q_{10}=$ **0.2** cfs

$Q_{100}=$ **0.3** cfs

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On-Site Subbasin Calculations

Project: University Bikeways Phase 2
Location: Albuquerque, NM
Date: January 28, 2015

Proj. Number: 221790.10
Proj. Engineer: A. Herting
Checker: L. Vick / E. Froberg

Reference: Chapter 22, Drainage, Flood Control and Erosion Control

Precipitation Zone: 2

Intensity	
2-yr, 6-hr=	2.04
10-yr, 6-hr=	3.41
100-yr, 6-hr=	5.05

Basin ID: **EX-51** (Onsite Calculation for Pre vs. Post Analysis)

1. Land Treatment Areas

A:	0	sq.ft.	0.00	acres
B:	0	sq.ft.	0.00	acres
C:	0	sq.ft.	0.00	acres
D:	3132	sq.ft.	0.07	acres
Total:	3132	sq.ft.	0.07	acres

2. Weighted C*A, Rational Coefficient*Acre

$C*A_{2}$=	0.1
$C*A_{10}$=	0.1
$C*A_{100}$=	0.1

3. Peak Discharge, Q

Q_{2}=	**0.1**	cfs
Q_{10}=	**0.2**	cfs
Q_{100}=	**0.3**	cfs

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On-Site Subbasin Calculations

Project:	University Bikeways Phase 2	**Proj. Number:**	221790.10
Location:	Albuquerque, NM	**Proj. Engineer:**	A. Herting
Date:	January 28, 2015	**Checker:**	L. Vick / E. Froberg

Reference: Chapter 22, Drainage, Flood Control and Erosion Control

Precipitation Zone: 2

Intensity	
2-yr, 6-hr=	2.04
10-yr, 6-hr=	3.41
100-yr, 6-hr=	5.05

Basin ID: **EX-15** (Onsite Calculation for Pre vs. Post Analysis)

1. Land Treatment Areas

A:	0	sq.ft.	0.00	acres
B:	0	sq.ft.	0.00	acres
C:	3013	sq.ft.	0.07	acres
D:	2503	sq.ft.	0.06	acres
Total:	5516	sq.ft.	0.13	acres

2. Weighted C*A, Rational Coefficient*Acre

$C*A_2$=	0.1
$C*A_{10}$=	0.1
$C*A_{100}$=	0.1

3. Peak Discharge, Q

Q_2=	**0.1**	cfs
Q_{10}=	**0.3**	cfs
Q_{100}=	**0.5**	cfs

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On-Site Subbasin Calculations

Project: University Bikeways Phase 2
Location: Albuquerque, NM
Date: January 28, 2015

Proj. Number: 221790.10
Proj. Engineer: A. Herting
Checker: L. Vick / E. Froberg

Reference: Chapter 22, Drainage, Flood Control and Erosion Control

Precipitation Zone: 2

Intensity	
2-yr, 6-hr=	2.04
10-yr, 6-hr=	3.41
100-yr, 6-hr=	5.05

Basin ID: **EX-52** (Onsite Calculation for Pre vs. Post Analysis)

1. Land Treatment Areas

A:	0	sq.ft.	0.00	acres
B:	0	sq.ft.	0.00	acres
C:	4414	sq.ft.	0.10	acres
D:	2030	sq.ft.	0.05	acres
Total:	6444	sq.ft.	0.15	acres

2. Weighted C*A, Rational Coefficient*Acre

$C*A_2$= 0.1

$C*A_{10}$= 0.1

$C*A_{100}$= 0.1

3. Peak Discharge, Q

Q_2= **0.1** cfs

Q_{10}= **0.3** cfs

Q_{100}= **0.5** cfs

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On-Site Subbasin Calculations

Project: University Bikeways Phase 2
Location: Albuquerque, NM
Date: January 28, 2015

Proj. Number: 221790.10
Proj. Engineer: A. Herting
Checker: L. Vick / E. Froberg

Reference: Chapter 22, Drainage, Flood Control and Erosion Control

Precipitation Zone: 2

Intensity	
2-yr, 6-hr=	2.04
10-yr, 6-hr=	3.41
100-yr, 6-hr=	5.05

Basin ID: **EX-16** (Onsite Calculation for Pre vs. Post Analysis)

1. Land Treatment Areas

A:	0	sq.ft.	0.00	acres
B:	0	sq.ft.	0.00	acres
C:	3303	sq.ft.	0.08	acres
D:	2617	sq.ft.	0.06	acres
Total:	5920	sq.ft.	0.14	acres

2. Weighted C*A, Rational Coefficient*Acre

$C*A_2$= 0.1

$C*A_{10}$= 0.1

$C*A_{100}$= 0.1

3. Peak Discharge, Q

Q_2= **0.2** cfs

Q_{10}= **0.3** cfs

Q_{100}= **0.5** cfs

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On-Site Subbasin Calculations

Project:	University Bikeways Phase 2	**Proj. Number:**	221790.10
Location:	Albuquerque, NM	**Proj. Engineer:**	A. Herting
Date:	January 28, 2015	**Checker:**	L. Vick / E. Froberg

Reference: Chapter 22, Drainage, Flood Control and Erosion Control

Precipitation Zone: 2

Intensity	
2-yr, 6-hr=	2.04
10-yr, 6-hr=	3.41
100-yr, 6-hr=	5.05

Basin ID: **EX-53** (Onsite Calculation for Pre vs. Post Analysis)

1. Land Treatment Areas

A:	0	sq.ft.	0.00	acres
B:	0	sq.ft.	0.00	acres
C:	6707	sq.ft.	0.15	acres
D:	3167	sq.ft.	0.07	acres
Total:	9874	sq.ft.	0.23	acres

2. Weighted C*A, Rational Coefficient*Acre

$C*A_2$=	0.1
$C*A_{10}$=	0.1
$C*A_{100}$=	0.2

3. Peak Discharge, Q

Q_2=	**0.2**	cfs
Q_{10}=	**0.5**	cfs
Q_{100}=	**0.8**	cfs

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On-Site Subbasin Calculations

Project: University Bikeways Phase 2
Location: Albuquerque, NM
Date: January 28, 2015

Proj. Number: 221790.10
Proj. Engineer: A. Herting
Checker: L. Vick / E. Froberg

Reference: Chapter 22, Drainage, Flood Control and Erosion Control

Precipitation Zone: 2

Intensity	
2-yr, 6-hr=	2.04
10-yr, 6-hr=	3.41
100-yr, 6-hr=	5.05

Basin ID: **EX-17** (Onsite Calculation for Pre vs. Post Analysis)

1. Land Treatment Areas

A:	0	sq.ft.	0.00	acres
B:	0	sq.ft.	0.00	acres
C:	9850	sq.ft.	0.23	acres
D:	0	sq.ft.	0.00	acres
Total:	9850	sq.ft.	0.23	acres

2. Weighted C*A, Rational Coefficient*Acre

$C*A_2=$ 0.1

$C*A_{10}=$ 0.1

$C*A_{100}=$ 0.1

3. Peak Discharge, Q

$Q_2=$ **0.1** cfs

$Q_{10}=$ **0.4** cfs

$Q_{100}=$ **0.7** cfs

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On-Site Subbasin Calculations

Project:	University Bikeways Phase 2	**Proj. Number:**	221790.10
Location:	Albuquerque, NM	**Proj. Engineer:**	A. Herting
Date:	January 28, 2015	**Checker:**	L. Vick / E. Froberg

Reference: Chapter 22, Drainage, Flood Control and Erosion Control

Precipitation Zone: 2

Intensity	
2-yr, 6-hr=	2.04
10-yr, 6-hr=	3.41
100-yr, 6-hr=	5.05

Basin ID: **EX-18** (Onsite Calculation for Pre vs. Post Analysis)

1. Land Treatment Areas

A:	0	sq.ft.	0.00	acres
B:	0	sq.ft.	0.00	acres
C:	0	sq.ft.	0.00	acres
D:	3458	sq.ft.	0.08	acres
Total:	3458	sq.ft.	0.08	acres

2. Weighted C*A, Rational Coefficient*Acre

$C*A_2$=	0.1
$C*A_{10}$=	0.1
$C*A_{100}$=	0.1

3. Peak Discharge, Q

Q_2=	**0.1**	cfs
Q_{10}=	**0.2**	cfs
Q_{100}=	**0.4**	cfs

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On-Site Subbasin Calculations

Project:	University Bikeways Phase 2	**Proj. Number:**	221790.10
Location:	Albuquerque, NM	**Proj. Engineer:**	A. Herting
Date:	January 28, 2015	**Checker:**	L. Vick / E. Froberg

Reference: Chapter 22, Drainage, Flood Control and Erosion Control

Precipitation Zone: 2

Intensity	
2-yr, 6-hr=	2.04
10-yr, 6-hr=	3.41
100-yr, 6-hr=	5.05

Basin ID: **EX-100** (Onsite Calculation for Pre vs. Post Analysis)

1. Land Treatment Areas

A:	0	sq.ft.	0.00	acres
B:	0	sq.ft.	0.00	acres
C:	0	sq.ft.	0.00	acres
D:	1622	sq.ft.	0.04	acres
Total:	1622	sq.ft.	0.04	acres

2. Weighted C*A, Rational Coefficient*Acre

$C*A_2$=	0.0
$C*A_{10}$=	0.0
$C*A_{100}$=	0.0

3. Peak Discharge, Q

Q_2=	**0.1**	cfs
Q_{10}=	**0.1**	cfs
Q_{100}=	**0.2**	cfs

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On-Site Subbasin Calculations

Project:	University Bikeways Phase 2	**Proj. Number:**	221790.10
Location:	Albuquerque, NM	**Proj. Engineer:**	A. Herting
Date:	January 28, 2015	**Checker:**	L. Vick / E. Froberg

Reference: Chapter 22, Drainage, Flood Control and Erosion Control

Precipitation Zone: 2

Intensity	
2-yr, 6-hr=	2.04
10-yr, 6-hr=	3.41
100-yr, 6-hr=	5.05

Basin ID: **EX-150** (Onsite Calculation for Pre vs. Post Analysis)

1. Land Treatment Areas

A:	0	sq.ft.	0.00	acres
B:	0	sq.ft.	0.00	acres
C:	0	sq.ft.	0.00	acres
D:	1657	sq.ft.	0.04	acres
Total:	1657	sq.ft.	0.04	acres

2. Weighted C*A, Rational Coefficient*Acre

$C*A_2=$ 0.0

$C*A_{10}=$ 0.0

$C*A_{100}=$ 0.0

3. Peak Discharge, Q

$Q_2=$ **0.1** cfs

$Q_{10}=$ **0.1** cfs

$Q_{100}=$ **0.2** cfs

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On-Site Subbasin Calculations

Project: University Bikeways Phase 2
Location: Albuquerque, NM
Date: January 28, 2015

Proj. Number: 221790.10
Proj. Engineer: A. Herting
Checker: L. Vick / E. Froberg

Reference: Chapter 22, Drainage, Flood Control and Erosion Control

Precipitation Zone: 2

Intensity	
2-yr, 6-hr=	2.04
10-yr, 6-hr=	3.41
100-yr, 6-hr=	5.05

Basin ID: **EX-101** (Onsite Calculation for Pre vs. Post Analysis)

1. Land Treatment Areas

A:	0	sq.ft.	0.00	acres
B:	0	sq.ft.	0.00	acres
C:	0	sq.ft.	0.00	acres
D:	1279	sq.ft.	0.03	acres
Total:	1279	sq.ft.	0.03	acres

2. Weighted C*A, Rational Coefficient*Acre

$C*A_{2}=$ 0.0

$C*A_{10}=$ 0.0

$C*A_{100}=$ 0.0

3. Peak Discharge, Q

$Q_{2}=$ **0.1** cfs

$Q_{10}=$ **0.1** cfs

$Q_{100}=$ **0.1** cfs

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On-Site Subbasin Calculations

Project: University Bikeways Phase 2
Location: Albuquerque, NM
Date: January 28, 2015

Proj. Number: 221790.10
Proj. Engineer: A. Herting
Checker: L. Vick / E. Froberg

Reference: Chapter 22, Drainage, Flood Control and Erosion Control

Precipitation Zone: 2

Intensity	
2-yr, 6-hr=	2.04
10-yr, 6-hr=	3.41
100-yr, 6-hr=	5.05

Basin ID: **EX-151** (Onsite Calculation for Pre vs. Post Analysis)

1. Land Treatment Areas

A:	0	sq.ft.	0.00	acres
B:	0	sq.ft.	0.00	acres
C:	0	sq.ft.	0.00	acres
D:	1279	sq.ft.	0.03	acres
Total:	1279	sq.ft.	0.03	acres

2. Weighted C*A, Rational Coefficient*Acre

$C*A_2=$ 0.0

$C*A_{10}=$ 0.0

$C*A_{100}=$ 0.0

3. Peak Discharge, Q

$Q_2=$ **0.1** cfs

$Q_{10}=$ **0.1** cfs

$Q_{100}=$ **0.1** cfs

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On-Site Subbasin Calculations

Project: University Bikeways Phase 2
Location: Albuquerque, NM
Date: January 28, 2015

Proj. Number: 221790.10
Proj. Engineer: A. Herting
Checker: L. Vick / E. Froberg

Reference: Chapter 22, Drainage, Flood Control and Erosion Control

Precipitation Zone: 2

Intensity	
2-yr, 6-hr=	2.04
10-yr, 6-hr=	3.41
100-yr, 6-hr=	5.05

Basin ID: **EX-102** (Onsite Calculation for Pre vs. Post Analysis)

1. Land Treatment Areas

A:	0	sq.ft.	0.00	acres
B:	0	sq.ft.	0.00	acres
C:	0	sq.ft.	0.00	acres
D:	1278	sq.ft.	0.03	acres
Total:	1278	sq.ft.	0.03	acres

2. Weighted C*A, Rational Coefficient*Acre

$C*A_2$= 0.0

$C*A_{10}$= 0.0

$C*A_{100}$= 0.0

3. Peak Discharge, Q

Q_2= **0.1** cfs

Q_{10}= **0.1** cfs

Q_{100}= **0.1** cfs

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On-Site Subbasin Calculations

Project: University Bikeways Phase 2
Location: Albuquerque, NM
Date: January 28, 2015

Proj. Number: 221790.10
Proj. Engineer: A. Herting
Checker: L. Vick / E. Froberg

Reference: Chapter 22, Drainage, Flood Control and Erosion Control

Precipitation Zone: 2

Intensity	
2-yr, 6-hr=	2.04
10-yr, 6-hr=	3.41
100-yr, 6-hr=	5.05

Basin ID: **EX-152** (Onsite Calculation for Pre vs. Post Analysis)

1. Land Treatment Areas

A:	0	sq.ft.	0.00	acres
B:	0	sq.ft.	0.00	acres
C:	0	sq.ft.	0.00	acres
D:	1106	sq.ft.	0.03	acres
Total:	1106	sq.ft.	0.03	acres

2. Weighted C*A, Rational Coefficient*Acre

$C*A_2$=	0.0
$C*A_{10}$=	0.0
$C*A_{100}$=	0.0

3. Peak Discharge, Q

Q_2=	**0.0**	cfs
Q_{10}=	**0.1**	cfs
Q_{100}=	**0.1**	cfs

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On-Site Subbasin Calculations

Project: University Bikeways Phase 2
Location: Albuquerque, NM
Date: January 28, 2015

Proj. Number: 221790.10
Proj. Engineer: A. Herting
Checker: L. Vick / E. Froberg

Reference: Chapter 22, Drainage, Flood Control and Erosion Control

Precipitation Zone: 2

Intensity	
2-yr, 6-hr=	2.04
10-yr, 6-hr=	3.41
100-yr, 6-hr=	5.05

Basin ID: **EX-103** (Onsite Calculation for Pre vs. Post Analysis)

1. Land Treatment Areas

A:	0	sq.ft.	0.00	acres
B:	0	sq.ft.	0.00	acres
C:	0	sq.ft.	0.00	acres
D:	1280	sq.ft.	0.03	acres
Total:	1280	sq.ft.	0.03	acres

2. Weighted C*A, Rational Coefficient*Acre

$C*A_2=$ 0.0

$C*A_{10}=$ 0.0

$C*A_{100}=$ 0.0

3. Peak Discharge, Q

$Q_2=$ **0.1** cfs

$Q_{10}=$ **0.1** cfs

$Q_{100}=$ **0.1** cfs

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On-Site Subbasin Calculations

Project: University Bikeways Phase 2
Location: Albuquerque, NM
Date: January 28, 2015

Proj. Number: 221790.10
Proj. Engineer: A. Herting
Checker: L. Vick / E. Froberg

Reference: Chapter 22, Drainage, Flood Control and Erosion Control

Precipitation Zone: 2

Intensity	
2-yr, 6-hr=	2.04
10-yr, 6-hr=	3.41
100-yr, 6-hr=	5.05

Basin ID: **EX-153** (Onsite Calculation for Pre vs. Post Analysis)

1. Land Treatment Areas

A:	0	sq.ft.	0.00	acres
B:	0	sq.ft.	0.00	acres
C:	0	sq.ft.	0.00	acres
D:	1290	sq.ft.	0.03	acres
Total:	1290	sq.ft.	0.03	acres

2. Weighted C*A, Rational Coefficient*Acre

$C*A_2=$ 0.0

$C*A_{10}=$ 0.0

$C*A_{100}=$ 0.0

3. Peak Discharge, Q

$Q_2=$ **0.1** cfs

$Q_{10}=$ **0.1** cfs

$Q_{100}=$ **0.1** cfs

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On-Site Subbasin Calculations

Project: University Bikeways Phase 2 **Proj. Number:** 221790.10
Location: Albuquerque, NM **Proj. Engineer:** A. Herting
Date: January 28, 2015 **Checker:** L. Vick / E. Froberg

Reference: Chapter 22, Drainage, Flood Control and Erosion Control

Precipitation Zone: 2

Intensity	
2-yr, 6-hr=	2.04
10-yr, 6-hr=	3.41
100-yr, 6-hr=	5.05

Basin ID: **EX-104** (Onsite Calculation for Pre vs. Post Analysis)

1. Land Treatment Areas

A:	0	sq.ft.	0.00	acres
B:	0	sq.ft.	0.00	acres
C:	0	sq.ft.	0.00	acres
D:	3019	sq.ft.	0.07	acres
Total:	3019	sq.ft.	0.07	acres

2. Weighted C*A, Rational Coefficient*Acre

$C*A_2$=	0.1
$C*A_{10}$=	0.1
$C*A_{100}$=	0.1

3. Peak Discharge, Q

Q_2=	**0.1**	cfs
Q_{10}=	**0.2**	cfs
Q_{100}=	**0.3**	cfs

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On-Site Subbasin Calculations

Project:	University Bikeways Phase 2	**Proj. Number:**	221790.10
Location:	Albuquerque, NM	**Proj. Engineer:**	A. Herting
Date:	January 28, 2015	**Checker:**	L. Vick / E. Froberg

Reference: Chapter 22, Drainage, Flood Control and Erosion Control

Precipitation Zone: 2

Intensity	
2-yr, 6-hr=	2.04
10-yr, 6-hr=	3.41
100-yr, 6-hr=	5.05

Basin ID: **EX-154** (Onsite Calculation for Pre vs. Post Analysis)

1. Land Treatment Areas

A:	0	sq.ft.	0.00	acres
B:	0	sq.ft.	0.00	acres
C:	0	sq.ft.	0.00	acres
D:	3585	sq.ft.	0.08	acres
Total:	3585	sq.ft.	0.08	acres

2. Weighted C*A, Rational Coefficient*Acre

$C*A_{2}$=	0.1
$C*A_{10}$=	0.1
$C*A_{100}$=	0.1

3. Peak Discharge, Q

Q_{2}=	**0.2**	cfs
Q_{10}=	**0.3**	cfs
Q_{100}=	**0.4**	cfs

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On-Site Subbasin Calculations

Project:	University Bikeways Phase 2	**Proj. Number:**	221790.10
Location:	Albuquerque, NM	**Proj. Engineer:**	A. Herting
Date:	September 26, 2016	**Checker:**	L. Vick / E. Froberg

Reference: Chapter 22, Drainage, Flood Control and Erosion Control

Precipitation Zone: 2

Intensity	
2-yr, 6-hr=	2.04
10-yr, 6-hr=	3.41
100-yr, 6-hr=	5.05

Basin ID: **EX-200** (Onsite Calculation for Pre vs. Post Analysis)

1. Land Treatment Areas

A:	0	sq.ft.	0.00	acres
B:	0	sq.ft.	0.00	acres
C:	5156	sq.ft.	0.12	acres
D:	694	sq.ft.	0.02	acres
Total:	5850	sq.ft.	0.13	acres

2. Weighted C*A, Rational Coefficient*Acre

$C*A_2=$ 0.0

$C*A_{10}=$ 0.1

$C*A_{100}=$ 0.1

3. Peak Discharge, Q

$Q_2=$ **0.1** cfs

$Q_{10}=$ **0.3** cfs

$Q_{100}=$ **0.4** cfs

On-Site Subbasin Calculations

Project: University Bikeways Phase 2
Location: Albuquerque, NM
Date: September 26, 2016

Proj. Number: 221790.10
Proj. Engineer: A. Herting
Checker: L. Vick / E. Froberg

Reference: Chapter 22, Drainage, Flood Control and Erosion Control

Precipitation Zone: 2

Intensity	
2-yr, 6-hr=	2.04
10-yr, 6-hr=	3.41
100-yr, 6-hr=	5.05

Basin ID: **EX-201** (Onsite Calculation for Pre vs. Post Analysis)

1. Land Treatment Areas

A:	0	sq.ft.	0.00	acres
B:	0	sq.ft.	0.00	acres
C:	0	sq.ft.	0.00	acres
D:	68268	sq.ft.	1.57	acres
Total:	68268	sq.ft.	1.57	acres

2. Weighted C*A, Rational Coefficient*Acre

$C*A_2$= 1.4

$C*A_{10}$= 1.4

$C*A_{100}$= 1.5

3. Peak Discharge, Q

Q_2= **2.9** cfs

Q_{10}= **4.9** cfs

Q_{100}= **7.4** cfs

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On-Site Subbasin Calculations

Project: University Bikeways Phase 2 **Proj. Number:** 221790.10
Location: Albuquerque, NM **Proj. Engineer:** A. Herting
Date: January 28, 2015 **Checker:** L. Vick / E. Froberg

Reference: Chapter 22, Drainage, Flood Control and Erosion Control

Precipitation Zone: 2

Intensity	
2-yr, 6-hr=	2.04
10-yr, 6-hr=	3.41
100-yr, 6-hr=	5.05

Basin ID: Sunport Trail West (Onsite Calculation for Pre vs. Post Analysis)

1. Land Treatment Areas

A:	0	sq.ft.	0.00	acres
B:	0	sq.ft.	0.00	acres
C:	9326	sq.ft.	0.21	acres
D:	9312	sq.ft.	0.21	acres
Total:	18638	sq.ft.	0.43	acres

2. Weighted C*A, Rational Coefficient*Acre

$C*A_2=$ 0.3

$C*A_{10}=$ 0.3

$C*A_{100}=$ 0.3

3. Peak Discharge, Q

$Q_2=$ **0.5** cfs

$Q_{10}=$ **1.0** cfs

$Q_{100}=$ **1.7** cfs

On-Site Subbasin Calculations

Project: University Bikeways Phase 2
Location: Albuquerque, NM
Date: January 28, 2015

Proj. Number: 221790.10
Proj. Engineer: A. Herting
Checker: L. Vick / E. Froberg

Reference: Chapter 22, Drainage, Flood Control and Erosion Control

Precipitation Zone: 2

Intensity	
2-yr, 6-hr=	2.04
10-yr, 6-hr=	3.41
100-yr, 6-hr=	5.05

Basin ID: Sunport Trail East (Onsite Calculation for Pre vs. Post Analysis)

1. Land Treatment Areas

A:	0	sq.ft.	0.00	acres
B:	0	sq.ft.	0.00	acres
C:	16683	sq.ft.	0.38	acres
D:	9872	sq.ft.	0.23	acres
Total:	26555	sq.ft.	0.61	acres

2. Weighted C*A, Rational Coefficient*Acre

$C*A_2=$	0.3
$C*A_{10}=$	0.4
$C*A_{100}=$	0.4

3. Peak Discharge, Q

$Q_2=$	**0.6**	cfs
$Q_{10}=$	**1.4**	cfs
$Q_{100}=$	**2.3**	cfs

Cross Section for SUNPORT TRAIL Capacity 16+34

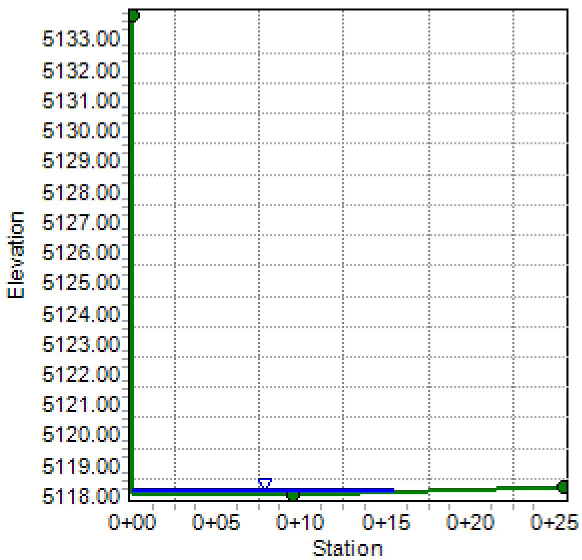
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.06080	ft/ft
Normal Depth	0.08	ft
Discharge	2.30	ft³/s

Cross Section Image



Worksheet for SUNPORT TRAIL Capacity 16+34

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.06080	ft/ft
Discharge	2.30	ft³/s
Section Definitions		

Station (ft)	Elevation (ft)
0+00	5133.72
0+00	5118.03
0+10	5118.02
0+26	5118.24

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00, 5133.72)	(0+10, 5118.02)	0.030
(0+10, 5118.02)	(0+26, 5118.24)	0.015

Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results

Normal Depth	0.08	ft
Elevation Range	5118.02 to 5133.72 ft	
Flow Area	0.99	ft²
Wetted Perimeter	15.55	ft
Hydraulic Radius	0.06	ft
Top Width	15.47	ft
Normal Depth	0.08	ft
Critical Depth	0.11	ft

Worksheet for SUNPORT TRAIL Capacity 16+34

Results

Critical Slope		0.02152	ft/ft
Velocity		2.32	ft/s
Velocity Head		0.08	ft
Specific Energy		0.17	ft
Froude Number		1.62	
Flow Type	Supercritical		

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.08	ft
Critical Depth	0.11	ft
Channel Slope	0.06080	ft/ft
Critical Slope	0.02152	ft/ft

Messages

Notes

100-Year Flow for Sunport Trail East= 2.3 cfs

Worksheet for Single Inlet In Sag , Sunport Trail East- Station 16+34

Project Description

Solve For	Spread

Input Data

Discharge	2.30	ft³/s
Gutter Width	14.00	ft
Gutter Cross Slope	0.02	ft/ft
Road Cross Slope	0.02	ft/ft
Grate Width	2.13	ft
Grate Length	3.20	ft
Local Depression	6.00	in
Local Depression Width	2.00	ft
Grate Type	P-50 mm (P-1-7/8")	
Clogging	50.00	%

Results

Spread	9.62	ft
Depth	0.19	ft
Gutter Depression	0.00	ft
Total Depression	0.50	ft
Open Grate Area	3.06	ft²
Active Grate Weir Length	5.33	ft

Messages

Notes

Total 100-Year flow from 'Sunport Trail East' is captured (2.3 cfs).

Cross Section for SUNPORT TRAIL Capacity 10+47

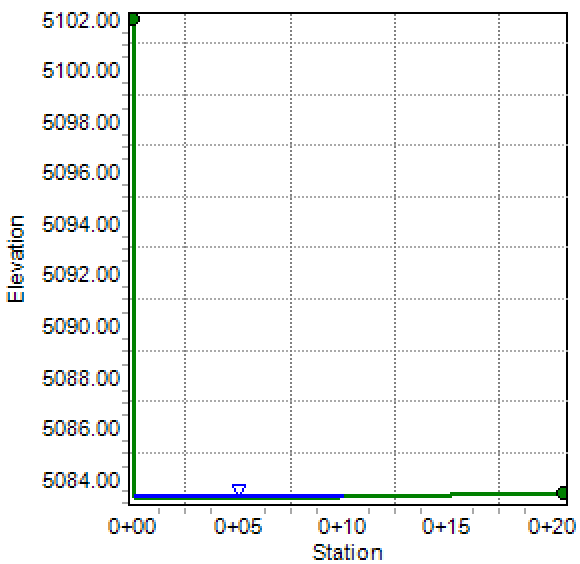
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.04750	ft/ft
Normal Depth	0.10	ft
Discharge	1.70	ft³/s

Cross Section Image



Worksheet for SUNPORT TRAIL Capacity 10+47

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.04750	ft/ft
Discharge	1.70	ft³/s

Section Definitions

Station (ft)	Elevation (ft)
0+00	5102.00
0+00	5083.24
0+05	5083.17
0+21	5083.45

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00, 5102.00)	(0+21, 5083.45)	0.015

Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results

Normal Depth	0.10	ft
Elevation Range	5083.17 to 5102.00 ft	
Flow Area	0.55	ft²
Wetted Perimeter	10.00	ft
Hydraulic Radius	0.05	ft
Top Width	9.97	ft
Normal Depth	0.10	ft
Critical Depth	0.14	ft
Critical Slope	0.00757	ft/ft

Worksheet for SUNPORT TRAIL Capacity 10+47

Results

Velocity		3.11	ft/s
Velocity Head		0.15	ft
Specific Energy		0.25	ft
Froude Number		2.34	
Flow Type	Supercritical		

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.10	ft
Critical Depth	0.14	ft
Channel Slope	0.04750	ft/ft
Critical Slope	0.00757	ft/ft

Messages

Notes

100-Year Flow for Sunport Trail West= 1.7 cfs

Worksheet for Double Inlet In Sag , Sunport Trail West - Station 10+47

Project Description

Solve For	Spread

Input Data

Discharge		1.70	ft³/s
Gutter Width		14.00	ft
Gutter Cross Slope		0.02	ft/ft
Road Cross Slope		0.02	ft/ft
Grate Width		2.13	ft
Grate Length		6.40	ft
Local Depression		0.50	in
Local Depression Width		2.00	ft
Grate Type	P-50 mm (P-1-7/8")		
Clogging		50.00	%

Results

Spread	9.78	ft
Depth	0.20	ft
Gutter Depression	0.00	ft
Total Depression	0.04	ft
Open Grate Area	6.12	ft²
Active Grate Weir Length	8.52	ft

Messages

Notes

Total 100-Year flow from 'Sunport Trail West' is captured (1.7 cfs).

Worksheet for S/W Culvert , Kirkland Channel Trail - Station 100+90

Project Description

Solve For	Spread

Input Data

Discharge	4.90	ft³/s
Gutter Width	0.00	ft
Gutter Cross Slope	0.00	ft/ft
Road Cross Slope	0.10	ft/ft
Curb Opening Length	6.00	ft
Opening Height	1.00	ft
Curb Throat Type	Horizontal	
Local Depression	0.00	in
Local Depression Width	0.00	ft
Throat Incline Angle	90.00	degrees

Results

Spread	4.20	ft
Depth	0.42	ft
Gutter Depression	0.00	ft
Total Depression	0.00	ft

Messages

Notes

Kirkland Trail - 14' wide, 1.5% cross slope, sideslopes 2:1 (near culvert)
4 - 2' sidewalk culverts
Assumes 20% clogging of culverts (effective length=6-feet). If unclogged, the culverts will pass the 100-year storm.

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APPENDIX B

Excerpts from the Albuquerque International Airport Storm Drainage Master Plan

ALBUQUERQUE
INTERNATIONAL AIRPORT

STORM DRAINAGE MASTER PLAN

Project No. 4255.01

City of Albuquerque, NM
Aviation Department

May 1995

JOHN M. PROVINE
NEW MEXICO
REGISTERED PROFESSIONAL ENGINEER

ALBUQUERQUE
NEW MEXICO
1706

MOLZEN-CORBIN & Associates

ALBUQUERQUE INTERNATIONAL AIRPORT

DRAINAGE MASTER PLAN

June, 1994

Prepared for:

City of Albuquerque
Aviation Department
Po Box 9022
Albuquerque, New Mexico 87119

Prepared by:

MOLZEN-CORBIN & Associates

2701 Miles Road SE
Albuquerque, New Mexico 87106
(505) 242-5700

Project No. ABQ11-14 P-01

I, John M. Provine, New Mexico Registered Professional Engineer No. 10999, do hereby certify that this document was prepared under my direct supervision and is true and correct to the best of my knowledge and belief.

John M. Provine   Date

DRAINAGE MASTER PLAN
Project No. 4255.01

✈ Albuquerque International Airport ✈

TABLE OF CONTENTS

APPENDICES

SECTION I

INTRODUCTION

A. <u>General.</u> For many years, capital improvement projects at the Albuquerque International Airport (AIA) have been planned and completed without the aid of a formalized master plan for storm drainage. Numerous runway, taxiway, apron and terminal improvement projects have been completed along with storm drainage system components, generally designed within each project's limits. This system of individual project development has led to some problems and various inefficiencies in expenditures for storm sewer improvements. Recent increase in capital improvement activities has led to an increased need for understanding the overall nature of drainage at the AIA. While paving and/or building projects can normally be restricted to specific project limits, drainage improvements usually extend well beyond the limits of an individual project area, to include upstream runoff contribution areas and downstream runoff impacts.

There are several reasons which contributed to this situation. Individual projects came to life in rather short time frames based on need and available funding. While one project was being completed, it was uncertain just what the next project would encompass or when it would occur. However, in recent years, better planning efforts have been formulated to develop not only current construction projects but to line up several future projects. The need to better master plan all drainage network system components reached a peak in 1991 during the design of a project to reconstruct Taxiway E which is the southern parallel taxiway to Runway 8-26. At this time it was determined that reconstruction of Taxiway E would be immediately followed by a similar reconstruction project for Taxiway A which is the northern parallel taxiway to Runway 8-26. Since Runway 8-26 is the primary runway at the AIA, it was felt that Taxiway E could be reconstructed, leaving Runway 8-26 and Taxiway A in service, resulting in little disruption to air traffic. After Taxiway E was completed, Taxiway A could then be reconstructed leaving Runway 8-26 and Taxiway E in service, again resulting in little disruption of air traffic. Recognizing this planned construction sequence, it was soon discovered that the drainage system for the Taxiway E project should not be confined to the specific project limits, but should be tailored to accommodate the planned improvements for the future Taxiway A project as well. In addition, much of the contributing drainage area for the Taxiway E drainage structures actually extends northward through the Taxiway A location and much of the Kirtland Air Force Base (KAFB) areas.

There are numerous other activities at the airport which have also stressed the need for better planning of storm drainage at the AIA.

> The major terminal renovation project during 1988 significantly changed the topographical nature of the airport. A significant portion of the airside infrastructure (runways, taxiways and aprons) drain through the terminal area. In addition, the terminal area contributes runoff to adjacent commercial development areas and the City of Albuquerque's storm drain system.

The AIA Airport Master Plan (AIA AMP) is to be completed in 1994. This master plan proposed substantial changes in the entire airport area which will be implemented in the very near future. The most significant changes include reconstruction of Runway 3-21 to be the primary air carrier cross wind runway (and to allow for simultaneous operations) and closure of Runway 17-35 and using the areas of Runway 17-35 to be abandoned for further expansion of the terminal facilities, and relocation of air freight operations to the southern and eastern area of Runway 3-21.

The Sunport Corridor, consisting of a new principal arterial and interchange to link the terminal area to Interstate 25 has been designed and will soon be under construction. This new roadway will change drainage patterns in the western portions of the AIA.

Construction of Spirit Drive has stimulated numerous developments on the west side of the AIA on properties owned by numerous private individuals including large areas owned by the University of New Mexico. Each of these development areas have potential impacts on the AIA drainage system and could be affected by AIA drainage.

It is now very clear that construction activities on and near the AIA property will increase significantly. A master planned storm drainage system is needed for orderly development of these proposed projects. Therefore, this document has been prepared in order to guide Aviation Department and City of Albuquerque Hydrology staff, developers and designers in implementing individual projects without adverse drainage impacts. An overall master plan such as this is not intended to final design all the details of the storm drainage system, however it is intended that the basic network character and size be determined at this time so that pipes, channels, ponds and other outfalls can be constructed at this time which will accommodate other future improvements.

B. **Agencies.** In master planning the storm drainage system it is necessary to first have an understanding of the numerous agencies affected by the drainage system. These agencies not only are interested in the drainage system, but will likely be involved in funding, constructing, operating and maintaining these systems.

The City of Albuquerque, Aviation Department is obviously the principal agency involved in implementing and maintaining the airport drainage system. The Aviation Department is the lead agency in overseeing all activities at the airport. KAFB currently has joint use of the AIA and also owns much of the lands that surround the airport. Some of the drainage system components will be owned and maintained by KAFB personnel. Since drainage runoff does not recognize property boundaries, the entire watersheds in many areas are also affected. This means that the City of Albuquerque Public Works Department is also involved. Much of the Gibson Boulevard storm drainage system as well as other City owned systems, is affected by this master plan. The University of New Mexico owns most of the lands west of Spirit Drive. These areas are the downstream recipient of much of the AIA flows. The New Mexico State Engineer's Office has been involved in the review and approval of at least two detention ponds constructed on or near the AIA. The Albuquerque Metropolitan Arroyo Flood Control Authority (AMAFCA) has review authority over many of the drainage plans prepared for airport area development. In addition, the South Diversion Channel and Tijeras Arroyo which represent primary outfalls for airport drainage area under AMAFCA jurisdiction. The New Mexico State Highway and Transportation

Department (NMSHTD) was involved in the design of the Sunport Corridor project. In addition, much of the airport drainage system is dependent upon the capacity of culverts under I-25. The Federal Aviation Administration funds most of the airside construction projects and establishes criteria for airport design and is an integral part of this and nearly all project developments.

C. **Abbreviations.** In the following pages, numerous abbreviations will be utilized. The following list is given for a quick reference to these abbreviations:

a-f	acre-feet
AIA	Albuquerque International Airport
AMAFCA	Albuquerque Metropolitan Arroyo Flood Control Authority
cfs	cubic feet per second
CLV	Culvert
DPM	City of Albuquerque Development Process Manual
FAA	Federal Aviation Administration
FAA AC	FAA Advisory Circular
KAFB	Kirtland Air Force Base
NMSHTD	New Mexico State Highway and Transportation Department
SEO	New Mexico State Engineer's Office
SCS	Soil Conservation Service
SDC	South Diversion Channel
SD	Storm Drain

SECTION II

CRITERIA

A. **General.** Selection of specific design criteria is difficult for a project of this complexity. As discussed in Section I of this report, there are numerous agencies directly affected by the AIA drainage system, each with their own specific drainage design criteria. However, the criteria used in this study has been specifically tailored for the conditions at the AIA, but based upon a combination of both FAA and City of Albuquerque Criteria. While this criteria development entails a complex combination of variables, **simply stated, the criteria used was to contain the 10-year event in underground networks (pipes) and contain the 100-year event with storage.** The 10-year event was used to size all pipes and then checked against the 100 year event. If the pipes could not keep the 100 year event from ponding on paved surfaces, pipe sizes were increased to avoid ponding on paved areas when considering future development.

As stated, both FAA and City of Albuquerque criteria were used and modified in developing the criteria for the AIA DMP. Neither of these two criteria were directly useable in and of themselves. Therefore, a combination of these criteria, along with an understanding of the nature of the AIA area and operations was necessary.

City of Albuquerque storm drainage criteria states that the 10 year event should be handles in storm sewers. In addition, this criteria further states that the 100 year event shall be conveyed in the storm sewer and the street section such that one traffic lane in each direction remain dry during the 100 year event. The AIA has adopted this same criteria for the 10 year event. However, for the 100 year event some modifications were necessary. Obviously, on airports there is no curb and gutter, thereby eliminating the surface conveyance system available on city streets. On airports, the pavement surfaces must remain free of runoff. However, it must be noted that the airport does contain some street sections and furthermore, some runoff from the airport does enter City of Albuquerque street sections such as on Gibson Boulevard. Therefore, this criteria cannot be totally cast aside.

Drainage on airport areas is dictated by FAA Advisory Circular 150\5320-5B, "Airport Drainage". This AC does not give mandatory requirements, but rather provides suggestions for a reasonable approach to airport drainage design. Most of the AC is dedicated to charts, nomographs and formulas to aid designers in drainage design. However, it is prudent at this point to review some of the recommendations given in the AC since FAA funding is crucial in future airport development. Following the FAA criteria is important to ensure that this funding is not jeopardized. Some important points provided in the AC are listed here.

1. Airports shall have smooth, well drained operations areas to permit safe movement of aircraft under all weather conditions. In drainage design, there area two basic purposes, to permit movement of air traffic and to maintain stable pavement. It is important to remember that not only does drainage affect traffic but it is crucial in protecting the life of pavement areas. This is particularly difficult on airports due to the fact that airport

airside development is, by design, very flat. These flat grades, by their nature are difficult to drain.

2. Proper drainage does not assure an all-weather airport but it does shorten the interval of non-use. This requires an economically designed system to realize the full value of the investment made. More frequent storms are by definition less severe and require smaller, less expensive drainage systems. Conversely, less frequent storms are much more severe (for example, the 100 year event) and require significantly larger, more expensive storm drainage facilities. The challenge in drainage design is to properly locate the optimal point in terms of storm frequency, severity and cost of the systems.

3. Inlets are the principal problem on airports because there is normally differential settlement around the inlet. This can be prevented by careful compaction in these areas and use of expansion joints if located in concrete pavement. Medium or high head ponding will be unacceptable to personnel servicing aircraft with baggage, fuel, food, etc. This could also obscure pavement markings and thus inhibit parking of aircraft at gate positions. Aprons serving instrument or all weather air carrier operations warrant a head limitation of 0.4 feet. also airports where continuing operations are regularly conducted in severe weather conditions would warrant use of a similar limitation.

4. There are a few important points to remember in using the FAA AC in drainage design. This AC is intended to be used for all airports, from general aviation to air carrier. The AIA operates continuously on a 24 hour a day schedule and in adverse weather conditions. Therefore, FAA criteria should be followed as closely as possible but should most importantly be tailored to the specific needs of the AIA.

B. **Hydrology.** The FAA AC suggests using the 2, 5, or 10 year event for design. Storm sewers should be designed to drain ponding areas based on total storm volume and keeping the maximum water surface elevation out of pavement areas in order to keep water from infiltrating pavement bases which would cause pavement failures. This design should then be modified in order to ensure that ponding areas drain in the shortest time possible. Furthermore, the FAA AC also recommends using rainfall events of 30 minutes, 1 hour or 2 hour intensities. These are much shorter storm durations than are normally used in New Mexico.

City of Albuquerque criteria requires use of the 10 year and 100 year events as stated in previous sections of this report. In addition, these events are based on rainfall 6 hours in duration. This is not a great departure from the FAA design suggestions. While the events used by the City are less frequent and more severe than those suggested by FAA, they are also of longer duration which balances the differences. In other words, the 5 year 30 minute storm is roughly equivalent to a 10 year 6 hour storm when comparing the resulting peak flows from a watershed. Again, when considering the critical nature of operations at the AIA, the City of Albuquerque criteria can be justified to ensure maximum use of the airport, minimization of non-use times, and reasonable cost of drainage facilities.

The criteria used for this study is therefore the 10 year 6 hour event for storm sewer design, the 100 year 6 hour event for ponding and storm sewers (keeping the pavement dry) and the 100 year 24 hour event for sizing detention ponds (which is necessary for NM SOE

approvals). This criteria is not held for the Sunport Blvd. Basin which required using a 100 year, 24-hour event.

C. **Soils.** A complete summary of soils in the study area will not be presented in this report. The SCS Soil Survey for Bernalillo County was utilized in preparing this study. This survey shows that the AIA area has mostly well drained soils with some areas of impervious clays, particularly on the east end of Runway 8-26. If further information is needed regarding the soils in the area, the reader should refer to this SCS Soil Survey.

D. **Drainage Areas.** Drainage area determinations were made utilizing several topographical maps of the airport area obtained through aerial photographs prepared for this study. Areas were delineated using these topo maps and were verified through extensive field surveys and visual observation. Area maps are included in this report in the plates provided.

E. **Modelling.** This entire drainage master plan is based upon hydrologic and hydraulic modelling of the study area utilizing AMAFCA's AHYMO491 computer program. Complete printouts of the input and output data files are available under separate cover.

Computer printouts for a project of this magnitude are quite voluminous and comprehensive. In order to more accurately and rapidly illustrate the computer model methodology, flow charts and summary tables were developed to graphically show drainage area characteristics (area, peak flows, times of concentration, etc.), how this area was routed downstream, where it was added to other areas, and the resulting outfall data. In most cases, an entire basin network is shown on a single sheet and the reader can trace the theory and pertinent data without extensive revue of the computer printouts. These flowcharts and summary tables are contained in the appendices.

EXISTING CONDITIONS

A. **General.** This study began with an analysis of existing conditions at the AIA. Existing conditions for the purpose of this study includes the completion of the reconstruction of Taxiways A and E which were completed in 1994. Existing conditions does not include reconstruction of Runway 3-21 to air carrier standards and abandonment of Runway 17-35. Existing conditions includes Runway 3-21 as general aviation and the freight apron located west of Runway 3-21. It further includes completion of Spirit Drive. A basic description of the major basins is given in the following sections.

B. **Basin G17.** This 0.10140 square mile basin encompasses the northern end of Runway 17-35 and developed areas west of the runway end. Drainage from the US Customs area ramps is collected in a storm sewer, routed around the north end of the runway and through developed commercial areas west of the runway end and just south of Gibson Blvd. The system experiences problems just south of Gibson Blvd. near the old potato chip factory where the storm sewer makes a 90 degree bend to connect to the 36 inch storm sewer in Gibson. Because of this bend, the hydraulic grade line surfaces and flows leave the storm sewer and surface in the street.

TABLE III-1
Basin G17

SUB-BASIN NO.	AREA (sq mi)	Q10 (cfs)	Q100 (cfs)	V10 (ac-ft)	V100 (ac-ft)	OUTFALL	DESCRIPTION
101	0.0284	32.42	54.60	1.3824	2.394	18" SD	US Customs Apron
102	0.0566	33.74	63.21	2.267	4.221	18" SD	E. of R/W 17-35 N. End
103	0.0622	34.00	65.13	2.504	4.652	24" SD	N. of R/W 17-35
104	0.0710	38.05	72.59	2.921	5.384	24" SD	W. of R/W 17-35 N. End
105	0.0820	36.55	75.76	3.461	6.319	27" SD	Offices NW of R/W 17-35
106	0.0727	32.77	68.80	2.982	5.502	Surface	Columbia Drive
107	0.0894	47.40	81.72	3.835	6.971	30" SD	Offices (SAIC) NW of R/W 17-35
108	0.0087	15.82	24.74	0.5433	0.890	21" SD	Commercial area on Gibson
Σ	0.1014	66.97	102.89	4.599	8.215	30"SD	to Gibson Blvd. Storm Drain

C. **Basin N17.** This 0.4119 square mile basin extends along Runway 17-35 from the Runway 8-26 intersection up to the north runway end. This area also includes the main parking structure, car rental parking area, the loop road, the main terminal ramp and commercial development areas just north of the parking structures to Alamo Drive. Drainage is conveyed to the Yale Blvd. storm sewer system and eventually discharged into the Kirtland Channel. Problems with storm sewer flows surfacing have been experienced just north of the parking structure near the commercial development. Furthermore, the terminal expansion project included installation of a restrictor plate in the storm sewer conveying flows from the ramp through the terminal area. This restrictor plate causes ponding on the aircraft parking ramp south of the terminal. The restrictor plate was installed to correct the first problem described above, that is the flooding near the commercial development caused by stormwater exiting the storm drain.

TABLE III-2
Basin N17

SUB-BASIN NO.	AREA (sq mi)	Q10 (cfs)	Q100 (cfs)	V10 (ac-ft)	V100 (ac-ft)	OUTFALL	DESCRIPTION
201	0.0129	5.38	9.67	0.538	1.000	24" SD	E. Side T/W D
202							eliminated
203	0.0210	28.89	48.83	0.951	1.713	24" SD	Between R/W 17-35 & T/W D
204	0.0217	31.28	52.67	0.973	1.759	24" SD	Between R/W 17-35 & T/W D
205	0.0267	20.35	34.26	1.169	2.131	24" SD	Between R/W 17-35 & T/W D
206	0.0405	20.50	25.67	1.861	3.337	36" SD	Between R/W 17-35 & T/W C
207	0.1267	66.58	91.50	5.913	10.570	36" SD	Between R/W 17-35 & T/W C
208	0.0435	22.95	30.82	2.029	3.620	24" SD	Between R/W 17-35 & T/W C
209	0.1408	75.33	107.05	6.545	11.689	42" SD	Between T/W C & Access Road
210	0.1449	77.03	109.64	6.730	12.019	42" SD	Between Access Road & Girard
211	0.0268	38.18	60.46	1.637	2.687	24" SD	Girard Airport Entrance
212	0.0058	11.58	17.64	0.414	0.654	24" SD	Rental Car Parking
213	0.0480	59.98	75.86	3.327	5.299	24" SD	Rental Car Parking
214	0.1084	141.64	204.43	7.213	11.597	24" SD	S. Side Airport Loop Road
214.1	0.2533	193.20	281.40	13.943	23.616	10" SD	S. Side Airport Loop Road
214.2	0.2839	220.09	332.63	15.079	25.819	36" SD	S. Side Airport Loop Road
215	0.0124	10.52	22.05	0.270	0.642	surface	W. side of Girard
216	0.0134	7.00	18.49	0.193	0.535	Surface	W. Side of Girard; N. of 215
217	0.0535	15.46	37.22	0.766	2.310	Surface	Business complex
217.1	0.3374	232.83	358.61	15.845	21.130	Surface	S. Side of Alamo Drive

SUB-BASIN NO.	AREA (sq mi)	Q10 (cfs)	Q100 (cfs)	V10 (ac-ft)	V100 (ac-ft)	OUTFALL	DESCRIPTION
218	0.0932	116.18	165.12	6.224	9.995	24" SD	Lower parking lot
219	0.664	105.46	105.46	4.587	7.309	Surface	Parking Structure
220	0.0327	97.81	97.81	2.260	3.603	36" SD	E. Terminal Ramp
221	0.0370	46.43	46.43	2.542	4.058	36" SD	Terminal Entrance, East
222	0.0215	45.55	45.55	1.351	2.196	24" SD	Terminal Entrance, West
223	0.3651	418.23	418.23	17.521	30.882	60" SD	Areas E. of Alamo/Yale
224	0.2612	295.18	295.18	14.315	24.274	24" SD	Amfac Hotel, East
225	0.0227	49.80	49.80	0.765	1.545	Surface	Amfac Hotel, North
226	0.0428	87.14	87.14	2.397	4.003	Surface	Amfac Hotel, West
227	0.0353	70.75	70.75	2.011	3.344	24" SD	Airport Entrance by Yale
228	0.4119	514.03	514.03	20.169	35.293	24" SD	E. side of Yale
Σ	0.4119	328.37	514.53	20.169	35.293	2-42" CMP	to Basin KC

D. **Basin KC.** This 0.6810 square mile basin extends from Yale Blvd to the South Diversion Channel and includes commercial development on each side of Randolph. The principal drainage feature of this basin is the Kirtland Channel which begins just west of the Yale/Alamo intersection and discharges to the South Diversion Channel via a baffle chute drop structure west of Mulberry. The principal problems experienced in this basin are in the lower reaches of the Kirtland Channel where the concrete lined channel makes two rather severe horizontal bends. Very high velocities which exist in the channel have resulted in the flows overtopping the channel banks in this area.

The Kirtland Channel has experienced some problems near the box culvert crossing on Mulberry. These problems have been noted through visual observations and some damages that have occurred during past rainfall events. The Kirtland Channel in this area makes two horizontal bends on what appears to be rather severe horizontal curves. Both of these bends occur just upstream from the Mulberry to form an "S" curve. The downstream curve immediately upstream of the Mulberry crossing has experienced overtopping along the southern channel bank encroaching on some existing homes in this area. In addition to this curvilinear alignment, there is a side channel discharging into the Kirtland Channel just upstream of the Mulberry crossing. The Mulberry crossing itself is a two cell 6'X6' box culvert. Downstream of this culvert is a short segment of channel and then a baffle drop spillway discharging into the South Diversion Channel.

From visual observation it appears that the problem of flow overtopping the channel is caused by superelevation of flows with high velocities around this second curve. Additional freeboard was added to this area by constructing a one foot high concrete retaining wall along this channel edge. However, the side channel inflow from the residential areas to the north cannot be modified in this same way as these flows cannot be blocked. It also appears that the box culvert may be causing some of the problem. If the box culvert is of insufficient capacity, then backwater might be causing some of the overtopping problem. These problems were analyzed and are discussed in the next section.

TABLE III-3
Basin KC

SUB-BASIN NO.	AREA (sq mi)	Q10 (cfs)	Q100 (cfs)	V10 (ac-ft)	V100 (ac-ft)	OUTFALL	DESCRIPTION
301	0.0197	37.04	57.39	1.304	2.099	2-54"	NE & SE Cor. Alamo/Yale
302	0.0251	47.59	73.55	1.678	2.694	2-54"	N. Side Randolph, W. of 301
303	0.4586	378.86	593.93	22.993	39.943	Surface	W. Side Yale, S. Side Randolph
304	0.0132	18.92	2.77	0.6425	1.113	Surface	W. Side Yale, S. of Randolph
305	0.0322	33.82	53.58	2.0962	3.373	Surface	S. of Randolph, W. of Yale
306	0.0163	31.40	48.31	1.1165	1.781	Surface	W. Side Yale @ Yale Airport Entrance
307	0.0235	40.32	64.18	1.410	2.316	Surface	N. Side Kirt. Chan., W. of 301
308	0.5012	440.23	691.32	25.548	44.141	Surface	BDM Complex
309	0.0527	44.08	70.93	3.078	5.075	Surface	S. Side Randolph, W. of 303
310	0.5119	459.35	720.25	26.201	45.213	Surface	S. Side Kirt. Chan., W. of 308
311	0.6619	553.86	921.55	31.081	54.644	Surface	N. Side Kirt. Chan.
312	0.6572	548.20	912.19	30.878	54.273	24" SD	S. Side Kirt. Chan. E. Side Univ.
313	0.0099	3.60	11.75	0.094	0.328	Surface	S. Side Randolph
313.1	0.0908	57.03	115.02	3.603	6.525	36" SD	SE Cor. Randolph/Univ.
314	0.0177	4.25	17.94	0.117	0.501	Surface	W. of 306
314.1	0.0282	11.29	33.97	0.431	1.122	Surface	E. Side Univ., S. of Randolph
315	0.0105	9.23	18.51	0.314	0.620	Surface	N. of Postal Facility
316	0.0090	10.78	19.47	0.345	0.645	Surface	N. Side Kirt. Chan., W. of Univ.
317	0.6995	578.50	977.11	31.956	56.593	Surface	N. Side Kirt. Chan., Univ. to SDC
Σ	0.6810	568.6	961.5	30.96	54.893	Kirt. Chan.	to South Diversion Channel

E. **Basin SP.** The Sunport Corridor basin consisting of 0.2010 square miles is currently undergoing alterations. The existing conditions of this basin has been modelled but will change with the construction of the Sunport Corridor which will be a new principal arterial connecting I-25 to the AIA. The proposed construction of the roadway was accompanied by a drainage report specifically for this roadway project and is further addressed in the next section of this report.

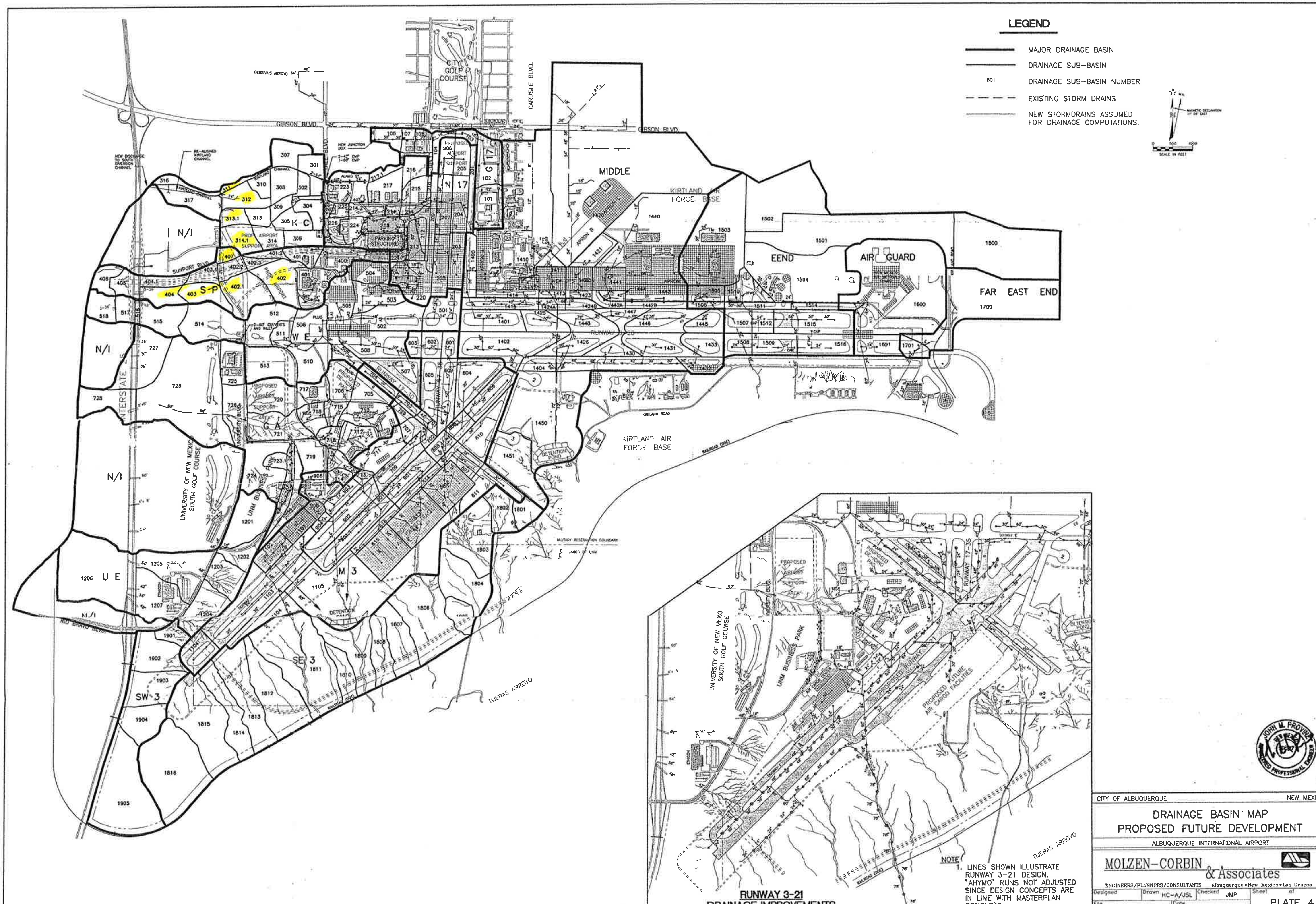
This basin originates at the west edge of the terminal area including the new postal facility. The flows are conveyed through earth channels south of George Road where they eventually cross University in culverts. Areas west of University drain primarily by surface conveyance and pass beneath I-25 via culverts and eventually discharge to the South Diversion Channel.

TABLE III-4
Basin SP

SUB-BASIN NO.	AREA (sq mi)	Q10 (cfs)	Q100 (cfs)	V10 (ac-ft)	V100 (ac-ft)	OUTFALL	DESCRIPTION
401	0.0280	51.96	80.77	1.839	2.959	24" SD	Post Office Site
402	0.1150	99.16	203.50	203.50	6.930	CLV	Adjacent to George Road
403	0.1560	60.30	128.40	128.40	7.761	SD	W of Univ, S of Randolf
404	0.1810	62.09	141.56	141.56	8.639	48" SD	University to I-25
405	0.1840	63.18	144.59	144.59	8.848	RR Bridge	University to RR tracks
406	0.0170	6.94	21.07	21.07	0.598	CLV	SE of I-25/SDC
407	0.1300	106.19	223.38	223.38	7.518	3-36" CLV	RR tracks to I-25
408						CLV	I-25
409						48" SD	SW of I-25/SDC
410						3-36" CLV	I-25
411						48" SD	I-25 to SDC
Σ	0.2010	60.19	150.6	3.846	9.445	Open Chan.	to South Diversion Channel

F. **WE Basin.** This 0.38 square mile basin inc'udes the southern portion of the terminal area, the west ends of Runway 8-26 and the Taxiway s A and E, and the undeveloped escarpment area between the airport and University Boulevard. The existing drainage situation consists of a collection system that is throttled into a 24" outfall to the escarpment area, the overland flow within the escarpment area, and a 2-60" culvert structure at University Boulevard. In addition to being throttled at the outfall, the collection system contains many sections that are inadequate to handle the 5 year design storm. The existing peak discharge reaching the culvert crossing is 101 cubic feet per second (cfs). The capacity of the 2-60" structure is 370 cfs

The proposed system for this basin includes many upgrades to the existing collection system necessary to handle the 10 year design storm, and to solve existing drainage problems. To


LEGEND
MAJOR DRAINAGE BASIN
DRAINAGE SUB-BASIN
601 DRAINAGE SUB-BASIN NUMBER
EXISTING STORM DRAINS
NEW STORMDRAINS ASSUMED FOR DRAINAGE COMPUTATIONS.
SCALE IN FEET
GIBSON BLVD.
CARLISLE BLVD.
CITY GOLF COURSE
MIDDLE
KIRTLAND AIR FORCE BASE
EEND
AIR GUARD
FAR EAST END
SUPPORT BLVD.
PARKING STRUCTURE
RUNWAY 17-35
KIRTLAND ROAD
DETENTION POND
UNIVERSITY OF NEW MEXICO SOUTH GOLF COURSE
UNM BUSINESS PARK
RIO BRAVO BLVD.
TIJERAS ARROYO
RUNWAY 3-21 DRAINAGE IMPROVEMENTS
PROPOSED FUTURE AIR CARGO FACILITIES
NOTE
1. LINES SHOWN ILLUSTRATE RUNWAY 3-21 DESIGN. "AHYMO" RUNS NOT ADJUSTED SINCE DESIGN CONCEPTS ARE IN LINE WITH MASTERPLAN CONCEPTS
CITY OF ALBUQUERQUE
NEW MEXICO
DRAINAGE BASIN MAP
PROPOSED FUTURE DEVELOPMENT
ALBUQUERQUE INTERNATIONAL AIRPORT
MOLZEN-CORBIN & Associates
ENGINEERS/PLANNERS/CONSULTANTS Albuquerque • New Mexico • Las Cruces
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Drawn HC-A/JSL
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Date JAN. 1995
PLATE 4

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APPENDIX C

Drainage Exhibits

Sunport Trail Total Runoff

Subbasin ID	Alignment	From STA	To STA	Proposed Subbasin Runoff (cfs) (2-yr 6-Hr)	Proposed Subbasin Runoff (cfs) (10-yr 6-Hr)	Proposed Subbasin Runoff (cfs) (100-yr 6-Hr)	Notes
Sunport Trail East	Sunport Trail (University Blvd to Transport St)	16+34	23+00	0.6	1.4	2.3	Single grate area drain at Station 16+34
Sunport Trail West	Sunport Trail (University Blvd to Transport St)	10+26	16+34	0.5	1.0	1.7	Double grate area drain at station 10+47

UNIVERSITY BOULEVARD BIKEWAYS PHASE II
GEORGE ROAD TO GIBSON BOULEVARD

EXHIBIT 1
ONSITE DRAINAGE KEY MAP

0 160 320 640 Feet

1 inch = 160 feet

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Subbasin ID	Alignment	From STA	To STA	Existing Subbasin Runoff (cfs) (2-yr 6-Hr)	Existing Subbasin Runoff (cfs) (10-yr 6-Hr)	Existing Subbasin Runoff (cfs) (100-yr 6-Hr)	Proposed Subbasin Runoff (cfs) (2-yr 6-Hr)	Proposed Subbasin Runoff (cfs) (10-yr 6-Hr)	Proposed Subbasin Runoff (cfs) (100-yr 6-Hr)	Difference (cfs) (Post - Pre) (2-yr 6-Hr)	Difference (cfs) (Post - Pre) (10-yr 6-Hr)	Difference (cfs) (Post - Pre) (100-yr 6-Hr)	Notes
PR-13	Sunport Trail (University Blvd to Transport St)	10+20	23+00	0.3	0.8	1.4	0.8	1.4	2.1	0.6	0.6	0.7	Two new catch basins to mitigate excess flow and velocity
PR-200	Kirtland Channel Trail (Mulberry St to San Jose Ave)	100+15	104+33	0.1	0.3	0.4	0.2	0.4	0.6	0.1	0.2	0.2	
EX-201	Kirtland Channel Trail - South	-	-	2.9	4.9	7.4	-	-	-	0.0	0.0	0.0	Area calculated to correctly size sidewalk culvert for 10-year storm.

UNIVERSITY BOULEVARD BIKEWAYS PHASE II
GEORGE ROAD TO GIBSON BOULEVARD

EXHIBIT 2
ONSITE DRAINAGE

0 100 200 400
Feet

1 inch = 100 feet

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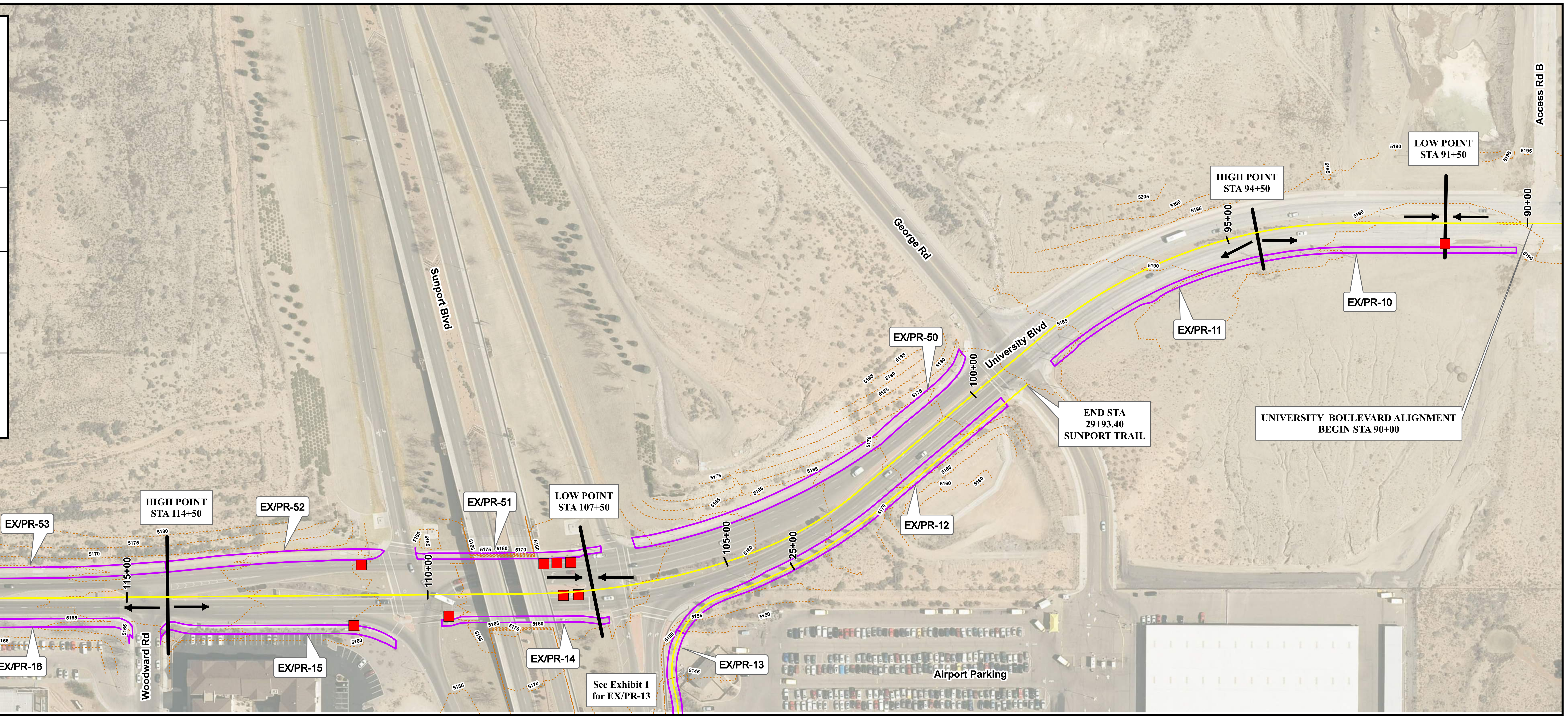

West Curb

Subbasin ID	Alignment	From STA	To STA	Existing Subbasin Runoff (cfs) (2-yr 6-Hr)	Existing Subbasin Runoff (cfs) (10-yr 6-Hr)	Existing Subbasin Runoff (cfs) (100-yr 6-Hr)	Proposed Subbasin Runoff (cfs) (2-yr 6-Hr)	Proposed Subbasin Runoff (cfs) (10-yr 6-Hr)	Proposed Subbasin Runoff (cfs) (100-yr 6-Hr)	Difference (cfs) (Post - Pre) (2-yr 6-Hr)	Difference (cfs) (Post - Pre) (10-yr 6-Hr)	Difference (cfs) (Post - Pre) (100-yr 6-Hr)	Notes
PR-10	University Blvd (George Rd to Randolph Rd)	90+00	94+50	0.1	0.2	0.3	0.2	0.3	0.4	0.1	0.1	0.1	
PR-11	University Blvd (George Rd to Randolph Rd)	94+50	98+64	0.1	0.2	0.3	0.2	0.3	0.4	0.1	0.1	0.1	
PR-12	University Blvd (George Rd to Randolph Rd)	99+68	106+00	0.2	0.5	0.9	0.5	0.8	1.2	0.3	0.3	0.3	
PR-13	Sunport Trail (University Blvd to Transport St)	10+20	23+00	0.3	0.8	1.4	0.8	1.4	2.1	0.6	0.6	0.7	Two new catch basins to mitigate excess flow and velocity
PR-14	University Blvd (George Rd to Randolph Rd)	107+00	109+29	0.1	0.2	0.3	0.1	0.2	0.3	0.0	0.0	0.0	
PR-15	University Blvd (George Rd to Randolph Rd)	110+50	114+50	0.1	0.3	0.5	0.2	0.4	0.6	0.1	0.1	0.1	
PR-16	University Blvd (George Rd to Randolph Rd)	114+87	119+00	0.2	0.3	0.5	0.3	0.4	0.6	0.1	0.1	0.1	
PR-17	University Blvd (George Rd to Randolph Rd)	119+74	124+50	0.1	0.4	0.7	0.4	0.7	1.1	0.3	0.3	0.4	
PR-18	University Blvd (San Jose Ave to Gibson Blvd)	17+00	18+00	0.1	0.2	0.4	0.1	0.2	0.4	0.0	0.0	0.0	
PR-100	University Blvd (San Jose Ave to Gibson Blvd)	18+45	20+17	0.1	0.1	0.2	0.1	0.1	0.2	0.0	0.0	0.0	
PR-101	University Blvd (San Jose Ave to Gibson Blvd)	20+93	22+67	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	
PR-102	University Blvd (San Jose Ave to Gibson Blvd)	23+44	25+15	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	
PR-103	University Blvd (San Jose Ave to Gibson Blvd)	25+93	27+67	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	
PR-104	University Blvd (San Jose Ave to Gibson Blvd)	28+50	33+50	0.1	0.2	0.3	0.1	0.2	0.3	0.0	0.0	0.0	
PR-200	Kirtland Channel Trail (Mulberry St to San Jose Ave)	100+15	104+33	0.1	0.3	0.4	0.2	0.4	0.6	0.1	0.2	0.2	
EX-201	Kirtland Channel Trail - South	-	-	2.9	4.9	7.4	-	-	-	0.0	0.0	0.0	Area calculated to correctly size sidewalk culvert for 10-year storm.

East Curb

Subbasin ID	Alignment	From STA	To STA	Existing Subbasin Runoff (cfs) (2-yr 6-Hr)	Existing Subbasin Runoff (cfs) (10-yr 6-Hr)	Existing Subbasin Runoff (cfs) (100-yr 6-Hr)	Proposed Subbasin Runoff (cfs) (2-yr 6-Hr)	Proposed Subbasin Runoff (cfs) (10-yr 6-Hr)	Proposed Subbasin Runoff (cfs) (100-yr 6-Hr)	Difference (cfs) (Post - Pre) (2-yr 6-Hr)	Difference (cfs) (Post - Pre) (10-yr 6-Hr)	Difference (cfs) (Post - Pre) (100-yr 6-Hr)	Notes
PR-50	University Blvd (George Rd to Randolph Rd)	99+68	106+50	0.3	0.6	1.0	0.5	0.8	1.3	0.2	0.2	0.2	
PR-51	University Blvd (George Rd to Randolph Rd)	107+00	110+20	0.1	0.2	0.3	0.1	0.2	0.3	0.0	0.0	0.0	
PR-52	University Blvd (George Rd to Randolph Rd)	110+50	114+35	0.1	0.3	0.5	0.3	0.5	0.7	0.1	0.1	0.2	
PR-53	University Blvd (George Rd to Randolph Rd)	114+35	119+74	0.2	0.5	0.8	0.4	0.7	1.1	0.2	0.2	0.2	
PR-150	University Blvd (San Jose Ave to Gibson Blvd)	18+45	20+17	0.1	0.1	0.2	0.1	0.1	0.2	0.0	0.0	0.0	
PR-151	University Blvd (San Jose Ave to Gibson Blvd)	20+93	22+67	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	
PR-152	University Blvd (San Jose Ave to Gibson Blvd)	23+44	25+15	0.0	0.1	0.1	0.0	0.1	0.1	0.0	0.0	0.0	
PR-153	University Blvd (San Jose Ave to Gibson Blvd)	25+93	27+67	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	
PR-154	University Blvd (San Jose Ave to Gibson Blvd)	28+50	33+50	0.2	0.3	0.4	0.2	0.3	0.4	0.0	0.0	0.0	