Edith Boulevard Reconstruction, Phase II
Candelaria Road to Tahoe Place

Project No. TS04-15
Bernalillo County, New Mexico

Drainage Report

Prepared for:

Bernalillo County Public Works Department

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EXECUTIVE SUMMARY

Edith Boulevard will be reconstructed from Candelaria Road to Tahoe Place, just south of Montaño Road. The project involves widening Edith to 5 lanes, with curb and gutter and sidewalk. Storm drainage improvements will be constructed to drain the proposed roadway and address localized flooding problems. This drainage report describes the results of the drainage analysis and makes recommendations for improvements.

The watershed has been studied extensively for past projects in the area. Previous studies reviewed for this report included:

- *Edith Boulevard Drainage Analysis*, Boyle Engineering, November 1990
- *Alameda and Riverside Drains Engineering Analysis, Volume 1,* Leedshill Herkenhoff, May 1991
- *Special Assessment District BC-83-1/Special Assessment District 216 Drainage Analysis,* Andrews, Asbury & Robert, December, 1992
- *Menaul/Mildred Drainage Improvements, Alameda and Riverside Drains Engineering Analysis Supplement,* March, 1991
- *Big I Project Final Drainage Report,* URS, 2005

The *Edith Boulevard Drainage Analysis*, by Boyle Engineering, provided the basis for the current project. Based on those reports and as-built drawings, downstream facilities have capacity available to accept drainage from the proposed project.

The following major drainage facilities are proposed as part of the current project.

- Storm drain and inlets will be constructed from just north of Candelaria Road to just south of Griegos Road. These systems will drain into a proposed 18 acre-foot capacity detention pond, Pond 1, on State land across from the New Mexico Youth Diagnostic Development Center (NMYDDC). The pond will have water quality features, and will outfall to the Alameda Drain via Headingly Avenue. The peak outflow will be limited to 6.4 cubic feet per second (cfs) for the 100-year event, in accordance with previous reports. The pond will be designed for future expansion to handle additional local drainage.
- The existing County drainage pond on Industrial Avenue east of Edith will be modified to increase the storage capacity. The existing outlet into the Alameda Lateral will be capped. The pond will drain into the proposed Edith storm drain

system.

- New drop inlets will be built to connect to the existing trunk line along Edith from Carmony Lane to just south of Nikanda Road. This trunk line drains into an existing County pond at the northeast corner of Griegos Road and the NMDOT railroad tracks.
- New storm drain and inlets will be built from just south of Nikanda Road to south of Tahoe Place. The new trunk line will connect to existing storm drain at that point. This system drains into an existing County pond near the southwest corner of Edith Boulevard and Montaño Road.

The Alameda Drain will carry about 6 cfs additional flow from the proposed detention Pond 1 across from the NMYDDC. Improvements to the culvert crossings along the Drain were recommended in the *Alameda and Riverside Drains Engineering Analysis.* Field reconnaissance indicated that some of the culverts south of I-40 have not been improved. These upgrades will be necessary in order for the Drain to carry developed flows. This issue, as well as a license application for the Alameda Drain connection, will be coordinated with the Middle Rio Grande Conservancy District (MRGCD).

As design proceeds, the proposed drainage improvements are being coordinated with several other agencies in addition to the MRGCD. Because of the size of Pond 1 and the proposed configuration, it may be regulated as a jurisdictional dam by the New Mexico Office of the State Engineer (OSE). Coordination will take place between PB, Bernalillo County, and the OSE as design proceeds. Coordination is ongoing with the City of Albuquerque, since portions of the proposed improvements are within City limits. In addition, the proposed storm drain crossing under the railroad tracks at Headingly Avenue will require a license agreement with the New Mexico Department of Transportation (NMDOT).

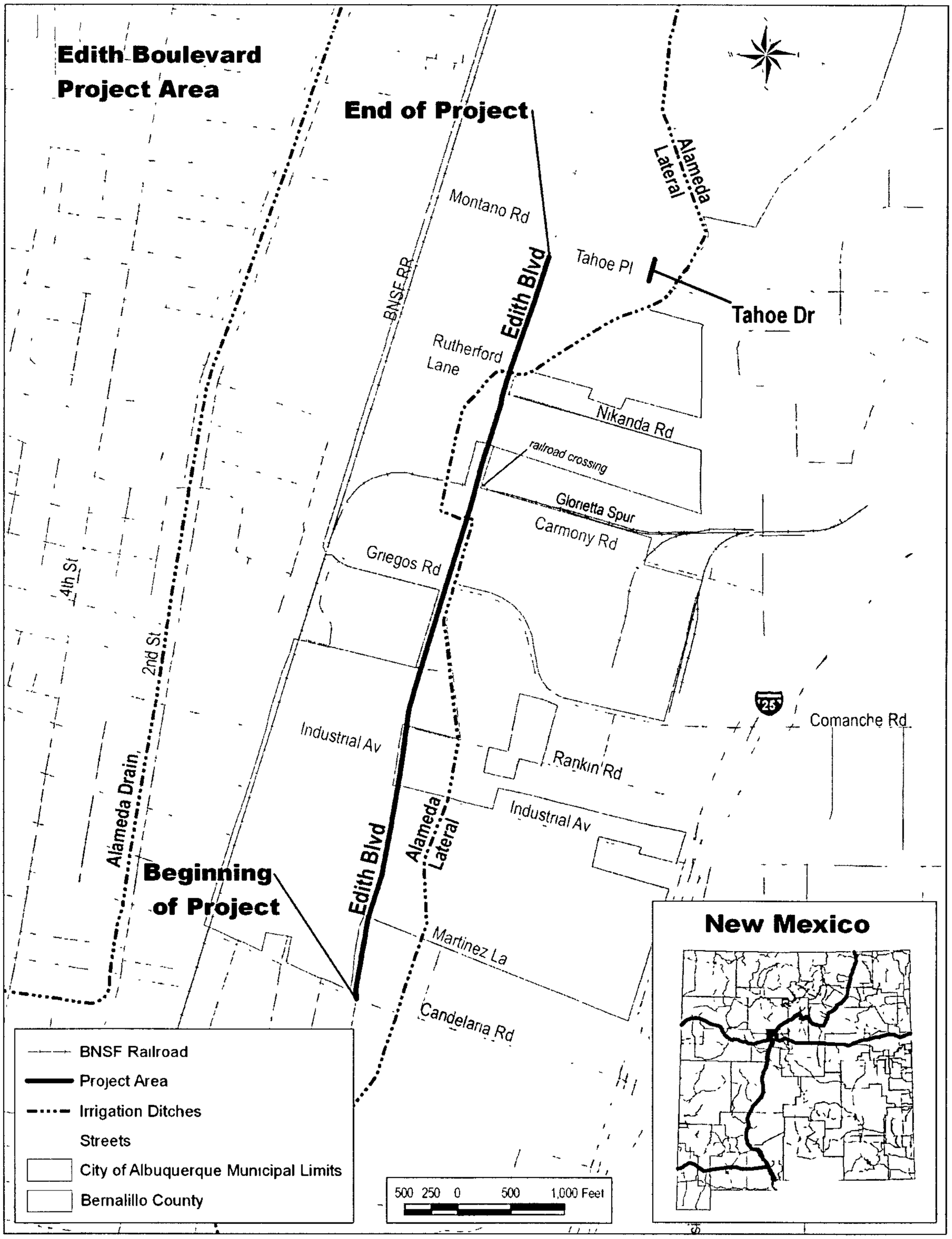
1 INTRODUCTION

The County of Bernalillo, Public Works Department authorized Parsons Brinckerhoff to perform a drainage assessment for the proposed improvements to Edith Boulevard from Candelaria Road to Tahoe Place as shown on **Figure 1**. For the purpose of this report, the watershed contributing to this drainage analysis is generally bounded by Tahoe Place on the north, Candelaria Road on the south the I-25 on the east and Edith Boulevard on the west.

This report examines the current drainage conditions and presents an efficient drainage network capable of reducing flooding along Edith Boulevard.

The basis for the majority of the improvements was taken from the *Edith Boulevard Drainage Analysis* by Boyle Engineering Corporation, November 1990. Most of the previous drainage improvements made in the area have relied on this report. Parsons Brinckerhoff's role is to verify the validity of the report and update the analysis to reflect any improvements that have been made since the original report was written.

Figure 1. Edith Boulevard Project Location Map



2 EXISTING CONDITIONS

2.1 Related Reports

Edith Boulevard Drainage Analysis

Boyle Engineering Corporation prepared a drainage report for Edith Boulevard in November 1990 for the County of Bernalillo Public Works Department. This report, referred to here as the Boyle report, addressed the proposed drainage infrastructure associated with improvements to Edith Boulevard from Candelaria Road to Osuna Road. The study area is shown in Exhibit 1. The key elements of the proposed plan that affect the current project were:

- Drainage System 7 and System 8
- System E-1
- System 9

A. System 7 and System 8

The proposed storm drain for System 7 lies along Edith Boulevard on the east side, between Candelaria Road and the north boundary of the New Mexico Youth Diagnostic Development Center (NMYDDC). System 7 would drain into a channel located on the west side of Edith across from the NMYDDC. This system would convey flow from the east including discharge from a small pond on the NMYDDC property, Pond E4, just east of Edith. A stub-out would be placed at Martinez Lane to provide for future system expansion in the area between Edith and the Alameda Lateral. See Exhibit 3 for pond locations and Exhibit 2 for a map of storm drain Systems.

The proposed System 8 consisted of a trunk line to the north of System 7, beginning near Comanche/Griegos and ending at System 7. An existing storm drain line in Industrial Avenue, originating near the I-25 south frontage road, would connect to System 8. A stub-out also would be provided at Rankin Road for future drainage facilities. The easterly line in Industrial Avenue would connect to an existing 36" diameter pipe at a point approximately 800' east of Edith Boulevard. The existing pipe drained areas on the I-25 roadway and an area east of the I-25 north bound frontage road that concentrated along Aztec Road. The existing Pond 5, located between Industrial Avenue and the NMYDDC, would be enlarged. The pond currently drains into the Alameda Lateral. The pond was designed to detain the runoff generated from the area along Industrial between the I-25 south bound frontage road and the pond. See Exhibit 3 for pond locations. This

proposed detention pond had a storage capacity of 2.9 acre-feet. The inlet to the pond would consist of two drop inlets and a 42" diameter storm drain at Industrial Avenue. Discharge from the detention basin would be limited to 10 cubic feet per second (cfs) by means of a flow restrictor plate. Outflow from Pond 5 would enter the new storm drain on Industrial Avenue, which then would drain west to Edith Boulevard where it would be joined by the flow in the main trunk. From there, the drainage would flow to a point 350' south of Industrial Avenue. At that point Systems 7 and 8 would turn west and enter a rip-rap lined channel. This channel would discharge into the proposed detention Pond 1, located just west of the NMDOT railroad (35.9 acre-foot capacity). The pond would have a 215' long spillway, designed to discharge 1568 cfs, which was half of the probable maximum flood (PMF).

Pond 1 would drain to the west under the railroad tracks, along Headingly Avenue, and finally into the Alameda Drain. Discharge from the pond would be limited to 6.4 cfs by a flow restriction plate.

The existing storm drain pipe and lift station on Headingly Avenue would be removed and plugged. The two existing inlets on Headingly would remain in place; however, the inlets would be modified to connect to the new pond outfall pipe. Due to the grade of existing street a junction structure with a flap gate would be required for connecting the two existing inlets to the new line.

The design hydraulic grade line for the Headingly Avenue system was based on the 10-year water surface elevation in the Alameda Drain. The hydraulic grade line control for Systems 7 and 8 was the 10-year water level in Pond 1. The drainage report assumed flows entering the detention basin on Industrial Avenue would be detained such that the outflow from Pond 5 could be neglected for the analysis of Pond 1.

B. <u>System E-1</u>

System E-1 was located along Edith Boulevard near the Hahn Arroyo, where a junction box was planned to collect the flow from three existing 24" diameter pipes. Then the storm drain continued south on Edith and tied to an 84" diameter pipe running east to west along Carmony Lane. The Carmony system continued west, where it discharged into the Griegos Pond (Pond E8).

Inlets placed on Edith Boulevard would drain runoff that was not collected by the Hahn Arroyo. As an interim measure, part of the flow within the Hahn Arroyo would be allowed to pass under Edith by means of a 36" diameter pipe. That pipe would be plugged at the junction box when the Carmony system and Griegos Pond were

completed.

C. System 9

Systems 9 and 10 were planned to drain into detention Pond 7, located on the west side of Edith Boulevard, just south of Montaño Road. System 9 would drain the area east of Edith Boulevard between Tahoe Place and the (former) Hahn Arroyo. Inlets would be placed on the Edith Boulevard to accept flow generated from the area between Edith and the Alameda Lateral. A stub-out would be provided at Nikanda Road and Tahoe Place to accept flows from future drainage facilities. At the intersection of Tahoe Place and Edith Boulevard, System 9 flow would be joined by flow from System 10, at a junction box. The combined flow then would travel west to detention Pond 7 by way of an 84" diameter pipe.

The detention basin would have a capacity of 13 acre-feet. Discharge from this pond would be limited to 15 cfs by a flow restriction plate. The flow from the detention basin would enter the Montaño Road drainage system. The hydraulic grade line control for System 9 was a 10-year water surface elevation of 4975.79 in Pond 7.

System 10 was designed to drain an area north of Tahoe Place. It lies north of the current project limits, so it was not analyzed further.

Comanche/Griegos Drainage Study

The drainage analysis of the Comanche/Griegos area, *Special Assessment District BC-83-1/Special Assessment District 216 Drainage Analysis,* was conducted in 1992 by Andrews, Asbury, and Roberts, Inc. (AAR) for the City of Albuquerque Public Works Department and the Bernalillo County Public Works Department. The study area was bounded by Hahn Arroyo on the north, Comanche/Griegos Road on the south, the North Diversion Channel on the east, and the NMDOT railway on the west (see Exhibit 1). Based on the study, AAR proposed storm drains on Carmony Lane and Comanche/Griegos Road. Both systems would drain into the Griegos Detention Basin (Pond E8 on Exhibit 3), located directly north of Griegos Road and east of the NMDOT railroad tracks. The discharge rate from the Griegos Pond into the existing Alameda Drain would be 22 cubic feet per second (cfs).

Engineering Analysis of Alameda and Riverside Drains

Leedshill-Herkenhoff Inc. (LH) in May, 1991 prepared an analysis of the capacity of the Alameda Drain and recommended improvements to handle a 100-year design storm. The Edith widening project was anticipated in this study, but the focus was primarily on the

Alameda and Riverside Drain capacity. This study incorporated the results of the Boyle report into the analysis. It should be noted that this report assumed an allowable discharge of 6.4 cfs into the Drain at Headingly Avenue.

Menaul/Mildred Drainage Improvements

The *Menaul/Mildred Drainage Improvements* study by Leedshill-Herkenhoff, March, 1991, did not directly affect the current study, but it contained some relevant information. Notably it included a re-analysis of the Alameda and Riverside Drains under more recent drainage criteria, using the AHYMO computer program. The authors concluded that the Alameda Drain flows did not change significantly under the new criteria, and that the previous studies for the drain were still generally valid. This makes sense intuitively, because storm water discharges into the Drain are generally limited by upstream controls, such as detention ponds.

Also, this report showed a watershed boundary for the Edith Pond 1 that differed from previous reports. Runoff from north of Pond 1 between Edith and the railroad tracks was shown flowing to the Pond. This was not included in prior reports, presumably because of topographic constraints. In addition, this report showed the northern boundary of the Menaul/Mildred watershed at the southern edge of Pond 1. These assumed drainage basin boundaries were not verified for this report.

2.1.1 Assessment of Previous Analyses

Drainage criteria and site conditions have changed since earlier reports were prepared. A complete verification of the previous reports was beyond the scope of the current project. For new on-site improvements, drainage is being re-analyzed in accordance with current criteria. For connections to existing facilities, the assumption was made that the prior drainage studies are still valid for design, and that the downstream facilities can accept the runoff from the proposed project.

2.2 Existing Project Area

Edith Boulevard is currently a two-lane roadway consisting of two 12' lanes and a 14' two-way left turn lane. The terrain within the study area slopes from the east to the west. The area east of Edith Boulevard has relatively steep slopes. West of the roadway, the terrain slopes gradually to the west towards the NMDOT railroad. The railroad grade is built up and acts as a dam in this area. The existing roadway lacks curb and gutter; consequently runoff coming from the east ponds in the right-of-way and on adjacent properties, causing localized flooding.

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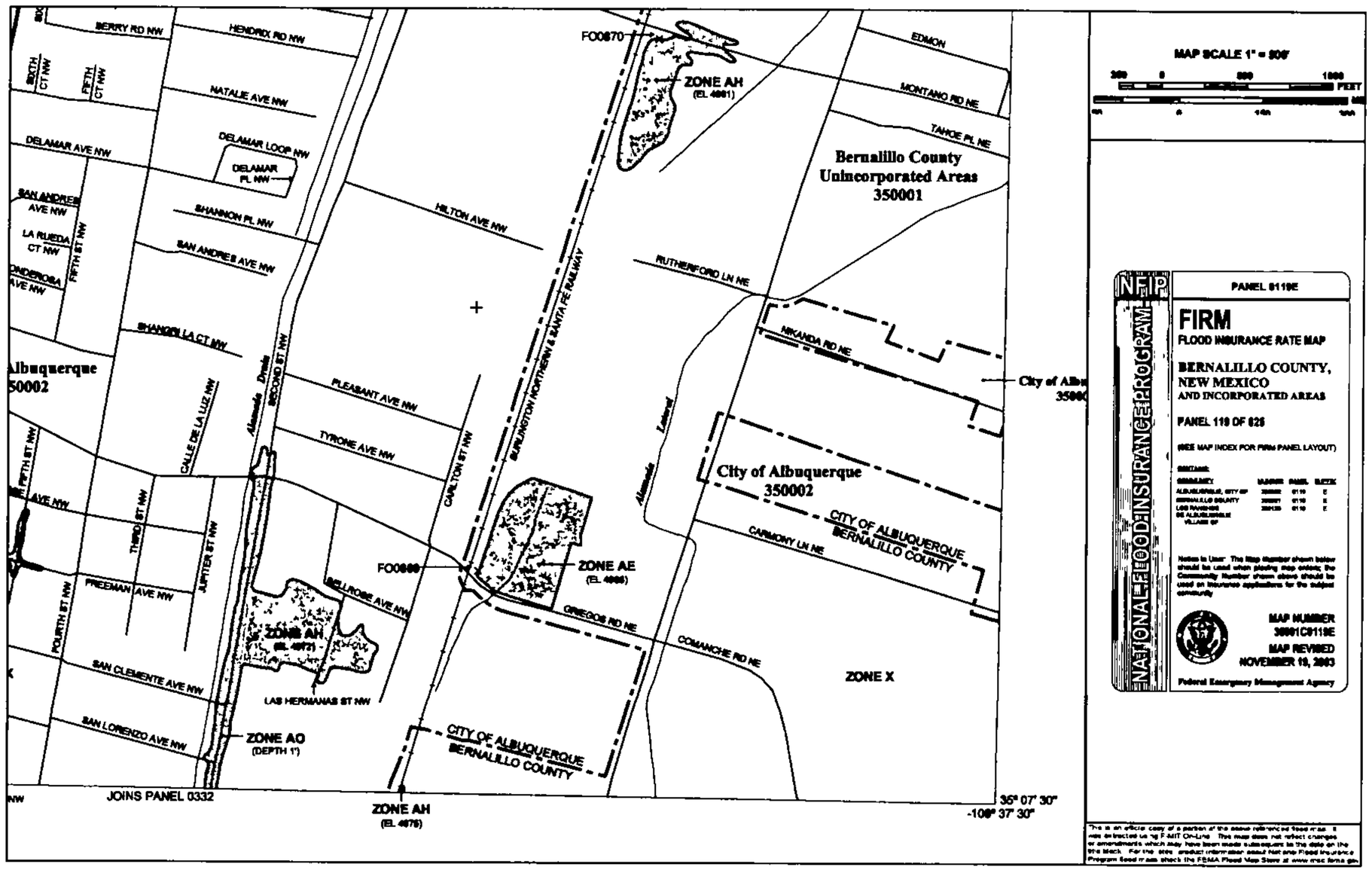
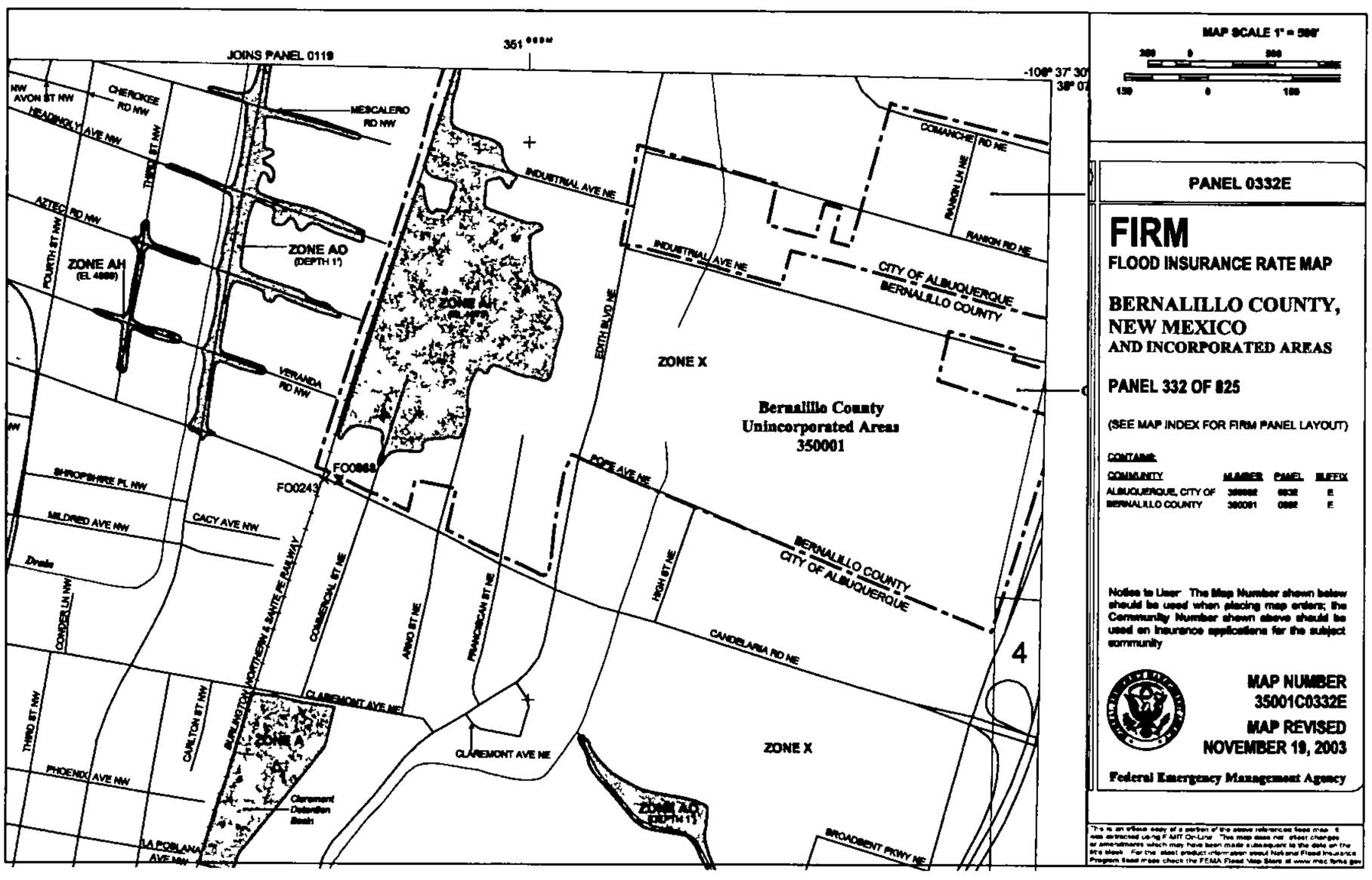
Figure 2. FEMA Flood Maps





Also, the area near the railroad is a special flood hazard area subject to inundation by the 1% annual chance flood based on maps from the Federal Emergency Management Agency. **Figure 2** shows two partial Flood Insurance Rate Map (FIRM) panels, "FIRMettes", produced from the FEMA National Flood Insurance Program internet site.

Note that the FIRMettes use the 1988 North American Vertical Datum (NAVD 88). The project is being designed using the 1929 NAVD. To covert from NAVD 88 to NAVD 29, subtract 2.70'.

2.3 Existing Drainage Facilities

Alameda Drain

The Alameda Drain runs from north to south parallel to 2nd Street. The Drain plays an essential role in the proposed Edith storm drain improvements. It is owned by the Bureau of Reclamation and is managed by the Middle Rio Grande Conservancy District (MRGCD). The Drain consists of an earth lined channel with a 12 foot average bottom width, steep side slopes, and is approximately 9 feet deep. It is the principal drainage channel for the east side of Bernalillo County's "North Valley".

The Alameda Drain was not originally designed to handle urban drainage flows. For that reason, inflow into the Drain must be metered. Roadway crossing culverts constrict the flow, which limits the Drain's capacity. The existing capacity of the Alameda Drain is discussed in Section 4.1.1.

Alameda Lateral

The Alameda Lateral consists of pipe and earth/shotcrete lined channel, managed by the MRGCD. It generally runs parallel to Edith Boulevard within the limits of the current project. The Lateral crosses Edith at two locations, just south of Carmony Road and just north of Nikanda Road. The Alameda Lateral only carries irrigation water; storm water discharge into the Lateral is not allowed for new projects.

Hahn Arroyo

The Hahn Arroyo originally crossed Edith Boulevard just south of Nikanda Road, but it has been filled in, and the flows have been diverted into underground storm drains. The arroyo watershed originally extended east to the base of the Sandia Mountains. Several projects have reduced the drainage area substantially. The North Diversion Channel intercepted drainage from the northeast heights. The Carmony trunk line, constructed with the Comanche/Griegos Project, captured the flow from most of the remaining area. The rest of the watershed east of Edith Boulevard apparently is intercepted by existing

inlets and storm drain on private property. A 48" diameter pipe may extend approximately 400' east of Edith along the former Hahn Arroyo alignment, based on the Boyle report. The 48" then connects to three 24" diameter pipes at a junction box on the 48" diameter trunk line in Edith. A field visit was conducted in order to verify the 48" pipe location; however, current improvements and site grading show no indication of the existing 48" pipe.

Comanche/Griegos and Carmony Drainage System

This drainage system was built in conjunction with roadway improvements as shown in the as-built drawings for the *Bernalillo County Special Assessment District BC-83-1, City of Albuquerque Special Assessment District 216 Project* (also referred to as the Comanche/Griegos Project). Two trunk lines cross Edith Boulevard within the current project limits. A 48" diameter pipe crosses at Comanche/Griegos, and a 96" diameter pipe crosses at Carmony Lane. Both trunks drain to a pond located near Griegos, Pond E8.

Edith Boulevard Storm System

There are two existing trunk lines parallel to Edith Boulevard within the limits of the project. The first, part of System E-1, is a 48" diameter pipe that starts about 950' north of the Edith/Carmony intersection and ties to a 96" diameter pipe running east-west along Carmony Lane. Proposed inlets along Edith will divert flows into this trunk. Currently this trunk carries off-site drainage from the east.

The second trunk line, part of System 9, is a 54" diameter pipe that starts about 240' south of Tahoe Place and then runs north to discharge into a detention pond located west of Edith and south of Montaño. This trunk line and pond were sized for flows from the proposed Edith Phase II project. This drainage system captures off-site sheet flow coming from the east and the concentrated flow from Tahoe Place.

3 HYDROLOGY AND HYDRAULICS

3.1 Hydrology

The methods applied to this drainage study adhere to design guidelines from the City of Albuquerque *Development Process Manual* (DPM), Volume 2 Section 22.2, 2005. The Rational Method was used to determine peak runoff rates for pavement drainage and drop inlet analysis purposes. The analysis of the proposed detention ponds was done using the latest Arid Land Hydrologic Modeling (AHYMO) computer model by Anderson-Hydro, August, 1997.

3.1.1 Rational Method

The Rational Method is described by the formula:

$$Q = C\ I\ A$$

Q = peak discharge, cfs

C = runoff coefficient, dimensionless

I = the maximum average intensity over the time of concentration, inches per hour

A = discharge area, acres

The runoff coefficients were determined using Tables A-4, A-5, and A-11 of the DPM. The prevailing land uses are Land Treatments C and D with percentages based on Light Industrial, Commercial, and School development. Light Industrial was assumed for the majority of the watershed. School type land treatments were assumed for the NMYDDC property. For the 10-year return period storm:

$$C_{Roadway} = 0.95 \text{ assumed}$$

$$C_{Light\ Industrial} = .3*(.50) + .7*(.92) = 0.79$$

$$C_{Commercial} = .3*(.50) + .7*(.92) = 0.79$$

$$C_{School} = .25*(.28) + .25*(.50) + .5*(.92) = 0.66$$

Bernalillo County is divided into four precipitation zones. From the DPM Section 22.2 Table A-1 and Figure A-1, Zone 2 was selected. The 10-year, 6-hour storm will be used to determine peak flow rates for pavement drainage design purposes. The 100-year, 6-hour storm will be checked as design proceeds to avoid curb overtopping.

The maximum intensities used for the 10-year and 100-year storms were 3.41 inches/hour and 5.05 inches/hour, respectively based on Table A-10 of the DPM, for a 12 minute

minimum time of concentration (T_c). The time of concentration represents the hydraulic travel time from the most distant point in a watershed to the discharge location. For times of concentration greater than 12 minutes, the flow path was divided into segments using formulas b-1 and b-2 of the DPM:

$T_c = (L1/V1 + L2/V2 + \ldots. LX/VX) /3600$ seconds/hour for L<4000' with sheet flow only for the upper 400' of the watershed

$V = 10 * K * (s)^{1/2}$ where s is the slope in foot/foot.

K depends upon conveyance condition as shown on Table B-1 of the DPM. Then the intensity, I, was recomputed using formula a-12 of the DPM:

$I=0.726*(\log_{10}(24.6*T_c)) * (1/T_c)*P_{60}$, where P_{60} is the 60 minute rainfall depth

3.1.2 The AHYMO Hydrologic Model

The AHYMO computer program was used for pond and routing analysis. This unit hydrograph procedure is used for computing peak discharges from large or complex drainage areas instead of the Rational Method; nonetheless, the input information is similar. The input information is as follows:

- For time of concentration the procedure outlined under the Rational Method applies to the AHYMO procedure as well. The time to peak is a basin characteristic that represents the time from the beginning of runoff to the peak of the hydrograph. Set the time to peak equal to 2/3 times the time of concentration, but not less than 8 minutes, or 2/3 times 12 minutes.
- The land treatment is given in terms of percentage using Table A-4 for pervious and impervious cover. Table A-5 was used to determine the percentage of treatment D for impervious cover.
- The 100-year, 24-hour rainfall was utilized in determining volumes of runoff for sizing detention ponds, due to the evacuation time being greater than 6 hours, per current County of Bernalillo Drainage Ordinance.
- The precipitation depths were obtained from *NOAA Atlas 2* and the figures and equations in Part C of the DPM. With a 100-year, 24-hour storm the rainfall depths are as follows (the subscripts indicate the storm duration, in minutes):

  P_{60} = 1.95" from Figure C-1 of the DPM

  P_{360} = 2.20" from Figure C-1 of the DPM

  P_{1440} = 2.60" from Figure C-1 of the DPM

3.2 Hydraulics

Methods used in the development of the hydraulic computations follow the DPM Volume 2 Section 22.3.

3.2.1 Pavement Drainage

Pavement drainage requires consideration of surface drainage, gutter flow, and inlet capacity. The design of these elements is dependent on storm frequency and the allowable spread of storm water on the pavement surface. Inlet analysis will follow the methods and procedures presented in Hydraulic Engineering Circular No. 12 (HEC-12) of the Federal Highway Administration. This design follows the criteria in the DPM.

- Inlet criteria
  - Design storm: 10-year
  - Allowable flow spread: outside lane width = 16'
  - Check 100-year storm for curb/driveway overtopping
- Storm drain criteria
  - Design storm: 100-year
  - Hydraulic grade line: keep maximum elevation below inlet grates
  - Minimum pipe size: 18" diameter
  - Minimum pipe velocity: 3 feet/second

3.2.2 Hydraulic Grade Lines

Hydraulic grade line elevations will be calculated during design.

The controlling outlet water surface elevation for conduits discharging into a detention facility and for a conduit discharging into an open channel is assumed to be the downstream 100-year water surface elevation. Appropriate steps will be taken to optimize the storm drain pipe size while avoiding the possibility of backflow out of manholes or inlets.

4 PROPOSED DRAINAGE SYSTEM

The proposed drainage system consists of four systems, similar to those presented in the Boyle report. System 7 and System 8 are major new trunk lines. Systems E-1 and 9 are extensions of the existing systems described in the Boyle report.

4.1 System 7 and System 8

System 7 begins at the south end of the project near the intersection of Candelaria Road and Edith Boulevard. Off-site flow generated from the area to the east between the Alameda Lateral and Edith Boulevard will be drained by inlets placed on Edith Boulevard. A stub-out will be built at Martinez Lane to provide for future system expansion. An inlet also will be built at Martinez Lane to intercept existing off-site flows before they reach Edith. The area intercepted by this inlet is drainage area 32A, shown in **Exhibit 3** and **Table 1**. This configuration should address current flooding problems at the Edith/Martinez intersection.

Table 1. AHYMO Summary – Systems 7 and 8

Drainage Area	Area (square miles)	Time to Peak (hours)	Land Treatment B	C	D	100-Year Peak Flow (cfs)	100-Year Volume 100 (acre-feet)
32A	0.0215	0.1693	0%	30%	70%	49	2.26
1A-9A	0.0081	0.1333	0%	30%	70%	21	0.85
10A-20A	0.0118	0.1333	0%	30%	70%	30	1.24
22A1	0.0293	0.1333	25%	25%	50%	66	2.52
22A2	0.0120	0.1333	25%	25%	50%	27	1.03
22A3	0.0121	0.1333	25%	25%	50%	27	1.04
22A4	0.0225	0.1333	25%	25%	50%	50	1.94
21A,23A,24A	0.0015	0.1333	0%	30%	70%	4	0.16
40A-52A	0.0112	0.1330	0%	30%	70%	29	1.18
29A-31A, 33A-39A	0.0388	0.1330	0%	30%	70%	100	1.97
32A1	0.0460	0.1330	0%	30%	70%	118	4.84
25A-28A	0.0143	0.1330	0%	30%	70%	37	1.50
25	0.0255	0.1330	0%	70%	30%	56	1.44
Totals to Detention Pond # 9						294 (routed)	21.98

Off-site area 22A will drain to an existing detention pond, Pond E4, located on the New Mexico Youth Diagnostic Detention Center (NMYDDC) campus just east of Edith Boulevard. Site investigations revealed three existing detention ponds within the limits of drainage area 22A. This drainage area was subdivided into basins 22A1, 2, 3 and 4 as shown on **Exhibit 3**. The NMYDDC entrance will be re-graded to divert runoff into the

pond. This existing pond was recently re-graded and enlarged. The pond retains approximately 0.3 acre-feet of water under existing conditions. Under proposed conditions, the 100-year peak pond outflow will be 85 cfs. Refer to **Table 2** for details. From the pond, flow will continue north in a storm drain to a point 350' south of Industrial Avenue.

Table 2. Detention Pond Summary

Pond No.	Contributory Basins	Capacity Ac-ft	Berm Elevation	Freeboard	100-Year Max. WSEL	100-Year Outflow (cfs)
E1	22A1	0.33	5022.00	0'	5022.00	10
E2	22A2	0.27	5024.50	0'	5024.50	5
E3	22A1, 22A2, 22A3	0.53	5002.50	0'	5002.50	5
E4	22A1, 22A2, 22A3, 22A4	0.33	4982.50	0'	4982.50	85
1	1A to 52A	18.00	Not set	2'-4'	4972.00	6
5	32A1	2.90	5000.00	2'	5000.00	10

Note: WSEL = water surface elevation

System 8 begins just south of the Comanche/Griegos and Edith Boulevard intersection. A combination of inlets will pick up the off-site flow from the east between the Alameda Lateral and the proposed roadway. Concentrated flow from Rankin Road, drainage area 39A, will be collected by new inlets, with a stub-out for future storm drain extension. The other street flow occurs at Industrial Avenue. Industrial passes through two drainage basins, 30A and 32A1. Several small private retention ponds were identified in the field. The runoff retained in these ponds was neglected for the hydrologic analysis. A stub-out will also be located for future storm drain extension to the east.

As previously mentioned, an existing 36" storm line runs along Industrial Avenue. It previously carried flow from a large area east of Interstate 25 at Aztec Road. Also, an area along the freeway is intercepted by this system. During the reconstruction of the I-40/I-25 "Big I" interchange, this drainage was rerouted to the south. The Aztec Road area drains into the I-25 drainage system and flows south to the Menaul Detention Basin. For details refer to the *Big I Project Final Drainage Report* by the URS Corporation, 2005. Therefore, the analysis performed for the Industrial area assumed the existing 36" trunk line can be abandoned and plugged.

Pond 5, an existing detention pond that drains into the Alameda Lateral, will be enlarged. Discharge from Pond 5 will enter the new drainage system on Industrial Avenue, which then flows west to Edith Boulevard picking up flow from drainage area 30A. The flow joins the Edith Boulevard main trunk line and heads south to System 7. Across from the

NMYDDC, flow from both Systems 7 and 8 will turn west and enter either an open channel or a storm drain to Pond 1. The combined flow will be 294 cfs. **Table 1** summarizes the 100-year peak discharges.

The pond property is currently owned by the State of New Mexico. The State has plans to develop the eastern 5 acres of the property, leaving up to 10 acres for the proposed pond. The total flow into the pond will be 343 cfs, including the flow from the proposed development. This was the only area west of Edith Boulevard included in the pond analysis. Existing flows from north and south of the pond now drain toward an existing timber bridge under the railroad tracks, located just north of Pond 1. Runoff into this low-lying area may build up, creating a floodplain (see Figure 2). With the proposed project, runoff from the north and south will continue to flow around the proposed pond berm to the bridge.

The proposed pond design has three major constraints:

- Backwater from the Alameda Drain should not flood the pond
- The pond should accommodate future drainage from surrounding areas
- The pond water level should be low enough to drain the proposed Edith project

The proposed detention Pond 1 configuration calls for an earth embankment and an emergency spillway. The storage capacity of the pond will be approximately 18 acre-feet, with up to 4' of freeboard. The pond storage volume will be provided above the maximum water surface in the Alameda Drain to avoid backwater. The assumed maximum 100-year water surface elevation in the Drain was 4969', estimated from the *Alameda and Riverside Drain Analysis*. The pond will be designed to drain in 96 hours or less.

Pond 1 could be considered a jurisdictional dam under Office of the State Engineer (OSE) criteria, since the proposed berm will hold more than 10 acre-feet of water above the existing grade. PB will coordinate this issue with Bernalillo County and the OSE as design continues.

During our review of previous drainage studies, it was not clear how the area bounded generally by the NMDOT railroad tracks, Edith Boulevard, Griegos Road, and Candelaria Road would drain in the future. For that reason, Pond 1 will be designed for future expansion to handle drainage from this area. The bottom of the pond could be excavated to increase the storage capacity. This would also allow for construction of inlets north and south of the pond. For the current project, the pond outlet will be constructed as low

as possible, realizing the outlet elevation is constrained by the Alameda Drain. If the pond is lowered in the future, a flapgate may be needed to prevent backflow from the Drain during major storms.

The pond will discharge into a 24" diameter pipe, which will cross under the NMDOT railroad tracks and flow west along Headingly Avenue to tie into the Alameda Drain. This discharge will be limited to a maximum of 6.4 cfs, consistent with previous drainage reports. The invert elevation of the 24" pipe at the Drain will be about 4962', which was assumed to be the normal water surface elevation. Erosion protection and energy dissipation will be designed at the pipe outlet to minimize scour.

Due to the high 100-year water level in the Alameda Drain and the low elevation of Headingly Avenue, the manholes located along Headingly will be bolted to prevent backflow out of the manholes. No inlets will be connected to the new storm drain in Headingly.

4.1.1 Alameda Drain Analysis

A field investigation was conducted to find out which of the improvements proposed in the *Alameda and Riverside Drains Analysis* have been made, and which are still needed. Figures 4 through 7 show the existing culvert locations along the Drain from Montaño to Rio Bravo. There are only a few crossings in the reach south of Rio Bravo, and these were neglected for this analysis. Table 3 shows the structure sizes and the results of our field inspection. Based on this, some culvert upgrades are needed south of Interstate 40. These upgrades should be done concurrently with the proposed Edith project in order for the Alameda/Riverside Drain system to function as originally planned.

BERNALILLO COUNTY	SHEET
BERNALILLO PROJECT NO.	NO.
TS04-15	

Parsons Brinckerhoff

POND #1

25

TRUNK SYSTEM "7"

TRUNK SYSTEM "8"

EDITH BLVD.

1A-9A

POPE/MARTINEZ

32A

10A-20A

#E4

22A4

#E3

22A3

#E2

22A2

#E1

22A1

21A-24A

25A

POND #5

INDUSTRIAL RD.

32A1

29A-31A 33A-39A

40A-52A

LEGEND

BASIN #

POND #

FIGURE 3
AHYMO FLOW CHART

Table 3 - Alameda Drain Culverts

Number	Crossing Location	Structure Type	Shape	NO. of Barrels	Height	Width	Upgrade Needed	Remarks
1	Griegos Rd.	CBC	Box	2	6'	10'	N/A	
2	San Lorenzo	CBC	Box	1	6'	10'	No	
3	Mescalero Rd.	CBC	Box	1	6'	10'	No	
4	Headingly	CBC	Box	1	6'	10'	No	
5	Aztec	CBC	Box	1	6'	10'	No	
6	Veranda	CBC	Box	1	6'	10'	No	
7	Candelaria Rd.	CMP	Arch		7'	12'	No	
8	Shropshire	CBC	Box	2	6'	10'	No	
9	Mildred Ave.	CMP	Round		14'	14'	No	
10	4th Street	CBC	Box	2	5'	5'	No	
11	12th Street	CMP	Arch		7'	12'	No	
12	San Isidro St	CMP	Round		15'	15'	No	
13	Indian School Rd.	CMP	Round		14'	14'	No	
14	Lilac Ave	CMP	Arch		6'	12'	No	
15	Rio Grande Blvd.	CBC	Box	1	6'	10'	No	
16	Interstate 40						N/A	Did not field verify due to locked gate
17	Aspen Ave.	CMP	Arch		6'	10'	Yes	Recommended Improvement. 2-6'X10' CBC
18	Zearing Ave	CMP	Arch		6'	10'	Yes	Recommended Improvement: 2-6'X10' CBC
19	Carson Rd.						N/A	Did not field verify due to locked gate
20	Mountain Rd						N/A	Did not field verify due to locked gate
21	Thompson						N/A	Did not field verify due to locked gate
22	New York/Central	CBC	Box	2	5'	8'	No	
23	Laguna Blvd	CMP	Round		6'	6'	Yes	Replace with Pedestrian Bridge
24	Crossing Unnamed						N/A	Did not field verify
25	Alcalde Pl	CMP	Round		8'	8'	Yes	Recommended Improvement: 2-6'X10' CBC
26	Zoo Crossing	CBC	Box		7'	14'	N/A	New structure
27	Marquez Ln.	CMP	Round		8'	8'	Yes	Recommended Improvement. 2-6'X10' CBC
28	Bridge Blvd.	CBC	Box	2	8'	10'	No	
29	Crossing Unnamed						N/A	Did not field verify
30	Rio Bravo #1	CMP	Arch		7'	10'	No	
31	Rio Bravo #2	CMP	Arch		7'	10'	No	

Abbreviations:

CMP=	Corrugated Metal Pipe
CBC=	Concrete Box Culvert
N/A=	Not Available

PB Parsons Brinckerhoff

Los Griegos
CITY BDY
MONTANO
LATERAL
AMERICAN
EL
RD
Douglas MacArthur Sch
DELMAR
AVE
Drive-in Theater
GRANT
BOUNDARY
Trinity Sch
GRIEGOS
HARWOOD
PAN
La Luz Sch
ALBUQUERQUE
Griegos Sch
ALAMEDA DRAIN
ST
RD
Valley High Sch
Harwood Ch
85
2
3
NM 47 1
PROPOSED OUTFALL
47
4
5
6
7
8
9
10
G 13 S
4968
CANDELARIA
POND
Los Candelarias
Matthew Meadows Park
Garfield Park
St Thomas Sch
12
11
MATHEW
AVE
ALAMEDA DRAIN
POND 1
BM 4973
4970
Cochiti Sch
Park
MENAUL
BLVD
NW
NM 47 12
Substa
Indian Pueblo Cultural Center
Job Corps Sch
Athletic Field
BM 4979
Graves Park
BM 4967
I-40
Coronado Park
Santo Barbara - Marine Town Park
Menaul
4999
Mt Calvary Cemetery
Vietnam Veterans Park
INDIAN
Museum of Natural History
Tiguex Park
VAN ALBUQUERQUE

FIGURE 4

SCALE 1:1000

BERN PROJECT NO._____ SHEET NO. XX

PB Parsons Brinckerhoff

Matthew McGowan Park

MATHEW AVE

ALAMEDA

ALAMEDA DRAIN

Cochiti Sch

Krogh Park

Well

Los Duranes Park

Duranes Sch

Community Center

Communication Towers

Indian Pueblo Cultural Center

UC Job Corps Sch

Athletic Field

BM 4979

Graves Park

MENAUL

INDIAN SCHOOL

12TH ST

ROAD

Mobile Home Park

Well

DITCH

Los Duranes

BLVD

40

BM 4977

I-40

Well

Communication Towers

TOWN OF ALBUQUERQUE

Albuquerque Museum

Old Town Gateway Park

Chavez Sch

DURANES

Old Town

Old Town Plaza

Tiguex Park

Museum of Natural History

State Park

GRANDE

ALAMEDA DRAIN

BM 4950

Golf Course

SAN PASQUALE AVE

LOMAS BLVD

Main Post Office

Main Park

CENTRAL AVE

Soldiers and Sailors Park

Middle School

Robinson Park

Kit Carson Park

LEVEE 4950

OLD TOWN BRIDGE

RIVERSIDE DRAIN

Albuquerque Country Club

Atrisco Park

Loop

Valle Vista Sch

SUNSET

ATRISCO

RIO GRANDE STATE PARK

RIO GRANDE VALLEY

Rio Grande Zoological Park

Tingley Field

ROAD

FIGURE 5

SCALE 1:1000

BERN PROJECT NO. _____ SHEET NO. XX

PB Parsons Brinckerhoff

buquerque
untry Club

Forest Park

Main Park

Soldiers and Sailors Park

National

Civic Plaza

Convention Center

City Hall

Courthouse

Library

Robinson Park

Kit Carson Park

Courthouse

Immanuel

BM 4956

BM 4961

SAN PASQUALE

CENTRAL AVE

23

24

25

26

27

28

29

30

31

314

RIO GRANDE VALLEY STATE PARK

ROAD ON LEVEE

RIVERSIDE DRAIN

Rio Grande Zoological Park

Tingley Field

Hazeldine

Eddie Garcia Park

Pete Padilla Park

Five Points

Armijo

Park Community

Old Armijo Sch

School on Hill

BARELAS BRIDGE

BLVD

ROAD

BRIDGE

SUNSET

RIVERSIDE

DRAIN

BARELAS DITCH

2ND ST

BROADWAY

WOODWARD

BM 4941

NM 361 2 4969

NM 47 18

4938

4940

4930

4910

4960

East and Co

South San Jose Park

Well

Barelas Railroad

SCALE
1:1000

FIGURE 6

BERN PROJECT NO. _____ SHEET NO. XX

PB Parsons Brinckerhoff

FIGURE 7

SCALE 1:1000

BERN PROJECT NO._____ SHEET NO. XX

4.1.2 Water Quality Requirements

The regional MS4 Permit requires storm water treatment to remove floatable trash and debris before it enters the Rio Grande. In addition, the MRGCD typically requires oil/floatables separation before water enters their system. For the current project, these requirements will be addressed at Pond 1 with a water quality outlet structure. The details of this structure will be finalized during design. No other inlets will be connected to the proposed storm drain along Headingly Avenue before it reaches the Alameda Drain. In addition, a fore bay will be designed for to trap sediment for removal by maintenance crews.

The remainder of the proposed storm drain system will drain into existing County Ponds 7 and E8. Modifications to these ponds are not included in the current project scope.

4.1.3 Floodplain Issues

The proposed design should have a negligible impact on the existing floodplain adjacent to the NMDOT railroad tracks. The proposed storm drain system and pond will capture much of the runoff that previously reached the area, which should reduce the depth and extent of flooding. Although the proposed berm may affect drainage locally, it will not block historic flow patterns. In addition, the pond will be designed to accept local drainage in the future if necessary.

4.2 System 9

System 9 starts just north of the Hahn Arroyo junction box. It picks up sheet flow from off-site and concentrated flow from Nikanda Road. A stub-out and inlet are proposed for this road also. The system drains toward the north and connects to an existing trunk line near Tahoe Place. This proposed storm drain extension is essentially the same as in the Boyle report.

4.3 System E-1

The System E-1 trunk will consist of an existing 48" pipe and proposed inlets that tie to the existing Carmony Road main trunk line. The drainage area to the east, the former Hahn Arroyo drainage area, was subdivided into drainage areas 10B, 12B 14B, 16B, 18B, 20B and 21B as shown on **Exhibit 3**. Runoff from these areas appears to be intercepted by existing inlets east of Edith Boulevard on private property. This assumption will be verified as design proceeds. Inlets will be constructed along Edith to handle drainage from the new roadway. These inlets will be connected to existing manholes, or to the existing trunk line.

5 CONCLUSION

Summary

This report described the analysis of drainage improvements for the Edith Boulevard Reconstruction Phase II Project. The following major drainage improvements will be constructed with this project.

- Construction of drop inlets and storm drain along Edith Boulevard from just north of Candelaria Road to just south of Tahoe Place, including:
    - New Systems 7 and 8
    - Extension of existing Systems 9 and E-1
- Construction of an 18 acre-foot capacity detention pond east of the NMDOT railroad tracks, across from the NMYDDC, with an outfall storm drain down Headingly Avenue to the Alameda Drain. The proposed peak discharge into the Drain will be 6.4 cfs, in accordance with previous reports.
- Expansion of the existing County pond (Pond 5) on Industrial Avenue east of Edith to 2.9 acre-feet capacity, with a storm drain outfall to Edith. Plug the current outfall to the Alameda Lateral.

Key Differences from Earlier Reports

There are several key differences between the current analysis and previous reports:

- The current report reflects the latest hydrologic and drainage criteria for Bernalillo County and the City of Albuquerque.
- The existing pond E4 on the NMYDDC property east of Edith was re-graded by others and will not be expanded further as of this writing. An outlet will be constructed to the Edith storm drain, and improvements will be made to direct drainage into the pond from the NMYDDC property.
- Small detention ponds on the NMYDDC property were included in the hydrologic analysis.
- The Big I reconstruction project diverted flows from east of I-25 near Aztec Road to the south, away from the study area.
- Detention Pond 1 will be designed to allow for future expansion to handle additional local drainage.

- Controlling downstream hydraulic grade lines were assumed to be for the 100-year storm, instead of the 10-year storm as in previous reports.

APPENDIX A

```
******** Edith Drainage
* Using the AHYMO Computer Program
* FILE: EdithBasin.DAT
* THE IA/INF METHOD USED TO COMPUTE THE RUNOFF
**********************************************************
START                TIME = 0.0    PUNCH CODE = 0
LOCATION             ALBUQUERQUE
RAINFALL             TYPE=2    QUARTER=0.0    HOUR=1.95    SIX=2.2
                     DAY=2.6    DT=0.05
*Used values from NOAA Atlas 2, 100yr, 24hr PRECIPITATION FREQUENCY

*DRAINAGE AREA 32A
**********************************************************
COMPUTE LT TP        LCODE=1    NK=3    ISLOPE=0
                     LENGTH=400 FT  SLOPE=0.0071     K=1.0
                     LENGTH=1345 FT SLOPE=0.0443     K=2.0
                     LENGTH=489 FT  SLOPE=0.0303     K=2.0

COMPUTE NM HYD       ID=1      HYD NO=1  DA=.0215 SQ MI
                     PER A=0   PER B=0   PER C=30   PER D=70
                     TP=0.0    MASSRAIN=-1
PRINT HYD            ID=1  CODE=1

*ROUTE DRAINAGE AREA 32A DOWN MARTINEZ/POPE DR
**********************************************************
COMPUTE RATING CURVE CID=1 VS NO=1 NO SEGS=1 MIN ELEV=99.33
                     MAX ELEV=100  CH SLP=0.02 FP SLP=0.02 N=0.013 DIST=42
                     DIST    ELEV       DIST    ELEV     DIST    ELEV
                     0       100          .1    99.33     21     99.75
                     41.9     99.33        42     100

ROUTE MCUNGE         ID=2 HYD NO=2 INFLOW ID=1
                     DT=0 LENGTH=485 NS=0 SLOPE=0.02
PRINT HYD            ID=2 CODE=1


*DRAINAGE AREA 1A,2A,3A,4A,5A,6A,7A,8A,9A
*TC IS LESS THAN 12MIN,THEREFORE TP=(2/3)TC
**********************************************************
COMPUTE NM HYD       ID=4       HYD NO=3  DA=.0081 SQ MI
                     PER A=0    PER B=0   PER C=30   PER D=70
                     TP=.1333   MASSRAIN=-1
PRINT HYD            ID=4       CODE=1

*ADD DRAINAGE AREAS AT AP #1
**********************************************************
ADD HYD              ID=5 HYD=5 ID I=2 ID II=4
PRINT HYD            ID=5 CODE=1


*DRAINAGE AREA 10A,11A,12A,13A,14A,15A,16A,17A,18A,19A,20A
*TC IS LESS THAN 12MIN,THEREFORE TP=(2/3)TC
**********************************************************
COMPUTE NM HYD       ID=6       HYD NO=6  DA=.0118 SQ MI
                     PER A=0    PER B=0   PER C=30   PER D=70
                     TP=.1333   MASSRAIN=-1
PRINT HYD            ID=6       CODE=1

*ADD DRAINAGE AREAS AT AP #1
**********************************************************
ADD HYD              ID=7 HYD=7 ID I=5 ID II=6
PRINT HYD            ID=7 CODE=1

*ROUTE DRAINAGE AREA THROUGH EDITH STORM DRAIN
**********************************************************
COMPUTE RATING CURVE CID=1 VS NO=12 CODE=-1 SLP=.0095
                     DIA=5.0 N=0.015

ROUTE MCUNGE         ID=8 HYD NO=8 INFLOW ID=7
                     DT=0 LENGTH=700 FT NS=0 SLOPE=0.0024
PRINT HYD            ID=8 CODE=1



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

```
*DRAINAGE AREA 22A1
**********************************************************
COMPUTE NM HYD      ID=221     HYD NO=221  DA=.0293 SQ MI
                    PER A=0    PER B=25  PER C=25  PER D=50
                    TP=.133    MASSRAIN=-1
PRINT HYD           ID=221     CODE=1


*ROUTE HYDROGRAPH 22A1 THROUGH POND #1 ON EAST SIDE OF GIRLS SCHOOL
**********************************************************
ROUTE RESERVOIR     ID=9 HYD=9       INFLOW ID=221     CODE=24
                    OUTFLOW (CFS)    STORAGE (AC FT)   ELEV (FT)
                      0                0                5020
                     10               .3273             5022
                     22.5             .5287             5023
                     141.4            .7301             5024


PRINT HYD           ID=9  CODE=1

*ROUTE OVERFLOW THROUGH CHANNEL #1
**********************************************************
COMPUTE RATING CURVE CID=3   VS NO=4    NO SEG=1
                     MIN ELEV= 0        MAX ELEV=4
                     CH SLOPE=0.013     FP SLOPE=0.013
                     N=0.060            DIST=5 FT
                     DIST   ELEV        DIST   ELEV
                      0      .5         2.5    0
                      5      .5


ROUTE MCUNGE        ID=10 HYD NO=10 INFLOW ID=9
                    DT=0.0 HR LENGTH=655 FT
                    NS=0  SLOPE=0.013
PRINT HYD           ID=10 CODE=1


*DRINAGE AREA 22A2
**********************************************************
COMPUTE NM HYD      ID=222     HYD NO=11  DA=0.012 SQ MI
                    PER A=0    PER B=25   PER C=25  PER D=50
                    TP=.133    MASSRAIN=-1
PRINT HYD           ID=222     CODE=1


*ROUTE HYDROGRAPH 22A2 THROUGH POND #2 IN MIDDLE OF GIRLS SCHOOL
**********************************************************
ROUTE RESERVOIR     ID=12 HYD=12     INFLOW ID=222     CODE=24
                    OUTFLOW (CFS)    STORAGE (AC FT)    ELEV (FT)
                    0                0                 5020
                    0.02             .1076             5022
                    0.04             .2709             5024
                    15               .3669             5025
                    156.42           .4616             5026

PRINT HYD           ID=12  CODE=1


*ROUTE DRAINAGE AREA 22A2
**********************************************************
COMPUTE RATING CURVE CID=4   VS NO=5    NO SEG=1
                     MIN ELEV= 0        MAX ELEV=.5
                     CH SLOPE=0.013     FP SLOPE=0.013
                     N=0.060            DIST=100 FT
                     DIST   ELEV        DIST   ELEV
                      0      .5         50     0
                      100    .5


ROUTE MCUNGE        ID=99 HYD NO=99 INFLOW ID=12
                    DT=0.0 HR LENGTH=560 FT
                    NS=0  SLOPE=0.013
PRINT HYD           ID=99 CODE=1
```

```
*ADD DRAINAGE AREAS AT 22A1 AND 22A2 AT AP #2
**********************************************************
ADD HYD              ID=98 HYD=98 ID I=10 ID II=99
PRINT HYD            ID=98 CODE=1


*DRINAGE AREA 22A3
**********************************************************
COMPUTE NM HYD       ID=223     HYD NO=13  DA=0.0121 SQ MI
                     PER A=0    PER B=25   PER C=25  PER D=50
                     TP=.133    MASSRAIN=-1
PRINT HYD            ID=223     CODE=1

*ADD HYDROGRAPHS 22A1, 22A2, AND 22A3 AT AP #2
**********************************************************
ADD HYD              ID=113 HYD=113 ID I=98 ID II=223

PRINT HYD            ID=113  CODE=1


*ROUTE HYDROGRAPH THROUGH POND #3 IN MIDDLE OF GIRLS SCHOOL
**********************************************************
ROUTE RESERVOIR      ID=14 HYD=14      INFLOW ID=113    CODE=24
                     OUTFLOW (CFS)   STORAGE (AC FT)   ELEV (FT)
                     0               0                 4998
                     0.01            .1898             5000
                     0.02            .5276             5002
                     15              .5388             5003
                     156.42          .7397             5004

PRINT HYD            ID=14   CODE=1


*DRAINAGE AREA 22A4
**********************************************************
COMPUTE NM HYD       ID=224     HYD NO=15  DA=.0225 SQ MI
                     PER A=0    PER B=25    PER C=25  PER D=50
                     TP=.133    MASSRAIN=-1
PRINT HYD            ID=224     CODE=1


*ADD HYDROGRAPHS 22A1, 22A2, 22A3, AND 22A4 AT AP #3
**********************************************************
ADD HYD              ID=16  HYD=16 ID I=14 ID II=224
PRINT HYD            ID=16  CODE=1


*ROUTE HYDROGRAPH 22A4 THROUGH POND #4 IN GIRLS SCHOOL EAST OF EDITH   2-36" PIPES FOR RATING CURVE
**************************************************************************************
ROUTE RESERVOIR      ID=17 HYD=17    INFLOW ID=16     CODE=24
                     OUTFLOW (CFS)   STORAGE (AC FT)   ELEV (FT)
                        0               0                 4980
                       16               .1014             4981
                       38               .2178             4982
                       70               .3495             4983
                      100               .4971             4984

PRINT HYD            ID=17   CODE=1


*ROUTE FLOW FROM POND #4 IN GIRLS SCHOOL THROUGH PIPE TO EDITH STORM DRAIN
**********************************************************
COMPUTE RATING CURVE CID=1 VS NO=5 CODE=-1 SLP=0.02
                     DIA=4 N=0.013

ROUTE MCUNGE         ID=18 HYD NO=18 INFLOW ID=17
                     DT=0 LENGTH=87 NS=0 SLOPE=0.02

PRINT HYD            ID=18 CODE=1


**************************************************************************************
**************************************************************************************


*ADD HYDROGRAPHS 32A, 1A-9A, 10A-20A, AND 22A.1-22A.4 AT AP #4
**********************************************************
ADD HYD              ID=19 HYD=19 ID I=8 ID II=18
PRINT HYD            ID=19  CODE=1
```

```
*ROUTE HYDROGRAPH THROUGH EDITH STORM DRAIN
**********************************************************
COMPUTE RATING CURVE CID=1 VS NO=6 CODE=-1 SLP=0.0024
                     DIA=6 N=0.013

ROUTE MCUNGE         ID=20 HYD NO=20 INFLOW ID=19
                     DT=0 LENGTH=245 NS=0 SLOPE=0.0024

PRINT HYD            ID=20 CODE=1
PLOT HYD             ID=20


*DRAINAGE AREA 21A, 23A, 24A TC IS LESS THAN 12MIN,THEREFORE TP=(2/3)TC
**********************************************************
COMPUTE NM HYD       ID=21    HYD NO=21  DA=.0015 SQ MI
                     PER A=0   PER B=0  PER C=30  PER D=70
                     TP=.1333  MASSRAIN=-1
PRINT HYD            ID=21     CODE=1

*ADD HYDROGRAPHS 32A, 1A-9A, 10A-20A, AND 22A.1-22A.4 WITH 24A AT AP# 5
**********************************************************
ADD HYD              ID=22 HYD=22 ID I=21 ID II=20
PRINT HYD            ID=22  CODE=1



**********************************************************************************
**********************************************************************************

*DRAINAGE AREA 40A-52A
**********************************************************

COMPUTE NM HYD       ID=400     HYD NO=400  DA=.0112 SQ MI
                     PER A=0    PER B=0    PER C=30  PER D=70
                     TP=.133    MASSRAIN=-1
PRINT HYD            ID=400     CODE=1

*ROUTE DRAINAGE AREA 40A-52A THROUGH EDITH STORM DRAIN
**********************************************************
COMPUTE RATING CURVE CID=1 VS NO=7 CODE=-1 SLP=0.0024
                     DIA=3.0 N=0.013

ROUTE MCUNGE         ID=225 HYD NO=225 INFLOW ID=400
                     DT=0  LENGTH=622 NS=0 SLOPE=0.0024
PRINT HYD            ID=225 CODE=1

*DRAINAGE AREA 29A,30A, 31A,33A,34A,35A,36A,37A,38A,39A
**********************************************************
COMPUTE NM HYD       ID=299     HYD NO=23  DA=.0388 SQ MI
                     PER A=0    PER B=0    PER C=30  PER D=70
                     TP=.133    MASSRAIN=-1
PRINT HYD            ID=299     CODE=1

*ADD 40A-52A TO 29A,30A,31A,33A,34A,35A,36A,37A,38A,39A AT AP #6
**********************************************************

ADD HYD              ID=24  HYD=24 ID I=225 ID II=299

PRINT HYD            ID=24  CODE=1



**********************************************************************************
**********************************************************************************

*DRAINAGE AREA 32A1 Industrial Drainage Basin
*Drainage area was reduced due to the 3 small ponds on the
*32A1 basin. .0494-.00336=.0460 SQ MI
**********************************************************

COMPUTE NM HYD       ID=27     HYD NO=27  DA=.0460 SQ MI
                     PER A=0   PER B=0    PER C=30  PER D=70
                     TP=0.1333 MASSRAIN=-1
PRINT HYD            ID=27  CODE=1
```

```
*ROUTE HYDROGRAPH 32A1 THROUGH POND 24" PIPE WITH 25 CFS RESTRICTION
**************************************************************************
ROUTE RESERVOIR      ID=28 HYD=28     INFLOW ID=27     CODE=24
                     OUTFLOW (CFS)    STORAGE (AC FT)    ELEV (FT)
                       0                 0                 4995
                      25                 2.90              5000


PRINT HYD            ID=28  CODE=1

*ROUTE DRAINAGE THROUGH INDUSTRIAL STORM DRAIN
**********************************************************
COMPUTE RATING CURVE CID=1 VS NO=9 CODE=-1 SLP=0.0280
                     DIA=3 N=0.013

ROUTE MCUNGE         ID=29 HYD NO=29 INFLOW ID=28
                     DT=0 LENGTH=550 NS=0 SLOPE=0.0280
PRINT HYD            ID=29 CODE=1


**************************************************************************
**************************************************************************



*ADD 40A-52A AND 29A,29A,30A, 31A,33A,34A,35A,36A,37A,38A,39A TO 32A1 BASIN
*AT AP # 6
**********************************************************

ADD HYD              ID=38  HYD=38 ID I=24 ID II=29

PRINT HYD            ID=38  CODE=1


*ROUTE DRAINAGE AREA 40A-52S AND 29A,29A,30A, 31A,33A,34A,35A,36A,37A,38A,39A
*AND 32A1 THROUGH EDITH STORM DRAIN
**********************************************************

COMPUTE RATING CURVE CID=1 VS NO=8 CODE=-1 SLP=0.0046
                     DIA=5.0 N=0.013

ROUTE MCUNGE         ID=25 HYD NO=25 INFLOW ID=38
                     DT=0  LENGTH=264 NS=0 SLOPE=0.0046
PRINT HYD            ID=25 CODE=1



*DRAINAGE AREA 25A, 26A, 27A, 28A
**********************************************************
COMPUTE NM HYD       ID=255     HYD NO=255  DA=.0143 SQ MI
                     PER A=0    PER B=0  PER C=30  PER D=70
                     TP=.133    MASSRAIN=-1
PRINT HYD            ID=255     CODE=1


*ADD 40A-52A,29A,29A,30A, 31A,33A,34A,35A,36A,37A,38A,39A, 32A1, AND 25A-28A
**********************************************************

ADD HYD              ID=39  HYD=39 ID I=255 ID II=25

PRINT HYD            ID=39  CODE=1


**************************************************************************
**************************************************************************

*ADD HYD FROM TRUNK 7 TO HYD FROM TRUNK 8 AT AP#5
**********************************************************
ADD HYD              ID=41  HYD=41 ID I=39 ID II=22

PRINT HYD            ID=41  CODE=1


*ROUTE COMBINED DRAINAGE AREA IN CHANNEL #2
**********************************************************
```

```
COMPUTE RATING CURVE CID=1    S NO=10    NO SEG=1
                     MIN ELEV= 0         MAX ELEV=4
                     CH SLOPE=0.013      FP SLOPE=0.013
                     N=0.035             DIST=34 FT
                     DIST    ELEV        DIST    ELEV        DIST    ELEV
                      0       4          8        0           26      0
                      34      4

ROUTE MCUNGE         ID=42 HYD NO=42 INFLOW ID=41
                     DT=0.0 HR LENGTH=483 FT
                     NS=0  SLOPE=0.013
PRINT HYD            ID=42 CODE=1



**********************************************************************************
**********************************************************************************

*DRAINAGE AREA 25
*****************************************************
COMPUTE NM HYD       ID=43     HYD NO=43  DA=.0255 SQ MI
                     PER A=0   PER B=0  PER C=70  PER D=30
                     TP=.133   MASSRAIN=-1
PRINT HYD            ID=43     CODE=1


*ADD 25 TO CHANNEL FLOW AT AP #8
*****************************************************

ADD HYD              ID=44  HYD=44 ID I=42 ID II=43

PRINT HYD            ID=44  CODE=1
PLOT HYD             ID=44


*ROUTE HYDROGRAPH THROUGH POND #1
*****************************************************
ROUTE RESERVOIR      ID=45 HYD=45    INFLOW ID=44       CODE=24.8
                     OUTFLOW (CFS)   STORAGE (AC FT)    ELEV (FT)
                       0               0                  4969
                       3.6             5.27               4970
                       5.2             10.63              4971
                       6.4             18.01              4972

PRINT HYD            ID=45  CODE=1


FINISH
```

AHYMO PROGRAM SUMMARY TABLE (AHYMO_97) - - VERSION: 1997.02d RUN DATE (MON/DAY/YR) =09/01/2006
INPUT FILE = C:\PROGRA~1\AHYMO_97\EDC954~1.DAT USER NO.= AHYMO-I1Parsons-Br-NM-AH

COMMAND	HYDROGRAPH IDENTIFICATION	FROM ID NO.	TO ID NO.	AREA (SQ MI)	PEAK DISCHARGE (CFS)	RUNOFF VOLUME (AC-FT)	RUNOFF (INCHES)	TIME TO PEAK (HOURS)	CFS PER ACRE	NOTATION	
START										TIME=	.00
LOCATION		ALBUQUERQUE									
RAINFALL TYPE= 2										RAIN24=	2.600
COMPUTE NM HYD	1.00	-	1	.02150	48.91	2.261	1.97156	1.550	3.554	PER IMP=	70.00
ROUTE MCUNGE	2.00	1	2	.02150	48.67	2.260	1.97081	1.600	3.537	CCODE =	.1
COMPUTE NM HYD	3.00	-	4	.00810	20.81	.852	1.97156	1.500	4.015	PER IMP=	70.00
ADD HYD	5.00	2& 4	5	.02960	65.42	3.112	1.97098	1.550	3.453		
COMPUTE NM HYD	6.00	-	6	.01180	30.31	1.241	1.97155	1.500	4.014	PER IMP=	70.00
ADD HYD	7.00	5& 6	7	.04140	92.13	4.352	1.97114	1.550	3.477		
ROUTE MCUNGE	8.00	7	8	.04140	90.05	4.342	1.96663	1.550	3.399	CCODE =	.1
COMPUTE NM HYD	221.00	-	**	.02930	65.68	2.524	1.61498	1.500	3.503	PER IMP=	50.00
ROUTE RESERVOIR	9.00	**	9	.02930	64.22	2.524	1.61497	1.550	3.425	AC-FT=	.599
ROUTE MCUNGE	10.00	9	10	.02930	53.42	2.505	1.60334	1.650	2.849	CCODE =	.1
COMPUTE NM HYD	11.00	-	**	.01200	26.91	1.034	1.61498	1.500	3.504	PER IMP=	50.00
ROUTE RESERVOIR	12.00	**	12	.01200	19.45	.781	1.22044	1.600	2.533	AC-FT=	.370
ROUTE MCUNGE	99.00	12	99	.01200	15.95	.769	1.20122	1.900	2.076	CCODE =	.1
ADD HYD	98.00	10&99	98	.04130	53.43	3.274	1.48648	1.650	2.021		
COMPUTE NM HYD	13.00	-	**	.01210	27.13	1.042	1.61498	1.500	3.504	PER IMP=	50.00
ADD HYD	113.00	98&**	**	.05340	68.43	4.316	1.51559	1.650	2.002		
ROUTE RESERVOIR	14.00	**	14	.05340	70.11	3.789	1.33034	1.650	2.051	AC-FT=	.617
COMPUTE NM HYD	15.00	-	**	.02250	50.44	1.938	1.61499	1.500	3.503	PER IMP=	50.00
ADD HYD	16.00	14&**	16	.07590	98.00	5.727	1.41472	1.650	2.017		
ROUTE RESERVOIR	17.00	16	17	.07590	85.44	5.727	1.41466	1.700	1.759	AC-FT=	.425
ROUTE MCUNGE	18.00	17	18	.07590	85.44	5.727	1.41466	1.700	1.759	CCODE =	.0
ADD HYD	19.00	8&18	19	.11730	154.83	10.069	1.60947	1.650	2.062		
ROUTE MCUNGE	20.00	19	20	.11730	154.83	10.069	1.60947	1.650	2.062	CCODE =	.0
COMPUTE NM HYD	21.00	-	21	.00150	3.87	.158	1.97155	1.500	4.028	PER IMP=	70.00
ADD HYD	22.00	21&20	22	.11880	156.92	10.227	1.61404	1.650	2.064		
COMPUTE NM HYD	400.00	-	**	.01120	28.80	1.178	1.97156	1.500	4.018	PER IMP=	70.00
ROUTE MCUNGE	225.00	**	**	.01120	26.97	1.172	1.96273	1.550	3.763	CCODE =	.2
COMPUTE NM HYD	23.00	-	**	.03880	99.73	4.080	1.97155	1.500	4.016	PER IMP=	70.00
ADD HYD	24.00	**&**	24	.05000	126.28	5.252	1.96956	1.500	3.946		
COMPUTE NM HYD	27.00	-	27	.04600	118.13	4.837	1.97156	1.500	4.012	PER IMP=	70.00
ROUTE RESERVOIR	28.00	27	28	.04600	23.10	4.836	1.97129	2.050	.785	AC-FT=	2.680
ROUTE MCUNGE	29.00	28	29	.04600	23.10	4.836	1.97133	2.050	.785	CCODE =	.2
ADD HYD	38.00	24&29	38	.09600	135.45	10.088	1.97041	1.500	2.205		
ROUTE MCUNGE	25.00	38	25	.09600	135.45	10.088	1.97041	1.500	2.205	CCODE =	.0
COMPUTE NM HYD	255.00	-	**	.01430	36.77	1.504	1.97156	1.500	4.017	PER IMP=	70.00
ADD HYD	39.00	**&25	39	.11030	172.21	11.592	1.97055	1.500	2.440		
ADD HYD	41.00	39&22	41	.22910	297.73	21.819	1.78568	1.550	2.031		
ROUTE MCUNGE	42.00	41	42	.22910	293.52	21.788	1.78317	1.550	2.002	CCODE =	.1
COMPUTE NM HYD	43.00	-	43	.02550	55.62	1.960	1.44153	1.500	3.408	PER IMP=	30.00
ADD HYD	44.00	42&43	44	.25460	343.48	23.748	1.74895	1.550	2.108		
ROUTE RESERVOIR	45.00	44	45	.25460	6.43	23.764	1.75006	4.400	.039	AC-FT=	18.204
FINISH											

APPENDIX B

PB Parsons Brinckerhoff

HEADINGLY AVE.

RAILROAD

BERM

PROPOSED DETENTION POND

PROPOSED CHANNEL OR PIPE

FUTURE DEVELOPMENT SITE (5 ACRES)

SOUTH BOULEVARD

SHED

GATE

OBSCURED AREA

BIT.

GRAVEL

OPP. END NOT APPAREN

STOCKPILE

4970

2+3

23+00

24+00

25+00

26+00

27+00

28+00

20+00

21+00

POND 1
CONCEPTUAL PLAN

SCALE
1:100