EXCERPTS FROM RIO RANCHO SAD DRAINAGE REPORT

ENGINEERING STUDY

FOR

PROPOSED

SPECIAL ASSESSMENT DISTRICT NO. 3

RIO RANCHO, NEW MEXICO

PREPARED BY:

WILSON & COMPANY, ENGINEERS & ARCHITECTS

JANUARY 1986
REVISED FEBRUARY 1986
(85-539)

WILSON & COMPANY
ENGINEERS
ARCHITECTS

INTRODUCTION

The City of Rio Rancho has engaged Wilson & Company to prepare a study of required drainage improvements, any change in sanitary sewerage system and required street improvements that would be incorporated within the proposed Special Assessment District No. 3. The limits of the proposed paving district are shown on Figure 1. The limits of the drainage improvements are shown on Figure 2.

The drainage section identifies the drainage basins, the estimated storm water flows and the means of conveyance of the storm water flows.

The sanitary sewerage section evaluates the soil type, depth of groundwater and existing land use zoning to determine if a sanitary sewerage collection system will be required or if septic tanks will be an acceptable means of disposing of domestic wastes.

The street improvement section develops recommended street sections based on drainage requirements, traffic volumes and construction costs for the various streets within the Special Assessment District.

DRAINAGE

General

The purpose of this portion of the study is to identify the means of conveyance for the storm water flows based on a drainage study prepared earlier for the City. The storm water runoffs are based on a fully developed properties with paved streets. The conveyance of the 100-year design storm runoff controlled the means of conveyance.

Preliminary street grades were determined to estimate the hydraulic capacity of the streets. The maximum water depth allowed in the street right-of-way is 0.8 feet. The existing drainage conditions and recommended drainage improvements are discussed later in this section.

Hydrology

The Rationale Method was used for estimating the peak runoff rate. The larger drainage areas were divided into subareas so that various alternative methods of storm drainage could be investigated and compared. A runoff coefficient, "c", of 0.45 was used in all cases. The time of concentration, T_c, for each subarea was determined by the Kirpich Equation:

$$T_c = .0078 \frac{L^{0.77}}{S^{0.385}}$$

Peak flow rates for storms with 10- and 100-year frequencies were determined and used as a basis for determining the hydrologic adequacy of the various alternatives considered. Street capacities were based on a 32 foot street width with 2 percent crown and 8 inch curbs. Typical street sections are shown on Figure 5. Hydrologic computations are included in the Appendix.

Hydraulics

It was assumed that storm sewers and drainage channels would be designed to accommodate uniform flow. The Manning Equation was used to compute uniform flow conditions and for preliminary determinations of channel and pipe sizes required. The Manning retardance coefficient, n, was taken as 0.013 for concrete pipes and concrete lined channels, 0.030 for grass covered channels, and 0.017 for flow in streets. Hydraulic computations are presented in the Appendix.

Existing Conditions

The study area is bounded by Golf Course Road on the west, the county line on the south, Sara Road on the north and just west of 36th Street on the east (36th Street drains to the east down 19th Avenue away from the study area). The overall drainage flow is north to south with approximately 30 percent of the study area being developed. The study area has three drainage areas with the following characteristics:

Area 1 drains approximately 350 acres to a pond at 19th Avenue and 34th Street;

Area 2 drains approximately 150 acres to a low area between 20th Avenue and 21st Avenue, 500 east of Golf Course Road;

Area 3 drains approximately 50 acres to a 28 inch x 20 inch horizontal elliptical metal pipe on 23rd Avenue discharging to the south.

These areas are shown on Figure 2 - Existing Drainage Conditions.

Proposed Improvements

Drainage Area 1. This area includes approximately 350 acres with flows currently carried in the streets or across undeveloped property. As the area develops and the lots are filled the increased runoff and restricted flowage paths will cause flooding problems. The major problem area is at the north end of 32nd Circle where storm water runoff north of Ann Circle is collected and conveyed south on 32nd Circle at a flat grade. This problem may be solved by:

1) Improving the water carrying capabilities of 32nd Circle by increasing the grade, widening the roadway section, increasing the curb height and installing a storm sewer, or

2) Distributing part of the storm water runoff via concrete lined channels to other streets capable of conveying additional storm water.

The improvements to the street section and grade on 32nd Circle were restricted due to the current development and the storm sewer pipe required to convey the excess flow would have a 60 inch diameter. The cost for the storm sewer would be approximately $690,000. Therefore, the recommended

plan to drain this area consists of concrete lined channels to convey the storm water flows from the north end of 32nd Circle to the east and south. (See Figure 3.)

This plan would split the storm water flows going to the pond on the south side of 19th Avenue between 33rd Street, 34th Street and 35th Street. A storm sewer is not required and the flows will be in the streets or the concrete lined ditches (10 foot bottom width maximum). The estimated cost for the recommended improvements is $270,000 (see the Appendix for a detailed estimate).

Other improvements required to convey the 100-year storm in the right-of-way are:

1) Street sections 32 feet wide face of curb to face of curb with 8-inch curbs;

2) 40 foot wide street sections on 32nd Circle from Sara Road 400 feet south and on 19th Avenue from 33rd Street to 35th Street;

3) Lower road profiles on 33rd Street, 34th Street and 35th Street between 19th Avenue and 16th Avenue to allow a 10-inch water depth within the street right-of-way;

4) Ten foot easement and a shallow unpaved ditch to allow drainage to flow from 21st Avenue north to the inlet on 20th Avenue.

The existing 20th Avenue inlet and 24-inch storm drain are capable of conveying approximately a 5-year storm. The larger storms will cause some flooding in 20th Avenue and the channel to the south; however, the drainage area is small and preliminary flood routing indicates the flooding will have an average depth of 0.6 foot (1.2 foot maximum at the inlet). No modifications are recommended for this structure.

As the area develops, the volume of storm water runoff in the 19th Avenue pond will increase. This volume of water will not be adequately disposed of by infiltration and evaporation and a pump and discharge line to the SR 528 ditch will be required. It is recommended a 2-1/2-inch discharge line along 19th Avenue be installed with a portable 30 gpm pump. The estimated cost for this improvement is $34,000.

Drainage Area 2. This area includes approximately 150 acres that flow to low areas at 20th Avenue and 21st Avenue which have no positive drainage outlet. Drainage improvements to this area can be accomplished by either 1) reducing the area draining to the low area by diverting storm sewers or 2) developing a pond similar to the 19th Avenue pond. The large pond concept similar to the 19th Street pond would have a lower initial estimated cost of $89,000, but the maintenance costs and aesthetic considerations make this concept undesirable. The recommended plan for this area is to divert the storm water runoff from north of 19th Avenue to the 19th Avenue pond via a 36" diameter storm sewer. The runoff from the area south of 19th Avenue would be held in a shallow, landscaped pond (see Figure 3 for location). The estimated cost for the proposed improvement is $39,000 for the pond and $170,000 for the storm drain on 19th Avenue.

A concept using the road right-of-way and drain material was studied, but the runoff volume was too great to be adequately controlled within the street right-of-way.

Drainage Area 3. This area drains approximately 50 acres to a 28 inch x 20 inch elliptical storm drain in 23rd Avenue discharging to the south. It is recommended that an easement be obtained to drain 22nd Avenue south to this storm drain. This area currently drains across undeveloped lots. This storm drain will be capable of conveying a 5-year storm with larger storms ponding runoff in the streets. The 100-year storm will overflow the street to the south without causing damage to houses or creating a safety hazard. Therefore, it is recommended that no improvements be made to this structure.

SANITARY SEWERAGE SYSTEM

Topography

The topography of the study area has been modified by wind and rain to form mesas and arroyos. Slopes in the area vary from 0 to 15%; the steeper slopes occurring along arroyos. The elevations in the area range from 5,000 to 6,000 feet above mean sea level.

Soils

The Soil Conservation Service has classified the soils as deep, well-drained upland soil consisting of a combination of alluvium and wind blown deposits. Generally, the site soils in the area consist of a surface layer of silty fine sand. The surface layer, ranging from 2 to 10 feet in thickness, is soft to moderately firm in relative firmness. Underlying the surface layer is a firm to very firm layer that may have some calcareous cementation and caliche pockets.

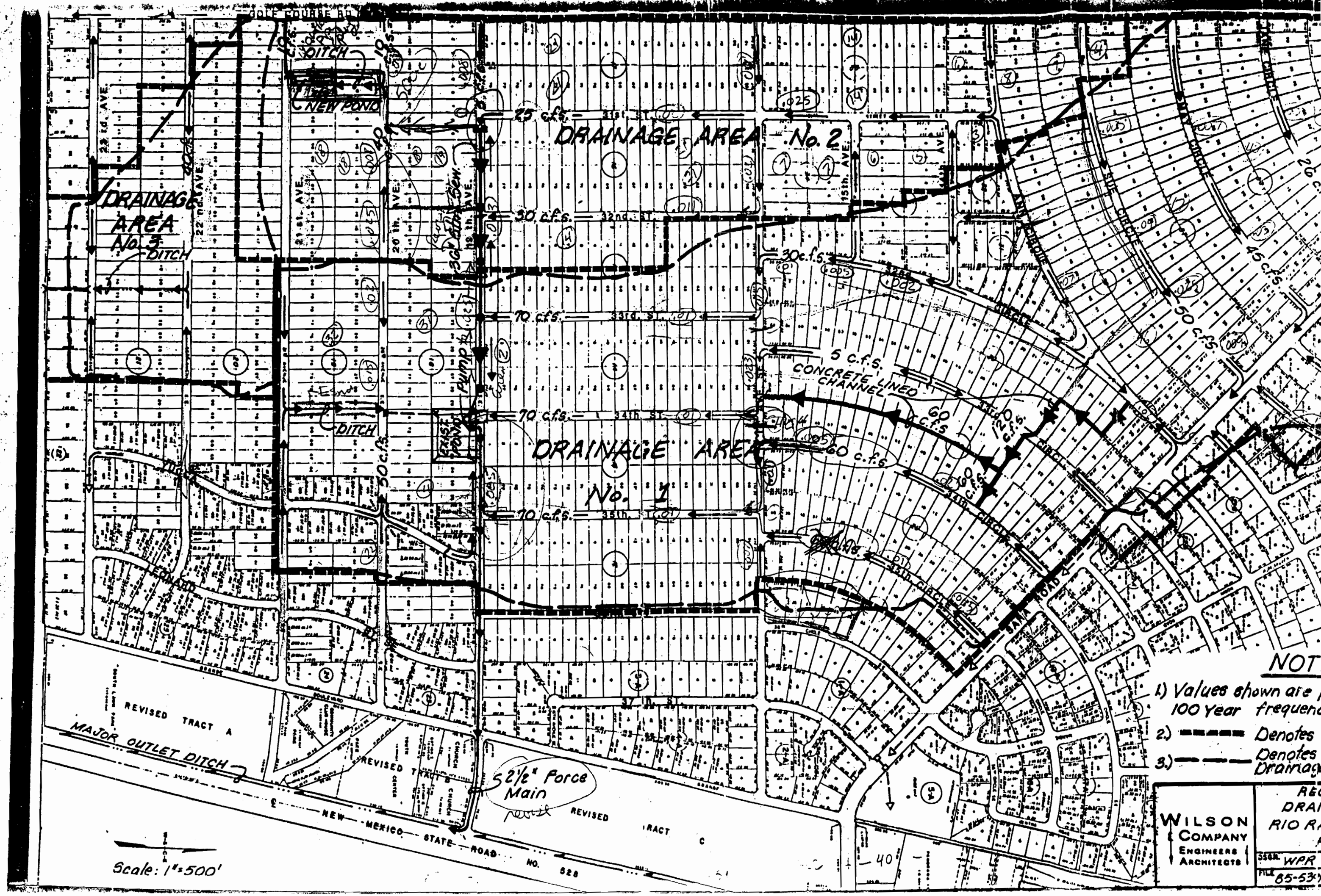
Percolation Rate

It is estimated that the percolation rate is 10 to 15 min/in with a range of 5 to 45 min/in when tested as outlined in the NMEID publication, Liquid Waste Disposal by Conventional Methods: Septic Tank and Absorption Field.

The soils in the study area are generally considered to be acceptable for the construction of septic tanks and absorption fields. Isolated areas of calcareous cementation and caliche pockets, which can prevent adequate percolation, will potentially affect the location or type of construction of septic systems.

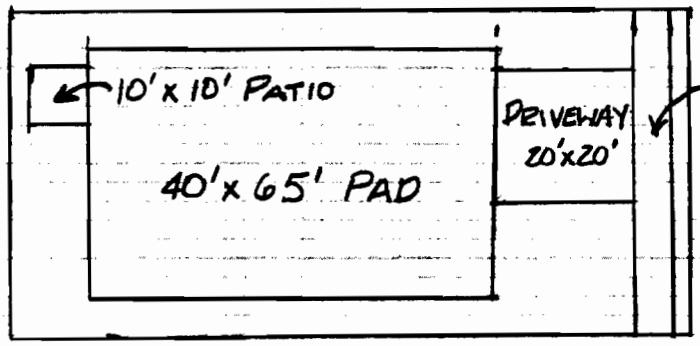
Groundwater

The depth of the groundwater is approximately 350 feet. Two existing community water wells, owned and operated by Albuquerque Utilities, are located at 33rd Street and 19th Avenue and at 33rd Street and 1,000 feet north of 19th Avenue. The wells are 900 and 1,200 feet deep, respectively. The shallower well has a production rate of 90 gpm, while the deeper well has a production rate of 550 gpm. Albuquerque Utilities operates a water distribution system throughout the area. In addition to the existing community wells, there may be private wells in the study area.


GOLF COURSE RD.
NEW POND
DITCH
DRAINAGE AREA No. 3
DRAINAGE AREA No. 2
DRAINAGE AREA No. 1
75 c.f.s.
31st. ST.
30 c.f.s.
32nd. ST.
70 c.f.s.
33rd. ST.
70 c.f.s.
34th. ST.
70 c.f.s.
35th. ST.
22nd. AVE.
21st. AVE.
20th. AVE.
19th. AVE.
15th. AVE.
30c.f.s.
5 c.f.s.
CONCRETE LINED CHANNEL
60 c.f.s.
50 c.f.s.
45 c.f.s.
120 c.f.s.
34th CIRCLE
SAN JUAN ROAD
REVISED TRACT A
REVISED TRACT B
REVISED TRACT C
MAJOR OUTLET DITCH
NEW MEXICO STATE ROAD NO. 528
52½" Force Main
Scale: 1"=500'
NOT
1.) Values shown are
100 Year frequen
2.) Denotes
3.) Denotes
Drainag
WILSON COMPANY
ENGINEERS
ARCHITECTS
RIO R
DSGN. WPR
FILE 85-53

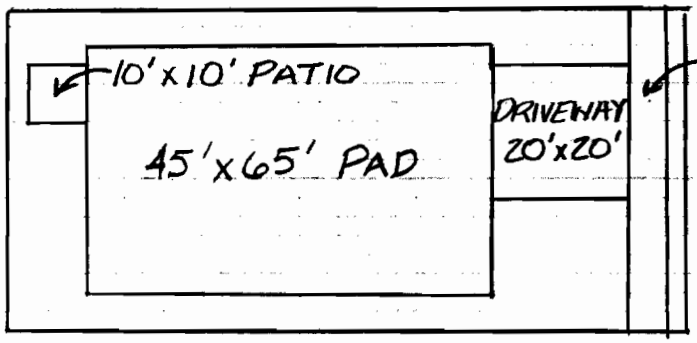
PROPOSED DEVELOPED CONDITIONS - FLOWRATE CONDITIONS

50' LOT



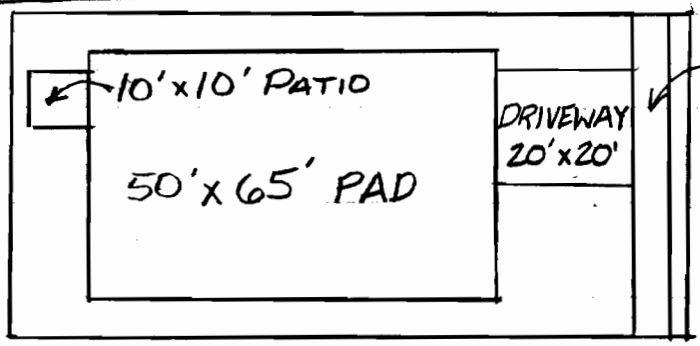
50' LOT TOTAL IMPERVIOUS AREA = 3300 ☒

55' LOT



55' LOT TOTAL IMPERVIOUS AREA = 3645 ☒

60' LOT



60' LOT TOTAL IMPERVIOUS AREA = 3990 ☒

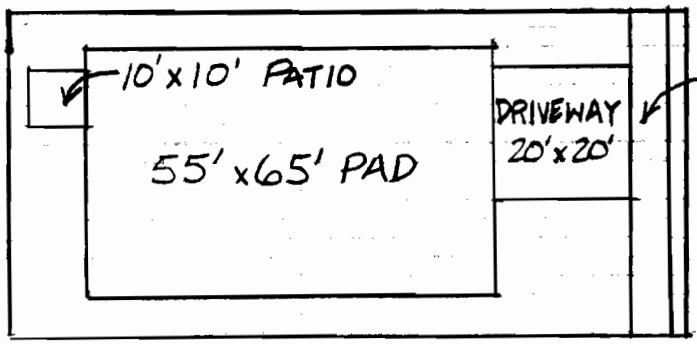
BOHANNAN-HUSTON INC.

PROJECT NAME TRACTS A & D SHEET 1 OF 2

PROJECT NO. 9321740 BY PE DATE

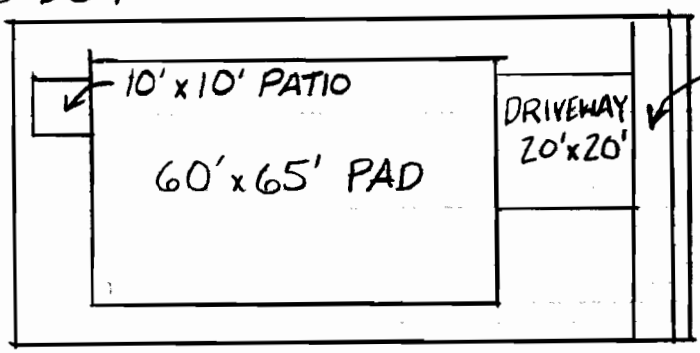
SUBJECT HYDROLOGY CH'D DATE

65' LOT



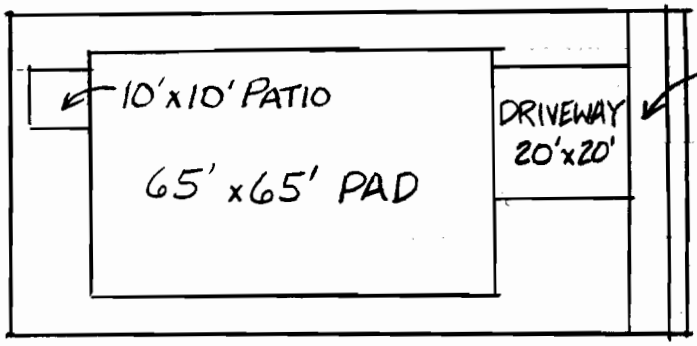
65' LOT TOTAL IMPERVIOUS AREA = 4335 ☒

70' LOT



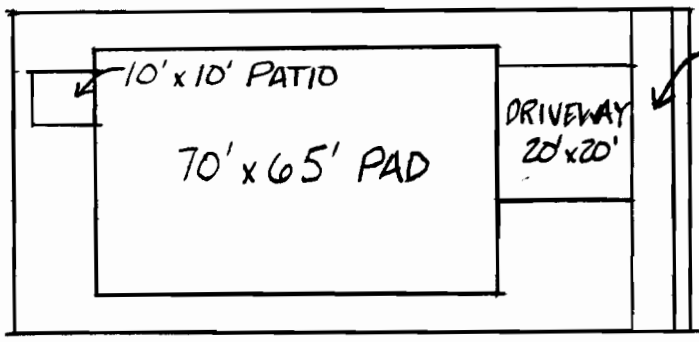
70' LOT TOTAL IMPERVIOUS AREA = 4680 ☒

75' LOT



75' LOT TOTAL IMPERVIOUS AREA = 5025 ☒

80' LOT



80' LOT TOTAL IMPERVIOUS AREA = 5370 ☒

BOHANNAN-HUSTON INC.

PROJECT NAME _____ SHEET _____ OF _____

PROJECT NO. _____ BY _____ DATE _____

SUBJECT _____ CH'D _____ DATE _____

FULLY DEVELOPED CONDITIONS

100-YEAR STORM

SUMMARY OF HYDROLOGIC DATA

BASIN ID	AREA AC	AREA SQ.MI.	% LAND TREATMENT A	B	C	D	TIME TO PEAK	DISCHARGE CFS/AC	Q (R) CFS	RATIONAL COMPOSITE C	RATIONAL I (IN/HR)	RATIONAL Q (CFS)
A-1	17.981	0.0281	3.7	26.0	26.0	44.4	0.1333	3.26	58.6	0.69	4.70	58.5
A-2	21.355	0.0334	3.9	22.4	22.4	51.3	0.1333	3.39	72.4	0.72	4.70	72.3
A-3	17.443	0.0273	4.2	20.7	20.7	54.5	0.1333	3.45	60.1	0.73	4.70	60.1
A-4	13.182	0.0206	3.1	25.8	25.8	45.3	0.1333	3.28	43.3	0.70	4.70	43.2
A-5	18.889	0.0295	3.9	18.8	18.8	58.5	0.1333	3.53	66.7	0.75	4.70	66.6
A-6	13.432	0.0210	3.2	24.0	24.0	48.8	0.1333	3.35	45.0	0.71	4.70	44.9
A-7	15.147	0.0237	3.3	20.8	20.8	55.0	0.1333	3.47	52.5	0.74	4.70	52.5
A-8	14.908	0.0233	4.4	14.0	14.0	67.5	0.1333	3.69	55.1	0.79	4.70	55.0
A-9	18.828	0.0294	2.3	26.3	26.3	45.0	0.1333	3.29	61.9	0.70	4.70	61.8
S-1A	2.432	0.0038	0.0	25.0	30.0	45.0	0.1333	3.34	8.1	0.71	4.70	8.1
S-1B	5.227	0.0082	0.0	25.0	30.0	45.0	0.1333	3.34	17.4	0.71	4.70	17.4
S-1C	4.545	0.0071	0.0	25.0	30.0	45.0	0.1333	3.34	15.2	0.71	4.70	15.1
S-1D	2.025	0.0032	0.0	0.0	10.2	89.8	0.1333	4.22	8.5	0.90	4.70	8.5
S-2	3.701	0.0058	0.0	0.0	17.6	82.4	0.1333	4.11	15.2	0.87	4.70	15.2
S-3	2.733	0.0043	0.0	0.0	25.0	75.0	0.1333	4.00	10.9	0.85	4.70	10.9

FULLY DEVELOPED CONDITIONS
10-YEAR STORM

SUMMARY OF HYDROLOGIC DATA

BASIN ID	AREA AC	AREA SQ.MI.	A	% LAND TREATMENT B	C	D	TIME TO PEAK	DISCHARGE CFS/AC	Q (R) CFS	RATIONAL COMPOSITE C	I (IN/HR)	Q (CFS)
A-1	17.981	0.0281	3.7	26.0	26.0	44.4	0.1333	1.88	33.7	0.60	3.14	33.6
A-2	21.355	0.0334	3.9	22.4	22.4	51.3	0.1333	2.00	42.6	0.63	3.14	42.5
A-3	17.443	0.0273	4.2	20.7	20.7	54.5	0.1333	2.05	35.8	0.65	3.14	35.7
A-4	13.182	0.0206	3.1	25.8	25.8	45.3	0.1333	1.90	25.0	0.60	3.14	24.9
A-5	18.889	0.0295	3.9	18.8	18.8	58.5	0.1333	2.12	40.1	0.68	3.14	40.0
A-6	13.432	0.0210	3.2	24.0	24.0	48.8	0.1333	1.96	26.3	0.62	3.14	26.2
A-7	15.147	0.0237	3.3	20.8	20.8	55.0	0.1333	2.07	31.3	7.00	3.14	332.9
A-8	14.908	0.0233	4.4	14.0	14.0	67.5	0.1333	2.28	33.9	0.72	3.14	33.9
A-9	18.828	0.0294	2.3	26.3	26.3	45.0	0.1333	1.90	35.7	0.60	3.14	35.6
S-1A	2.432	0.0038	0.0	25.0	30.0	45.0	0.1333	1.94	4.7	0.62	3.14	4.7
S-1B	5.227	0.0082	0.0	25.0	30.0	45.0	0.1333	1.94	10.1	0.62	3.14	10.1
S-1C	4.545	0.0071	0.0	25.0	30.0	45.0	0.1333	1.94	8.8	0.62	3.14	8.8
S-1D	2.025	0.0032	0.0	0.0	10.2	89.8	0.1333	2.75	5.6	0.87	3.14	5.6
S-2	3.701	0.0058	0.0	0.0	17.6	82.4	0.1333	2.64	9.8	0.84	3.14	9.8
S-3	2.733	0.0043	0.0	0.0	25.0	75.0	0.1333	2.54	6.9	0.81	3.14	6.9

IMPERVIOUS AREA CALCULATIONS

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	3645	3990	4335	4680	5025	5370
	sq.ft/lot			sq.ft/lot	sq.ft/lot	sq.ft/lot	

ROADWAY	TYPE 1	TYPE 2	TYPE 3	TYPE 4	CUL 1
F-F WIDTH	76	48	28	28	
SIDEWALK	6	4	4	4	0
RADIUS					40
	88	56	36	36	5027
	sq.ft/ft	sq.ft/ft	sq.ft/ft	sq.ft/ft	sq.ft

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-SAC PER BASIN
7.98	44.4	40	32	0	0	0	0	0	0	110	0	2300	2
10.96	51.3	0	44	46	0	0	0	0	0	110	0	2980	4
9.51	54.5	0	79	0	0	0	0	0	0	280	0	2090	7
5.97	45.3	0	0	24	20	0	0	0	0	110	0	1700	2
11.06	58.5	0	0	39	41	0	0	0	0	110	0	3110	6
6.55	48.8	0	0	25	22	0	0	0	0	110	0	1500	6
8.34	55.0	0	0	0	14	12	22	6	0	100	0	2580	1
10.06	67.5	0	0	0	14	27	23	8	0	110	0	2260	1
8.47	45.0	0	0	0	8	14	19	7	0	110	0	3460	1
1.08	45.0								535				
2.32	45.0								1150				
2.02	45.0								1000				
1.82	89.8								900				
3.05	82.4									2371			
2.05	75.0										2480		

DRAINAGE AREA OFF1

TOTAL AREA = 50 ACRES (WILSON & CO REPORT)
45.9 ACRES (SCALED FROM DRAWING)
USE 50 ACRES
N = UNITS / ACRE = 2 UNITS/ACRE (LOTS 80'x290)

→ FROM DPM 22.2 TABLE A-5,

$\%D = 7\sqrt{N^2 + 5N}$

$= \underline{26\%}$ USE 6% A, SPLIT REMAINDER

% A = 6
B = 34
C = 34
D = 26

→ FROM DPM 22.2 TABLE A-9:

PEAK DISCHARGE = .06(1.29) + .34(2.63) + .34(2.87) + .26(4.37)
= 2.88 CFS/ACRE

PEAK Q = 2.88(50) = 144 CFS

→ FROM DPM 22.2 p. B-2:

$$T_c = \frac{\frac{600}{0.7\sqrt{2}} + \frac{120}{3\sqrt{0.5}} + \frac{600}{4\sqrt{2}} + \frac{300}{3\sqrt{2}}}{3600} = 0.233 \text{ HRS}$$

$T_p = \frac{2}{3} T_c = 0.155$ HRS

FROM HYMO RUN:

RUNOFF VOL = 5.225 ACRE-FT
Q_p = 130.5 CFS

CONDUIT IS 28x20 HORIZONTAL ELLIPTICAL - METAL
USE 24" CIRCULAR AS MODEL

OUTLET ELEVATION = ±5210
INLET ELEVATION = ± 5225

BOHANNAN-HUSTON INC.

PROJECT NAME TRACT AD SHEET 1 OF
PROJECT NO. BY PR DATE 3/25/94
SUBJECT HYDROLOGY CH'D DATE

OFF1 CONTD

ORIFICE: $Q = CA\sqrt{2gh}$ USING 0.6 = C

$Q = 0.6(\pi(1)^2)\sqrt{2(32.2)(2)}$

$= 21.4$ CFS

CMP ⇒ n = 0.025

$K_{RCP} = 226.2$ $K_{CMP}(n=0.025) = 226.2\left(\frac{.013}{.025}\right) = 117.6$

$Q = 117.6\sqrt{.057} = 28$ CFS = MAX Q w/ 2' HEAD.

FOR POND ROUTING, USE THE FOLLOWING STORAGE-DISCHARGE:

ELEV.	POND STORAGE, AC-FT	DISCHARGE, CFS	
5223 (0)	0	0	
(TOP OF PIPE) 2	0.01	15	
3	0.69	21	
4	3.2	26	(350 x 200)

USING ROUTE RESERVOIR IN AHYMO RUN -

$Q_p = 24.85$ CFS.

BOHANNAN-HUSTON INC.

PROJECT NAME _____ SHEET 2 OF _____

PROJECT NO. _____ BY _____ DATE _____

SUBJECT _____ CH'D _____ DATE _____