City of Albuquerque
P.O. BOX 1293 ALBUQUERQUE, NEW MEXICO 87103

April 27, 1999

Mr. John A. Andrews
The Larkin Group
Consulting Engineers
8500 Menaul Blvd NE - Suite A-440
Albuquerque, NM 87112

Re: Calmat Business Park (F16/D14) Conceptual Grading and Drainage Plan, dated February 19, 1999 for Site Development Plan for Subdivision

Dear Mr. Andrews:

The referenced drainage submittal is approved for site development plan for subdivision. Prior to approval of a Site Development Plan for building permit, preliminary plat or building permits, an approved drainage report will be required. This report will need to include street design and storm drain requirements.

Sincerely,

Fred J. Aguirre, P.E.
City Hydrologist
Public Works Department

c: Andrew Garcia
File

Calmat of New Mexico

DRAINAGE ANALYSIS
FOR
CALMAT BUSINESS PARK – PHASE I
STORM DRAIN IMPROVEMENTS

Revised
October 25, 1999

REGISTERED PROFESSIONAL ENGINEER
STATE OF NEW MEXICO
No. 3960
JOHN A. ANDREWS

Prepared by:

THE LARKIN GROUP
CONSULTING ENGINEERS AND SURVEYORS

8500 Menaul Boulevard NE, Suite A-440
Albuquerque, New Mexico 87112

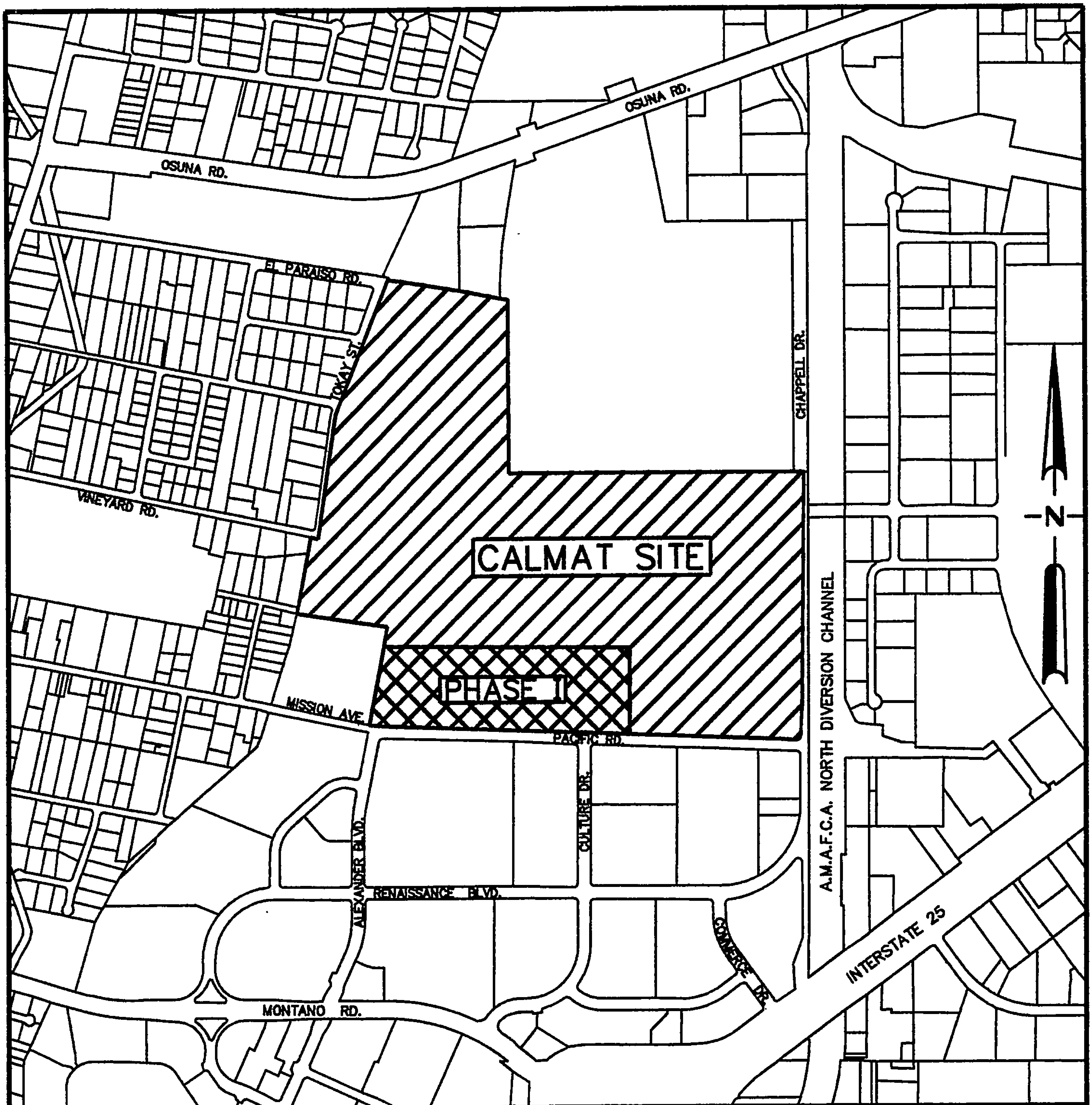
Section I

INTRODUCTION

Calmat of New Mexico proposes to develop a tract of land, currently used for sand and gravel extraction and processing, in a phased planning and construction sequence. This project is located in the northeast quadrant of the Albuquerque Metropolitan area, west of the North Diversion Channel, east of Tokay Street NE, north of Mission Road NE and south of Osuna Road NE. See **Figure 1 – Calmat Business Park Location Map**. The Phase I project involves the development of five lots adjacent to Mission Road NE for light industrial uses. Phase I also includes the widening of Chappell Drive and all existing intersections along the east boundary of the Calmat Tract. This report, with enclosed maps, provides a site specific Drainage Plan for Phase I improvements and a Master Drainage Plan for the entire Calmat Business Park.

The land on which the Phase I project lies has previously been mined of gravel and all mining activities have ceased in the immediate project area. The Phase I land will require significant regrading, as the earthen berm at the southern boundary of the gravel excavation operation will be moved north of the proposed Phase I lots. The proposed storm drain improvements to Calmat Business Park Phase I include the installation of catch basins, storm drain and channel from Mission Road to a detention basin at the southwest corner of the Calmat tract. The proposed storm drain facilities will discharge into the proposed detention basin. Improvements to Chappell Drive require storm drain inlets that will outlet to AMAFCA's North Diversion Channel. This hydrologic and hydraulic analysis of the watershed and proposed drainage facilities within the area of the Calmat Business Park was performed, with the assistance of the current AHYMO hydrologic modeling program and Hydraflow 7.0, respectively. The drainage areas and runoff values affecting the site under developed conditions and the location of the proposed storm drain improvements are shown on **Figure 2**, **Figure 3A**, and **Figure 3B**. No portion of the entire 161-acre Calmat Tract is within a FEMA designated floodplain. **Figure 8**, enclosed

Guidelines for this analysis are based upon Section 22.2, Hydrology, of the Development Process Manual (DPM), Design Criteria for the City of Albuquerque, New Mexico, July 1997. The AHYMO, January 1994 version, hydrologic modeling program was also used in this analysis. The model runs are located in **Appendix A**, page A-1.



ZONE ATLAS MAP E-16 & F-16
SCALE: 1"=1000'

CALMAT CO. OF NEW MEXICO				
CALMAT BUSINESS PARK ALBUQUERQUE, NEW MEXICO **LOCATION MAP**				
THE LARKIN GROUP INC.				
FILE No. 96-0748	DRAWN BY AE	CHECKED BY PG	DATE OCT. 1999	FIGURE 1

Section II

EXISTING CONDITIONS

A. GENERAL

The 161-acre Calmat tract is bounded by the North Diversion Channel on the east, Mission Road on the south, Tokay Street on the west and existing lots south of Osuna Road on the North. The land use zoning designation for the site is SU-1 for gravel excavation and processing. Under current conditions, most of the stormwater generated from excess precipitation flows toward a constructed sump area near the southwest corner of the tract and is retained on-site. However, throughout the site there are numerous, active sand and gravel extraction pits. Therefore, the exact volume of runoff and peak flow of any design storm under existing conditions is not able to be determined due to the ever-changing topography of the site.

B. OFF-SITE GENERATED RUNOFF

The Calmat tract receives stormwater runoff from the Renaissance Center development to the south and from Mission Hills Elementary School at the southwest corner of the Calmat tract. The volume and peak flows of runoff from these two areas are restricted by independent drainage covenants between Renaissance Center and Calmat and Albuquerque Public Schools and Calmat. The individual drainage characteristics of these basins are described further on pages 5,6 and 7 of this report. Please refer to **Figure 2**.

1. Renaissance Center Stormwater Runoff

Renaissance Center is a commercial and industrial park located south of Calmat. The vast majority of stormwater runoff generated in this area is handled through its own storm drainage system that outlets to a detention basin west of Renaissance Center. The Master Drainage Plan for the Renaissance Center, prepared by Andrews, Asbury and Robert, Inc., allows a 100-year runoff of approximately 64 cubic feet per second to be discharged to the Calmat tract. The resulting volume of the 100-year design storm contributes a total of 6.7 acre-feet to the Calmat tract. These runoff calculations were used in the Drainage Covenant that exists between Renaissance Center and Calmat. This runoff is conveyed to the Calmat tract through a 48-inch reinforced concrete pipe running normal to Mission Road and approximately 200 feet east of Alexander Boulevard. The pipe terminates approximately 170 feet north of Mission Road. An earthen channel conveys the runoff from the pipe outlet to the existing retention area of the Calmat tract near the southwest corner of the tract. Please refer to **Figure 2** and **Figure 3A**, enclosed.

2. Mission Hills Elementary School Stormwater Runoff

In general, runoff from the Mission Hills Elementary School tract flows from south to north. Investigation of the Drainage Plan on file with the City of Albuquerque, Drainage Plan F16/D12, reveals the following drainage characteristics. Calmat has granted a drainage easement to Albuquerque Public Schools for the purpose of draining a maximum of 2 acre-feet of stormwater runoff per 100-year storm event from the Mission Hills Elementary tract. A subsurface storm drain system collects and conveys runoff, via numerous inlets, from the Mission Hills tract. This storm drain system discharges to a constructed retention basin on the Calmat tract. Fencing surrounds the retention basin. Please refer to **Figure 2** and **Figure 3A**, enclosed.

3. Off-Site Areas Not Contributing Runoff to the Calmat Tract

The Universal Industrial Park is situated north of the Calmat tract. Please refer to **Figure 2**, enclosed. Currently, this land is also being used for gravel extraction and processing. The drainage plan for this tract, on file with the City of Albuquerque's Hydrology Division, describes the future use and drainage of this area. The drainage plan for Universal Industrial Park, Lot 4B-1 is filed under City of Albuquerque Drainage Plan E16/D13 and details that all runoff is to be retained on-site. This Drainage Plan, dated February 1995 and prepared by Bohannon-Huston, describes a developed condition with a retention pond at the southeast section of the tract. This retention pond is designed to retain two, 6-hour precipitation events of the 100-year frequency. Specifically, the pond will have a total surface area of 11.7973 acres and a total volume capacity of 27.4573 acre-feet.

The area immediately west of the Calmat Tract is downstream of the project area. Runoff in this area is ultimately collected by the storm drainage improvements in Edith Boulevard, which were completed in the spring of 1994. This system, designed by Boyle Engineering Corporation, was designed and built to receive the detained runoff from the Calmat Tract. Please reference the enclosed Record Drawings of the Construction Plans for Widening of Edith Boulevard Phase I, From Montano Road to Osuna Road (in back pocket of this report). The outfall of the proposed Calmat Business Park Detention Basin is to connect into the Edith Boulevard storm drain system at the intersection of Vineyard Road and Edith Boulevard. The Record Drawings for this project indicate a 30-inch diameter reinforced concrete pipe stub-out in Vineyard Road. This stub-out terminates approximately 160 feet east of the centerline of Edith Boulevard. The invert of the pipe at this location is at 4978.81. The drainage report for this project, also prepared by Boyle Engineering, indicates that the detained runoff from Calmat Business Park must not be greater than five cubic feet per second. Please reference the enclosed Record Drawings for the Edith Boulevard improvements.

C. CONCLUSIONS

Under developed conditions, the Calmat Tract will continue to receive stormwater runoff from Mission Hills Elementary School and the Renaissance Center Business Park. The North Diversion Channel diverts runoff from off-site areas east of the Calmat tract. North of the Calmat Tract, runoff will be retained on the site of Universal Industrial Park.

III

DEVELOPED CONDITIONS

A. Proposed Development of Calmat Business Park – Phase I

Calmat of New Mexico proposes to develop its 161-acre tract of land in three phases. Therefore, a Master Drainage Plan for the proposed Business Park is required in order to address peak runoff rates and total volume of runoff generated by a 100-year design storm event under fully developed conditions. The phases of development are indicated on **Figure 2**, enclosed.

1. Calmat Business Park Master Drainage Plan

Figure 2, Calmat Business Park Master Drainage Plan, indicates the drainage basins and peak flow rates for the entire Calmat Business Park under fully developed conditions. As the Business Park is developed, each phase will likely be zoned for light industrial land use.. In accordance with the City of Albuquerque Development Process Manual, Section 22.2, light industrial land use requires a hydrologic model using seventy-percent land type "D." The land types used in the AHYMO hydrologic model for the entire 161-acre tract were typically seventy percent land type "D" with the remaining a mixture of fifteen percent "B" and fifteen percent "C." Please refer to Table A-5, page 22-11, COA, DPM Section 22.2. The AHYMO hydrologic models are included in Appendix A. The Master Drainage Plan includes storm drainage improvements for Phase I development. Improvements to Phase II and Phase III will be further designed after land use, lot size and lot layout are more fully defined. The future detention basin and related outlet works shown in **Figure 2** and **Figure 4** are designed to detain the 100-year runoff event with the entire Calmat Business Park fully developed for light industrial land use. The drainage basin areas and land types used in the AHYMO hydrologic model are listed in **Table 1**. The time of concentration for each of the basins was calculated using the Upland Method, as described in the DPM. The resulting peak runoffs of a 100-year storm event, under developed conditions, are listed for several analysis points in **Table 2**. The location of each analysis point is shown in **Figure 2**, enclosed.

The preliminary calculations for the outlet works for the detention basin have been included in Appendix A of this report. The outlet standpipe; a 16-inch outer diameter, Schedule 40, steel pipe; in the detention pond is designed to discharge a maximum of 5 cubic feet per second at the maximum water level storage stage of 5028.43. Hydraulic calculations are included in Appendix A. At this stage the pond detains a maximum 26.4 acre-feet of stormwater runoff. Due to the depth and storage of this detention basin, a State Engineer's Filing Sheet describing the basin and its hydraulic functions will be required with submittal of preliminary plans for a permit to construct. The detention basin should completely convey the detained runoff in the required 96 hours following the 100-year, 24-hour precipitation event. The standpipe will discharge to a proposed manhole at the intersection of Vineyard Road and Tokay Street. Please refer to the enclosed **Figure 4** and Record Drawings for the Widening of Edith Boulevard, Phase I. An 18-inch reinforced concrete pipe storm drain is required to discharge the runoff from the proposed manhole to the 30-inch diameter stub-out from Edith Boulevard Storm Drain.

Table 1 – Master Drainage Plan
AHYMO Modeled Basin Characteristics for Developed Conditions (See Figure 2)

Basin	Area (Square Miles)	Land Treatment "A" (Percent)	Land Treatment "B" (Percent)	Land Treatment "C" (Percent)	Land Treatment "D" (Percent)
A-1	0.00364	0	15	15	70
A-1.1	0.00088	0	65	30	5
A-2	0.00338	0	15	15	70
A-2.1	0.00073	0	65	30	5
A-3	0.00344	0	15	15	70
A-3.1	0.00069	0	65	30	5
A-4	0.00328	0	15	15	70
A-4.1	0.00072	0	65	30	5
A-5	0.00394	0	15	15	70
A-5.1	0.00091	0	65	30	5
A-6	0.00433	0	50	15	35
A-7	0.00663	30	20	45	5
B-1	0.02766	0	15	15	70
B-2	0.03266	0	15	15	70
B-3	0.01984	0	15	15	70
B-4	0.00688	50	35	15	0
C-1	0.01188	0	15	15	70
C-2	0.01172	0	15	15	70
C-3	0.01297	0	15	15	70
C-4	0.02297	0	15	15	70
C-5	0.01047	0	15	15	70
C-6	0.00566	0	15	15	70
C-7	0.00891	0	15	15	70
C-8	0.00922	0	15	15	70
C-9	0.02672	0	15	15	70
C-10	0.01313	0	15	15	70
C-11	0.00475	0	0	10	90

Table 2 – Master Drainage Plan
Peak Flow / Volume of Runoff Generated by a 100 Year, 24-hour Event
Developed Conditions (See Figure 2)

Analysis Point	Peak Discharge, Q_p, for a 100-Year, 24 hour Event	Volume of Runoff Generated from 100-Year, 24 Hour Event
AP-A	77.4 cfs	3.807 acre-feet
AP-B	57.8 cfs	2.434 acre-feet
AP-C	112.4 cfs	5.679 acre-feet
AP-D	244.1 cfs	11.757 acre-feet
AP-E	204.5 cfs	9.005 acre-feet
AP-F	447.1 cfs	20.934 acre-feet
AP-G	35.2 cfs	1.433 acre-feet
AP-H	523.8 cfs	24.530 acre-feet
AP-I	100.5 cfs	6.571 acre-feet
AP-J	607.7 cfs	31.350 acre-feet

2.0 Calmat Business Park, Phase I

Calmat of New Mexico proposes to develop five lots (Lot 1 through Lot 5, Phase I) along Mission Road NE, the southerly boundary of its tract of land, adjacent to Renaissance Center commercial and industrial park. This development will constitute Phase I of Calmat Business Park. Each of these proposed lots is 2.5 to 2.9 acres in size. The proposed zoning and land use for these lots as well as Phase II and Phase III of Calmat Business Park is light industrial. The site development plan for the Calmat Business Park indicates that all lots are to have a landscaped border at all areas near the major streets. The land use factors for these areas have been adjusted accordingly. The storm drainage improvements outlined in this report include permanent and temporary improvements. The Drainage Plan for the proposed, Phase I, developed conditions is shown on **Figure 3A** and **Figure 3B**, enclosed.

This drainage plan establishes the major drainage facilities to be constructed at the time the infrastructure for Phase I of the project is to be constructed. The drainage facilities required for Phase I construction are catch basins and a 48-inch diameter RCP storm drain from Mission Road NE, a drainage channel, and a temporary retention basin. Chappell Drive, under Phase I development, is to be improved to four lanes and include a median. Stormwater catch basins are required on the southbound lanes of Chappell Drive and will discharge to AMAFCA's North Diversion Channel at exiting rundowns to the channel. It is understood that AMAFCA's approval is required. Hydrologic and hydraulic calculations of catch basin layout and capacity are located in the last section of Appendix A in this report. Phase I drainage plans include the use of the existing drainage channel flowing in a north-northwesterly direction from the low point of Mission Road NE. Phase I plans also include the continued use of the existing retention basin for the Calmat site and the existing retention basin for the Mission Hills Elementary School also located on the Calmat site (See **Figure 3A**).

2.1 Phase I Stormwater Collection and Conveyance System

Figure 3A shows the catch basin placement at Mission Road NE, storm drain and outflow channel to the proposed Calmat Detention Basin. Calculations for catch basin capacity and the hydraulic grade line for the storm drain and drainage channel are included in Appendix A. Catch basin placement for Chappell Drive NE is shown on **Figure 3B**. Calculations for catch basin capacity are included in Appendix A.

Two drainage easements for the purpose of draining the Phase I Lots and City of Albuquerque right-of-way are required for Phase I drainage improvements. A drainage easement between Lot 1 and

Lot 2 will be required for the installation and maintenance of the 48-inch storm drain collecting offsite runoff from Mission Road NE and Renaissance Center. Another drainage easement for the purpose of stormwater drainage will be required for Lots 2 through 5 and the collection of stormwater from the extension of Culture Drive NE of the Phase I development. This is proposed as a 40-foot easement directly north of Lots 1 – 4 of Phase I. Approximately eighty percent of these lots will drain northward to the easement. A drainage channel will be placed in the easement. Stormwater will flow westward to the terminus of the proposed 48-inch storm drain. The swale is to discharge into the proposed drainage channel at the terminus. The confluence of the drainage swale and storm drain will be connected to the existing drainage channel. Runoff will continue to flow in a northwesterly direction to the existing retention basin, Pond #1. It is proposed that stormwater drainage from lots in Phases II and III is to be covered by a blanket cross-lot drainage easement. The hydrologic model, for Phase I improvements, assumes that all excess runoff from the Calmat site will discharge to the existing retention basin. Assuming a 25 percent land treatment "B" and a 75 percent land treatment "C" for land areas in Phases II and III, the existing Pond #1 will retain all stormwater runoff generated, 17.945 acre-feet, with Phase I fully developed and Phases II and III undeveloped. This is a conservative estimate as there are numerous active gravel extraction and processing pits within the Calmat site and not all runoff will be delivered to the existing retention basin. Pond #2, Pond #3, and Pond # 4 add 9.2 acre-feet, 4.0 acre-feet, and 3.6 acre-feet, respectively. All four existing ponds have the capacity to retain two 100-year, 24-hour precipitation events.

2.2 Calmat Business Park Retention Basin

The existing retention basin is of sufficient size and capacity to retain all on-site runoff from the

Calmat Business Park as well as the runoff from Renaissance Center for a 100-year, 24-hour precipitation event. The calculations for stage and volume of the existing retention basin are included in **Appendix A**. The AHYMO hydrologic model indicates that the total volume of runoff from these areas is 18.5 acre-feet when the Phase I of the Calmat Business Park is complete. The existing retention basin has a capacity of approximately 21 acre-feet. The retention basin is to be reshaped and converted into a detention basin as Phases II and/or III are developed. The proposed detention basin, described in Section III.A.1, will be 10 to 11.5 feet in depth and covers an area of approximately 4.4 acres.

B. Calmat Business Park Outline for Phasing of Infrastructure

Improvements for Phase II and Phase III provided as information only and are subject to change prior to their development.

I. Phase I

A. Alexander Boulevard

1. Extension 400 ft North of Mission Avenue
   a. 4-Lane Roadway Section
   b. 86 ft ROW
   c. 6 ft Bikelanes North and Southbound
   d. 60 ft Flowline to Flowline
2. COA Standard Private Entrance for Mission School
   a. 20 ft radius on curb returns
   b. COA Standard Wheelchair Access Ramps, Each Curb Return
3. Extension of 10-inch Waterline 400 ft North
4. Extension of Gas Line

B. Culture Drive

1. Extension 400 ft North of Mission Avenue
   a. 4-Lane Roadway Section, 12 ft Lanes
   b. 68 ft ROW
   c. 48 ft Flowline to Flowline
2. Valley Gutter
3. COA Standard Wheelchair Access Ramps at NE and NW corners of Intersection
4. 25 ft Curb Returns
5. Extension of 10-inch and 12-inch Waterlines 400 ft Northward
6. Extension of Gas Line

C. Chappell Drive

1. Widen existing 2-Lane roadway to 4-lanes with 16 ft Median from Mission Avenue to Singer Blvd.
   a. Reconstruct intersection at Mission

b. Reconstruct Intersection at Singer
c. Reconstruct Intersection at Private Entrance
d. 25 ft Curb Returns
e. Provide Left Turn Bays as Necessary
f. 86 to 91 ft ROW
g. Transition from 4-Lane to 2-Lane North of Private Entrance

2. Extension of Waterline
3. Extension of Sewer
4. Extension of Gas Line
5. Installation of 2 – Type C, Single Grate Storm Drain inlets and RCP SD Piping to Outlet into North Diversion Channel at Existing Rundowns

D. Mission Road

1. Eastbound to Northbound Left Turn Bay at intersection of Mission Road and Culture Drive.
2. Installation of battery of storm drain inlets, 2 – Type A, Double Grate; 4- Type C Double Grate and RCP Storm Drain Pipe Connections

E. Drainage Channel

1. Trapezoidal drainage channel parallel to Mission Road, armored with rip-rap of one foot depth.

II. Phase II

A. Alexander Boulevard

1. Extension from North Lot Line of Phase I to 450 ft North of Proposed Intersection of Alexander and Singer
    a. 4-Lane Roadway Section, 12-ft Lane Width
    b. 86-ft ROW
    c. 6-ft Bikelanes North and Southbound
    d. 60-ft Flowline to Flowline
2. Construct Storm Drain System; Collecting Phase I, Renaissance and Mission Hills Elementary Stormwater Runoff and Outletting to Calmat Business Park Detention Pond

3. Construct T-Intersection of Alexander and Singer
    a. 25-ft radius on curb returns
    b. COA Standard Wheelchair Access Ramps, Each Curb Return
4. Construct 2-Lane Roadway (1/2 of 4-Lane) from 450 ft North of Proposed Intersection of Alexander and Singer to 900 ft East of El Paraiso Rd. NE
5. Extension of 10-inch Waterline Northward to 900 ft East of El Paraiso Rd. NE
6. Extension of Gas Line Northward to 900-ft East of El Paraiso Rd. NE

B. Construct Calmat Business Park Detention Basin
1. Construct Outlet Riser
2. Construct Manholes
3. Construct RCP outlet storm drain from Vineyard and Tokay intersection westward to 36" RCP Stub-out at Edith Boulevard
4. Construct Storm Drainage Rundowns into Detention Pond
5. Fill and Compact Earthen Drainage Ditch

III. Phase III Infrastructure

A. Culture Drive
1. Extension from North Lot Line of Phase I to Proposed Intersection of Culture and Singer
    a. 4-Lane Roadway Section, 12-ft Lane Width
    b. 68-ft ROW
    c. 48-ft Flowline to Flowline
2. Construct Storm Drain System; Collecting Phase III and Outletting to Calmat Business Park Detention Pond
3. Construct T-Intersection of Culture and Singer
    a. 25-ft radius on curb returns
    b. COA Standard Wheelchair Access Ramps, Each Curb Return
5. Extension of 10-inch and 12-inch Waterlines Northward to Proposed Intersection of Culture and Singer
6. Extension of Gas Line Northward to Proposed Intersection of Culture and Singer

B. Singer Avenue

1. Extension from Chappell Drive to Proposed Alexander Boulevard
    a. 4-Lane Roadway Section, 12-ft Lane Width
    b. 86-ft ROW
    c. 60-ft Flowline to Flowline
2. Construct Storm Drain System; Collecting Phase III and Outletting to Calmat Business Park Detention Pond
3. Construct T-Intersection of Singer and Chappell Drive
    a. 25-ft radius on curb returns
    b. COA Standard Wheelchair Access Ramps, Each Curb Return
4. Extension of 10-inch and 12-inch Waterlines
5. Extension of Gas Line

IV

REFERENCES

1. North Edith Boulevard Improvements, prepared by Boyle Engineering Corporation, for the County of Bernalillo, New Mexico, November 1990.

2. Section 22.2 of the Development Process Manual, Volume 2, Design Criteria for the City of Albuquerque, New Mexico in Cooperation with Bernalillo County, New Mexico and the Albuquerque Metropolitan Arroyo Flood Control Authority. July 1997.

3. Section 22.3, Hydraulic Design, of the Development Process Manual, Volume 2, Design Criteria for the City of Albuquerque, New Mexico in Cooperation with Bernalillo County, New Mexico and the Albuquerque Metropolitan Arroyo Flood Control Authority. March 1982.

HYDROLOGIC SUB-BASINS

X INDICATES SUB-BASIN DRAINS TO ANALYSIS POINT

	A-1 A-1.1	A-2 A-21	A-3 A-31	A-4 A-41	A-5 A-51	A-6 A-7	B-1 B-2 B-3 B-4	C-1	C-2	C-3	C-4	C-5	C-6	C-7	C-8	C-9	C-10	C-11	MISSION HILLS
AP-A	X	X	X	X	X	X													
AP-B															X		X		
AP-C	X	X	X	X	X	X													
AP-D	XX	XX	XX	XX	XX	XX					X		X		X		X		
AP-E								X	X	X		X		X		X			
AP-F								X	X	X		X		X		X			
AP-G								X	X	X		X		X		X			X
AP-H							X	X	X	X		X		X		X			
AP-I							XX												
AP-J	XX	XX	XX	XX	XX	XX	XXXX	X	X	X	X	X	X	X	X	X	X		X

AHYMO SUMMARY TABLE (AHYMO194) - AMAFCA Hydrologic Model - January, 1994 RUN DATE (MON/DAY/YR) =10/26/1999
INPUT FILE = C:\projects\748\AHYMO\MASTER\100MSTR4.DAT USER NO.= ANASRONM.I01

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
*S CALMAT SITE - 100 YR - 24 HR STORM EVENT WITH BASIN FULLY DEVELOPED										
*S CALMAT SITE MASTER DRAINAGE PLAN HYDROLOGIC MODEL										
*S DEVELOPED CONDITIONS *** DEVELOPED CONDITIONS *** DEVELOPED CONDITIONS										
RAINFALL TYPE= 2										RAIN24= 2.750
*S BASIN A-6 - LOT NO.10,11 AND 12 PHASE III										
COMPUTE NM HYD	A-6.HYD	-	1	.00433	8.95	.331	1.43272	1.500	3.230	PER IMP= 35.00
*S BASIN A-5.1 - LOT NO.5 PHASE I										
COMPUTE NM HYD	A-5.1_HYD	-	2	.00091	1.55	.046	.95736	1.500	2.672	PER IMP= 5.00
*S ADD BASIN A-5.1 AND BASIN A-6										
ADD HYD	A-50.HYD	1& 2	50	.00523	10.50	.376	1.34696	1.500	3.134	
*S BASIN A-4.1 - LOT NO. 4 PHASE I										
COMPUTE NM HYD	A-4.1_HYD	-	3	.00072	1.23	.037	.95736	1.500	2.679	PER IMP= 5.00
*S ADD A-4.1_HYD AND A-50.HYD										
ADD HYD	A-51.HYD	3&50	51	.00595	11.73	.412	1.29697	1.500	3.079	
*S BASIN A-3.1 - LOT NO. 3 PHASE I										
COMPUTE NM HYD	A-3.1_HYD	-	4	.00069	1.18	.035	.95736	1.500	2.681	PER IMP= 5.00
*S ADD A-3.1_HYD AND A-51.HYD										
ADD HYD	A-52.HYD	4&51	52	.00664	12.91	.446	1.25925	1.500	3.037	
*S BASIN A-2.1 - LOT NO. 2 PHASE I										
COMPUTE NM HYD	A-2.1_HYD	-	5	.00073	1.26	.037	.95736	1.500	2.679	PER IMP= 5.00
*S ADD A-2.1_HYD AND A-52.HYD										
ADD HYD	A-53.HYD	5&52	53	.00738	14.17	.483	1.22678	1.500	3.002	
*S BASIN A-1.1 - LOT NO. 1 PHASE I										
COMPUTE NM HYD	A-1.1_HYD	-	6	.00088	1.50	.045	.95736	1.500	2.672	PER IMP= 5.00
*S ADD A-1.1_HYD AND A-53.HYD										
ADD HYD	AP-A.PTL1	6&53	54	.00825	15.66	.526	1.19565	1.500	2.967	
*S RENAISSANCE CENTER OFF-SITE CONTRIBUTION TO CALMAT SITE										
COMPUTE NM HYD	REN.HYD	-	7	.08152	66.92	3.281	.75468	1.650	1.283	PER IMP= 5.00
*S ADD AP-A.PTL1 AND REN.HYD										
ADD HYD	AP-A.TTL	7&54	55	.08977	77.44	3.807	.79520	1.600	1.348	
*S ROUTE AP-A.TTL VIA 48" RCP TO AP-C										
ROUTE	AP-A.RTE	55	56	.08977	77.06	3.807	.79521	1.600	1.341	
*S BASIN A-5 - LOT NO. 5 PHASE I										
COMPUTE NM HYD	A-5.HYD	-	11	.00394	10.20	.429	2.04282	1.500	4.046	PER IMP= 70.00
*S BASIN A-4 - LOT NO. 4 PHASE I										
COMPUTE NM HYD	A-4.HYD	-	12	.00328	8.50	.357	2.04282	1.500	4.048	PER IMP= 70.00
*S ADD A-5.HYD AND A-4.HYD										
ADD HYD	A-60.HYD	11&12	60	.00722	18.70	.786	2.04273	1.500	4.047	
*S BASIN A-3 - LOT NO. 3 PHASE I										
COMPUTE NM HYD	A-3.HYD	-	13	.00344	8.90	.375	2.04282	1.500	4.047	PER IMP= 70.00
*S ADD A-3.HYD AND A-60.HYD										
ADD HYD	A-61.HYD	11&12	61	.00722	18.70	.786	2.04273	1.500	4.047	
*S BASIN A-2 - LOT NO. 2 PHASE I										
COMPUTE NM HYD	A-2.HYD	-	14	.00338	8.74	.368	2.04282	1.500	4.047	PER IMP= 70.00
*S ADD HYDROGRAPHS A-2.HYD & A-61.HYD										
ADD HYD	A-62.HYD	14&61	62	.01059	27.44	1.154	2.04273	1.500	4.047	
*S BASIN A-1 - LOT NO. 1 PHASE I										
COMPUTE NM HYD	A-1.HYD	-	15	.00364	9.43	.397	2.04282	1.500	4.047	PER IMP= 70.00
*S ADD HYDROGRAPHS A-1.HYD & A-62.HYD										

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
ADD HYD	A-63.HYD	15&62	63	.01424	36.87	1.551	2.04273	1.500	4.047	
*S BASIN A-7 - DRAINAGE WAY PHASE I										
COMPUTE NM HYD	A-7.HYD	-	16	.00663	8.64	.321	.90979	1.550	2.038	PER IMP= 5.00
*S ADD HYDROGRAPHS A-7.HYD & A-63.HYD										
ADD HYD	AP-C.PTL1	16&63	64	.02086	44.57	1.872	1.68290	1.500	3.338	
*S ADD HYDROGRAPHS AP-C.PTL1 & AP-A.RTE										
ADD HYD	AP-C.TTL	64&56	65	.11063	112.45	5.679	.96259	1.550	1.588	
*S ROUTE HYDROGRAPH AP-C.TTL TO ANALYSIS POINT AP-D										
ROUTE	AP-C.RTE	65	66	.11063	112.53	5.679	.96259	1.550	1.589	
*S BASIN C-10 LOT NOS. 10, 11 AND 12 PHASE III										
COMPUTE NM HYD	C-10.HYD	-	21	.01313	33.95	1.430	2.04282	1.500	4.042	PER IMP= 70.00
*S BASIN C-8 LOT NOS. 8 AND 10 PHASE III										
COMPUTE NM HYD	C-8.HYD	-	22	.00922	23.85	1.004	2.04282	1.500	4.043	PER IMP= 70.00
*S ADD HYDROGRAPHS C-8.HYD & C-10.HYD										
ADD HYD	AP-B.TTL	21&22	70	.02234	57.80	2.434	2.04279	1.500	4.042	
*S BASIN C-6 LOT NO. 6 PHASE III										
COMPUTE NM HYD	C-6.HYD	-	23	.01047	27.08	1.141	2.04282	1.500	4.042	PER IMP= 70.00
*S ADD HYDROGRAPHS AP-B.TTL & C-6.HYD										
ADD HYD	A-71.HYD	23&70	71	.03281	84.89	3.575	2.04279	1.500	4.042	
*S ROUTE HYDROGRAPH A-71.HYD TO ANALYSIS POINT AP-D										
ROUTE	AP-71.RTE	71	72	.03281	81.09	3.575	2.04281	1.550	3.861	
*S BASIN C-4 LOT NO. 4 PHASE III										
COMPUTE NM HYD	C-4.HYD	-	24	.02297	50.50	2.502	2.04282	1.550	3.435	PER IMP= 70.00
*S ADD HYDROGRAPH C-4.HYD & A-71.RTE										
ADD HYD	AP-D.PTL1	24&72	73	.05578	131.59	6.077	2.04279	1.550	3.686	
*S ADD HYDROGRAPHS AP-D.PTL1 & AP-C.RTE										
ADD HYD	AP-D.TTL	73&66	74	.16641	244.12	11.757	1.32469	1.550	2.292	
*S BASIN C-11 CHAPPELL DRIVE										
COMPUTE NM HYD	C-11.HYD	-	25	.00475	13.61	.602	2.37805	1.500	4.476	PER IMP= 90.00
*S BASIN C-9 LOT NO. 9 PHASE III										
COMPUTE NM HYD	C-9.HYD	-	26	.02672	61.41	2.911	2.04282	1.550	3.591	PER IMP= 70.00
*S BASIN C-3 LOT NO. 3 PHASE III										
COMPUTE NM HYD	C-3.HYD	-	27	.01297	33.55	1.413	2.04282	1.500	4.042	PER IMP= 70.00
*S ADD HYDROGRAPHS C-11.HYD & C-9.HYD										
ADD HYD	A-76.HYD	27&26	76	.03969	93.30	4.324	2.04280	1.500	3.673	
*S BASIN C-7 LOT NO. 7 PHASE III										
COMPUTE NM HYD	C-7.HYD	-	28	.00891	23.05	.971	2.04282	1.500	4.043	PER IMP= 70.00
*S ADD HYDROGRAPH A-76.HYD & C-7.HYD										
ADD HYD	A-77.HYD	28&76	77	.04860	116.36	5.295	2.04280	1.500	3.741	
*S BASIN C-2 LOT NO. 2 PHASE III										
COMPUTE NM HYD	C-2.HYD	-	29	.01172	30.32	1.277	2.04282	1.500	4.042	PER IMP= 70.00
*S ADD HYDROGRAPH C-2.HYD & A-77.HYD										
ADD HYD	A-78.HYD	29&77	78	.06032	146.67	6.571	2.04280	1.500	3.800	
*S BASIN C-5 LOT NO. 5 PHASE III										
COMPUTE NM HYD	C-5.HYD	-	30	.01047	27.07	1.140	2.04282	1.500	4.042	PER IMP= 70.00
*S ADD HYDROGRAPH C-5.HYD & A-78.HYD										
ADD HYD	A-78.HYD	30&78	79	.07078	173.75	7.712	2.04279	1.500	3.835	
*S BASIN C-1 LOT NO. 1 PHASE III										
COMPUTE NM HYD	C-1.HYD	-	31	.01188	30.72	1.294	2.04282	1.500	4.042	PER IMP= 70.00
*S ADD HYDROGRAPH C-1.HYD & A-79.HYD										
ADD HYD	AP-E.TTL	31&79	80	.08266	204.46	9.005	2.04279	1.500	3.865	
*S ROUTE HYDROGRAPH AP-E.TTL TO ANALYSIS POINT AP-F										

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
ROUTE	AP-E.RTE	80	81	.08266	199.59	9.005	2.04280	1.550	3.773	
*S ADD HYDROGRAPH AP-E.RTE & AP-D.TTL										
ADD HYD	AP-F.PTL1	74&81	82	.24907	443.71	20.762	1.56300	1.550	2.784	
*S BASIN C-12 ALEXANDER BOULEVARD NE										
COMPUTE NM HYD	AP-C.HYD	-	1	.00136	3.90	.172	2.37805	1.500	4.489	PER IMP= 90.00
*S ADD HYDROGRAPH AP-F.PTL1 & C-12.HYD										
ADD HYD	AP-F.TTL	1&82	2	.25042	447.12	20.934	1.56743	1.550	2.790	
*S AP-G - MISSION HILLS ELEMENTARY SCHOOL OFF-SITE RUNOFF										
COMPUTE NM HYD	AP-G.HYD	-	3	.01563	35.20	1.433	1.71970	1.500	3.520	PER IMP= 55.00
*S ADD HYDROGRAPH AP-G.HYD TO AP-F.TTL										
ADD HYD	AP-H.PTL1	2& 3	4	.26605	478.55	22.368	1.57637	1.550	2.810	
*S B-3 - LOT NO. 3 PHASE II										
COMPUTE NM HYD	B-3.HYD	-	5	.01984	51.32	2.162	2.04282	1.500	4.041	PER IMP= 70.00
*S ADD HYDROGRAPHS B-3.HYD TO AP-H.PTL1										
ADD HYD	AP-H.TTL	4& 5	6	.28589	523.84	24.530	1.60874	1.550	2.863	
*S BASIN B-1										
COMPUTE NM HYD	B-1.HYD	-	7	.02766	46.10	3.013	2.04282	1.650	2.605	PER IMP= 70.00
*S BASIN B-2										
COMPUTE NM HYD	B-2.HYD	-	8	.03266	54.43	3.558	2.04282	1.650	2.604	PER IMP= 70.00
*S ADD HYDROGRAPHS B-1.HYD TO B-2.HYD										
ADD HYD	AP-I.TTL	7& 8	9	.06031	100.53	6.571	2.04280	1.650	2.604	
*S BASIN B-4										
COMPUTE NM HYD	B-2.HYD	-	10	.00688	8.72	.249	.68033	1.500	1.983	PER IMP= .00
*S ADD HYDROGRAPH AP-I.TTL TO B-4.HYD										
ADD HYD	AP-J.PTL1	9&10	11	.06719	105.91	6.820	1.90338	1.650	2.463	
*S ADD HYDROGRAPH FROM AP-J.PTL1 TO AP-H.TTL										
ADD HYD	AP-J.TTL	11& 6	12	.35308	607.70	31.350	1.66481	1.550	2.689	
ROUTE RESERVOIR	DETFAC.RTE	12	13	.35308	4.67	10.423	.55351	4.100	.021	AC-FT= 25.927
FINISH										

AHYMO SUMMARY TABLE (AHYMO194) - AMAFCA Hydrologic Model - January, 1994 RUN DATE (MON/DAY/YR) =10/26/1999
INPUT FILE = C:\projects\748\AHYMO\PHASE_1\PHASE1.DAT USER NO.= ANASRONM.I01

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
*S CALMAT SITE - 100 YR - 24 HR STORM EVENT WITH BASIN FULLY DEVELOPED										
*S CALMAT BUSINESS PARK - PHASE I - DRAINAGE PLAN HYDROLOGIC MODEL										
*S PHASE I - LOTS 1 THROUGH 5 DEVELOPED										
*S ALL OTHER ON-SITE AREAS UNDER EXISTING CONDITIONS										
*S RENAISSANCE CENTER FULLY DEVELOPED										
RAINFALL TYPE= 2										RAIN24= 2.750
*S BASIN A-6 - LOT NO.10,11 AND 12 PHASE III										
COMPUTE NM HYD	A-6.HYD	-	1	.00433	7.44	.216	.93603	1.500	2.686	PER IMP= .00
*S BASIN A-5.1 - LOT NO.5 PHASE I										
COMPUTE NM HYD	A-5.1_HYD	-	2	.00091	1.55	.046	.95736	1.500	2.672	PER IMP= 5.00
*S ADD BASIN A-5.1 AND BASIN A-6										
ADD HYD	A-50.HYD	1& 2	50	.00523	8.99	.261	.93629	1.500	2.684	
*S BASIN A-4.1 - LOT NO. 4 PHASE I										
COMPUTE NM HYD	A-4.1_HYD	-	3	.00072	1.23	.037	.95736	1.500	2.679	PER IMP= 5.00
*S ADD A-4.1_HYD AND A-50.HYD										
ADD HYD	A-51.HYD	3&50	51	.00595	10.22	.297	.93590	1.500	2.683	
*S BASIN A-3.1 - LOT NO. 3 PHASE I										
COMPUTE NM HYD	A-3.1_HYD	-	4	.00069	1.18	.035	.95736	1.500	2.681	PER IMP= 5.00
*S ADD A-3.1_HYD AND A-51.HYD										
ADD HYD	A-52.HYD	4&51	52	.00664	11.40	.331	.93559	1.500	2.683	
*S BASIN A-2.1 - LOT NO. 2 PHASE I										
COMPUTE NM HYD	A-2.1_HYD	-	5	.00073	1.26	.037	.95736	1.500	2.679	PER IMP= 5.00
*S ADD A-2.1_HYD AND A-52.HYD										
ADD HYD	A-53.HYD	5&52	53	.00738	12.66	.368	.93533	1.500	2.683	
*S BASIN A-1.1 - LOT NO. 1 PHASE I										
COMPUTE NM HYD	A-1.1_HYD	-	6	.00088	1.50	.045	.95736	1.500	2.672	PER IMP= 5.00
*S ADD A-1.1_HYD AND A-53.HYD										
ADD HYD	AP-A.PTL1	6&53	54	.00825	14.16	.411	.93511	1.500	2.682	
*S RENAISSANCE CENTER OFF-SITE CONTRIBUTION TO CALMAT SITE										
COMPUTE NM HYD	REN.HYD	-	7	.08152	66.92	3.281	.75468	1.650	1.283	PER IMP= 5.00
*S ADD AP-A.PTL1 AND REN.HYD										
ADD HYD	AP-A.TTL	7&54	55	.08977	76.64	3.692	.77125	1.600	1.334	
*S ROUTE AP-A.TTL VIA 48" RCP TO AP-C										
ROUTE	AP-A.RTE	55	56	.08977	76.21	3.692	.77126	1.600	1.327	
*S BASIN A-5 - LOT NO. 5 PHASE I										
COMPUTE NM HYD	A-5.HYD	-	11	.00394	10.20	.429	2.04282	1.500	4.046	PER IMP= 70.00
*S BASIN A-4 - LOT NO. 4 PHASE I										
COMPUTE NM HYD	A-4.HYD	-	12	.00328	8.50	.357	2.04282	1.500	4.048	PER IMP= 70.00
*S ADD A-5.HYD AND A-4.HYD										
ADD HYD	A-60.HYD	11&12	60	.00722	18.70	.786	2.04273	1.500	4.047	
*S BASIN A-3 - LOT NO. 3 PHASE I										
COMPUTE NM HYD	A-3.HYD	-	13	.00344	8.90	.375	2.04282	1.500	4.047	PER IMP= 70.00
*S ADD A-3.HYD AND A-60.HYD										
ADD HYD	A-61.HYD	11&12	61	.00722	18.70	.786	2.04273	1.500	4.047	
*S BASIN A-2 - LOT NO. 2 PHASE I										
COMPUTE NM HYD	A-2.HYD	-	14	.00338	8.74	.368	2.04282	1.500	4.047	PER IMP= 70.00
*S ADD HYDROGRAPHS A-2.HYD & A-61.HYD										
ADD HYD	A-62.HYD	14&61	62	.01059	27.44	1.154	2.04273	1.500	4.047	
*S BASIN A-1 - LOT NO. 1 PHASE I										

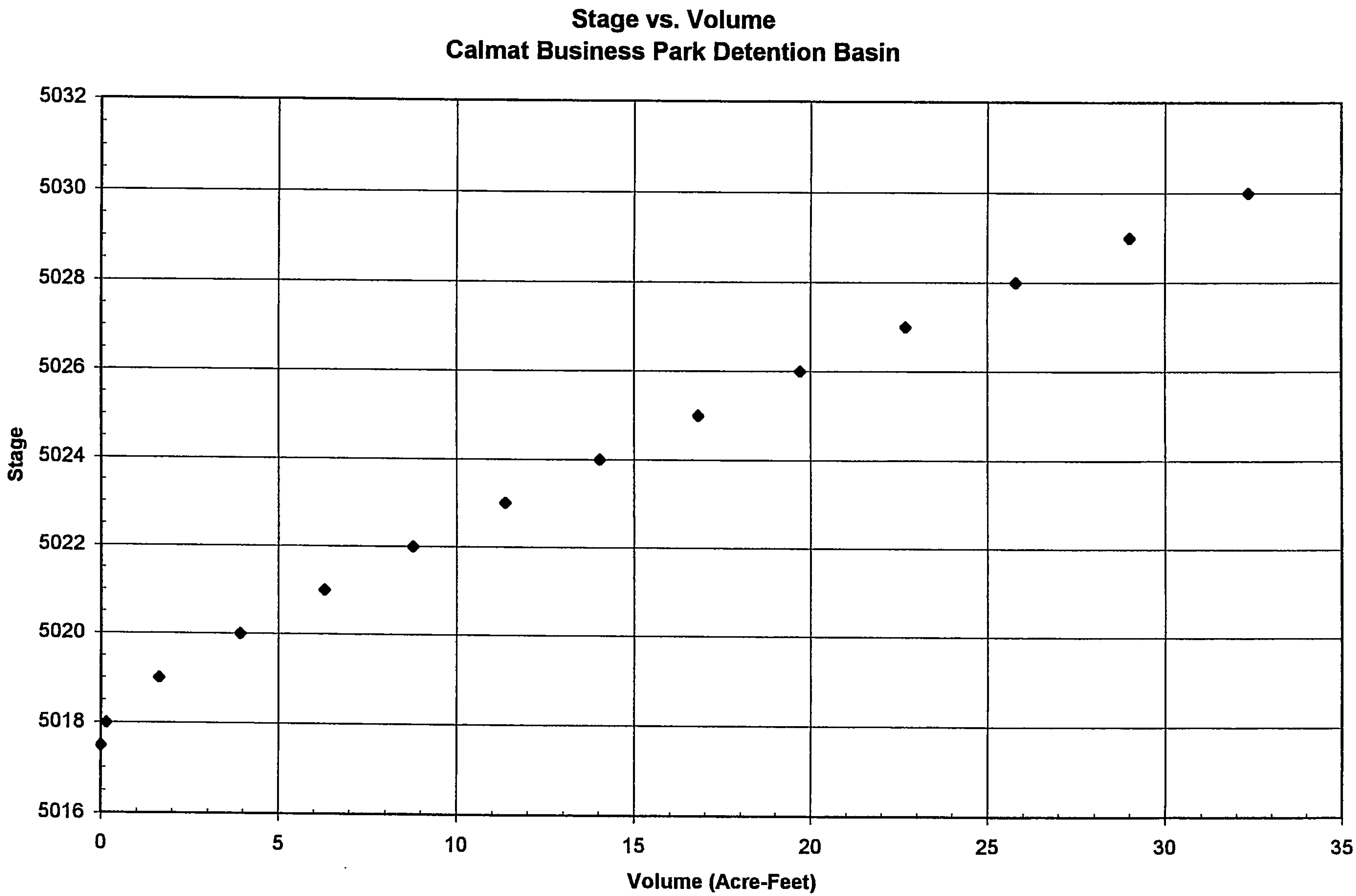
COMMAND	HYDROGRAPH IDENTIFICATION	FROM ID NO.	TO ID NO.	AREA (SQ MI)	PEAK DISCHARGE (CFS)	RUNOFF VOLUME (AC-FT)	RUNOFF (INCHES)	TIME TO PEAK (HOURS)	CFS PER ACRE	NOTATION
COMPUTE NM HYD	A-1.HYD	-	15	.00364	9.43	.397	2.04282	1.500	4.047	PER IMP= 70.00
*S ADD HYDROGRAPHS A-1.HYD & A-62.HYD										
ADD HYD	A-63.HYD	15&62	63	.01424	36.87	1.551	2.04273	1.500	4.047	
*S BASIN A-7 - DRAINAGE WAY PHASE I										
COMPUTE NM HYD	A-7.HYD	-	16	.00663	8.64	.321	.90979	1.550	2.038	PER IMP= 5.00
*S ADD HYDROGRAPHS A-7.HYD & A-63.HYD										
ADD HYD	AP-C.PTL1	16&63	64	.02086	44.57	1.872	1.68290	1.500	3.338	
*S ADD HYDROGRAPHS AP-C.PTL1 & AP-A.RTE										
ADD HYD	AP-C.TTL	64&56	65	.11063	111.19	5.565	.94316	1.550	1.570	
*S ROUTE HYDROGRAPH AP-C.TTL TO ANALYSIS POINT AP-D										
ROUTE	AP-C.RTE	65	66	.11063	111.36	5.565	.94316	1.600	1.573	
*S BASIN C-10 LOT NOS. 10, 11 AND 12 PHASE III										
COMPUTE NM HYD	C-10.HYD	-	21	.01313	24.27	.718	1.02578	1.500	2.890	PER IMP= .00
*S BASIN C-8 LOT NOS. 8 AND 10 PHASE III										
COMPUTE NM HYD	C-8.HYD	-	22	.00922	17.05	.504	1.02578	1.500	2.890	PER IMP= .00
*S ADD HYDROGRAPHS C-8.HYD & C-10.HYD										
ADD HYD	AP-B.TTL	21&22	70	.02234	41.32	1.222	1.02577	1.500	2.890	
*S BASIN C-6 LOT NO. 6 PHASE III										
COMPUTE NM HYD	C-6.HYD	-	23	.01047	19.36	.573	1.02578	1.500	2.890	PER IMP= .00
*S ADD HYDROGRAPHS AP-B.TTL & C-6.HYD										
ADD HYD	A-71.HYD	23&70	71	.03281	60.69	1.795	1.02577	1.500	2.890	
*S ROUTE HYDROGRAPH A-71.HYD TO ANALYSIS POINT AP-D										
ROUTE	AP-71.RTE	71	72	.03281	59.45	1.795	1.02579	1.550	2.831	
*S BASIN C-4 LOT NO. 4 PHASE III										
COMPUTE NM HYD	C-4.HYD	-	24	.02297	33.78	1.257	1.02578	1.550	2.298	PER IMP= .00
*S ADD HYDROGRAPH C-4.HYD & A-71.RTE										
ADD HYD	AP-D.PTL1	24&72	73	.05578	93.23	3.052	1.02577	1.550	2.611	
*S ADD HYDROGRAPHS AP-D.PTL1 & AP-C.RTE										
ADD HYD	AP-D.TTL	73&66	74	.16641	204.49	8.616	.97085	1.550	1.920	
*S BASIN C-11 CHAPPELL DRIVE										
COMPUTE NM HYD	C-11.HYD	-	25	.00475	13.61	.602	2.37805	1.500	4.476	PER IMP= 90.00
*S BASIN C-9 LOT NO. 9 PHASE III										
COMPUTE NM HYD	C-9.HYD	-	26	.02672	42.66	1.462	1.02578	1.550	2.495	PER IMP= .00
*S BASIN C-3 LOT NO. 3 PHASE III										
COMPUTE NM HYD	C-3.HYD	-	27	.01297	23.98	.710	1.02578	1.500	2.890	PER IMP= .00
*S ADD HYDROGRAPHS C-3.HYD & C-9.HYD										
ADD HYD	A-76.HYD	27&26	76	.03969	64.79	2.171	1.02577	1.550	2.551	
*S BASIN C-7 LOT NO. 7 PHASE III										
COMPUTE NM HYD	C-7.HYD	-	28	.00891	16.48	.487	1.02578	1.500	2.890	PER IMP= .00
*S ADD HYDROGRAPH C-7.HYD & A-76.HYD										
ADD HYD	A-77.HYD	28&76	77	.04860	80.51	2.659	1.02577	1.500	2.589	
*S BASIN C-2 LOT NO. 2 PHASE III										
COMPUTE NM HYD	C-2.HYD	-	29	.01172	21.67	.641	1.02578	1.500	2.890	PER IMP= .00
*S ADD HYDROGRAPH C-2.HYD & A-77.HYD										
ADD HYD	A-78.HYD	29&77	78	.06032	102.19	3.300	1.02577	1.500	2.647	
*S BASIN C-5 LOT NO. 5 PHASE III										
COMPUTE NM HYD	C-5.HYD	-	30	.01047	19.36	.573	1.02578	1.500	2.890	PER IMP= .00
*S ADD HYDROGRAPH C-5.HYD & A-78.HYD										
ADD HYD	A-79.HYD	30&78	79	.07078	121.54	3.872	1.02577	1.500	2.683	
*S BASIN C-1 LOT NO. 1 PHASE III										
COMPUTE NM HYD	C-1.HYD	-	31	.01188	21.96	.650	1.02578	1.500	2.890	PER IMP= .00
*S ADD HYDROGRAPH C-1.HYD & A-79.HYD										

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
ADD HYD	AP-E.TTL	31&79	80	.08266	143.51	4.522	1.02577	1.500	2.713	
*S ROUTE HYDROGRAPH AP-E.TTL TO ANALYSIS POINT AP-F										
ROUTE	AP-E.RTE	80	81	.08266	144.59	4.522	1.02578	1.550	2.733	
*S ADD HYDROGRAPH AP-E.RTE & AP-D.TTL										
ADD HYD	AP-F.PTL1	74&81	82	.24907	349.07	13.138	.98908	1.550	2.190	
*S BASIN C-12 ALEXANDER BOULEVARD NE										
COMPUTE NM HYD	AP-C.HYD	-	1	.00136	3.90	.172	2.37805	1.500	4.489	PER IMP= 90.00
*S ADD HYDROGRAPH AP-F.PTL1 & C-12.HYD										
ADD HYD	AP-F.TTL	1&82	2	.25042	352.48	13.311	.99661	1.550	2.199	
*S AP-G - MISSION HILLS ELEMENTARY SCHOOL OFF-SITE RUNOFF										
COMPUTE NM HYD	AP-G.HYD	-	3	.01563	35.20	1.433	1.71970	1.500	3.520	PER IMP= 55.00
*S B-3 - LOT NO. 3 PHASE II										
COMPUTE NM HYD	B-3.HYD	-	5	.01984	36.69	1.086	1.02578	1.500	2.889	PER IMP= .00
*S ADD HYDROGRAPHS B-3.HYD TO AP-F.TTL										
ADD HYD	AP-H.TTL	2& 5	6	.27027	386.34	14.396	.99875	1.550	2.234	
*S BASIN B-1 - LOT NO. 1 PHASE 2										
COMPUTE NM HYD	B-1.HYD	-	7	.02766	28.81	1.513	1.02578	1.700	1.627	PER IMP= .00
*S BASIN B-2 - LOT NO. 2 PHASE 2										
COMPUTE NM HYD	B-2.HYD	-	8	.03266	34.01	1.787	1.02578	1.700	1.627	PER IMP= .00
*S ADD HYDROGRAPHS B-1.HYD TO B-2.HYD										
ADD HYD	AP-I.TTL	7& 8	9	.06031	62.82	3.300	1.02577	1.700	1.627	
*S BASIN B-4 - EXISTING RETENTION BASIN AND PROPOSED DETENTION BASIN										
COMPUTE NM HYD	B-2.HYD	-	10	.00688	8.72	.249	.68033	1.500	1.983	PER IMP= .00
*S ADD HYDROGRAPH AP-I.TTL TO B-4.HYD										
ADD HYD	AP-J.PTL1	9&10	11	.06719	66.91	3.549	.99042	1.650	1.556	
*S ADD HYDROGRAPH FROM AP-J.PTL1 TO AP-H.TTL										
ADD HYD	AP-J.TTL	11& 6	12	.33746	439.98	17.945	.99709	1.550	2.037	
FINISH										

Calmat Business Park Detention Facility Stage/Volume/Surface Area Relationship

Elevation	Surface Area (SQ FT)	Incremental Volume (Acre-Feet)	Total Volume (Acre-Feet)	Surface Area (Acres)
5018	15238		0	0.349811
5020	19869	0.803589	0.80	0.456125
5022	32531	1.191051	1.99	0.746809
5024	48549	1.849112	3.84	1.114532
5026	62169	2.535298	6.38	1.427202
5028	70035	3.033192	9.41	1.607783
5030	78466	3.407287	12.82	1.801337
5032	88322	3.826711	16.65	2.027604
5034	99102	4.300306	20.95	2.275076

Existing Pond # 1/Sump Area


Stage vs. Volume
Calmat Business Park Detention Basin
Stage
5016
5018
5020
5022
5024
5026
5028
5030
5032
0
5
10
15
20
25
30
35
Volume (Acre-Feet)

Calmat Business Park Detention Facility Stage/Volume/Surface Area Relationship

Elevation	Surface Area (SQ FT)	Incremental Volume (Acre-Feet)	Total Volume (Acre-Feet)	Surface Area (Acres)
5002	6536		0	0.150046
5016	59659	9.207097	9.21	1.369582

Existing Pond # 2/Sump Area

Calmat Business Park Detention Facility Stage/Volume/Surface Area Relationship

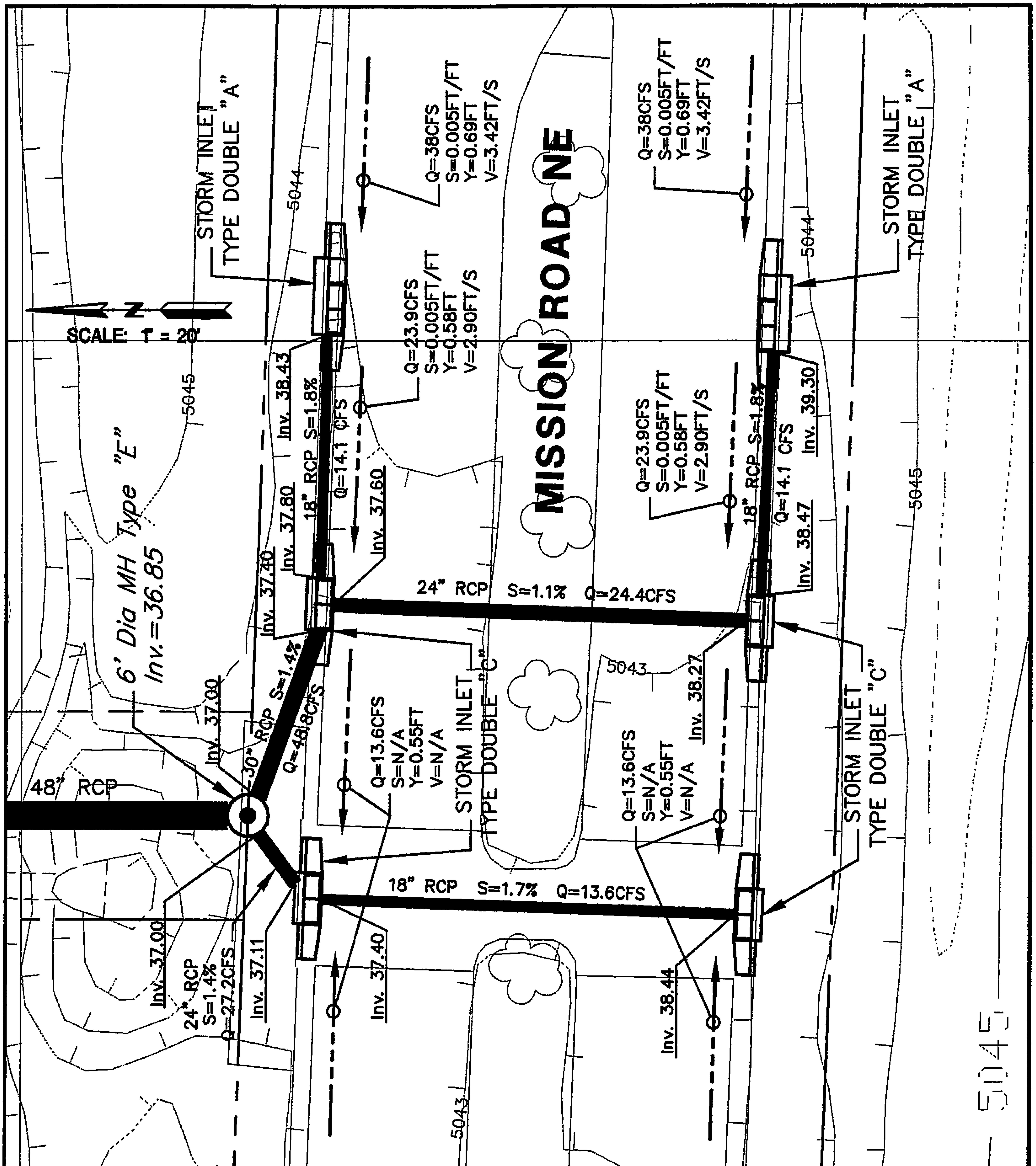
Elevation	Surface Area (SQ FT)	Incremental Volume (Acre-Feet)	Total Volume (Acre-Feet)	Surface Area (Acres)
5028	20030		0	0.459825528
5034	40097	4.061835	4.06	0.920500459

Existing Pond # 3/Sump Area

Calmat Business Park Detention Facility Stage/Volume/Surface Area Relationship

Elevation	Surface Area (SQ FT)	Incremental Volume (Acre-Feet)	Total Volume (Acre-Feet)	Surface Area (Acres)
5024	20001		0	0.45916
5030	33082	3.618274	3.62	0.759458

Existing Pond # 4/Sump Area



CALMAT CO. OF NEW MEXICO

CALMAT BUSINESS PARK
ALBUQUERQUE, NEW MEXICO

PHASE 1,
CATCH BASIN LAYOUT

THE LARKIN GROUP INC

FILE No.	DRAWN BY	CHECKED BY	DATE
96-0748	AE	PG, JA	OCT. 1999

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Client CALMAT
Job No. AL96-0748
Job Title CALMAT BUSINESS PARK, PHASE I
Made By P. GONZALES
Chkd. By

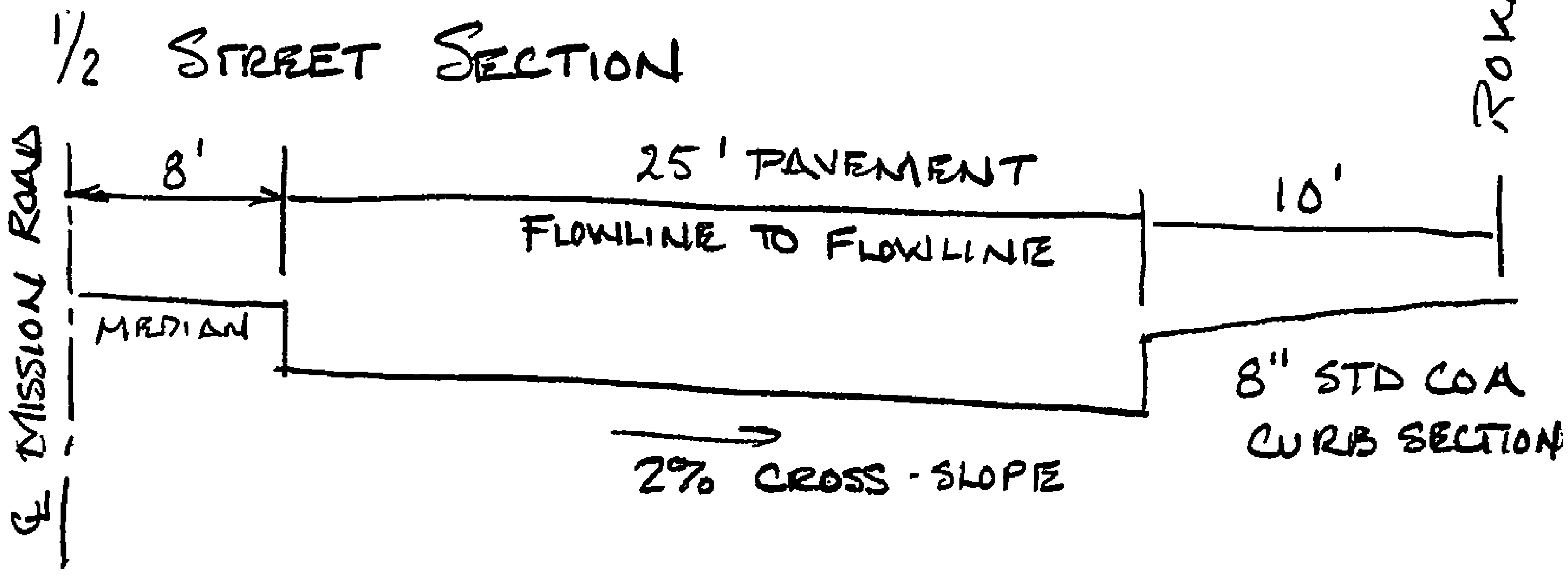
1. TYPE 2A INLET CAPACITY CALCULATIONS

2. PURPOSE - DETERMINE CAPACITY OF TYPE 2A INLET WITH CONDITIONS CONSTRAINED BY MISSION ROAD GEOMETRY AND HYDRAULIC SECTION

3. REFERENCES - COA, DPM SECTION 22.3
   FLOWMASTER V. 6.0

4. ASSUMPTIONS :
   a) RENAISSANCE CENTER AND ON-SITE CALMAT 100-YR PEAK FLOW IS APPROXIMATELY 76 CFS. AND DISCHARGES TO MISSION ROAD SUMP AREA, 450 FEET EAST OF ALEXANDER BLVD CENTERLINE. ½ STREET SECTION CARRIES 38 CFS.

   b) ½ STREET SECTION



LONGITUDINAL SLOPE = 0.0050 FT/FT

MANNINGS ROUGHNESS = 0.017 AS PER COA

5. CALCULATIONS

   a) DEPTH OF FLOW IN STREET SECTION IS 0.69 FT AS PER FLOWMASTER CALCS PROVIDED

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5. CALCULATIONS

b) TYPE 2A INLET CAPACITY

GRATE CAPACITY : COA DPM 22.3, PLATE 22.3 D-5

AT A DEPTH OF 0.69 FT, GRATE HAS A CAPACITY OF 10 CFS = Q_{GRATE}

THROAT CAPACITY :
LENGTH OF THROAT = 3.5 FT

WEIR EQUATION = $Q = CLH^{3/2}$
C = 3.3 - NRRNAH
L = 7.0 FT
H = 0.69 FT

$Q_{THROAT} = 3.3(3.5)(0.69')^{3/2} = 6.6$ CFS

TOTAL CAPACITY

$Q_{GRATE} + Q_{THROAT} = Q_{TOTAL}$

$6.6 + 10 = 16.6$ CFS

REDUCED CAPACITY DUE TO CLOGGING
15% REDUCTION

$Q_{REDUCED} = (1-0.15)\,Q_{TOTAL} = (0.85)(16.6) = 14.1$ CFS

BYPASSED FLOW

$Q_{BP} = 38 - 14.1 = 23.9$ CFS

Worksheet
Worksheet for Irregular Channel

Project Description	
Worksheet	Irregular Channel - 1
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	0.005000	ft/ft
Discharge	38.00	cfs

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Metho	Improved Lotter's Method
Closed Channel Weighting Meth	Horton's Method

Results		
Mannings Coefficient	0.017	
Water Surface Elevation	9.52	ft
Elevation Range	8.83 to 10.00	
Flow Area	11.1	ft²
Wetted Perimeter	26.33	ft
Top Width	25.56	ft
Actual Depth	0.69	ft
Critical Elevation	9.50	ft
Critical Slope	0.006052	ft/ft
Velocity	3.42	ft/s
Velocity Head	0.18	ft
Specific Energy	9.70	ft
Froude Number	0.92	
Flow Type	Subcritical	

.87' Energy

Roughness Segments

Start Station	End Station	Mannings Coefficient
0+00	0+25	0.017
0+25	0+35	0.030

Natural Channel Points

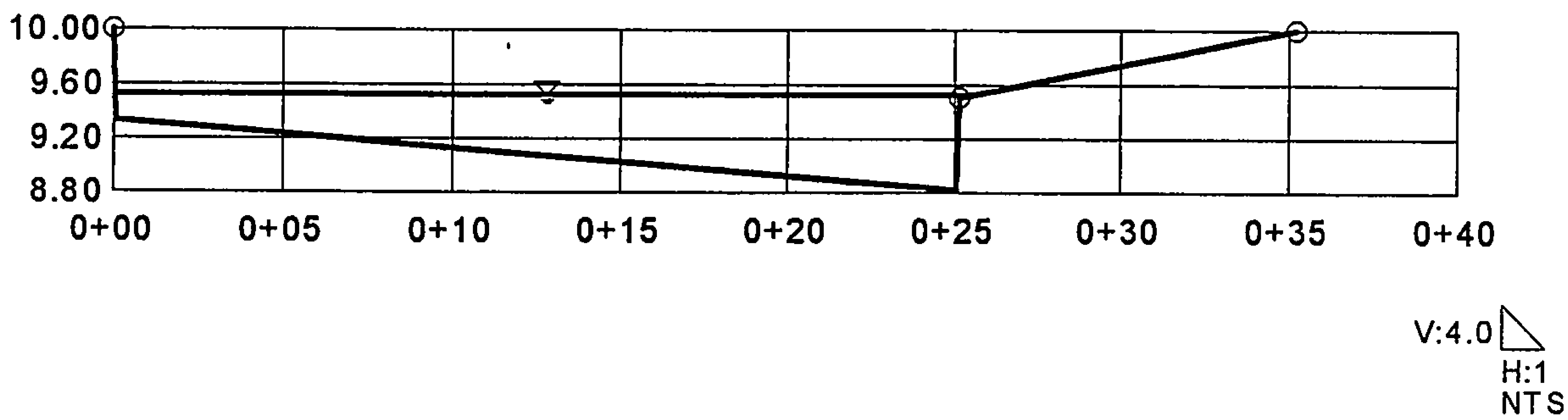
Station (ft)	Elevation (ft)
0+00	~~10.00~~ 9.83
0+00	9.33
0+25	8.83
0+25	9.50
0+35	~~10.00~~ 9.60

2% max cross slope

Cross Section
Cross Section for Irregular Channel

Project Description	
Worksheet	Irregular Channel - 1
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data	
Mannings Coefficient	0.017
Slope	0.005000 ft/ft
Water Surface Elevation	9.52 ft
Elevation Range	8.83 to 10.00
Discharge	38.00 cfs



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Client CALMAT
Job No. AL96-0748
Job Title
Made By
Chkd. By

1. TYPE 2C INLET CAPACITY CALCULATIONS

2. DETERMINE CAPACITY OF TYPE 2C INLET WITH CONDITIONS CONSTRAINED BY MISSION ROAD GEOMETRY AND HYDRAULIC SECTION

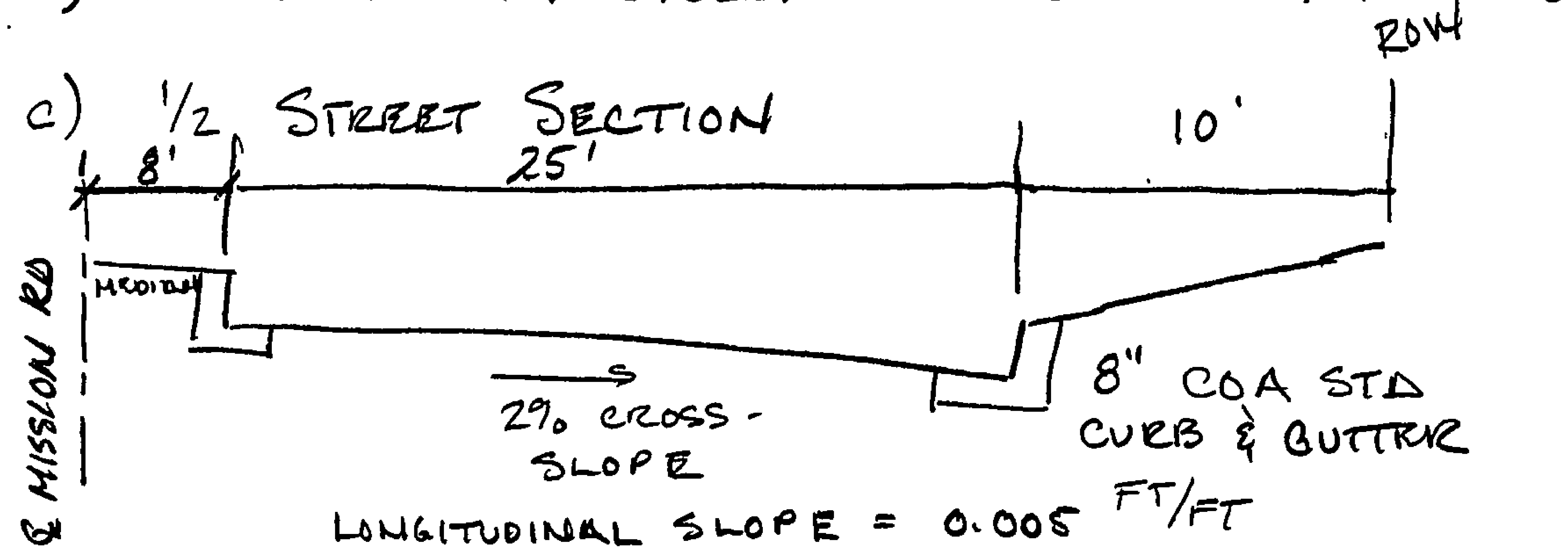
3. REFERENCES - COA, DPM SECTION 22.3
   FLOWMASTER V. 6.0

4. ASSUMPTIONS

   a) TYPE 2A INLET UPSTREAM OF TYPE 2C INLET. TYPE 2C INLETS ARE 30 FT DOWNSTREAM

   b) PEAK FLOW IN STREET IS APPROXIMATELY 23.9 CFS

   c) 1/2 STREET SECTION



LONGITUDINAL SLOPE = 0.005 FT/FT
MANNINGS ROUGHNESS = 0.017

5. CALCULATIONS

   a) DEPTH OF FLOW = 0.58 FT
   AS CALCULATED WITH FLOWMASTER. CALCULATIONS PROVIDED.

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5. CALCULATIONS
b) TYPE 2C INLET CAPACITY

GRATE CAPACITY : COA, DPM 223, PLATE 22.3 D-6
AT A DEPTH OF 0.58 FT, GRATE HAS A CAPACITY OF APPROXIMATELY 8 CFS = Q_{GRATE}

THROAT CAPACITY :
ASSUME 1/2 LENGTH OF INLET FUNCTIONS AS A WEIR.

$$Q_{THROAT} = CLH^{3/2}$$

C = 3.3 - NEWMAN
L = 3.5 FT
H = 0.50 FT

$$Q_{THROAT} = 3.3(3.5)(0.5)^{3/2}$$

$$Q_{THROAT} = 4.1 \text{ CFS}$$

TOTAL CAPACITY

$$Q_{TOTAL} = Q_{GRATE} + Q_{THROAT} = 8 \text{ CFS} + 4.1 \text{ CFS} = 12.1 \text{ CFS}$$

REDUCED CAPACITY DUE TO 15% CLOGGING

$$Q_{REDUCED} = (1-0.15)(Q_{TOTAL}) = (0.85)(12.1) = 10.3 \text{ CFS}$$

BYPASSED FLOW

$$Q_{BP} = 23.9 - 10.3 = 13.6 \text{ CFS}$$

Worksheet
Worksheet for Irregular Channel

Project Description	
Worksheet	Irregular Channel - 1
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	0.005000	ft/ft
Discharge	23.90	cfs

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Metho	Improved Lotter's Method
Closed Channel Weighting Meth	Horton's Method

Results		
Mannings Coefficient	0.017	
Water Surface Elevation	9.41	ft
Elevation Range	8.83 to 10.00	
Flow Area	8.2	ft²
Wetted Perimeter	25.67	ft
Top Width	25.08	ft
Actual Depth	0.58	ft
Critical Elevation	9.38	ft
Critical Slope	0.006441	ft/ft
Velocity	2.90	ft/s
Velocity Head	0.13	ft
Specific Energy	9.54	ft
Froude Number	0.89	
Flow Type	Subcritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
0+00	0+25	0.017
0+25	0+35	0.030

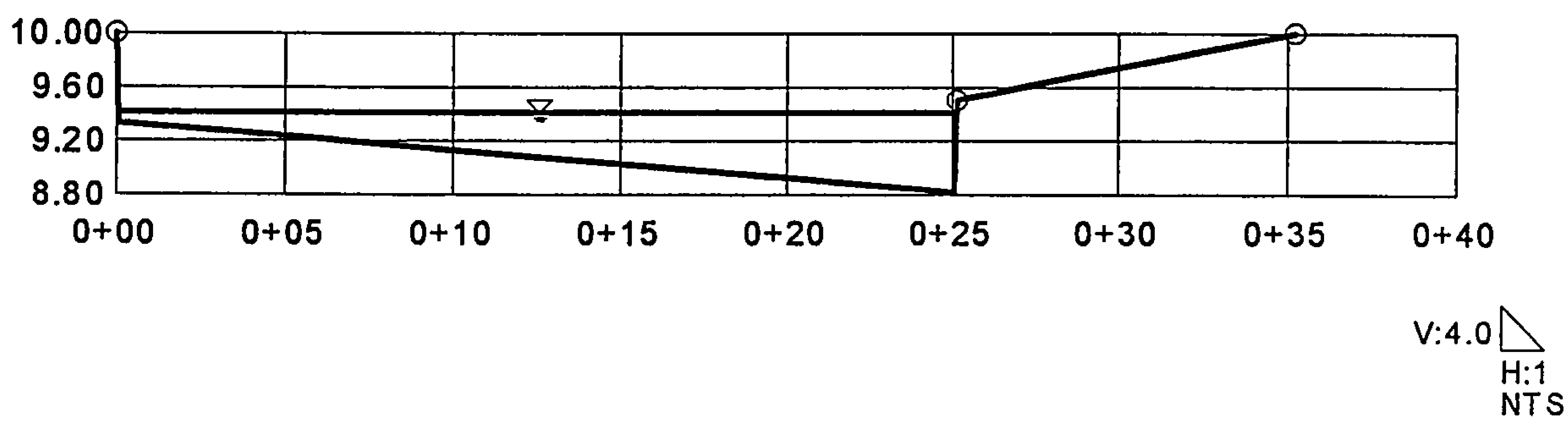
Natural Channel Points

Station (ft)	Elevation (ft)
0+00	~~10.00~~ 9.83
0+00	9.33
0+25	8.83
0+25	9.50
0+35	~~10.00~~ 9.60

Cross Section
Cross Section for Irregular Channel

Project Description	
Worksheet	Irregular Channel - 1
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.017	
Slope	0.005000	ft/ft
Water Surface Elevation	9.41	ft
Elevation Range	8.83 to 10.00	
Discharge	23.90	cfs



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Client CALMAT
Job No. AL96-0748
Job Title CALMAT BUSINESS PARK PHASE I
Made By P. GONZALES
Chkd. By

1. TYPE 2C INLET CAPACITY CALCULATIONS

2. PURPOSE - FIND DEPTH OF FLOW IN STREET SECTION THAT WILL CAPTURE REMAINING 13.6 CFS OF STORMWATER FLOW IN MISSION ROADSUMP AREA.

3. REFERENCES - COA, DPM SECTION 22.3
FLOWMASTER v. 6.0

4. ASSUMPTIONS

a) NEED TO CAPTURE REMAINING 13.6 CFS
b) FULL THROAT SECTION ACTS AS A WEIR IN PONDING SITUATIONS
c) NO CLOGGING DUE TO TWO UPSTREAM INLETS AND FLOW FROM WEST ON MISSION IS NEGLIGIBLE.

5. CALCULATIONS

ITERATIVE PROCESS: ASSUME DEPTH, CALCULATE GRATE AND THROAT CAPACITY

ASSUME DEPTH IS 0.50 FT

GRATE CAPACITY: COA, DPM SECTION 22.3, PLATE D-6

$Q_{GRATE} \approx 5$ CFS

THROAT CAPACITY: REDUCE DEPTH 0.1 FT DUE TO GRATE FLOW

$Q_{THROAT} = CLH^{3/2}$ $\quad C = 3.3,\ L = 7.0$ FT

$Q_{THROAT} = 5.8$ CFS $\quad H = 0.4$ FT

$Q_{TOTAL} = 5 + 5.8 = 10.8$ CFS — INSUFFICIENT

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5. CALCULATIONS

ASSUME DEPTH IS 0.55 FT

GRATE CAPACITY, $Q_{GRATE} \approx 6.4$ CFS

THROAT CAPACITY, REDUCE DEPTH 0.1 FT

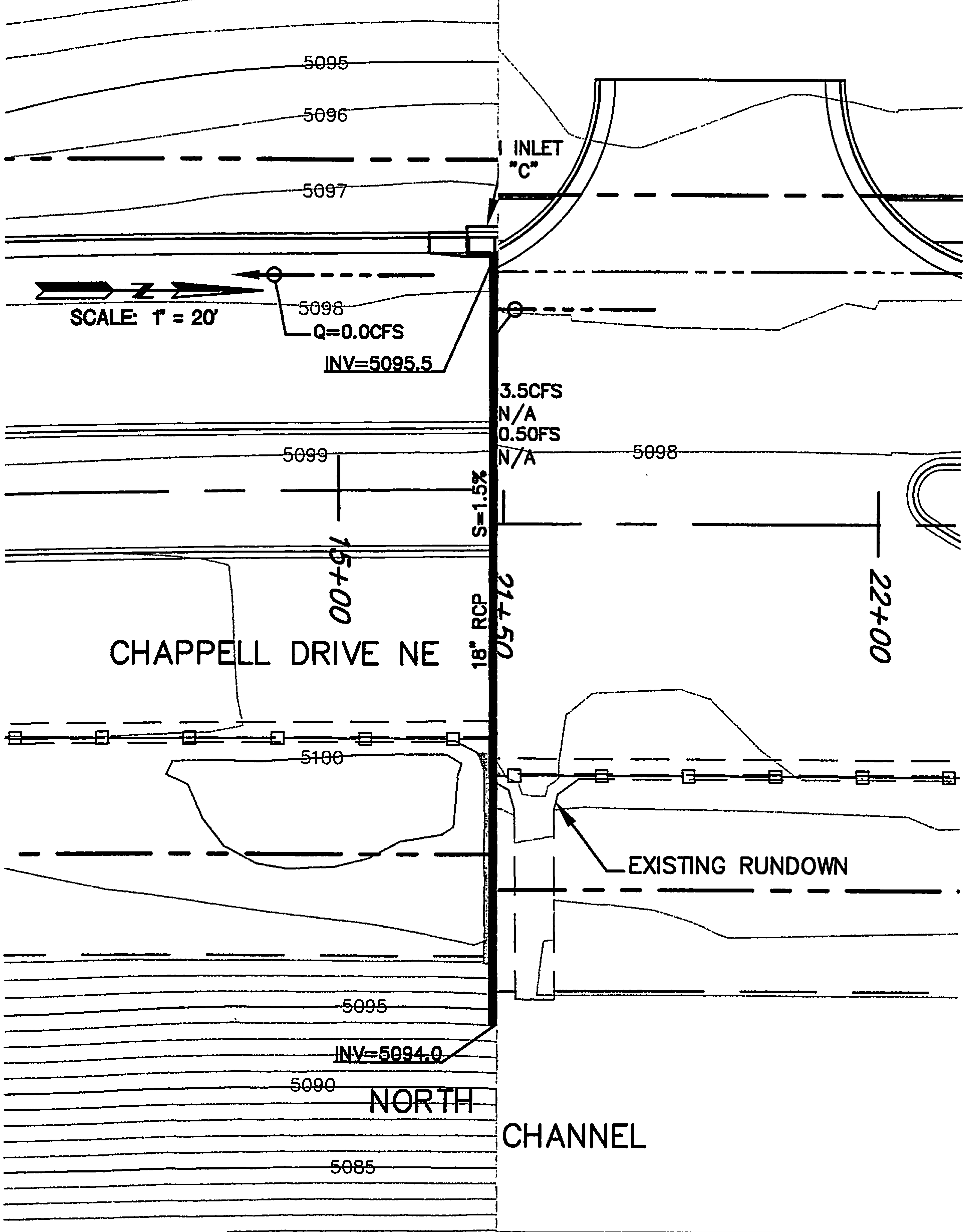
$$Q_{THROAT} = 3.3\,(7.0)(0.45)^{3/2} = 7.0 \text{ CFS}$$

TOTAL CAPACITY, Q_{TOTAL}

$$Q_{TOTAL} = Q_{GRATE} + Q_{THROAT} = 6.4 + 7.0 = 13.4 \text{ CFS}$$

$$Q_{TOTAL} = 13.4 \approx 13.6 = Q_{BP}$$

∴ DEPTH OF PONDING APPROXIMATELY 0.55 FT AT FLOWLINE OF MISSION ROAD



THE LARKIN GROUP INC.

CALMAT CO. OF NEW MEXICO

CALMAT BUSINESS PARK
ALBUQUERQUE, NEW MEXICO

PHASE 1,
CATCH BASIN LAYOUT

No.	DRAWN BY	CHECKED BY	DATE
-0748	AE	PG, JA	OCT. 1999

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Date 10/18/99 Page 1 of 2
Client CALMAT
Job No. AL96-0748
Job Title CALMAT BUSINESS PARK PHASE I
Made By P. GONZALES
Chkd. By

CHAPPELL DRIVE CATCH BASIN CALCULATIONS

1. TYPE 1 C INLET CALCULATIONS

2. PURPOSE - FIND PEAK FLOW AT INLET LOCATIONS. CALCULATE DEPTH OF FLOW REQUIRED TO CAPTURE PEAK FLOW.

3. REFERENCES - COA, DPM SECTION 22.2, 22.3
   AHYMO MODEL CALCULATIONS
   FOR CALMAT BUSINESS PARK, PHASE I

4. a) CAPTURE FLOWS FROM ℄ STREET TO ROW.
   b) AHYMO CALCULATES A PEAK FLOW RATIO OF 4.5 CFS/ACRE

5. CALCULATIONS

A. INLET @ STA 15+25 CHAPPELL DRIVE

DRAINAGE AREA EXTENDS 265' NORTHWARD
WIDTH OF DRAINAGE AREA 43'

AREA = 265' x 43' = 11 395 SQ FT ≈ 0.262 AC

$Q_{P_{15+25}}$ = 0.262 AC × 4.5 CFS/AC = 1.2 CFS

DEPTH OF FLOW GIVEN: (FLOWMASTER)

Q = 1.2 CFS
S = 0.0074 FT/FT
1/2 STREET SECTION
n = 0.017

y = 0.18 FT

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Client CALMAT
Job No. AL96-0748
Job Title CALMAT BUSINESS PARK PHASE I
Made By P. GONZALES
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TYPE 1C INLET
GRATE CAPCITY ≈ 1.0 CFS   COA DPM PLATE 22.3 D-5

1.0 CFS CAPACITY ≈ 1.2 CFS PEAK FLOW

ASSUME BYPASS FLOW, IF ANY IS NEGLIGIBLE.

B. INLET AT STA 21+50, IN SAG VERTICAL CURVE.

DRAINAGE AREA
LENGTH = 795 FT
WIDTH = 43' FT

AREA = 795' × 43' = 34185 SQ FT ≈ 0.785 AC

$Q_{P\,21+50}$ = 0.785 AC (4.5 CFS/AC) = 3.5 CFS

DEPTH OF FLOW TO DISCHARGE 3.5 CFS
THROUGH GRATE OF TYPE 1C INLET

COA, DPM PLATE 22.3, D-5 INDICATES
AT APPROXIMATELY 0.5 FT DEPTH A TYPEIC
GRATE WILL DISCHARGE 3.5 CFS

Worksheet
Worksheet for Irregular Channel

Project Description	
Worksheet	Irregular Channel - 1
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	0.007400	ft/ft
Discharge	1.20	cfs

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Metho	Improved Lotter's Method
Closed Channel Weighting Meth	Horton's Method

Results		
Mannings Coefficient	0.017	
Water Surface Elevation	9.01	ft
Elevation Range	8.83 to 10.00	
Flow Area	0.8	ft²
Wetted Perimeter	9.15	ft
Top Width	8.99	ft
Actual Depth	0.18	ft
Critical Elevation	9.00	ft
Critical Slope	0.009804	ft/ft
Velocity	1.49	ft/s
Velocity Head	0.03	ft
Specific Energy	9.04	ft
Froude Number	0.88	
Flow Type	Subcritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
0+00	0+25	0.017
0+25	0+35	0.030

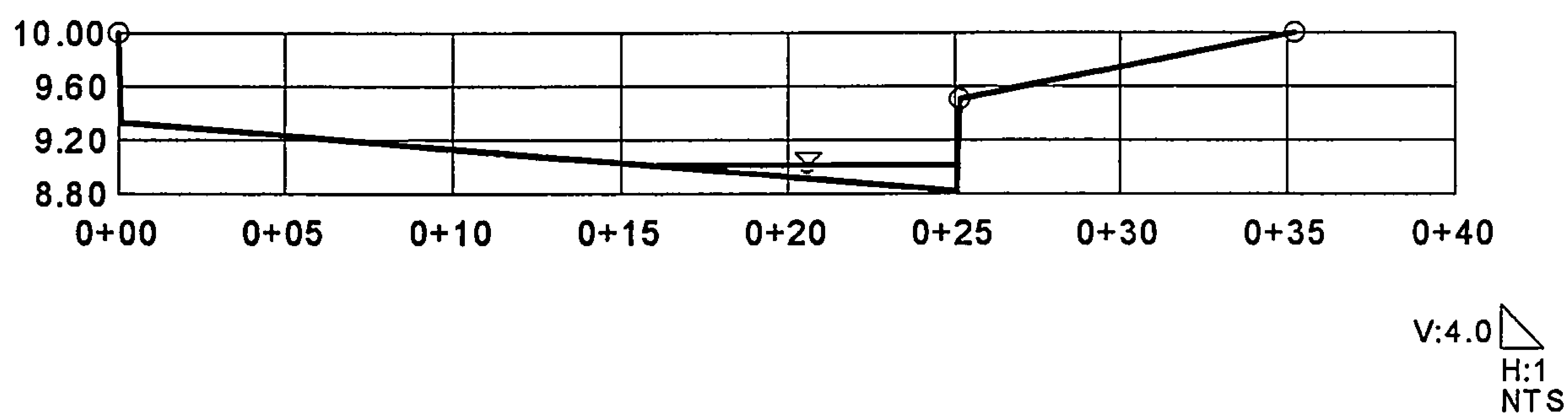
Natural Channel Points

Station (ft)	Elevation (ft)
0+00	10.00
0+00	9.33
0+25	8.83
0+25	9.50
0+35	10.00

Cross Section
Cross Section for Irregular Channel

Project Description	
Worksheet	Irregular Channel - 1
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.017	
Slope	0.007400	ft/ft
Water Surface Elevation	9.01	ft
Elevation Range	8.83 to 10.00	
Discharge	1.20	cfs



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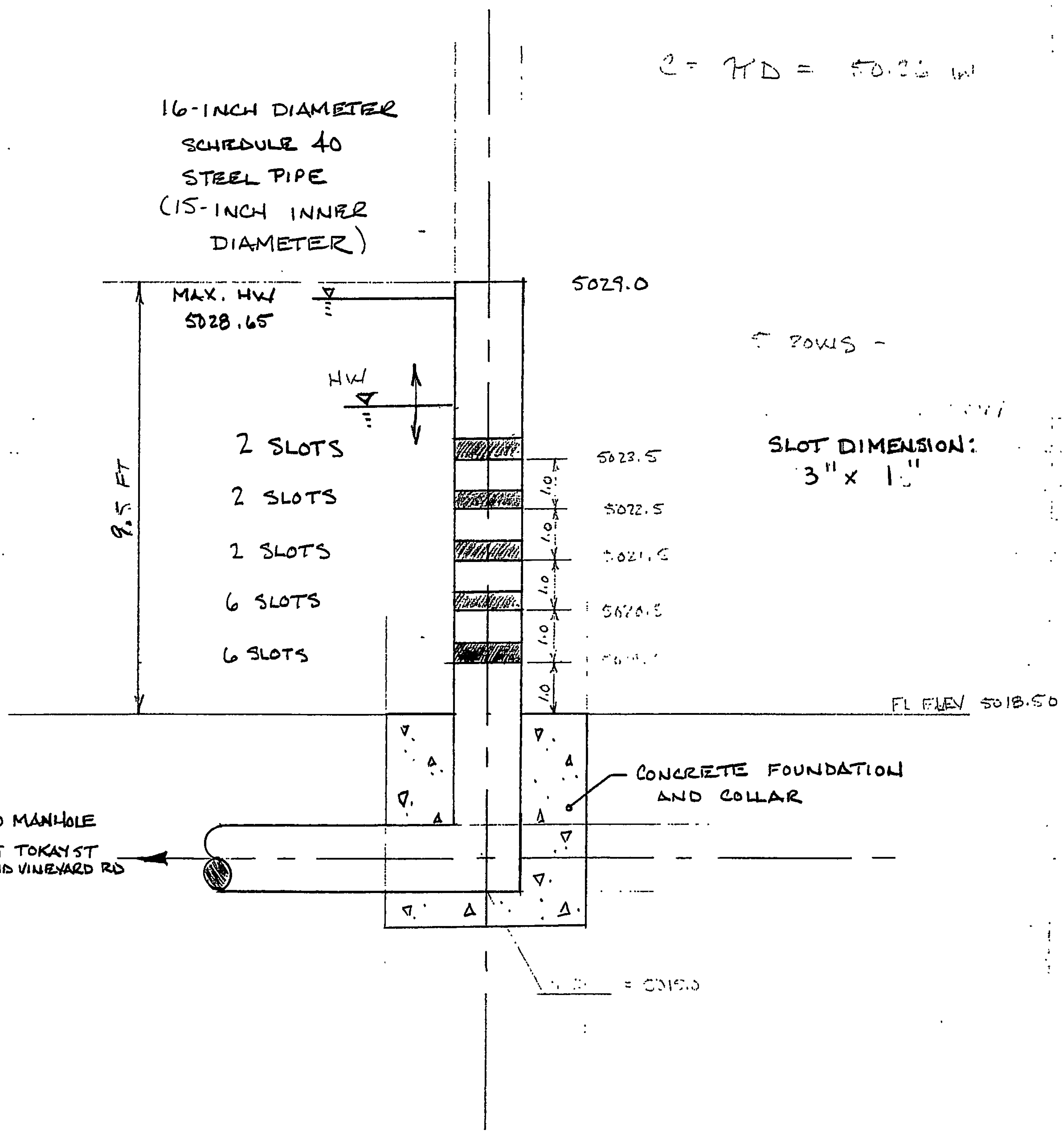
Date AUGUST 10, 1998
Job No. AL96-0748
Made By P. GONZALES
Chkd. By ____

CLIENT CALMAT OF NEW MEXICO
JOB CALMAT BUSINESS PARK PHASE 1

DETENTION BASIN STANDPIPE



Calmat Business Park Detention Basin

Basin Riser Flow Calculations

Orifice Equation: C = 0.6

a = 0.020833 1" x 3" Orifice

Q=C*a*SQRT(2*g*h) g = 32.2

Head (FT)	Number of Orifices	Flow Rate per Orifice (CFS)		Total Flow Rate (CFS)		
9	6	0.300936		1.806		
8	6	0.283725		1.702		
7	2	0.265401		0.531		
6	2	0.245713		0.491		
5	2	0.224304		0.449		
			SUM	4.979	Elevation	5028.5
8	6	0.283725		1.702		
7	6	0.265401		1.592		
6	2	0.245713		0.491		
5	2	0.224304		0.449		
4	2	0.200624		0.401		
			SUM	4.636	Elevation	5027.5
7	6	0.265401		1.592		
6	6	0.245713		1.474		
5	2	0.224304		0.449		
4	2	0.200624		0.401		
3	2	0.173745		0.347		
			SUM	4.264	Elevation	5026.5
6	6	0.245713		1.474		
5	6	0.224304		1.346		
4	2	0.200624		0.401		
3	2	0.173745		0.347		
2	2	0.141863		0.284		
			SUM	3.853	Elevation	5025.5
5	6	0.224304		1.346		
4	6	0.200624		1.204		
3	2	0.173745		0.347		
2	2	0.141863		0.284		
1	2	0.100312		0.201		
			SUM	3.381	Elevation	5024.5
4	6	0.200624		1.204		
3	6	0.173745		1.042		
2	2	0.141863		0.284		
1	2	0.100312		0.201		
			SUM	2.731	Elevation	5023.5
3	6	0.173745		1.042		
2	6	0.141863		0.851		
1	2	0.100312		0.201		
			SUM	2.094	Elevation	5022.5
2	6	0.141863		0.851		
1	6	0.100312		0.602		
			SUM	1.453	Elevation	5021.5
1	6	0.100312		0.602		
			SUM	0.602	Elevation	5020.5

CALMAT DRAINAGE ANALYSIS PHASE-I
Worksheet for Circular Channel

Project Description	
Worksheet	Circular Channel - 1
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.013	
Slope	0.005000	ft/ft
Diameter	48	in
Discharge	76.60	cfs

Results		
Depth	2.59	ft
Flow Area	8.6	ft²
Wetted Perimeter	7.49	ft
Top Width	3.82	ft
Critical Depth	2.65	ft
Percent Full	64.9	%
Critical Slope	0.004710	ft/ft
Velocity	8.88	ft/s
Velocity Head	1.23	ft
Specific Energy	3.82	ft
Froude Number	1.04	
Maximum Dischar	109.25	cfs
Discharge Full	101.57	cfs
Slope Full	0.002844	ft/ft
Flow Type	Supercritical	

Worksheet
Worksheet for Trapezoidal Channel

Project Description	
Worksheet	Trapezoidal Channel - 1
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.030	
Slope	0.005000	ft/ft
Left Side Slope	0.33	V : H
Right Side Slope	0.33	V : H
Bottom Width	8.00	ft
Discharge	110.00	cfs

Results		
Depth	1.91	ft
Flow Area	26.3	ft²
Wetted Perimeter	20.18	ft
Top Width	19.57	ft
Critical Depth	1.48	ft
Critical Slope	0.013215	ft/ft
Velocity	4.18	ft/s
Velocity Head	0.27	ft
Specific Energy	2.18	ft
Froude Number	0.64	
Flow Type	Subcritical	

Worksheet
Worksheet for Trapezoidal Channel

Project Description	
Worksheet	Trapezoidal Channel - 1
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.030	
Slope	0.005000	ft/ft
Left Side Slope	0.33	V : H
Right Side Slope	0.33	V : H
Bottom Width	8.00	ft
Discharge	120.00	cfs

Results		
Depth	2.00	ft
Flow Area	28.0	ft²
Wetted Perimeter	20.73	ft
Top Width	20.09	ft
Critical Depth	1.56	ft
Critical Slope	0.013049	ft/ft
Velocity	4.28	ft/s
Velocity Head	0.28	ft
Specific Energy	2.28	ft
Froude Number	0.64	
Flow Type	Subcritical	