CITY OF
Albuquerque
P.O. Box 1293 Albuquerque, NM 87103

May 17, 1996

Martin J. Chávez, Mayor

John Alexander
Bohannan Huston, Inc.
7500 Jefferson NE
Albuquerque, NM 87109

RE: SUPPLEMENTAL INFO FOR TRACT B-3 SEVEN BAR NORTH (A-13/D7C)
RECEIVED APRIL 24, 1996 WORK & FINAL PLAT
ENGINEER'S STAMP DATED 3/21/96

Dear Mr. Alexander:

Based on the information included in the submittal referenced above, City Hydrology accepts the Drainage Report, dated 3/21/96, for Work Order & Final Plat.

It is understood that a Grading Plan will be submitted for Tract 3A. That Grading Plan must be used to certify Unit 2.

If you have any questions about this project, You may contact me at 768-2727.

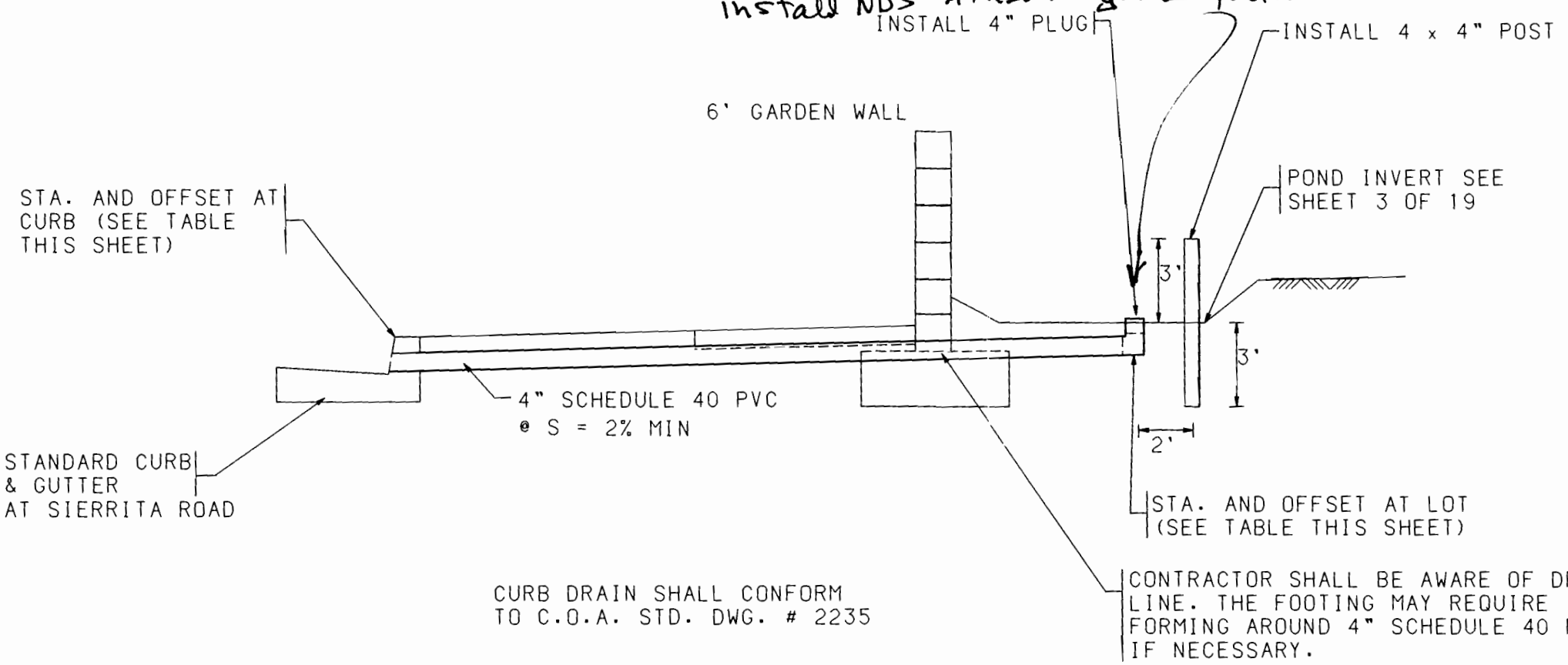
Sincerely,

John P. Curtin, P.E.
Civil Engineer, Hydrology

c: Andrew Garcia
Fred Aguirre, DRB 95-526
Kurt Browning, AMAFCA

with this project we will remove existing plug and install NDS ATRIUM grate part # 75.

JCA. 5-6-97



TYPICAL CURB DRAIN SECTION

NO SCALE AT LOTS 86, 87, 88.

CURB DRAIN TABLE

LOT	CURB DRAIN INVERT AT LOT	STATION & OFFSET AT LOT	FLOWLINE ELEV.	CURB DRAIN INVERT EL.	STATION & OFFSET AT CURB
86	10.19	29+32.42, 51.00'RT.	09.45	09.49	29+32.65, 16.01'RT.
87	07.57	28+82.71, 51.00'RT.	06.83	06.87	28+82.15, 16.00'RT.
88	05.72	28+37.72, 50.94'RT.	04.98	05.02	28+35.77, 16.00'RT.

STATIONING WITH RESPECT TO CENTERLINE SIERRITA ROAD

THIS WAS BUILT WITH B-3, UNIT 1 (PN# 4982.97)

Drainage Report
for
Tract B-3
Seven Bar North Subdivision

MARCH 1996

DRAINAGE REPORT
FOR TRACT B-3
SUBDIVISION AT SEVEN BAR NORTH

Prepared for:

BROWN/NZD DEVELOPMENT JOINT VENTURE
C/O BROWN & ASSOCIATES
3411 CANDELARIA, NE
ALBUQUERQUE, NEW MEXICO 87107

Job No. 95286A2415

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3. DRAINAGE PLAN & ONSITE BASIN MAP (PROPOSED DEVELOPED CONDITIONS)

4. SUBDIVISION SITE GRADING AND DRAINAGE PLAN - SHEET 1 OF 2

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8. CURB TYPE IDENTIFICATION MAP

I. INTRODUCTION AND PURPOSE OF REPORT

This report presents the drainage management plan for preliminary plat approval for the development of a residential subdivision on Tract B-3, of Seven Bar North. The property is 17 acres, zoned R-LT and proposed for development of 88 detached, single-family residential dwelling units and the related streets and infrastructure. Development of the property will occur in two phases. Before approval of final phased plats, detailed phased drainage and grading plans will be submitted for City of Albuquerque review and approval. As shown on the Drainage Basin Map, the property is bounded by Sierrita Road on the west, Westside Boulevard on the north, Skyview Channel on the east, and Cerro Crestado Subdivision (formerly Tract B-2) on the south.

This report outlines the hydrological methods used, and summarizes the existing and proposed drainage conditions. Calculations and supporting data are presented in the appendices. A drainage basin map, a preliminary grading plan and a copy of the preliminary plat are included at the end of this report. The purpose of this report is to obtain a drainage report approval for the preliminary plat for Tract B-3.

II. STUDY METHODOLOGY

Existing, undeveloped conditions and proposed, developed conditions were analyzed for the 100-year, 6-hour storm event consistent with the City of Albuquerque Design Process Manual (DPM), including the January 1993 revision of Section 22.2, Hydrology. The analysis also references, and is consistent with, the previously submitted and approved reports.

- Drainage Master Plan for the Seven Bar North Subdivisions, dated April 1994 and revised June 6, 1994. (A13/D7)

- Drainage Report for Tracts B-1 and B-2 at Seven Bar North Subdivisions, dated May 4, 1994. (A13/D7)

- Drainage Report for Tracts B-4, B-5, and B-6 at Seven Bar North Subdivisions, dated October 1994. (A13/D7)

- Drainage Report for Tracts B-7, B-8, and B-9 at Seven Bar North Subdivisions, dated March 1995. (A13/D7)

Street hydraulics were analyzed using Manning's equation with the "n" values suggested in the DPM. Rating tables for streets are provided in the appendices along with hydrologic and hydraulic calculations. Streets are designed to convey the energy grade line of the design storm event within the right-of-way. Normal flow depth is confined to the top of the curb. The calculated pipe hydraulics assumes pressure flow conditions and are analyzed by computer spreadsheets in Appendix 3.

III. EXISTING CONDITIONS

Site Characteristics

This site is currently undeveloped vacant land with slopes ranging from 3% to 9% generally in a southernly direction. Soils are highly absorptive sandy soils with occasional clay lenses. Vegetation is light, consisting of grasses and small sagebrush.

The site is not found within a FEMA floodplain, as shown on the floodplain map provided on the Drainage Master Plan map plate. The existing drainage conditions are shown graphically on the Existing Drainage Conditions Map and are summarized as follows:

Onsite Drainage Basins

Drainage basin E-3, approximately 17.0 acres, generates 23.9 cfs in a 100-year storm and runs in a southern sheet flow to a diversion swale. The swale is located at the northern boundary of the developed area of Cerro Crestado Subdivision (formerly Tract B-2 at Seven Bar North). The swale conveys the flow to a temporary drainage pond constructed with Tract B-7. The pond is designed to remove the sediment from

the 10-year storm and has an orifice-controlled discharge into a connector pipe that runs to a storm drain manhole in Sierrita Road, where the flow continues south to Black Diversion Channel. Calculations for the pond and diversion swale are found in Appendix 4 of the previously submitted and approved drainage report for Tracts B-7, B-8, and B-9.

Offsite Drainage Basins

No offsite basins impact Tract B-3.

IV. PROPOSED DEVELOPED CONDITIONS

The proposed development is a single-family, detached residential subdivision with 88 lots on 17.0 acres, producing a density of 5.18 dwelling units per acre. Proposed street configurations are shown on the Preliminary Plat, Drainage Basin Map and Preliminary Grading Plan. For drainage, the development can be broken down into two phases, Unit One and Unit Two as seen on the Drainage Master Plan. Unit One will develop the southern half basin E-3B, and Unit Two will develop the remainder of basin E-3B and all of basin E-3A as seen on the Existing Drainage Conditions Map.

Unit One Development

Unit One includes the construction of Sierrita Road, and its associated storm drain and utility lines, from the southwest corner of Tract B-3's boundary northward to the existing Westside Boulevard intersection. Also, the development of the residential subdivision in the southern third of Tract B-3 (within basin E-3B), and a temporary diversion berm along its northern border. The berm will divert undeveloped runoff from the upper half of basin E-3B to Skyview Channel. The runoff from basin E-3A will continue to sheet flow into Skyview Channel.

For purposes of analysis, Unit One will be subdivided into two smaller basins. Basins "D" and "E", as shown on the Drainage Basin Map, together they generate a fully developed runoff of 21.3 cfs (20.0 + 1.3). The runoff generated by basin "D" is

conveyed to the west side of the basin by street flow. The runoff is intercepted by a sump inlet and conveyed by a connector pipe to the storm drain system in Sierrita Road. This inlet and connector pipe are sized to intercept and convey 200 percent of the 100 year storm event. The runoff generated from basin "E" is conveyed by sheet flow down to Sierrita Road. This flow, along with all other future residual flows associated with the Seven Bar North Subdivision Tracts B-1 through B-9, will be intercepted by a battery of existing catch basins at approximately Station 12+00 Seven Bar Loop Road. The catch basin design can be found in Appendix 3 of the previously submitted and approved drainage report for Tracts B-7, B-8, and B-9 of Seven Bar North. A time-to-peak analysis on the onsite basins that impact the above mentioned existing catch basins were generated using AHYMO to obtain an accurate profile of the hydraulic grade line channel. Supporting data is found in Appendix 3 of this report.

As stated in the Study Methodology section of this report, street flows were calculated and energy grade lines were confined within the right-of-way. Normal flow depth is confined to the top of the curb. A summary table of the street calculations is provided in appendix two for review and reference. The allowable limits for roll curb have been identified on the Curb Type Identification Map in the plates section of this report.

Unit Two Development

Unit Two will complete the development of the residential subdivision Tract B-3 northward up to Westside Boulevard.

For purposes of analysis, Unit Two is subdivided into three smaller basins. Basins "A", "B" and "C", as shown on the Drainage Basin Map, together they generate a fully developed runoff of 36.3 cfs (14.2 + 9.5 + 12.6). The runoff generated by basin "A" is conveyed to the east side of the basin by street flow and is discharged into Skyview Channel via a shallow lined channel. The runoff generated by basin "B" is conveyed to the east side of the basin by street flow and is discharged

into Skyview Channel via a shallow lined channel. The runoff generated by basin "C" is conveyed south by street flow to the sump inlet built in Unit One. This brings the total flow at the sump inlet to 32.6 cfs (12.6 + 20.0). The sump inlet and connector pipe were designed using 200 percent the total flow, calculations for the sump inlet can be found in Appendix 3 of this report.

As stated in the Study Methodology section of this report, street flows were calculated and energy grade lines were confined within the right-of-way. Normal flow depth is confined to the top of the curb. A summary table of the street calculations is provided in Appendix 2 for review and reference. The allowable limits for roll curb have been identified on the Curb Type Identification Map in the plates section of this report.

Backyard Ponds

Several lots will require backyard ponds due to elevation differences between the backyards and adjacent properties. The ponds will only retain backyard flows, all impervious flows, except a 100 square foot rear patio, will be routed to the front of the lots and onto their respective street. The retention ponds are designed to contain the 100-year, 10-day volume. Pond locations and details are shown on the preliminary grading plan and grading details sheet. They are enclosed in the plates section of this report.

V. PHASING/BUILDING PERMIT/FINAL PLAT APPROVALS

This report requests only preliminary plat approval. Before final plat and building permit approvals, final grading plans and work order construction plans by phase, will be submitted and approved by the City, AMAFCA and NMUI.

VI. CONCLUSION

The drainage management plan presented in this report for Tract B-3 provides a workable solution to the drainage issues created by the development of this property and should be approved as satisfying the requirements for Preliminary Plat Drainage Report.

HYDROLOGY - FORMULAS USED

From Section 22.2 of DPM w/January 93 update

EXISTING CONDITIONS:

Time of Concentration, $t_c = \left(\frac{L_1}{V_1} + \frac{L_2}{V_2} + \ldots + \frac{L_n}{V_n}\right)/3600 \text{ sec/hr}$

where $V = K\sqrt{S}$

K from Table B-1

S is slope in percent

$\Sigma L_n \leq 4000$ FT.

Intensity: $I = 0.726 \left(\log 24.6 \times t_c\right) \frac{P_{60}}{t_c}$

Rational Method "C" = %A(.27) + %B(.43) + %C(.61) + %D(.93)

(ZONE 1, 100yr, 6hr storm)

$Q_p = CIA$

DEVELOPED CONDITIONS:

For Small Watersheds $t_p = 8$ min.

$t_c = 12$ min

Rational Method -

C = %A(.27) + %B(.43) + %C(.61) + %D(.93)

(Zone 1, 100 yr, 6 Hr. storm)

C = %A(.08) + %B(.24) + %C(.47) + %D(.92)

(Zone 1, 10 yr, 6 hr. storm)

Excess Precipitation = E_c

E_c = %A(.44) + %B(.67) + %C(.99) + %D(1.97)

Volume = Area (E_c)

BOHANNAN-HUSTON INC.

PROJECT NAME 7 Bar North tract B-3 SHEET _____ OF _____

PROJECT NO. 95286.42 BY JCA DATE 8-15-95

SUBJECT HYDROLOGY CH'D _____ DATE _____

Existing Drainage:

BASIN E3

S < 10%, UNDEVELOPED, PRIMARILY SHEET FLOW

95% TREATMENT A.

5% CHANNEL

$$t_c = \frac{\frac{1200}{0.7\sqrt{6}} + \frac{600}{4\sqrt{2}}}{3600} = 0.22 \text{ HR}$$

$I = 4.53$ in/HR (EQ A. A-12)

$C = 0.28$

$A = 19.0$ Ac.

$Q = 23.9$ cfs

BOHANNAN-HUSTON INC.

PROJECT NAME 7-Bar North Tract B-3 SHEET _____ OF _____

PROJECT NO. 95286.92 BY JCA DATE 8-15-95

SUBJECT _____ CH'D _____ DATE _____

HYDROLOGIC DATA-SEVEN BAR NORTH
TRACT 3

03/19/96

EVENT	PEAK DISCHARGE, CFS/ACRE A	B	C	D
100-YR (1)	1.29	2.03	2.87	4.37
10-YR (2)	0.24	0.76	1.49	2.89
3	0.44	0.67	0.99	1.97
4	0	0.22	0.44	1.24
2	0.24	0.76	1.49	2.89

The backyards in Lots 4 → 15 were removed from Basin 3D and placed into Basin 3E.

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

FULLY DEVELOPED CONDITIONS

SUMMARY OF HYDROLOGIC DATA — **RATIONAL METHOD (100YR)**

BASIN ID	AREA AC	AREA SQ.MI.	% LAND TREATMENT A	B	C	D	TIME TO PEAK	10-YR DISCHARGE CFS/AC	Q(10YR) CFS	COMPOSITE C	I (IN/HR)	Q(100YR) (CFS)
3A	4.156	0.0065	5.1	20.5	20.5	54.0	0.1333	2.03	8.4	0.73	4.70	14.2
3B	2.704	0.0042	4.8	18.8	18.8	57.6	0.1333	2.10	5.7	0.74	4.70	9.5
3C	3.707	0.0058	5.4	20.5	20.5	53.5	0.1333	2.02	7.5	0.73	4.70	12.6
3D	5.753	0.0090	4.6	19.5	19.5	56.3	0.1333	2.08	12.0	0.74	4.70	20.0
3E	0.520	0.0008	0.0	50.0	50.0	0.0	0.1333	1.13	0.6	0.52	4.70	1.3
SUMS	***16.84***											***57.6***
SIERRITA ROAD												
3F	1.200	0.0019	0.0	10.0	10.0	80.0	0.1333	2.54	3.0	0.85	4.70	4.8
3G	0.380	0.0006	0.0	8.3	8.3	83.4	0.1333	2.60	1.0	0.86	4.70	1.5
SUMS	***1.58***											***6.3***

IMPERVIOUS AREA CALCULATIONS

03/19/96

LOT WIDTH (IN FEET)		50	55	60	65	70	75	80
PAD WIDTH		40	45	50	55	55	60	65
PAD DEPTH		65	65	65	65	65	65	65
DRIVEWAY	(20'x20')	400	400	400	400	400	400	400
WALKWAY	(4' WIDE)	0	0	0	0	0	0	0
PATIO	(10'x10')	100	100	100	100	100	100	100
TOTAL IMPERVIOUS		3100 sq.ft/lot	3425 sq.ft/lot	3750 sq.ft/lot	4075 sq.ft/lot	4075 sq.ft/lot	4400 sq.ft/lot	4725 sq.ft/lot

(INCLUDED WITH ROAD)

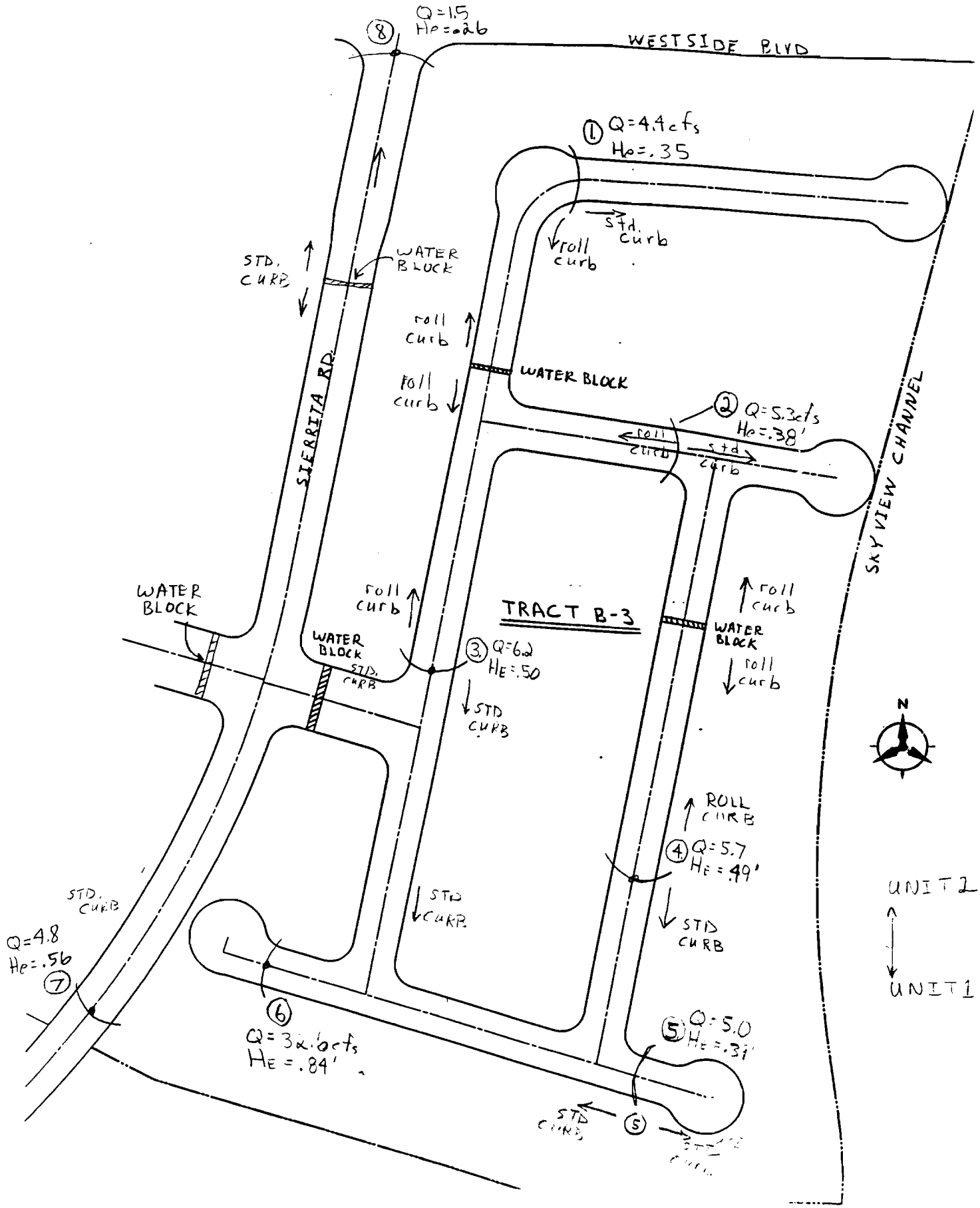
PONDING

ROADWAY	TYPE 1	TYPE 2	TYPE 3	TYPE 4	CUL 1
F-F WIDTH	28	51	26	32	
SIDEWALK	4	4	4	4	0
RADIUS					40
	36 sq.ft/ft	59 sq.ft/ft	34 sq.ft/ft	40 sq.ft/ft	5027 sq.ft

BASIN ID	AREA TYPE D AC	PERCENT TYPE D	TOTAL NUMBER OF LOTS PER BASIN 50'	55'	60'	65'	70'	75'	80'
3A	2.24	54.0	23	0	0	0	0	0	0
3B	1.56	57.6	14	0	0	0	0	0	0
3C	1.98	53.5	22	0	0	0	0	0	0
3D	3.24	56.3	29	0	0	0	0	0	0
3E	0.00	0.0	0	0	0	0	0	0	0
3F	0.96	80.0	0	0	0	0	0	0	0
3G	0.32	83.4	0	0	0	0	0	0	0

BASIN ID	TOTAL LENGTH OF ROADWAY PER BASIN TYPE 1	TYPE 2	TYPE 3	TYPE 4	NUMBER OF CUL-DE-SACS PER BASIN
3A	0	0	555	0	1.5
3B	450	0	95	0	1.0
3C	505	0	0	0	0.0
3D	550	100	455	0	2.0
3E	0	0	0	0	0.0
3F	0	0	0	1045	0.0
3G	0	0	0	345	0.0

POINT LOCATIONS FOR STREET CAPACITY ANALISIS



HYDRAULIC GRADE LINE ANALYSIS

EQUATIONS USED:

FROM DPM CH 22.3 EXCEPT WHERE NOTED.

CONVEYANCE $K = \frac{1.486\ AR^{2/3}}{n}$

$= \frac{1.486\ A\left(\frac{r}{2}\right)^{2/3}}{0.013}$

FRICTION SLOPE : $S_f = \left[\frac{Q}{K}\right]^2$

ENERGY LOSSES:

FRICTION LOSS = $H_f = S_f L$

BEND LOSS = $H_B = 0.2\left(\frac{\Delta}{90}\right)^{\frac{1}{2}} \frac{\bar{V}^2}{2g}$

* JUNCTION LOSS = $\frac{Q_3 V_3 - QV_1 - Q_3 V_3 \cos\theta}{\left(\frac{A_1 + A_2}{2}\right)g} + HV_1 - HV_2 = H_J$

* FROM LA METHODS - STD. 5.

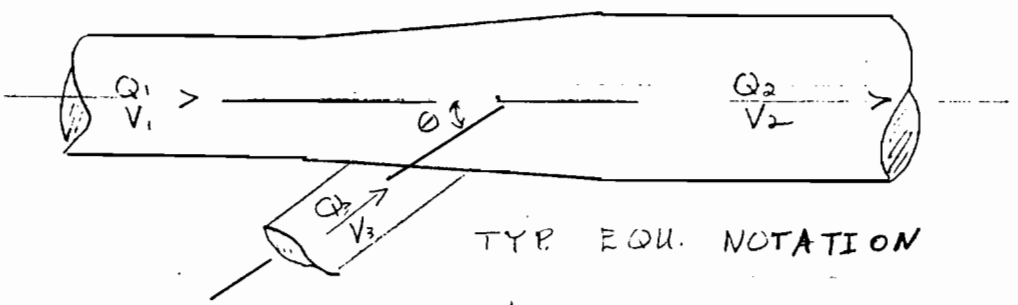
MANHOLE LOSS = $H_{mH} = 0.05 \frac{\bar{V}^2}{2g}$

TRANSITION LOSS = $H_T = 0.1 \frac{(V_1 - V_2)^2}{2g}$ FOR CONTRACTION

$= 0.2 \frac{(V_1 - V_2)^2}{2g}$ FOR EXPANSION

VELOCITY HEAD = $HV = \frac{V^2}{2g}$

AVER. VELOCITY = $\bar{V} = \frac{V_1 + V_2}{2}$



TYP EQU. NOTATION

BOHANNAN-HUSTON INC.

PROJECT NAME _____ SHEET _____ OF _____

PROJECT NO. _____ BY JC A DATE 12-19

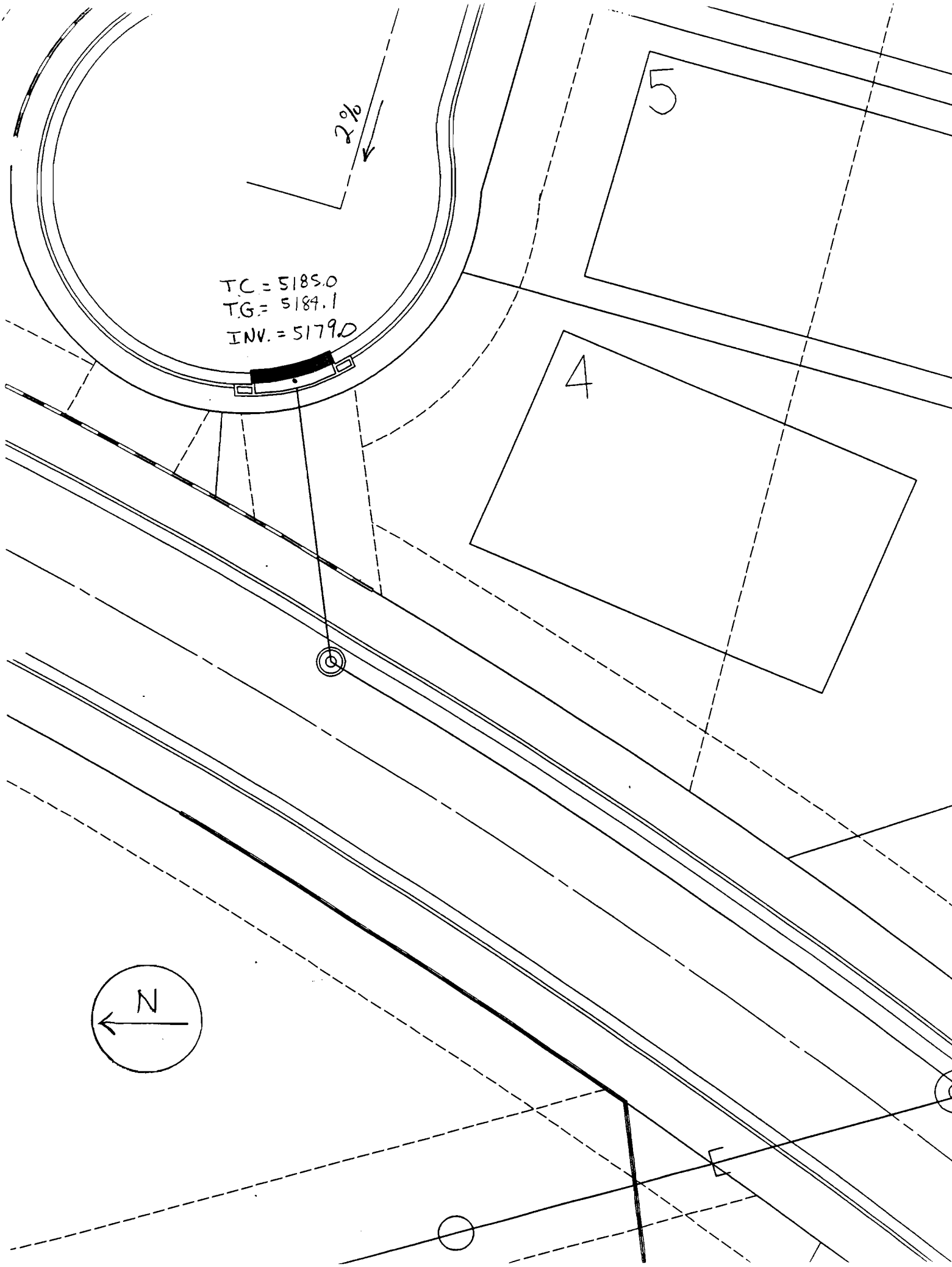
SUBJECT _____ CH'D _____ DATE _____

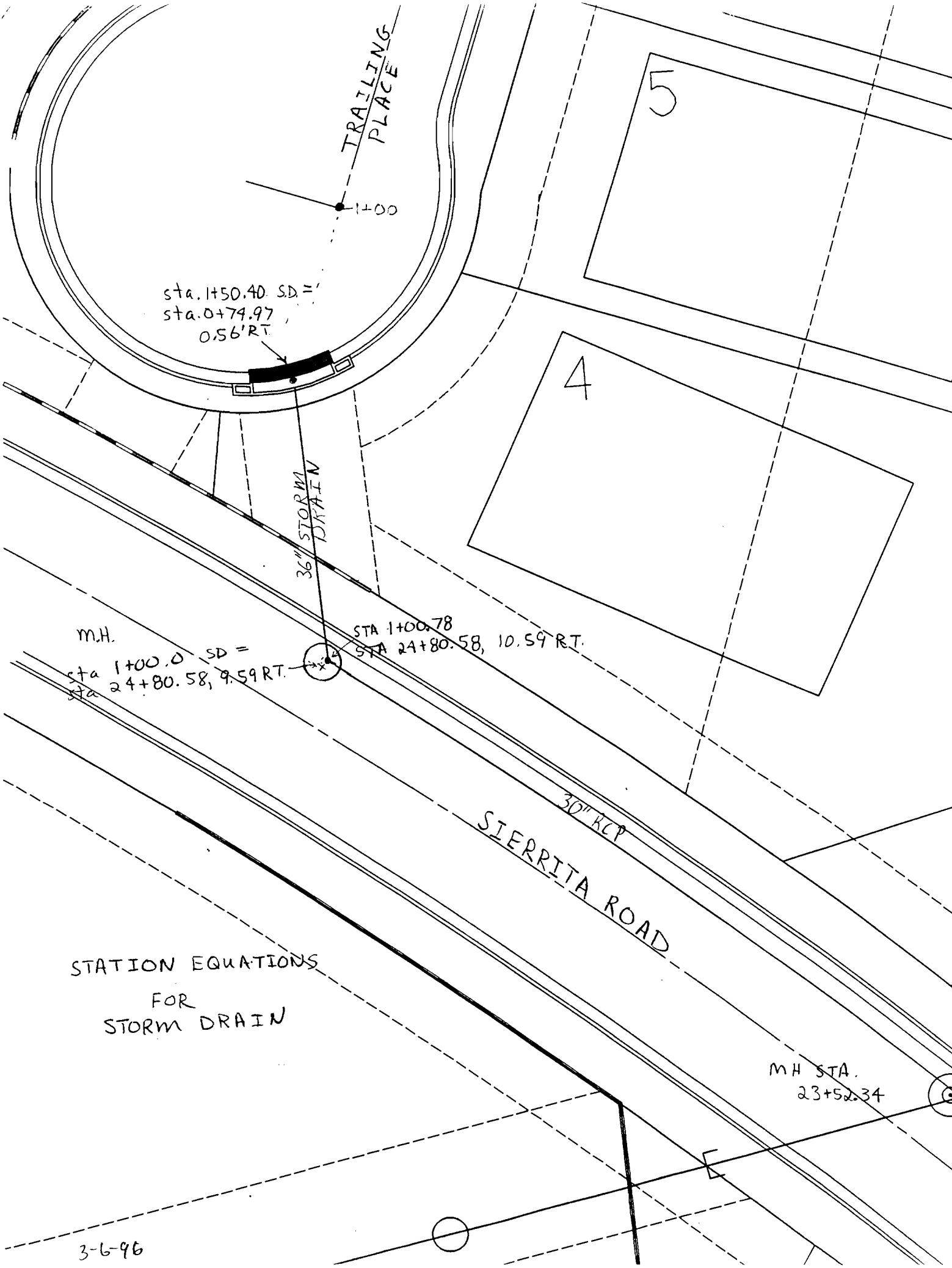
STORM DRAIN SYSTEM

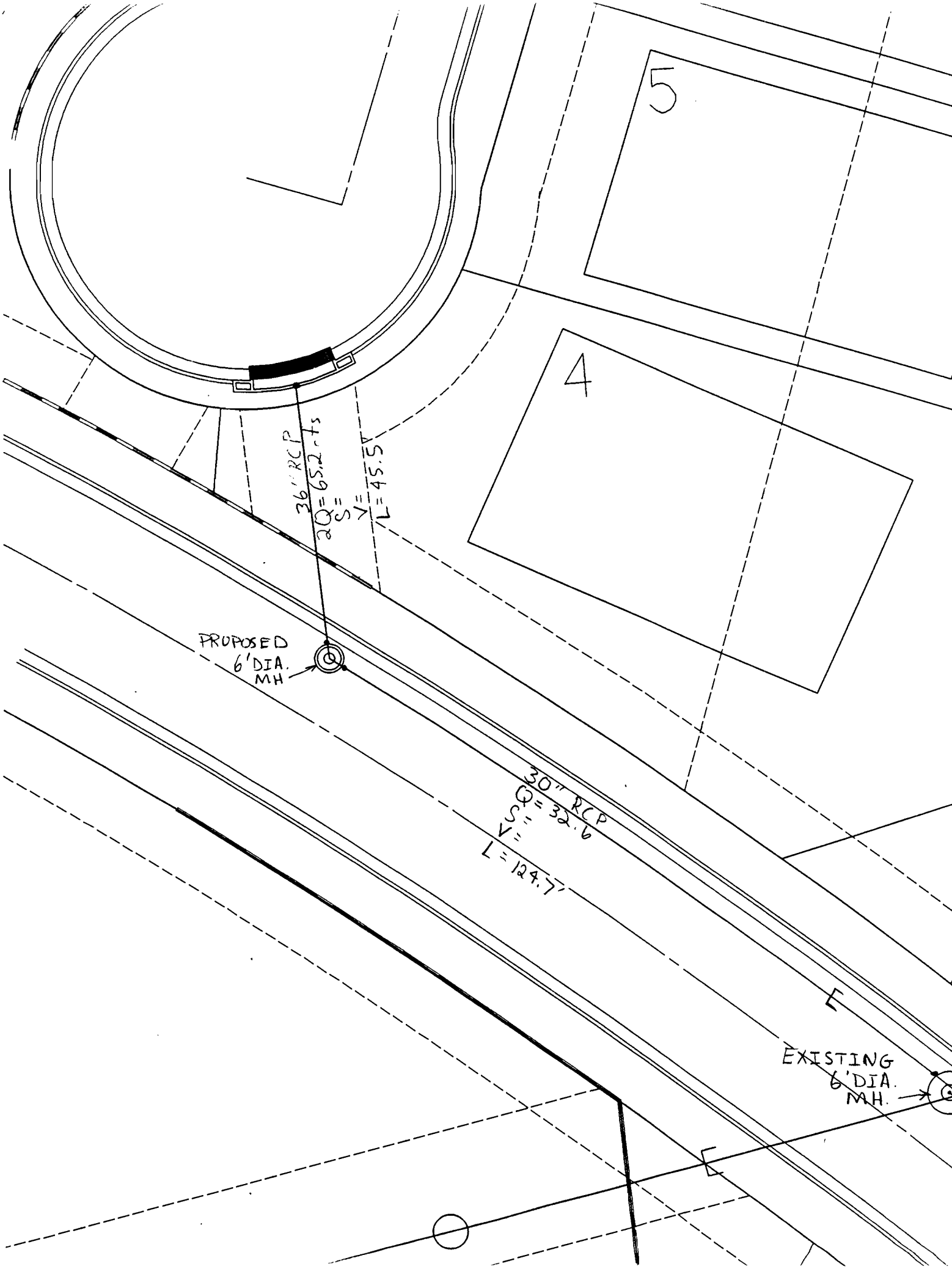
GENERAL DESIGN OF STORM DRAIN TRACT B-3:

The northern portion of the tract will drain to the two most northern cul-de-sacs. From there it is conveyed into the existing Skyview Channel.

The southern portion of the tract will drain to the cul-de-sac on the southwestern corner of Tract B-3. It is intercepted by a sump drain and conveyed by a connector pipe to the storm drain line in Sierrita Road.


2%
TC = 5185.0
TG = 5184.1
INV. = 5179.0
5
4
N


TRAILING PLACE
1+00
5
4
sta. 1+50.40 S.D. =
sta. 0+79.97
0.56' RT
36" STORM DRAIN
M.H.
sta 1+00.0 SD =
sta 24+80.58, 9.59 RT.
STA 1+00.78
STA 24+80.58, 10.59 RT.
30" RCP
SIERRITA ROAD
STATION EQUATIONS
FOR
STORM DRAIN
MH STA.
23+52.34
3-6-96

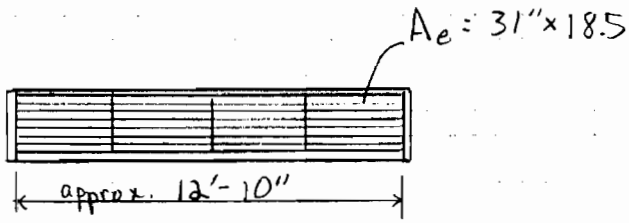

5
4
36" RCP
Q= 65.2 cfs
S=
V=
L= 45.5'
PROPOSED
6' DIA.
MH
30" RCP
Q= 32.6
S=
V=
L= 124.7'
EXISTING
6' DIA.
MH.

CATCH BASIN DESIGN

STA. 71,97, 0.56' RT.

MODIFIED DOUBLE WING QUADRUPLE TYPE 'A'

$Q_{Design} = 2 \times (FLOW) = 2 \times 32.6\ cfs = \underline{65.2\ cfs}$ ✓



Capacity of Orfice (grate):

$A_e = 4\left[31 \times 18.5/144\right] = 15.93\ sf$

$h = .83' + .18' = 1'$ @ Right of Way

$Q = 0.6\ A_e \sqrt{2gh}$

$Q = 0.6\ (15.93) \sqrt{64.4\ (1)} = 76.71\ cfs$ ✓

Capacity of Orfice (pipe):

$A_{36"} = 7.06\ sf$

$h = 5.0 = (v\ depth)$

$Q = 0.6\ (7.06) \sqrt{64.4\ (5)} = \underline{76.1}$ ✓ controlls

$76.1\ cfs > 65.2\ cfs$ OK

BOHANNAN-HUSTON INC.

PROJECT NAME Seven Bar N. SHEET 1 OF 1

PROJECT NO. 95286A2490 BY JCH DATE 2-26-96

SUBJECT Unit B-3 Catch Basin CH'D _____ DATE _____

CATCH BASIN CA ULATION SHEET

Sht 1 of 1

PROJECT Z-Bar N. B-3

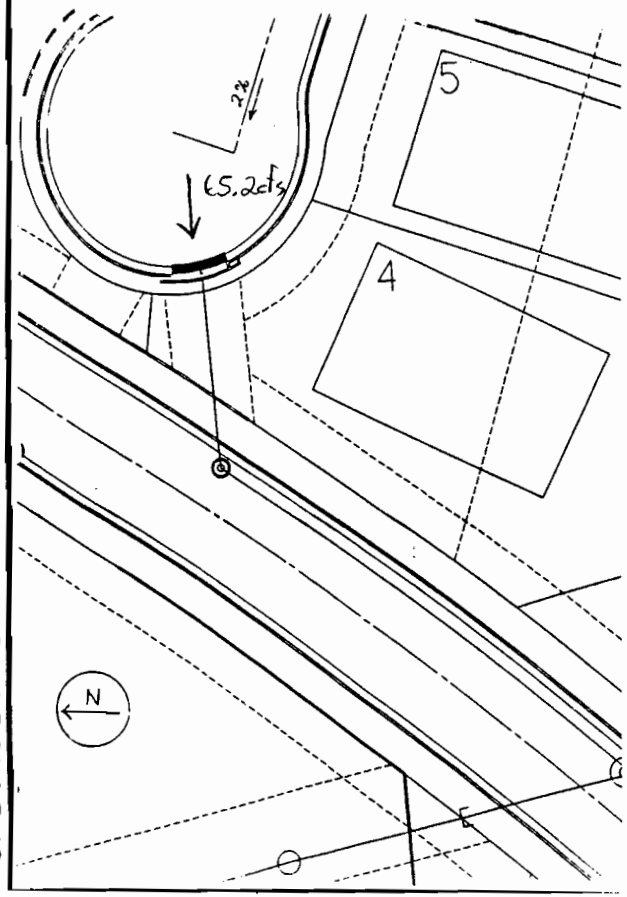
CALCULATED BY JCA

DESIGN FREQUENCY 100 yr

DATE 3-7-96

FULL

FLOW DIAGRAM (Indicate street slopes)	Sym.	Drain. Area	Q Total	Q Inter.	Cap. of ½ Street	Gutter "d"	C.B. No.	C.B. Size	Connector Pipe Head	Connector Pipe L	Connector Pipe Dia.	V Depth
	1		2Q= 65.2	65.2	44/2	1'	1	QUAD A		45'	3	6.



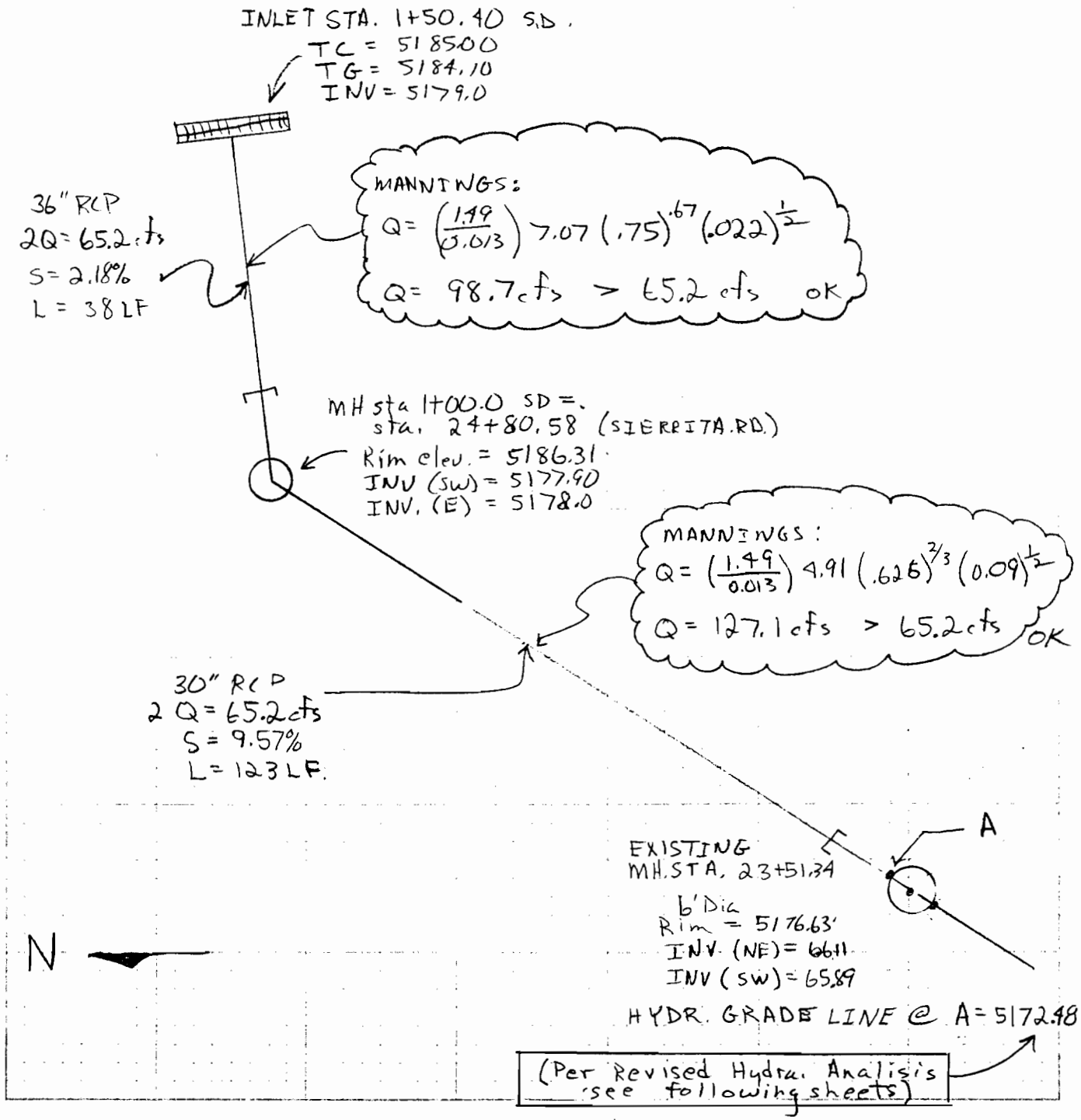
4-82

80

PLATE 22.3 D-10

22.3

TRACT B-3
FLOW CHART FOR HYDRO
GRADE LINE ANALISIS.



BOHANNAN-HUSTON INC.

PROJECT NAME I-Bar North SHEET ____ OF ____

PROJECT NO. ____ BY JCA DATE 3-6-96

SUBJECT FLOW CHART CH'D ____ DATE ____

SUMMARY	OF HYMO HYDROGRAPHS								
REFER TO	HGL SPREAD SHEETS FOR TIMES SHOWN IN ITALICS - PEAKS IN BOLD								
REFER TO	DRAINAGE MASTERPLAN FOR BASIN ID LOCATIONS								
	HYD ID #	HYD ID #	HYD ID #	HYD ID #	HYD ID #	HYD ID #	HYD ID #	HYD ID #	HYD ID #
TIME	SD1D	A3D3	SD2	A7.SD1D	SD1E	SD1E2	SD1E3	SD1E4	7BAROUT
1.45	38.60	22.60	56.10	68.30	117.70	125.90	133.60	164.10	165.10
1.46	42.00	24.40	61.60	74.30	129.30	137.50	145.10	178.20	181.20
1.47	45.10	26.20	66.70	80.00	140.50	148.80	156.50	192.10	196.90
1.48	47.90	27.70	71.80	84.90	151.00	159.20	166.90	204.80	211.60
1.49	50.20	28.90	76.60	89.10	160.50	168.80	176.50	215.90	224.50
1.50	52.00	29.80	80.90	92.20	168.70	177.00	184.80	226.20	236.40
1.51	53.10	30.20	84.30	94.10	175.20	183.50	191.40	233.40	245.20
1.52	***53.50***	***32.60***	*86.90*	***94.70***	*179.60*	*188.00*	*196.00*	*238.60*	*251.60*
1.53	*53.20*	*30.00*	*88.50*	*94.20*	*181.90*	*190.30*	*198.40*	***240.80***	*254.90*
1.54	*52.30*	*29.40*	***89.10***	*92.60*	***182.10***	***190.60***	***198.80***	*240.70*	***255.30***
1.55	51.00	28.50	88.70	90.20	180.50	189.00	197.30	238.20	253.30
1.56	49.20	27.50	87.50	87.10	177.10	185.60	194.10	233.80	248.70
1.57	47.20	26.30	85.60	83.60	172.40	180.90	189.40	227.60	242.40
1.58	45.10	25.10	83.10	79.90	166.70	175.20	183.70	220.30	234.50
1.59	42.90	23.90	79.80	76.00	160.00	168.60	177.10	211.90	225.50
1.60	40.70	22.70	76.30	72.20	152.80	161.30	169.90	203.60	216.20
1.61	38.60	21.50	73.70	68.50	145.90	154.40	163.00	194.50	206.40
1.62	36.70	20.50	70.80	65.10	139.50	148.10	156.60	186.60	197.40
1.63	34.90	19.50	67.40	61.90	133.10	141.60	150.10	178.60	188.70
1.64	33.20	18.50	63.90	58.90	126.60	135.10	143.60	170.80	179.70
1.65	31.70	17.70	60.60	56.10	120.30	128.80	137.30	163.10	171.20

**** HYDRAULIC GRADE LINE CALCULATIONS *****

SEVEN BAR LOOP ROAD-100 YEAR

t=1.52 hrs

										MH	JNCT						Total			Low			
	Station	Structure	Diam.	Q	HYD ID	Area	Vel.	K	Sf	Length	Dia.	Angle	Hf	Hb	Hj	Hmh	Ht	Losses	HGL(dn)	HGL(up)	Point	HV	EGL(dn)	EGL(up)
	SEVEN BAR LOOP																							
	9+60	OUTLET									0.00	0.00		0.00	0.00	0.00	0.00	0.00	5115.80	5115.80	5122.15	6.22	5122.02	5122.02
			48	251.6	7BAROUT	12.57	20.02	1470	0.0293	72.40			2.12					2.12						
	10+06.84	MH									8.00	45.00		0.20	0.00	0.00	0.00	0.20	5117.92	5118.74	5122.15	5.60	5124.14	5124.34
			48	238.6	SD1E4	12.57	18.99	1470	0.0263	86.49			2.28					2.28						
	10+93.33	MH									8.00	0.00		0.00	0.85	0.00	0.01	0.85	5121.02	5121.03	5124.41	6.44	5126.62	5127.47
			42	196.0	SD1E3	9.62	20.37	1030	0.0362	31.51			1.14					1.14						
	11+24.84	WYE									0.00	0.00		0.00	0.11	0.00	0.00	0.11	5122.17	5122.80	5125.00	5.93	5128.61	5128.73
			42	188.0	SD1E2	9.62	19.54	1030	0.0333	24.00			0.80					0.80						
	11+48.84	MH									8.00	0.00		0.00	0.49	0.00	0.00	0.49	5123.60	5124.60	5125.46	5.41	5129.53	5130.02
			42	179.6	SD1E	9.62	18.67	1030	0.0304	392.39			11.93					11.93						
	15+40	MH									6.00	15.00		0.48	0.00	0.00	0.00	0.48	5136.54	5137.02	5142.58	5.41	5141.95	5142.43
			42	179.6	SD1E	9.62	18.67	1030	0.0304	242.08			7.36					7.36						
**	17+78.42	MH									8.00	10.00		0.27	0.86	0.00	0.09	1.21	5144.38	5148.22	5151.94	2.79	5149.79	5151.01
			36	94.7	A7.SD1D	7.07	13.40	683	0.0192	102.45			1.97					1.97						
	18+89	MH									4.00	30		0.26	2.33	0.00	0.02	2.61	5150.19	5153.74	5155.48	1.84	5152.98	5155.59
			30	53.5	SD1D	4.91	10.90	420	0.0162	474.00			7.70					7.70						
***	23+68	MH									6.00	25.00		0.19	0.00	0.09	0.00	0.29	5161.44	5161.73	5176.78	1.84	5163.28	5163.57
			30	53.5	SD1D	4.91	10.90	420	0.0162	376.92			6.12					6.12						

* PIPE DIA. IS MODELED TO SHOW THE EQUIVILENT ACTUAL FLOW AREA

** MANHOLE WHICH SEVENBAR AND SEIRRITA S.D. INTERSECT

*** MANHOLE AT WHICH TRACT 8 RUNOFF TIES INTO 7 BAR ROAD STORM DRAIN = 53.6 - 1.3 = 52.3

12-07-95 t=1.52 hrs

										MH	JNCT						Total			Low			
	Station	Structure	Diam.	Q		Area	Vel.	K	Sf	Length	Dia.	Angle	Hf	Hb	Hj	Hmh	Ht	Losses	HGL(dn)	HGL(up)	Point	HV	EGL(dn)	EGL(up)
	SIERRITA ROAD		42.00	179.60		9.62																		
**	10+09.58	MH									8.00	60.00		0.49	1.35	0.00	0.00	1.83	5144.38	5150.36	5151.94	1.27	5149.79	5151.63
			42	86.9	SD2	9.62	9.03	1030	0.0071	26.49			0.19					0.19						
	10+32.91	MH									6.00	55.00		0.20	0.00	0.06	0.00	0.26	5150.55	5150.81	5152.71	1.27	5151.82	5152.08
			42	86.9	SD2	9.62	9.03	1030	0.0071	420.33			2.99					2.99						
	14+50	MH									6.00	15.00		0.10	0.00	0.06	0.00	0.17	5153.80	5153.97	5155.40	1.27	5155.07	5155.24
			42	86.9	SD2	9.62	9.03	1030	0.0071	273.00			1.94					1.94						
	17+23	MH									6.00	0.00		0.00	0.00	0.00	0.03	0.03	5155.91	5154.87	5156.73	2.35	5157.18	5157.21
			36	86.9	SD2	7.07	12.29	683	0.0162	130.00			2.11					2.11						
	18+50	MH									4.00	15.00		0.14	0.00	0.00	0.03	0.18	5155.91	5155.01	5157.36	2.35	5157.18	5157.36
			36	86.9	SD2	7.07	12.29	683	0.0162	302.70			4.90					4.90						
	21+50	MH									4.00	10.00		0.23	0.00	0.00	0.09	0.32	5159.92	5157.72	5164.02	4.87	5162.26	5162.59
			30	86.9	SD2	4.91	17.70	420	0.0428	203.15			8.70					8.70						
***	23+51.34	MH									4.00	10.00		0.15	0.00	0.00	0.00	0.15	5166.42	5170.76	5176.55	0.68	5171.29	5171.44
			30	32.6	A3D3	4.91	6.64	420	0.0060	56.30			0.34					0.34						
	24+8.11	MH									4.00	10.00		0.01	0.68	0.00	0.00	0.70	5171.10	5172.48	5186.21	0.00	5171.78	5172.48
			30	0.0		4.91	0.00	420	0.0000	0.00														

* PIPE DIA. IS MODELED TO SHOW THE EQUIVILENT ACTUAL FLOW AREA

** MANHOLE AT WHICH SEIRRITA RUNOFF TIES INTO SEVENBAR RD. STORM DRAIN =

** MANHOLE AT WHICH TRACT9 RUNOFF TIES INTO SIERRITA STORM DRAIN

*** MANHOLE AT WHICH TRACT 3 RUNOFF TIES INTO SIERRITA STORM DRAIN

HYDRAULIC GRADE LINE CALCULATIONS
SEVEN BAR LOOP ROAD-100 YEAR
t=1.53 hrs

										MH	JNCT						Total			Low			
	Station	Structure	Diam.	Q	HYD ID	Area	Vel.	K	Sf	Length	Dia.	Angle	Hf	Hb	Hj	Hmh	Ht	Losses	HGL(dn)	HGL(up)	Point	HV	EGL(dn)	EGL(up)
	SEVEN BAR LOOP																							
	9+60	OUTLET									0	0		0.00	0.00	0.00	0.00	0.00	5115.80	5115.80	5122.15	6.39	5122.19	5122.19
			48	254.9	7BAROUT	12.57	20.28	1470	0.0301	72.40			2.18					2.18						
	10+06.84	MH									8	45		0.20	0.00	0.00	0.00	0.20	5117.98	5118.86	5122.15	5.70	5124.36	5124.57
			48	240.8	SD1E4	12.566	19.16	1470	0.0268	86.49			2.32					2.32						
	10+93.33	MH									8	0		0.00	0.90	0.00	0.01	0.91	5121.18	5121.19	5124.41	6.60	5126.89	5127.79
			42	198.4	SD1E3	9.6211	20.62	1030	0.0371	31.51			1.17					1.17						
	11+24.84	WYE									0	0		0.00	0.12	0.00	0.00	0.12	5122.36	5123	5125.00	6.07	5128.96	5129.08
			42	190.3	SD1E2	9.6211	19.78	1030	0.0341	24.00			0.82					0.82						
	11+48.84	MH									8	0		0.00	0.50	0.00	0.00	0.50	5123.82	5124.85	5125.46	5.55	5129.90	5130.40
			42	181.9	SD1E	9.6211	18.91	1030	0.0312	392.39			12.24					12.24						
	15+40	MH									6	15		0.50	0.00	0.00	0.00	0.50	5137.09	5137.59	5142.58	5.55044	5142.64	5143.14
			42	181.9	SD1E	9.6211	18.91	1030	0.0312	242.08			7.55					7.55						
**	17+78.42	MH									8	10		0.27	0.69	0.00	0.10	1.06	5145.14	5148.99	5151.94	2.75773	5150.69	5151.75
			36	94.2	A7.SD1D	7.0686	13.33	683	0.0190	102.45			1.95					1.95						
	18+89	MH									4	30		0.26	2.30	0.00	0.02	2.58	5150.94	5154.46	5155.48	1.82389	5153.70	5156.28
			30	53.2	SD1D	4.9087	10.84	420	0.0161	474.00			7.61					7.61						
***	23+68	MH									6	25		0.19	0.00	0.09	0.00	0.28	5162.07	5162.35	5176.78	1.82389	5163.89	5164.17
			30	53.2	SD1D	4.9087	10.84	420	0.0161	376.92			6.05					6.05						

* PIPE DIA. IS MODELED TO SHOW THE EQUIVILENT ACTUAL FLOW AREA

** MANHOLE WHICH SEVENBAR AND SEIRRITA S.D. INTERSECT

*** MANHOLE AT WHICH TRACT 8 RUNOFF TIES INTO 7 BAR ROAD STORM DRAIN = 53.6 - 1.3 = 52.3

12-07-95 t=1.53 hrs

										MH	JNCT						Total			Low			
	Station	Structure	Diam.	Q		Area	Vel.	K	Sf	Length	Dia.	Angle	Hf	Hb	Hj	Hmh	Ht	Losses	HGL(dn)	HGL(up)	Point	HV	EGL(dn)	EGL(up)
	SIERRITA ROAD		42	181.90		9.6211																		
**	10+09.58	MH									8	60		0.50	1.40	0.00	0.00	1.90	5145.14	5151.27	5151.94	1.31386	5150.69	5152.59
			42	88.5	SD2	9.6211	9.199	1030	0.0074	26.49			0.20					0.20						
	10+32.91	MH									6	55.00		0.21	0.00	0.07	0.00	0.27	5151.47	5151.74	5152.71	1.31386	5152.78	5153.05
			42	88.5	SD2	9.6211	9.199	1030	0.0074	420.33			3.10					3.10						
	14+50	MH									6	15		0.11	0.00	0.07	0.00	0.17	5154.84	5155.02	5155.40	1.31386	5156.16	5156.33
			42	88.5	SD2	9.6211	9.199	1030	0.0074	273.00			2.02					2.02						
	17+23	MH									6	0		0.00	0.00	0.00	0.03	0.03	5157.03	5155.95	5156.73	2.43409	5158.35	5158.38
			36	88.5	SD2	7.0686	12.52	683	0.0168	130.00			2.18					2.18						
	18+50	MH									4	15		0.15	0.00	0.00	0.03	0.18	5157.03	5156.1	5157.36	2.43409	5158.35	5158.53
			36	88.5	SD2	7.0686	12.52	683	0.0168	302.70			5.09					5.09						
	21+50	MH									4	10		0.24	0.00	0.00	0.09	0.34	5161.18	5158.91	5164.02	5.04732	5163.62	5163.95
			30	88.5	SD2	4.9087	18.03	420	0.0444	203.15			9.03					9.03						
***	23+51.34	MH									4	10		0.15	0.00	0.00	0.00	0.15	5167.93	5172.55	5176.55	0.57999	5172.98	5173.13
			30	30.0	A3D3	4.9087	6.112	420	0.0051	56.30			0.29					0.29						
	24+8.11	MH									4	10		0.01	0.58	0.00	0.00	0.59	5172.84	5174.01	5186.21	0	5173.42	5174.01
			30	0.0		4.9087	0	420	0.0000	0.00														

* PIPE DIA. IS MODELED TO SHOW THE EQUIVILENT ACTUAL FLOW AREA

** MANHOLE AT WHICH SEIRRITA RUNOFF TIES INTO SEVENBAR RD. STORM DRAIN =

** MANHOLE AT WHICH TRACT9 RUNOFF TIES INTO SIERRITA STORM DRAIN

*** MANHOLE AT WHICH TRACT 3 RUNOFF TIES INTO SIERRITA STORM DRAIN

12-07-95 DRAINAGE GRADE LINE CALCULATIONS J.C.A

SEVEN BAR LOOP ROAD-100 YEAR

t=1.54 hrs

	Station	Structure	Diam.	Q	HYD ID	Area	Vel.	K	Sf	Length	MH Dia.	JNCT Angle	Hf	Hb	Hj	Hmh	Ht	Total Losses	HGL(dn)	HGL(up)	Low Point	HV	EGL(dn)	EGL(up)
	SEVEN BAR LOOP																							
	9+60	OUTLET									0	0		0.00	0.00	0.00	0.00	0.00	5115.80	5115.80	5122.15	6.41	5122.21	5122.21
			48	255.3	7BAROUT	12.57	20.32	1470	0.0301	72.40			2.18					2.18						
	10+06.84	MH									8	45		0.20	0.00	0.00	0.00	0.20	5117.98	5118.9	5122.15	5.70	5124.39	5124.59
			48	240.7	SD1E4	12.566	19.15	1470	0.0268	86.49			2.32					2.32						
	10+93.33	MH									8	0		0.00	0.93	0.00	0.01	0.94	5121.21	5121.22	5124.41	6.63	5126.91	5127.85
			42	198.8	SD1E3	9.6211	20.66	1030	0.0373	31.51			1.17					1.17						
	11+24.84	WYE									0	0		0.00	0.11	0.00	0.00	0.11	5122.4	5123.04	5125.00	6.09	5129.02	5129.14
			42	190.6	SD1E2	9.6211	19.81	1030	0.0343	24.00			0.82					0.82						
	11+48.84	MH									8	0		0.00	0.50	0.00	0.00	0.50	5123.87	5124.9	5125.46	5.56	5129.96	5130.46
			42	182.1	SD1E	9.6211	18.93	1030	0.0313	392.39			12.27					12.27						
	15+40	MH									6	15		0.50	0.00	0.00	0.00	0.50	5137.17	5137.67	5142.58	5.56265	5142.73	5143.23
			42	182.1	SD1E	9.6211	18.93	1030	0.0313	242.08			7.57					7.57						
**	17+78.42	MH									8	10		0.27	0.59	0.00	0.11	0.96	5145.23	5149.09	5151.94	2.66484	5150.80	5151.75
			36	92.6	A7.SD1D	7.0686	13.1	683	0.0184	102.45			1.88					1.88						
	18+89	MH									4	30		0.25	2.22	0.00	0.02	2.50	5150.97	5154.37	5155.48	1.7627	5153.64	5156.13
			30	52.3	SD1D	4.9087	10.65	420	0.0155	474.00			7.35					7.35						
***	23+68	MH									6	25		0.19	0.00	0.09	0.00	0.27	5161.73	5162	5176.78	1.7627	5163.49	5163.76
			30	52.3	SD1D	4.9087	10.65	420	0.0155	376.92			5.85					5.85						

* PIPE DIA. IS MODELED TO SHOW THE EQUIVILENT ACTUAL FLOW AREA

** MANHOLE WHICH SEVENBAR AND SEIRRITA S.D. INTERSECT

*** MANHOLE AT WHICH TRACT 8 RUNOFF TIES INTO 7 BAR ROAD STORM DRAIN = 53.6 - 1.3 = 52.3

	12-07-95	t=1.54 hrs									MH	JNCT						Total			Low			
	Station	Structure	Diam.	Q		Area	Vel.	K	Sf	Length	Dia.	Angle	Hf	Hb	Hj	Hmh	Ht	Losses	HGL(dn)	HGL(up)	Point	HV	EGL(dn)	EGL(up)
	SIERRITA ROAD		42	182.10		9.6211																		
**	10+09.58	MH									8	60		0.50	1.42	0.00	0.00	1.92	5145.23	5151.39	5151.94	1.33173	5150.80	5152.72
			42	89.1	SD2	9.6211	9.261	1030	0.0075	26.49			0.20					0.20						
	10+32.91	MH									6	55.00		0.21	0.00	0.07	0.00	0.27	5151.58	5151.86	5152.71	1.33173	5152.92	5153.19
			42	89.1	SD2	9.6211	9.261	1030	0.0075	420.33			3.15					3.15						
	14+50	MH									6	15		0.11	0.00	0.07	0.00	0.18	5155	5155.18	5155.40	1.33173	5156.34	5156.51
			42	89.1	SD2	9.6211	9.261	1030	0.0075	273.00			2.04					2.04						
	17+23	MH									6	0		0.00	0.00	0.00	0.03	0.03	5157.22	5156.12	5156.73	2.4672	5158.56	5158.59
			36	89.1	SD2	7.0686	12.61	683	0.0170	130.00			2.21					2.21						
	18+50	MH									4	15		0.15	0.00	0.00	0.03	0.19	5157.22	5156.27	5157.36	2.4672	5158.56	5158.74
			36	89.1	SD2	7.0686	12.61	683	0.0170	302.70			5.16					5.16						
	21+50	MH									4	10		0.24	0.00	0.00	0.10	0.34	5161.43	5159.12	5164.02	5.11599	5163.90	5164.24
			30	89.1	SD2	4.9087	18.15	420	0.0450	203.15			9.15					9.15						
***	23+51.34	MH									4	10		0.15	0.00	0.00	0.00	0.15	5168.27	5172.98	5176.55	0.55702	5173.39	5173.54
			30	29.4	A3D3	4.9087	5.989	420	0.0049	56.30			0.28					0.28						
	24+8.11	MH									4	10		0.01	0.56	0.00	0.00	0.57	5173.26	5174.38	5186.21	0	5173.81	5174.38
			30	0.0		4.9087	0	420	0.0000	0.00														

* PIPE DIA. IS MODELED TO SHOW THE EQUIVILENT ACTUAL FLOW AREA

** MANHOLE AT WHICH SEIRRITA RUNOFF TIES INTO SEVENBAR RD. STORM DRAIN =

** MANHOLE AT WHICH TRACT9 RUNOFF TIES INTO SIERRITA STORM DRAIN

** MANHOLE AT WHICH TRACT 3 RUNOFF TIES INTO SIERRITA STORM DRAIN

***** HYDRAULIC GRADE LINE CALCULATIONS *****

03/21/96

FROM:: MH @ STA. 23+52.34 10' RT. (SIERRITA RD.)

TO:: INLET AT STA 0+74.97, 0.56' RT. (TRAILING PL. CUL-DE-SAC)

PT 'A' on previous flow chart.

Station	Structure	Diam.	Q	Area	Vel.	K	Sf	Length	MH Dia.	JNCT Angle	Hf	Hb	Hj	Hmh	Ht	Total Losses	HGL(dn)	HGL(up)	Low Point	HV	EGL(dn)	EGL(up)
		30																				
23+52.34	MH								6.00	0.00		0.00	0.68	0.00	0.00	0.68	5172.48	5172.48	5176.13	0.68	5173.16	5173.16
		30	32.6	4.91	6.64	410	0.0063	122.00			0.77					0.77						
24+80.58	MH								6.00	0.00		0.00	0.00	0.00	0.01	0.01	5173.25	5173.61	5185.81	0.33	5173.94	5173.94
		36	32.6	7.07	4.61	667	0.0024	45.00			0.11					0.11						
0+74.97	INLET #1								0.00	0.00		0.00	0.00	0.00	0.00	0.00	5173.72	**5174.05**	5183.67	0.00	5174.05	5174.05
		36									0.00					0.00						

ACTUAL HGL = Normal water depth in pipe.

MANNINGS n 0.013

see: CUL3_IN,OUT spread sheet Back of this appendix. For determination of normal water depth in pipe.

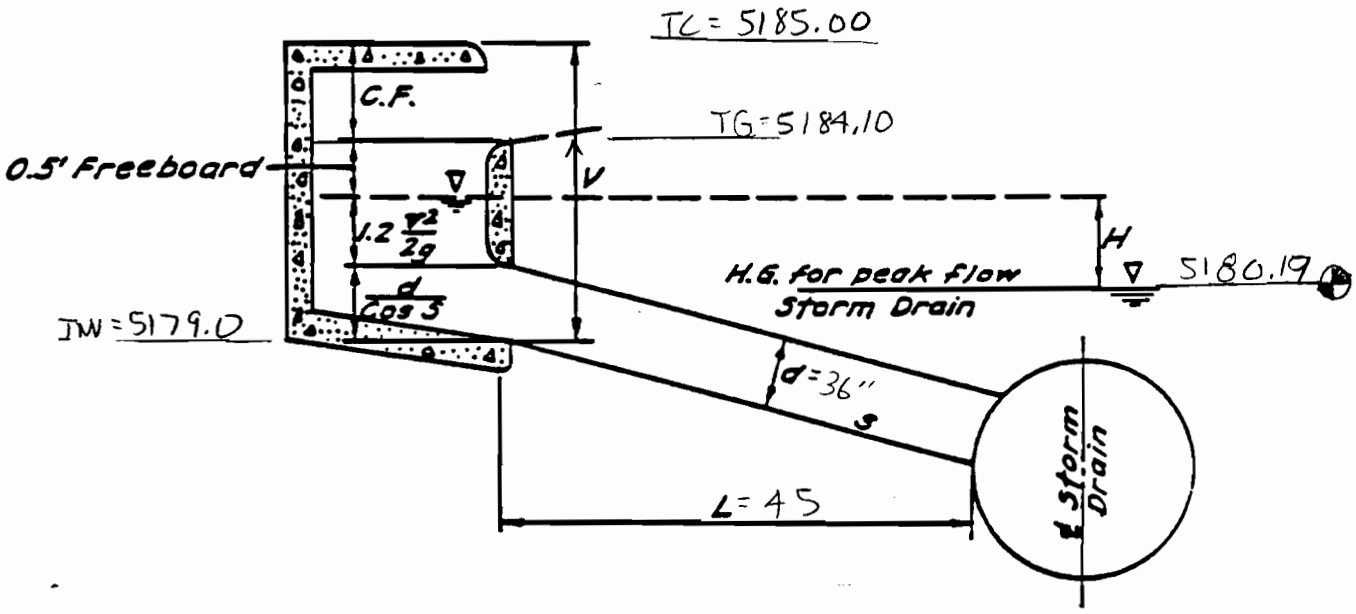
3HGL

***** HYDRAULIC GRADE LINE CALCULATIONS CONT. *****

Dia. 3	Dia. 3 Angle	Δ	Ht(inc.)	Ht(dec.)	Actual Slope	Invert Elev.	Depth
3.0	54	-3.8388	0.0000	0.0000		5166.11	10.02
					0.0964	11.76	
0.0	0	0.0000	0.0064	0.0000		5178.00	7.81
					0.0218	0.98	
0.0	0	0.0000	0.0000	0.0000		5178.98	4.69

INLET #1 BASIN DEPTH = 1. 4.69 = **6.02**

3HGL



$Q_{des} = 65.2$ (Factored by 200%)

$A_p = 7.07$ (36")

$V = Q/A = 9.22$ fps

$Y_{min} = 1.2 \frac{V^2}{2g} = 1.58'$

Reqd. $V = 1.33 + 1.58 + 3' = 5.91'$: USE 6' depth.

INV. = $5185.00 - 6' = 5179.00$

$TC - 1.33 \overset{?}{\geq} H.G.L.$

$5185.0 - 1.33 > 5180.19$ ✓

H.G.L. = Normal water depth in pipe = 4" deep.
see CUL3_IN.out

BOHANNAN-HUSTON INC.

PROJECT NAME _____ SHEET _____ OF _____

PROJECT NO. _____ BY _____ DATE _____

SUBJECT _____ CH'D _____ DATE _____