CITY OF ALBUQUERQUE

Planning Department
David Campbell, Director

Mayor Timothy M. Keller

December 18, 2018

Sara Lavy, PE
Parametrix
9600 San Mateo Blvd. NE
Albuquerque, NM, 87113

RE: Alameda Blvd & Barstow St.
Drainage Report
Engineer's Stamp Date: 12/18/18
Hydrology File: C20D080

Dear Ms. Lavy:

Based upon the information provided in your submittal received 11/27/2018 and AMAFCA's approval email on 12/18/18, the Drainage Report is approved for DRC Work Order.

If you have any questions, please contact me at 924-3995 or rbrissette@cabq.gov .

Sincerely,

Renée C. Brissette

Renée C. Brissette, P.E. CFM
Senior Engineer, Hydrology
Planning Department

PO Box 1293

Albuquerque

NM 87103

www.cabq.gov

City of Albuquerque

Planning Department

Development & Building Services Division

DRAINAGE AND TRANSPORTATION INFORMATION SHEET (REV 6/2018)

Project Title: Alameda Blvd. And Barstow St. Building Permit #: _____ Hydrology File #: _____

DRB#: _____ EPC#: _____ Work Order#: 770342

Legal Description: _____

City Address: Alameda Blvd. between Barstow Ave. and Rich Ct. and Barstow Ave between the La Cueva Channel and approximately 300' south of Alameda Blvd.

Applicant: City of Albuquerque DMD Contact: Bridgette Aragon

Address: City of Albuquerque, Engineering Division, Department of Municipal Development

Phone#: 505-768-3679 Fax#: _____ E-mail: bridgettearagon@cabq.gov

Other Contact: Parametrix Contact: Sara Lavy

Address: 9600 San Mateo Blvd. NE

Phone#: 505-998-5581 Fax#: _____ E-mail: SLAVY@parametrix.com

TYPE OF DEVELOPMENT: _____ PLAT (# of lots) _____ RESIDENCE _____ DRB SITE ___ ADMIN SITE

IS THIS A RESUBMITTAL? _____ Yes ___X___ No

DEPARTMENT _____ TRANSPORTATION ___X___ HYDROLOGY/DRAINAGE

Check all that Apply:

TYPE OF SUBMITTAL:

____ ENGINEER/ARCHITECT CERTIFICATION
____ PAD CERTIFICATION
____ CONCEPTUAL G & D PLAN
____ GRADING PLAN
__X__ DRAINAGE REPORT
____ DRAINAGE MASTER PLAN
____ FLOODPLAIN DEVELOPMENT PERMIT APPLIC
____ ELEVATION CERTIFICATE
____ CLOMR/LOMR
____ TRAFFIC CIRCULATION LAYOUT (TCL)
____ TRAFFIC IMPACT STUDY (TIS)
____ STREET LIGHT LAYOUT
____ OTHER (SPECIFY) _____
____ PRE-DESIGN MEETING?

TYPE OF APPROVAL/ACCEPTANCE SOUGHT:

____ BUILDING PERMIT APPROVAL
____ CERTIFICATE OF OCCUPANCY

____ PRELIMINARY PLAT APPROVAL
____ SITE PLAN FOR SUB'D APPROVAL
____ SITE PLAN FOR BLDG. PERMIT APPROVAL
____ FINAL PLAT APPROVAL

____ SIA/ RELEASE OF FINANCIAL GUARANTEE
____ FOUNDATION PERMIT APPROVAL
____ GRADING PERMIT APPROVAL
____ SO-19 APPROVAL
____ PAVING PERMIT APPROVAL
____ GRADING/ PAD CERTIFICATION
__X__ WORK ORDER APPROVAL
____ CLOMR/LOMR
____ FLOODPLAIN DEVELOPMENT PERMIT
____ OTHER (SPECIFY) _____

DATE SUBMITTED: 11-27-18 By: Sara Lavy, PE

COA STAFF: ELECTRONIC SUBMITTAL RECEIVED: _____

FEE PAID: _____

Parametrix
ENGINEERING . PLANNING . ENVIRONMENTAL SCIENCES

9600 SAN MATEO BOULEVARD NE | ALBUQUERQUE, NM 87113 | P 505.821.4700

TECHNICAL MEMORANDUM

DATE: November 13, 2018
TO: Josh Ellison
FROM: Sara Lavy, PE
SUBJECT: Drainage Analysis - FINAL
CC:
PROJECT NUMBER: 564-4354-015, Task 9
PROJECT NAME: Barstow and Alameda Project

The Alameda Boulevard and Barstow Street intersection is located in northeast Albuquerque (see Figure 1). The project scope includes the design of permanent improvements on the north side of Alameda at the Barstow Street intersection. A new second lane will accommodate westbound traffic and connect to existing lanes on the west and east sides of Barstow. New pavement on Barstow on the north side of Alameda will provide continuity with existing pavement on Barstow. A new trail will be constructed on Barstow on the south side of Alameda that connects to the existing bike lane and will end at Alameda. This memo summarizes the evaluation of the existing drainage conditions in the project corridor and provides recommendations for necessary improvements.

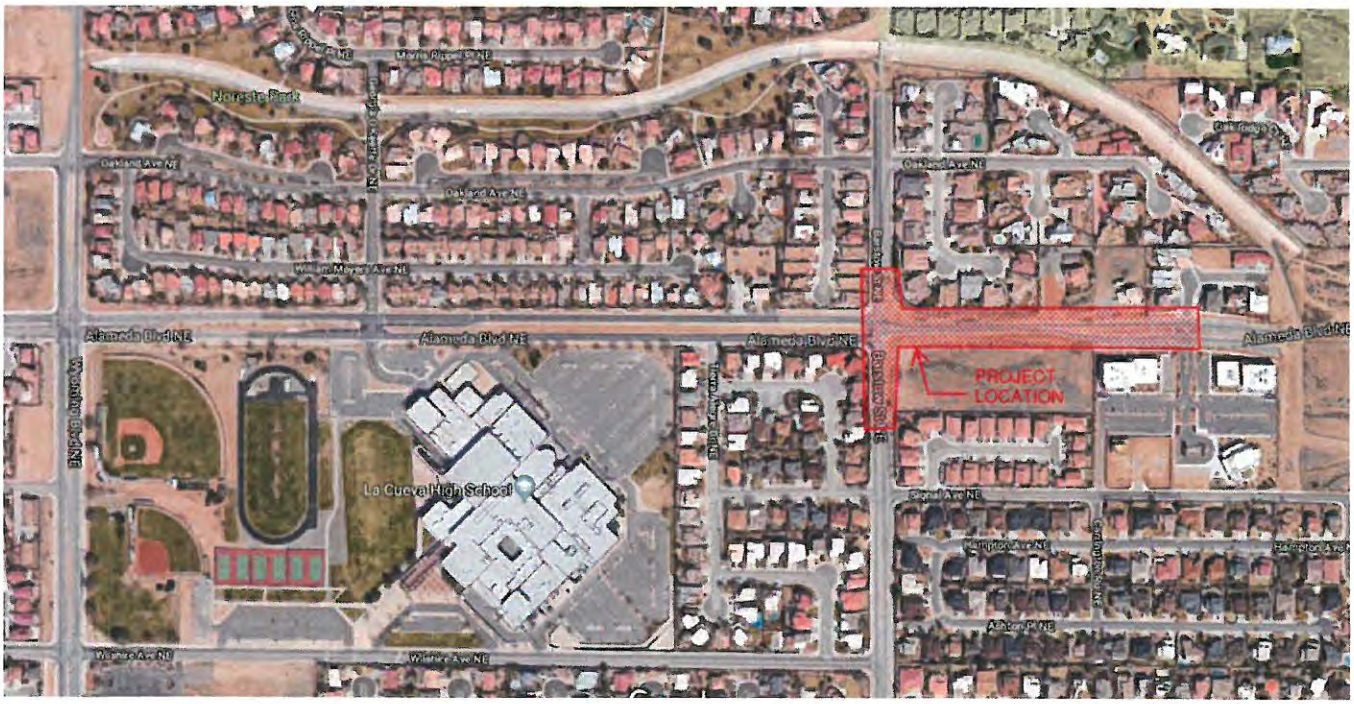


Figure 1. Location Map

Existing Conditions

Alameda Boulevard drains from the east towards the west. Barstow Street has a high point just north of the Alameda intersection. North of Alameda, Barstow drains north to the existing La Cueva Channel. Barstow south of Alameda drains south towards to the North Domingo Baca Arroyo. Both channels are maintained and operated by AMAFCA. The undeveloped property located at the southeast corner of Barstow and Alameda drains to the southwest and does not impact Alameda. The undeveloped property drainage enters Barstow and flows south.

Existing Drainage Reports

Existing drainage reports reviewed for the project are listed below:

- North Albuquerque Acres Drainage Master Plan (NAADMP)
  This Master Plan was prepared by RTI for the City of Albuquerque in 1998. The Master Plan provides a coherent plan for future development and improvements within the plan area. The current project lies within Basins 924.4 and 111.3 of the Master Plan. The southern portion of Barstow lies within Basin 924.4 and Alameda and the northern portion of Barstow lie within Basin 111.3. In addition, the Master Plan designed future storm drains. A 30" storm drain is shown in Barstow, extending from the La Cueva Arroyo to Alameda with an outflow to the La Cueva Arroyo.

- Hope Plaza Subdivision (C20-D64)
  Correspondence between the City of Albuquerque Hydrology Department and the Project Engineer indicate that 14.51 cfs is discharged from the site to Alameda.

- Pica La Cueva Subdivision (C20-D15)
  This residential subdivision is located at the northeast corner of Alameda and Barstow. Flows from the subdivision flow to the adjacent streets, are picked up by an existing 24" storm drain in Barstow which outflows to the La Cueva Arroyo located north of the project. The subdivision flows do not impact Alameda.

- Rich Court Subdivision (C20-D44)
  This residential subdivision is located north of Alameda between Barstow and Ventura Street. Flows from the site drain to Rich Court and then north to a small drainage channel that discharges 9 cfs to Estrada Court. These flows combine with the Estrada Court flows and drain west in Oakland Avenue to Barstow Street. Flows from this subdivision do not enter Alameda Boulevard.

- Estrada Court (C20-D42)
  This residential subdivision is located at the east end of Oakland along Estrada Court cul-de-sac. Developed flows of 5.86 cfs free discharge from the site to Oakland and eventually to Barstow and the La Cueva Channel.

- Oakland Meadows (C20-D43)
  This residential subdivision is located at the northeast corner of Barstow and Oakland. Flows from the site drain in several directions: 4.75 cfs drains south to Oakland, 3.64 cfs drains through west through yard walls to Barstow, and another 3.77 cfs is picked up by a storm drain at the end of the cul-de-sac and ties to the existing storm drain in Barstow.

- Oakland Meadows (C20-D53)
  This residential subdivision is located just east of Oakland Meadows. The flows from this subdivision drain north to the La Cueva Channel and do not impact Oakland Avenue.

FIRM Map

The site is located on FIRM Map 35001C0141G as shown in the appendix. The map shows that the corridor does not lie within any 100-year flood plains.

Drainage Calculations and Criteria

The drainage calculations are based on the requirements of Chapter 22 of the City of Albuquerque Development Process Manual, Volume II. The site lies within precipitation Zone 3 of Bernalillo County and the Weighted E method was used to calculate the existing and proposed runoff rates for Alameda and Barstow for the 10-year, 6-hour storm and the 100-year, 6-hour storm.

Basin Analysis

The existing drainage basins are shown on Figure 2. There are seven drainage basins within this project corridor. There are two offsite basins that impact Alameda (OS-1 and OS-2), one offsite basin that affects Barstow (OS-3), and there are two Alameda basins for the north and south sides of the roadway (Basins 1 and 2). There are two Barstow basins for the east side of the roadway. Basin 3 consists of the east side of the street between Alameda and Oakland Avenue and Basin 4 consists of the east side between Oakland and the La Cueva Channel. See Table 1 below for basin sizes and flow information.

Table 1. Basin Flows

Basin	Location	Size (acres)	10-year Flow (cfs)	100-year Flow (cfs)
1	Alameda – North	1.86	5.91	8.90
2	Alameda - South	1.84	5.82	8.77
3	Barstow – North of Alameda	0.32	1.02	1.54
4	Barstow – North of Oakland Avenue	0.24	0.76	1.14
OS-1	Residential lots on north side of Alameda	1.58	2.83	5.14
OS-2	Hope Plaza located on south side of Alameda	1.56	9.72	14.51
OS-3	Undeveloped lot at southeast corner of Alameda and Barstow	2.88	8.50	13.07

Basin OS-3 consists of the undeveloped property at the southeast corner of Alameda and Barstow. The developed flows for this basin are assumed to drain north for a more conservative design. However, those flows are programmed to drain south in the NAADMP and every effort should be made to ensure the flows from OS-3 follow the approved master plan.

All the basin flows except for OS-2 were estimated using the Weighted E method. Basin OS-2 is part of the Hope Plaza Subdivision. No drainage report was found for this development although a letter was discovered that mentions that the 100-year flow from OS-2 is 14.51 cfs. No information regarding the 10-year flow rate was found so it was estimated to be 67% of the 100-year flow rate based on the ratio of the 100-year to 10-year flows of the other nearby basins.

Street Capacity

The DPM states that arterials are required to have one driving lane free of flowing or standing water in each traffic direction during the 10-year storm. Alameda Boulevard is classified as a Principal Arterial and therefore should meet this criterion. Barstow Street is classified as a Collector and is not required to meet the one lane dry requirement. Figure 1 shows five analysis point locations where the street capacity was analyzed. Table 2 summarizes the analysis.

Analysis Point 1 is the total flow on the north side of Alameda of 14.04 cfs during the 100-year storm. This includes flows from the north side of Alameda and the two residential lots (Basin OS-1). The north side of Alameda has capacity for the 100-year flows at AP-1 with a maximum depth of flow of 0.43 feet. During the 10-year storm this portion of the street meets the one-lane dry requirement.

Analysis Point 2 is the south side of Alameda and consists of the flows from the south side of Alameda and Basin OS-2. This side of Alameda has more flow than the north side due to the Hope Plaza flows (OS-2). The street has capacity for the 100-year flows with a depth of 0.50 feet but will exceed the one lane dry requirement in the future two eastbound lanes configuration. However, currently the south side of Alameda is not being developed. The south side will remain one lane with no curb and gutter until the undeveloped property located at the southeast corner is developed. The developer will be responsible for constructing the additional lane, curb and gutter, and sidewalk along the south side of Alameda. In the interim condition, storm water drains to an adjacent earth ditch and then west towards Barstow.

The flows from AP-1 need to drain north to the La Cueva Channel for compliance with the NAADMP. However, the high point on Barstow is just north of the Alameda intersection making this currently impossible. Storm drain would need to be extended to Alameda to capture these flows. An alternate option is to remove and repave approximately 100 feet of pavement on Barstow just north of Alameda to remove the current high point, which would improve the drainage and allow the Alameda flows to drain north.

Table 2. Street Capacity Summary

Analysis Point	Location	100-year Flow (cfs)	Depth (feet)	10-year Flow (cfs)	Meets 10-year 1-Lane Dry Requirement Y/N
AP-1	Alameda – North	14.04	0.43	8.74	Yes
AP-2	Alameda – South	23.28	0.50	15.54	No
AP-3	Barstow – South of Oakland Avenue	15.58	0.57	N/A	N/A
AP-4	Barstow – North of Oakland Avenue	27.90	0.69	N/A	N/A
AP-5	Barstow – End of Street	19.40	0.61	N/A	N/A

Storm Drain

The NAADMP shows a proposed 30" storm drain in Barstow, north of Alameda, draining to the La Cueva Arroyo. As-builts show that the existing storm drain constructed in Barstow is a 24" RCP. The storm drain begins on Barstow just south of Oakland and extends north to the La Cueva Channel where it outflows. As-builts indicate that 31.01 cfs outflows from the storm drain to the La Cueva Channel. Hydraflow's Storm Sewer analysis program was used to perform an analysis of the mainline storm drain in Barstow to check the system's capacity. The analysis shows that the existing storm drain system is functioning adequately but does not have capacity for additional flows.

Analysis Points 3, 4, and 5 on Figure 2 show the flows in Barstow at various points both before and after the existing storm drain inlets reduce the street flows. The flows in the existing storm drain are taken from the provided as-builts for the storm drain.

This project will reconstruct and extend the existing storm drain in Barstow. The storm drain will be extended to Alameda to collect flows from the north side of Alameda. A stub will be constructed that can be extended in the future to collect flows from the south side of Alameda. In addition, the new system will be sized to collect the flows from the south side of Alameda although that portion will not be constructed at this time. The existing storm drain pipes in Barstow do not have capacity for the additional flows so the existing storm drain, beginning at Oakland, will be removed and reconstructed with larger pipe sizes. This will also necessitate reconstructing the outflow to the La Cueva Channel. Initial conversations with AMAFCA indicate that reconstruction of the outflow structure is acceptable to AMAFCA. The outflow structure will require AMAFCA approval and must meet AMAFCA standards.

Summary

The existing streets and proposed storm drain will have capacity for the flows from this roadway project. The south side of Alameda does not meet the one-lane dry criterion for the future conditions. However, the current configuration of Alameda with one-lane, no curb and gutter, and an adjacent drainage ditch keeps flows off the roadway and does not have drainage concerns. The existing storm drain in Barstow has capacity for the current flows. However, the existing storm drain does not have capacity for the entire proposed developed flows without additional storm drain.

Recommendations

- Ensure existing drainage swale along south side of Alameda continues to drain east.
- Construct rip-rap lined drainage swale on east side of Barstow south of Alameda to convey flows from undeveloped lot south and prevent them from affecting the new roadway improvements.
- Provide curb cuts in new curb on north side of Alameda to allow roadway flows to enter seeded bioswale area between the new curb and new sidewalk.
- Remove and reconstruct the existing storm drain in Barstow to provide capacity for the proposed flows in Alameda. The existing laterals in Barstow from the existing drop inlets may need to be reconstructed to connect to the new system. The existing drop inlets should be able to remain in place.

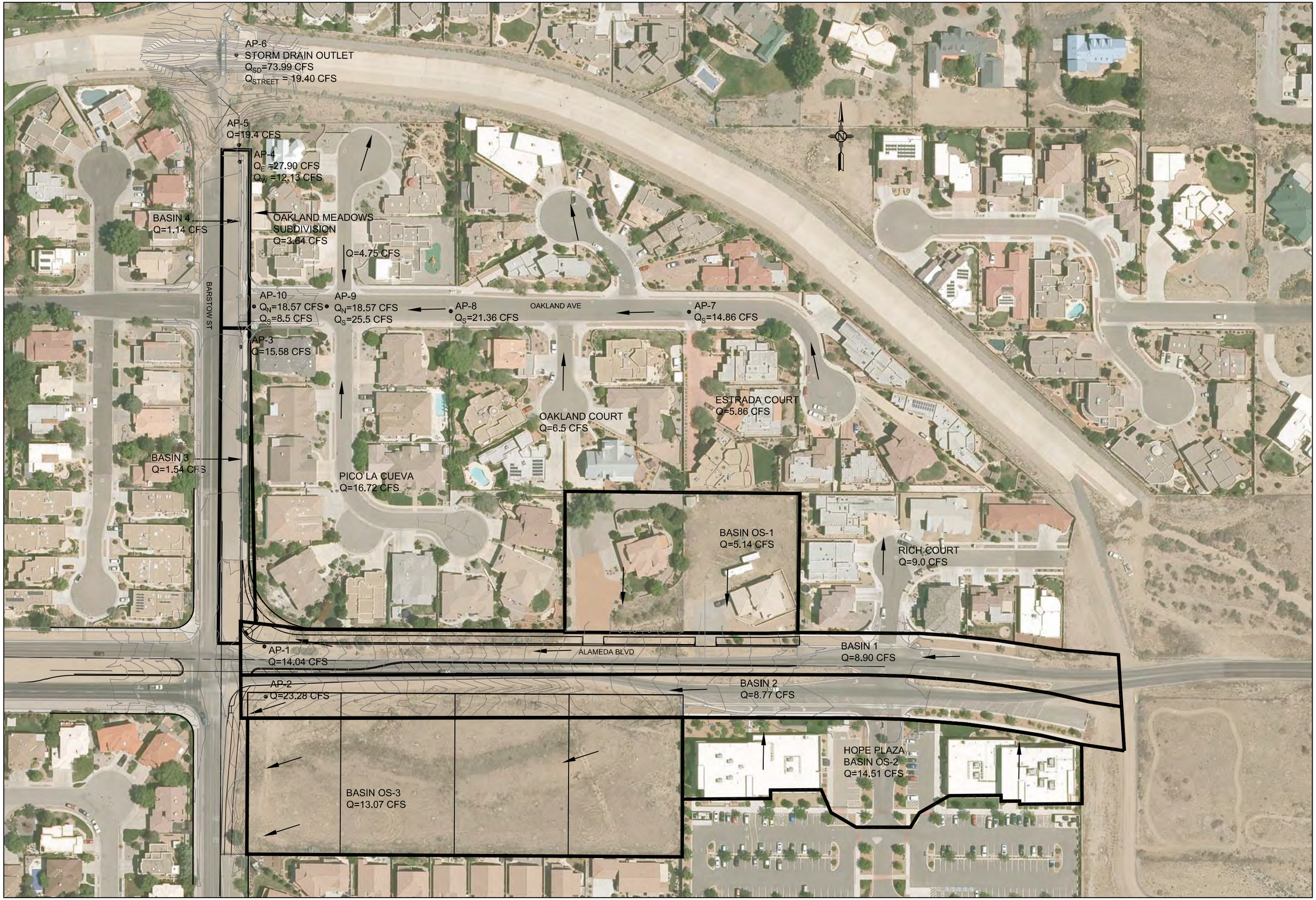


FIGURE 2. BASIN LAYOUT

APPENDIX A Hydrology

Weighted E Method

											100-Year			10-Year		
Basin	Area (sf)	Area (acres)	Treatment A		Treatment B		Treatment C		Treatment D		Weighted E (ac-ft)	Volume (ac-ft)	Flow cfs	Weighted E (ac-ft)	Volume (ac-ft)	Flow cfs
			%	(acres)	%	(acres)	%	(acres)	%	(acres)						
1	81,160	1.86	0%	0	10%	0.19	0%	0.00	90%	1.68	2.216	0.344	8.90	1.386	0.215	5.91
2	79,993	1.84	0%	0	10%	0.18	0%	0.00	90%	1.65	2.216	0.339	8.77	1.386	0.212	5.82
3	13,998	0.32	0%	0	10%	0.03	0%	0.00	90%	0.29	2.216	0.059	1.54	1.386	0.037	1.02
4	10,434	0.24	0%	0	10%	0.02	0%	0.00	90%	0.22	2.216	0.044	1.14	1.386	0.028	0.76
OS-1	68,750	1.58	0%	0	60%	0.95	20%	0.32	20%	0.32	1.282	0.169	5.14	0.640	0.084	2.83
OS-3	125,515	2.88	0%	0	20%	0.58	0%	0.00	80%	2.31	2.072	0.498	13.07	1.272	0.305	8.50

Equations:

Weighted E = Ea*Aa + Eb*Ab + Ec*Ac + Ed*Ad / (Total Area)

Volume = Weighted D * Total Area

Flow = Qa * Aa + Qb * Ab + Qc * Ac + Qd * Ad

Excess Precipitation, E (inches)		
Zone 3	100-Year	10 - Year
E_a	0.66	0.19
E_b	0.92	0.36
E_c	1.29	0.62
E_d	2.36	1.50

Peak Discharge (cfs/acre)		
Zone 3	100-Year	10 - Year
Q_a	1.87	0.58
Q_b	2.60	1.19
Q_c	3.45	2.00
Q_d	5.02	3.39

National Flood Hazard Layer FIRMette

FEMA

Feet 1:6,000

0 250 500 1,000 1,500 2,000

Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS
- Without Base Flood Elevation (BFE) *Zone A, V, A99*
- With BFE or Depth
- Regulatory Floodway *Zone AE, AO, AH, VE, AR*

OTHER AREAS OF FLOOD HAZARD
- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee. See Notes. *Zone X*
- Area with Flood Risk due to Levee *Zone D*

OTHER AREAS
- NO SCREEN — Area of Minimal Flood Hazard *Zone X*
- Effective LOMRs
- Area of Undetermined Flood Hazard *Zone D*

GENERAL STRUCTURES
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES
- 20.2 — Cross Sections with 1% Annual Chance
- 17.5 — Water Surface Elevation
- Coastal Transect
- Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature

MAP PANELS
- Digital Data Available
- No Digital Data Available
- Unmapped

N

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The base map shown complies with FEMA's base map accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 4/9/2018 at 5:31:01 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: base map imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

APPENDIX B Street Hydraulics

Street Capacity Summary

Analysis Point	Street	Street Slope (%)	Half Street Width (ft)	Curb Height (inches)	Basins Contributing to Street	100-Year Flow (cfs)	10-Year Flow (cfs)	Depth of Flow (inches)	Velocity (fps)	D*V (<6.5)	Capacity (cfs)
AP-1	Alameda	3.00	26	8	1, OS-1	14.04	8.74	0.43	4.67	2.01	19.76
AP-2	Alameda	3.00	26	8	2, OS-2	23.28	15.54	0.50	5.30	2.65	19.76
AP-3	Barstow	0.70	28	8	1, 3, OS-1	15.58		0.57	2.77	1.58	27.9
AP-4	Barstow	0.70	28	8	1, 3, 4, OS-1, Oakland Flows, Oakland Meadows Flows	*27.90		0.69	3.22	2.22	27.90
AP-5	Barstow	0.70	28	8	1, 3, 4, OS-1, Oakland Flows, Oakland Meadows Flows	19.40		0.59	2.87	1.69	27.9
AP-8	Oakland	3.00	20	8	Rich Court, Estrada Court, Oakland Court, Pico La Cueva, Oakland Meadows	**25.5		0.53	5.57	2.95	25.5

Calculations for AP-4

15.58	Flows at AP- 3
7.4	Subtract SD Inlet
27.07	Add Oakland Ave. flows (North and South)
1.14	Add Barstow Basin
3.64	Add Oakland Flows from Oakland Meadows
40.03	Total at AP-4

*Max half street capacity is 27.90, 12.13 cfs (40.03-27.90) will overflow crown to west side of Barstow

Calculations for AP-5

27.90	Flows at AP- 4
8.50	Subtract SD Inlet
19.40	Total at AP-5

Calculations for AP-7

9.0	Rich Court
5.86	Estrada Court
14.86	Total at AP-7

Calculations for AP-8

14.86	Flows at AP- 7
6.5	Oakland Court
21.36	Total at AP-8

Calculations for AP-9

21.36	Flows at AP-8
17.96	Pico La Cueva
4.75	Oakland Meadows
44.07	Total at AP-9

*Max half street capacity is 25.50, 18.57 cfs (44.07-25.5) will overflow crown to north side of Oakland

Worksheet for Alameda - North AP-1

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.03	ft/ft
Discharge	14.04	ft³/s

Section Definitions

Station (ft)	Elevation (ft)
0+00	0.67
0+00	0.00
0+02	0.13
0+26	0.61
0+26	0.67

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00, 0.67)	(0+26, 0.67)	0.017

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		0.43	ft
Elevation Range	0.00 to 0.67 ft		
Flow Area		3.01	ft²
Wetted Perimeter		17.52	ft
Hydraulic Radius		0.17	ft
Top Width		17.09	ft
Normal Depth		0.43	ft
Critical Depth		0.54	ft

Worksheet for Alameda - North

Results

Critical Slope		0.00710	ft/ft
Velocity		4.67	ft/s
Velocity Head		0.34	ft
Specific Energy		0.77	ft
Froude Number		1.96	
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	0.43	ft
Critical Depth	0.54	ft
Channel Slope	0.03	ft/ft
Critical Slope	0.00710	ft/ft

Cross Section for Alameda - North

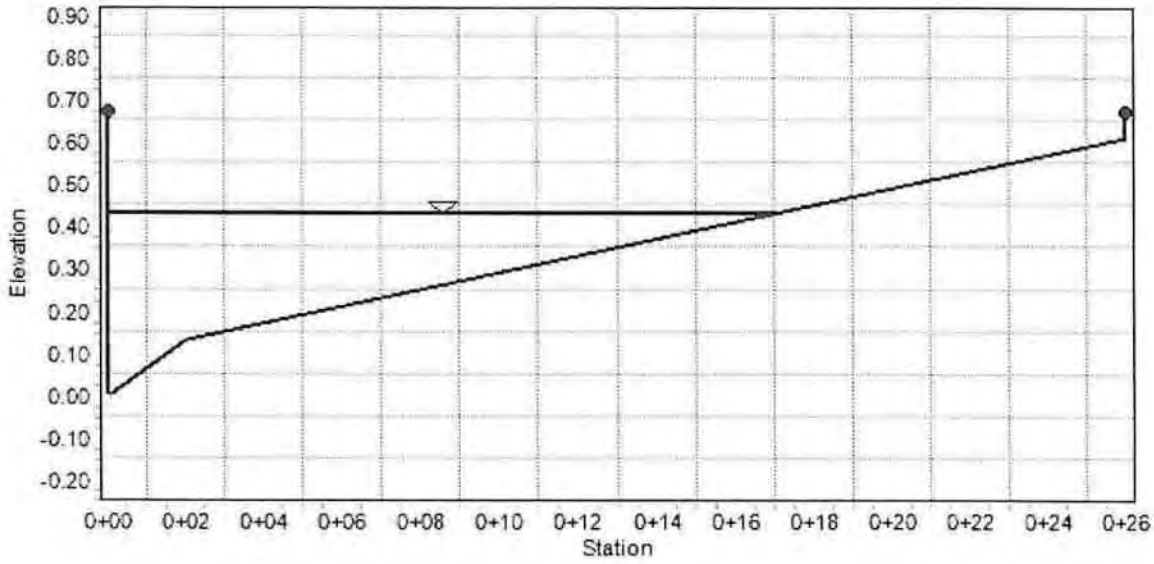
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.03	ft/ft
Normal Depth	0.43	ft
Discharge	14.04	ft³/s

Cross Section Image



Worksheet for Alameda - South

AP-2

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.03000	ft/ft
Discharge	23.28	ft³/s

Section Definitions

Station (ft)	Elevation (ft)
0+00	0.67
0+00	0.00
0+02	0.13
0+26	0.61
0+26	0.67

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00, 0.67)	(0+26, 0.67)	0.017

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		0.50	ft
Elevation Range	0.00 to 0.67 ft		
Flow Area		4.39	ft²
Wetted Perimeter		21.27	ft
Hydraulic Radius		0.21	ft
Top Width		20.76	ft
Normal Depth		0.50	ft
Critical Depth		0.63	ft

Worksheet for Alameda - South

Results

Critical Slope		0.00657	ft/ft
Velocity		5.30	ft/s
Velocity Head		0.44	ft
Specific Energy		0.94	ft
Froude Number		2.03	
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	0.50	ft
Critical Depth	0.63	ft
Channel Slope	0.03000	ft/ft
Critical Slope	0.00657	ft/ft

Cross Section for Alameda - South

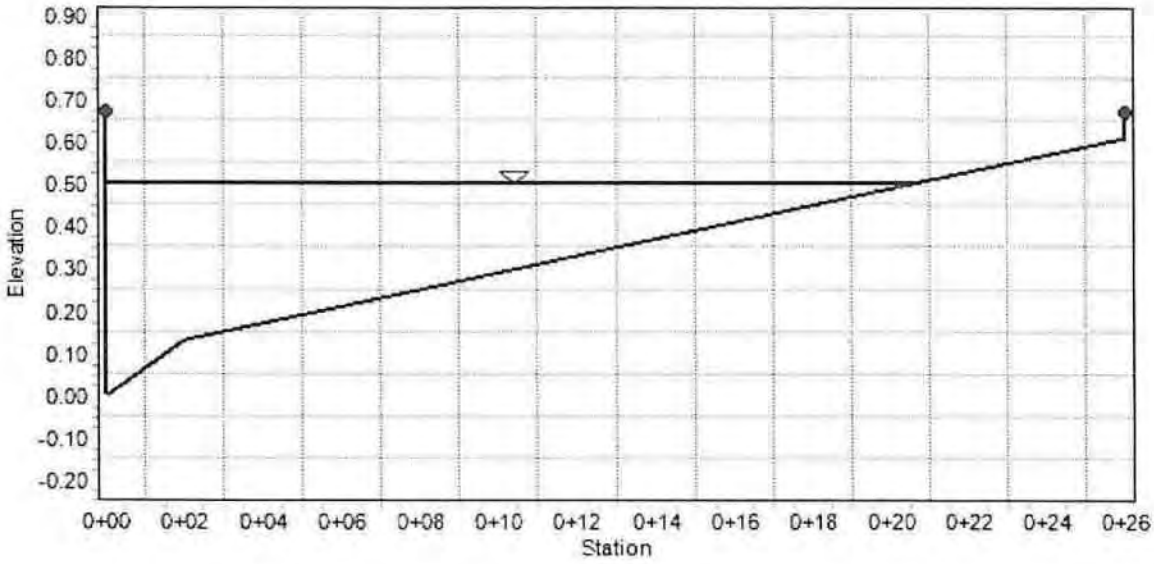
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.03000	ft/ft
Normal Depth	0.50	ft
Discharge	23.28	ft³/s

Cross Section Image



Worksheet for Barstow - AP-3

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.007	ft/ft
Discharge	15.58	ft³/s

Section Definitions

Station (ft)	Elevation (ft)
0+00	0.67
0+00	0.00
0+02	0.13
0+28	0.69

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00, 0.67)	(0+28, 0.69)	0.017

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	0.57	ft
Elevation Range	0.00 to 0.69 ft	
Flow Area	5.62	ft²
Wetted Perimeter	23.26	ft
Hydraulic Radius	0.24	ft
Top Width	22.68	ft
Normal Depth	0.57	ft
Critical Depth	0.57	ft
Critical Slope	0.00695	ft/ft

Worksheet for Barstow - AP-3

Results

Velocity		2.77	ft/s
Velocity Head		0.12	ft
Specific Energy		0.69	ft
Froude Number		0.98	
Flow Type	Subcritical		

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	0.57	ft
Critical Depth	0.57	ft
Channel Slope	0.007	ft/ft
Critical Slope	0.00695	ft/ft

Cross Section for Barstow - AP-3

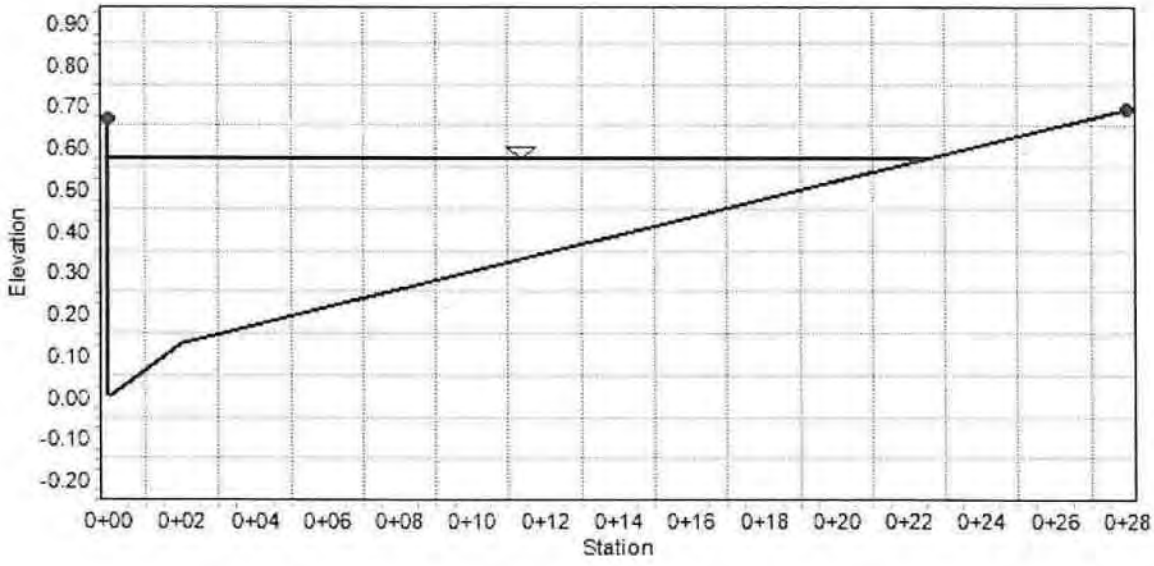
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.007	ft/ft
Normal Depth	0.57	ft
Discharge	15.58	ft³/s

Cross Section Image



Worksheet for Barstow - AP-4

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.007	ft/ft
Discharge	27.90	ft³/s

Section Definitions

Station (ft)	Elevation (ft)
0+00	0.67
0+00	0.00
0+02	0.13
0+28	0.69

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00, 0.67)	(0+28, 0.69)	0.017

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	0.69	ft
Elevation Range	0.00 to 0.69 ft	
Flow Area	8.67	ft²
Wetted Perimeter	28.70	ft
Hydraulic Radius	0.30	ft
Top Width	28.00	ft
Normal Depth	0.69	ft
Critical Depth	0.69	ft
Critical Slope	0.00641	ft/ft

Worksheet for Barstow - AP-4

Results

Velocity		3.22	ft/s
Velocity Head		0.16	ft
Specific Energy		0.85	ft
Froude Number		1.02	
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	0.69	ft
Critical Depth	0.69	ft
Channel Slope	0.007	ft/ft
Critical Slope	0.00641	ft/ft

Cross Section for Barstow - AP-4

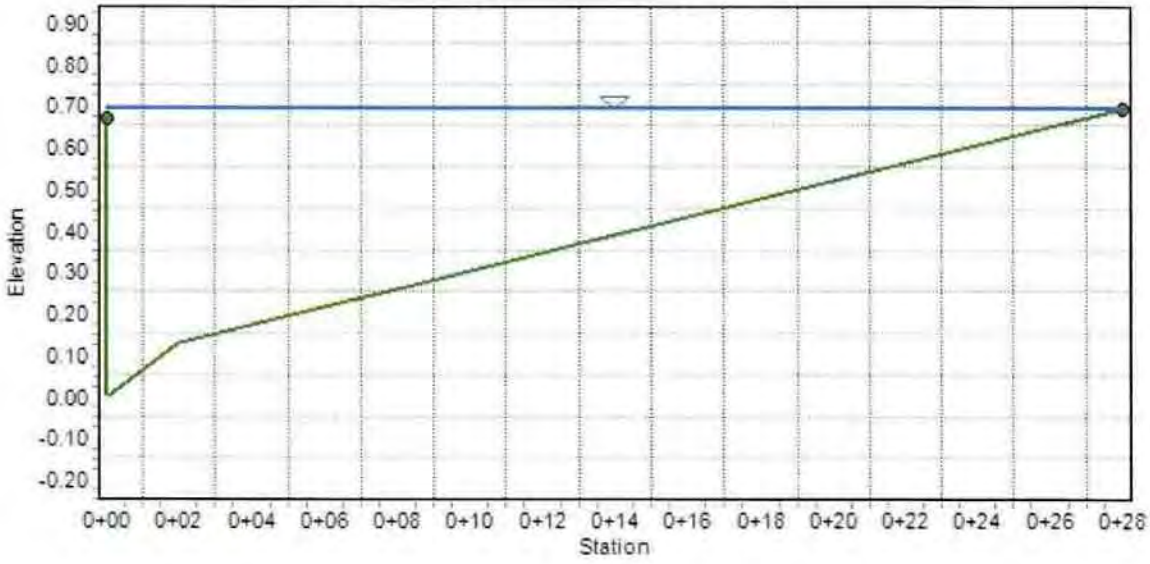
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.007	ft/ft
Normal Depth	0.69	ft
Discharge	27.90	ft^3/s

Cross Section Image



Worksheet for Barstow - AP-5

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.007	ft/ft
Discharge	19.40	ft³/s

Section Definitions

Station (ft)	Elevation (ft)
0+00	0.67
0+00	0.00
0+02	0.13
0+28	0.69

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00, 0.67)	(0+28, 0.69)	0.017

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	0.61	ft
Elevation Range	0.00 to 0.69 ft	
Flow Area	6.62	ft²
Wetted Perimeter	25.26	ft
Hydraulic Radius	0.26	ft
Top Width	24.63	ft
Normal Depth	0.61	ft
Critical Depth	0.61	ft
Critical Slope	0.00675	ft/ft

Worksheet for Barstow - AP-5

Results

Velocity		2.93	ft/s
Velocity Head		0.13	ft
Specific Energy		0.75	ft
Froude Number		1.00	
Flow Type	Subcritical		

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		0.61	ft
Critical Depth		0.61	ft
Channel Slope		0.007	ft/ft
Critical Slope		0.00675	ft/ft

Cross Section for Barstow - AP-5

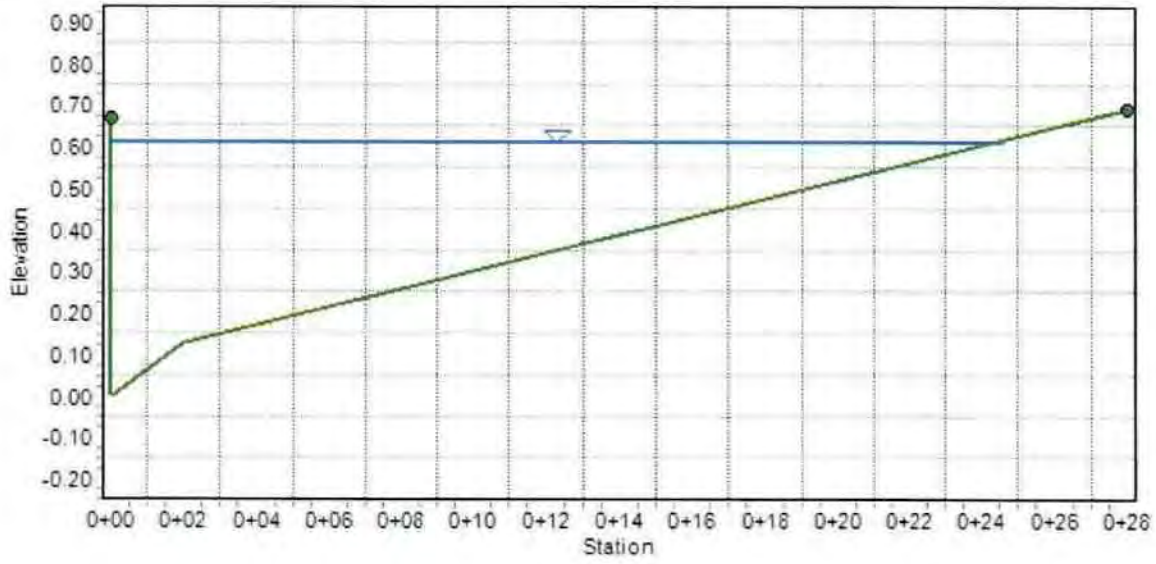
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.007	ft/ft
Normal Depth	0.61	ft
Discharge	19.40	ft³/s

Cross Section Image



Worksheet for Oakland - AP-8

Project Description

Friction Method	Manning Formula
Solve For	Discharge

Input Data

Channel Slope	0.030	ft/ft
Normal Depth	0.53	ft

Section Definitions

Station (ft)	Elevation (ft)
0+00	0.67
0+00	0.00
0+02	0.13
0+20	0.53

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00, 0.67)	(0+20, 0.53)	0.017

Options

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

Results

Discharge	25.50	ft^3/s
Elevation Range	0.00 to 0.67 ft	
Flow Area	4.58	ft^2
Wetted Perimeter	20.54	ft
Hydraulic Radius	0.22	ft
Top Width	20.00	ft
Normal Depth	0.53	ft
Critical Depth	0.67	ft
Critical Slope	0.00619	ft/ft

Worksheet for Oakland - AP-8

Results

Velocity		5.57	ft/s
Velocity Head		0.48	ft
Specific Energy		1.01	ft
Froude Number		2.05	
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	0.53	ft
Critical Depth	0.67	ft
Channel Slope	0.030	ft/ft
Critical Slope	0.00619	ft/ft

Cross Section for Oakland - AP-8

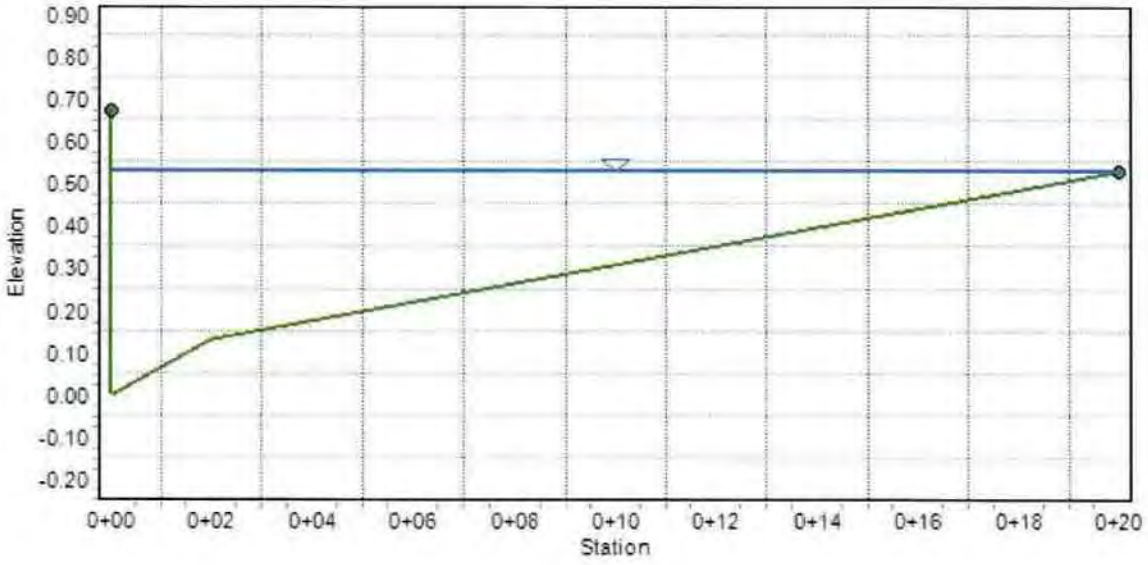
Project Description

Friction Method	Manning Formula
Solve For	Discharge

Input Data

Channel Slope	0.030	ft/ft
Normal Depth	0.53	ft
Discharge	25.50	ft^3/s

Cross Section Image



APPENDIX C Storm Drain Calculations

STORM SEWER SUMMARY REPORT

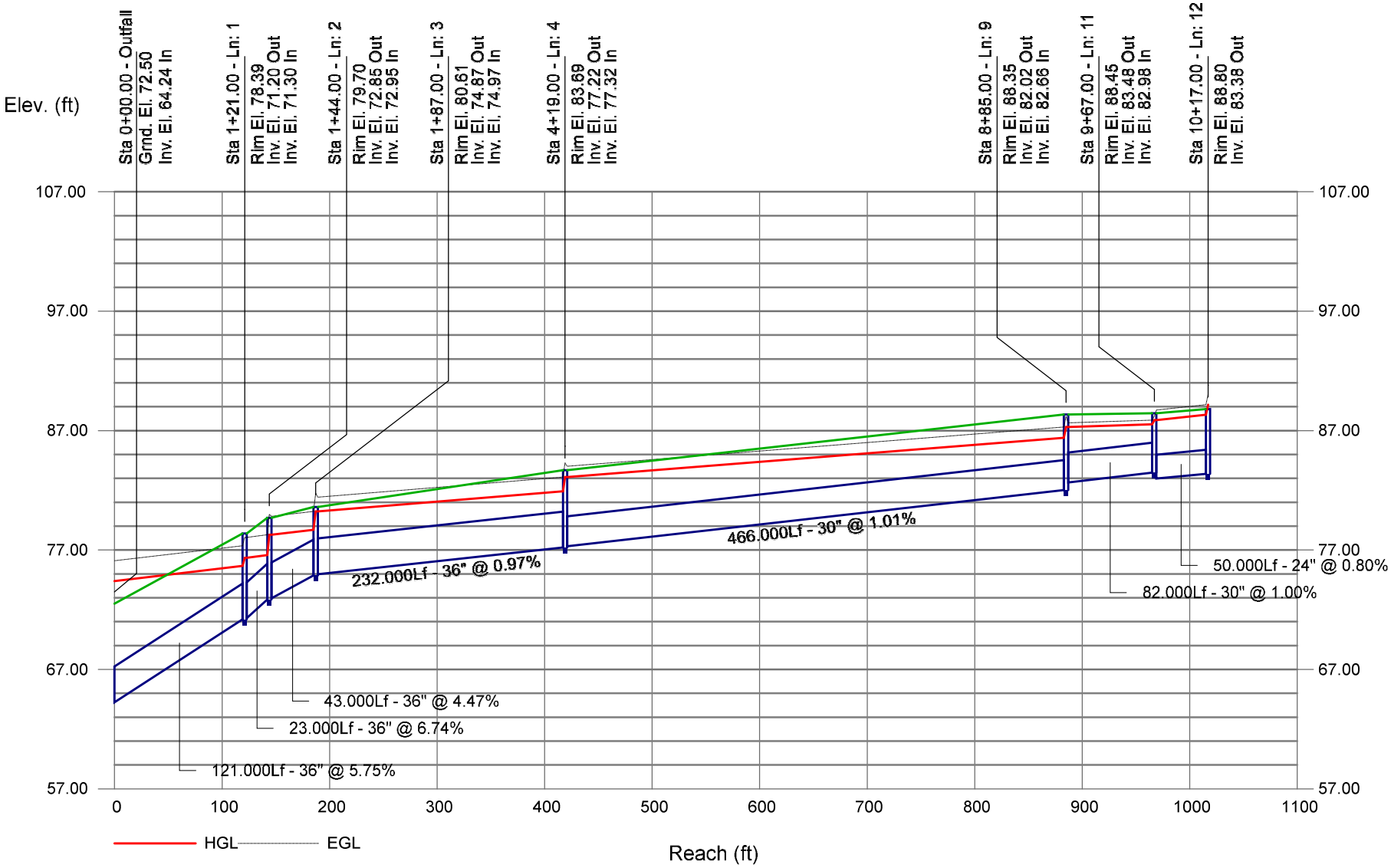
Line No.	Line ID	Flow Rate (cfs)	Line Size (in)	Line Type	Line Length (ft)	Gnd/Rim El Up (ft)	Invert Up (ft)	Invert Dn (ft)	Line Slope (%)	HGL Dn (ft)	HGL Up (ft)	DnStm Ln No	Junct Type
1	Outfall	73.99	36	Cir	121.000	78.39	71.20	64.24	5.75	74.39	75.66	Outfall	MH
2	Barstow Ave.	73.99	36	Cir	23.000	79.70	72.85	71.30	6.74	76.34	76.58	1	MH
3	Barstow Ave.	70.22	36	Cir	43.000	80.61	74.87	72.95	4.47	78.29	78.69	2	MH
4	Barstow Ave.	61.72	36	Cir	232.000	83.69	77.22	74.97	0.97	80.23	81.92	3	MH
5		7.40	18	Cir	30.630	83.75	80.47	77.99	8.10	83.11	83.24	4	Comb.
6	Oakland Meadows	3.77	18	Cir	160.000	85.30	81.97	73.75	5.14	78.29	82.71 j	2	Comb.
7		8.50	18	Cir	5.000	80.54	77.12	75.53	31.80	80.23	80.26	3	Comb.
8	Oakland Ave.	17.00	18	Cir	36.000	84.66	80.76	77.99	7.69	83.11	83.91	4	Comb.
9		37.32	30	Cir	466.000	88.35	82.02	77.32	1.01	83.11	86.40	4	MH
10	Alameda N.	14.04	24	Cir	40.000	89.82	85.37	82.02	8.38	87.29	87.43	9	Comb.
11	Barstow Ave.	23.28	30	Cir	82.000	88.45	83.48	82.66	1.00	87.29	87.52	9	MH
12	Alameda S.	23.28	24	Cir	50.000	88.80	83.38	82.98	0.80	87.87	88.32	11	Generic

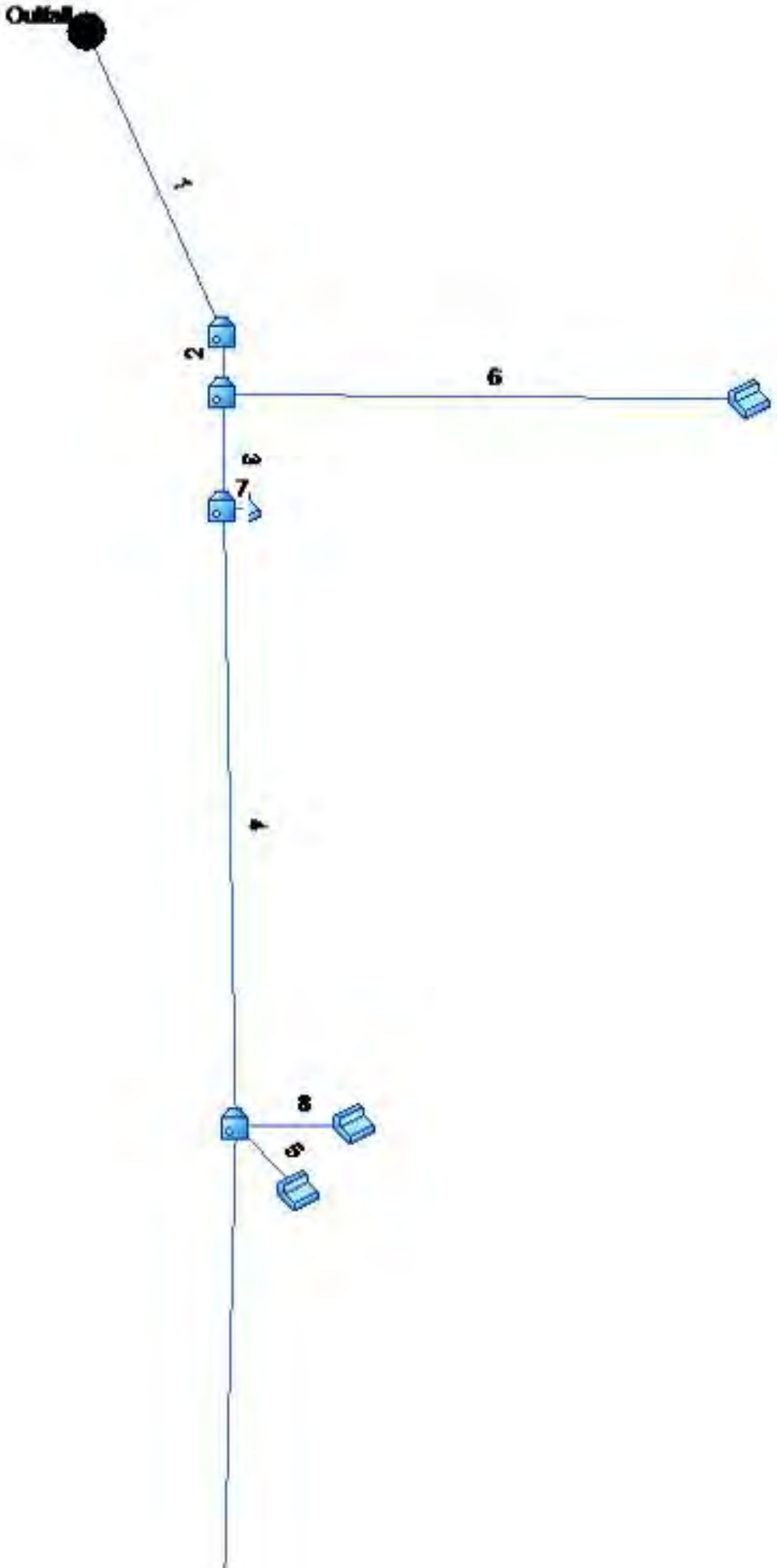
Project File: Barstow SD No dev. flows.stm | Number of lines: 12 | Date: 11/8/2018

NOTES: ** Critical depth

Storm Sewer Profile

Proj. file: Barstow SD No dev. flows.stm

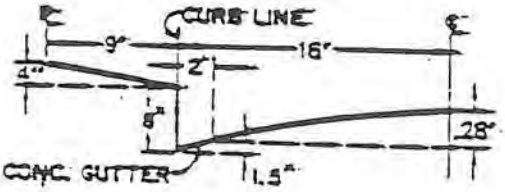



Outfall
1
2
6
3
7
4
8
5


9
10
11
12

GRATING CAPACITIES FOR TYPE "A", "C" and "D"

GRATING & GUTTER PLAN



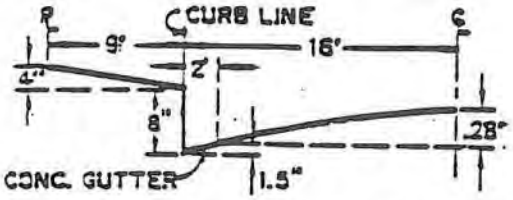
TYPICAL HALF STREET SECTION
(ABOVE BASIN)

D = DEPTH OF FLOW (FT.) ABOVE NORMAL GUTTER GRADE

S = .007
AP- 4
Q = 27.90, d = 0.69'

GRATING CAPACITIES FOR TYPE DOUBLE A, "C," AND "D"

GRATING & GUTTER PLAN



TYPICAL HALF STREET SECTION
(ABOVE BASIN)

S = 0.007

AP-3

Q = 15.58, d = 0.57

APPENDIX D As-builts and Report Excerpts

TABLE A-7 (cont.) NORTH DOMINGO BACA FUTURE CONDITION					
Sub-basin	**Area (sq. mi.)**	**10-yr Vol (ac-ft)**	**10-yr Qp (cfs)**	**100-yr Vol (ac-ft)**	**100-yr Qp (cfs)**
922.0	.0210	.713	17.26	1.462	33.77
922.1	.0070	.412	10.43	1.443	41.55
922.2	.0148	.784	21.04	1.396	35.69
922.3	.0415	2.199	58.97	3.913	100.03
923.0	.0070	.515	12.15	.844	19.32
924.2	.0250	1.487	38.43	2.588	64.23
924.1	.0190	1.130	29.21	1.967	48.82
924.3	.0270	1.593	41.20	2.753	68.50
924.4	.0172	1.006	25.91	1.741	43.28
925.3	.0105	.6140	15.82	1.063	26.43
925.4	.0370	2.255	58.52	3.887	96.45
926.0	.0578	3.381	87.05	5.850	145.40
926.1	.0120	.709	18.12	1.228	30.38
929.0	.0240	1.658	41.00	2.752	65.77
930.0	.0850	4.874	125.30	8.468	211.88
931.0	.0605	3.878	66.31	6.529	109.47
932.1	.0073	.450	11.58	.766	19.08
932.2	.0073	.450	11.46	.766	18.89
932.3	.0313	1.928	49.09	3.284	80.93
932.4	.0574	3.605	91.59	6.135	150.03
934.1	.1031	5.911	151.58	10.243	257.43
935.0	.1100	5.401	143.08	9.731	254.57
937.0	.0452	2.592	66.86	4.491	112.45

TABLE A-9 LA CUEVA ARROYO FUTURE CONDITIONS					
Sub-basin	**Area (sq. mi.)**	**10-yr Vol (ac-ft)**	**10-yr Qp (cfs)**	**100-yr Vol (ac-ft)**	**100-yr Qp (cfs)**
110.0	.1634	5.774	138.24	11.738	275.61
111.0	.0533	1.823	57.02	3.739	108.83
111.1	.0500	2.054	57.41	7.699	195.97
111.3	.0420	2.498	64.56	4.348	107.90
111.4	.0141	0.482	15.09	0.989	28.80
112.1	.0894	5.152	129.98	8.942	219.11
112.2	.0826	4.760	120.22	8.262	202.31
113.0	.1000	6.393	159.65	10.797	262.65
115.0	.1202	7.581	189.15	12.750	312.21
116.1	.1028	6.570	164.05	11.100	270.05
116.2	.0719	4.529	113.32	7.629	185.54
116.21	.0344	1.682	45.58	3.024	79.13
117.2	.0500	2.788	72.23	4.836	121.61
117.22	.0156	1.108	27.22	1.820	43.06
117.3	.1172	6.536	167.85	11.336	286.33
117.4	.0512	3.225	80.83	5.432	132.07
117.5	.0550	3.907	95.92	6.417	151.76

N

1000 0 500 1000

(IN FEET)

LEGEND

107.1 SUBBASIN DESIGNATION

SUBBASIN BOUNDARY

EXISTING PLATTING

EXISTING ARROYO FLOW PATH

AP 107.29 (8756 cfs) ANALYSIS POINT AND FUTURE CONDITION FLOW RATE

* FLOW RATE NOT BULKED FOR SEDIMENT

2 POTENTIAL AVULSION LOCATION

MUNICIPAL LIMITS

NORTH ALBUQUERQUE ACRES
MASTER DRAINAGE PLAN

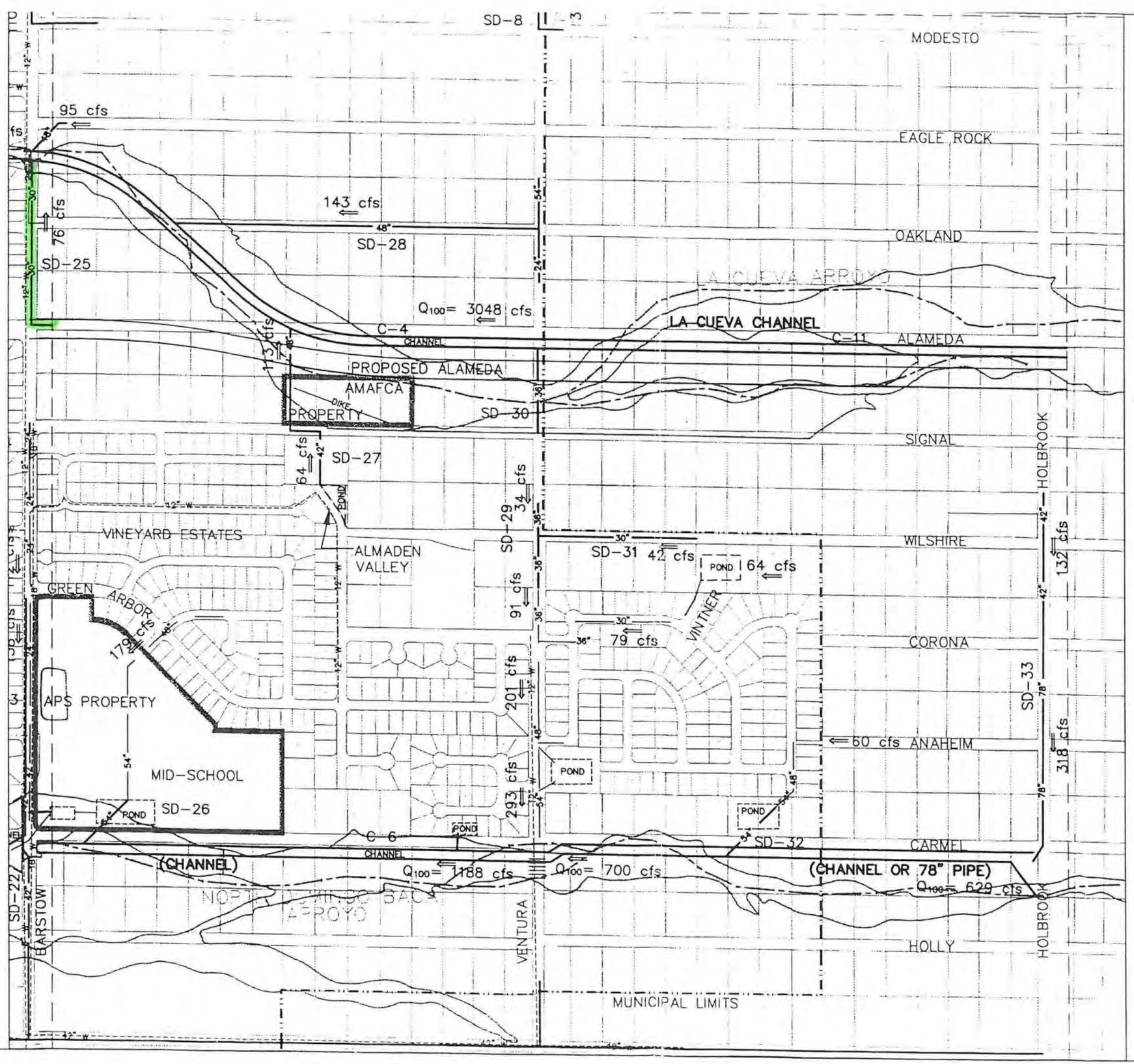
FUTURE CONDITION

FIGURE 4A

CITY OF ALBUQUERQUE
PUBLIC WORKS DEPARTMENT

CITY OF Albuquerque

Resource Technology, Inc.
Civil Engineering
Environmental Sciences
Water Resources
Landscape Architecture
Planning
1720 - B Randolph Road SE
Albuquerque, New Mexico 87106
E-mail: rti@rtinc.com
Telephone: (505) 243-7300
Facsimile: (505) 243-7400



N

500 0 250 500

(IN FEET)

LEGEND

- MUNICIPAL LIMITS
- EXISTING PLATTING
- EXISTING ARROYO FLOW PATH
- 10" W — EXISTING WATER LINE
- 10" SAS — EXISTING SANITARY SEWER
- 12" VHP — EXISTING GAS LINE
- 78" — EXISTING STORM DRAIN
- 54" — PROPOSED STORM DRAIN
- CHANNEL — PROPOSED CHANNEL
- PROPOSED STRUCTURE OR ROAD
- PROPOSED DIKE
- #5 AV-5 — POTENTIAL AVULSION

NOTE:
All flow rates shown are future condition 100-year.

NORTH ALBUQUERQUE ACRES
MASTER DRAINAGE PLAN

STORM DRAIN FACILITIES C-20

FIGURE 5F

CITY OF ALBUQUERQUE
PUBLIC WORKS DEPARTMENT

CITY OF Albuquerque

Resource Technology, Inc.
Civil Engineering
Environmental Sciences
Water Resources
Landscape Architecture
Planning
1720 - B Randolph Road SE
Albuquerque, New Mexico 87106
E-mail: rti@nmia.com
Telephone (505) 243-7300
Facsimile (505) 243-7400

D:\data\97-080\BASPRP 10-22-97 8:35:36 am EST

STREET FLOW CONSIDERATIONS:

Oakland Meadows Subdivision: NE corner of Oakland & Barstow NE

C30 - D43

IN A NUTSHELL: Qpeak-100year to the proposed inlet is 4.64 cfs. For the given half street section of 30' CL to FC and a slope of 1.41%, the calculated depth is 0.34' (4-1/8"). A normal Type A inlet will handle 4.64 cfs at a normal street depth of 0.39', while a Double A (2 grates + the "sweeper" opening) will handle it at 0.37'. Either should work fairly well. Either inlent could be recessed back toward the sidewalk to create extra head over the inlet thereby increasing its capacity.

GENERAL DISCUSSION:
Most data below are approximate, taken by Per Se Engineering from paper print of the Oakland Meadows Grading & Drainage plan dated 3-14-2003.

The west half of Barstow is paved for a little over 200' north of the intersection (where the pavement stops shortly before the arroyo) and the entire street is paved south of the intersection. The south half of Oakland is paved east of the intersection for several hundred feet (stopping near the arroyo, which runs diagonally) and all of Oakland is paved west of the intersection. There is a water block (high point) west of the intersection; this shows up on the ground and in site photos but may not be apparent from either photo-topo (not accurate enough?) or site topo (didn't extend that far).

There are 2 "Double A" (double grate plus sweeper opening) existing inlets on the south side of Oakland east of Barstow and 1 on the east side of Barstow south of Oakland. There are no inlets nearby on the west side of Barstow. This analysis <u>assumes</u> that these inlets are adequate to handle their respective upstream-same-side-of-street flows. In reality there is typically some bypass for all inlets.

Although not part of this analysis, it is Per Se Engineering's suggestion that the proposed new inlet on the east side of Barstow north of Oakland be recessed from the flowline to increase the performance of the inlet, particularly for low flows. Recessing the inlet so the back of inlet concrete butted against face of side walk could add approximately 0.04' to 0.11' (1/2" to 2-3/8") of head to the inlet, plus drawing more water to the inlet.

ASSUME travel times are smaller than time of concentration for such a small area. Use DPM small watershed hydrology methods (no routing) and add appropriate flows to get peak flows.

TUCKER A. GREEN 10731 NEW MEXICO REGISTERED PROFESSIONAL ENGINEER

4-3-02

BARSTOW NE:
80' ROW, ½ section 40', 30' paving to <u>face</u> of curb, standard 8" curb & gutter included in that 30', 6' sidewalk at PL leaves apx 5.37' say 5' "dirt" (5/40 = 1/8 = 0.125 = 12.5%) between SW and <u>back</u> of curb. 25' radius at PL, 25' radius at FC at NE corner of Oakland. Design slope 1.41%. Total contributing ROW = 9265 sf.

New inlet will be apx 200' N of Oakland CL (170' N of subdiv S PL)

OAKLAND NE:
60' ROW, ½ section 30', 20' paving to face of curb, standard 8" curb & gutter included in that 20', 4' sidewalk at PL leaves apx 5.37' say 5' "dirt" (5/30 = 1/6 = 16.67 apx 17%) between SW and back of curb. 25' radius at PL, 25' radius at FC at NE corner of Oakland AND at Cul de Sac (CS). Existing slope varies: apx 5.13% on east (upstream), 2.89% west of CS. Including the entrance to the Cul de Sac, 9781 sf of ROW contributing.

CUL DE SAC:
33' "ROW", 24' FC to FC (including apx 18" C&G, prob. mountable) then SW to "ROW" each side, 25' radius at PL, 25' radius at FC at Oakland, high point apx 12' N of curb return from Oakland (based on P&P for CS). Somewhat less than ½ of Lot 4 (the 100' wide southeast lot) and ¼ of Lot 1 (the 78' wide southwest lot) - not including the driveway of either drain to this part of the CS. This part of the CS "ROW" is included in "OAKLAND" above.

OAKLAND MEADOWS SUBDIV:
Lots 1 & 2 drain through/under the wall to Barstow. Each lot has a 50'L x 40'W (2000sf) pad shown. Taking the dividing line as the middle of the pad westward, each lot has 78*75 = 5850 sf draining to Barstow, neglecting any "bite" taken by curved ROW at street intersections. From the typical site layout, directly applicable to Lots 1 & 2, this area contains (1) half the building pad (1000sf) = Trt D; (2) 1400 sf of lawn = Trt B; (3) roughly 120 sf of CMU wall as Trt D; and (4) the rest as native landscaping, Trt A. Trt D as an actual percent then = (1000+120)/5850 = 19.15% and Trt B = 1400/5850 = 23.93%. For calculation use 24% = 1404sf D and 26% = 1521sf B leaving 50% = 2925 sf A for each lot (use total area = 11,700 for both lots, a little more than actual)..

Use these same percentages for the portions of Lots 1 & 4 which drain to Oakland. Lot 1 SE corner = 1902 sf: 24% D apx 456, 26% B = apx 496sf, leaving apx 1360sf A. Lot 4 south "half" = 6190sf: apx 1486 D, apx 1609 B, leaving apx 3095 sf A.

REMAINING DEVELOPABLE AREA east of site on N side of Oakland draining past site. (Get info from copy of drawing [oakbarh3->oakbarh4] for La Cueva arroyo flood plain analysis, w/assumptions.) Use same percentage A, B, D as for OAKLAND and SUBDIV.

Apx 20,5000sf developable.
Apx 10,560 developable to Oakland: 24% = 2534sf D, 26% = 2746sf B, 50% = 5280sf A.
Apx 6300sf of N side of Oakland drains to Barstow: 17% = 1071sf B, 9489sf = D.

ALBUQUERQUE, NM (1/93) CRITERIA - SIMPLE PROCEDURE FOR <= 40 ACRES
PX100-6 = PRECIPITATION EXCESS FROM 100-YEAR 6-HOUR STORM
VOL10D = VOLUME OF RUNOFF FROM 100-YEAR 10-DAY STORM
TRTMT CLASS A=UNDISTURBED, B=LAWNS, C=UNPAVED ROADS, D=ROOFS,PAVEMENT: SEE DPM 22.2 P A-5

****** PROJECT INFO ******
OAK-BAR FLOW IN STREET - SEE SEPARATE SHEET FOR DISCUSSION
CALC SEQUENTIAL SMALL AREAS SEPARATELY, ADD (OK BECAUSE Time odf Concentration IS SMALL)
** ALL FLOWS ARE FOR DEVELOPED CONDITIONS **
AREAS BY AUTOCAD POLYLINES

RAIN ZONE 3 SEE DPM P 22.2-2
100-YEAR PRECIPTATION (P) DEPTHS, INCHES

1 HR	6 HR	24 HR	4 DAY	10 DAY
2.14	2.6	3.1	3.95	4.9

DEVELOPABLE PART OF LOT TO EAST OF SITE THAT REASONABLY MIGHT DRAIN TO OAKLAND — SF TOTAL 10,560

TRTMT CLASS	AREA SQUARE FEET	AREA ACRES	PX100-6 IN/AC	QP100-6 CFS/AC	QP100-6 CFS	VOL6HR AC-FT	VOL1D AC-FT	VOL4D AC-FT	VOL10D AC-FT	TRTMT PERCENT
A	5,280.0	0.1212	0.66	1.87	0.227	0.007	0.007	0.007	0.007	50.00
B	2,746.0	0.0630	0.92	2.60	0.164	0.005	0.005	0.005	0.005	26.00
C	0.0	0.0000	1.29	3.45	0.000	0.000	0.000	0.000	0.000	0.00
D	2,534.0	0.0582	2.36	5.02	0.292	0.011	0.014	0.018	0.023	24.00
TOTAL	10,560	0.2424	AVG Q/AC=	2.816	0.683	0.023	0.025	0.029	0.034	100.00
	SQ MI=>	0.000379			CU FT=>	999	1105	1284	1485	<=CU FT
			Cumulative Total, CFS		**0.683**					

N HALF OF OAKLAND ROW OPPOSITE DEVELOPABLE PART OF LOT TO EAST OF SITE, ETC. — SF TOTAL 6,300

TRTMT CLASS	AREA SQUARE FEET	AREA ACRES	PX100-6 IN/AC	QP100-6 CFS/AC	QP100-6 CFS	VOL6HR AC-FT	VOL1D AC-FT	VOL4D AC-FT	VOL10D AC-FT	TRTMT PERCENT
A	0.0	0.0000	0.66	1.87	0.000	0.000	0.000	0.000	0.000	0.00
B	1,071.0	0.0246	0.92	2.60	0.064	0.002	0.002	0.002	0.002	17.00
C	0.0	0.0000	1.29	3.45	0.000	0.000	0.000	0.000	0.000	0.00
D	5,229.0	0.1200	2.36	5.02	0.603	0.024	0.029	0.037	0.047	83.00
TOTAL	6,300	0.1446	AVG Q/AC=	4.609	0.667	0.025	0.030	0.039	0.049	100.00
	SQ MI=>	0.000226			CU FT=>	1110	1328	1699	2113	<=CU FT
			Cumulative Total, CFS		**1.349**					

PORTION OF OAKLAND MEADOWS SUBDIV DRAINING TO OAKLAND RD. — SF TOTAL 8,092

TRTMT CLASS	AREA SQUARE FEET	AREA ACRES	PX100-6 IN/AC	QP100-6 CFS/AC	QP100-6 CFS	VOL6HR AC-FT	VOL1D AC-FT	VOL4D AC-FT	VOL10D AC-FT	TRTMT PERCENT
A	4,045.0	0.0929	0.66	1.87	0.174	0.005	0.005	0.005	0.005	49.99
B	2,105.0	0.0483	0.92	2.60	0.126	0.004	0.004	0.004	0.004	26.01
C	0.0	0.0000	1.29	3.45	0.000	0.000	0.000	0.000	0.000	0.00
D	1,942.0	0.0446	2.36	5.02	0.224	0.009	0.011	0.014	0.017	24.00
TOTAL	8,092	0.1858	AVG Q/AC=	2.816	0.523	0.018	0.019	0.023	0.026	100.00
	SQ MI=>	0.000290			CU FT=>	766	847	984	1138	<=CU FT
			Cumulative Total, CFS		**1.872**					

3

N HALF OF OAKLAND ROW OPPOSITE OAKLAND MEADOWS SUBDIV — SF TOTAL 9,781

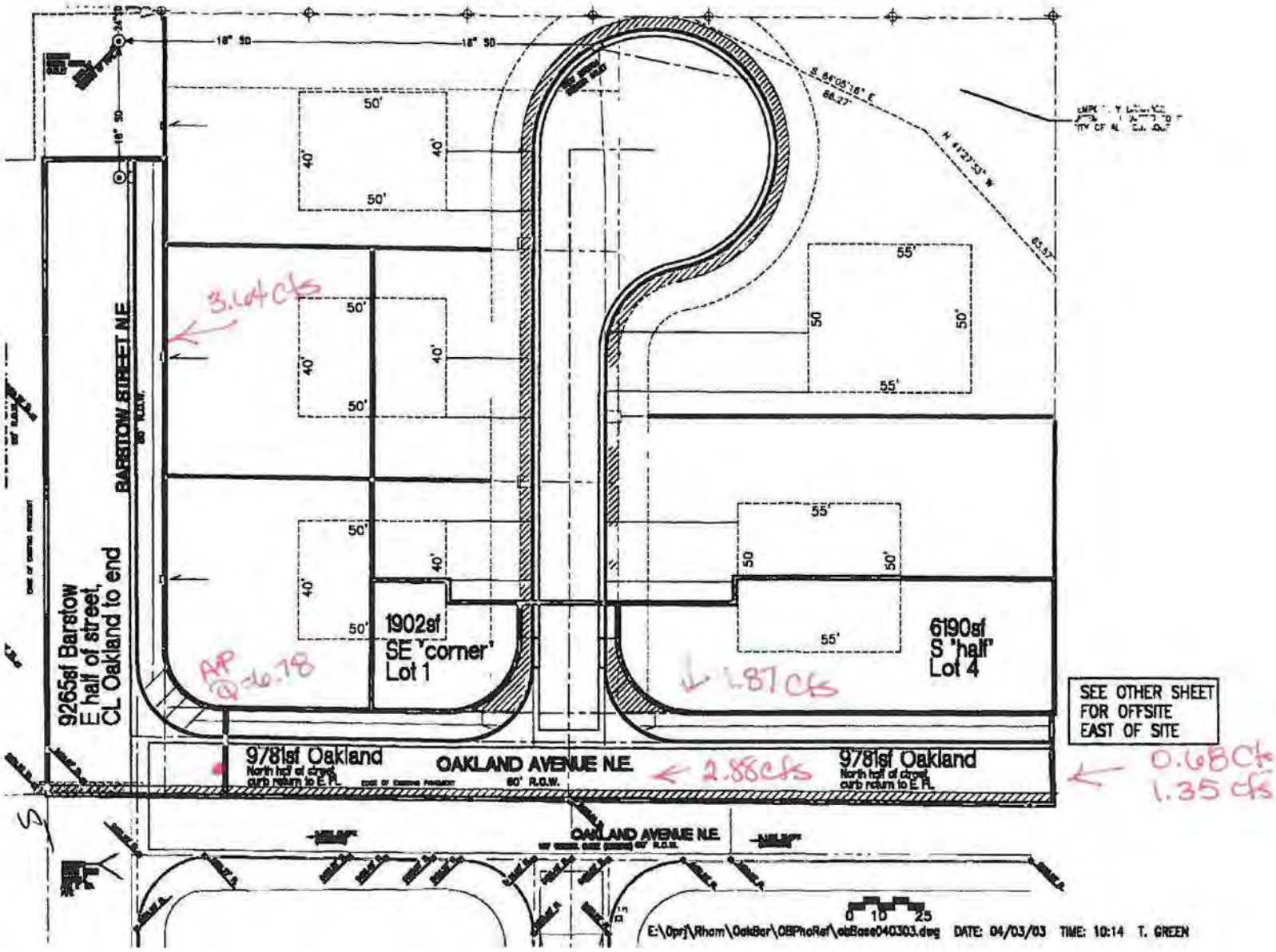
TRTMT CLASS	AREA SQUARE FEET	AREA ACRES	PX100-6 IN/AC	QP100-6 CFS/AC	QP100-6 CFS	VOL6HR AC-FT	VOL1D AC-FT	VOL4D AC-FT	VOL10D AC-FT	TRTMT PERCENT
A	1,663.0	0.0382	0.66	1.87	0.071	0.002	0.002	0.002	0.002	17.00
B	0.0	0.0000	0.92	2.60	0.000	0.000	0.000	0.000	0.000	0.00
C	0.0	0.0000	1.29	3.45	0.000	0.000	0.000	0.000	0.000	0.00
D	8,118.0	0.1864	2.36	5.02	0.936	0.037	0.044	0.058	0.072	83.00
TOTAL	9,781	0.2245	AVG Q/AC=	4.484	1.007	0.039	0.047	0.060	0.074	100.00
	SQ MI=>	0.000351			CU FT=>	1688	2026	2601	3244	<=CU FT
			Cumulative Total, CFS		2.879					

PORTION OF OAKLAND MEADOWS DRAINING TO BARSTOW AT YARD WALLS — SF TOTAL 11,700

TRTMT CLASS	AREA SQUARE FEET	AREA ACRES	PX100-6 IN/AC	QP100-6 CFS/AC	QP100-6 CFS	VOL6HR AC-FT	VOL1D AC-FT	VOL4D AC-FT	VOL10D AC-FT	TRTMT PERCENT
A	5,850.0	0.1343	0.66	1.87	0.251	0.007	0.007	0.007	0.007	50.00
B	3,042.0	0.0698	0.92	2.60	0.182	0.005	0.005	0.005	0.005	26.00
C	0.0	0.0000	1.29	3.45	0.000	0.000	0.000	0.000	0.000	0.00
D	2,808.0	0.0645	2.36	5.02	0.324	0.013	0.015	0.020	0.025	24.00
TOTAL	11,700	0.2686	AVG Q/AC=	2.816	0.756	0.025	0.028	0.033	0.038	100.00
	SQ MI=>	0.000420			CU FT=>	1107	1224	1423	1645	<=CU FT
			Cumulative Total, CFS		3.635					

E HALF OF BARSTOW OPPOSITE OAKLAND MEADOWS — SF TOTAL 9,265

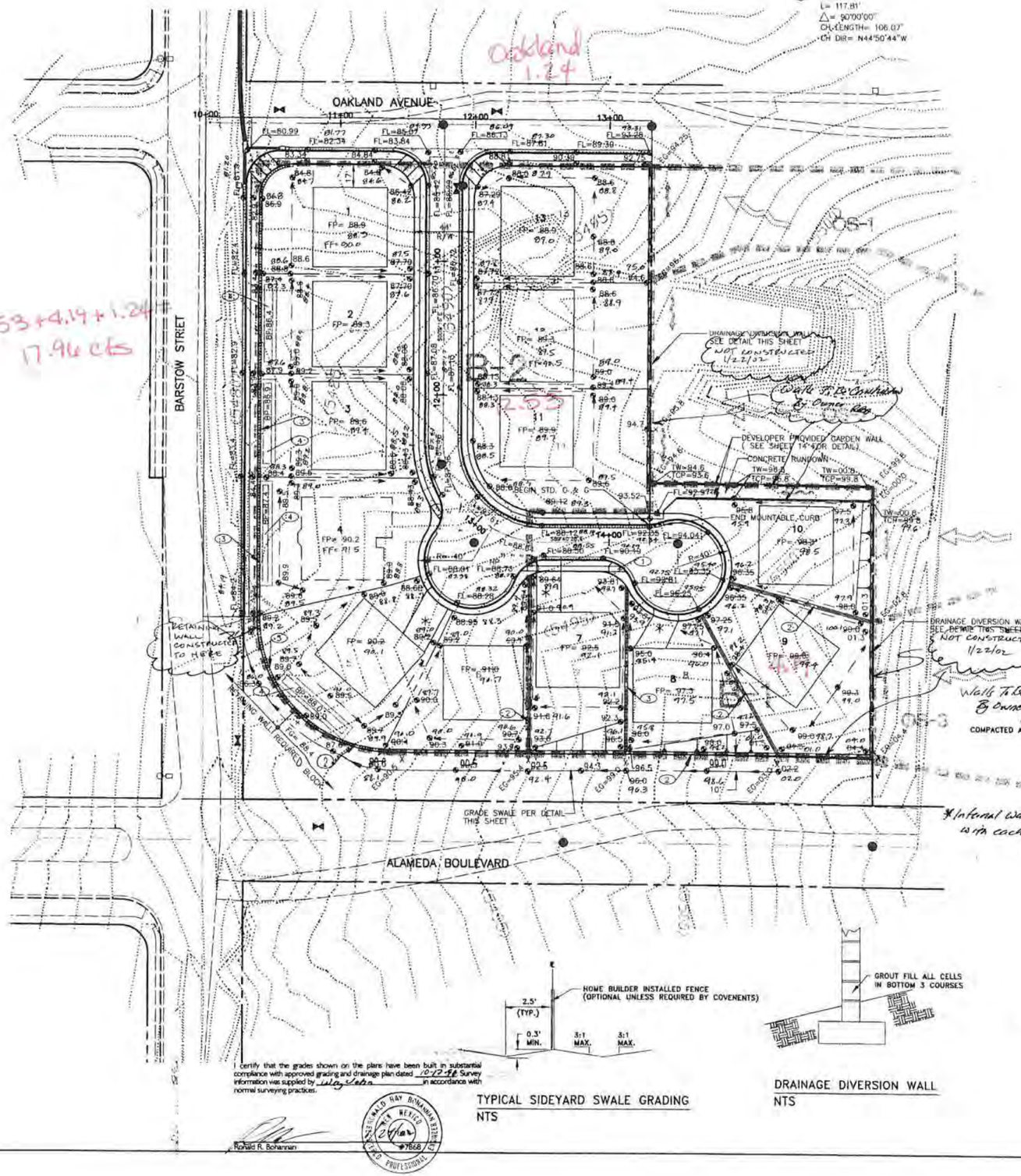
TRTMT CLASS	AREA SQUARE FEET	AREA ACRES	PX100-6 IN/AC	QP100-6 CFS/AC	QP100-6 CFS	VOL6HR AC-FT	VOL1D AC-FT	VOL4D AC-FT	VOL10D AC-FT	TRTMT PERCENT
A	0.0	0.0000	0.66	1.87	0.000	0.000	0.000	0.000	0.000	0.00
B	1,158.0	0.0266	0.92	2.60	0.069	0.002	0.002	0.002	0.002	12.50
C	0.0	0.0000	1.29	3.45	0.000	0.000	0.000	0.000	0.000	0.00
D	8,107.0	0.1861	2.36	5.02	0.934	0.037	0.044	0.058	0.072	87.50
TOTAL	9,265	0.2127	AVG Q/AC=	4.718	1.003	0.039	0.046	0.060	0.074	100.00
	SQ MI=>	0.000332			CU FT=>	1683	2021	2595	3237	<=CU FT
			Cumulative Total, CFS		4.639					


BARSTOW STREET N.E.
9265sf Barstow
E half of street,
CL Oakland to end
1902sf
SE "corner"
Lot 1
6190sf
S "half"
Lot 4
9781sf Oakland
North half of street,
curb return to E.P.L.
OAKLAND AVENUE N.E.
80' R.O.W.
9781sf Oakland
North half of street,
curb return to E.P.L.
OAKLAND AVENUE N.E.
3.64 cfs
AP @ 16.78
1.87 cfs
2.88 cfs
SEE OTHER SHEET
FOR OFFSITE
EAST OF SITE
0.68 cfs
1.35 cfs
0 10 25
E:\0prj\Rham\OakBar\OBPhoRef\obBase040303.dwg DATE: 04/03/03 TIME: 10:14 T. GREEN

Pico La Cuera (C00 - D15)

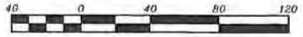
'SUMMARY OF HYDROLOGIC DATA FOR BASINS

BASIN	AREA (SM)	FLOWS IN CFS EXISTING	DEVELOPED
OS-1	0.0007	1.58	1.82
OS-2	0.0034	7.64	8.78
OS-3	0.0014	3.36	3.36
B-1	0.0016	3.60	4.19
B-2	0.0048	10.79	12.53
OAKLAND AVE ROW	0.0004	0.91	1.24
ALAMEDA BLVD ROW	0.0018	5.32	5.32
BARSTOW STREET ROW	0.0014	4.42	4.42

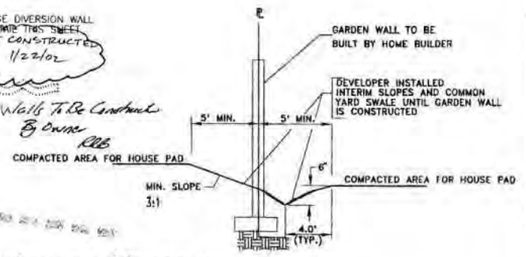


VICINITY MAP C-20-Z

NO SCALE



SCALE: 1" = 40 FEET



TYPICAL SIDE YARD SECTION @ GARDEN WALLS

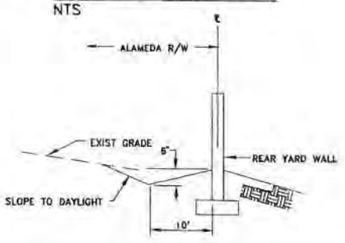
NTS

TYPICAL SIDEYARD SWALE GRADING

NTS

DRAINAGE DIVERSION WALL

NTS



TEMPORARY ALAMEDA BLVD. SWALE

NTS

I certify that the grades shown on the plans have been built in substantial compliance with approved grading and drainage plan dated 10-17-96 Survey information was supplied by Isla Geba in accordance with normal surveying practices.

Ronald R. Bohannan

NEW MEXICO 7868 REGISTERED PROFESSIONAL ENGINEER

LEGAL DESCRIPTION:

LOTS 1,2,30,31,AND 32, BLOCK 3, NORTH ALBUQUERQUE ACRES, TOWNSHIP 11 NORTH, RANGE 4 EAST, SECTION 17, CITY OF ALBUQUERQUE, BERNALILLO COUNTY, NEW MEXICO

ADDRESS:

SOUTHEAST CORNER OF BARSTOW STREET AND OAKLAND AVENUE, NORTH OF ALAMEDA BLVD.

GENERAL NOTES:

A) PRIOR TO ANY EXCAVATION, CONTRACTOR MUST CONTACT NEW MEXICO ONE CALL AT 1-800-321-2537 FOR LOCATION AND BLUESTAKING OF EXISTING UTILITIES

B) CONTRACTOR MUST SECURE A TOPSOIL DISTURBANCE PERMIT PRIOR TO STARTING CONSTRUCTION.

C) CONTRACTOR SHALL ENSURE THAT NO SOIL ERODES FROM THE SITE INTO PUBLIC R/W OR ONTO PRIVATE PROPERTY. THIS CAN BE ACHIEVED BY CONSTRUCTING TEMPORARY BERMS AT THE PROPERTY LINES AND WETTING THE SOIL TO KEEP IT FROM BLOWING

D) THE CONTRACTOR SHALL PROMPTLY CLEAN UP ANY MATERIAL EXCAVATED WITHIN THE PUBLIC R/W SO THAT THE EXCAVATED MATERIAL IS NOT SUSCEPTIBLE TO BEING WASHED DOWN THE STREET

E) DISTURBED AREAS WILL BE RESEEDED PER C.O.A. SPECIFICATION SECTION 1012

KEYED NOTES:

1. TRANSITION FROM MOUNTABLE TO STD. CURB
2. GARDEN WALL PER DETAIL THIS SHEET
3. RETAINING WALL
4. TYPICAL POND DEPTH= 1'

NOTE:

ALL ROOF AREAS MUST DRAIN TO STREET R/W

LEGEND:

- = FLOW DIRECTION
- = HISTORIC FLOW DIRECTION
- B-1 = ON-SITE DRAINAGE BASIN LABEL
- OS-1 = OFF-SITE BASIN LABEL
- = MOUNTABLE CURB & GUTTER
- = STANDARD CURB & GUTTER
- = REQUIRED GARDEN WALL
- = RETAINING WALL
- = DRAINAGE DIVERSION WALL
- (5405) = EXISTING CONTOUR
- FG=11.0 = PROPOSED SPOT ELEVATION
- FL = FLOWLINE
- TC = TOP OF CURB
- FF = FINISHED PAD
- EG = EXISTING GRADE
- TW = TOP OF WALL
- * = MANDATORY DRIVEWAY LOCATION

Crawford Development Services
Founded 1989
PROFESSIONAL CIVIL ENGINEER REGISTERED IN NM, CA & AZ

Stephen L. Crawford, P.E.
(505)865-6442
3634 HIGHWAY 47, PERALTA, NM 87031

AS BUILT INFORMATION
CONTRACTOR
WORK BY
INSPECTED
ACCEPTANCE BY
DATE
AS-BUILTED BY
DATE
COMMENCED BY
DATE

MICRO-FILM INFORMATION
RECORDED BY
DATE
NO.

BENCH MARKS
ELEVATION SHOWN ARE BASED ON CITY OF ALBUQUERQUE CONTROL MONUMENT "1-B30" LOCATED AT THE NORTHEASTERLY CORNER O MODESTO AND BARSTOW AND TRANSFERED TO PROJECT AREA BY GPS SURVEY USING TRIMBLE 4000 SE GLOBAL POSITIONING EQUIPMENT.
ELEVATION= 5374.43

SURVEY INFORMATION
FIELD NOTES
NO. | BY | DATE

ENGINEER'S SEAL
NEW MEXICO 7868 REGISTERED PROFESSIONAL ENGINEER
10-17-96

NO.	DATE	REMARKS	BY	
1	8/19/96	CHANGE DUE TO DEVELOPERS REQUEST	J.J.D.	

REVISIONS

DESIGN			
DESIGNED BY	J. DIPOLLINO	DATE	OCT., 1996
DRAWN BY	A. MARTINEZ	DATE	OCT., 1996
CHECKED BY	S. CRAWFORD	DATE	OCT., 1996

CITY OF ALBUQUERQUE
PUBLIC WORKS DEPARTMENT
ENGINEERING DEVELOPMENT GROUP

TITLE: *PICO LA CUEVA SUBDIVISION*
GRADING & DRAINAGE PLAN

Design Review Committee	City Engineer Approval	Last Design Update	Mo./Day/Yr.	Mo./Day/Yr.
NOTE: THIS GRADING PLAN WAS APPROVED BY THE DRB ON SEPTEMBER 24TH 1996				

RECEIVED
JAN 24 2002
P&D DESIGN REVIEW

City Project No. 556781 | Zone Map No. C-20 | Sheet 3 Of 14

THIS SHEET FOR INFORMATION ONLY

9600BIG1.DWG PLOT DATE: OCT.17,1996

Cherne, Curtis

From: Cherne, Curtis
Sent: Wednesday, March 26, 2008 9:46 AM
To: 'Graeme Means'
Subject: RE: Hope Plaza

Graeme,
The revised basin, shifting 0.3 ac from basin 111.3 to 924.4 is acceptable. In addition, the land treatments you proposed are also acceptable. It would be helpful if you showed the basins on the plan.

Thanks.

Curtis Cherne, P.E.
Senior Engineer
Development and Building Services
Planning Department, COA
924-3695

From: Graeme Means [mailto:GMeans@highmesacg.com]
Sent: Tuesday, March 25, 2008 10:53 AM
To: Cherne, Curtis
Subject: FW: Hope Plaza

Attachments!

HIGH MESA Consulting Group

J. Graeme Means, P.E.
Principal

6010-B Midway Park Blvd. NE
Albuquerque, NM 87109
www.highmesacg.com

Phone: 505.345.4250
Fax: 505.345.4251
gmeans@highmesacg.com

-----Original Message-----
From: Graeme Means
Sent: Tuesday, March 25, 2008 11:52 AM
To: 'Cherne, Curtis '
Subject: Hope Plaza

Curtis,
I received your comments for C20/D064 (Copy attached). You estimate the split should be closer to 55/45 based on the NAA MDP, however, the Alameda Realignment results in about 0.5 acres being taken out of the site which skews the percentages of what I'm working with to a resultant appropriate split of 58/42 for the remaining area. I have revised the plan from the originally

proposed 80/20 drainage split between Signal and Alameda to result in a 64/36 split by sending more water out to Alameda. This is a lot closer to the appropriate split of 58/42 and is the best I can do given the site topography and site plan. The net result is about 0.3 acres of my site draining to Signal instead of Alameda.

Regarding the estimated total discharge of 22.5 cfs vs the proposed 25.8, the difference is that the MDP did not take into account the office zoning and assumed residential at 50% D as opposed to the 70% we have. As the designer of the North Domingo Baca Channel and being familiar with Barstow (60 ft f-f), I know that the channel has extra capacity (When I designed it in 1995 the AHYMO had a much bigger flow rate and that Barstow can carry a heck of a lot of water. I don't think the few extra cfs is that significant when looking at the big picture. All the upstream undeveloped land is zoned residential and I don't anticipate any other overages in the basin.

It was always my intention to include the sidewalk culverts to Alameda with the work order, and I should have shown them on the grading plan. I have added them now along with the roof flows. The entire rooftops for the offices go to the north to Alameda.

I'd like to resubmit with the 64/36 split and the above justification for the few extra cfs. Please review and let me know if this approach will work.

Thanks for your time.

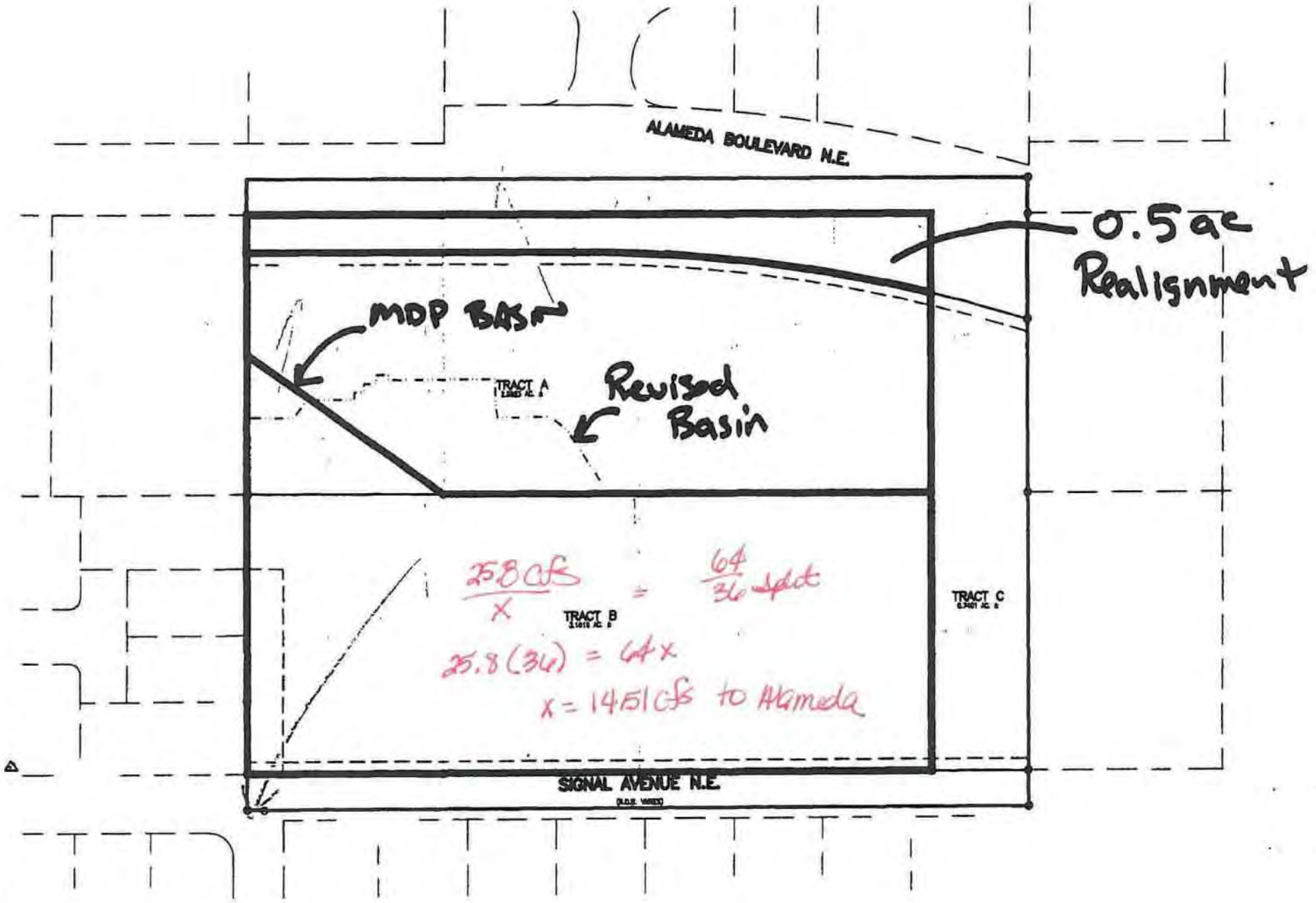
Graeme

HIGH MESA Consulting Group

J. Graeme Means, P.E.
Principal

6010-B Midway Park Blvd. NE
Albuquerque, NM 87109
www.highmesacg.com

Phone: 505.345.4250
Fax: 505.345.4254
gmeans@highmesacg.com


ALAMEDA BOULEVARD N.E.
0.5 ac Realignment
MDP BASIN
TRACT A
Revised Basin
258 cfs / X = 64 / 36 dot
TRACT B
TRACT C
25.8(36) = 64x
x = 145.1 cfs to Alameda
SIGNAL AVENUE N.E.

Clark Consulting Engineers
19 Ryan Road
Edgewood, New Mexico 87015
Tele: (505) 281-2444
Fax: (505) 281-2444

DATE: 4/20/02 fwc
PROJECT: Oakland Ct. Subd.
6-LOTS, Keeran
C-30, D-35

CALCULATIONS

DESIGN CRITERIA

HYDROLOGIC METHODS PER SECTION 22.2, HYDROLOGY OF THE DEVELOPMENT PROCESS MANUAL (DPM) REVISED JANUARY 1993 FOR CITY OF ALBUQUERUQUE, ADOPTED BY THE COUNTY OF BERNALILLO
DISCHARGE RATE: Q=QPEAK x AREA.."Peak Discharge Rates For Small Watersheds"
VOLUMETRIC DISCHARGE: VOLUME = EWeighted x AREA
P100 = 2.60 Inches, Zone 3 Time of Concentration, TC = 10 Minutes
DESIGN STORM: 100-YEAR/6-HOUR, 10-YEAR/6-HOUR [ ] = 10 YEAR VALUES

EXISTING CONDITIONS

PROJECT AREA = 1.78 ACRES, WHERE EXCESS PRECIP. 'A' =0.66 In. [0.19]
PEAK DISCHARGE, Q100 = 3.3 CFS [1.07], WHERE UNIT PEAK DISCHARGE 'A' = 1.9 CFS/AC. [0.60]
THEREFORE: VOLUME 100 = 4265 CF [1228]

DEVELOPED CONDITIONS DETERMINE LAND TREATMENTS, PEAK DISCHARGE AND VOLUMETRIC DISCHARGE FOR STUDY AREA - USE DPM TABLE A-5, MAX. IMPERVIOUS 'D'
N=3 D.U.s Per Acre (34% 'D')

	AREA	LAND TREATM'T	Q_{Peak}	E
UNDEVELOPED	--- Ac.	A	1.87[0.58]	0.66[0.19]
LANDSCAPING - 10% SL.	0.67 Ac.	B	2.60[1.19]	0.92[0.36]
COMPACTED SOIL & Slopes >	0.50 Ac.	C	3.45[2.00]	1.29[0.62]
ROOF - PAVEMENT	0.61 Ac.	D	5.02[3.39]	2.36[1.50]
	1.78 Ac.			

THEREFORE: $E_{Weighted}$ = 1.517 In.[0.82] &
Q100 = 6.5 FS — VOLUME 100 = 9802 CF
Q10 = 3.9 CFS — VOLUME 10 = 5298 CF

UNIT DISCHARGE = 6.5 CFS/1.78 AC. = 3.65 CFS/AC.
AND... 6.5 CFS/ 6 LOTS = 1.08 CFS Per LOT

UPSTREAM / DOWNSTREAM ANALYSIS

- TWO (2) EXISTING DROP INLETS ARE LOCATED AT THE ESE CURB RETURN OF BARSTOW AND OAKLAND ST. STORM RUN-OFF IS THEN CONVEYED VIA 24" DIA. RCP TO THE LA CUEVA CHANNEL AT THE ENTRANCE TO NOR ESTE SUBDIVISION. SINCE THE INTERSECTION IS AT THE LOWER END OF OVERALL BASIN, PROJECT RUN-OFF IS CONVEYED EARLY WITHIN OVERALL BASIN TIME TO PEAK, CAPACITY EXISTS.

- UPSTREAM ANALYSIS - SEE HEC-RAS WATER SURFACE MODEL OF LA CUEVA, attached/ ON FILE WITH CITY HYDROLOGY

  PER RTI STUDY, Q100 = 2796 CFS AT VENTURA ST.

EROSION SET BACK ANALYSIS - PER SEDIMENT EROSION DESIGN GUIDE (SEDG)

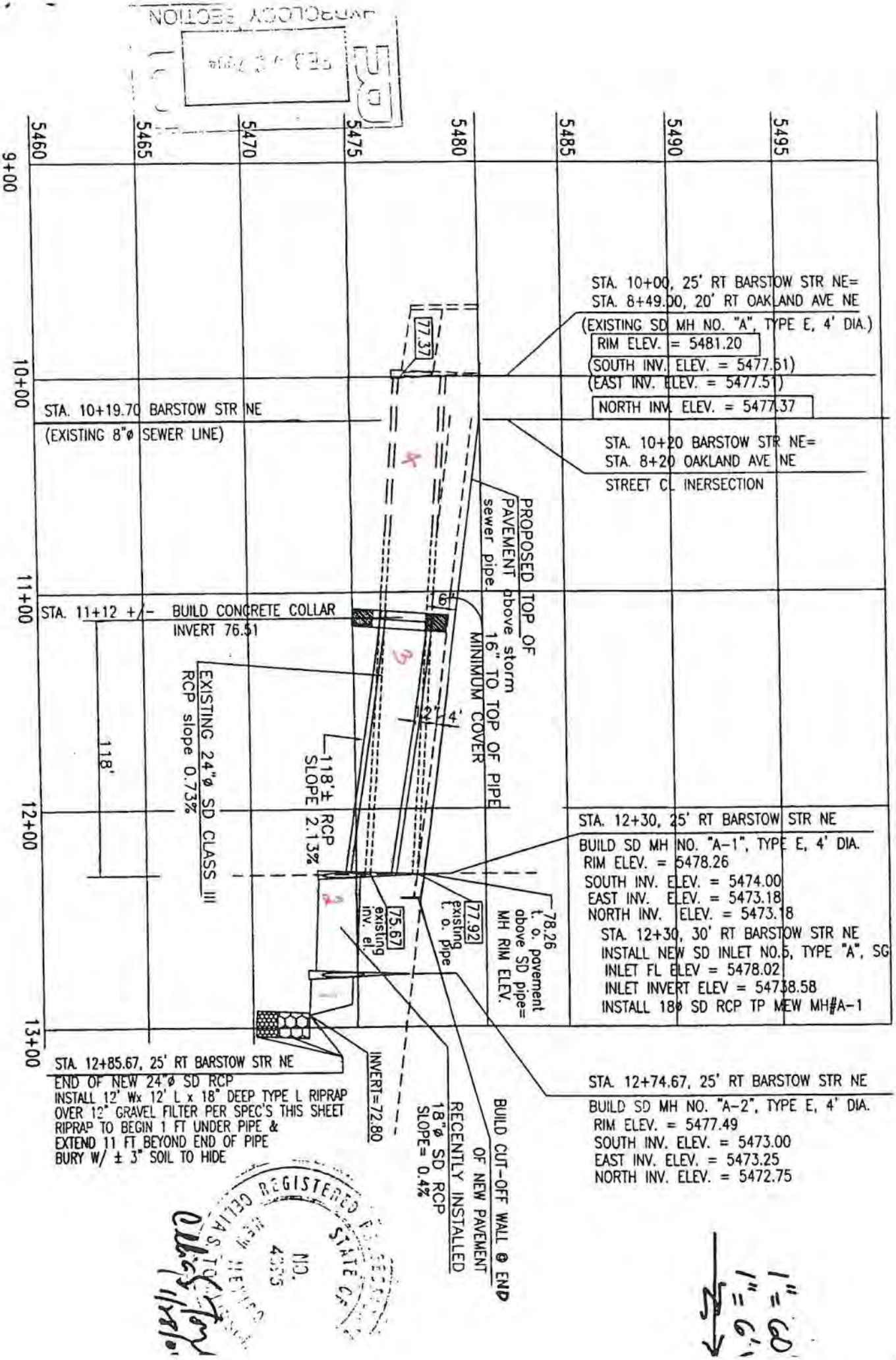
Q_{100} = 2850 CFS....LA CUEVA ARROYO

$Q_D = 0.20_{100}$ = 570 CFS $W_D = 4.6 Q_D^{0.4}$ = 58 FEET

LAMDA = $[0.8 + 4 \log Q_{10D}] W_D$ = 685 FEET

BANK SETBACK = LAMDA/4 = 171 FEET

CENTER LINE SETBACK = BSB + $W_D/2$ = 200 FEET, See Plan..

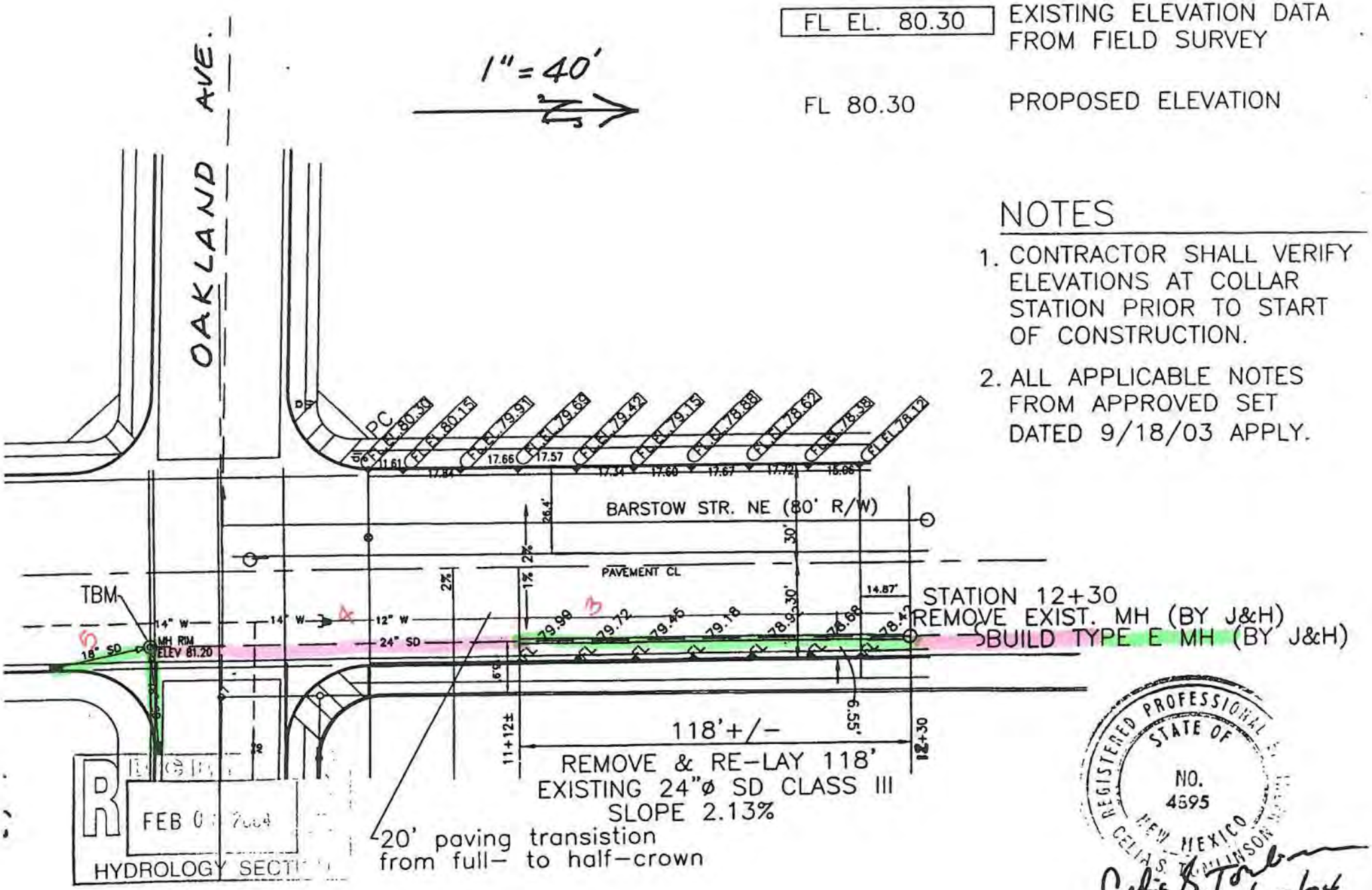

5460
5465
5470
5475
5480
5485
5490
5495
9+00
10+00
11+00
12+00
13+00
STA. 10+00, 25' RT BARSTOW STR NE=
STA. 8+49.00, 20' RT OAKLAND AVE NE
(EXISTING SD MH NO. "A", TYPE E, 4' DIA.)
RIM ELEV. = 5481.20
(SOUTH INV. ELEV. = 5477.51)
(EAST INV. ELEV. = 5477.51)
NORTH INV. ELEV. = 5477.37
77.37
STA. 10+19.70 BARSTOW STR NE
(EXISTING 8"ø SEWER LINE)
STA. 10+20 BARSTOW STR NE=
STA. 8+20 OAKLAND AVE NE
STREET C.L. INERSECTION
PROPOSED TOP OF PAVEMENT above storm sewer pipe
16" TO TOP OF PIPE MINIMUM COVER
STA. 11+12 +/- BUILD CONCRETE COLLAR
INVERT 76.51
EXISTING 24"ø SD CLASS III RCP slope 0.73%
118'
118'± RCP SLOPE 2.13%
4'
STA. 12+30, 25' RT BARSTOW STR NE
BUILD SD MH NO. "A-1", TYPE E, 4' DIA.
RIM ELEV. = 5478.26
SOUTH INV. ELEV. = 5474.00
EAST INV. ELEV. = 5473.18
NORTH INV. ELEV. = 5473.18
STA. 12+30, 30' RT BARSTOW STR NE
INSTALL NEW SD INLET NO.5, TYPE "A", SG
INLET FL ELEV = 5478.02
INLET INVERT ELEV = 5473.58
INSTALL 18ø SD RCP TP NEW MH#A-1
77.92
t. o. existing pipe
75.67
existing inv. el.
78.26
t. o. pavement above SD pipe= MH RIM ELEV.
STA. 12+85.67, 25' RT BARSTOW STR NE
END OF NEW 24"ø SD RCP
INSTALL 12' Wx 12' L x 18" DEEP TYPE L RIPRAP
OVER 12" GRAVEL FILTER PER SPEC'S THIS SHEET
RIPRAP TO BEGIN 1 FT UNDER PIPE &
EXTEND 11 FT BEYOND END OF PIPE
BURY W/ ± 3" SOIL TO HIDE
INVERT=72.80
RECENTLY INSTALLED 18"ø SD RCP SLOPE= 0.4%
BUILD CUT-OFF WALL @ END OF NEW PAVEMENT
STA. 12+74.67, 25' RT BARSTOW STR NE
BUILD SD MH NO. "A-2", TYPE E, 4' DIA.
RIM ELEV. = 5477.49
SOUTH INV. ELEV. = 5473.00
EAST INV. ELEV. = 5473.25
NORTH INV. ELEV. = 5472.75
1" = 60'
1" = 6'

LEGEND

FL EL. 80.30	EXISTING ELEVATION DATA FROM FIELD SURVEY
FL 80.30	PROPOSED ELEVATION

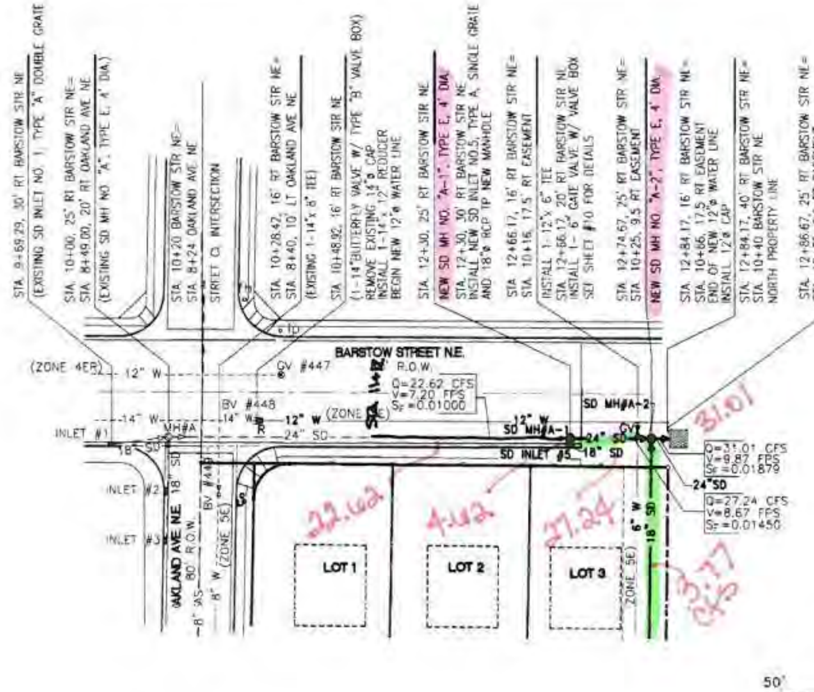
NOTES

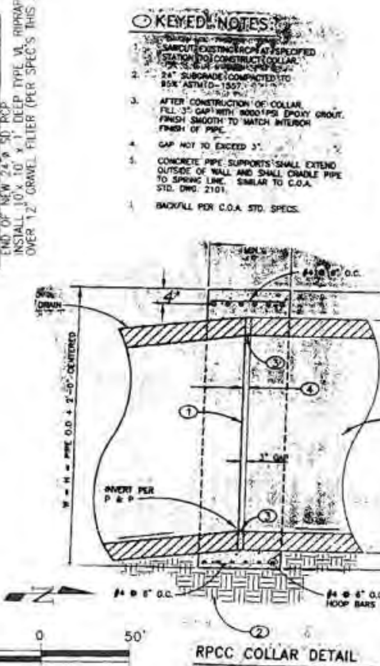
1. CONTRACTOR SHALL VERIFY ELEVATIONS AT COLLAR STATION PRIOR TO START OF CONSTRUCTION.
2. ALL APPLICABLE NOTES FROM APPROVED SET DATED 9/18/03 APPLY.



REGISTERED PROFESSIONAL ENGINEER
STATE OF NEW MEXICO
NO. 4595
CELIAS B. TOLLINSON

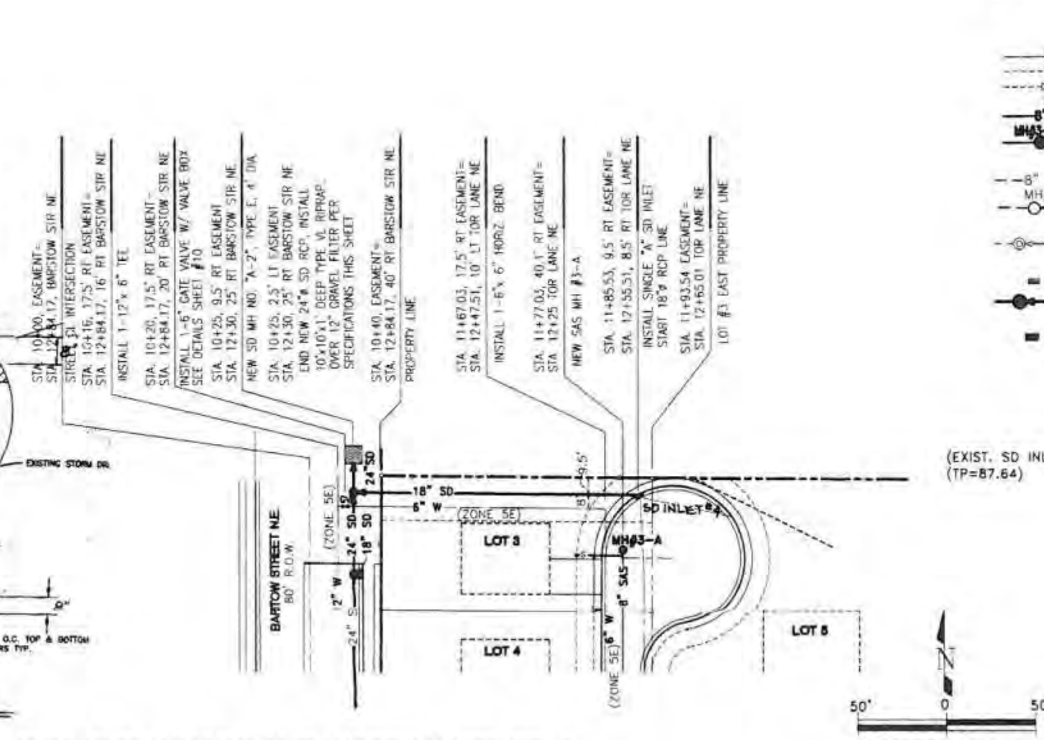
Celia B. Tollinson 1/22/04





SCALE: 1"=50'

BARSTOW STR. NE



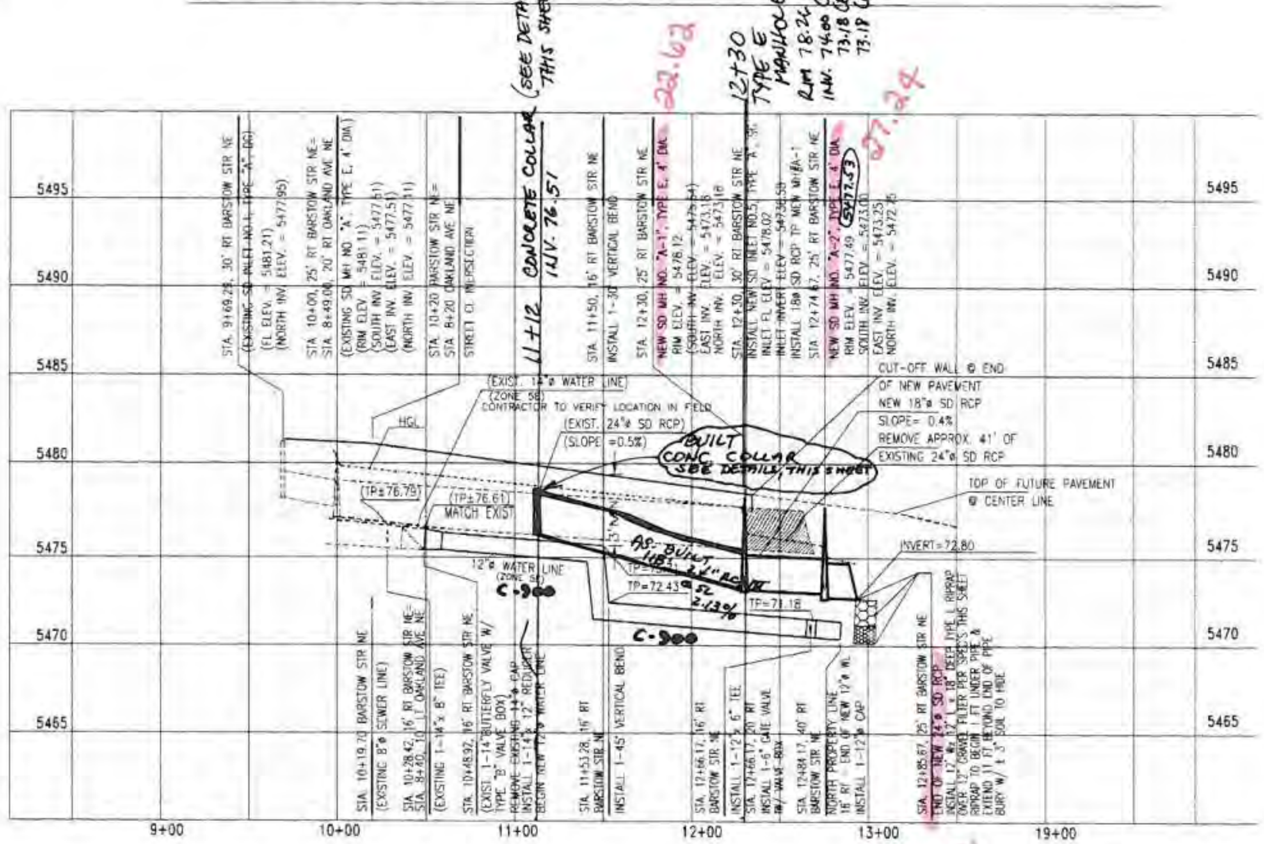
SCALE: 1"=50'

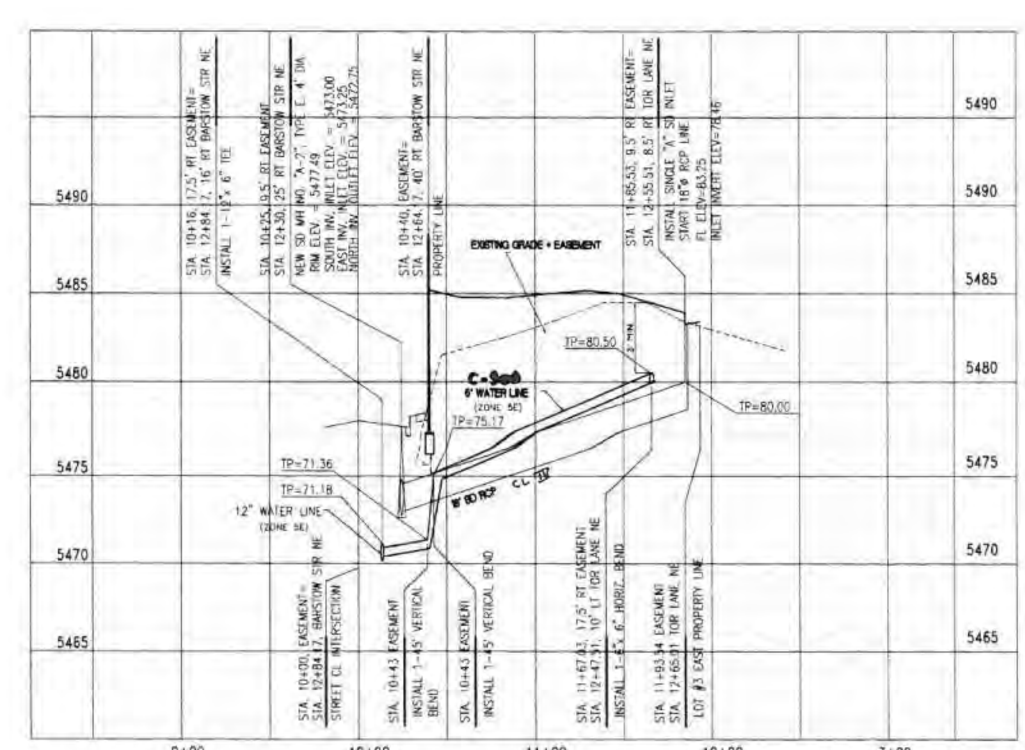
PUBLIC DRAINAGE AND WATER EASEMENT

LEGEND

- NEW SINGLE WATER METER AND BOX
- NEW DOUBLE WATER METER AND BOX
- NEW GATE VALVE W/ TYPE "A" VALVE
- NEW REDUCER
- NEW WATER LINE
- EXISTING WATER LINE
- EXISTING GATE VALVE
- NEW SANITARY SEWER LINE
- NEW SANITARY SEWER MANHOLE AND FLOW DIRECTION
- EXISTING SANITARY SEWER LINE
- EXISTING SANITARY SEWER MANHOLE AND FLOW DIRECTION
- EXISTING STORM SEWER MANHOLE AND FLOW DIRECTION
- EXISTING STORM SEWER INLET
- NEW STORM SEWER MANHOLE AND FLOW DIRECTION
- NEW STORM SEWER INLET
- EXISTING FIRE HYDRANT LOCATION
- NEW LIGHT POLE
- EXISTING LIGHT POLE

(EXIST. SD INLET #1) DATA FROM AS-BUILT DRAWINGS. (TP=87.64)





SCALE: HORIZONTAL 1"=50'
VERTICAL 1"= 5'

SCALE: HORIZONTAL 1"=50'
VERTICAL 1"= 5'

GENERAL NOTES

1. CONSTRUCT SAS SERVICES PER COA STANDARD DRAWING #2125.
2. CONSTRUCT ALL SINGLE AND DOUBLE WATER SERVICES PER COA STANDARD DRAWINGS, SEE SHEET #10.
3. SEE MASTER UTILITY PLAN FOR RESTRAINED JOINT LENGTHS FOR WATERLINE FITTINGS.
4. SEE MASTER UTILITY PLAN FOR WATER SHUTOFF PLAN
5. ALL AS-BUILT INFORMATION DATA IS BASED ON THE FOLLOWING AS-BUILT DRAWINGS:
   LA CUEVA ARROYO CHANNEL IMPROVEMENT, PROJ. #8030 – 14, DATED 5-12-87.
   NOR ESTE ESTATES, PROJ. #3186, DATED 5-14-87.
   PICO LA CUEVA SUBDIVISION, PROJ. #55678, DATED 10-17-96.

RESTRAINED JOINT LENGTH FOR WATER FITTINGS

FITTING DESCRIPTION	RESTRAINED JOINT LENGTH
6"ø PIPE, 90° HORIZONTAL BEND	20'
6"ø PIPE, 45° VERTICAL BEND	23' HIGH SIDE, 8' LOW SIDE
12"ø PIPE, 30° VERTICAL BEND	27' HIGH SIDE, 10' LOW SIDE
12"ø PIPE, 60° VERTICAL BEND	59' HIGH SIDE, 21' LOW SIDE
14"x12" REDUCER	30' @ 14"ø SIDE, 30' @12"ø SIDE
12"x6" TEE	12' @ 12"ø SIDE,
8"x6" TEE	8' @ 8"ø SIDE,
6"ø GATE VALVE	46'
12"ø CAP	102'

GRAVEL FILTER MATERIAL: AN ENGINEERED AGGREGATE MIXTURE CONFORMING TO THE FOLLOWING GRADATION TABLE:

US STANDARD (SQUARE MESH) SIEVE SIZE	PERCENT PASSING (BY WEIGHT)
3"	90–100
3/4"	20–90
#4	0–20
#200	0–3

TYPE L (LIGHT) RIPRAP, PER COA STANDARD SPECIFICATIONS SECTION 109
MEAN DIAMETER=9" (=>50% FINER BY WEIGHT)

MAXIMUM DIMENSION (INCHES)	PERCENT PASSING (BY WEIGHT)
18	100
12	50–70
6	30–55
3	10

OUTLET
Q=31.01 CFS V=9.87 FPS $S_{friction}$=0.01879

MANHOLE #A2
Q=27.24 CFS V=8.67 FPS $S_{friction}$=0.01450

MANHOLE #A1
Q=22.62 CFS V=7.20 FPS $S_{friction}$=0.01000

CERTIFICATE OF SUBSTANTIAL COMPLIANCE ON PLANS

I, CELIA S. TOMLINSON, NMPE #..., OF THE FIRM RHOMBUS P.A., INC., A REGISTERED PROFESSIONAL ENGINEER IN THE STATE OF NEW MEXICO, DO HEREBY CERTIFY TO THE BEST OF MY KNOWLEDGE AND BELIEF, THAT THE INFRASTRUCTURE INSTALLED AS PART OF THIS PROJECT HAS BEEN INSPECTED BY ME OR BY A QUALIFIED PERSON UNDER MY DIRECT SUPERVISION AND HAS BEEN CONSTRUCTED IN ACCORDANCE WITH THE PLANS AND SPECIFICATIONS APPROVED BY THE CITY ENGINEER AND THAT THE ORIGINAL DESIGN INTENT OF THE APPROVED PLANS AND SPECIFICATIONS HAVE BEEN MET, EXCEPT AS NOTED BY ME ON THE AS-BUILT CONSTRUCTION DRAWINGS. THIS CERTIFICATION IS BASED ON SITE INSPECTIONS BY ME OR PERSONNEL UNDER MY DIRECTION AND SURVEY INFORMATION PROVIDED BY JOHN L. MIERS, NMPS #12447.

CELIA S. TOMLINSON, PE — DATE

ENGINEERS SEAL

AS BUILT INFORMATION

BENCHMARK: STANDARD ACS BRASS TABLET STAMPED 1-B20, SET IN TOP OF CONCRETE POST PROJECTING 0.3' ABOVE GROUND, LOCATED IN THE NORTHEAST QUADRANT OF BARSTOW STREET N.E. AND MODESTO AVENUE STREET N.E. ELEV (NGVD29)=5474.51

06/25/2003

RHOMBUS P.A., INC.
FACILITIES ENGINEERS / ENVIRONMENTAL CONSULTANTS

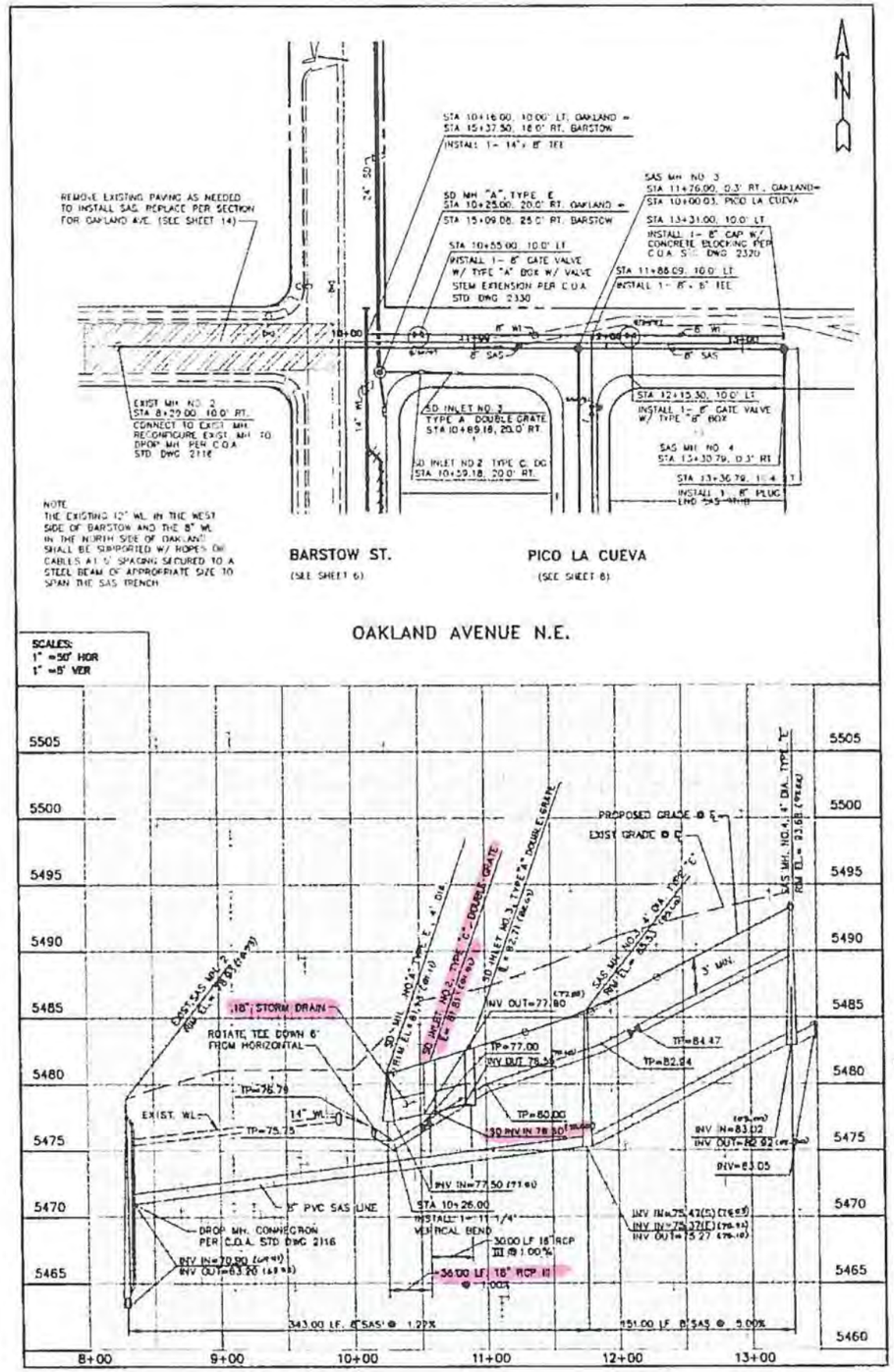
26 7104.81 0905

CITY OF ALBUQUERQUE
PUBLIC WORKS DEPARTMENT
ENGINEERING DEVELOPMENT GROUP

TITLE
OAKLAND MEADOWS SUBDIVISION
UTILITY PLAN & PROFILE - BARSTOW STR. NE & EASEMENT

Design Review Committee: APPROVED
City Engineer Approval: APPROVED — CITY ENGINEER
Last Design Update

City Project No.	Zone Map No.	Sheet	Of
710481	C-20	9	12



NOTE: AS BUILT ELEVATIONS SHOWN IN PARENTHESES ( ) WATER VALVES VERIFIED WITH CIRCLE AND DOT

LEGEND

EXISTING	NEW	
▷◁	▶◀	= GATE VALVE
◻	●	= FIRE HYDRANT
○	●	= SANITARY SEWER MANHOLE
--⊣	⟶⊣	= PIPE CAP / PLUG
		= WATER SERVICE W/ METER & BOX
		= DOUBLE WATER SERVICE W/ METER AND BOX
		= SANITARY SEWER SERVICE
(FVME)		= FIELD VERIFY, MATCH EXISTING
		= STORM SEWER INLET
		= 2" WATER-AIR RELEASE VALVE PER C.O.A. STD DWG 2350
		= BUTTERFLY VALVE
		= REMOVE AND REPLACE EXISTING PAVEMENT
		= STORM DRAIN MANHOLE

RESTRAINING LENGTHS

FITTING	LR (FT)
6" CAP	31' RUN
8" CAP	41' RUN
14" CAP	58' RUN
14"x 8" TEE	20' RUN, 0 BRANCH
8"x 8" TEE	20' RUN, 0 BRANCH
6"x 6" TEE	20' RUN, 0 BRANCH
8" GATE VALVE	41' RUN
6" GATE VALVE	31' RUN
14" BUTTERFLY VALVE	58' RUN
14" 22 1/2° BEND	4' RUN
6" 22 1/2° BEND	31' RUN
14" 45° BEND	3' RUN
8" 11-1/4° VERTICAL BEND	5' RUN

LR = LENGTH TO BE RESTRAINED EACH SIDE OF THE FITTING. FOR TEES, ALL THREE LEGS SHALL BE RESTRAINED FOR A DISTANCE OF "LR". FOR REDUCERS, "LR" IS GIVEN FOR THE LARGER DIAMETER SIZE OF THE FITTING AND NO RESTRAINING IS REQUIRED ON THE SMALL SIDE OF THE FITTING. GATE VALVES SHALL BE MECHANICALLY RESTRAINED AND INSTALLED WITH CONCRETE BLOCKING PER COA STD DWG 2333 IN ADDITION TO THE MECHANICALLY RESTRAINED LENGTHS. ALL CAPS SHALL BE INSTALLED WITH CONCRETE BLOCKING PER COA STD DWG 2320 RESTRAIN ALL JOINTS ON FIRE HYDRANTS.

1. RESTRAINED JOINTS, SUCH AS MEGA-LUG, EQUIVALENT BRANDS ACCEPTABLE TO THE ENGINEER, SHALL BE USED ON ALL TEES, BENDS, CROSSES AND CAPS IN LIEU OF CONCRETE THRUST BLOCKING. RESTRAINED JOINTS SHALL BE CONSIDERED INCIDENTAL TO THIS CONTRACT AND NO ADDITIONAL COMPENSATION, MEASUREMENT, OR PAYMENT WILL BE MADE THEREFORE.
2. ALL FIRE HYDRANTS AND FITTINGS, ETC SHALL BE CONTINUOUSLY RESTRAINED AND SHALL BE BUILT IN ACCORDANCE WITH C.O.A. STD. DWG'S 2301 THRU 2380 INCLUSIVE.

Crawford Development Services
Stephen L. Crawford, P.E.
(505)865-5442
3634 HIGHWAY 47 PERALTA, NM 87031

SURVEY INFORMATION
FIELD NOTES
NO | BY | DATE

BENCH MARKS
ELEVATIONS SHOWN ARE BASED ON CITY OF ALBUQUERQUE CONTROL MONUMENT "1-B20" LOCATED AT THE NORTHEASTERLY CORNER OF MORESSO AND BARSTOW AND TRANSFERED TO PROJECT AREA BY GPS SURVEY USING TRIMBLE 4600 SE GLOBAL POSITIONING EQUIPMENT
ELEVATION= 5474.53

AS BUILT INFORMATION
DRAWING NO. | DATE | BY
MICRO-FILM INFORMATION
RECORDED BY | DATE

ENGINEER'S SEAL
10-17-96

REMARKS | DATE | BY
REVISIONS
DESIGN DATE OCT., 1996
DESIGNED BY J. DIPOLLARO
DRAWN BY A. MARTINEZ
CHECKED BY S. CRAWFORD

CITY OF ALBUQUERQUE
PUBLIC WORKS DEPARTMENT
ENGINEERING DEVELOPMENT GROUP

TITLE: *PICO LA CUEVA SUBDIVISION*
IU.3 OAKLAND AVENUE N.E.

Design Review Committee | City Engineer Approval | Last Design Update

City Project No. 556781 | Zone Map No. C-20 | Sheet 7 Of 14