Revised Drainage Report
for
Tracts B-7, B-8 & B-9
Seven Bar North Subdivision

MARCH 1995
(Revised June 95)

REVISED DRAINAGE REPORT FOR TRACTS B-7, B-8 AND B-9 SUBDIVISION AT SEVEN BAR NORTH

Prepared for:

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I. INTRODUCTION AND PURPOSE OF REPORT

This report presents the drainage management plan for preliminary plat approval for the development of residential subdivisions on Tracts B-7, B-8 and B-9 of Seven Bar North Subdivision. The property is 61.5 acres, zoned R-1 and proposed for development of 175 detached, single family residential dwelling units and the related streets and infrastructure. Development of the property will occur in three phases, to be called Units 7, 8 and 9; however, phasing is not addressed in this report in a detailed manner. Prior to 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 location map on the Drainage Basin Map, the property is bounded by Seven Bar Loop Road on the west, Westside Boulevard on the north, and Sierrita Road on the south and east.

This report outlines the hydrology 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 Tracts B-7, B-8, and B-9.

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 on the following page.

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

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

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

Street hydraulics were analyzed using Manning's equation with the Manning's "n" values suggested in the DPM. Rating curves 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 assume pressure flow conditions and are analyzed by computer spreadsheets.

III. EXISTING CONDITIONS

Site Characteristics

This site is currently undeveloped vacant land with slopes ranging from 2% to 8% generally in a southwest direction. Soils are highly absorptive sandy soils with occasional clay lenses. Vegetation is light, consisting of grasses and small sagebrush.

The site is not located 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-1, approximately 23.8 acres, generates 28.5 cfs which drains in a southern sheet flow to a temporary swale, constructed with Units 1 and 2. The swale runs adjacent to and east of Seven Bar Loop Road, and will terminate at the existing pond at Sierrita Road. The pond will have a piped outflow which will convey the flow to the Seven Bar Loop Road right-of-way, where it continues south to Black Diversion Channel.

Drainage basin E-2, approximately 29.9 acres, generates 36.0 cfs in a 100-year storm which drains in a south-westerly sheet flow to a diversion swale, constructed with Units 1 and 2. The channel conveys the flow to a temporary drainage pond and from there flows into the storm drain system in the Seven Bar Loop Road right-of-way, where it continues south to Black Diversion Channel.

Calculations for the pond and diversion swales are found in the previously submitted drainage reports Tracts B-1 and B-2; and Tracts B-4, B-5, and B-6.

Offsite Drainage Basins

Drainage basin E-3, approximately 19.0 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 Units 1 and 2. The flow is then conveyed by the swale to a channel on the north side of Sierrita Road. The channel conveys the flow to a temporary drainage pond, then into the storm drain system in the Seven Bar Loop Road right-of-way, where the flow continues south to Black Diversion Channel. The pond is designed to remove the sediment from the 10-year storm and have an orifice-controlled discharge into a connector pipe that runs to a storm drain manhole currently under construction in Sierrita Road. Calculations for the pond and diversion swales are found in the previously submitted drainage reports for Tracts B-1 and B-2; and Tracts B-4, B-5, and B-6.

IV. PROPOSED DEVELOPED CONDITIONS

The proposed development is a single-family, detached residential subdivision with 175 lots on 61.5 acres, producing a density of 2.85 dwelling unit 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 three major areas, Units 7, 8, and 9 respectively.

Unit 7 Development

Unit 7 includes the residential subdivision development of Tract B-7, a temporary diversion swale along its northern border, and two temporary desilting ponds. The swales will divert undeveloped runoff from offsite basins, located north between Tract B-7 and proposed Westside Boulevard, and terminate at the desiltation ponds. The ponds will be located just outside of the extreme northwest and northeast boundary of Tract B-7. The existing swale used to divert basin E-3B will be shortened and diverted into the northeastern desilting pond. Each pond is designed to remove the sediment from the 10-year storm and will have an orifice-controlled discharge into a connector pipe. The connector pipe will convey the flow to the storm drain manholes at Seven Bar Loop Road (west pond) and Sierrita Road (east pond). Calculations for the swale, ponds, and their outflows are located in Appendix 4.

For purposes of analysis, Tract B-7 is subdivided into eight smaller basins. Basins 7A through 7E, as shown on the Drainage Basin Map, together generate a fully developed runoff of ~~46.9~~ 49.0 cfs (5.2+14.8+4.1+20.5+4.4). This runoff is conveyed to the southwest corner of B-7's interior loop road by street flow, all but ~~4.9~~ 8.2 cfs is intercepted by a battery of catch basins. It is then discharged into a proposed storm drain which runs within an easement into the Seven Bar Loop Road storm drain at an existing 30 inch stub out. The ~~4.9~~ 8.2 cfs will flow to Seven Bar Loop Road via backyard 4" curb drains to Sierrita Road (2.2 cfs) and street flow down the entrance road of B-7 (~~2.7~~ 6.0 cfs). Basin 7F generates a fully developed flow of 2.9 cfs. This flow will be conveyed to Seven Bar Loop Road, via backyard 4" curb drains. Basin 7G generates a fully developed flow of 0.5 cfs. This flow is conveyed down the western interior trail to Seven Bar Loop Road. Basin 7H generates a fully developed flow of 0.5 cfs. This flow is conveyed down the eastern interior trail to Sierrita Road. These flows, 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 located at approximately Station 12+00 Seven Bar Loop Road. The catch basin design can be found in Appendix 3 of this report.

Due to the nature of the grading in Basin 7A cross lot drainage is necessary. Lot 56 drains to Lot 57 and then both drain to Lot 38. The flow is conveyed through the lots by a swallow swale that will be built within a 5' easement that exists in each of the previously mentioned lots (see subdivision site grading and drainage plan, sheet 1 of 4). The flow will exit into B-7 Loop Rd. via a sidewalk culvert.

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. A summary table of the street calculations is provided in Appendix 2 for review and reference. The allowable limits for the use of roll curb have been identified on the Curb Type Identification Map in the plates section of this report.

Unit 8 Development

Unit 8 includes the residential subdivision development of Tract B-8 and the construction of the southern 24 feet of pavement on Westside Boulevard and its associated storm drain and water main up to the eastern edge of Tract B-8. The construction of Seven Bar Loop Road and its associated storm drain and water main will be included unless it has already been constructed in the Tracts B-4 and B-5 development.

For purposes of analysis, Tract B-8 is subdivided into five smaller basins, Basins 8A through 8E, as shown on the Drainage Basin Map. The five basins together generate a fully developed runoff of 53.5 cfs (13.1+13.5+12.6+8.4+5.8). This runoff is conveyed south by street flow to the south-western corner of tract B-8 where it is entirely intercepted by a series of catch basins and a sump basin. It is then discharged into a proposed storm drain which runs within an easement into the Seven Bar Loop Road storm drain at an existing 30 inch stub out.

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. A summary table of the street calculations is provided in Appendix 2 for review and reference. The allowable limits for the use of roll curb have been identified on the Curb Type Identification Map in the plates section of this report.

Unit 9 Development

Unit 9 includes the residential subdivision development of Tract B-9 and the final construction of the southern 24 feet of pavement on Westside Boulevard and its associated storm drain and water main up to the intersection of Sierrita Road. The construction of Sierrita Road and its associated storm drain, water main, and sanitary lines will also be included in this phase. A temporary desiltation pond will be constructed at the southwest corner of the offsite basin E-3B. The pond will be designed to remove the sediment from the 10-year storm and will have an orifice-controlled discharge into a connector pipe. The connector pipe will convey the flow to the storm drain at Sierrita Road. Calculations for the ponds and its outflow is found in Appendix 4.

For purposes of analysis, Tract B-9 is subdivided into seven smaller basins, Basins 9A through 9G, as shown on the Drainage Basin Map. The seven basins together generate a fully developed runoff of 61.5 cfs (10.4+6.8+16.2+4.6+9.5 +8.9 + 5.1). This runoff is conveyed south by street flow to the south-eastern corner of Tract B-9 where it is entirely intercepted by a series of catch basins and a sump basin. It is then discharged into a proposed storm drain which runs within an utilities easement into the Sierrita Road storm drain at an existing 36 inch stub out.

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. A summary table of the street calculations is provided in appendix 2 for review and reference. The allowable limits for the use of roll curb have been identified on the Curb Type Identification Map in the plates section of this report.

Backyard Ponding

Several lots will require backyard ponds due to elevation differences between streets, and the split pad configurations. The ponds will only retain backyard flows, all impervious flows, with the exception of a 100 square foot patio, will be routed to the front of the lots and into there respective street. The ponds are designed to contain the 100-year, 10-day volume. The hydraulic street capacities of Sierrita Road and Seven Bar Loop Road and their respective storm drains have been designed to convey the flows (using 4" curb drains) from the ponds. Pond locations are shown on the preliminary grading plans enclosed in the plates section of this report.

In Lots 1, 31, and 32 it was necessary to lower the lots below top of curb elevation. Therefore, the entire lot drains to the backyard. Each lot has a detention pond design with a 4" curb drain to Seven Bar Loop Road.

Offsite Basins

The offsite basin that impacts Units B-7 and B-9 is Basin E-3B. Basin E-3B consists of approximately 8.9 acres which generates a peak flow of 11.3 cfs and a peak volume of 0.33 acre-ft during the 100-year storm. During Unit B-7 construction the flow will be captured in a temporary desilting pond that will be constructed at the southeast corner of Unit B-9. There is an existing earthen swale that drains basin E-3B, it was built during the Units B-1 and B-2 construction phase. The swale will be shortened and diverted slightly to terminate at the proposed pond. During Unit B-9 construction the flow from basin E-3B will captured in a temporary desilting pond that will be constructed at the southwest corner of the offsite basin E-3B. The existing swale from basin E-3B will be shortened again and slightly diverted to terminate in the proposed desilting pond. The pond will be designed to remove the sediment from the 10-year storm and will have an orifice-controlled discharge into a connector pipe. The connector pipe will convey the flow to the storm drain at Sierrita Road. Calculations for the pond and its outflow is found in Appendix 4.

V. PHASING/BUILDING PERMIT/FINAL PLAT APPROVALS

This report requests only preliminary plat approval. Prior to 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 Tracts B-7, B-8, and B-9 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

$\Sigma L_n \leq 4000 \text{ FT}$

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

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)

PROJECT NAME 7Bar North tract 7

PROJECT NO. 94250.42

SUBJECT HYDROLOGY

JCA

9-28-94

THE FOLLOWING CALCULATIONS HAVE BEEN COPIED FROM THE EXISTING CONDITIONS DRAINAGE IN THE PREVIOUSLY SUBMITTED DRAINAGE REPORT FOR TRACTS B-4, B-5, & B-6.

EXISTING DRAINAGE:

BASIN	%A	(S<10%, UNDEVELOPED, PRIMARILY SHEET FLOW)
E1	100	
E2	95	
E3	95	

CALCULATION OF t_c:

t_c (TRACTS 4,5,6): L=2100' (PRIMARILY SHEET FLOW)

$$t_c = \frac{\frac{2000}{0.7\sqrt{6}} + \frac{100}{3\sqrt{6}}}{3600}$$

(6% AVG)

$P_{60} = 1.87''$

= 0.33 HRS

$$I = 0.726\left(\log((24.6)(.33))\right)\frac{1}{.33}(1.87) = 3.74 \text{ IN/HR}$$

t_c (BASIN E-1): L=1400' (PRIMARILY SHEET FLOW)

$$t_c = \frac{1400}{0.7\sqrt{6}} \Big/ 3600 = 0.23 \text{ HR} \quad I = 4.44 \text{ IN/HR}$$

t_c (BASIN E-2): L= 2200' (SHEET & CHANNEL)

$$t_c = \frac{\frac{1200}{0.7\sqrt{6}} + \frac{1000}{4\sqrt{2}}}{3600} = 0.24 \text{ HR}$$

I= 4.33 IN/HR

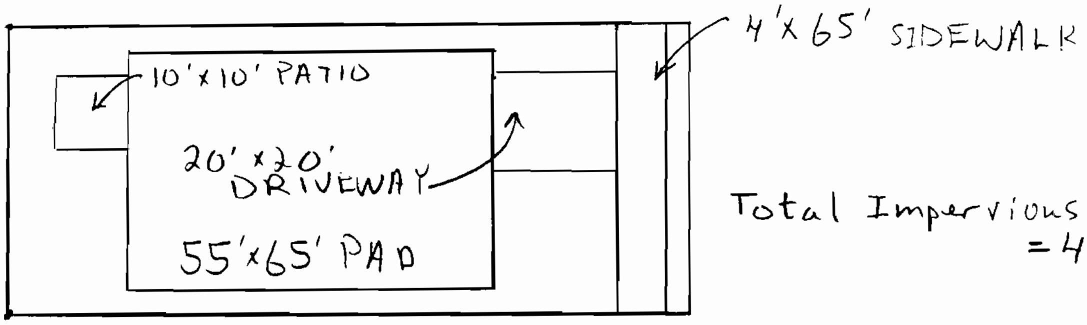
t_c (BASIN E-3) L=1800' (SHEET & CHANNEL)

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

I= 4.53 IN/HR

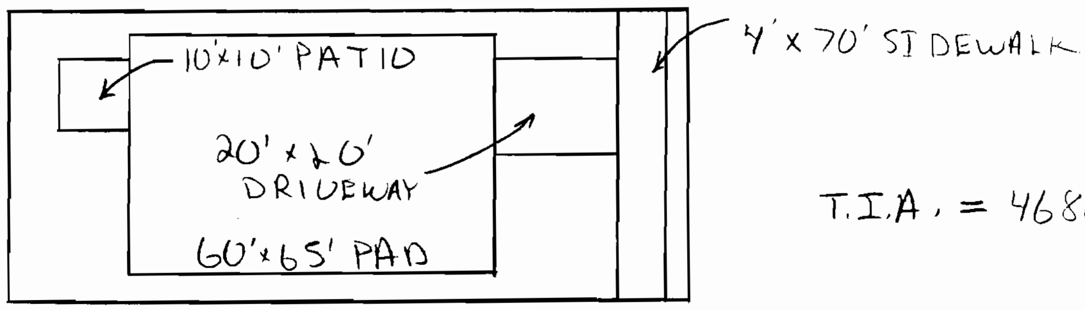
BASIN	C	I	A (AC)	Q
E1	0.27	4.44	23.8	28.5
E2	0.28	4.33	29.9	36.0
E3	0.28	4.53	19.0	23.9

65' LOT



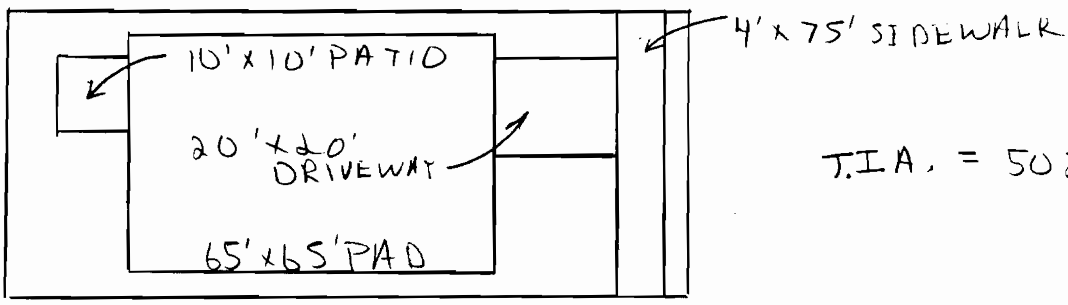
Total Impervious Area = 4335 sf

70' LOT



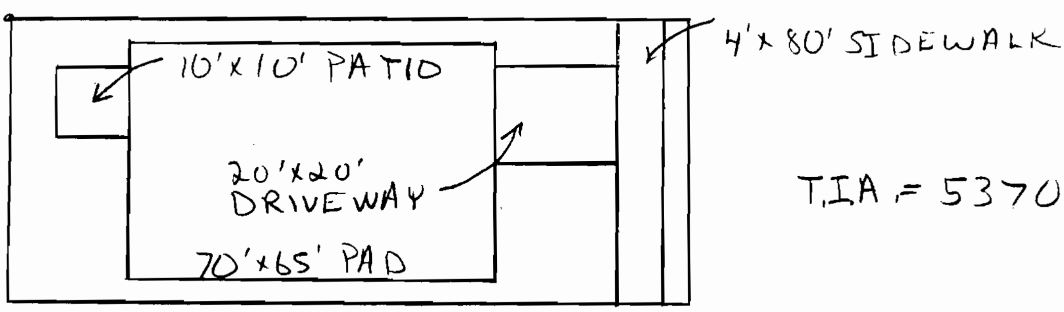
T.I.A. = 4680 sf

75' LOT



T.I.A. = 5025 sf

80' LOT



T.I.A. = 5370 sf

BOHANNAN-HUSTON INC.

PROJECT NAME 7Bar North - Tract 7 SHEET ____ OF ____
PROJECT NO. 94250.42 BY JCA DATE 10-2-94
SUBJECT Impervious Areas CH'D ____ DATE ____

HYDROLOGIC DATA-SEVEN BAR NORTH 06/02/95
TRACT 7

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

(INCLUDED \
(NOT INCLUDED WITH BACKY/

FULLY DEVELOPED CONDITIONS

SUMMARY OF HYDROLOGIC DATA

BASIN ID	AREA AC	AREA SQ.MI.	% LAND TREATMENT A	B	C	D	TIME TO PEAK	10-YR DISCHARGE CFS/AC	Q(10YR) CFS	RATIONAL METHOD (100YR) COMPOSITE C	I (IN/HR)	Q(100YR) (CFS)
7A	1.526	0.0024	3.0	23.0	23.0	51.0	0.1333	2.00	3.1	0.72	4.70	5.2
7B	4.290	0.0067	3.9	20.6	20.6	55.0	0.1333	2.06	8.8	0.74	4.70	14.8
7C	1.256	0.0020	2.9	26.6	26.6	43.9	0.1333	1.87	2.4	0.69	4.70	4.1
7D	5.996	0.0094	3.5	22.1	22.1	52.3	0.1333	2.02	12.1	0.73	4.70	20.5
7E	1.259	0.0020	2.9	21.4	21.4	54.3	0.1333	2.06	2.6	0.74	4.70	4.4
7F	0.829	0.0013	3.3	21.3	21.3	54.0	0.1333	2.05	1.7	0.73	4.70	2.9
7G	0.196	0.0003	0.0	50.0	50.0	0.0	0.1333	1.13	0.2	0.52	4.70	0.5
7H	0.217	0.0003	0.0	50.0	50.0	0.0	0.1333	1.13	0.2	0.52	4.70	0.5
SUMS	***15.6***											***52.8***

06/02/95

IMPERVIOUS AREA CALCULATIONS

		50	55	60	65	70	75	80
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
WITH ROAD) WALKWAY	(4' WIDE)	0	0	0	0	0	0	0
ARD PONDIN 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

ROADWAY	TYPE 1	TYPE 2	TYPE 3	TYPE 4	CUL 1
F-F WIDTH	28	51	26	0	
SIDEWALK	4	4	4	0	0
RADIUS					40
	36 sq.ft/ft	59 sq.ft/ft	34 sq.ft/ft	0 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'	TOTAL LENGTH OF ROADWAY PER BASIN TYPE 1	TYPE 2	TYPE 3	TYPE 4	NUMBER OF CUL-DE-SACS PER BASIN
7A	0.78	51.0	0	0	0	0	1	2	2	308	0	0	0	0.10
7B	2.36	55.0	0	0	0	6	8	3	1	742	0	0	0	0.20
7C	0.55	43.9	0	0	0	0	0	3	1	170	0	0	0	0.00
7D	3.14	52.3	0	0	0	4	1	11	7	885	0	0	0	0.60
7E	0.68	54.3	0	0	0	1	2	1	0	0	0	239	0	1.00
7F	0.45	54.0	0	0	0	0	2	1	0	0	118	0	0	0.00
7G	0.00	0.0	0	0	0	0	0	0	0	0	0	0	0	0.00
7H	0.00	0.0	0	0	0	0	0	0	0	0	0	0	0	0.00

HYDROLOGIC DATA-SEVEN BAR NORTH
TRACT 8

02/16/95

	PEAK DISCHARGE, CFS/ACRE			
EVENT	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

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)
8A	3.756	0.0059	3.2	20.4	20.4	55.9	0.1333	2.08	7.8	0.74	4.70	13.1
8B	3.832	0.0060	3.8	18.7	18.7	58.8	0.1333	2.13	8.2	0.75	4.70	13.5
8C	3.768	0.0059	2.7	24.2	24.2	48.9	0.1333	1.96	7.4	0.71	4.70	12.6
8D	2.560	0.0040	2.9	25.5	25.5	46.1	0.1333	1.91	4.9	0.70	4.70	8.4
8E	1.698	0.0027	2.7	22.2	22.2	52.9	0.1333	2.04	3.5	0.73	4.70	5.8
SUMS	***15.6***											***53.5***

IMPERVIOUS AREA CALCULATIONS

02/16/95

LOT WIDTH (IN FEET)		50	55	60	65	70	75	80
PAD WIDTH		40	45	50	55	60	65	70
PAD DEPTH		65	65	65	65	65	65	65
DRIVEWAY	(20'x20')	400	400	400	400	400	400	400
WALKWAY	(4' WIDE)	200	220	240	260	280	300	320
PATIO	(10'x10')	100	100	100	100	100	100	100
TOTAL IMPERVIOUS		3300 sq.ft/lot	3645 sq.ft/lot	3990 sq.ft/lot	4335 sq.ft/lot	4680 sq.ft/lot	5025 sq.ft/lot	5370 sq.ft/lot

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

			TOTAL NUMBER OF LOTS PER BASIN							TOTAL LENGTH OF ROADWAY PER BASIN				NUMBER OF CUL-DE-SACS PER BASIN
BASIN ID	AREA TYPE D AC	PERCENT TYPE D	50'	55'	60'	65'	70'	75'	80'	TYPE 1	TYPE 2	TYPE 3	TYPE 4	
8A	2.10	55.9	0	0	0	0	2	8	3	600	61	0	0	0.13
8B	2.25	58.8	0	0	0	7	6	3	0	639	0	0	0	0.34
8C	1.84	48.9	0	0	0	2	3	3	3	644	0	0	0	0.64
8D	1.18	46.1	0	0	0	0	3	3	2	182	0	0	0	1.00
8E	0.90	52.9	0	0	0	0	1	2	2	362	0	0	0	0.13

HYDROLOGIC DATA-SEVEN BAR NORTH
TRACT 9

02/16/95

	PEAK DISCHARGE, CFS/ACRE			
EVENT	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

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)
9A	3.016	0.0047	3.0	21.2	21.2	54.6	0.1333	2.06	6.2	0.74	4.70	10.4
9B	1.930	0.0030	3.3	18.8	18.8	59.1	0.1333	2.14	4.1	0.75	4.70	6.8
9C	4.660	0.0073	3.3	20.4	20.4	55.9	0.1333	2.08	9.7	0.74	4.70	16.2
9D	1.277	0.0020	3.6	18.0	18.0	60.3	0.1333	2.16	2.8	0.76	4.70	4.6
9E	2.683	0.0042	3.4	19.2	19.2	58.3	0.1333	2.12	5.7	0.75	4.70	9.5
9F	2.467	0.0039	3.7	17.3	17.3	61.7	0.1333	2.18	5.4	0.76	4.70	8.9
9G	1.533	0.0024	3.0	24.6	24.6	47.9	0.1333	1.94	3.0	0.71	4.70	5.1
SUMS	***17.6***											***61.5***

IMPERVIOUS AREA CALCULATIONS

02/16/95

LOT WIDTH (IN FEET)	50	55	60	65	70	75	80
PAD WIDTH	40	45	50	55	60	65	70
PAD DEPTH	65	65	65	65	65	65	65
DRIVEWAY (20'x20')	400	400	400	400	400	400	400
WALKWAY (4' WIDE)	200	220	240	260	280	300	320
PATIO (10'x10')	100	100	100	100	100	100	100
TOTAL IMPERVIOUS	3300 sq.ft/lot	3645 sq.ft/lot	3990 sq.ft/lot	4335 sq.ft/lot	4680 sq.ft/lot	5025 sq.ft/lot	5370 sq.ft/lot

ROADWAY	TYPE 1	TYPE 2	TYPE 3	TYPE 4	CUL 1
F-F WIDTH	28	51	26	0	
SIDEWALK	4	4	4	0	0
RADIUS					40
	36 sq.ft/ft	59 sq.ft/ft	34 sq.ft/ft	0 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'	TOTAL LENGTH OF ROADWAY PER BASIN TYPE 1	TYPE 2	TYPE 3	TYPE 4	NUMBER OF CUL-DE-SACS PER BASIN
9A	1.65	54.6	0	0	0	1	4	4	1	577	0	0	0	0.49
9B	1.14	59.1	0	0	0	0	4	1	2	423	0	0	0	0.00
9C	2.61	55.9	0	0	0	2	6	8	1	711	0	0	0	1.12
9D	0.77	60.3	0	0	0	1	3	0	1	273	0	0	0	0.00
9E	1.56	58.3	0	0	0	3	4	1	2	413	75	0	0	0.26
9F	1.52	61.7	0	0	0	5	2	2	1	410	0	0	0	1.00
9G	0.73	47.9	0	0	0	3	1	0	1	0	0	114	0	1.00

06/06/95

STREET CAPACITY ANALYSIS
SEVEN BAR NORTH
TRACT 7

ANALYSIS POINT	SLOPE, %	Q-100YR (CFS)	DEPTH (FT)	V-100YR (FPS)	E-100YR (FT)	E<0.85'? <.51 ROLL	TRIBUTARY BASIN(S)	***NOTE***
TRACT 7 LOOP		14.8+5.2-20.0						
1 STD	0.88	26.8	0.50	3.4	0.68	YES	7C,7D,7E	#2
2 STD	4.40	17.3	0.35	4.8	0.71	YES	% 7A,7B	#2
3-ROLL STD	0.50	14.8	0.41 >7C	2.1	0.48	YES	7B	~~#1~~ 2
4-ROLL STD	0.50	16.9	0.43	2.2	0.50	YES	7C+ 60% 7D	~~#1~~ 2
5-ROLL	4.00	4.6	0.20	3.4	0.38	YES	7E	#1
7BAR LOOP RD								
6-STD	3.00	30.2	0.43	4.7	0.77	YES	RESIDUAL	#2
7-STD	2.30	36.2	0.48	4.7	0.82	YES	RESIDUAL	#2

NOTES &
SUMMARY:

#1 USE ROLL CURB
#2 USE STD CURB

SEE POINTS OF ANALYSIS MAP (FOLLOWING PAGE)
SEE CURB TYPE LOCATION MAP FOR LIMITS OF CURBS, PLATE 10-A
SEE DRAINAGE BASIN MAP, PLATE 3, FOR TRIBUTARY BASIN DESIGNATION

Backyard Pond Drainage:

The following lots will are assumed to drain into:
SIERRITA ROAD

TRACT-7 17 → 3D ⇒ Q = 2.21 cfs

TRACT-9 114-118 ⇒ Q = 1.29 cfs

3.5 cfs (✱)

into:
SEVEN BAR LOOP

Tract-7
BASIN 7F ⇒ Q = 2.9 cfs ☆

Tract-8
82-87 ⇒ Q = 1.56 cfs (✱)

4.5 cfs

(✱) Since those runnoffs have been included in the General Basin layout. They will be subtracted from their resective street flows in the street capicity spreed sheets. (To avoid counting them twice). They will be included in the street capicity for Sierrita and Seven Bar Roads.

☆ BASIN 7F will BE CALCULATED AS AN INDEPENTANT BASIN NOT INCLUDED WITH TRACT B-7.

JCA 5-26-95

STREET CAPACITY ANALYSIS
SEVEN BAR NORTH
TRACT 8

04/18/95

ANALYSIS POINT	SLOPE, %	Q-100YR (CFS)	DEPTH (FT)	V-100YR (FPS)	E-100YR (FT)	E<0.85'? <.51 ROLL	TRIBUTARY BASIN(S)	***NOTE***
TRACT 8 LOOP								
1-STD	0.50	26.9	0.55	2.9	0.68	YES	8C,8D,8E	#2
2-STD	0.50	26.7	0.56	2.9	0.69	YES	8A,8B	#2
3-STD	4.00	13.6	0.33	4.4	0.63	YES	8B	#2
4-STD	N/A							#1,#3
5-STD	N/A							#1,#3
6-STD	4.00	12.7	0.32	4.4	0.62	YES	8C	#2
7-STD	4.00	8.4	0.29	4.0	0.54	YES	8D	#2
8-STD	N/A							#1,#3
1-ROLL	0.50	26.9	0.51 >TC	2.4	0.60	NO	8C,8D,8E	#2
2-ROLL	0.50	26.7	0.51	2.4	0.60	NO	8A,8B	#2
3-ROLL	4.00	13.6	0.28	4.3	0.57	NO	8B	#2
4-ROLL	1.00	10.2	0.32	2.5	0.42	YES	75% 8B	#1,#3
5-ROLL	6.00	7.0	0.21	4.2	0.48	YES	55% 8C	#1,#3
6-ROLL	4.00	12.7	0.32	4.4	0.62	NO	8C	#2
7-ROLL	4.00	8.4	0.29	4.0	0.54	NO	8D	#2
8-ROLL	8.00	4.2	0.18	4.4	0.48	YES	50% 8D	#1,#3

NOTES & SUMMARY:

#1 USE ROLL CURB
#2 USE STD CURB
#3 POINT OF ANALYSIS TO DETERMINE LOCATION OF CURB TRANSITION

SEE POINTS OF ANALYSIS MAP (FOLLOWING PAGE)
SEE CURB TYPE LOCATION MAP FOR LIMITS OF CURBS, PLATE 10-B
SEE DRAINAGE BASIN MAP, PLATE 3, FOR TRIBUTARY BASIN DESIGNATION

STREET CAPACITY ANALYSIS
SEVEN BAR NORTH
TRACT 9

04/18/95

ANALYSIS POINT	SLOPE, %	Q-100YR (CFS)	DEPTH (FT)	V-100YR (FPS)	E-100YR (FT)	E<0.85'? <.51 ROLL	TRIBUTARY BASIN(S)	***NOTE***
TRACT 9 LOOP								
1_STD	1.00	38.5	0.56	4.1	0.82	YES	9A,9B,9C,9G	#2
2-STD	4.00	5.1	0.25	3.5	0.44	YES	9G	#1
3-STD	5.30	23.0	0.37	5.5	0.84	YES	9B,9C	#2
4-STD	4.00	16.2	0.35	4.6	0.68	YES	9C	#2
5-STD	4.90	3.3	0.22	3.5	0.41	YES	50% 9D	#1,#3
6-STD	0.50	8.9	0.39 >TC	1.8	0.44	YES	9F	#~~1~~2
7-STD	4.90	14.5	0.33	4.8	0.69	YES	9D,9F	#2
8-STD	2.00	24.0	0.43	4.3	0.72	YES	9D,9E,9F	#2
1-ROLL	1.00	38.5	0.51 >TC	3.4	0.69	NO	9A,9B,9C,9G	#2
2-ROLL	4.00	5.1	0.21	3.5	0.40	YES	9G	#1
3-ROLL	5.30	23.0	0.32	5.7	0.82	NO	9B,9C	#2
4-ROLL	4.00	16.2	0.30	4.5	0.61	NO	9C	#2
5-ROLL	4.90	3.3	0.18	3.4	0.36	YES	50% 9D	#1,#3
6-ROLL	0.50	8.9	0.34	1.9	0.40	YES	9F	#1
7-ROLL	4.90	14.5	0.28	4.8	0.64	NO	9D,9F	#2
8-ROLL	2.00	24.0	0.38 >TC	4.0	0.63	NO	9D,9E,9F	#2

NOTES & SUMMARY:

#1 USE ROLL CURB
#2 USE STD CURB
#3 POINTS OF ANALYSIS TO DETERMINE LOCATION OF CURB TRANSITION

SEE POINTS OF ANALYSIS MAP (FOLLOWING PAGE)
SEE CURB TYPE LOCATION MAP FOR LIMITS OF CURBS, PLATE 10-C
SEE DRAINAGE BASIN MAP, PLATE 3, FOR TRIBUTARY BASIN DESIGNATION

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

* JUNCTION LOSS $= \frac{Q_2 V_2 - Q V_1 - Q_3 V_3 \cos\theta}{\left(\frac{A_1 + A_2}{2}\right) g} + HV_1 - HV_2 = H_J$

* FROM LA METHOD - STD. 5.

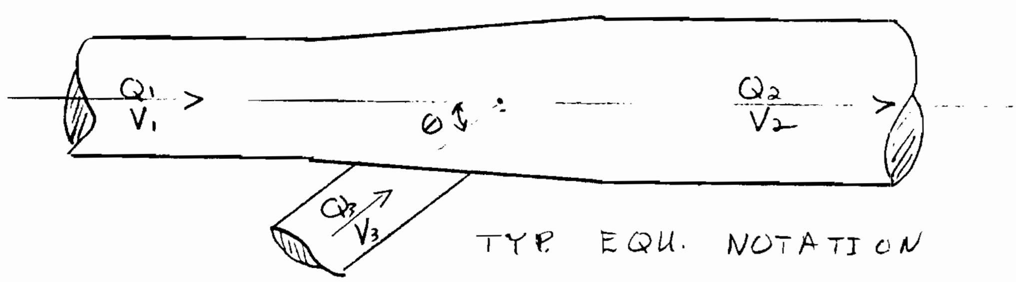
MANHOLE LOSS $= H_{MH} = 0.05 \frac{\bar{V}^2}{2g}$

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

JCA 2-95

Backyard Pond Drainage:

The following lots ~~will~~ are assumed to drain into:

SIERRITA ROAD

TRACT-7	17 → 30	⇒	Q = 2.21 cfs
TRACT-9	114 - 118	⇒	Q = 1.29 cfs
			3.5 cfs (✱)

into:

SEVEN BAR LOOP

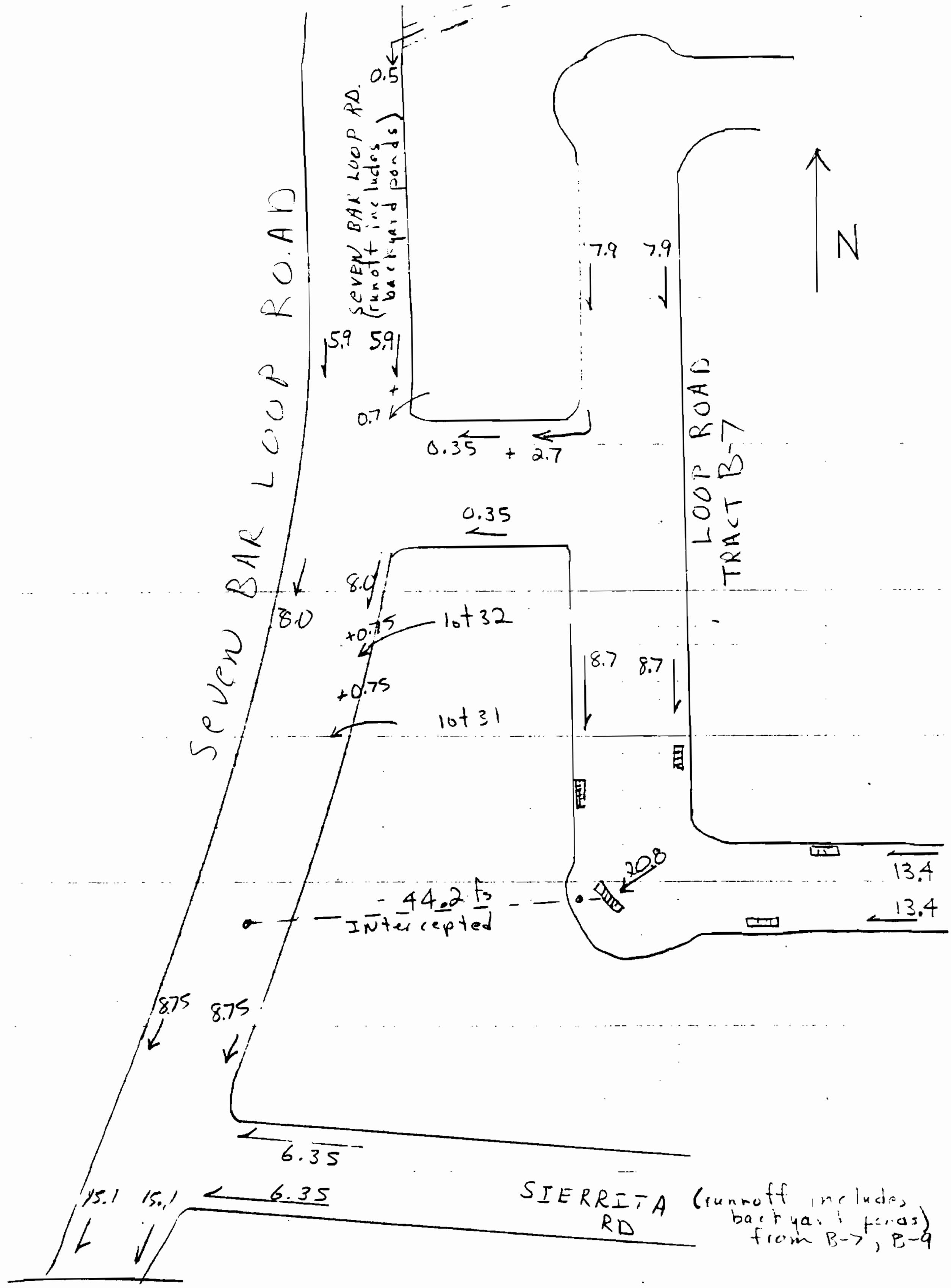
Tract-7			
	BASIN 7F	⇒	Q = 2.9 cfs ☆
Tract-8			
	82 - 87	⇒	Q = 1.56 cfs (✱)
			4.5 cfs

(✱) Since these runoffs have been included in the General Basin layout. They will be subtracted from their resective street flows in the street capicity spreed sheets. (To avoid counting them twice). They will be included in the street capicity for Sierrita and Seven Bar Roads.

☆ BASIN 7F will BE CALCULATED AS AN INDEPENTANT BASIN NOT INCLUDED WITH TRACT B-7.

BOHANNAN-HUSTON INC.

PROJECT NAME ______ SHEET ______ OF ______
PROJECT NO. ______ BY JCA DATE 5-26-95
SUBJECT ______ CH'D ______ DATE ______

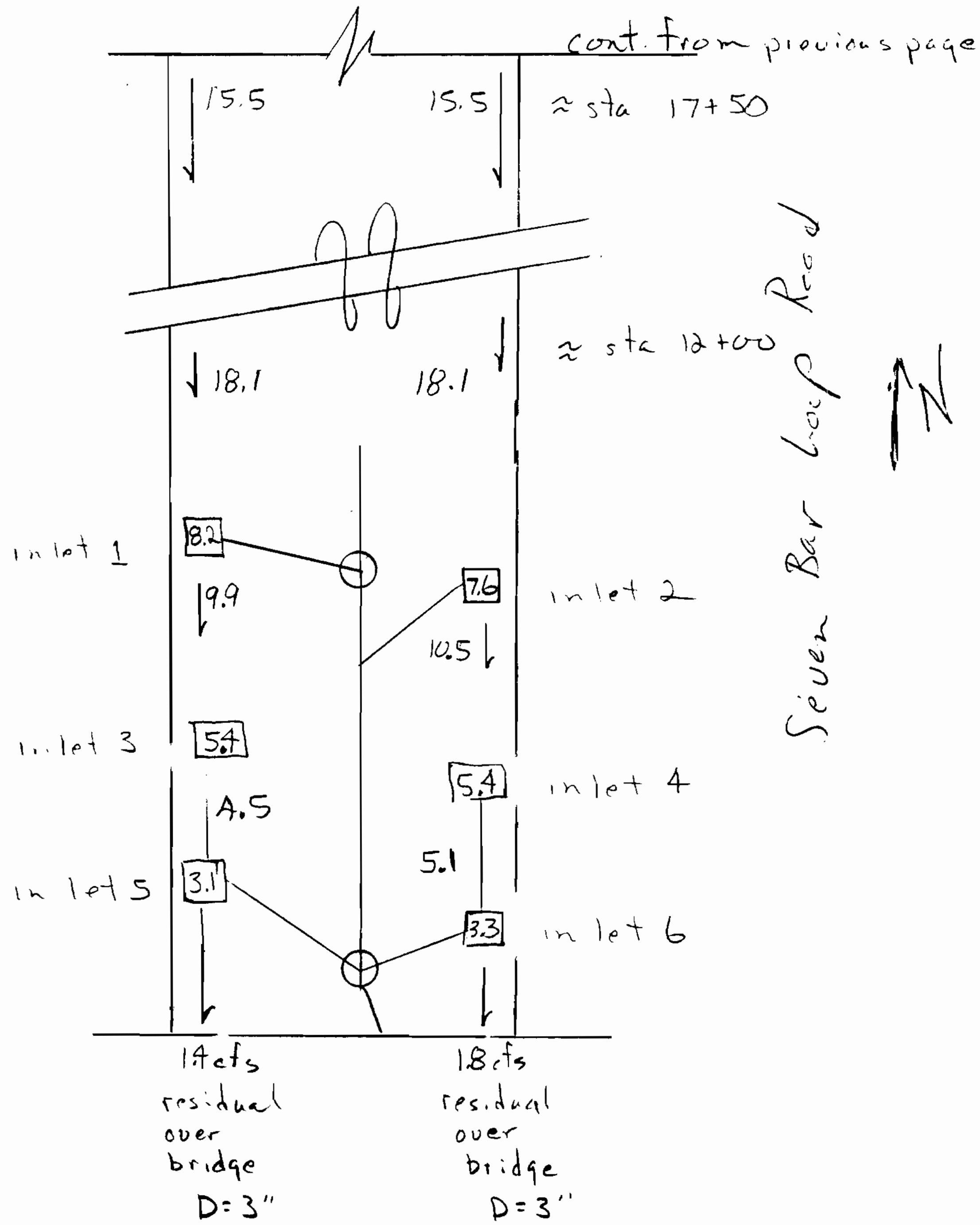


BOHANNAN-HUSTON INC.

PROJECT NAME ______ SHEET ______ OF ______

PROJECT NO. ______ BY JrA DATE 5-26-95

SUBJECT ______ CH'D ______ DATE ______


cont. from previous page
15.5
15.5
≈ sta 17+50
≈ sta 12+00
Seven Bar Loop Road
N
18.1
18.1
inlet 1
8.2
9.9
7.6
inlet 2
10.5
inlet 3
5.4
5.4
inlet 4
A.5
5.1
inlet 5
3.1
3.3
inlet 6
1.4 cfs
residual
over
bridge
D=3"
1.8 cfs
residual
over
bridge
D=3"

JCA 5-30

CATCH BASIN CAL JLATION SHEET

Sht___ of___

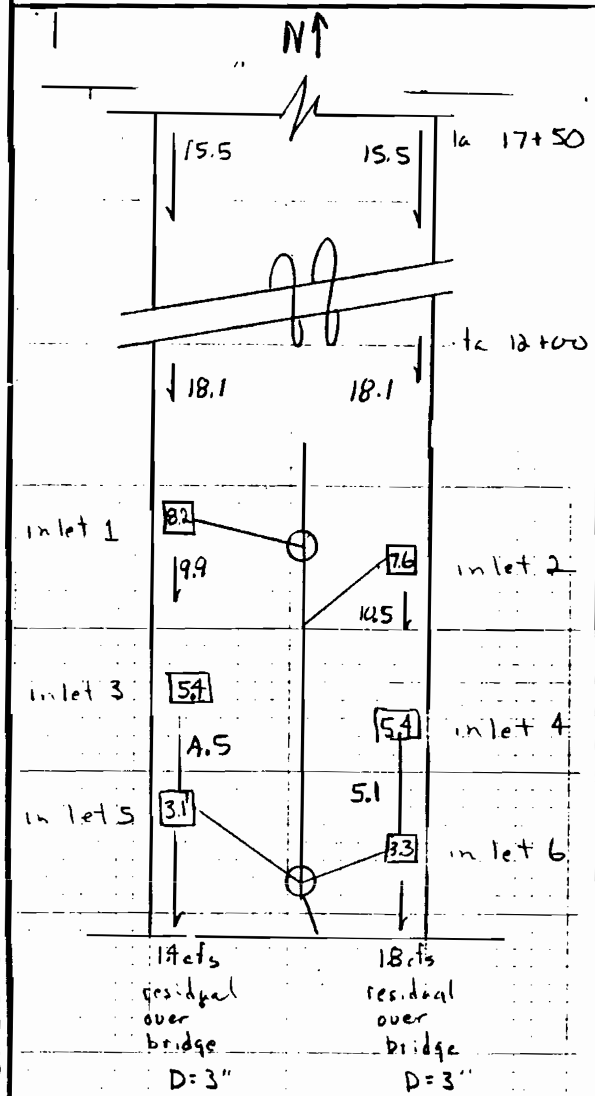
PROJECT 7-Bar North

CALCULATED BY JCA

DESIGN FREQUENCY 100 year

DATE 5-30-95

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		18.1	8.2								
2		18.1	7.6								
3		9.9	5.4								
4		10.5	5.4								
5		4.5	3.1								
6		5.1	3.3								
			3.2 cfs	residual		over	bridge				

6-02-95 J.C.A

***** HYDRAULIC GRADE LINE CALCULATIONS *****
SEVEN BAR LOOP ROAD-100 YEAR

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)	Dia. 3
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	6.39	5122.19	5122.19	0
		48	255.0	12.57	20.29	1436	0.0315	72.40			2.28					2.28							
10+06.84	MH								8.00	45.00		0.20	0.00	0.00	0.00	0.20	5118.08	5119.09	5122.15	5.58	5124.48	5124.67	0
		48	238.2	12.57	18.96	1436	0.0275	86.49			2.38					2.38							
10+93.33	MH								8.00	0.00		0.00	0.53	0.00	0.00	0.53	5121.47	5121.47	5124.41	6.11	5127.05	5127.58	1 *
		42	190.8	9.62	19.83	1006	0.0360	31.51			1.13					1.13							
11+24.84	WYE								0.00	0.00		0.00	0.11	0.00	0.00	0.11	5122.61	5123.20	5125.00	5.63	5128.71	5128.83	1 *
		42	183.2	9.62	19.04	1006	0.0332	24.00			0.80					0.80							
11+48.84	MH								8.00	0.00		0.00	0.48	0.00	0.00	0.48	5123.99	5124.96	5125.46	5.14	5129.62	5130.10	1 *
		42	175.0	9.62	18.19	1006	0.0303	392.39			11.87					11.87							
15+40	MH								6.00	15.00		0.46	0.00	0.00	0.00	0.46	5136.83	5137.29	5142.58	5.14	5141.97	5142.43	0
		42	175.0	9.62	18.19	1006	0.0303	242.08			7.32					7.32							
** 17+78.42	MH								8.00	10.00		0.26	1.24	0.00	0.06	1.57	5144.62	5148.43	5151.94	2.89	5149.75	5151.32	3 *
		36	96.5	7.07	13.65	667	0.0209	102.45			2.14					2.14							
18+89	MH								4.00	30		0.26	2.39	0.00	0.03	2.68	5150.57	5154.38	5155.48	1.76	5153.47	5156.14	3
		30	52.3	4.91	10.65	410	0.0163	474.00			7.71					7.71							
*** 23+68	MH								6.00	25.00		0.19	0.00	0.09	0.00	0.27	5162.09	5162.36	5176.78	1.76	5163.85	5164.13	BEND
		30	52.3	4.91	10.65	410	0.0163	376.92			6.13					6.13							

* 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

4-20-95

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)	Dia. 3
SIERRITA ROAD		42.00	175.00	9.62																			
** 10+09.58	MH								8.00	60.00		0.44	1.07	0.00	0.00	1.51	5144.62	5150.23	5151.94	1.03	5149.75	5151.26	3 *
		42	78.5	9.62	8.16	1006	0.0061	26.49			0.16					0.16							
10+32.91	MH								6.00	55.00		0.16	0.00	0.05	0.00	0.21	5150.39	5150.60	5152.71	1.03	5151.42	5151.63	0
		42	78.5	9.62	8.16	1006	0.0061	420.33			2.56					2.56							
14+50	MH								6.00	15.00		0.08	0.00	0.05	0.00	0.14	5153.16	5153.30	5155.40	1.03	5154.19	5154.33	0
		42	78.5	9.62	8.16	1006	0.0061	273.00			1.66					1.66							
17+23	MH								6.00	0.00		0.00	0.00	0.00	0.03	0.03	5154.96	5154.10	5156.73	1.92	5155.99	5156.02	0
		36	78.5	7.07	11.11	667	0.0139	130.00			1.80					1.80							
18+50	MH								4.00	15.00		0.12	0.00	0.00	0.03	0.14	5154.96	5154.22	5157.36	1.92	5155.99	5156.14	0
		36	78.5	7.07	11.11	667	0.0139	302.70			4.19					4.19							
21+50	MH								4.00	10.00		0.19	0.00	0.00	0.07	0.26	5158.41	5156.62	5164.02	3.97	5160.33	5160.59	0
		30	78.5	4.91	15.99	410	0.0366	203.15			7.44					7.44							
*** 23+51.34	MH								4.00	10.00		0.19	0.00	0.00	0.04	0.23	5164.06	5166.35	5176.55	1.92	5168.03	5168.26	0
		36	78.5	7.07	11.11	667	0.0139	56.30			0.78					0.78							
INFLOW	MH																						

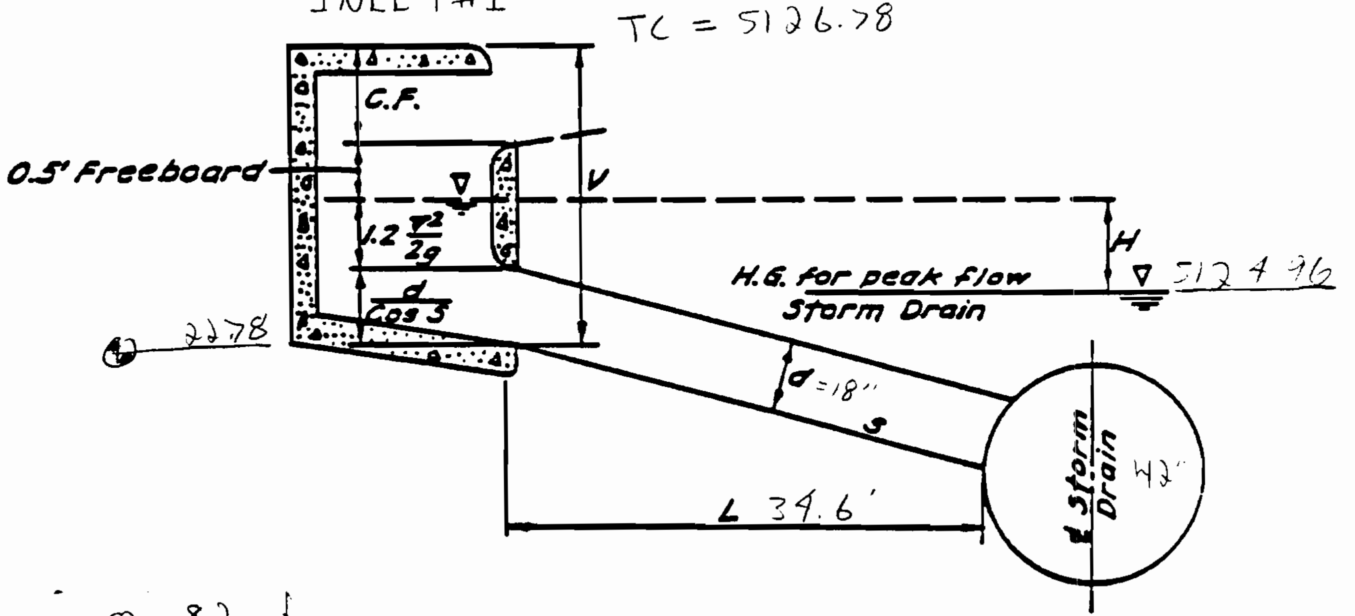
* PIPE DIA. IS MODELED TO SHOW THE EQUIVILENT ACTUAL FLOW AREA

** MANHOLE AT WHICH SEIRRITA RUNOFF TIES INTO SEVENBAR RD. STORM DRAIN 78.5 + 45.8 +(53.6 - 1.3)= 176.6

** MANHOLE AT WHICH TRACT9 RUNOFF TIES INTO SIERRITA STORM DRAI18.3 + 61.5 -1.29 = 78.5

BASINS @ 7 BAR ROAD
CHECK EXISTING CONDITIONS

STA. 11+74.8
INLET #1



Q = 8.2 cfs
A = 1.77
V = 4.63 fps

~~$1.2\frac{V^2}{2g} = .40$~~

Reqd V = 1.33 + .40 + 1.5 = 3.2'
Depth Provided = 4.0' OK ✓
INV. = 5122.78

$H_1 = \left(\frac{Q}{K}\right)^2 L = \left(\frac{10.5}{105}\right)^2 34.6 = .35'$

H.G.L @ BASIN = 5124.96 + .35' = 5125.31

$INV. + 1.2\frac{V^2}{2g} + D < TC - .50$

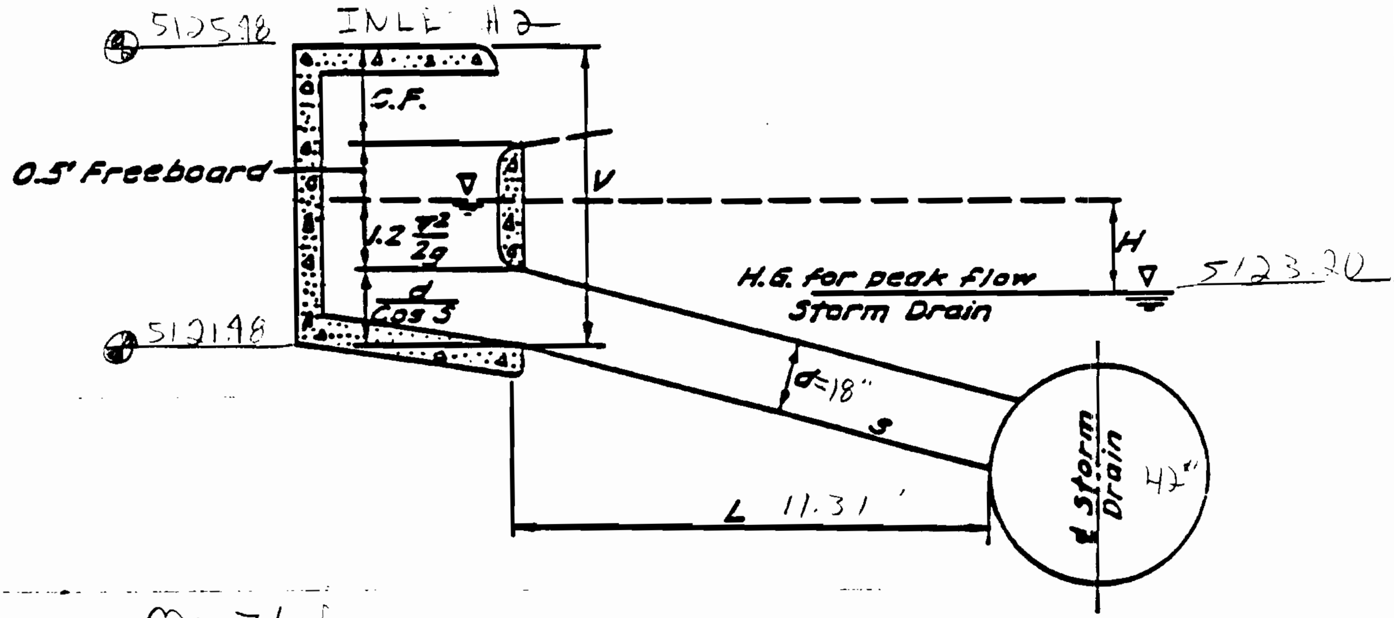
5122.78 + .40 + 1.5 < 5126.78 − .5
5124.66 < 5126.28 ✓ FREE BOARD.
also 5125.31 < 5126.28 ✓

BOHANNAN-HUSTON INC.

PROJECT NAME 7-BAR NORTH SHEET ____ OF ____
PROJECT NO. 9425043 BY JCA DATE 5-30-95
SUBJECT CHECK OF EXISTING BASIN CH'D ____ DATE ____

BASINS @ TURK LOOP ROAD
CHECK EXISTING CONDITIONS

sta 11+31.0 18' RT



Q = 7.6 cfs
A = 1.77
V = 4.29 fps

$1.2 \frac{V^2}{2g} = .34$

Reqd. $V_1 = 1.33 + .34 + 1.5 = 3.1'$ ✓ OK

Vprovided = 4'0.

INV. = 5121.48

$H_i = \left(\frac{9.2}{105}\right)^2 11.31 = .09'$

HGL @ BASIN = 5123.20 + .09 = 5123.29

$INV + 1.2 \frac{v^2}{2g} + D < TC - .50$

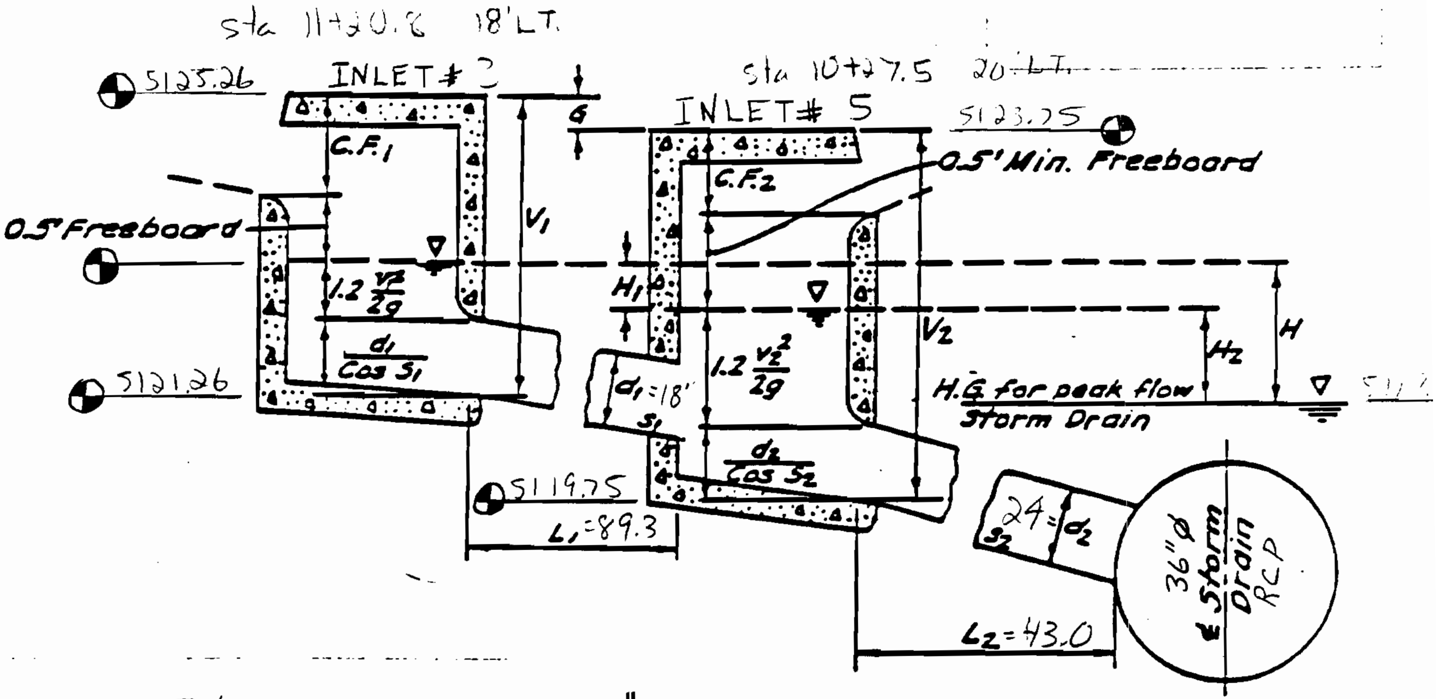
$21.48 + .34 + 1.5 < 25.48 - .5$
$23.32 < 24.98$ ✓ OK (FREEBOARD)

also 5123.29 < 24.98 ✓ OK

BOHANNAN-HUSTON INC.

PROJECT NAME ______ SHEET ______ OF ______
PROJECT NO. ______ BY JCA DATE 5-30-95
SUBJECT CHECK OF EXISTING CH'D ______ DATE ______

BASINS @ 7 BAR LOOP ROAD
CHECK EXISTING CONDITIONS



$Q_1 = 5.4$

$A_{18} = 1.77$

$Vel = Q/A = 3.05$

$1.2 \frac{V^2}{2g} = .17$

$V_1\ min = 1.33 + .17 + 1.5 = 3.1$

Depth Provided = 4.0' OK ✓

INV. = 5121.26

$H_1 = \left(\frac{Q_1}{K_1}\right)^2 L_1 = \left(\frac{5.4}{105}\right)^2 89.3 = .23$

$Q_2 = 3.1 + 5.4 = 8.5$

$A_{18} = 3.14$

$H_2 = \left(\frac{Q_2}{K_2}\right)^2 L = \left(\frac{9}{226}\right)^2 43 = .07$ (struck through)

$Vel_2 = \left(\frac{Q_2}{A}\right) = 2.71$

$1.2 \frac{V_2^2}{2g} = 0.14$

$V_2\ min = 1.33 + H_1 + 1.2 \frac{V_2^2}{2g} + d_2 - G$ (struck through)

$V_2\ min = 1.33 + .23 + .14 + 2 - 1.51 = 2.2$

V_2 provided = 4'-0" INV = 5119.75

$FB_2 = V_2 - D_2 - 1.2 \frac{V^2}{2g}$ ~~- 83.9~~

$FB_2 = 4 - 2 - .14 - .90 = 1.0'$ ✓

$V_2 - .5 \overset{?}{>} V_1 - G$

$4 - .5 > 4 - 1.51$ OK ✓

HGL @ INLET 3 = 5119.09 + .23 + .01 = 5119.33

HGL @ INLET 5 = 5119.09 + .01 = 5119.10

or normal water depth in BASIN

BOHANNAN-HUSTON INC.

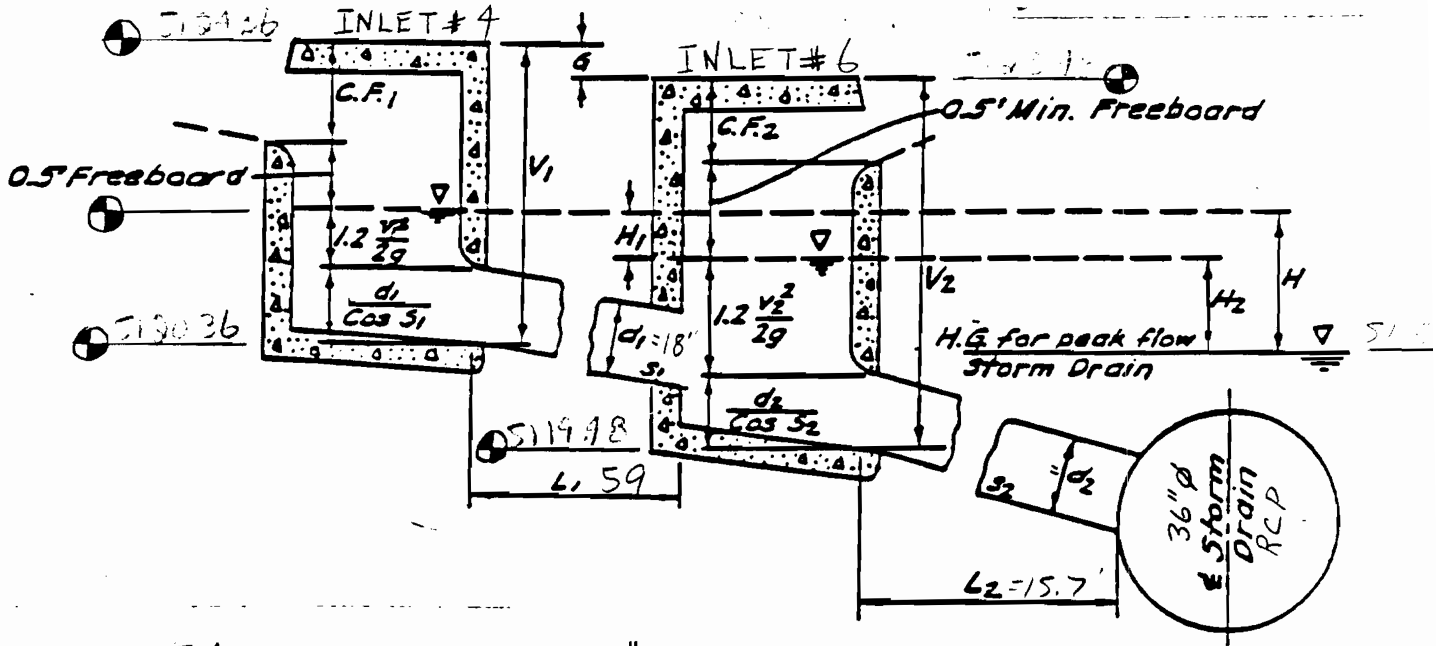
PROJECT NAME ________ SHEET ____ OF ____

PROJECT NO. ________ BY JCA DATE 5-30-95

SUBJECT CHECK CHK'D ____ DATE ____

C

BASINS @ 7BAR LOOP ROAD
CHECK EXISTING CONDITIONS



$Q_1 = 5.4$

$A_{18} = 1.77$

$Vel = Q/A = 3.05'$

$1.2 \frac{V^2}{2g} = 0.17'$

$V_1 \; min = 1.33 + .17' + 1.5 = 3.0'$

Depth Provided = 4' ✓

INV. = 5120.36

$H_1 = \left(\frac{Q_1}{K_1}\right)^2 L_1 = \left(\frac{5.4}{105}\right)^2 59 = .16'$

$Q_2 = 3.3 + 5.4 = 8.7$

$A_{18} = 3.14$

$H_2 = \left(\frac{Q_2}{K_2}\right)^2 L = \left(\frac{8.7}{226}\right)^2 15.7 = 0.02$

$Vel_2 = \left(\frac{Q_2}{A}\right) = 2.77$ fps

$1.2 \frac{V_2^2}{2g} = .14'$

~~$V_2 \; min = 1.33 + H_1 + 1.2 \frac{V_2^2}{2g} + d_2 - G$~~

$V_2 \; min = 1.33 + .16 + .14 + 2 - .88 = 2.57$

V_2 provided = 4' INV = 5119.98

$FB_2 = V_2 - D_2 - 1.2 \frac{V^2}{2g} - ~~.85~~ .9$

$FB_2 = 4 - 2 - .03 - .9 = 1.1'$ ✓

$V_2 - .5 \overset{?}{>} V_1 - G$

$4 - .5 > 4 - .88$ ✓ OK ✓

HGL @ INLET 4 = 5119.09 + .16 + .005 = 5119.25

HGL @ INLET 6 = 5119.09 + .005 = 5119.10

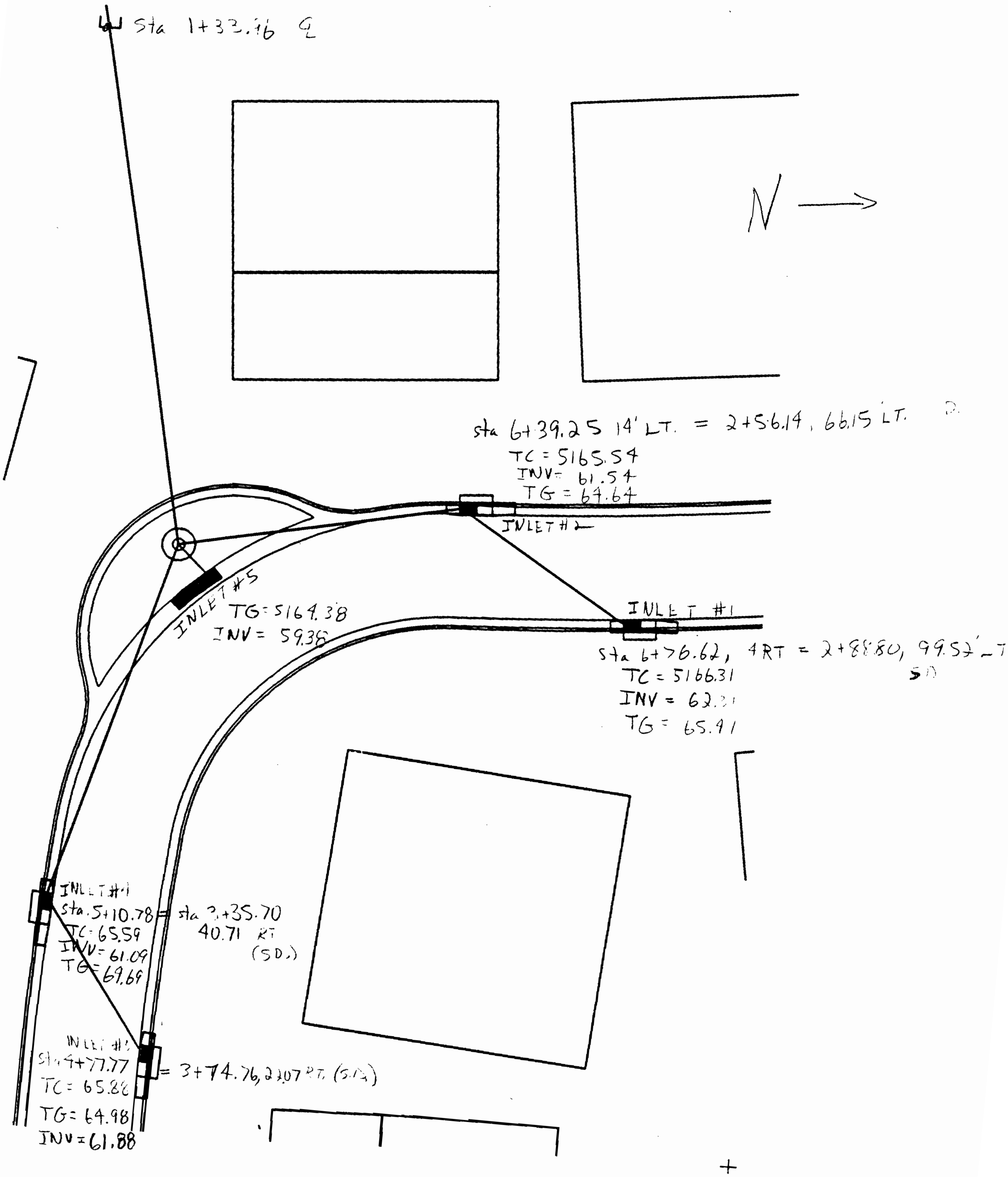
or normal water depth in 15" RCP

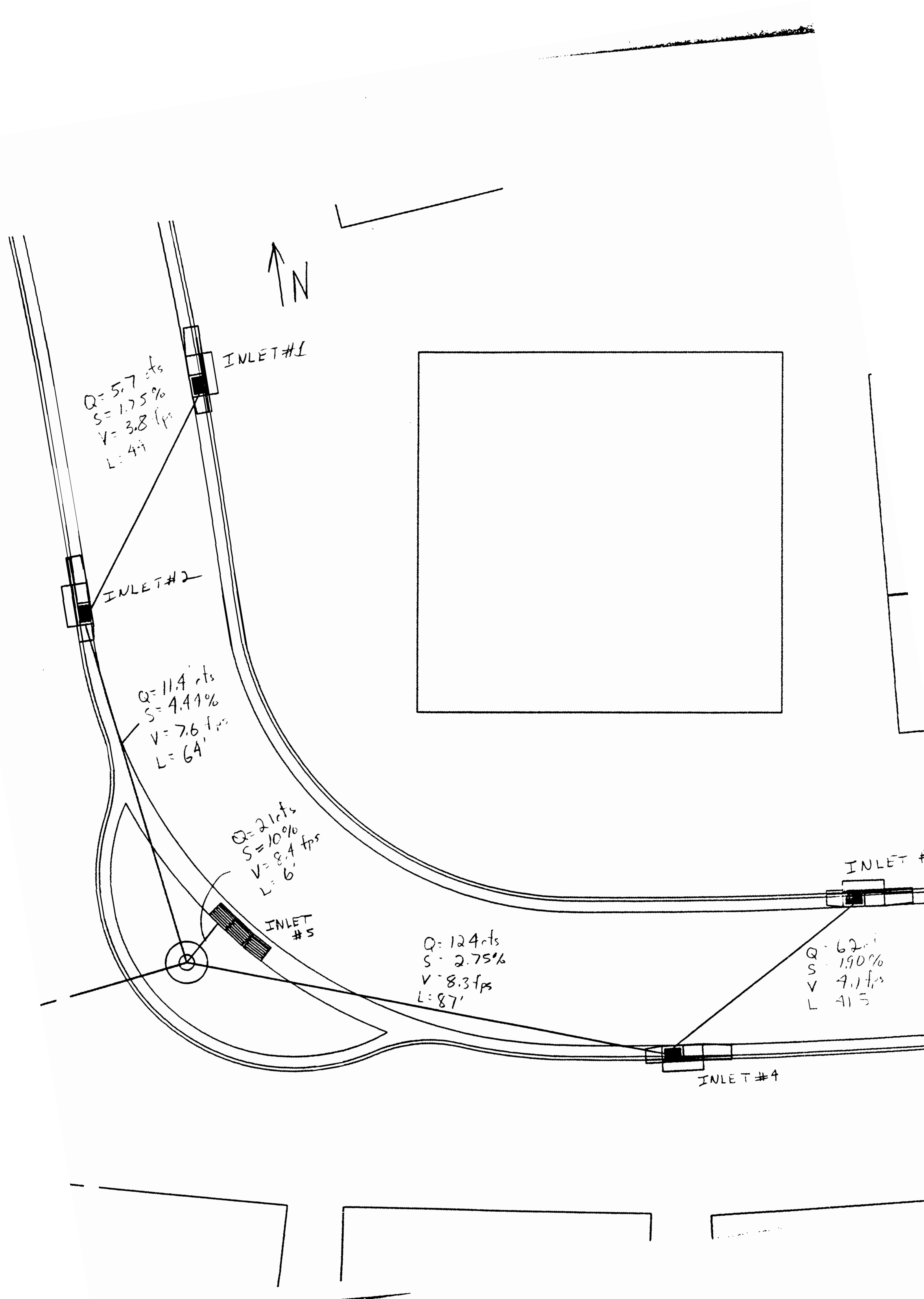
BOHANNAN-HUSTON INC.

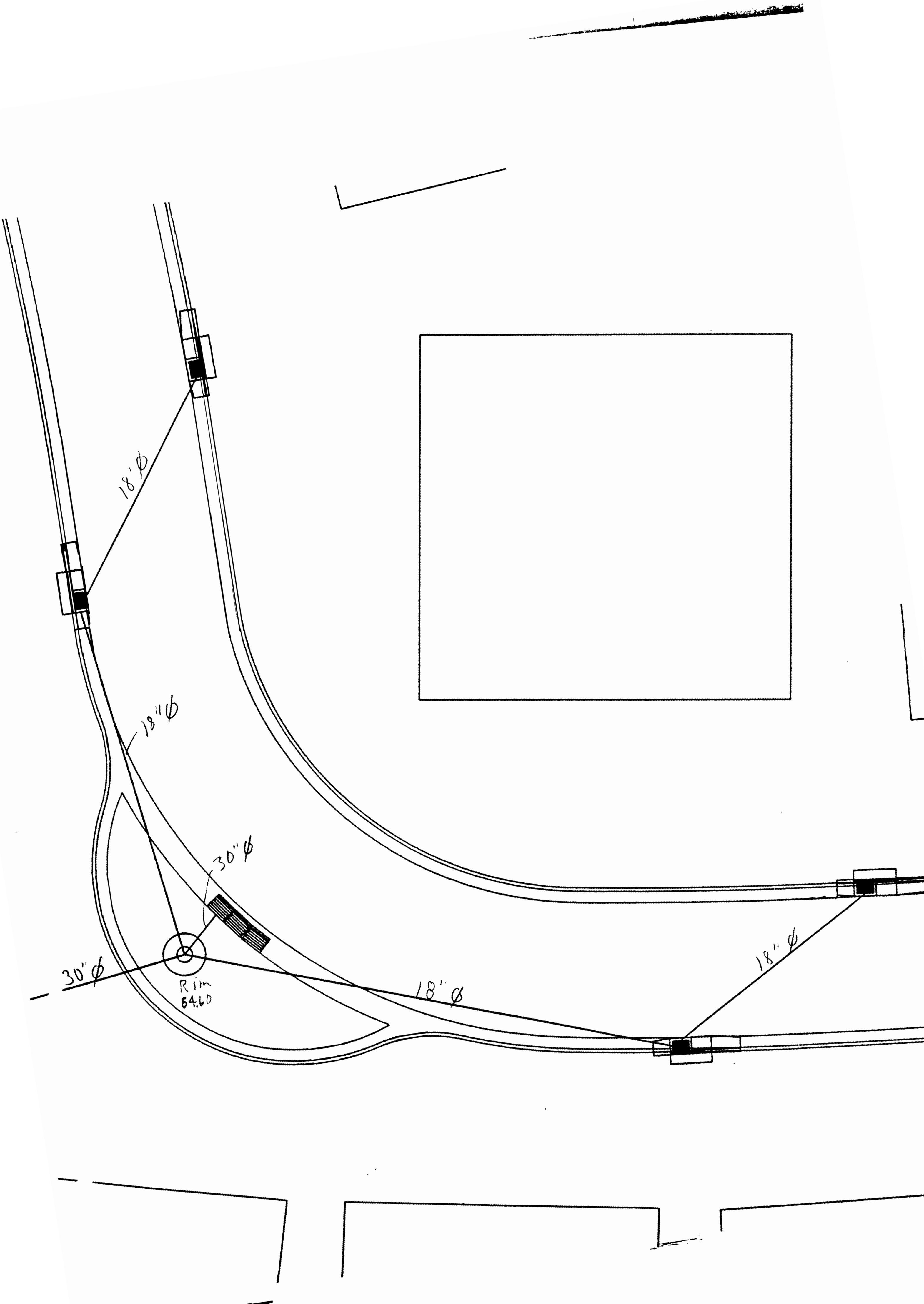
PROJECT NAME ______ SHEET ______ OF ______

PROJECT NO. CHECK BY JCA DATE 5-30-95

SUBJECT CHK'D DATE


Sta 1+33.96 ℄
N
sta 6+39.25 14' LT. = 2+56.14, 66.15 LT.
TC = 5165.54
INV = 61.54
TG = 64.64
INLET #2
INLET #5
TG = 5164.38
INV = 59.38
INLET #1
Sta 6+76.62, 4 RT = 2+88.80, 99.57
TC = 5166.31
TG = 65.41
INLET #4
Sta. 5+10.78 = sta 3+35.70
40.71 RT
(SD.)
TC = 65.59
INV = 61.09
TG = 69.69
Sta 4+77.77
= 3+74.76, 22.07 RT. (SD)
TC = 65.88
TG = 64.98
INV = 61.88


N
INLET #1
Q= 5.7 cfs
S= 1.75%
V= 3.8 fps
INLET #2
Q= 11.4 cfs
S= 4.41%
V= 7.6 fps
L= 64'
Q= 21 cfs
S= 10%
V= 8.4 fps
L= 6'
INLET #5
Q= 12.4 cfs
S= 2.75%
V= 8.3 fps
L= 87'
INLET #4
S= 1.90%


18"ϕ
18"ϕ
30"ϕ
30"ϕ
Rim
84.60
18"ϕ
18"ϕ

CATCH BASIN C . ULATION SHEET

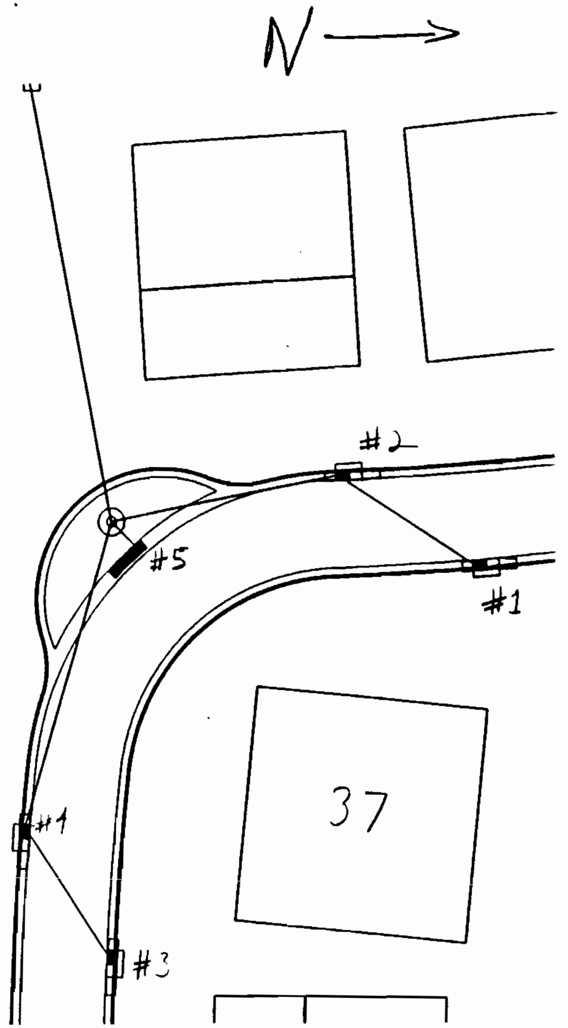
Sht.___ of___

PROJECT 7-Bar North B-7

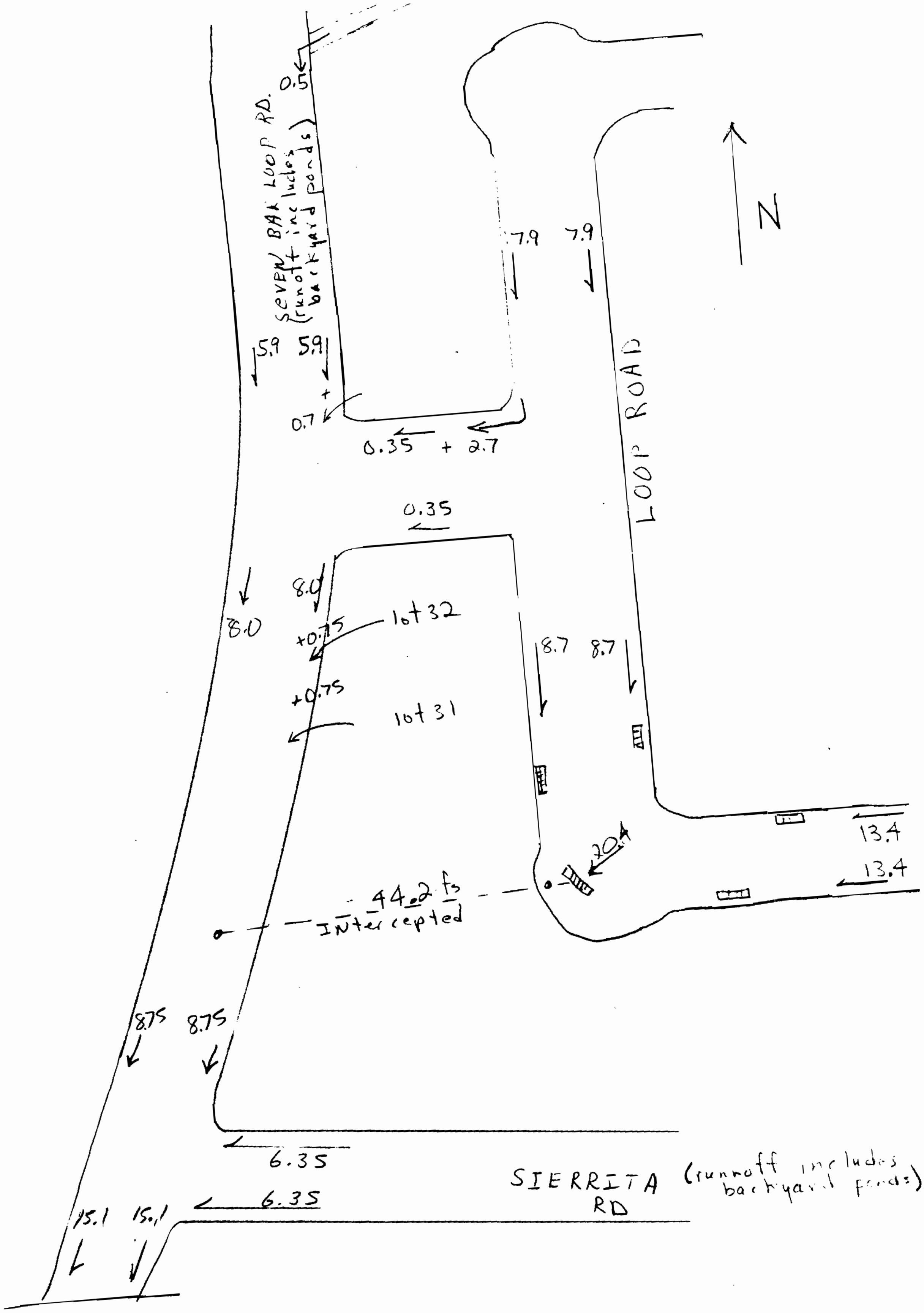
CALCULATED BY JrA

DESIGN FREQUENCY 100 yr.

DATE 5-31-95



FLOW DIAGRAM (Indicate street slopes)	Sym.	Drain. Area	Q		Cap. of ½ Street	Gutter "d"	C.B.		Connector Pipe			V
			Total	Inter.			No.	Size	Head	L	Dia.	Depth
	1		8.7	5.7								4
	2		8.7	5.7								4
	3		13.4	6.2								4
	4		13.4	6.2								4.5
	5		21	21								5


SEVEN BAR LOOP RD. (runoff includes backyard ponds)
0.5
7.9
7.9
N
5.9
5.9
0.7
0.35 + 2.7
LOOP ROAD
0.35
8.0
8.0
+0.75
lot 32
+0.75
lot 31
8.7
8.7
13.4
13.4
20.4
44.2 fs
Intercepted
8.75
8.75
6.35
SIERRITA RD (runoff includes backyard ponds)
6.35
15.1
15.1

JCA 5-26-95

14.8 + 5.2 − ?

CATCH BASIN 1 Type 'A'

TOTAL FLOW Right Side $= \frac{1}{2}\ 17.3 = 8.7$ cfs

$D = .35$, $S = 4.4\%$ > read $Q_1 = 5.7$ fs (NOMOGRAPH #1)

residual = 3.0 cfs

CATCH BASIN 2

$\frac{1}{2}$ streetflow Left side $= \frac{1}{2}\ 17.3 = 8.7$ cfs

$D = .35$, $S = 4.43\%$ > read $Q = Q_2 = 5.7$ cfs (NOMOGRAPH #1)

residual = 3.0 fs

CATCH BASINS 3 & 4 TYPE 'A' INLETS.

$\frac{1}{2}$ street flow $= \frac{1}{2}\ 26.8 = 13.4$ cfs

$D = .50$, $S = 0.9\%$ > read $Q_3 = Q_4 = 6.2$ cfs (NOMOGRAPH #2)

residual = 14.4 cfs

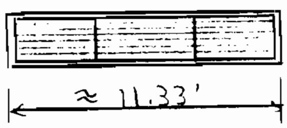
CATCH BASIN #5 (SUMP INLET)

$Q = 3 + 3 + 14.4 = 20.4$ cfs

$Q_{Design} = 200\%\ Q = 40.8$ cfs

Assume 50% clogging

'TRIPLE C'



CAPACITY OF GRATE ORFICE $= Q = .6\ A_n \sqrt{2gh}$

Grates $A_n = 3[31 \times 18.5 / 144] = 11.95$

$h = .83' + .18' = 1$ (@ R/W)

$Q = 0.6\ (11.95 \sqrt{64.4}) = 57.5$ cfs (50%)

$57.5 > 40.8$ OK

$28.8 > 20.4$

JCA 5-26

CHECK ORFICE CAPICITY

TRACT 7

INLET	ORFICE	DEPTH BASIN
1	18"	4'
2	18"	4.5
3	18"	4.
4	18"	4.5
5	30"	4.5'

18" PIPE

$h = 4.5 + 1 - \frac{1.5}{2} = 4.75'$

$A = 1.77$ sf

$Q = .6(1.77)\sqrt{64.4(4.75)} = 18.6 > 12.4$ ok

30" PIPE:

$h = 5.0 + 1 - \frac{2.5}{2} = 4.75'$

A 4.91

$Q = .6(4.91)\sqrt{64.4(4.75)} = 51.5$ cfs

$51.5 > 40.8$ cfs OK

JCA 5-26 95

6-02-95 J.C.A

***** HYDRAULIC GRADE LINE CALCULATIONS *****
SEVEN BAR LOOP ROAD-100 YEAR

	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)	Dia. 3
	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	6.39	5122.19	5122.19	0
			48	255.0	12.57	20.29	1436	0.0315	72.40			2.28					2.28							
	10+06.84	MH								8.00	45.00		0.20	0.00	0.00	0.00	0.20	5118.08	5119.09	5122.15	5.58	5124.48	5124.67	0
			48	238.2	12.57	18.96	1436	0.0275	86.49			2.38					2.38							
	10+93.33	MH								8.00	0.00		0.00	0.53	0.00	0.00	0.53	5121.47	5121.47	5124.41	6.11	5127.05	5127.58	1 *
			42	190.8	9.62	19.83	1006	0.0360	31.51	•		1.13					1.13							
	11+24.84	WYE								0.00	0.00		0.00	0.11	0.00	0.00	0.11	5122.61	5123.20	5125.00	5.63	5128.71	5128.83	1 *
			42	183.2	9.62	19.04	1006	0.0332	24.00			0.80					0.80							
	11+48.84	MH								8.00	0.00		0.00	0.48	0.00	0.00	0.48	5123.99	5124.96	5125.46	5.14	5129.62	5130.10	1 *
			42	175.0	9.62	18.19	1006	0.0303	392.39			11.87					11.87							
	15+40	MH								6.00	15.00		0.46	0.00	0.00	0.00	0.46	5136.83	5137.29	5142.58	5.14	5141.97	5142.43	0
			42	175.0	9.62	18.19	1006	0.0303	242.08			7.32					7.32							
**	17+78.42	MH								8.00	10.00		0.26	1.24	0.00	0.06	1.57	5144.62	5148.43	5151.94	2.89	5149.75	5151.32	3 *
			36	96.5	7.07	13.65	667	0.0209	102.45			2.14					2.14							
	18+89	MH								4.00	30		0.26	2.39	0.00	0.03	2.68	5150.57	5154.38	5155.48	1.76	5153.47	5156.14	3
			30	52.3	4.91	10.65	410	0.0163	474.00			7.71					7.71			HG.L = H_o				
***	23+68	MH								6.00	25.00		0.19	0.00	0.09	0.00	0.27	5162.09	5162.36	5176.78	1.76	5163.85	5164.13	BEND
			30	52.3	4.91	10.65	410	0.0163	376.92			6.13					6.13							

* 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

4-20-95

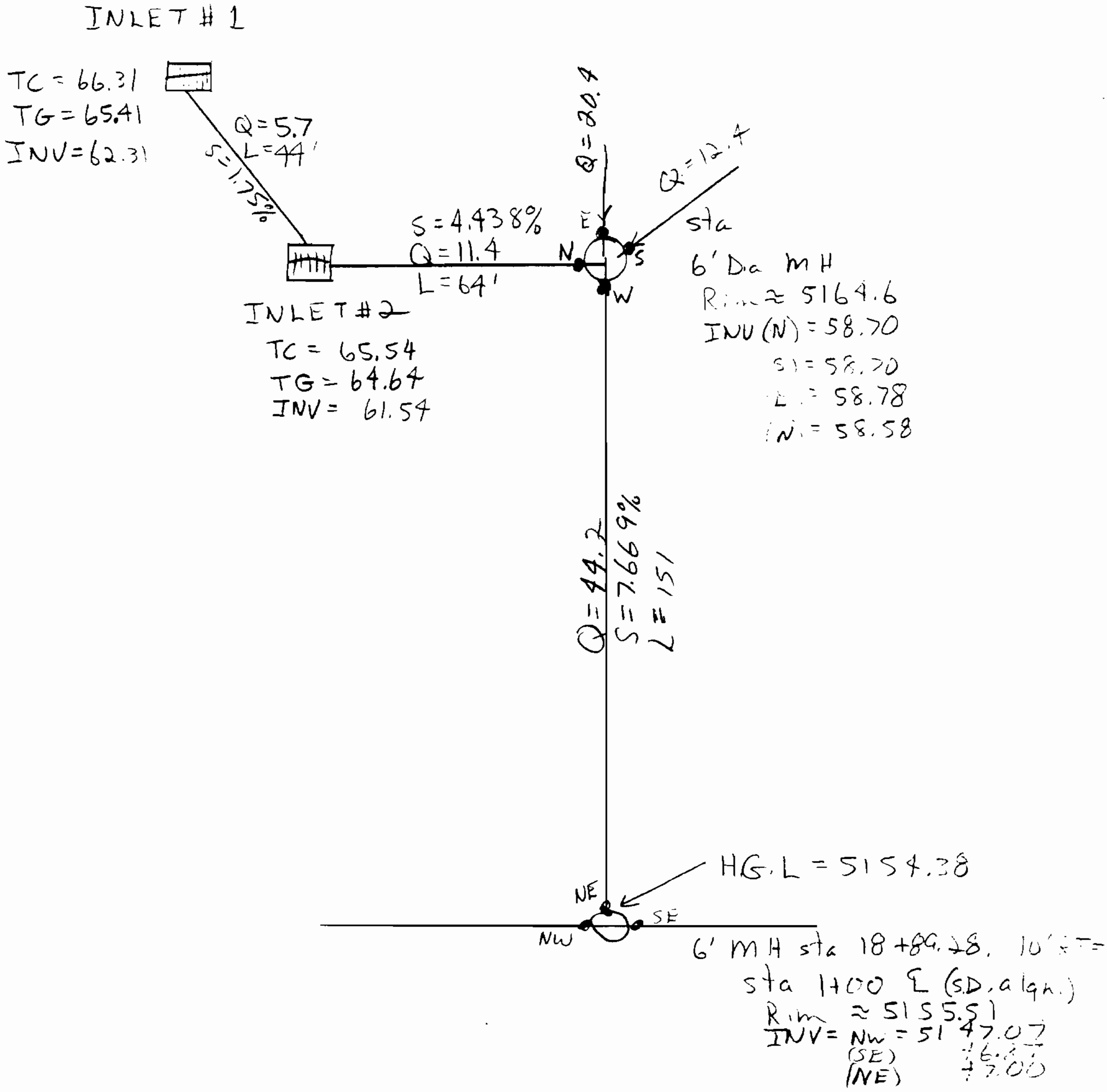
	Station	Structure	Diam.	Q	Area	Vel.	K	Sf	Length	MH Dia.	JNCT Angle	Hf	Hb	Hj	Hmh	Ht	Total Losses	HGL(dn)	HGL(up)	Low Point	HV	EGL(dn)	EGL(up)	Dia. 3
	SIERRITA ROAD		42.00	175.00	9.62																			
**	10+09.58	MH								8.00	60.00		0.44	1.07	0.00	0.00	1.51	5144.62	5150.23	5151.94	1.03	5149.75	5151.26	3 *
			42	78.5	9.62	8.16	1006	0.0061	26.49			0.16					0.16							
	10+32.91	MH								6.00	55.00		0.16	0.00	0.05	0.00	0.21	5150.39	5150.60	5152.71	1.03	5151.42	5151.63	0
			42	78.5	9.62	8.16	1006	0.0061	420.33			2.56					2.56							
	14+50	MH								6.00	15.00		0.08	0.00	0.05	0.00	0.14	5153.16	5153.30	5155.40	1.03	5154.19	5154.33	0
			42	78.5	9.62	8.16	1006	0.0061	273.00			1.66					1.66							
	17+23	MH								6.00	0.00		0.00	0.00	0.00	0.03	0.03	5154.96	5154.10	5156.73	1.92	5155.99	5156.02	0
			36	78.5	7.07	11.11	667	0.0139	130.00			1.80					1.80							
	18+50	MH								4.00	15.00		0.12	0.00	0.00	0.03	0.14	5154.96	5154.22	5157.36	1.92	5155.99	5156.14	0
			36	78.5	7.07	11.11	667	0.0139	302.70			4.19					4.19							
	21+50	MH								4.00	10.00		0.19	0.00	0.00	0.07	0.26	5158.41	5156.62	5164.02	3.97	5160.33	5160.59	0
			30	78.5	4.91	15.99	410	0.0366	203.15			7.44					7.44							
***	23+51.34	MH								4.00	10.00		0.19	0.00	0.00	0.04	0.23	5164.06	5166.35	5176.55	1.92	5168.03	5168.26	0
			36	78.5	7.07	11.11	667	0.0139	56.30			0.78					0.78							
	INFLOW	MH																						

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

** MANHOLE AT WHICH SEIRRITA RUNOFF TIES INTO SEVENBAR RD. STORM DRAIN 78.5 + ~~45.8~~ 41.2 + (53.6 - 1.3) = ~~176.6~~ = 175.0

** MANHOLE AT WHICH TRACT9 RUNOFF TIES INTO SIERRITA STORM DRAI18.3 + 61.5 - 1.29 = 78.5

TRACT B-7
FLOW CHART
FOR INLETS 1&2



7-Bar North
942504 3

JCK 6-2-95

06/03/95

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

FROM:: MH @ STA.18+89 10' RT. (7-BAR RD.)

TO:: INLET #1 STA. 6+78.37 14' RT. AND INLET #2 STA. 6+40.99, 14' LT. (TRACT 7 LOOP RD.)

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																				
18+89	MH								4.00	0.00		0.00	0.00	0.00	0.00	0.00	5150.57	5154.38	5155.50	1.26	5151.83	5155.64
		30	44.2	4.91	9.00	410	0.0116	152.00			1.77					1.77						
5+85.84, 25'L	MH								6.00	90.00		0.19	1.13	0.00	0.02	1.34	5156.15	5158.09	5164.40	0.65	5157.40	5158.74
		18	11.4	1.77	6.45	105	0.0118	64.00			0.75					0.75						
6+40.99, 14LT	INLET #2								0.00	45.00		0.05	0.00	0.00	0.00	0.05	5158.85	**5159.38**	5164.21	0.16	5159.49	5159.54
		18	5.7	1.77	3.23	105	0.0029	44.00			0.13					0.13						
6+78.37, 14'R	INLET #1								0.00	0.00		0.00	0.00	0.00	0.00	0.00	5159.51	**5159.67**	5164.98	0.00	5159.67	5159.67
		18									0.00					0.00						

MANNINGS n 0.013

7HGL #1AND #2

SINCE THE CALCULATED HYDRAULIC GRADE LINE IS BELOW THE BASIN INVERT, THE ACTUAL H.G.L. WILL EQUAL THE NORMAL WATER DEPTH IN THE 18" RCP

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

Dia. 3	Dia. 3 Angle	Δ	Ht(inc.)	Ht(dec.)	Actual Slope	Invert Elev.	High Water Depth
0.0	0	0.0000	0.0000	0.0000		5147.00	8.50
					0.0762	11.58	
2.0	65	1.7423	0.0000	0.0202		5158.70	5.70
					0.0444	2.84	
0.0	0	0.0000	0.0000	0.0000		5161.54	2.67
					0.0175	0.77	
0.0	0	0.0000	0.0000	0.0000		5162.31	2.67

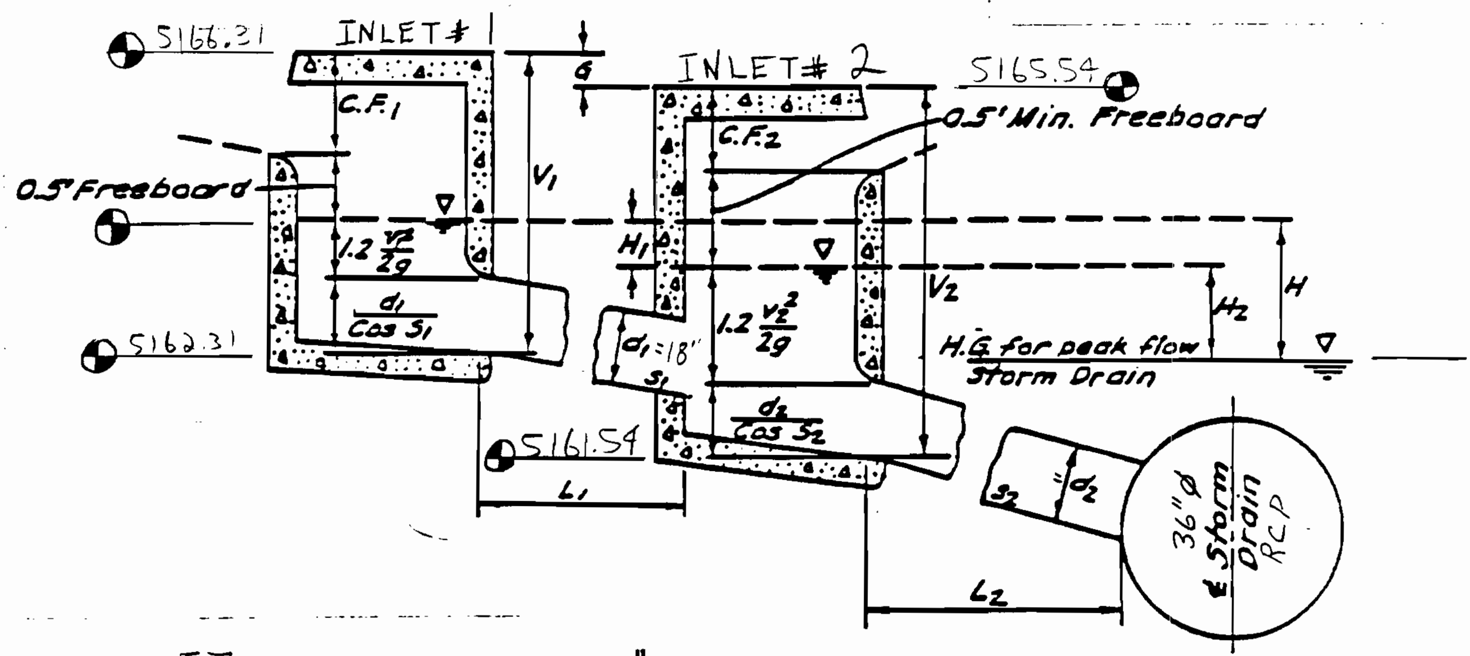
++

INLET #1 BASIN DEPTH = 1.33 + 2.67 = **4.00**

INLET #2 BASIN DEPTH = 1.33 + 2.67 = **4.00**

7HGL #1 AND #2

CATCH BASIN DEPTH
TRACT - 7



$Q_1 = 5.7$

$A_{18} = 1.77$

$Vel = Q/A = 3.22$

$1.2 \frac{V^2}{2g} = .19$

$V_1 \min = 1.33 + .19 + 1.5 = 3'$

Depth Provided = 4

INV. = 5162.31

$H_1 = \left(\frac{Q_1}{K_1}\right)^2 L_1 = \left(\frac{5.7}{105}\right)^2 44 = .13$

$Q_2 = 5.7 + 5.7$

$A_{18} = 1.77$

~~$H_2 = \left(\frac{Q_2}{K_2}\right)^2 L = \left(\frac{11.4}{105}\right)^2 64 = .75'$~~

$Vel_2 = \left(\frac{Q_2}{A}\right) = 6.44$

$1.2 \frac{V_2^2}{2g} = .77'$

~~$V_2 \min = 1.33 + H_1 + 1.2 \frac{V_2^2}{2g} + d_2 - G$~~

$V_2 \min = 1.33 + .33 + .77 + 1.5 - (.77) = 3.2'$

V_2 provided = 4.0'   INV = 5161.54

$FB_2 = V_2 - D_2 - 1.2 \frac{V^2}{2g} - .90$

$FB_2 = 4.0 - 1.5 - .77 - .90 = 0.83' > .5$

$V_2 - .5 \overset{?}{>} V_1 - G$

$4 - .5 > 4 - .77$ OK ✓

H.G.L. = THE NORMAL WATER DEPTH AT THE BASINS.

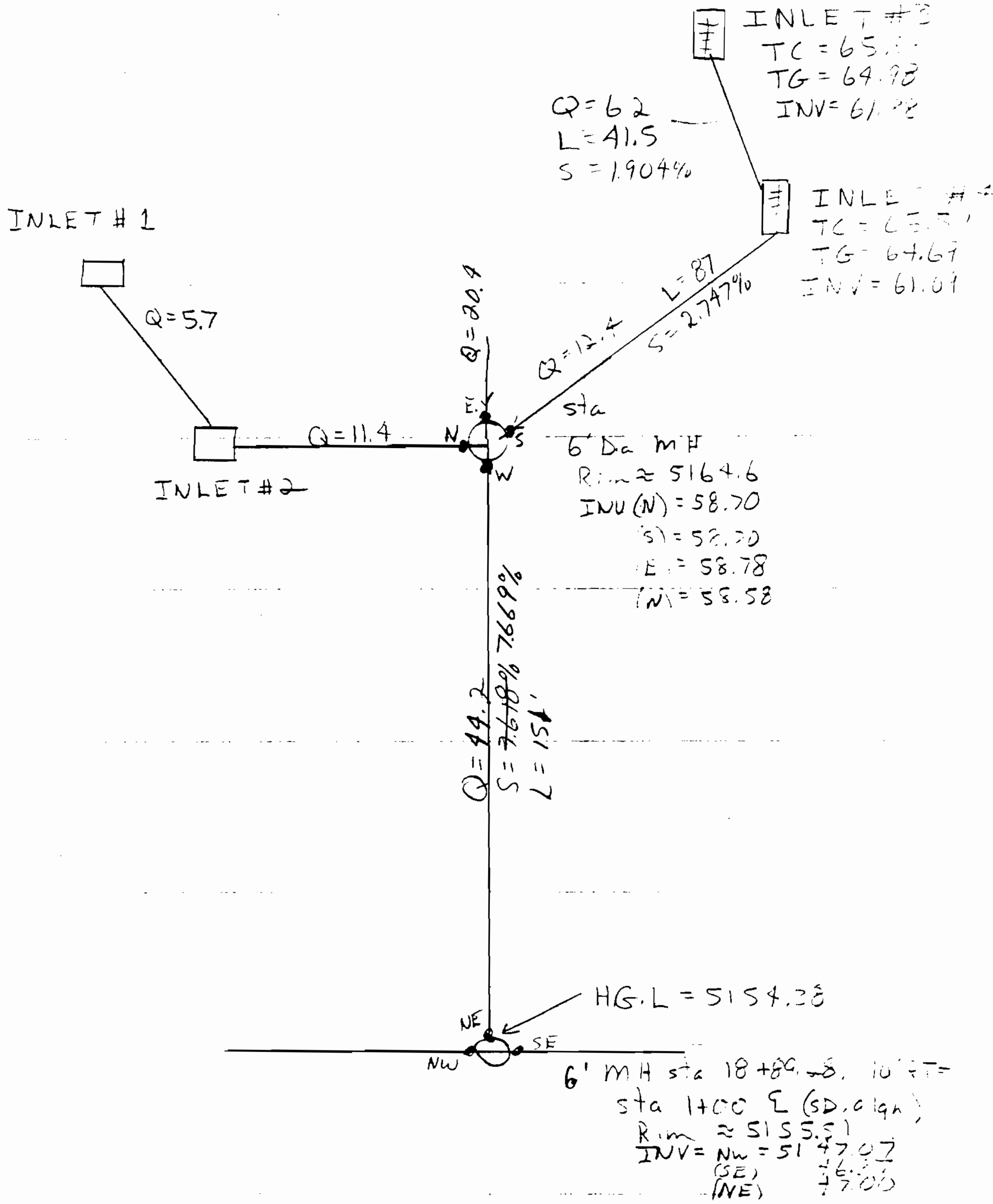
BOHANNAN-HUSTON INC.

PROJECT NAME ______ SHEET ______ OF ______

PROJECT NO. ______ BY JCA DATE 6-2-95

SUBJECT ______ CH'D ______ DATE ______

TRACT B-7
FLOW CHART
FOR INLETS 3 & 7



BOHANNAN-HUSTON INC.

PROJECT NAME ______ SHEET ______ OF ______
PROJECT NO. ______ BY JCA DATE 6-2-95
SUBJECT ______ CH'D ______ DATE ______

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

06/03/95

FROM:: MH @ STA.18+89 10' RT. (7-BAR RD.)
TO:: INLET #3 STA. 4+75.95, 14' RT. AND INLET #4 STA. 5+08.97, 14' LT. (TRACT 7 LOOP RD.)

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																				
18+89	MH								4.00	0.00		0.00	0.00	0.00	0.00	0.00	5150.57	5154.38	5155.50	1.26	5151.83	5155.64
		30	44.2	4.91	9.00	410	0.0116	152.00			1.77					1.77						
5+85.84, 25'L	MH								6.00	30.00		0.12	2.21	0.00	0.01	2.34	5156.15	5158.98	5164.40	0.76	5157.40	5159.75
		18	12.4	1.77	7.02	105	0.0139	87.00			1.21					1.21						
5+08.97, 14'L	INLET #4								0.00	50.00		0.06	0.00	0.00	0.00	0.06	5160.19	**5160.83**	5164.26	0.19	5160.96	5161.02
		18	6.2	1.77	3.51	105	0.0035	41.50			0.14					0.14						
4+75.95, 14'R	INLET #3								0.00	0.00		0.00	0.00	0.00	0.00	0.00	5160.98	**5161.17**	5164.55	0.00	5161.17	5161.17
		18									0.00					0.00						

MANNINGS n 0.013

SINCE THE CALCULATED HYDRAULIC GRADE LINE IS BELOW THE INVERT OF THE BASINS, THE ACTUAL H.G.L. WILL EQUAL THE NORMAL WATER DEPTH IN THE 18" RCP

<u>7HGL #3AND #4</u>

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

Dia. 3	Dia. 3 Angle	Δ	Ht(inc.)	Ht(dec.)	Actual Slope	Invert Elev.	High Water Depth
0.0	0	0.0000	0.0000	0.0000		5147.00	8.50
					0.0762	11.58	
2.0	85	2.7090	0.0000	0.0123		5158.70	5.70
					0.0275	2.39	
0.0	0	0.0000	0.0000	0.0000		5161.09	3.17
					0.0190	0.79	
0.0	0	0.0000	0.0000	0.0000		5161.88	2.67

++

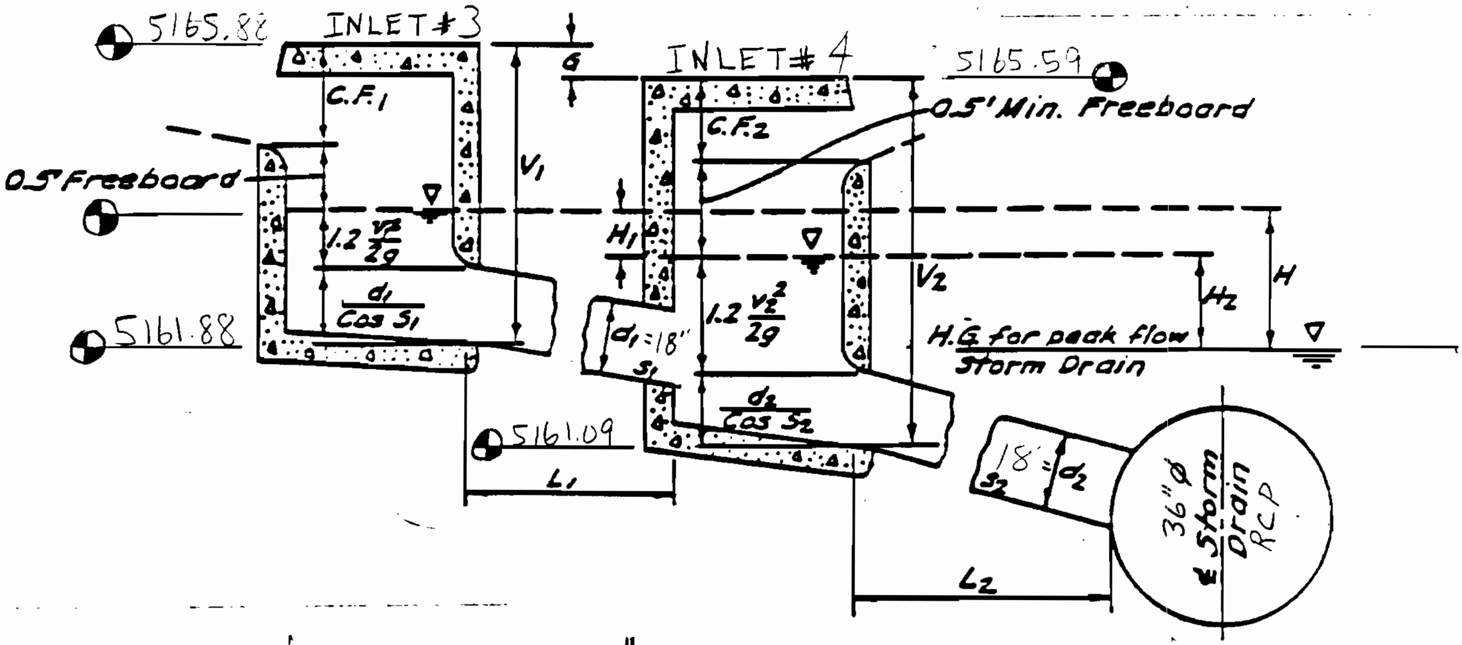
INLET #3 BASIN DEPTH = 1.33 + 2.67 = **4.00**

INLET #4 BASIN DEPTH = 1.33 + 3.17 = **4.50**

<u>7HGL #3 AND #4</u>

CATCH BASIN DEPTH

TRACT - 7



$Q_1 = 6.2$ cfs

$A_{18} = 1.77$

$Vel = Q/A = 3.5$ fps

$1.2 \frac{V^2}{2g} = .23'$

$V_1 \min = 1.33 + .23 + 1.5 = 3.1'$

Depth Provided $= 4.0'$

INV. = 5161.88

$H_1 = \left(\frac{Q_1}{K_1}\right)^2 L_1 = \left(\frac{6.2}{105}\right)^2 41.5 = 0.15'$

$Q_2 = 6.2 + 6.2 = 12.4$ cfs

$A_{18} = 1.77$

$H_2 = \left(\frac{Q_2}{K_2}\right)^2 L = \left(\frac{12.4}{105}\right)^2 87' = 1.213$

$Vel_2 = \left(\frac{Q_2}{A}\right) = 7$

$1.2 \frac{V_2^2}{2g} = .92'$

~~$V_2 \min = 1.33 + H_1 + 1.2 \frac{V_2^2}{2g}$~~ $+ d_2 - G$

$V_2 \min = 1.33 + .15 + .92 + 1.5 - (.29) = 3.6'$

V_2 provided $= 4.5$ INV = 5161.09

$FB_2 = V_2 - D_2 - 1.2 \frac{V^2}{2g} - .90$

$FB_2 = 4.5 - 1.5 - .92 - .90 = 1.18' > .5'$ OK

$V_2 - .5 \overset{?}{>} V_1 - G$

$4.5 - .5 > 4 - .29$

$4 > 3.71$ OK

H.G.L = THE NORMAL WATER DEPTH AT THE BASINS

BOHANNAN-HUSTON INC.

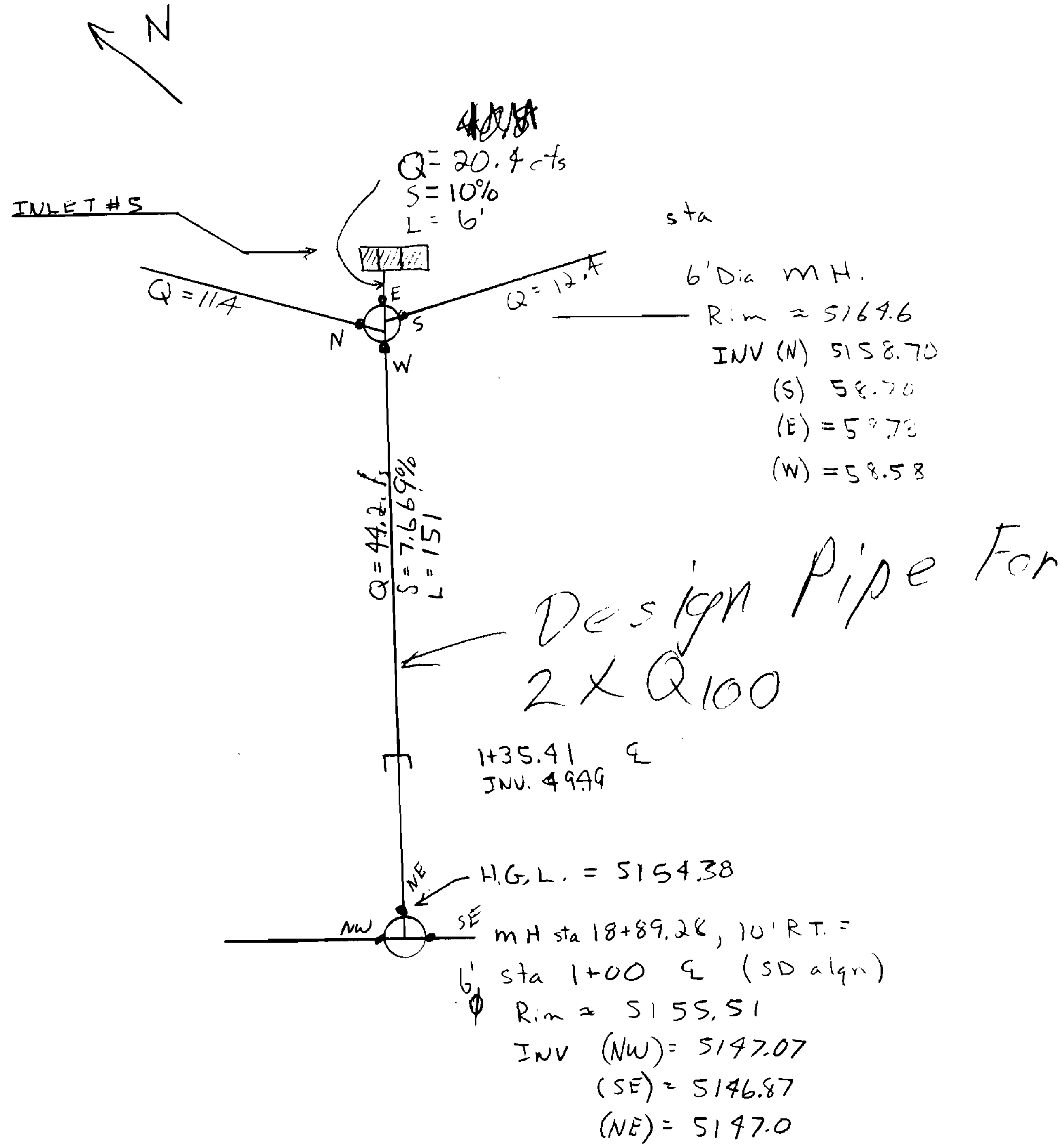
PROJECT NAME ______ SHEET ______ OF ______

PROJECT NO. ______ BY JCA DATE 6-3-90

SUBJECT ______ CH'D ______ DATE ______

TRACT B-7

INLET #5



JCA 5-30-95

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

06/03/95

FROM:: MH @ STA. 18+89 10' RT. (7-BAR RD.)
TO:: INLET #5 STA. 5+86.49 14' LT. (TRACT 7 LOOP RD.)

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																				
18+89	MH								4.00	0.00		0.00	0.00	0.00	0.00	0.00	5150.57	5154.38	5155.50	1.26	5155.64	5155.64
		30	44.2	4.91	9.00	410	0.0116	152.00			1.77					1.77						
5+85.84, 25LT	MH								6.00	50.00		0.10	0.05	0.00	0.00	0.15	5156.15	5157.28	5164.60	0.27	5157.40	5157.55
		30	20.4	4.91	4.16	410	0.0025	6.00			0.01					0.01						
5+86.49, 14LT	INLET #5								0.00	0.00		0.00	0.00	0.00	0.00	0.00	5157.30	5157.56	5163.88	0.00	5157.56	5157.56
		30																				

MANNINGS n 0.013

7HGL #5

SINCE THE CALCULATED HGL IS BELOW THE CATCH BASIN INVERT, THE ACTUAL HGL WILL EQUAL THE NORMAL WATER DEPTH IN THE BASIN AND 18' RCP

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

Dia. 3	Dia. 3 Angle	Δ	Ht(inc.)	Ht(dec.)	Actual Slope	Invert Elev.	High Water Depth
0.0	0	0.0000	0.0000	0.0000		5147.00	8.50
					0.0762	11.58	
2.0	30	1.0360	0.0000	0.0000		5158.78	5.82
					0.1000	0.60	
0.0	0	0.0000	0.0000	0.0000		5159.38	4.50

+++

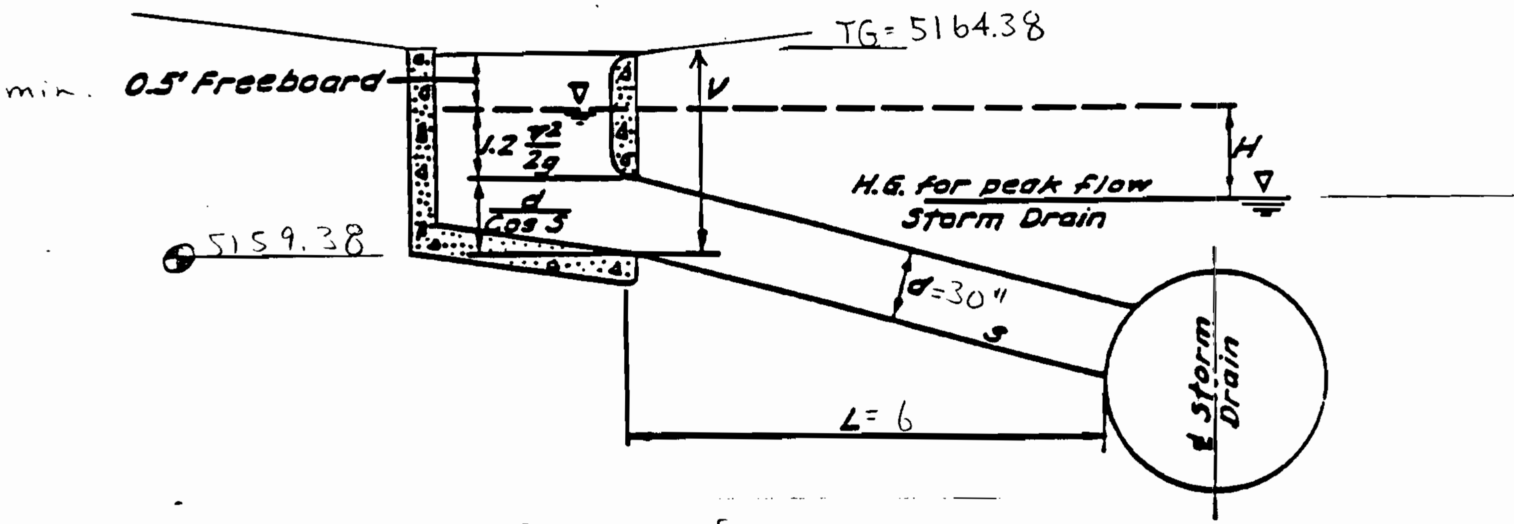
INLET #5 BASIN DEPTH= **5.00**

7HGL #5

CATCH BASIN DEPTH Type "D" SUMP

$TG = TC - 8\frac{1}{2} = 64.38$

INLET #5.



$Q_{Des} = 200\% (202 cfs) = 404 cfs$

$A_p = 4.91 sf$

$V = Q/A = 8.23 fps$

V_{min} $1.2\frac{V^2}{2g} = 1.26$

Reqd. V = .5' + 1.26 + 2.5 = 4.3'

Depth Provided = 5.0'

INV. = 5159.38

TG − .5' $\overset{?}{\geq}$ H.G.L.

5164.38 − .5' >

SEE CUL7.OUT SPREADSHEETS FOR THE DETERMINATION OF H.G.L. (NORMAL WATER DEPTH)

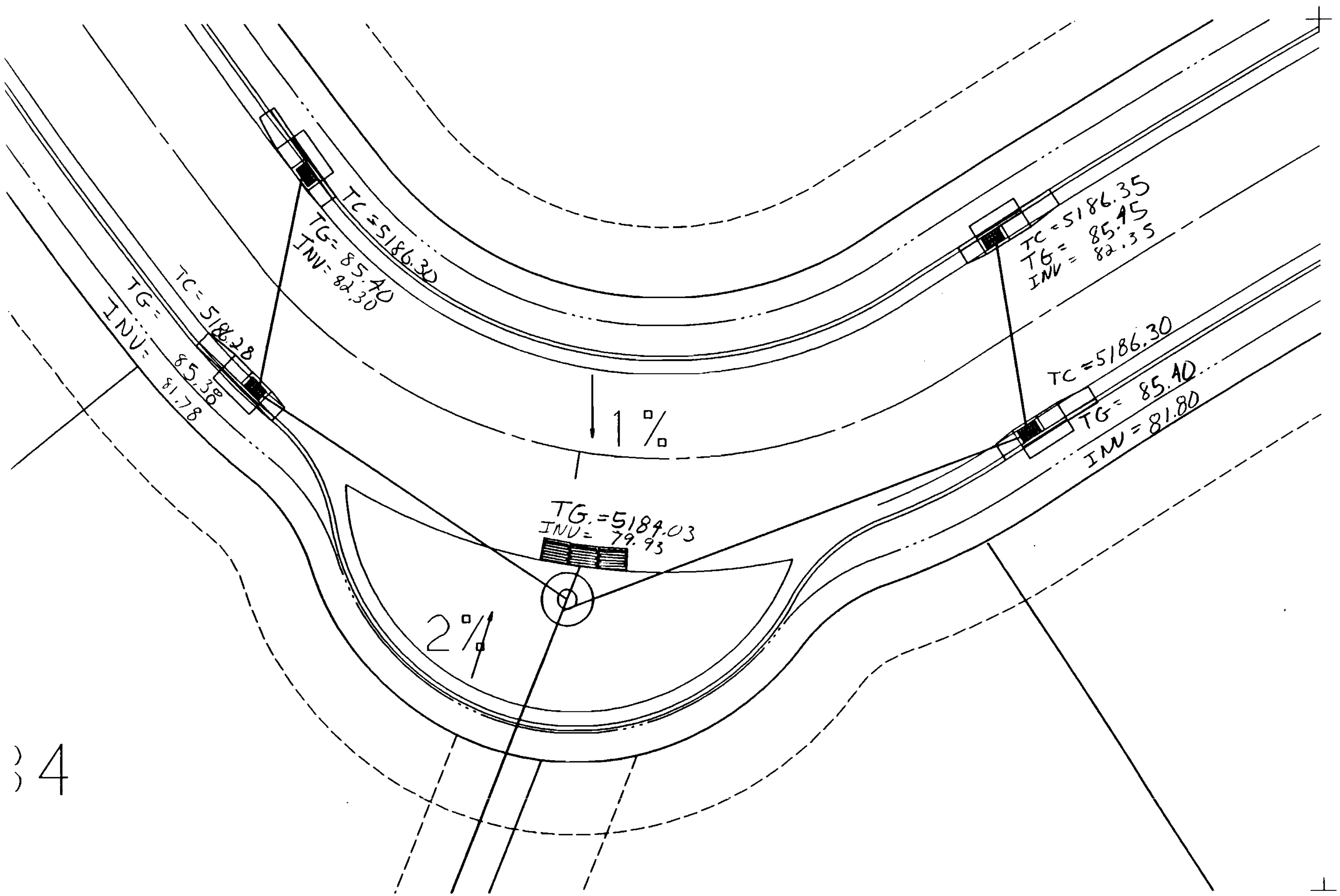
H.G.L. = THE NORMAL WATER DEPTH AT THE BASINS.

BOHANNAN-HUSTON INC.

PROJECT NAME ______ SHEET ______ OF ______

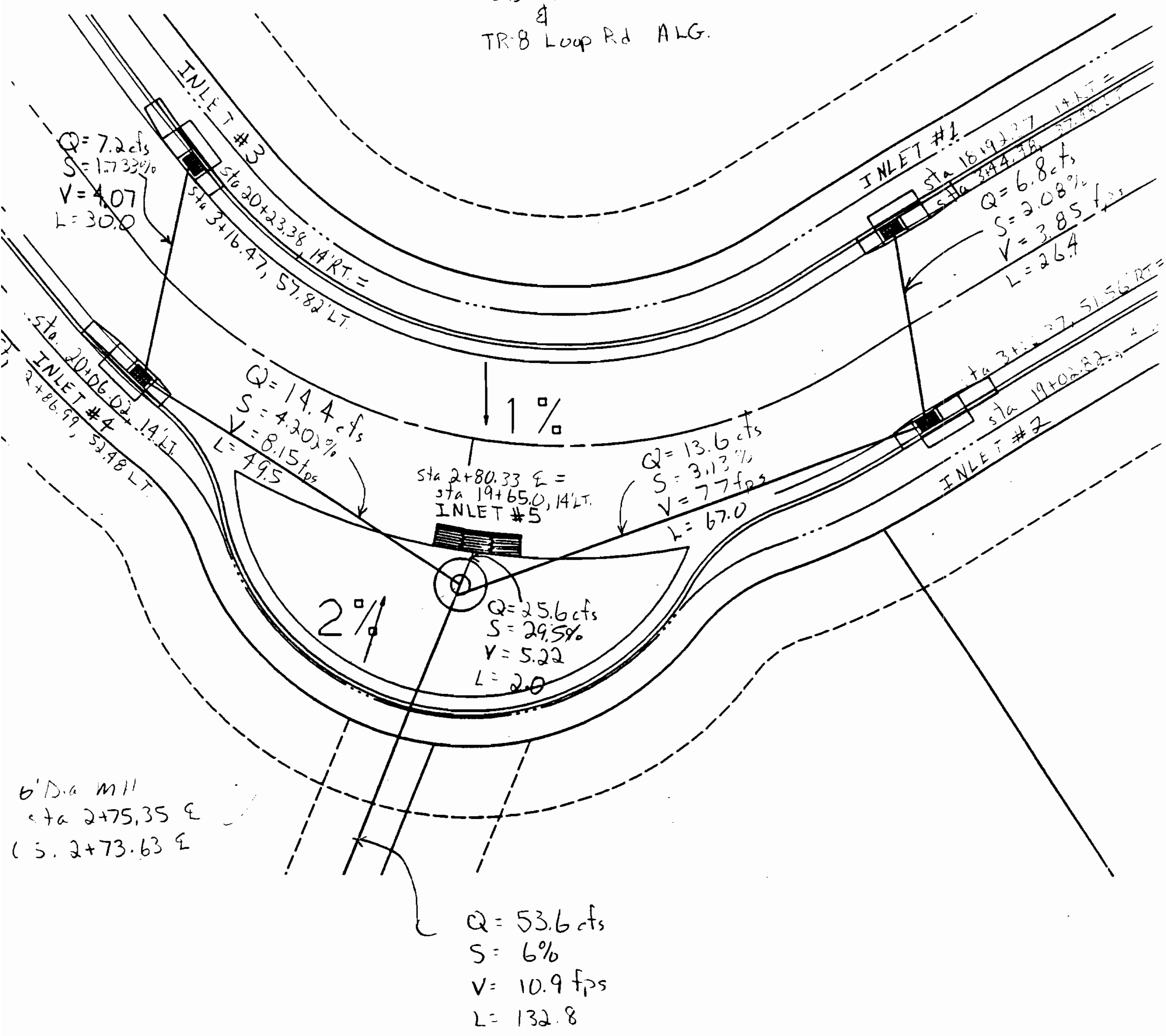
PROJECT NO. ______ BY ______ DATE ______

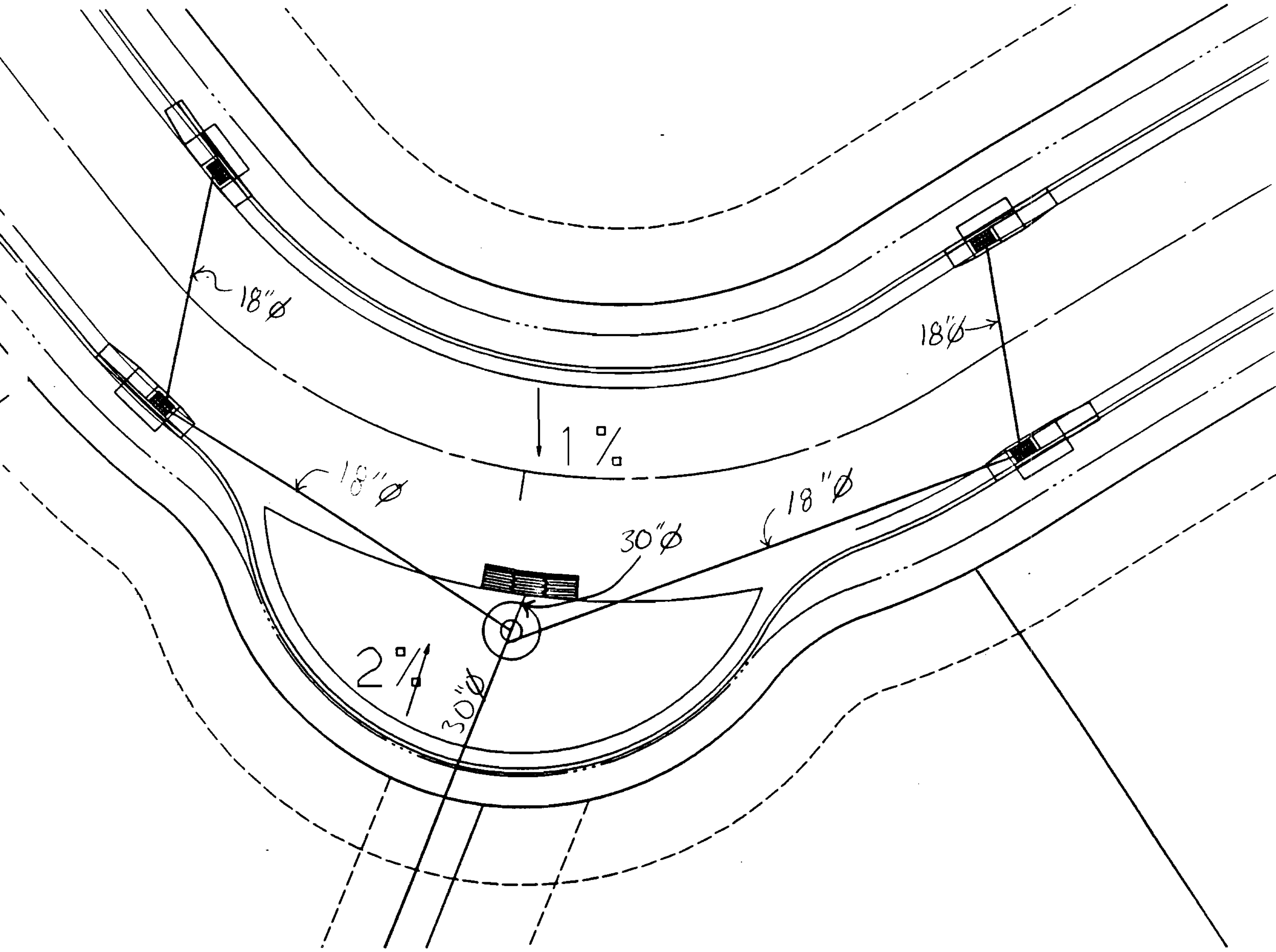
SUBJECT ______ CH'D ______ DATE ______



TC=5186.30
TG= 85.40
INV= 82.30
TC=5186.35
TG= 85.45
INV= 82.35
TC=5186.30
TG= 85.40
INV=81.80
TC= 5186.28
TG= 85.38
INV= 81.78
1%
TG.=5184.03
INV= 79.93
2%
34

sta equations of
SD ALG.
&
TR-8 Loop Rd ALG.





18"ø
18"ø
1%
18"ø
18"ø
30"ø
2%
30"ø

CATCH BASIN CALCULATION SHEET

Sht.___ of___

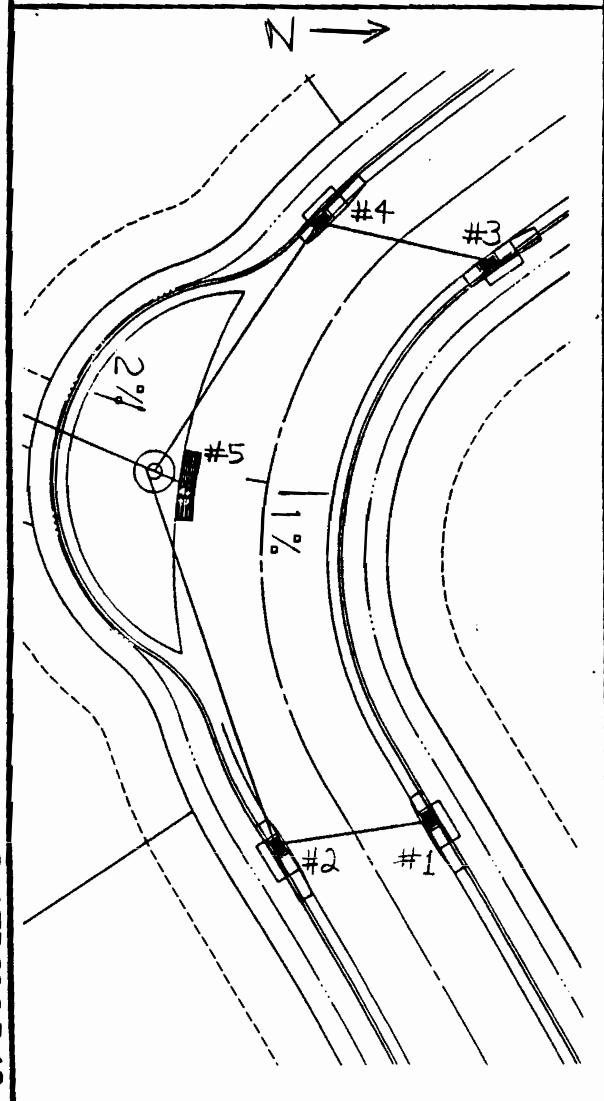
PROJECT 7 BAR NORTH TRACT 8.

DESIGN FREQUENCY 100 yr.

CALCULATED BY JCA

DATE 4-13-95

FLOW DIAGRAM (Indicate street slopes)	Sym.	Drain. Area	Q		Cap. of ½ Street	Gutter "d"	C.B.		Connector Pipe			V
			Total	Inter.			No.	Size	Head	L	Dia.	Depth
	#1&#2		26.9	2x6.8	30.5 cfs	.55	2	A			18' / 18'	#1-4' #2-4.5'
	#3&4		26.7	2x7.2	30.5 cfs	.56	2	A			18' / 18'	#3-4' #4-4.5
	#5		200% x 25.6	51.2	30.5 cfs		3	D			30"	#5 5'



STORM DRAIN DESIGN: TRACT 8

General Design: Loop Rd.

The low point of the loop road will have Type 'D' inlets with no overflow allowed. Four Type 'A' catch basins will be used Two on each side of the type Ds. (one on each side of the street)

INLETS 1&2

STA. 18+92.37 14' RT. & STA 19+02.82 14' LT.
TYPE 'A' CATCH BASINS

½ STREET FLOW = ½ 26.9 cfs = 13.4 cfs

D = .55', S = 0.5% > read: 6.8 cfs intercepted (Nomagraph 4)

residual = 13.4 - 6.8 = 6.6 cfs (each Basin)

INLETS 3&4

STA 20+23.38, 14' RT. & STA 20+06.02, 14' LT.
TYPE 'A' CATCH BASINS

½ STREET FLOW = ½ 26.7 cfs = 13.4 cfs

D = .56', S = 0.5% > read: 7.2 intercepted (Nomagraph 5)

residual = 13.4 - 7.2 = 6.2 (each Basin)

T-Bar North
94250 42
Storm Drains

JCA

12-16-94

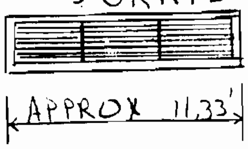
STA 19+65

TYPE 'D' SUMP.

Q_{DES} = (residual flows) × 2 ← F.S. for no overflow (sump grates only)

$Q_{DES} = [(6.6 \times 2) + (6.2 \times 2)]\, 2 = 51.2$ cfs

3 GRATE



Capicity of Orfice : $Q = .6\, A_n \sqrt{2gh}$ × 50% clogging

Grates: $A_n = 3\,[31 \times 18.5 / 144] = 11.95$ sf

$h = 0.83' + .18' = 1'$ @ Right of Way

$Q = 0.6\,(11.95 \sqrt{64.4}) = 57.53$ cfs

57.53 > 51.2 ok ✓

7-Bar North
9425042
Storm Drains

JCA

12-16-94

CHECK PIPE ORFICE CAPICITY

PIPE FROM INLETS. @ TRACT 8.

INLET	ORFICE PIPE	BASIN DEPTH
1	18"	4'
2	18"	4.5
3	18'	4'
4	18"	4.5
5	30"	5'

18" Pipe :

$h = 4.5 + 1 - \frac{1.5}{2} = 4.75'$

$A = 1.77\ sf$

$Q = .6\,(1.77)\sqrt{64.4\,(4.75)} = 18.6\ cfs > 14.4$ OK✓

30" PIPE

$h = 5 + 1 - \frac{2.5}{2} = 4.75$

$A = 4.91\ sf$

$Q = .6\,(4.91)\sqrt{64.4\,(4.75)} = 51.5\ cfs > 51.2\ cfs$ OK✓

I have decided to use 30' Pipe since a 30" pipe has been utilized In 7-Bar Rd.

BOHANNAN-HUSTON INC.

PROJECT NAME 7-Bar North SHEET ____ OF ____
PROJECT NO. ____ BY JCA DATE 12-16-94
SUBJECT ____ CH'D ____ DATE ____

4-20-95

***** HYDRAULIC GRADE LINE CALCULATIONS *****
SEVEN BAR LOOP ROAD-100 YEAR

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)	Dia. 3
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	6.07	5121.87	5121.87	0
		48	248.4	12.57	19.77	1436	0.0299	72.40			2.17					2.17							
10+06.84	MH								8.00	45.00		0.18	0.00	0.00	0.00	0.18	5117.97	5119.03	5122.15	5.19	5124.03	5124.22	0
		48	229.7	12.57	18.28	1436	0.0256	86.49			2.21					2.21							
10+93.33	MH								8.00	0.00		0.00	0.39	0.00	0.00	0.39	5121.24	5121.24	5124.41	5.57	5126.43	5126.82	1 *
		42	182.3	9.62	18.95	1006	0.0328	31.51			1.03					1.03							
11+24.84	WYE								0.00	0.00		0.00	0.06	0.00	0.00	0.06	5122.28	5122.84	5125.00	5.07	5127.85	5127.91	1 *
		42	173.9	9.62	18.07	1006	0.0299	24.00			0.72					0.72							
11+48.84	MH								8.00	0.00		0.00	0.38	0.00	0.00	0.38	5123.55	5124.52	5125.46	4.48	5128.63	5129.00	1 *
		42	163.4	9.62	16.98	1006	0.0264	392.39			10.35					10.35							
15+40	MH								6.00	15.00		0.41	0.00	0.00	0.00	0.41	5134.87	5135.28	5142.58	4.48	5139.35	5139.76	0
		42	163.4	9.62	16.98	1006	0.0264	242.08			6.39					6.39							
17+78.42	MH								8.00	10.00		0.16	-0.10	0.00	0.27	0.33	5141.67	5145.58	5151.94	0.89	5146.15	5146.48	4
		36	53.6	7.07	7.58	667	0.0065	102.45			0.66					0.66							
18+79.31	MH								8.00	30		0.15	0.00	0.00	0.03	0.19	5146.24	5145.47	5155.48	1.85	5147.14	5147.32	0
		30	53.6	4.91	10.92	410	0.0171	450.00			7.68					7.68							
** 23+22.49	MH								6.00	25.00		0.20	0.00	0.09	0.00	0.29	**5153.16**	**5153.45**	5176.78	1.85	5155.01	5155.30	BEND
		30	53.6	4.91	10.92	410	0.0171	376.92			6.44					6.44							

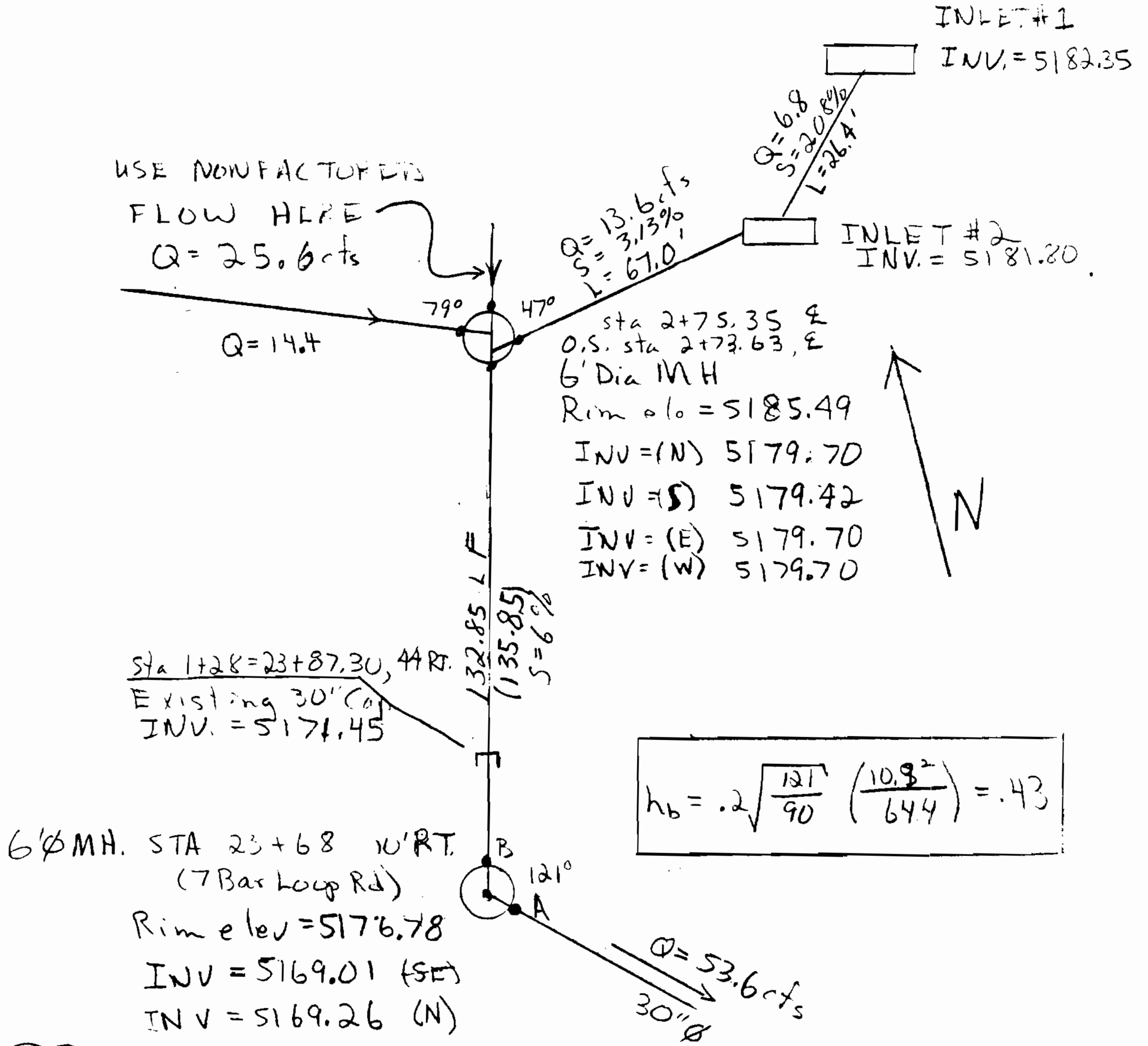
* PIPE DIA. IS MODELED TO SHOW THE EQUIVILENT FLOW AREA

** MANHOLE AT WHICH TRACT 8 RUNOFF TIES INTO 7 BAR ROAD STORM DRAIN

USE NORMAL Water Depth
INV + 23" =
5169.01 + 1.92 = 5170.93

FLOW CHART FOR HYDRO. GRADE LINE

FOR INLETS #1 & #2



$$h_b = .2\sqrt{\frac{121}{90}}\left(\frac{10.9^2}{64.4}\right) = .43$$

Normal Water Depth RP CULVERT. → HGL @ A = 5170.93

HGL @ B = 5170.93 + .43 = 5171.36 (BEND & MH & Δelev.)

BOHANNAN-HUSTON INC.

PROJECT NAME: 7-Bar North   SHEET ____ OF ____
PROJECT NO. 94250 40   BY JCA   DATE 4-13-95
SUBJECT: H.G.L.   CH'D ____   DATE ____

***** HYDRAULIC GRADE LINE CALCULATIONS ***** 04/12/95

FROM:: MH @ STA. 23+68 10' RT. (7-BAR RD.)
TO:: INLET #1 STA. 18+92.37 14' RT. AND INLET #2 STA. 19+02.82, 14' LT. (TRACT 8 LOOP RD.)

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+68	MH								0.00	0.00		0.00	0.00	0.00	0.00	0.00	5170.93	5171.36	5175.78	1.85	5172.78	5173.21
		30	53.6	4.91	10.92	410	0.0171	170.00			2.90					2.90						
19+62, 21'LT	MH								6.00	47.00		0.19	-0.93	0.00	0.03	-0.71	5174.26	5174.49	5185.49	0.92	5176.11	5175.41
		18	13.6	1.77	7.70	105	0.0168	67.00			1.12					1.12						
19+03, 14LT	INLET #2								0.00	102.00		0.11	0.00	0.00	0.00	0.11	5175.61	5176.41	5184.97	0.23	5176.53	5176.64
		18	6.8	1.77	3.85	105	0.0042	26.40			0.11					0.11						
18+92, 14'RT	INLET #1								0.00	0.00		0.00	0.00	0.00	0.00	0.00	5176.52	5176.75	5185.02	0.00	5176.75	5176.75
		18									0.00					0.00						

MANNINGS n 0.013

8HGL #1AND #2

THESE H.G.L. ELEVS. ARE BELOW THE INVERT OF THEIR RESPECTIVE PIPES. THEREFORE I USED THE HEIGHT OF H2O IN THE PIPE AS THE HYDRO GRADE LINE. SEE CULVERT.OUT SPREAD SHEETS.

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

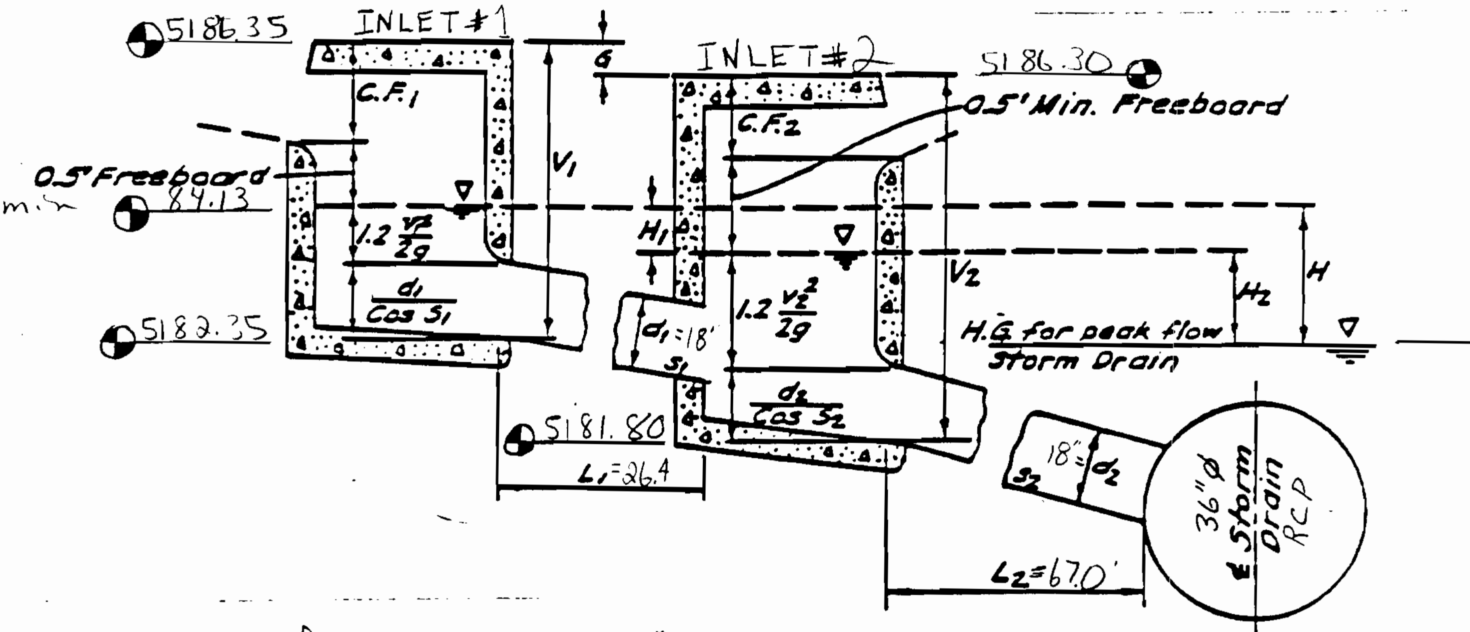
Dia. 3	Dia. 3 Angle	Δ	Ht(inc.)	Ht(dec.)	Actual Slope	Invert Elev.	Depth
0.0	0	0.0000	0.0000	0.0000		5169.26	6.52
					0.0600	10.20	
1.5	47	-1.1720	0.0000	0.0323		5179.70	5.79
					0.0313	2.10	
0.0	0	0.0000	0.0000	0.0000		5181.80	3.17
					0.0208	0.55	
0.0	30	0.0000	0.0000	0.0000		5182.35	2.67

INLET #1 BASIN DEPTH = 1.33 + 2.67 = **4.00**

INLET #2 BASIN DEPTH = 1.33 + 3.17 = **4.50**

8HGL #1 AND #2

CATCH BASIN DEPTH
TRACT-8



$Q_1 = 6.8\,cfs$

$A_{18} = 1.77\,sf$

$Vel = Q/A = 3.84\,fps$

$1.2\frac{V^2}{2g} = 0.28'$

$V_1\,min = 1.33 + .28 + 1.5 = 3.11$

Depth Provided = 4'

INV. = 5182.35

$H_1 = \left(\frac{Q_1}{K_1}\right)^2 L_1 = \left(\frac{6.8}{105}\right)^2 26 = .11'$

$Q_2 = 6.8\,cfs + 6.8 = 13.6$

$A_{18} = 1.77\,sf$

$H_2 = \left(\frac{Q_2}{K_2}\right)^2 L = \left(\frac{13.6}{105}\right)^2 67.0 = 1.12$

$Vel_2 = \left(\frac{Q_2}{A}\right) = \left(\frac{13.6}{1.77}\right) = 7.7$

$1.2\frac{V_2^2}{2g} = 1.1$

$V_2\,min = 1.33 + H_1 + 1.2\frac{V_2^2}{2g} + d_2 - G$

$V_2\,min = 1.33 + .11 + 1.1 + 1.5 - .05 = 3.99'$

V_2 provided = 4.5' INV = 81.80

$FB_2 = V_2 - D_2 - 1.2\frac{V_2^2}{2g} - .88$

$FB_2 = 4.5 - 1.5 - 1.1 - .88 = 1.0'$ ✓

$V_2 - .5 \overset{?}{>} V_1 - G$

$4.5 - 0.5 > 4 - .05$ ✓

$TC - 1.33 \overset{?}{\geq} H.G.L$ ✓

$5186.35 - 1.33 > 5183.05$

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

$5186.30 - 1.33 > 5187.25$

SEE 8HGL #1 & #2 Spread Sheet and, CUL8_18A.out Spread Sheet for the Determination of H.G.L. elevations.

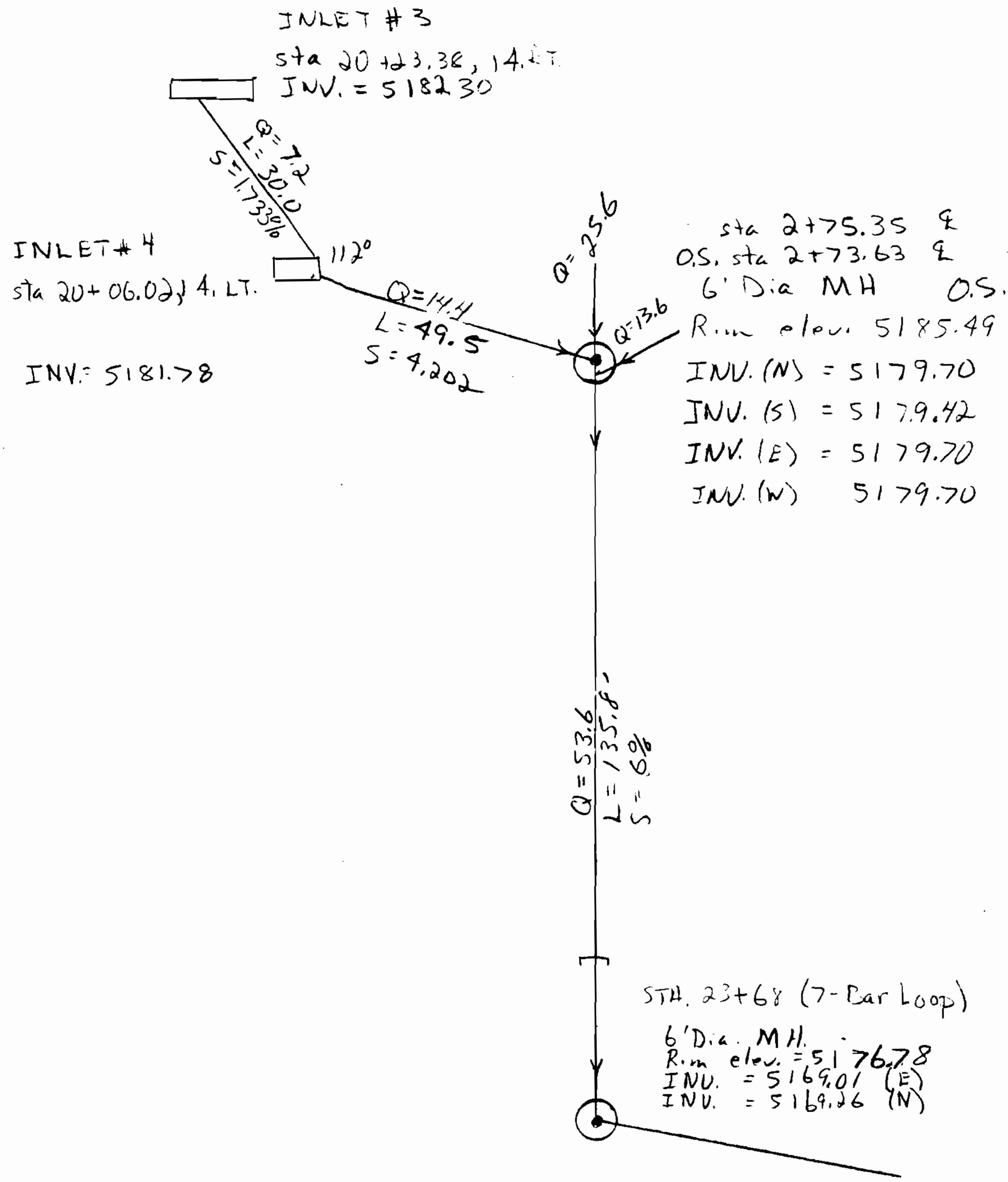
BOHANNAN-HUSTON INC.

PROJECT NAME ______ SHEET ______ OF ______

PROJECT NO. ______ BY JCA DATE 4-13-95

SUBJECT ______ CH'D ______ DATE ______

FLOW CHART FOR HYDRO GRADE LINE FOR INLETS 3 & 4



BOHANNAN-HUSTON INC.

PROJECT NAME 7-Bar North SHEET ______ OF ______
PROJECT NO. 94250.42 BY JCA DATE 12-12-94
SUBJECT TRACT 8 Storm Drain CH'D ______ DATE ______

***** HYDRAULIC GRADE LINE CALCULATIONS ***** 04/12/95

FROM:: MH @ STA. 23+68 10' RT. (7-BAR RD.)
TO:: INLET #3 STA. 20+23.38 14' RT. AND INLET #4 STA. 20+06.02, 14' LT. (TRACT 8 LOOP RD.)

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+68	MH								0.00	0.00		0.00	0.00	0.00	0.00	0.00	5170.93	5171.36	5175.78	1.85	5172.78	5173.21
		30	53.6	4.91	10.92	410	0.0171	170.00			2.90					2.90						
19+62, 21'LT	MH								6.00	79.00		0.26	2.10	0.00	0.02	2.39	5174.26	5177.47	5185.49	1.03	5176.11	5178.50
		18	14.4	1.77	8.15	105	0.0188	49.50			0.93					0.93						
20+06, 14LT	INLET #4								0.00	112.00		0.13	0.00	0.00	0.00	0.13	5178.40	<u>5179.30</u>	5184.95	0.26	5179.43	5179.56
		18	7.2	1.77	4.07	105	0.0047	30.00			0.14					0.14						
20+23, 14'RT	INLET #3								0.00	0.00		0.00	0.00	0.00	0.00	0.00	5179.44	<u>5179.70</u>	5184.97	0.00	5179.70	5179.70
		18									0.00					0.00						

MANNINGS n 0.013

8HGL #3AND #4

THESE H.G.L. ELEVS. ARE BELOW THE INVERT OF THEIR RESPECTIVE PIPES. THEREFORE I USED THE HEIGHT OF H_2O IN THE PIPE AS THE HYDRO GRADE LINE.
SEE CULVERT.OUT SPREAD SHEETS.

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

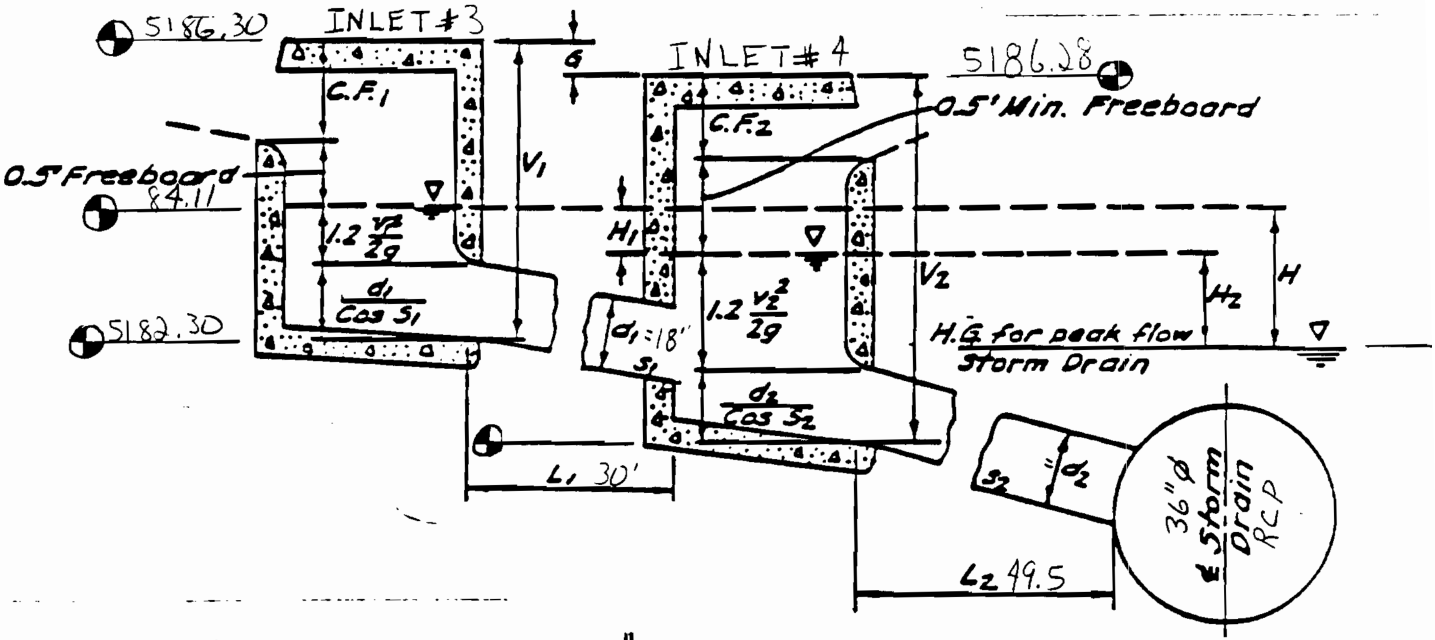
Dia. 3	Dia. 3 Angle	Δ	Ht(inc.)	Ht(dec.)	Actual Slope	Invert Elev.	Depth
0.0	0	0.0000	0.0000	0.0000		5169.26	6.52
					0.0600	10.20	
1.5	79	2.9175	0.0000	0.0238		5179.70	5.79
					0.0420	2.08	
0.0	0	0.0000	0.0000	0.0000		5181.78	3.17
					0.0173	0.52	
0.0	0	0.0000	0.0000	0.0000		5182.30	2.67

INLET #3 BASIN DEPTH = 1.33 + 2.67 = **4.00**

INLET #4 BASIN DEPTH = 1.33 + 3.17 = **4.50**

8HGL #3 AND #4

CATCH BASIN DEPTH
TRACT-8



$Q_1 = 7.2$

$A_{18} = 1.77$

$Vel = Q/A = 4.07$

$1.2\frac{V^2}{2g} = .31$

$V_1\ min = 1.33 + .31 + 1.5 = 3.2'$

Depth Provided = 4.0'

INV. = 5182.30

$H_1 = \left(\frac{Q_1}{K_1}\right)^2 L_1 = \left(\frac{7.2}{105}\right)^2 30 = .14'$

$Q_2 = 7.2$

$A_{18} = 1.77$

$H_2 = \left(\frac{Q_2}{K_2}\right)^2 L = \left(\frac{14.4}{105}\right)^2 49.5 = .93$

$Vel_2 = \left(\frac{Q_2}{A}\right) = 8.14$

$1.2\frac{V_2^2}{2g} = 1.23$

~~$V_2\ min = 1.33 + H_1 + 1.2\frac{V_2^2}{2g} + d_2 - G$~~

$V_2\ min = 1.33 + .14 + 1.2 + 1.5 - .02 = 4.18$

V_2 provided = 4.5' INV = 5181.78

$FB_2 = V_2 - D_2 - 1.2\frac{V_2^2}{2g} - .88$

$FB_2 = 4.5 - 1.5 - 1.23 - .88 = .89' > .5$ ✓

$V_2 - .5 \overset{?}{>} V_1 - G$

$4.5 - .5 > 4 - .02$ OK ✓

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

$5186.30 - 1.33 > 5187.07$ ✓

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

$5186.28 - 1.33 > 5187.18$ ✓

SEE 8HGL #3 & 4 Spread Sheet and CUL8_18A.out Spread Sheet for the Determination of HGL elevations.

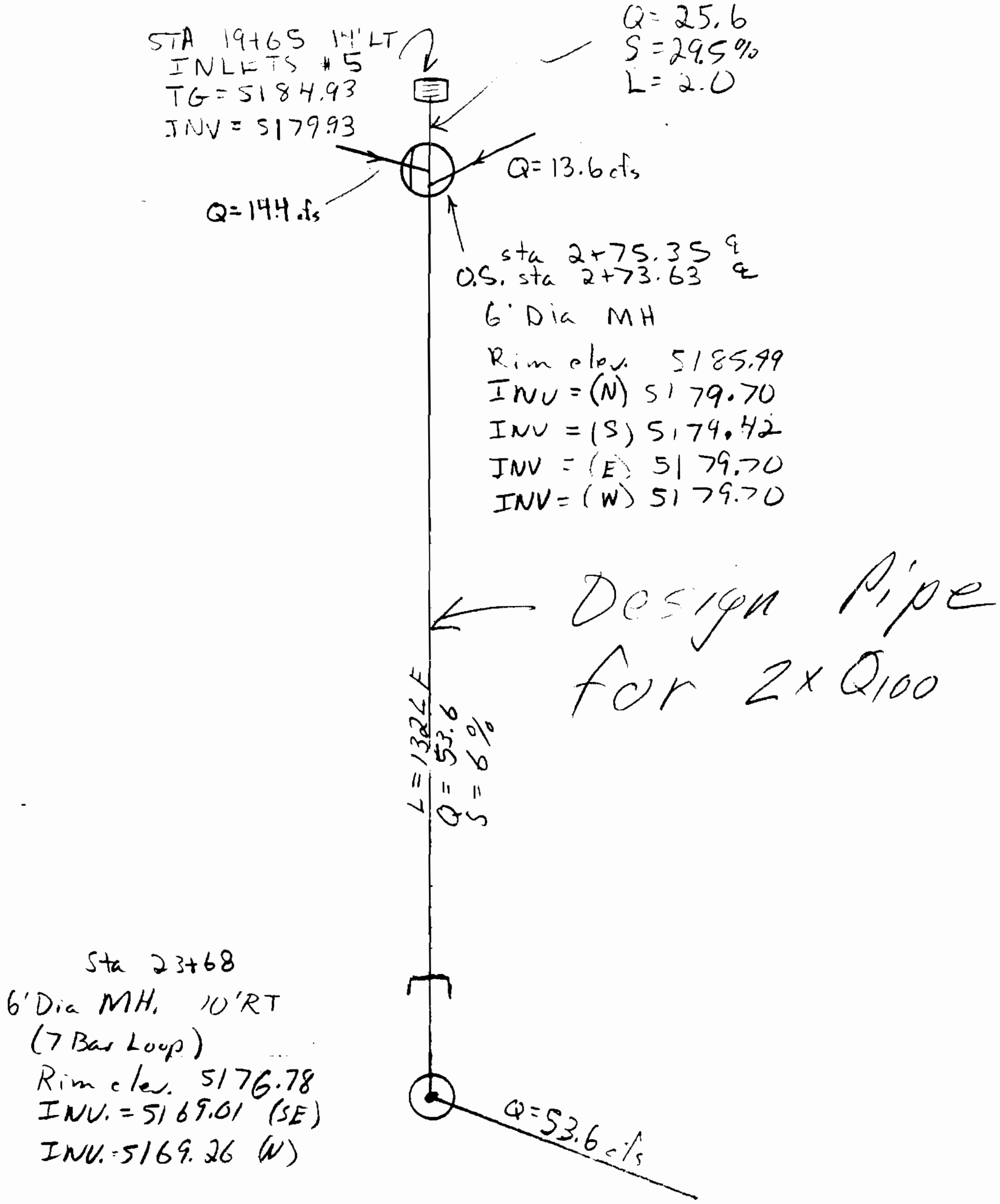
BOHANNAN-HUSTON INC.

PROJECT NAME ____ SHEET ____ OF ____

PROJECT NO. ____ BY JCA DATE 4-13-95

SUBJECT ____ CH'D ____ DATE ____

FLOW CHART FOR HYDRO GRADE LINE FOR INLET #5



BOHANNAN-HUSTON INC.

PROJECT NAME 7-Bar North SHEET ____ OF ____
PROJECT NO. 94250.42 BY JCA DATE 12-12-94
SUBJECT TRACT 8 STORM DRAIN CH'D ____ DATE ____

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

04/12/95

FROM:: MH @ STA. 23+68 10' RT. (7-BAR RD.)
TO:: INLET #5 STA. 19+65 14' LT. (TRACT 8 LOOP RD.)

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+68	MH								0.00	0.00		0.00	0.00	0.00	0.00	0.00	5171.36	5171.36	5175.71	1.85	5173.21	5173.21
		30	53.6	4.91	10.92	410	0.0171	170.00			2.90					2.90						
19+62, 21LT	MH								6.00	0.00		0.00	1.30	0.00	0.00	1.30	5174.26	5176.99	5185.49	0.42	5176.11	5177.41
		30	25.6	4.91	5.22	410	0.0039	2.00			0.01					0.01						
19+65, 14LT	INLET #5								0.00	0.00		0.00	0.00	0.00	0.00	0.00	5177.00	5177.42	5184.~~48~~ .81	0.00	5177.42	5177.42
		30																				

MANNINGS n 0.013

8HGL #5

THESE H.G.L. ELEVS. ARE BELOW THE INVERT OF THEIR RESPECTIVE PIPES. THEREFORE I USED THE HEIGHT OF H_2O IN THE PIPE AS THE HYDRO GRADE LINE.
SEE CULVERT.OUT SPREAD SHEETS.

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

Dia. 3	Dia. 3 Angle	Δ	Ht(inc.)	Ht(dec.)	Actual Slope	Invert Elev.	Depth
0.0	0	0.0000	0.0000	0.0000		5169.26	6.45
					0.0600	10.20	
2.5	79	2.7283	0.0000	0.0000		5179.70	5.79
					0.2950	0.59	
0.0	0	0.0000	0.0000	0.0000		5180.29	4.52

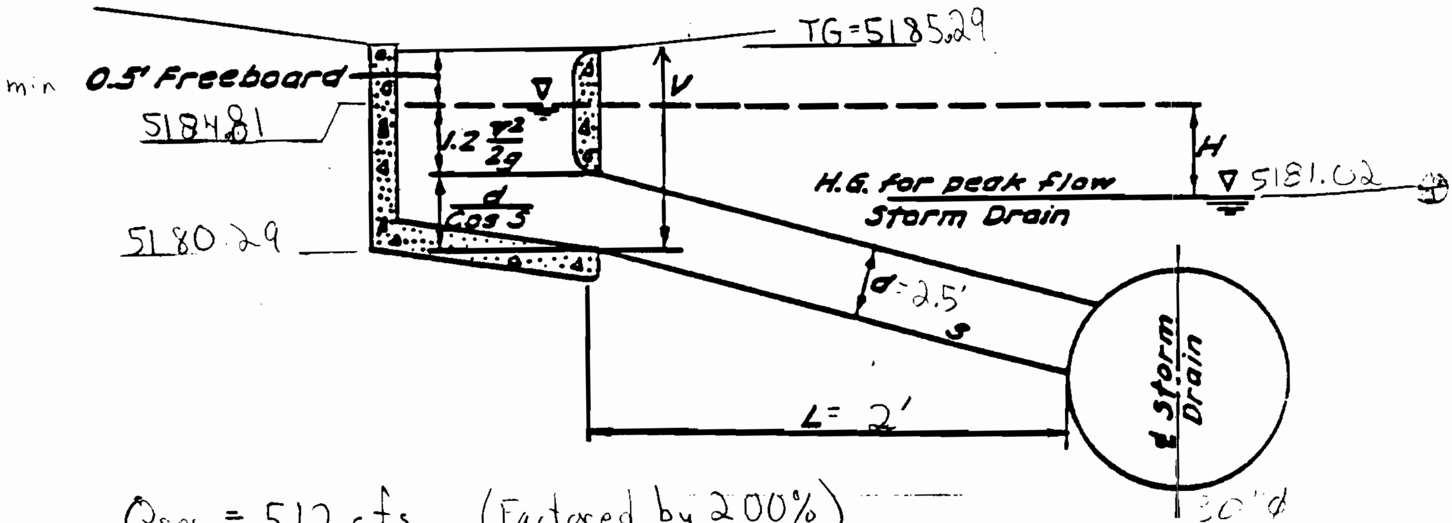
BASIN DEPTH= **5.02**

<u>8HGL #5</u>

CATCH BASIN DEPTH
TYPE 'D'

INLET #5

TC+36.00-.27=TG



Q_{DES} = 51.2 cfs (Factored by 200%)

A = 4.91 sf (30")

V = Q/A = 10.43 fps

$V_{min} = 1.2 \frac{V^2}{2g} = 2.02'$

Reqd. V = .5' + 2.02' + 2.5' = 5.02'

Depth provided = 5.00'

INV. = 5180.29'

See spread sheets: 2HGL#5 & cul3_30B... For the determination of the H.G.L. elevation

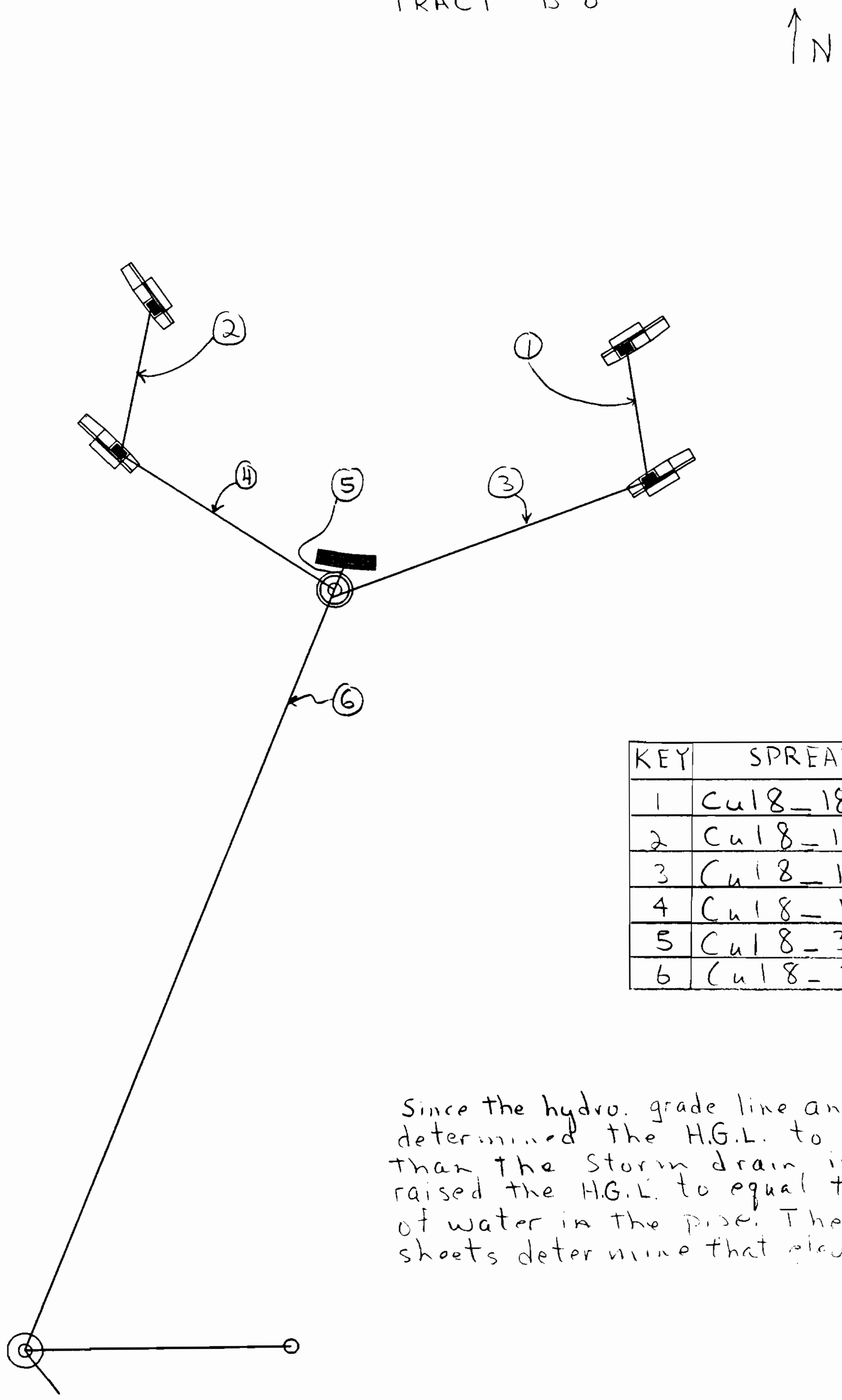
$TG - .5' \overset{?}{\geq} H.G.L$

$5185.29 - .5 \geq 5181.02$ OK ✓

BOHANNAN-HUSTON INC.

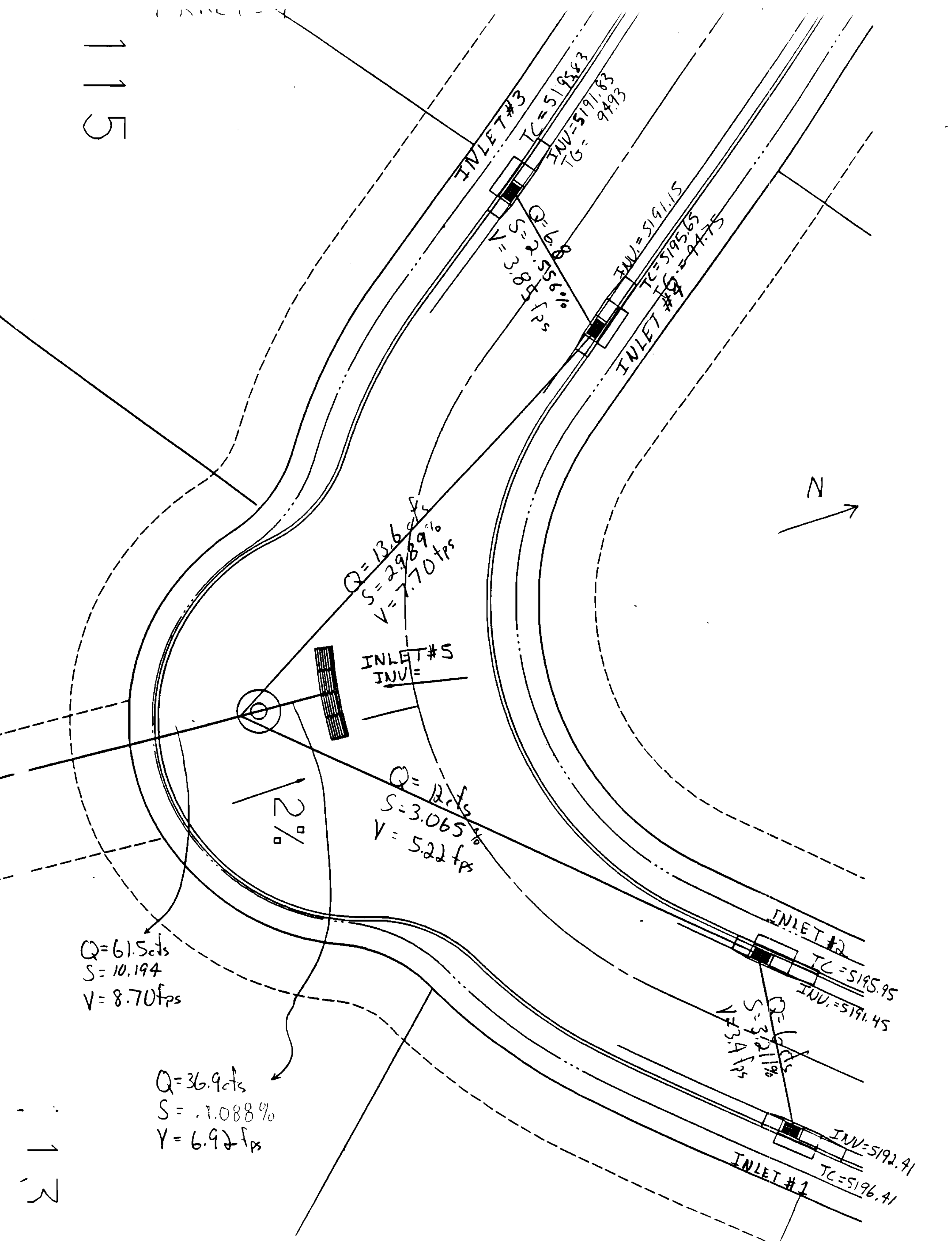
PROJECT NAME 7-Bar North SHEET ____ OF ____
PROJECT NO. 94250.42 BY JCA DATE 12-16-94
SUBJECT ____ CH'D ____ DATE ____

KEY TO CULVERT TABLES
TRACT B-8

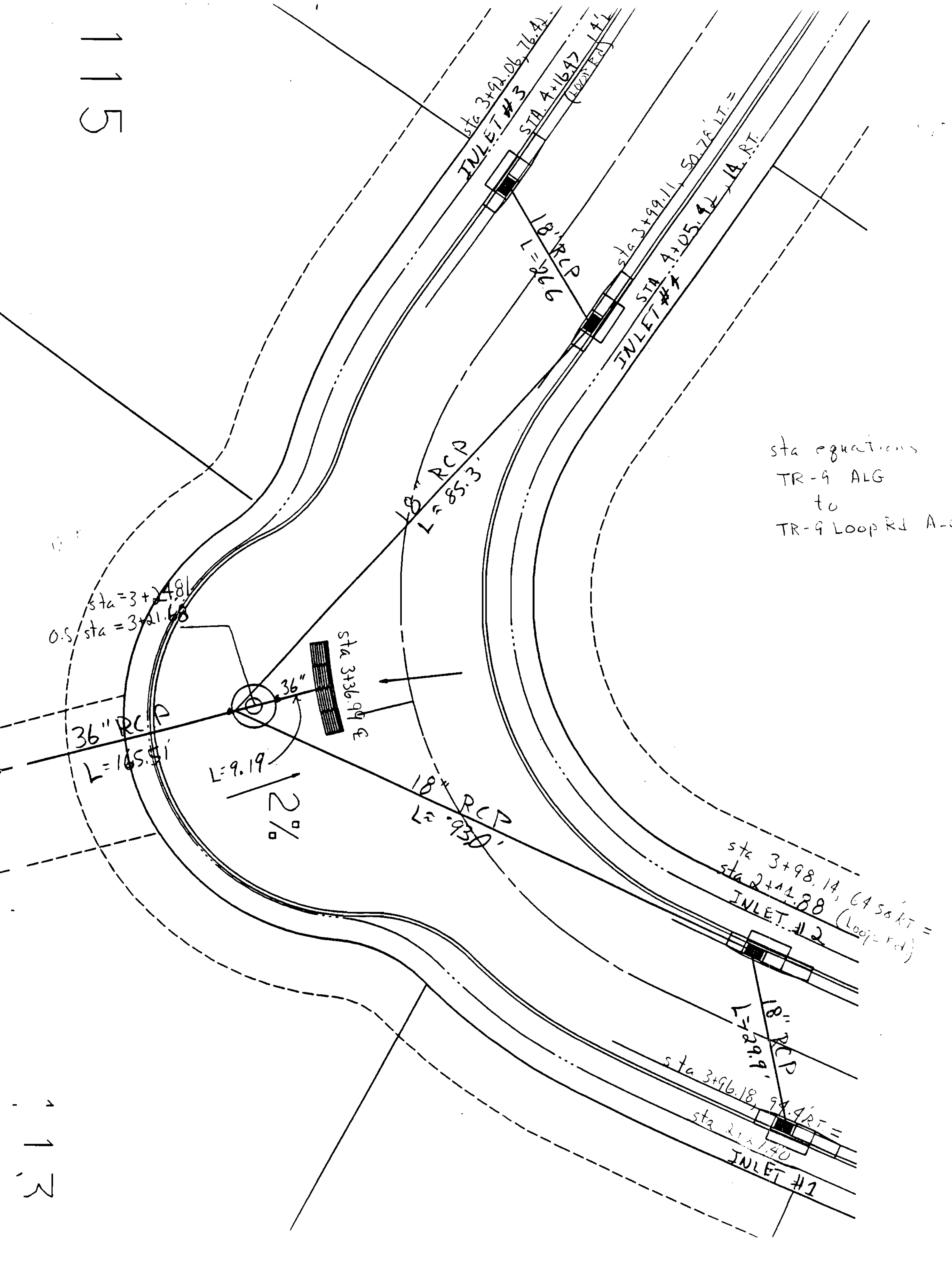


KEY	SPREADSHEET
1	Cul8_18A.out
2	Cul8_18B.out
3	Cul8_18C.out
4	Cul8_18D.out
5	Cul8_30B.out
6	Cul8_30A.out

Since the hydro. grade line analysis determined the H.G.L. to be lower than the Storm drain invert, I raised the H.G.L. to equal the Q_{100} height of water in the pipe. These spread sheets determine that elevation.


INLET #3
TC=5195.83
INV=5191.83
TG= 94.93
Q=6.8
S=2.556%
V=3.85 fps
INV=5191.15
TC=5195.65
TG=94.75
INLET #4
N
Q=13.6 cfs
S=2.989%
V=7.70 fps
INLET #5
INV=
12%
Q=12 cfs
S=3.065%
V=5.22 fps
Q=61.5cfs
S=10.194
V=8.70fps
Q=36.9cfs
S=1.088%
V=6.92fps
INLET #2
TC=5195.95
INV.=5191.45
V=3.4fps
INV=5192.41
TC=5196.41
INLET #1

115



sta 3+92.06, 76.4' L =
STA. A+16.47, 14' L
(Loop Rd)
INLET #3
18" RCP
L=26.6
sta 3+99.11, 50.78' LT. =
STA. A+05.42, 14' RT.
INLET #4
18" RCP
L=85.3'
sta equations
TR-9 ALG
to
TR-9 Loop Rd A-
sta =3+24.81
O.S. sta =3+21.68
sta 3+36.99 ℄
36"
36" RCP
L=165.51'
L=9.19
2%
18" RCP
L=93.0'
sta 3+98.14, 64.58' RT =
sta 2+11.88 (Loop Rd)
INLET #2
18" RCP
L=29.9'
sta 3+96.18, 94.4' RT =
sta 2+17.40
INLET #1

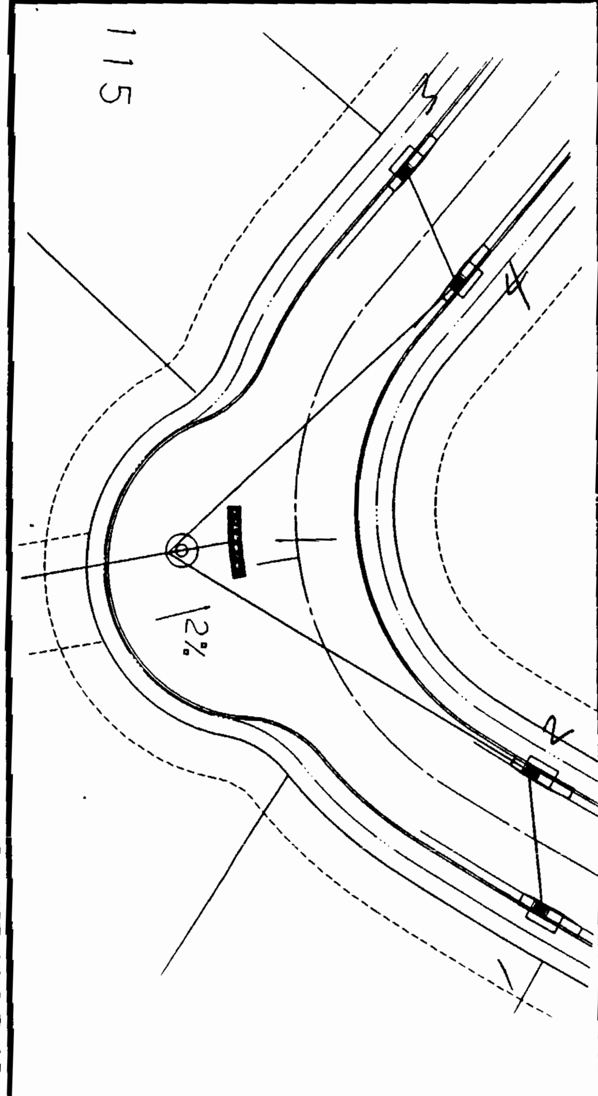
CATCH BASIN CALCULATION SHEET

Sht.___ of___

PROJECT ______________ CALCULATED BY __________

DESIGN FREQUENCY ______________ DATE __________

FLOW DIAGRAM (Indicate street slopes)



Sym.	Drain. Area	Q		Cap. of ½ Street	Gutter "d"	C.B.		Connector Pipe			V
		Total	Inter.			No.	Size	Head	L	Dia.	Depth
#1		12.0	6.0	23.8	.43'	1	A			1.5	4.0'
#2		12.0	6.0	23.8	.43'	1	A			1.5	4.5'
#3		19.3	6.8	29.0	.56'	1	A			1.5	4.0'
#4		19.3	6.8	29.0	.56'	1	A			1.5	4.5'
#5	X 200%	36.9	73.8	58.0		4	D				5.5'

STORM DRAIN DESIGN TRACT 9.

General Design — The low point of the loop road will have several Type 'D' inlets with no overflow allowed. Four type A catch Basins will be used two on each side of the type "Ds". (one on each side of the street).

STA. 2+27.40 14' LT. INLET # 1
TYPE 'A' CATCH BASIN

$\frac{1}{2}$ STREET FLOW = $\frac{1}{2}$ 24 cfs = 12 cfs

D = .43'
S = 2% > read: Q intercept = 6 cfs (NOMAGRAPH 6)

residual = 12 - 6 = 6 cfs

STA. 2+44.48 14' RT. INLET # 2
TYPE 'A' CATCH BASIN

$\frac{1}{2}$ STREET FLOW = $\frac{1}{2}$ 24 cfs = 12 cfs (NOMAGRAPH 6)

D = .43'
S = 2% > read: Q intercept = 6 cfs

residual = 12 - 6 = 6 cfs

STORM DRAIN DESIGN CONT.

STA. 4+16.47 14' LT. INLET #3

TYPE 'A' CATCH BASIN

$\frac{1}{2}$ STREET FLOW = $\frac{1}{2}$ 38.5 = 19.25 cfs

D = .56', S = 1% > read: $Q_{intercept}$ = 6.8 cfs (NOMAGRAPH 7)

residual = 19.25 − 6.8 = 12.45 cfs

STA. 4+05.42 14' RT. INLET #4

TYPE 'A' CATCH BASIN

$\frac{1}{2}$ STREET FLOW = $\frac{1}{2}$ 38.5 = 19.25 cfs

D = .56', S = 1% > read: $Q_{intercept}$ = 6.8 cfs (NOMAGRAPH 7)

residual = 19.25 − 6.8 = 12.45 cfs

Total Residual = 2 × (6 + 12.45) = <u>36.9 cfs</u>

Continued next page.

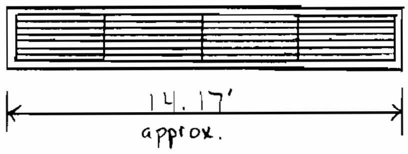
STORM DRAIN DESIGN CONT.

STA. 3+30.50 14' LT   INLETS #5

TYPE 'D' SUMP

$Q_{Design} = (36.9 \text{ cfs})\,2$ ← F.S. for no overflow (sump grates only)

$Q_D = 73.8 \text{ cfs}$



Capicity of Orfice : $Q = .6\, A_n \sqrt{2gh}$

Grates : $A_n = 4[31 \times 18.5/144] = 15.9 \text{ sf} \times 50\%$ clogging

$h = 0.83' + .18' = 1'$ @ Top of Right of Way

$Q = 0.6\,(15.9)\sqrt{64.4} = 76.7 \text{ cfs}$

$76.7 > 73.8$ OK ✓

7-Bar North
9425042
TR9 STORM DRAINS

JCA[3]   2-8-95

CHECK PIPE ORFICE CAPICITY

PIPE FROM INLETS @ TR9

Inlet	Dia	BASIN DEPTH
1	18"	4'
2	18"	4.5'
3	18"	4'
4	18"	4.5
5	36"	6'

18" PIPE:

$h = 4.5 + 1 - \frac{1.5}{2} = 4.75'$

$A = 1.77 \, sf$

$Q = .6\,(1.77)\sqrt{64.4\,(4.75)} = 18.6\,cf > (2)6.8 = 13.6$ OK ✓

36" PIPE:

$h = 6' + 1 - \frac{3}{2} = 5.5'$

$A = 7.07 \, sf$

$Q = .6\,(7.07)\sqrt{64.4\,(5.5)} = 79.8\,cfs$

$79.8\,cfs > 73.8\,cfs$ OK ✓

4-20-95

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)	Dia. 3
SIERRITA ROAD		42.00	163.40	9.62																			
10+09.58	MH								8.00	60.00		0.51	1.03	0.00	0.00	1.54	5141.67	5145.66	5151.94	2.02	5146.15	5147.69	2 *
		42	109.8	9.62	11.41	1006	0.0119	26.49			0.32					0.32							
10+32.91	MH								6.00	55.00		0.32	0.00	0.10	0.00	0.42	5145.98	5146.40	5152.71	2.02	5148.00	5148.42	0
		42	109.8	9.62	11.41	1006	0.0119	420.33			5.01					5.01							
14+50	MH								6.00	15.00		0.17	0.00	0.10	0.00	0.27	5151.40	5151.67	5155.40	2.02	5153.42	5153.69	0
		42	109.8	9.62	11.41	1006	0.0119	273.00			3.25					3.25							
** 17+23	MH								6.00	0.00		0.00	1.35	0.00	0.00	1.35	5154.92	5156.31	5156.73	1.98	5156.94	5158.29	2 *
		36	79.8	7.07	11.29	667	0.0143	130.00			1.86					1.86							
18+50	MH								4.00	15.00		0.16	0.00	0.00	0.00	0.16	5154.92	5155.13	5157.36	1.98	5156.94	5157.11	0
		36	79.8	7.07	11.29	667	0.0143	302.70			4.33					4.33							
21+50	MH								4.00	10.00		0.20	0.00	0.00	0.08	0.27	5159.46	5157.61	5164.02	4.10	5161.44	5161.71	0
		30	79.8	4.91	16.26	410	0.0379	203.15			7.69					7.69							
*** 23+51.34	MH								4.00	10.00		0.20	0.00	0.00	0.04	0.23	5165.30	5167.66	5176.55	1.98	5169.40	5169.64	0
		36	79.8	7.07	11.29	667	0.0143	56.30			0.81					0.81							
INFLOW	MH																						

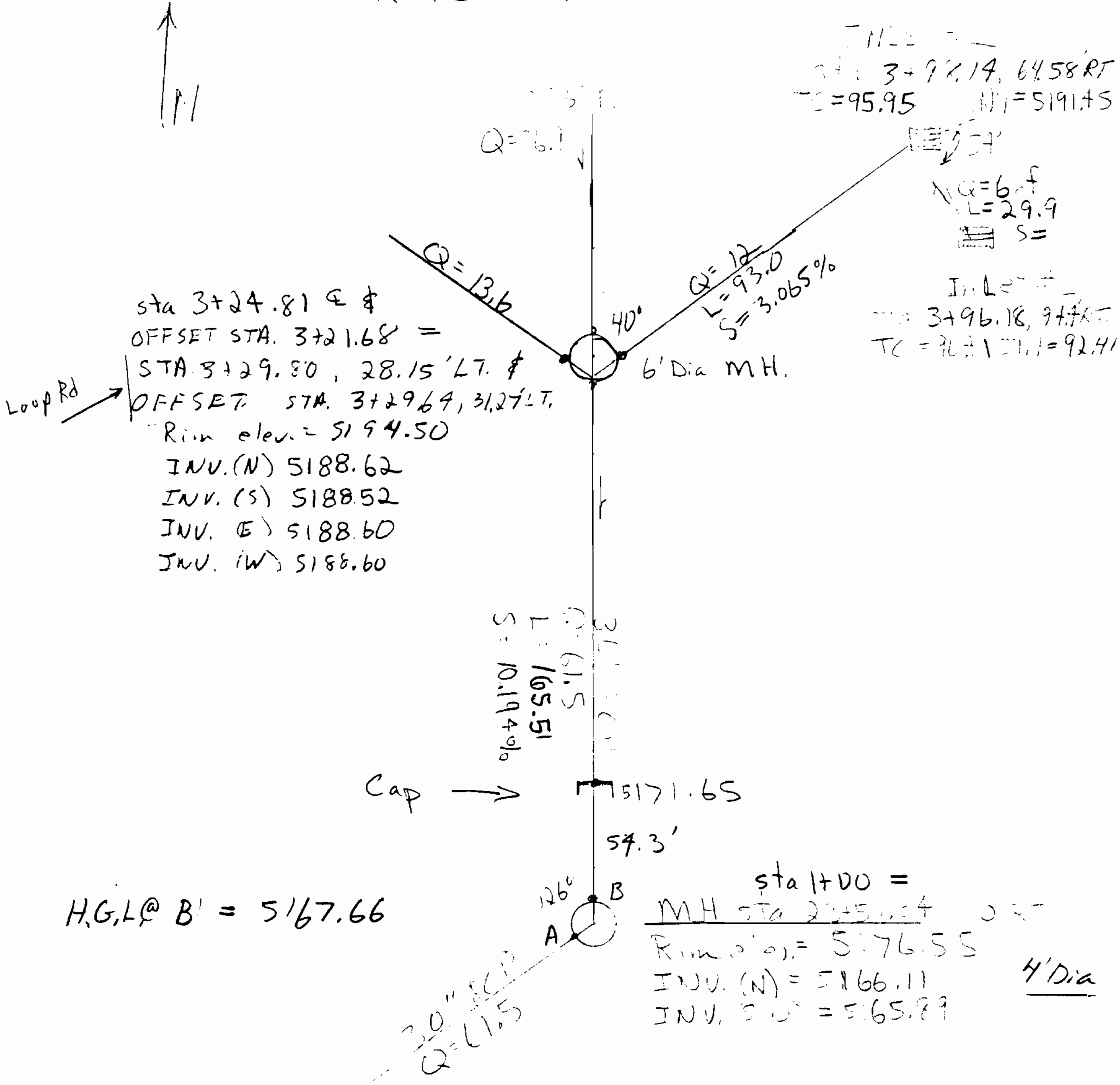
UP STREAM SIDE OF MH., SIERRITA RD. SD. for TR-9 outlet

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

** MANHOLE AT WHICH TRACT 7 RUNOFF TIES INTO SIERRITA STORM DRAIN

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

TRACT-9



94250.42 JCA 2-10-95
H.G.L. Inlets 1&2

***** HYDRAULIC GRADE LINE CALCULATIONS ***** 04/21/95

FROM:: MH @ STA. 23+51.34 10' RT. (SIERRITA RD.)
TO:: INLET #1 STA 2+27.40 14' LT. AND INLET #2 STA 2+44.88 14' RT. (TRACT 9 LOOP RD.)

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+51.34	MH								4.00	126.00		0.00	0.00	0.00	0.00	0.00	5165.30	5167.66	5176.55	1.18	5168.84	5168.84
		36	61.5	7.07	8.70	667	0.0085	220.90			1.88					1.88						
3+30, 28.1'LT	MH								6.00	40.00		0.12	0.93	0.00	0.01	1.06	5169.54	5171.06	5194.50	0.72	5170.71	5171.78
		18	12.0	1.77	6.79	105	0.0131	93.00			1.21					1.21						
2+45, 14RLT	INLET #2								0.00	54.00		0.06	0.00	0.00	0.00	0.06	5172.27	5172.87	5194.62	0.18	5172.99	5173.05
		18	6.0	1.77	3.40	105	0.0033	29.90			0.10					0.10						
2+26.7, 14LT	INLET #1								0.00	0.00		0.00	0.00	0.00	0.00	0.00	5172.97	5173.15	5195.08	0.00	5173.15	5173.15
		18									0.00					0.00						

MANNINGS n 0.013

THESE H.G.L. ELEVS. ARE BELOW
THE INVERT OF THEIR RESPECTIVE
PIPES. THEREFORE I USED THE
HEIGHT OF H_2O IN THE PIPE
AS THE HYDRO. GRADE LINE.
SEE CULVERT.OUT SPREAD SHEETS.

9HGL #1& #2

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

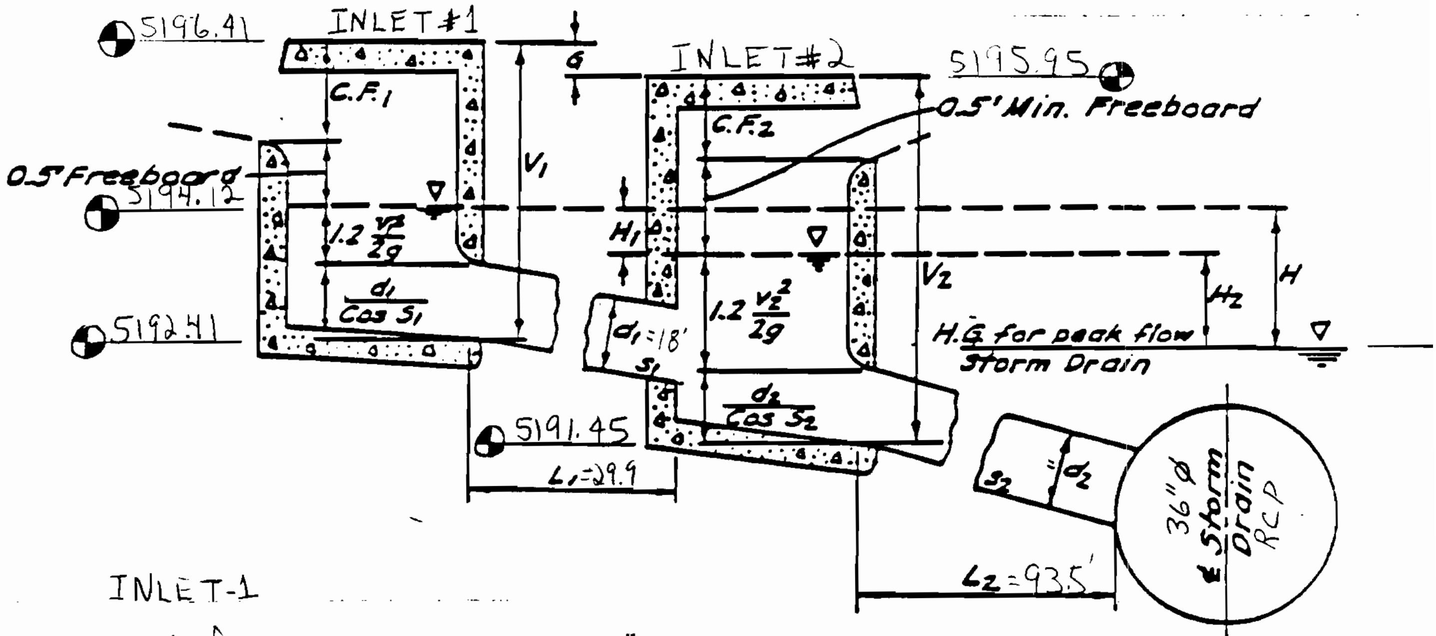
Dia. 3	Dia. 3 Angle	Δ	Ht(inc.)	Ht(dec.)	Actual Slope	Invert Elev.	Depth
0.0	0	0.0000	0.1175	0.0000		5166.11	10.44
					0.1019	22.52	
3.0	40	1.3866	0.0000	0.0113		5188.60	5.90
					0.0307	2.85	
0.0	0	0.0000	0.0000	0.0000		5191.45	3.17
					0.0321	0.96	
0.0	0	0.0000	0.0000	0.0000		5192.41	2.67

INLET #1 BASIN DEPTH = 1.3 2.67 = **4.00**
INLET #2 BASIN DEPTH = 1.3 3.17 = **4.50**

9HGL #1& #2

CATCH BASIN DEPTH

TRACT-9



INLET-1

$Q_1 = 6 cfs$

$A_{18} = 1.77 sf$

$Vel = Q/A = 3.39 fps$

$1.2 \frac{V^2}{2g} = .21$

$V_1 \min = 1.33 + .21 + 1.5 = 3.04$

Depth Provided = 4.0'

INV. = 5192.41

$H_1 = \left(\frac{Q_1}{K_1}\right)^2 L_1 = \left(\frac{6}{105}\right)^2 (30) = 0.10'$

$Q_2 = 6+6 = 12 cfs$

$A_{18} = 1.77$

$H_2 = \left(\frac{Q_2}{K_2}\right)^2 L = \left(\frac{12}{105}\right)^2 (93.5) = 1.22'$

$Vel_2 = \left(\frac{Q_2}{A}\right) = \frac{12}{1.77} = 6.78 fps$

$1.2 \frac{V_2^2}{2g} = .86'$

$V_2 \min = 1.33 + H_1 + 1.2 \frac{V_2^2}{2g} + d_2 - G$

$V_2 \min = 1.33 + .10 + .86 + 1.5 - .46 = 3.33$

V_2 provided = 4.5' INV = 5191.45

$FB_2 = V_2 - D_2 - 1.2 \frac{V_2^2}{2g} - .83$

$FB_2 = 4.5 - 1.5 - .86 - .83 = 1.31 > .5$ OK

$V_2 - .5 \overset{?}{>} V_1 - G$

4' > 3.54 OK✓

$TC - 1.33 \overset{?}{\geq} HGL$

5196.04 − 1.33 > 5192.33

(see ... C:9_18Cout) ✓

$TC - 1.33 \overset{?}{\geq} HGL$

5196.43 − 1.33 > 5192.99

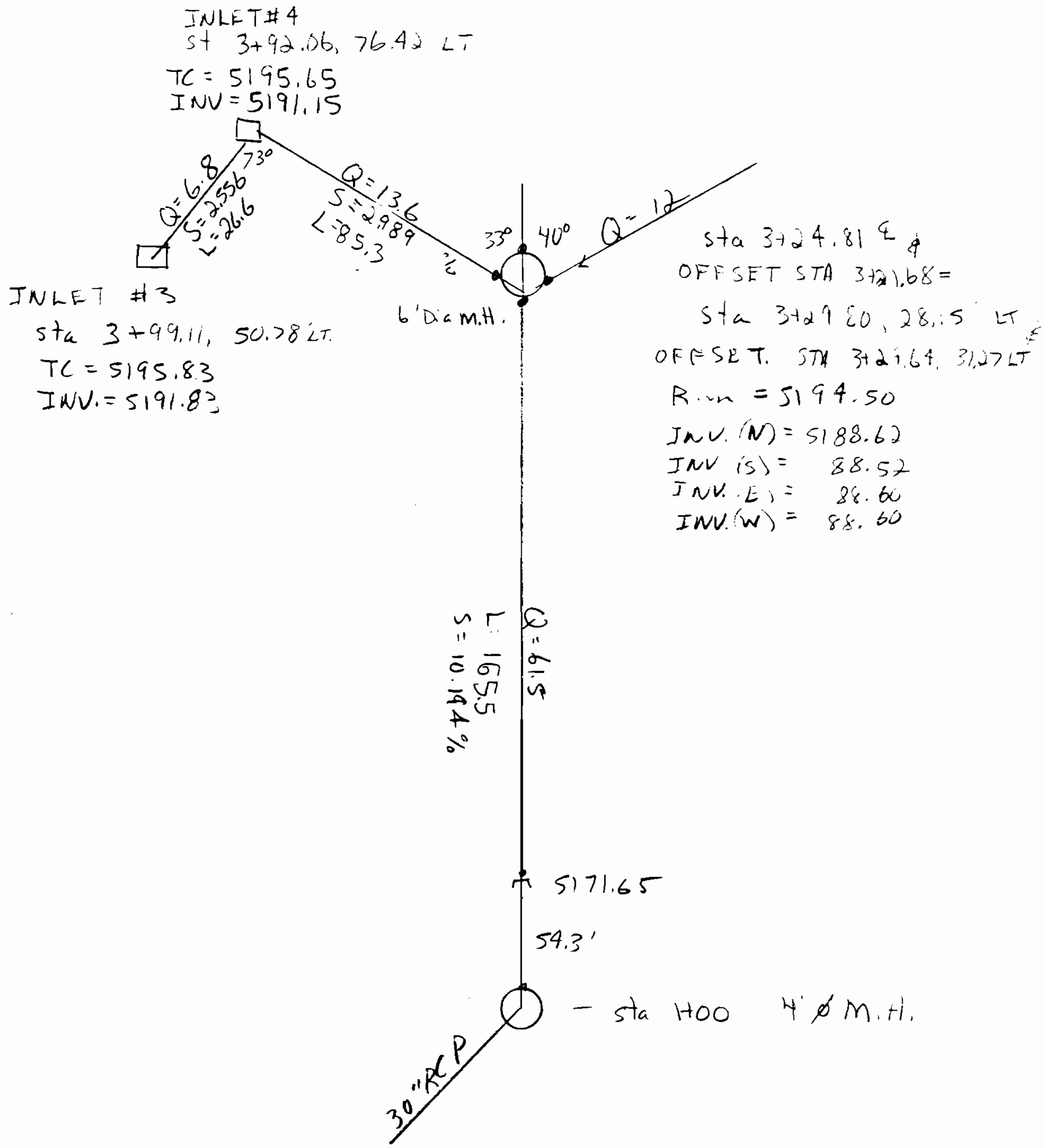
(see ... C:19_18A.out) ✓

BOHANNAN-HUSTON INC.

PROJECT NAME ______ SHEET ______ OF ______

PROJECT NO. ______ BY JCA DATE 4-14-95

SUBJECT ______ CH'D ______ DATE ______



9425043 JCA 4-19-95

H.G.L @ Inlets 3&4

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

04/21/95

FROM:: MH @ STA. 23+51.34 10' RT. (SIERRITA RD.)
TO:: INLET #3 STA 4+16.47 14' LT. AND INLET #4 STA 4+05.42 14' RT. (TRACT 9 LOOP RD.)

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+51.34	MH								4.00	126.00		0.00	0.00	0.00	0.00	0.00	5165.30	5167.66	5176.55	1.18	5168.84	5168.84
		36	61.5	7.07	8.70	667	0.0085	220.90			1.88					1.88						
3+30, 28.1'LT	MH								6.00	33.00		0.13	0.93	0.00	0.00	1.06	5169.54	5170.86	5194.50	0.92	5170.71	5171.78
		18	13.6	1.77	7.70	105	0.0168	85.30			1.43					1.43						
4+05, 14RLT	INLET #4								0.00	73.00		0.09	0.00	0.00	0.00	0.09	5172.29	**5173.07**	5194.32	0.23	5173.20	5173.30
		18	6.8	1.77	3.85	105	0.0042	26.60			0.11					0.11						
4+16.5, 14LT	INLET #3								0.00	0.00		0.00	0.00	0.00	0.00	0.00	5173.18	**5173.41**	5194.50	0.00	5173.41	5173.41
		18									0.00					0.00						

MANNINGS n 0.013

THESE H.G.L. ELEVS. ARE BELOW THE INVERT OF THEIR RESPECTIVE PIPES. THEREFORE I USED THE HEIGHT OF H_2O IN THE PIPE AS THE HYDRO. GRADE LINE.
SEE CULVERT.OUT SPREAD SHEETS.

9HGL #3& #4

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

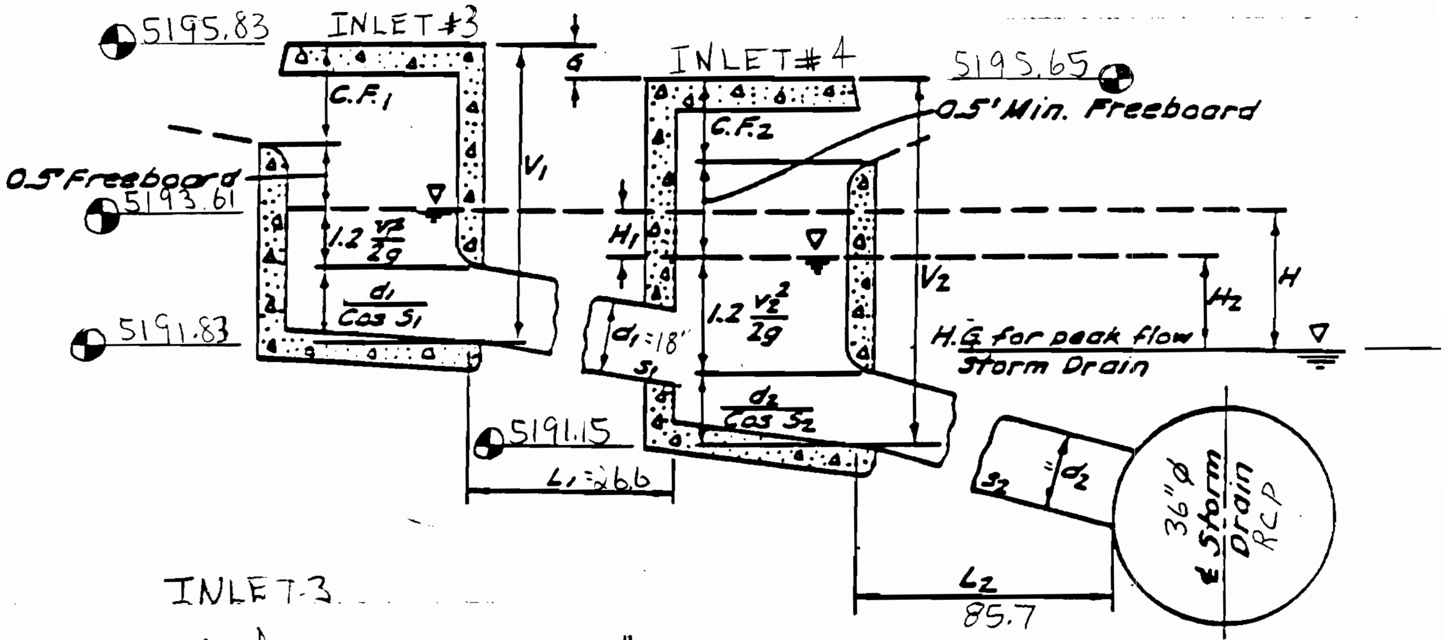
Dia. 3	Dia. 3 Angle	Δ	Ht(inc.)	Ht(dec.)	Actual Slope	Invert Elev.	Depth
0.0	0	0.0000	0.1175	0.0000		5166.11	10.44
					0.1019	22.52	
3.0	33	1.1878	0.0000	0.0031		5188.60	5.90
					0.0299	2.55	
0.0	0	0.0000	0.0000	0.0000		5191.15	3.17
					0.0256	0.68	
0.0	0	0.0000	0.0000	0.0000		5191.83	2.67

INLET #3 BASIN DEPTH = 1.3 2.67 = **4.00**
INLET #4 BASIN DEPTH = 1.3 3.17 = **4.50**

9HGL #3& #4

CATCH BASIN DEPTH

TRACT - 9



INLET 3

$Q_1 = 6.8$ cfs

$A_{18} = 1.77$

$Vel = Q/A = 3.84$ fps

$1.2 \frac{V^2}{2g} = .28'$

V_1 min $= 1.33 + .28 + 1.5 = 3.1'$

Depth Provided $= 4.0'$

INV. = 5191.83

$H_1 = \left(\frac{Q_1}{K_1}\right)^2 L_1 = .12'$

$Q_2 = 6.8 + 6.8 = 13.6$ cfs

$A_{18} = 1.77$

$H_2 = \left(\frac{Q_2}{K_2}\right)^2 L = 1.44'$

$Vel_2 = \left(\frac{Q_2}{A}\right) = 7.68$ fps

$1.2 \frac{V_2^2}{2g} = 1.10'$

V_2 min $= 1.33 + H_1 + 1.2 \frac{V_2^2}{2g} + d_2 - G$

V_2 min $= 1.33 + .12 + 1.10 + 1.5 - .18 = 3.87$

V_2 provided $= 4.5'$ INV = 5191.15

$FB_2 = V_2 - D_2 - 1.2 \frac{V_2^2}{2g} - .83$

$FB_2 = 4.5 - 1.5 - 1.1 - .83 = 1.07' > .5'$ ok

$V_2 - .5 \overset{?}{>} V_1 - G$

$4' > 3.82'$ OK ✓

TC − 1.33 $\overset{?}{\geq}$ H.G.L.

5195.61 − 1.33 > 5192.12

(see spreadsheet Cu19_14B.wk)

TC − 1.33 $\overset{?}{\geq}$ H.G.L.

5195.83 − 1.33 > 5192.04

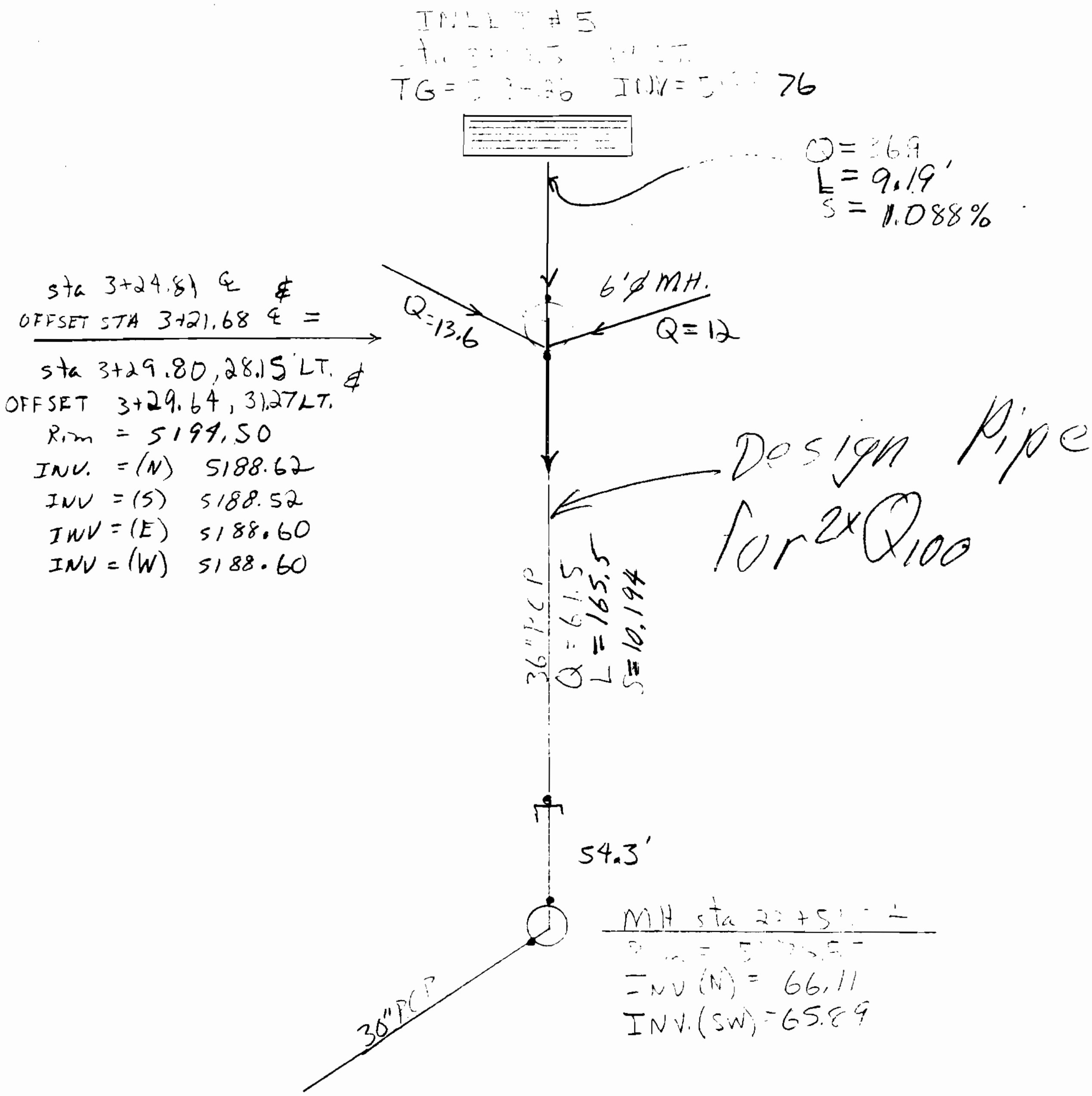
(see spreadsheet Cu19_18A.wk)

BOHANNAN-HUSTON INC.

PROJECT NAME ____ SHEET ____ OF ____

PROJECT NO. ____ BY JCA DATE 4-15-95

SUBJECT ____ CH'D ____ DATE ____



94250.42
HGL Inlet 5

JCA 2-10-95

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

04/21/95

FROM:: MH @ STA. 23+51.34 10' RT. (SIERRITA RD.)
TO:: INLET #5, STA 3+30.5, 14' LT. (TRACT 9 LOOP RD.)

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+51.34	MH								4.00	126.00		0.00	0.00	0.00	0.00	0.00	5165.30	5167.66	5176.55	1.18	5168.84	5168.84
		36	61.5	7.07	8.70	667	0.0085	219.80			1.87					1.87						
3+30,28.1LT	MH								6.00	0.00		0.00	0.39	0.00	0.00	0.39	5169.53	5170.35	5194.50	0.74	5170.70	5171.10
		36	48.9	7.07	6.92	667	0.0054	9.19			0.05					0.05						
3+30.5, 14LT	INLET #5								0.00	0.00		0.00	-0.74	0.00	0.00	-0.74	5170.40	5170.40	5193.~~76~~ .72	0.00	5171.15	5170.40
		36									0.00					0.00						

MANNINGS n 0.013

9HGL #5

THESE H.G.L. ELEVS. ARE BELOW THE INVERT OF THEIR RESPECTIVE PIPES. THEREFORE I USED THE HEIGHT OF H_2O IN THE PIPE AS THE HYDRO GRADE LINE.
SEE CULVERT.OUT SPREAD SHEETS.

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

Dia. 3	Dia. 3 Angle	Δ	Ht(inc.)	Ht(dec.)	Actual Slope	Invert Elev.	Depth
0.0	54	0.0000	0.1175	0.0000		5166.11	10.44
					0.1019	22.41	
3.0	35	0.8254	0.0000	0.0000		5188.62	5.88
					0.0109	0.10	
1.5	41	-6.0011	0.0000	0.0000		5188.72	5.00

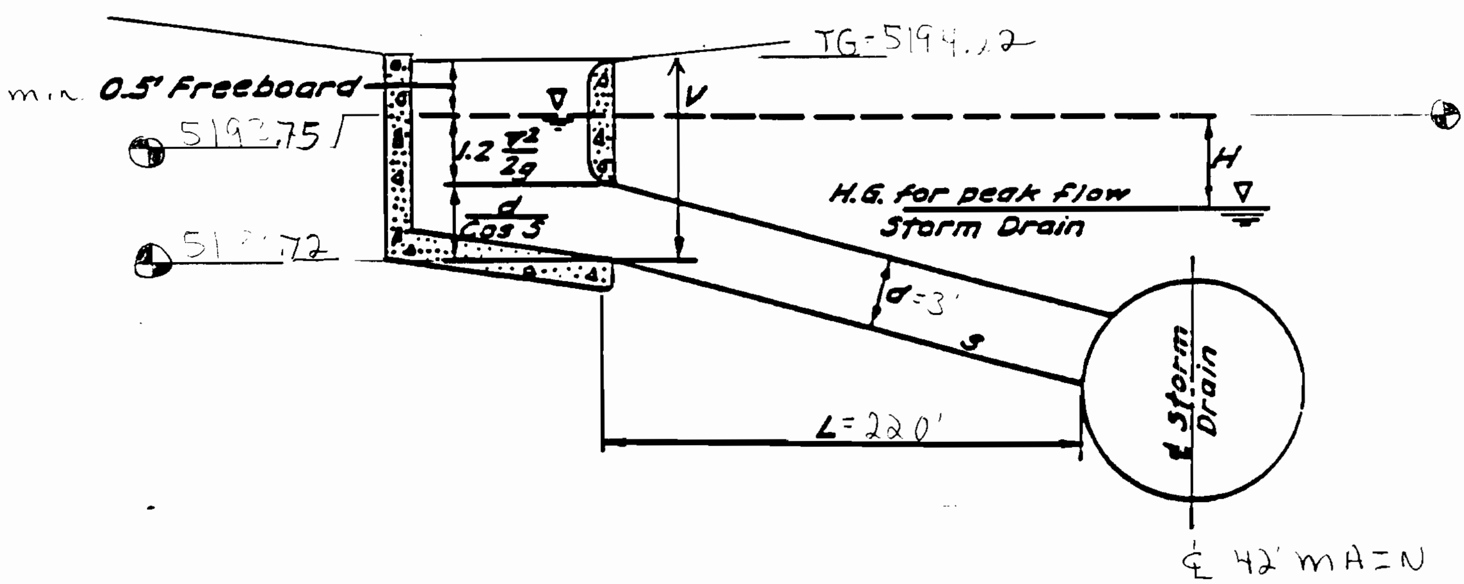
INLET #5 BASIN DEPTH = 0.5+5.00 = **5.50**

9HGL #5

CATCH BASIN DEPTH
TYPE D

INLET #5

TG = TC - 8½



$Q_{Des} = 73.8$ cfs

$A_{pipe} = 7.07$

$V = Q/A = 10.44$ fps

$V_{min} = 1.2 \frac{v^2}{2g} = 2.03$

Reqd. $V = .5' + 2.03 + 3.0' = 5.53'$

Depth Provided = 5.5'

INV. = 5___.72

H.G.L. = 5190.18

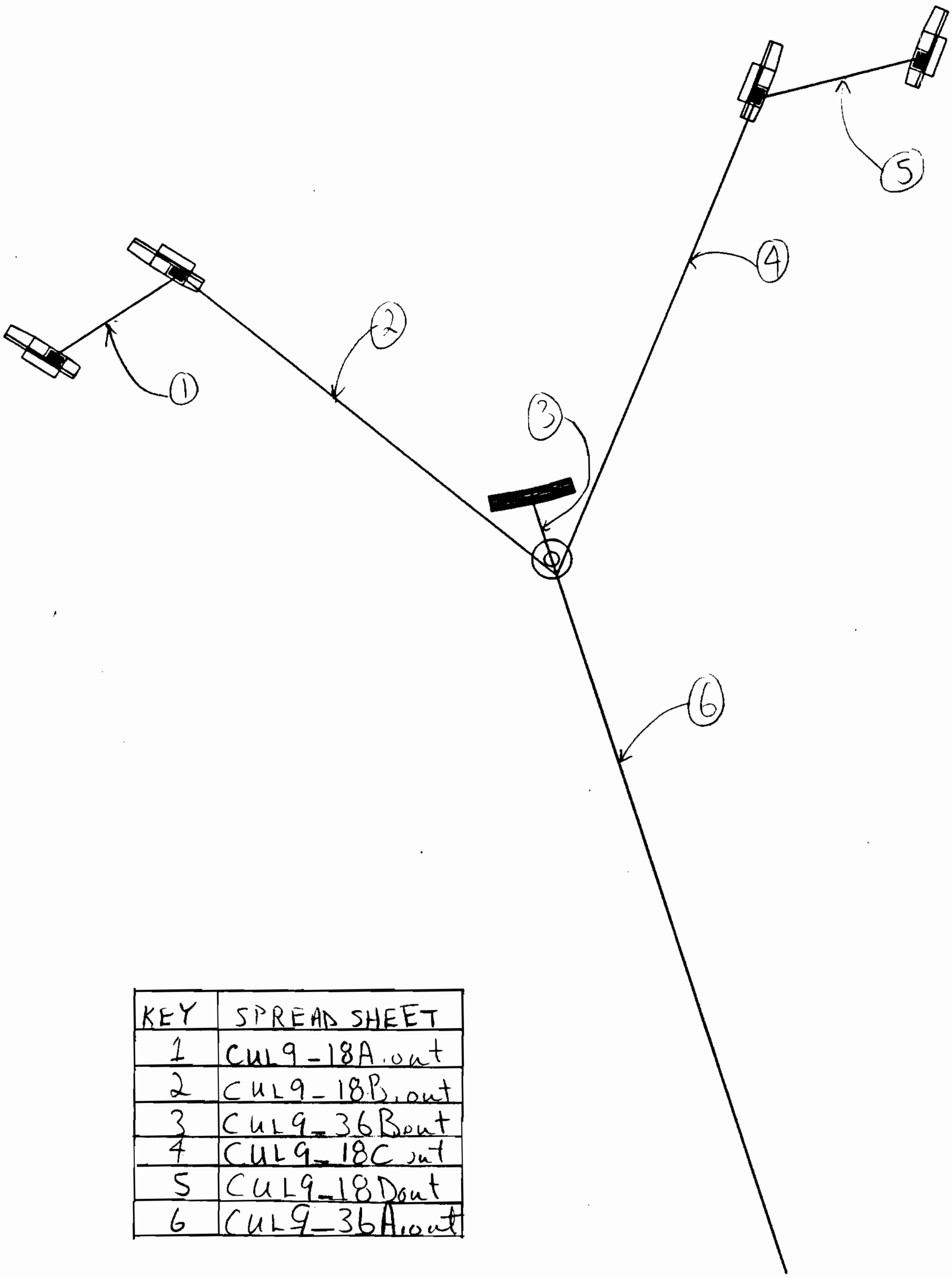
TG - .5' $\overset{?}{\geq}$ H.G.L.

5194.22 - .5 > 5190.14 ✓

also see spread sheet
CUL9_36B.out

BOHANNAN-HUSTON INC.

PROJECT NAME 7-Bar North SHEET ____ OF ____
PROJECT NO. 94250.42 BY JCA DATE 2- -95
SUBJECT ____ CH'D ____ DATE ____



KEY	SPREAD SHEET
1	CUL9_18A.out
2	CUL9_18B.out
3	CUL9_36B.out
4	CUL9_18C.out
5	CUL9_18D.out
6	CUL9_36A.out

THESE SPREAD SHEETS WILL DETERMINE NORMAL WATER DEPTH GIVEN A FLOW AND SLOPE OF A PIPE.

TREATMENT OF EXISTING FLOWS AFTER UNIT 7 IS DEVELOPED.

(I.)

A. EAST SIDE DETENTION POND:

1. THE UPSTREAM UNDEVELOPED BASINS (E-3 and 61% of E-2) HAVE THE FOLLOWING CHARACTERISTICS:

AREA = 19.0 + .61 (29.9) = 37.2 AC

~~100% TREATMENT A = ZONE 1 =~~

Calculate t_c

$L_1 = 1300'$ $S_1 = 6\%$ $K = .7$ $V_1 = 1.71$

$L_2 = 800$ $S_2 = 3\%$ $K = 3$ $V_2 = 5.20$

$$t_c = \left(\frac{1300}{1.71} + \frac{800}{5.20}\right)\frac{1}{3600} = .25 \text{ hr}$$

$$I = 0.726 \times \log(24.6 \times .25) \times \frac{1}{.25} \times 1.87$$ ← P_{60} eqn A-12

$I = 4.31$

$E = .44$

$C = .27$

$Q = CIA = 43.3$ cfs

$$V_{100} = \frac{.44}{12}(37.2) = 1.36 \text{ AC-FT}$$

BOHANNAN-HUSTON INC.

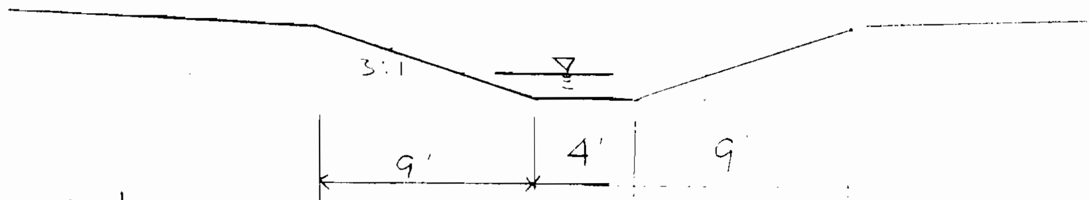
PROJECT NAME ______ SHEET 1 OF ______
PROJECT NO. ______ BY JCA DATE 2-25-95
SUBJECT Detention Pond above Unit 7 CH'D ______ DATE ______

Convey Basin E-3 [illegible] by [illegible]
[illegible] 4 with Unit #2.

The remaining flow (43.3 − 23.7 = 19.[illegible])
will also be conveyed by a earthen
swale running adjacent to the
North Eastern [illegible] of the [illegible]
unit 7.

- The slope will equal 2%
- mannings 'n' = 0.030

To keep velocity in swale < 8 fps [illegible]
The swale dimension as figure [illegible]



$Q = 19.4$ cfs
$Vel_{100} = 4.5$ fps
>2' free board all points

see [illegible] stream output.

[RP-EAST SWALE].out

2.
JCA 2-25-95

Conveyed Flow E. Swale

I B. SEDIMENT POND (EAST SIDE)

PROVIDE A SEDIMENTATION, DETENTION POND ABOVE THE NORTH EAST CORNER OF UNIT-7. IT WILL ACCEPT FLOWS FROM BASIN E-3 and 61% of E-2. Flow will DISCHARGE INTO THE STORM DRAIN IN SIERRITA RD.

~~$Vol = 1.36\ AC\text{-}FT = 59{,}240\ ft^3$~~

$Q = 43.3\ cfs$

ASSUME FLOWS ENTER AN ORFICE CONTROLLED 18" OUTLET THAT ENTERS INTO THE S.D. MANHOLE AT 23+51.34 10' RT. (SIERRITA RD.)

POND IS SIZED ON SETTLING VELOCITY (V_s)

ASSUME:
- DESIGN PARTICLE: VERY FINE SAND (D=0.06mm)
- 100% REMOVAL OF DESIGN PARTICLE FOR 10 YR ST.
- V_s = 0.009 fps FOR VERY FINE SAND

SURFACE AREA = $SA = (1.2)(Q_{10})/V_s$

WHERE $Q_{10} = 9.4$ cfs $\Rightarrow V_{10} = \frac{E_{10}}{12}(A) = \frac{.08}{12}(37\ldots) = \ldots5$ AC

$SA = (1.2)(9.4)/0.009 = 1255$ SF

ASSUME POND LENGTH = 3X POND WIDTH = 3W

OR (3W) W = 1255 SF

W = 21'

L = 63'

BOHANNAN-HUSTON INC.

PROJECT NAME ______ SHEET 4- OF ______

PROJECT NO. ______ BY JCA DATE 2-26-95

SUBJECT ______ CH'D ______ DATE ______

I 2.B SEDIMENT POND BASED ON SEDIMENT STORAGE

PROVIDE A SEDIMENTATION POND

- FROM USLE SPREAD SHEET (ATTACHED), THE AVERAGE ANNUAL SEDIMENT YIELD FOR BASINS 61% E-2 + E3 IS 540CY or 14,580CF

ASSUME MAXIMUM SEDIMENT STORAGE DEPTH = 3′
MINIMUM SETTLING DEPTH = 1′

USING SA = 1255 SF FROM PREVIOUS PAGE. WHERE THE VOLUME IS A FUNCTION OF THE DEPTH Z.

BOTTOM AREA = 21×63 = 1323 SF
TOP AREA = (1323 + 504Z + 36Z² ← (21+6Z)(63+6Z)

$$Volume = \frac{(BOTTOM\ A) + (TOP\ A)}{2} Z = 14580CF$$

$$Volume = 1323 Z + 252 Z^2 + 18 Z^3$$

FOR SEDIMENT VOLUME = 14580 ⇒ Z = 5′ No Good

ENLARGE POND : TRY (35′ x 100′)

$$Vol = 3500 Z + 405 Z^2 + 18 Z^3 = 14580\ cf$$

Solving for Z = 3.0′ ✓ OK

POND VOLUME METRICS:

FROM SITE GEOMETERY

PRELIMINARY
35 x 100

3:1 slopes

POND INVERT = 5173.0
POND TOP = 5179.0
POND DEPTH = 5.0
POND VOLUME = 39468

Vol. IN = 59240 + 14580
= 73820 CF

Qin = 43.3 cfs

BOHANNAN-HUSTON INC.

PROJECT NAME ______ SHEET 5 OF [illegible]
PROJECT NO. ______ BY JCA DATE 2-28-95
SUBJECT ______ CH'D ______ DATE ______

Pond Volumeterics (Cont.)

For A Pond: $V_{ponded} = \left(\frac{V_{TOTAL}}{Q_{in}^2}\right) Q_{out}^2 - (Duration) Q_{out} + V_{TOTAL}$

where $Duration = \frac{2 V_{TOTAL}}{Q_{in}} = \frac{2(73820)}{43.3} = 3410.0$ sec.

so $39468 = \left(\frac{73820}{(43.3)^2}\right) Q_{out}^2 - (3410) Q_{out} + 73820$

or: $39.37\, Q_{out}^2 - 3410\, Q_{out} + 34352$

$Q_{out} = 11.6$ cfs To maintain pond Volumetrics

ORIF CONTROL:

1.) ASSUME 18" OUTLET

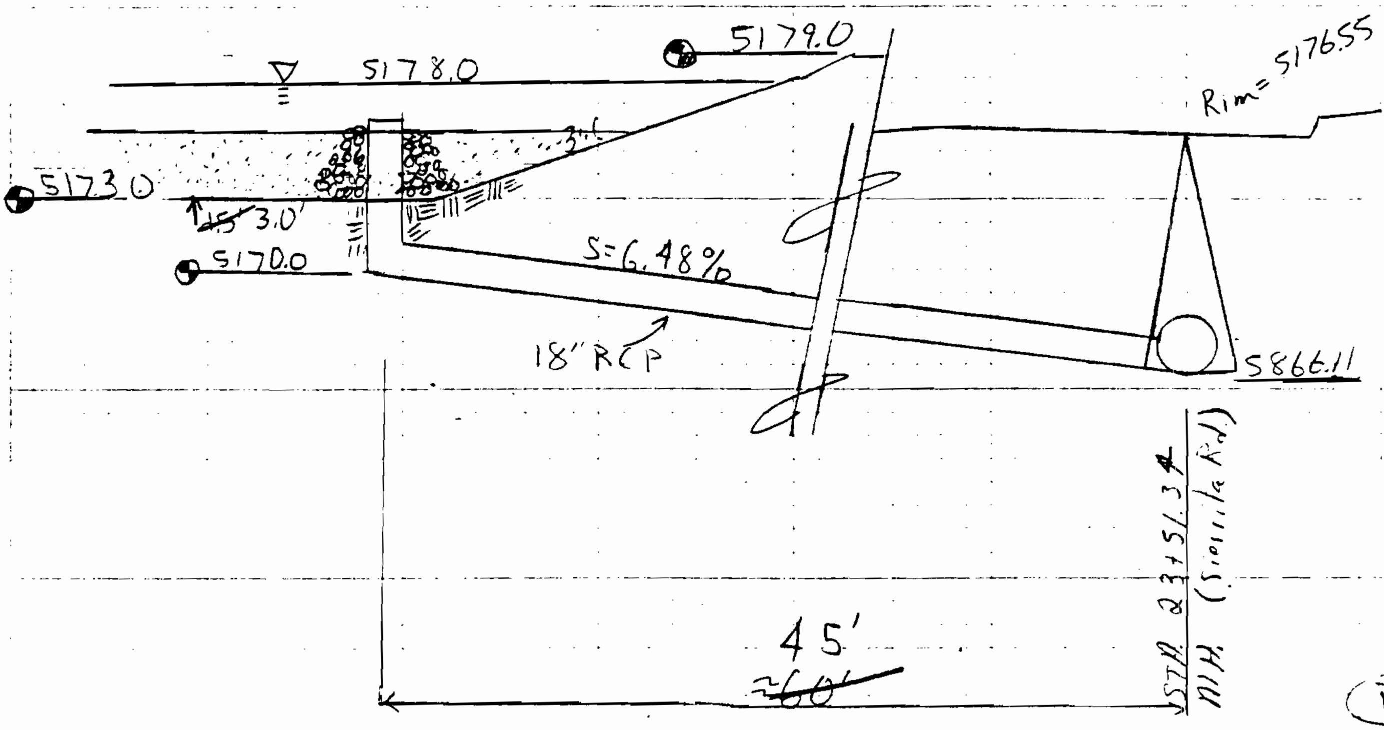
IF $Q = 0.6\, A \cdot \sqrt{2gh}$

$h = Q^2 / .72 (A^2) g = \frac{11.6^2}{.72(1.77)^2 g} = 1.9'$

Pond Depth available for water = 6 - 3 = 3.0

3.0' > 1.9' OK

Connection from Stand Pipe to S.D.



P6

II A. WEST SIDE DETENTION POND:

1. THE UPSTREAM UNDEVELOPED BASIN (85% of E-1) HAS THE FOLLOWING CHARACTERISTICS:

AREA = 20.1 AC
100% TREATMENT 'A' ZONE 1

CALCULATE t_c

$L_1 = 800'$ $S_1 = 6\%$ $K = .7$ $V_1 = 1.71$
$L_2 = 500'$ $S_2 = 3\%$ $K = 3$ $V_2 = 5.20$

$t_c = \left(\frac{800}{1.71} + \frac{500}{5.20}\right)\frac{1}{3600} = .16\,hr < .2$ USE .2 hr

$I = 4.70$

$E = .44$ in

$C = .27$

$Q = CIA = 25.5$ cfs

$V_{100} = \frac{.44}{12}(20.1) = .74$ AC-FT

JCA 2-25-95

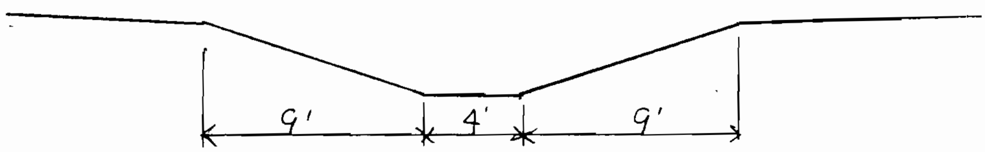
CONVEY BASIN (85% E-1) FLOW BY EARTHEN SWALE WHICH IS TO BE BUILT WITH THE UNIT-7 DEVELOPMENT. THE SWALE WILL RUN ADJACENT TO THE NORTH-WEST EDGE OF TR-7. THERE IS ANOTHER SWALE THAT WILL BE BUILT WITH THE UNIT 4-5-6 DEVELOPMENT. IT WILL RUN AJACENT TO (EAST SIDE) OF 7 BAR LOOP RD. AND TERMINATE AT The POND. (see TRACTS 4-5-6 DRAINAGE REPORT FOR ITS CALCS.

NORTH WEST SWALE:

Slope = 3%
n = 0.030

TO KEEP VEL IN SWALE < 8 fps use THE SWALE DIMENSIONS BELOW.

ALSO SEE SPREAD SHEET FOLLOWING PAGE



Q = 25.5 cfs
V_{100} = 5.45 cfs
> 1'-10" free board at all points

see attached stream output

8

JCA 2-25-95

II

1.B. SEDIMENT POND (WEST SIDE)

PROVIDE A SEDIMENTION, DETENTION POND ABOVE THE NORTH WEST CORNER OF UNIT-7. IT WILL ACCEPT FLOW FROM 85% OF BASIN E1. FLOW WILL DISCHARGE INTO S.D. IN 7 BAR LOOP RD.

Vol = 0.74 AC-FT = 32235 ft^3

ASSUME FLOWS ENTER AN ORFICE CONTROLLED 18" OUTLET THAT ENTERS INTO THE S.D. MANHOLE AT 23+67.99 10'RT. (7 BAR LOOP ROAD)

POND IS SIZED ON SETTLING VELOCITY (V_s)

ASSUME: • DESIGN PARTICLE VERY FINE SAND (D = 0.06 mm)
- 100% REMOVAL OF DESIGN PARTICLE <u>FOR 10 YR ST.</u>
- V_s = 0.009 fps FOR VERY FINE SAND.

SURFACE AREA = SA = $(1.2)(Q_{10})/V_s$

where: Q_{10} = 5.05 cfs V_{10} = .13 AC-FT

SA = (1.2) (5.05) / 0.009 = 675 SF

ASSUME POND LENGTH = 3X POND WIDTH = 3W

OR 3W (W) = 675 SF

W = 15'
L = 45'

JCA 2-25-95

II 2B. SEDIMENT POND BASED ON SEDIMENT STORAGE

PROVIDE A SEDIMENTATION POND

- FROM USLE SPREAD SHEET (ATTACHED), THE AVERAGE ANNUAL SEDIMENT YIELD FOR 85% of BASIN E-1 IS 146.0 CY or 3942 CF

ASSUME MAXIMUM SEDIMENT STORAGE DEPTH = 1.5'

USING SA = 675 SF FROM PREVIOUS PAGE. WHERE THE VOLUME IS A FUNCTION OF THE DEPTH Z.

BOTTOM AREA = 15 x 45 = 675 SF

TOP AREA = (675 + 360 Z + 36 Z^2 ← (15+6Z)(45+6Z)

$$\text{Volume} = \frac{(\text{BOTTOM A}) + (\text{TOP A})}{2} Z = 3942 \text{ CF}$$

$$\text{Volume} = 675 Z + 180 Z^2 + 18 Z^3$$

FOR SEDIMENT VOLUME = 3942 CF ⇒ Z = 2.9' No Good

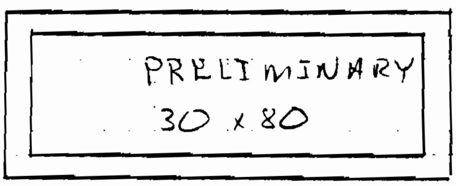
ENLARGE POND, TRY (30' x 80)

$$\text{Vol} = 2400 Z + 330 Z^2 + 18 Z^3 = 3942 \text{ CF}$$

Solving for Z = 1.4' ✓ OK

POND VOLUME METRICS:

FROM SITE GEOMETRY



3:1 slopes

POND INVERT = 5171.0
POND TOP = 5175.0
POND DEPTH = 4.0'
POND VOLUME = 16032 CF

Vol. IN = 32235 + 3942
= 36177.0 CF

Q_{in} = 25.5 cfs

BOHANNAN-HUSTON INC.

PROJECT NAME ______ SHEET 11 OF [illegible]
PROJECT NO. ______ BY JC# DATE 2-28-95
SUBJECT ______ CH'D ______ DATE ______

II. POND VOLUMETRICS

$$V_{pond} = \left(\frac{V_{TOTAL}}{(Q_{in})^2}\right) Q_{out}^2 - (\text{Duration})\, Q_{out} + V_{TOTAL}$$

where: $\text{Duration} = \frac{2 V_{TOTAL}}{Q_{in}} = \frac{2(36177)}{25.5} = 2837$ sec

so, $16032 = \left(\frac{36177}{25.5^2}\right)(Q_{out}^2) - (2837) Q_{out} + 36177$

or $0 = 556 Q^2 - 2837 Q + 20145$

$Q_{out} = 8.5'$ cfs

ORFICE CONTROL

1) ASSUME OUTLET = 18"

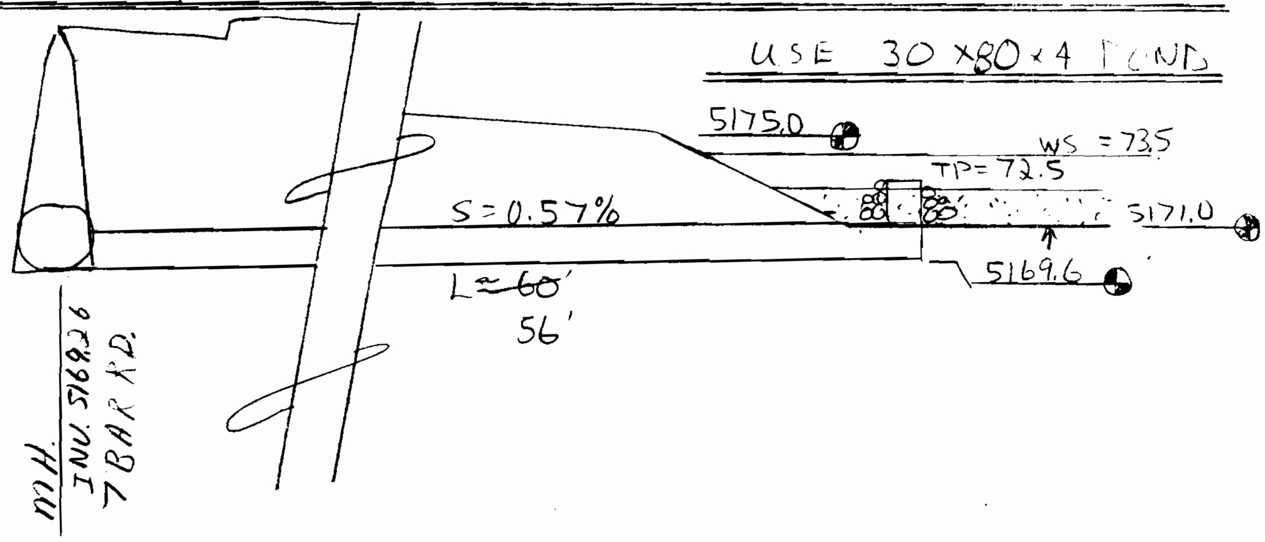
IF $Q = 0.6 A \sqrt{2gh}$

$h = Q^2 / .72 (A^2) g = \frac{8.5^2}{.72 (1.77)^2 g} = 1.0'$

Pond depth avalable for water = 4 - 1.4 = 2.6'

2.6 > 1.0' OK✓

USE A 18" ⌀ CMP STAND PIPE



12
JCA 2-28-95

TREATMENT OF EXISTING FLOWS AFTER UNIT 9 IS DEVELOPED.

III

A. OFFSITE BASIN E-3B DETENTION POND

BASIN E-3 HAS BEEN DIVIDED INTO 2 BASINS, E-3A, E3B. BASIN E-3A WILL FLOW INTO THE EXISTING CONCRETE LINED CHANNEL. HOWEVER E-3B WILL FLOW INTO A DETENTION POND. IT HAS THE FOLLOWING CHARACTERISTICS

$A = 8.9$ AC

100% TREATMENT A.   ZONE 1

Calculate t_c

$L_1 = 550'$ $S_1 = 6.5\%$ $K = .7$ $V_1 = 1.78'$

$L_2 = 100$ $S_2 = 1\%$ $K = 3$ $V_2 = 3.0'$

$t_c = \left(\frac{550}{1.78} + \frac{100}{3.00}\right) \frac{1}{3600} = .1hr < .2$ USE .2 hr

$I = 0.726 \times \left[\log(24.6 \times .2)\right]^{\frac{1}{.2}} \times 1.87$ eqn A-1

$I = 4.70$

$E = .44$

$C = .27$

$Q = CIA = 11.3$ cfs

$V_{100} = \frac{.44}{12}(8.9) = .33$ AC-FT

13
JCA   2-5-95

Detention Pond above Unit 7

III [illegible] (TO BE [illegible] B-9 [illegible])

PROVIDE A [illegible] TRADITIONAL DETENTION POND [illegible]
SOUTH WEST [illegible]
[illegible] BASIN [illegible] THE [illegible]
DISCHARGE INTO THE STORM DRAIN IN [illegible].

$E = .44$ $A = 8.9$ AC

$Vol = \frac{.44}{12} 8.9 = .33$ AC-FT $= 14215$ CF

$Q = 11.3$ cfs

ASSUME FLOWS ENTER AN ORIFICE CONTROLLED [illegible]
THAT ENTERS INTO THE S.D. MANHOLE AT [illegible]
(SIERRITA [illegible])

POND [illegible] BASED ON SETTLING VELOCITY ft/s

ASSUME: DESIGN PARTICLE: VERY FINE SAND ([illegible])
- 100% REMOVAL OF DESIGN PARTICLE [illegible] 10 YR [illegible]
- $V_s = 0.009$ ft/s For VERY FINE SAND

SURFACE AREA $= SA = (1.2)(Q_{10})/V_s$

WHERE $Q_{10} = 2.2$ cfs , $V_{10} = \frac{E_{10}}{12}(A) = \frac{.08}{12}(8.9) = 0.06$ AC-FT

$SA = (1.2)(2.2)/0.009 = 300$ SF

ASSUME POND LENGTH = 3X POND WIDTH [illegible]

OR $(3W)W = 300$

$W = 10'$

$L = 30$

JCA 2-28-95

III 2B. SEDIMENT POND BASED ON SEDIMENT STORAGE

PROVIDE A SEDIMENTATION POND

- FROM USLE SPREAD SHEET (ATTACHED), THE AVERAGE ANNUAL SEDIMENT YIELD FOR BASIN E-3B IS 32.8 CY ~~886~~ CF

ASSUME MAXIMUM SEDIMENT STORAGE DEPTH = 1.5'

USING SA = 300 SF FROM PREVIOUS PAGE. WHERE THE VOLUME IS A FUNCTION OF THE DEPTH Z.

BOTTOM AREA = 10 × 30 = 300 SF

TOP AREA = $(300 + 240 Z + 36 Z^2)$ ← $(10+6Z)(30+6Z)$ w 3:1 slopes

$$\text{Volume} = \frac{(\text{BOTTOM A}) + (\text{TOP A})}{2} Z = 886 \text{ CF}$$

$$\text{Volume} = 300 Z + 120 Z^2 + 18 Z^3 = 886 \text{ CF}$$

FOR SEDIMENT VOLUME = 886 CF ⇒ Z = 1.7' No Good

ENLARGE POND TRY (20 × 35)

$$\text{Vol} = 700 Z + 165 Z^2 + 18 Z^3 = 886 \text{ CF}$$

Solving for Z = 1.0' ✓ OK

POND VOLUME METRICS:

FROM SITE GEOMETERY

POND INVERT = 5174.5

POND TOP = 5178.0

POND DEPTH = 3.5

POND VOLUME = 5243 CF

PRELIMINARY
20 × 35

3:1 slopes

Vol. IN = 14215 + 886
= 15101 cF

Q_{in} = 11.3 cfs

BOHANNAN-HUSTON INC.

PROJECT NAME ______ SHEET 4.15 OF 17

PROJECT NO. ______ BY JCA DATE 2-28-95

SUBJECT ______ CH'D ______ DATE ______

Pond Volumeterics (Cont.)

For A Pond: $V_{ponded} = \left(\frac{V_{TOTAL}}{Q_{in}^2}\right) Q_{out}^2 - (Duration) Q_{out} + V_{TOTAL}$

where $Duration = \frac{2 V_{TOTAL}}{Q_{in}} = \frac{2(15101)}{11.3} = 2673$ sec.

so $5243 = \left(\frac{15101}{(11.3)^2}\right) Q_{out}^2 - (2673) Q_{out} + 15101$

or: $118.3 Q_{out}^2 - 2673 Q_{out} + 9858 = 0$

$Q_{out} = 4.6$ cfs To maintain pond Volumetrics

ORFICE CONTROL

1) ASSUME OUTLET = 18" Ø

IF $Q = .6 A \sqrt{2gh}$

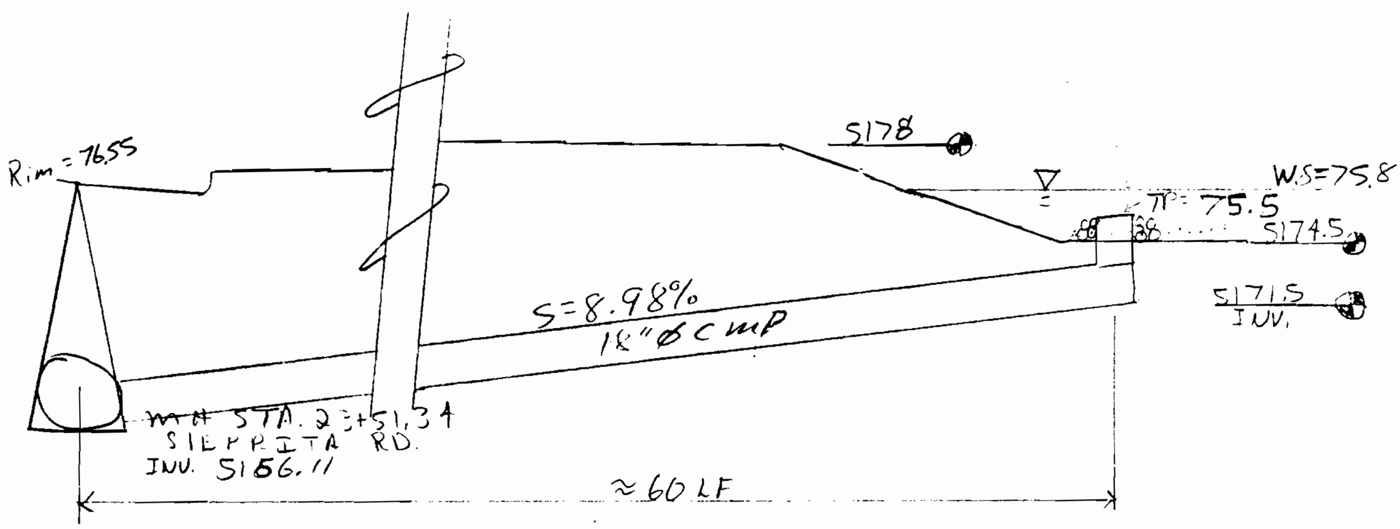
$h = Q^2 / .72 (A^2) g = \frac{4.6^2}{.72 (1.77)^2 g} = 0.3'$

Pond Depth Available for water 3.5 - 1 = 2.5'

2.5 > .3' OK ✓ (2' FREE BOARD)

USE: 20×35×3.5 POND

18" CMP STANDPIPE / 18" Connector Pipe



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JCA 2-22-15

MODIFIED UNIVERSAL SOIL LOSS EQUATION
struct:[jca.hydro]musle.wk4

DESCRIPTION	VARIABLE	UNIT			
BASIN			E-3 and 61% E-2	85% E-1	E-3B
Drainage Area	DA	Sq. Mi.	0.058	0.031	0.014
Storm Runoff	V	Acre-ft	0.248	0.134	0.060
Peak Flow	Qp	cfs	9.400	5.050	2.200
Slope	S	Ft/Ft	0.050	0.050	0.060
Slope Angle	THETA	Radians	0.050	0.050	0.060
	L	Feet	400.000	400.000	400.000
Coefficient for LS Equation	n		0.400	0.400	0.400
Rainfall	R		457.814	229.016	91.699
Soil Erodability*	K		0.280	0.280	0.280
Slope Length Factor	LS		0.899	0.899	1.131
Cover*	C		0.170	0.170	0.170
Support Practice Factor	P		1.000	1.000	1.000
Sediment Yield	A	Tons/Acre	19.601	9.805	4.936
		Tons	728.846	197.046	44.225
		Cy	**539.886**	**145.960**	**32.759**

Estimated Soil Unit Weight (Lbs/Cf) = 100