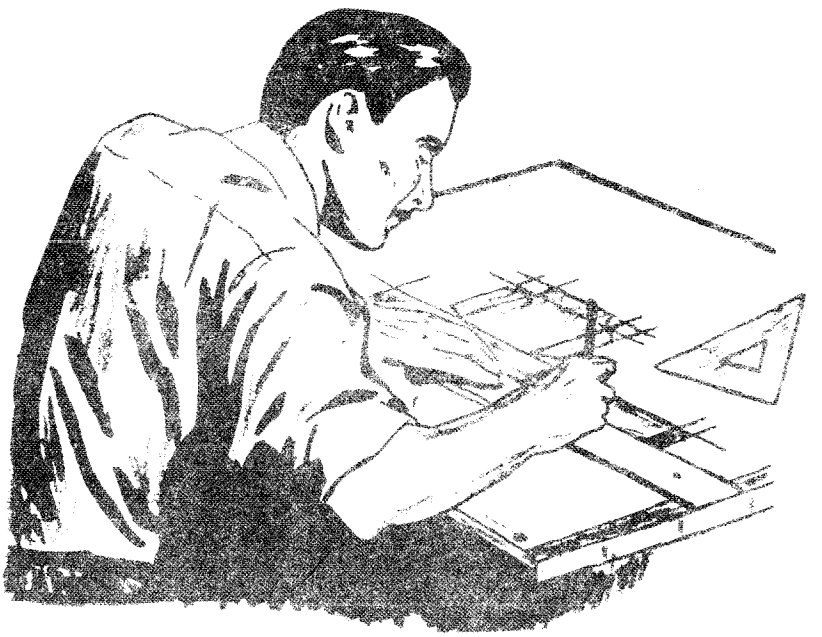
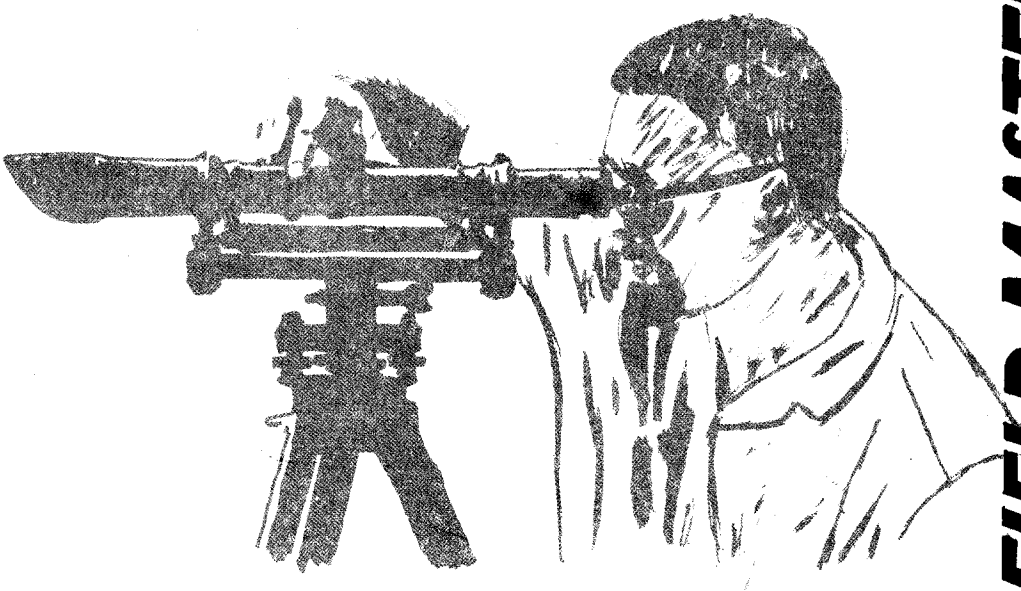
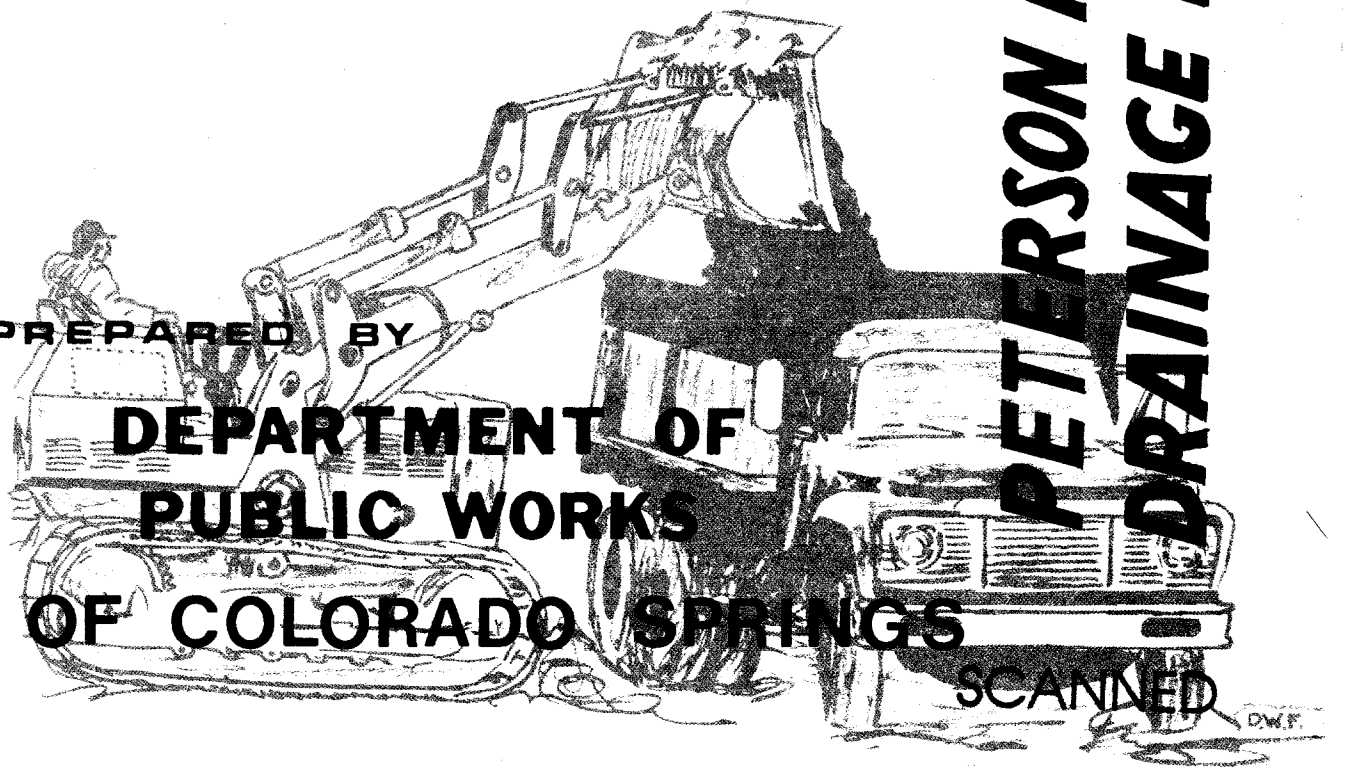




PETERSON FIELD MASTER DRAINAGE REPORT - 1975



PREPARED BY

DEPARTMENT OF PUBLIC WORKS

CITY OF COLORADO SPRINGS

PETERSON FIELD

MASTER DRAINAGE BASIN STUDY

1975

Prepared for: The City of Colorado Springs, Colorado

Prepared by: The Department of Public Works
City of Colorado Springs, Colorado

PETERSON FIELD
DRAINAGE BASIN

ENGINEERING REPORT

TABLE OF CONTENTS

I. PURPOSE OF THIS REPORT

The purpose of this report is to update previous plans, criteria and to finalize the exact route alignment. This required the reanalysis of the topography, basin boundaries, actual basin runoff characteristics, and existing right-of-way and structure capabilities. On this basis the plan contained herein was studied and evaluated.

This study does not attempt to establish the exact design of the drainage systems, but gives the general location and requirements that must be adhered to in order to make the system a safe, reasonable and adequate network.

II. BASIN DESCRIPTION

A. The Peterson Field Drainage Basin is an elongated area of approximately 5,485 Acres or 8.5 square miles. It is situated in T 14 S in portions of Sections 16, 17, 18, 19, 20, 21, 29 and 30 of Range 65 W and in portions of Sections 24, 25, 26, 34, 35 and 36 of Range 66 W of the 6th Principal Meridian.

It is bounded by the Sand Creek Basin on its southwest, and the Jimmy Camp Creek Basin and the Windmill Gulch Basin on its northeast. The basin is approximately 6.5 miles long with an average width of approximately 1.3 miles.

Its general direction of flow is to the southwest to where it flows into Fountain Creek approximately one mile north of Security, Colorado.

B. The topography of the basin ranges from relatively steep slopes (4%) at the northeast end to gradual slopes (1.6%) around the Peterson Field runways to relatively flat slopes (0.9%) in the vicinity of Academy Boulevard. The slope increases again to the west of Irrigation Canal No. 4 to approximately 2% and continues to the outfall at Fountain Creek.

The major basin boundaries in the southwest portion have been revised from preceeding reports and is reflected in the drainage plan.

C. The basin consists of two basic soil types. Approximately fifty-eight percent (58%) of the area consists of the Blakeland series (R7) which is a dark, coarse textured, loose sandy soil. The surface (6" to 20") is a loamy sand or light sandy loam. The subsoil (10"-14") is a loamy sand and the underlying material is a light colored loamy sand or sand extending to sixty inches (60") or more. The Blakeland series falls in the "A" hydrologic group. Approximately thirty-five percent (35%) consists of the Tructon series (R5) which is dark soils of sandy loam in texture throughout the profile. The surface layer is 5 to 8 inches thick with a subsoil 10 to 26 inches thick and a light colored underlying material usually extending to sixty inches (60") or more. The Tructon series is in the "B" hydrologic grouping.

There are several other types of soils also present which consist of the Eastonville series (R4) for 4.1 percent, Stapelton series (R2) for 1 percent, Sandy alluvial (XAO) for 2.3 percent. There are traces of other soils in the area also, but are considered insignificant in this report. For these soil type explanations see SCS classification in the appendix of this report. These soils are extremely unstable unless protected by cover. It erodes readily by wind and water when cover is destroyed and it is extremely difficult to re-establish vegetation growth.

The vegetation in the basin consist primarily of native grasses of the Sand Bluestem and Prairie Sandreed grass types. Other lesser grasses in the area consist of Needle

and Thread, Sand Dropseed, and Blue Grama. A good cover of these grasses now protect the soil from blowing and minor erosion.

III. BASIN ANALYSIS

A. Rainfall: During the past 40 years the annual rainfall for this basin has ranged from 6.1 inches in 1939 to 25.4 inches in 1965. The mean annual rainfall is 15.0 inches with an average of 64 percent occurring within the May through August period. During this period, masses of warm, moist air from the Gulf of Mexico and cold, comparatively dry air from the polar regions combine over the higher land areas to cause increased thunderstorm activity. The most intense thunderstorms occur in the late spring and early fall when the polar air intrusions are the most intensive. These are the storms that produce high peak flows, moderate volumes and relatively short durations. The storms having relatively long duration generally produce more moderate peak flows, but higher total volumes.

Snowfall is generally considered not to be a significant design parameter in this area. The snowfall records indicate up to 27.9 inches of snowfall in September 1959, however, the average is approximately 9 inches per month during the winter season. There is no known recorded damage in this area relating to flooding caused by snowmelt.

B. Runoff: Flow quantities were determined for the 50 yr (Q_{50}) and 100 yr. (Q_{100}) return periods and are tabulated in the appendix of this report. The method used for the calculations is that as prescribed by the City of Colorado Springs, Public Works Department, which is commonly referred to as the Soil Conservation Service method (Rev. by Bureau of Reclamation) as outlined in the second edition of the Design of Small Dams Book (simple triangular hydrograph).

The City Engineer has designated the 50 yr. return period storm as a storm of 2.0 inch intensity in a one hour duration and a 100 yr. design storm with a 3.0 inch intensity over a one hour duration. The design runoff is calculated for each subbasin (reach) with the following expression:

$$qp = \frac{484\ AQ}{Tpo} = \text{design runoff}$$

A = Area, sq. miles

Q = direct runoff in inches

Tpo = Time to peak, Hrs.

D = Rainfall excess time (D= 1.0 hrs)

Tc = Time of concentration

$$= \left(\frac{11.9L^3}{H}\right)^{0.385}, \text{ for overland flow}$$

L = Length of drainage course, miles

H = Difference in elevation, ft.

When the flow is not overland, but is carried in structures the expression for "Tc" cannot be used and the actual velocities in the structure must be used. When there is a combination of overland flow and channel flow, the times of concentration should be derived separately and added together. The direct runoff (Q) may be obtained from the rainfall intensity and the soil cover complex number corresponding to the soil type and its usage as defined by the Soil Conservation Service.

Several of the subbasins in the Peterson Field Basin have more than one soil type and most curve numbers in this report reflect composite curve number analysis.

All of the subbasin hydrographs in this report are based on the assumption that the entire basin has been developed in accordance with the 1975 Zoning Ordinance Maps. This provides for adequate design of channels and structures throughout the area.

Hydrographs were compiled for the various points of interest and most are contained in the appendix of this report. The composite hydrographs were obtained by plotting each subbasin hydrograph and summing numerically each to total the ordinate of the total hydrograph at a given time"t". Lag times were applied to the subbasin hydrographs according to their actual velocities in their respective carrier channels.

This report primarily reflects all 100 yr. frequency flows; however, some channels and structures may be designed to accomodate 50 yr. frequency flows if the "Q_{100}" is less than 500 cfs in accordance with the existing subdivision drainage policies. All drainage channels and structures have been sized to carry the 100 yr. frequency peak flows. The channels have been located with the intent of following the natural stream beds and generally do not interfere with the subdivision developments.

Recommended structures and concrete channels have been sized and located whenever the flow has increased to such a level as to be considered hazardous (generally in excess of 200 cfs). The sizes of the specified structures and channels may vary slightly depending on channel slopes and materials (i.e. RCP or CMP) used when designed for subdivision development; however, the capacities and objectives of this report must be adhered to.

C. Reservoir Staging: An effective and often economical method of drainage control may be utilized by the use of reservoir staging. In accordance with the Colorado State Engineer's criteria, two small reservoirs have been designed and are included in this report. The state engineer's criteria requiring the design of a maximum probable flood spillway is as follows:

1. If the water surface area at the crest is in excess of 20 acres.
2. If the dam is in excess of 10 ft high.
3. If the total storage is in excess of 1,000 acre-ft. of water.

If any one of these requirements is exceeded, the reservoir must have a spillway capable of handling the maximum probable flood flows. (This would approximately quadruple the flows at the reservoir points in question.) Such a spillway would not be economically advantageous for this basin.

The reservoirs at point No. 4 and No. 7 are proposed for the purpose of delaying the peak flow so that it will have less impact of the proceeding peak flows down stream. This method of analysis is thoroughly discussed in the second edition of the Small Dams Book and the calculations are presented in the appendix of this report. Both reservoirs have been designed to be maintenance free and self cleaning. (See Reservoir Details in appendix.)

D. Channel Hydraulics: All channels in this report were analyzed as trapezoidal channels with varying side slopes (~~Z~~). Mannings formula was used in all of the calculations with n = 0.015. The average velocities were obtained with the expression vel. = $\frac{\text{flow.}}{\text{area}}$

E. Structure Hydraulics: Structure capacity designs include entrance, elbow and channel or pipe losses (where applicable) and exit losses. These have been determined with the use of mannings formula (n = 0.015) and the Yarnell, Nagler and Woodward expression for box capacity coefficients: $C = (1.05 + \frac{0.0045\ L}{r\ 1.25}) - 1/2$

where $Q = CA\ 2gh\ h$. (Ref. King and Brater, Hyd. Handbook, 5th Ed.)

The depth of water curves as listed in the L.A. Flood control manual were also utilized.

IV. EXISTING DRAINAGE FACILITIES

A. Secondary Channels: Several secondary channels are in the Peterson Field Drainage Basin. Most of these have already been constructed and are in the Southborough 3, 4, 6, 7, & 8 Subdivisions, Pikes Peak Park Addition and the Peterson Field Complex area.

B. Main Channels: There has been minimal construction of main channel facilities in the basin area and most have been adequately planned for. The main channels generally follow the existing natural waterways which present no serious problems in the implementation of this report.

The Broadview Subdivision (7 J) is platted in the County and the reservoir and channel requirements will necessitate the purchasing of some of this property. This should be done as soon as possible. No dwelling structures presently exist in this subdivision, however, most of the lots have been individually purchased.

The area through the Colony Hills area has been developed and has only a thirty (30) foot drainage easement. In order to utilize this easement, a 240 foot long vertical concrete channel is proposed. (See detail in appendix). The existing box structure at Colony Hills Circle will require replacement and the existing 8 inch sanitary sewer will need to be lowered.

Lakehurst Drive is not yet completely constructed along the drainage easement and the planned easement will need to be widened 15 feet further to the north to provide room for a 45 foot easement as opposed to the existing planned 30 foot easement.

The existing 5-5'x9.5' box culvert at Academy Boulevard is capable of handling the required peak flows without further alterations, however, special design considerations must be given to the inflowing channel conditions. These are noted on the drainage plan.

The proposed channel will cross the irrigation canal No. 4 at the southwest corner of Cormack's Horse Ranch. This will require a 66" reinforced concrete pipe siphon under the main concrete channel to carry the irrigation flows. (See detail in appendix). The channel will then proceed across the Industrial Park, under Astrozon Boulevard and on to the AT&SF Railroad crossing where a series of reinforced box culverts are to be installed as noted on the drainage plan.

All easement widths specified are maximums and may be less depending on actual design in accordance with the detail in the appendix.

The Denver and Rio Grande-Grande Western Railroad tracks have been removed, however, the right-of-way remains the property of the railroad. No structure is designed for this railroad crossing, however, a walk bridge or minor crossing may be proposed in the future. There is a reinforced concrete structure proposed under Hamlin Road and concrete channel as specified to the outfall point at Fountain Creek. All channels specified have been designed with 1:1 side slopes except at Colony Hills. There are several areas along the main channel where excavation and fill will be required to obtain an efficient, safe and desirable alignment. These factors should be considered when preparing the actual construction plans.

Non-specified Facilities: Facilities other than those specifically proposed will also be required for subdivision developments. It is impossible to predict actual costs for these items until the proposed development plan is prepared. General cost estimates have been made for the particular areas with regard to development use, topography and volumes of flow. These are listed in the cost estimates for facilities with unspecified locations.

V. PEAK FLOWS

Study Point	Q_{100} (cfs)
2	750
3	1770
4 (Reservoir)	3250 (Inflow)
4 (Reservoir)	2070 (Outflow)
5	2390
6	3090
7J (Reservoir)	4200 (Inflow)
7J (Reservoir)	3590 (Outflow)
8	3590
9	3660
10	4080
11 Colony Hills Circle	4130
12 Academy Blvd.	4230
13 AT&SF Railroad	4330
14 Hamlin Rd.	4370
15 Outfall at Fountain Creek	4370
21	273 *
22	900
23	1100
31	105 *

Study Point	Q_{100} (cfs)
32	740
33 Hancock Expr.	850
40	86 *
41	550
53 Hancock Expr.	830

* Indicates 50 yr. design flow

VI. RECOMMENDATIONS

The drainage facilities to the north of Hancock Boulevard that have previously been constructed are to remain as constructed. They are adequate for the 50 yr. criteria in all cases and 100 yr. criteria in most cases. The sizings as indicated on the drainage plan are only recommendations for 100 yr. criteria and future drainage improvements. Some upgrading work is required thoughout the area, however, this is primarily at angle points on the existing channel. This is covered in the cost estimates under the city's share.

The outlet structures for the two included proposed reservoirs are under inlet control and may be "necked" down to a less expensive structure after the water is in the box. The actual design is not submitted here, but will have to be approved by the City Public Works office prior to construction. All reinforced concrete boxes (RCB's) in this report are assumed to have a slope of 1.0%.

To continue the implementation of this drainage plan it is recommended that this report be reviewed and approved as soon as possible by the Colorado State Engineers Office, Colorado Springs Subdivision Drainage Board and the Colorado Springs City Council. This is to prevent any further delays to development and to avoid any further construction of inadequate drainage facilities in the area.

The future development of this basin should be closely supervised in order to attain the objectives of this report. This is a safe, efficient and reasonable system and if proper supervision during construction is negligent, this system, as any other, could turn into a disaster area.

SUB BASIN (Reach)	AREA Planim. Read	Square Mile	BASIN LENGTH	HEIGHT	Tc	Curve No.	TPO	FLOW Q	qp	Tb
1-2	75.29	0.675	8500	179	0.61	90	0.87	1.09	411	2.31
2-3	108.52	0.973	9300	170	0.69	90	0.91	1.09	562	2.44
3-4	201.55	1.807	13450	232	0.94	90	1.06	1.09	897	2.84
4-5	55.06	0.494	7425	87	0.69	93	0.91	1.31	343	2.44
5-6	162.56	1.458	10775	156	0.85	81	1.01	0.61	427	2.69
20-21	31.50	0.282	5500	93	0.48	96	0.78	1.57	273	2.10
21-22	31.14	0.279	4525	77	0.41	96	0.74	1.57	285	2.00
22-23	17.52	0.157	3950	42	0.44	95	0.76	1.48	147	2.04
6-7J	21.18	0.190	3675	43	0.21	94	0.63	1.40	206	1.67
7J-8	19.64	0.176	3400	51	0.16	93	0.60	1.31	187	1.59
30-31	9.92	0.089	2650	59	0.24	96	0.65	1.57	105	1.72
31-32	35.01	0.313	3750	61	0.22	95	0.63	1.48	355	1.69
32-33	7.71	0.069	1925	27	0.23	93	0.64	1.31	69	1.70
8-9J	7.73	0.069	1750	20	0.15	90	0.59	1.09	62	1.57
40	9.31	0.083	2400	40	0.25	94	0.65	1.40	86	1.74
40-41	28.40	0.255	3850	62	0.37	95	0.72	1.48	254	1.92
50-53	10.25	0.091	4200	65	0.25	95	0.65	1.48	100	1.74
52-53	10.20	0.091	3400	49	0.22	94	0.63	1.40	98	1.69
9J-10J	11.82	0.105	1850	20	0.15	90	0.59	1.09	94	1.57
10J-11	11.68	0.104	2450	25	0.31	91	0.69	1.16	86	1.84
11-12	17.40	0.156	2650	30	0.32	90	0.69	1.09	119	1.84
12-13	22.34	0.200	2800	32	0.33	90	0.70	1.09	151	1.86
13-14	8.35	0.074	2250	10	0.40	81	0.74	0.61	30	1.97
14-15	2.85	0.025	2200	20	0.30	81	0.68	0.61	23	1.82

SUB BASIN (Reach)	AREA Planim. Read	Square Mile	BASIN LENGTH	HEIGHT	Tc	Curve No.	TPO	FLOW Q	qp	Tb
1-2	75.29	0.675	8500	179	0.61	90	0.87	1.98	747	2.31
2-3	108.52	0.973	9300	170	0.69	90	0.91	1.98	1020	2.44
3-4	201.55	1.807	13450	232	0.94	90	1.06	1.98	1629	2.84
4-5	55.06	0.494	7425	87	0.69	93	0.91	2.25	589	2.44
5-6	162.56	1.458	10775	156	0.85	81	1.01	1.32	924	2.69
20-21	31.50	0.282	5500	93	0.48	96	0.78	2.55	443	2.10
21-22	31.14	0.279	4525	77	0.41	96	0.74	2.55	463	2.00
22-23	17.52	0.157	3950	42	0.44	95	0.76	2.45	244	2.04
6-7J	21.18	0.190	3675	43	0.21	94	0.63	2.35	345	1.67
7J-8	19.64	0.176	3400	51	0.16	93	0.60	2.25	322	1.59
30-31	9.92	0.089	2650	59	0.24	96	0.65	2.55	170	1.72
31-32	35.01	0.313	3750	61	0.22	95	0.63	2.45	587	1.69
32-33	7.71	0.069	1925	27	0.23	93	0.64	2.25	116	1.70
8-9J	7.73	0.069	1750	20	0.15	90	0.59	1.98	112	1.57
40	9.31	0.083	2400	40	0.25	94	0.65	2.35	145	1.74
40-41	28.40	0.255	3850	62	0.37	95	0.72	2.45	420	1.92
50-53	10.25	0.091	4200	65	0.25	95	0.65	2.45	166	1.74
52-53	10.20	0.091	3400	49	0.22	94	0.63	2.35	164	1.69
9J-10J	11.82	0.105	1850	20	0.15	90	0.59	1.98	171	1.57
10J-11	11.68	0.104	2450	25	0.31	91	0.69	2.07	154	1.84
11-12	17.40	0.156	2650	30	0.32	90	0.69	1.98	217	1.84
12-13	22.34	0.200	2800	32	0.33	90	0.70	1.98	275	1.86
13-14	8.35	0.074	2250	10	0.40	81	0.74	1.32	64	1.97
14-15	2.85	0.025	2200	20	0.30	81	0.68	1.32	23	1.82

HYDROLOGIC COMPUTATION-BASIC DATA

Proj: Peterson Field Master Drainage Plan
100 yr. Return Period

By: C. Aamold
Date: 8/11/75

City of Colorado Springs, Colorado
Department of Public Works

VII PETERSON FIELD DRAINAGE BASIN
PRIMARY COST ESTIMATE

(All values reflect cost plus 10%
Engineering & Contingencies)

DRAINAGE						BRIDGE	
Reach	Description	City Cost	Airport Cost (not used for determining drainage fees)	New Airport Cost	Developer Cost	Total Cost	Description/ Location	Cost
1-2	60" RCPx80' at Hwy 94				$ 4,000	$ 4,000	1-6'x3'w, RCB at Marksheffel Rd. (120')	$17,500
	6'x5.5' trap.concr.lined channel (3670')				$127,900	$127,900		
2-3	16'x5.5' trap.concr. channel (5049')			$237,900		$237,900		
3-4	10'x7.0' trap.concr. channel (500')		$ 23,000			$ 23,000		
	40' Concrete splash pan (1700')		$ 75,000			$ 75,000		
	Box culvert outlet structures 3-8'dx8.5'w RCB's w/15° wing walls (540 LF @ 1.0%)		$245,000			$245,000		
	Reservoir Excavation		$ 35,000			$ 35,000		
	Concrete reservoir face slope protection		$ 15,000			$ 15,000		
	Reservoir property acquisition (25 acres)				$ 75,000	$ 75,000		
4-5	10'x7.0' trap.concr. channel (7344')		$332,700			$332,700		
	2-6.0'x10' RCB's (540 LF) at Pt. 5 with 30°wing walls & channel transition		$205,000			$205,000		
5-6	12'x8.0' trap.concr.channel (1275')		$ 65,000			$ 65,000		

DRAINAGE							BRIDGE	
Reach	Description	City Cost	Airport Cost	New Airport Cost	Developer Cost	Total Cost	Description/ Location	Cost
6-7	12'x8.0' trap.concr. channel (2264')				$114,000	$114,000		
	40' concrete splash pan (1500')				$ 66,200	$ 66,200		
	Reservoir Excavation				$ 60,000	$ 60,000		
	Reservoir property acquisition (25 Acres)				$100,000	$100,000		
	Channel easement Acquisition (55'x2265')=2.68 acres				$ 10,800	$ 10,800		
							3-8'x11.0' RCB's at Powers Blvd. (210')	$145,00(
7-8	10'x8.0' trap.concr. channel (2750')				$142,000	$142,000		
							(140') at Hancock Exp. with 30° wing walls & channel transition	$ 60,00(
8-9J	12'x8.5' trap.concr. channel (1740')				$ 96,000	$ 96,000		
33-9J	8'x5' trap.concr. channel (870')				$ 32,000	$ 32,000	1-5'x10' RCB (140') @ Hancock Exp.	$ 30,00(
9J-10J	12'x8.5' trap. concr. channel (1890') with transition to 7.25 deep				$106,000	$106,000		
53-10J	8'x5' trap.concr. channel (1305')				$ 47,000	$ 47,000		
							2-3'x9' RCB's (60') at Hancock Exp. other half in Southborough #6, Report	$ 23,40

DRAINAGE

Reach	Description	City Cost	Airport Cost	NewAirport Cost	Developer Cost	Total Cost	BRIDGE Description/ Location	Cost
10J-11	24'x7.25' trap.concr. channel (~~500'~~)				$ ~~33,500~~	$ ~~38,500~~		
11-Colony Hills Cir.	28'x7.75' vert.concr. channel (240')	$ ~~50,000 (Approx. 70% of total cost)~~				$ 50,500		
	Relocation of 8" sanitary sewer (310')	$ 7,000				$ 7,000		
	Replacement of box structure with 3-7.9'dx9.5'w RCB's (60')	$41,000				$ 41,000		
Colony Hills Cir. to (Acad.Blvd.)								
Pt. 12	32'x6.5' trap.concr.channel (900')				$ ~~69,000~~	$ 69,000		
	48'x5.5' trap.concr.channel transition (100')				$ 9,500	$ 9,500		
	5-5'x9.5'w,RCB's extension at Academy Blvd. (60') with 100' transition to 12'x9' channel				$ 54,000	$ 54,000		
12-13	12'x9.0' trap.concr.channel (3800')				$250,000	$250,000		
	60" RCP siphon for Irrig. conal crossing (70')				$ 5,500	$ 5,500		
	2-10'x12' RCB's at Cormacks driveway (40')with 30°wing walls				$ 30,000	$ 30,000		
							2-10'x12' RCB's at Astrozen Blvd. (80')with 30°wing walls	$60,000
13-14	12'x9.0' trap.concr.channel (850')				$ 53,000	$ 53,000		
	AT&SF RR crossing (45') with 30°wing walls				$ 37,000	$ 37,000		

DRAINAGE

Reach	Description	City Cost	Airport Cost	New Airport Cost	Developer Cost	Total Cost	BRIDGE Description/ Location	Cost
14-15	12'x9.0' trap.concr. channel (300')				$ 20,000	$ 20,000		
	Outfall structure at Fountain Creek				$ 5,000	$ 5,000		
20-21	6'x3.5' trap.concr. channel (1430')				$ 32,500	$ 32,500		
	72" RCP at Pt.21 (proposed) Fountain Blvd.(120') (50 yr. criteria)				$ 6,000	$ 6,000		
21-22	8'x5' trap.concr.channel (2700')				$ 83,000	$ 83,000		
							1-5'x10' w,RCB at Pt.22 (Astrozen Blvd.)(80')	$15,000
	6'x3.5' trap.concr. channel (2450')				$ 55,700	$ 55,700		
22-23	8'x6'trap.concr. channel (3600')				$135,000	$135,000		
30-31	3'x3' trap.concr. channel (2000')				$ 40,000	$ 40,000		
	48" RCP at Astrozen Blvd. Pt.31 (80')				$ 3,100	$ 3,100		
31-32	6'x5.5' trap.concr. channel(1770')				$ 59,000	$ 59,000		
40-41	4'x4' concr.trap. channel(first 600')				$ 15,500	$ 15,500		
	5'x4.5' concr.trap. channel (lower 2000')				$ 56,500	$ 56,500		
	54" RCP at Prop. Fountain Blvd. (120') Pt. 40				$ 5,400	$ 5,400		
	1-66" RCP (60')				$ 3,000	$ 3,000		
	2-5'x8' RCB's at street crossings (60')				$ 18,000	$ 18,000		
	Drainage facilities at unspecified locations, 25 catch basins & 7000' of RCP				$260,000	$260,000		

DRAINAGE BRIDGE

Reach	Description	City Cost	Airport Cost	New Airport Cost	Developer Cost	Total Cost	Description/ Location	Cost
50-53	Upgrading of existing concrete channel along Chelton to Hancock at sharp bends. a) rework walls of channel (160') at Chelton and London Dr. with leveling course backfill, sod placement, fence relocation & bevel RCP inlet obstruction	$ 13,000				$ 13,000		
	b) 350 LF of up to 2 ft. additional channel curb wall near Emmanuel Church, inlet reworking at Hancock	$ 15,000				$ 15,000		
	TOTALS	~~$126,500~~ ~~$156,624~~ ~~$156,778~~ 151,639	$995,700	$237,900	~~$2,320,100~~ ~~2,289,449~~ 2,310,502	$3,670,200		$350,900

FEE DETERMINATION

Drainage fees and Bridge fees are both required by developers to pay the costs of the required improvements within the basin. Certain costs are also to be paid by the City of Colorado Springs to update the capacity of the existing system. The area of the original Peterson Field Airport was not used to determine the fee schedules. The costs of the facilities required on the new airport area are included in the developer costs. The Bridge costs pertain to any structure required to carry in excess of 500 cfs under any arterial roadway. (Ref. 13-49 Subdivision Ordinance)

The following table shows the methods used in determining the applicable fees. The net acreage for fee assessment was derived by subtracting the area previously platted or drainage fees paid and the City owned property from the gross area of the basin. The costs of improvements on the original airport property and the costs to be paid by the City for upgrading the system are not included in the Developer's drainage cost estimates. The unit fees were then calculated by dividing the total cost to developers by the net acreage available in the basin for development.

FEE DETERMINATION

Gross Basin Area	5,485 Acres
Area of Original Peterson Field Airport within basin	2,175 Acres
Net area available in basin for development	3,310 Acres
Estimated cost of bridges in basin	$350,900

Bridge Fee: (ref. 13-49 Subdivision Ordinance)
350,900 ÷ 3,310A. = 106.00

Net basin area available for development	3,310 Acres
Area previously developed or drainage fee paid	- 758.8 Acres
Net Area to be assessed drainage fee	2,551.2 Acres

Estimated cost of drainage improvements to developers =
$2,320,100 + $237,900 = ~~$2,558,000~~

Drainage Fee:
~~$2,558,000~~ ÷ 2,551.2 Acres = ~~$1,003~~

BIBLIOGRAPHY

1. Handbook of Hydraulics; King & Brater, 5th Edition, McGraw Hill Book Co.
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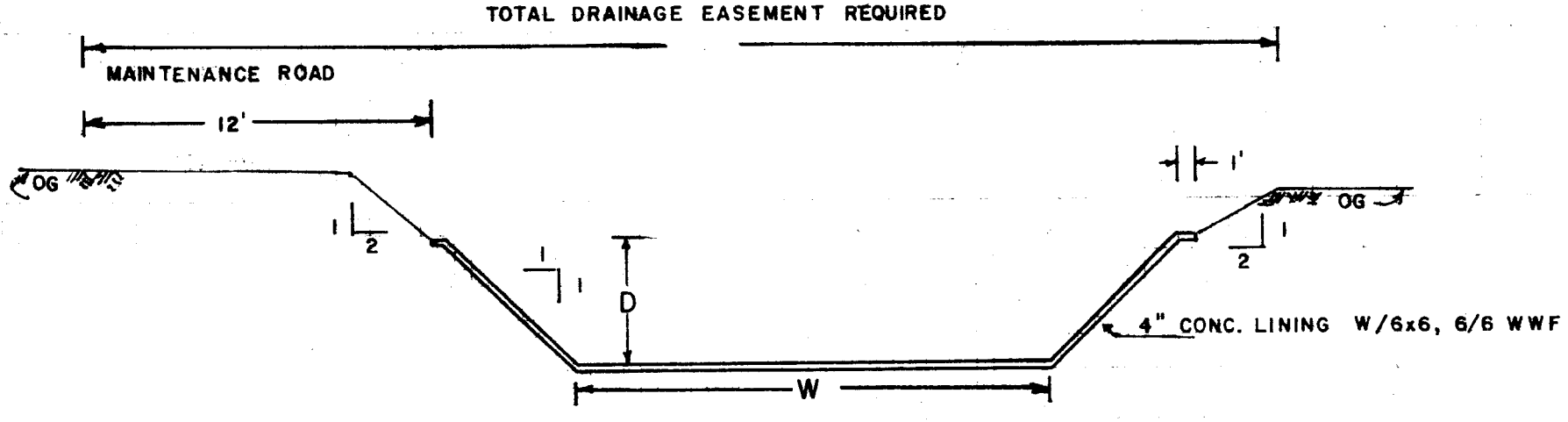
3. Peterson Field Master Drainage Report, 1965, Karcich and Weber, Inc.
4. Peterson Field Master Drainage Report, 1974, NHPQ Engineers, Inc.
5. Windmill Gulch Drainage Basin Study, 1971, United Western Engineers
6. Flood Plain Information; 1973, Army Corps of Engineers
7. Local Climatological Data; 1972, U.S. Dept. of Commerce
8. Hydrology and Hydraulics Design Manual, 1964, Los Angeles County Flood Control District
9. Procedures for Determining Peak Flows in Colorado, 1972, U.S. Dept. of Agriculture, Soils Conservation Service

APPENDIX

SPECIAL DETAILS

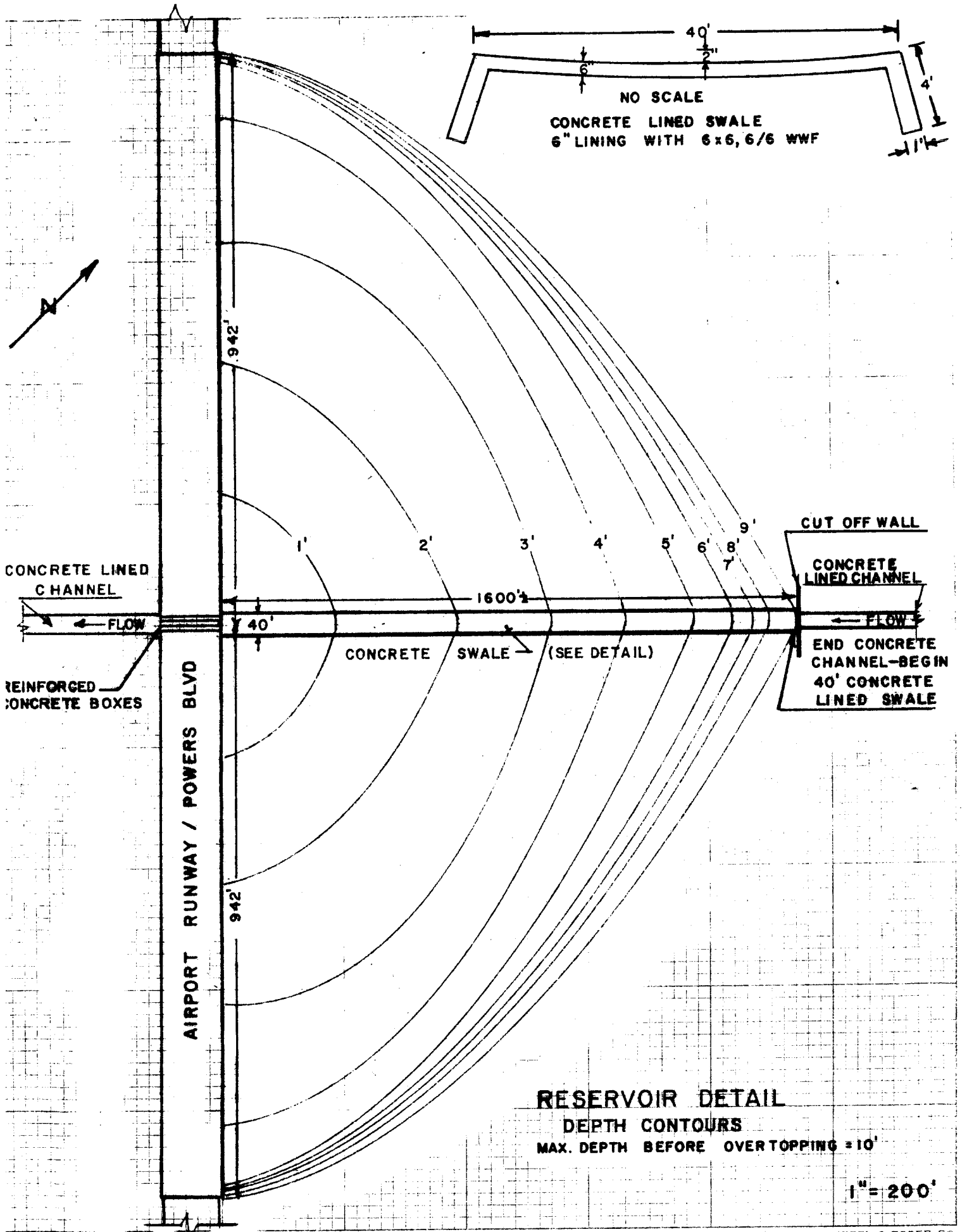
SOIL CLASSIFICATION MAPS

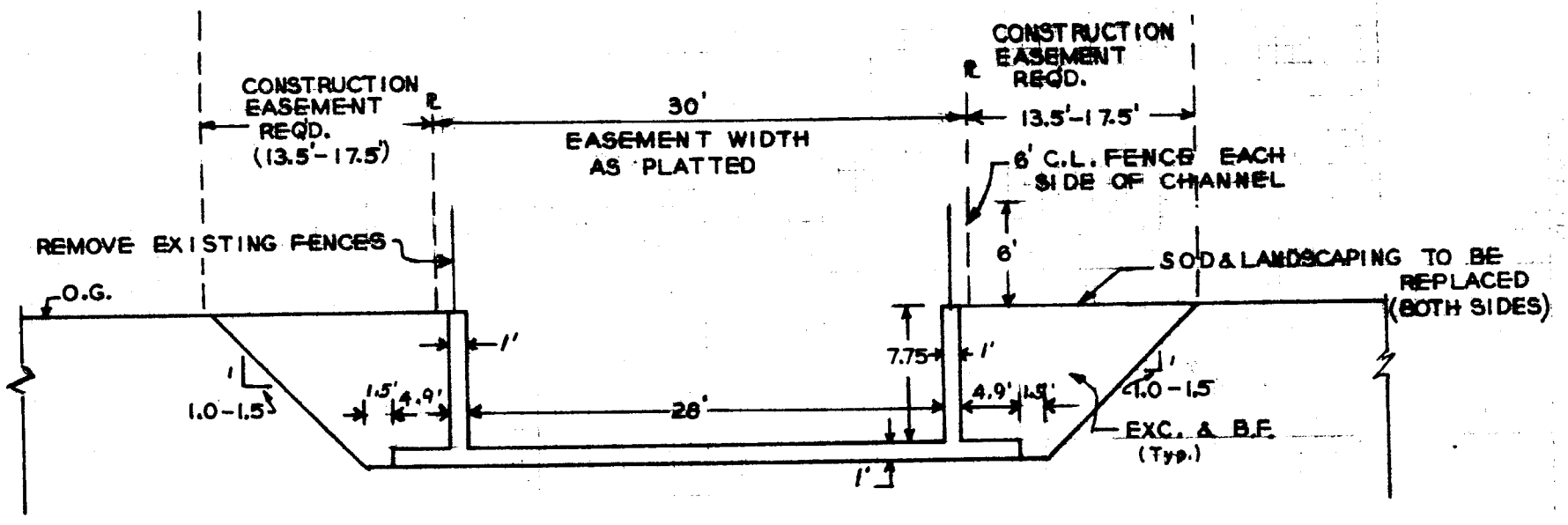
BASIN HYDROGRAPHS



TYPICAL CONCRETE CHANNEL DETAIL

1. PLAN NOTATIONS REFER TO W x D
2. MAINTENANCE ROAD REQUIRED ONLY FOR CHANNELS WITH A FLOW OF 500 CFS OR MORE.



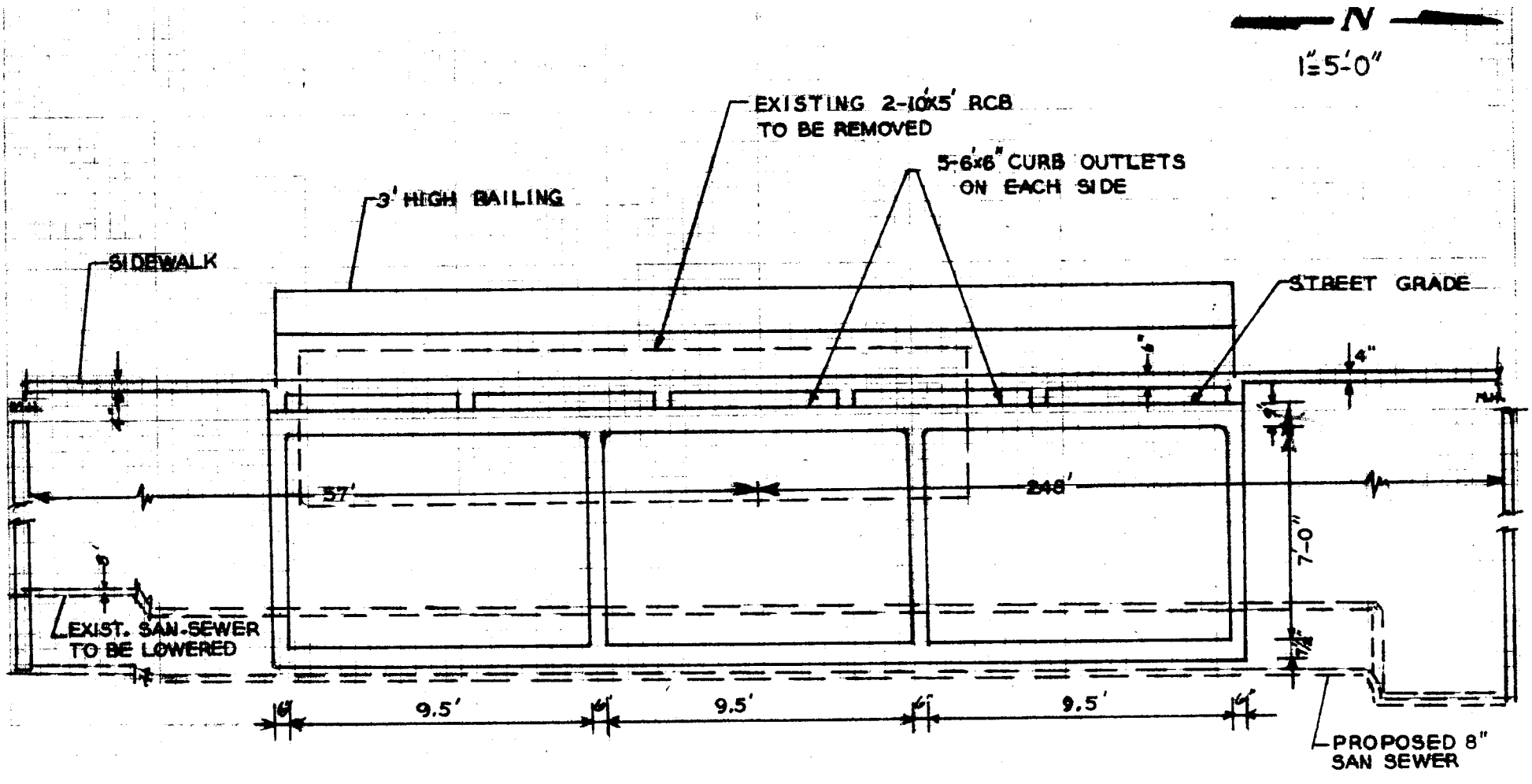


NOTES

1. Q = 4822 CFS
2. CAP. = 5911 CFS
3. S = 0.0077
4. 2" WEEP HOLES TO BE INSTALLED IN EACH WALL 6" ABOVE FLOOR AT 10'-0" INTERVALS.

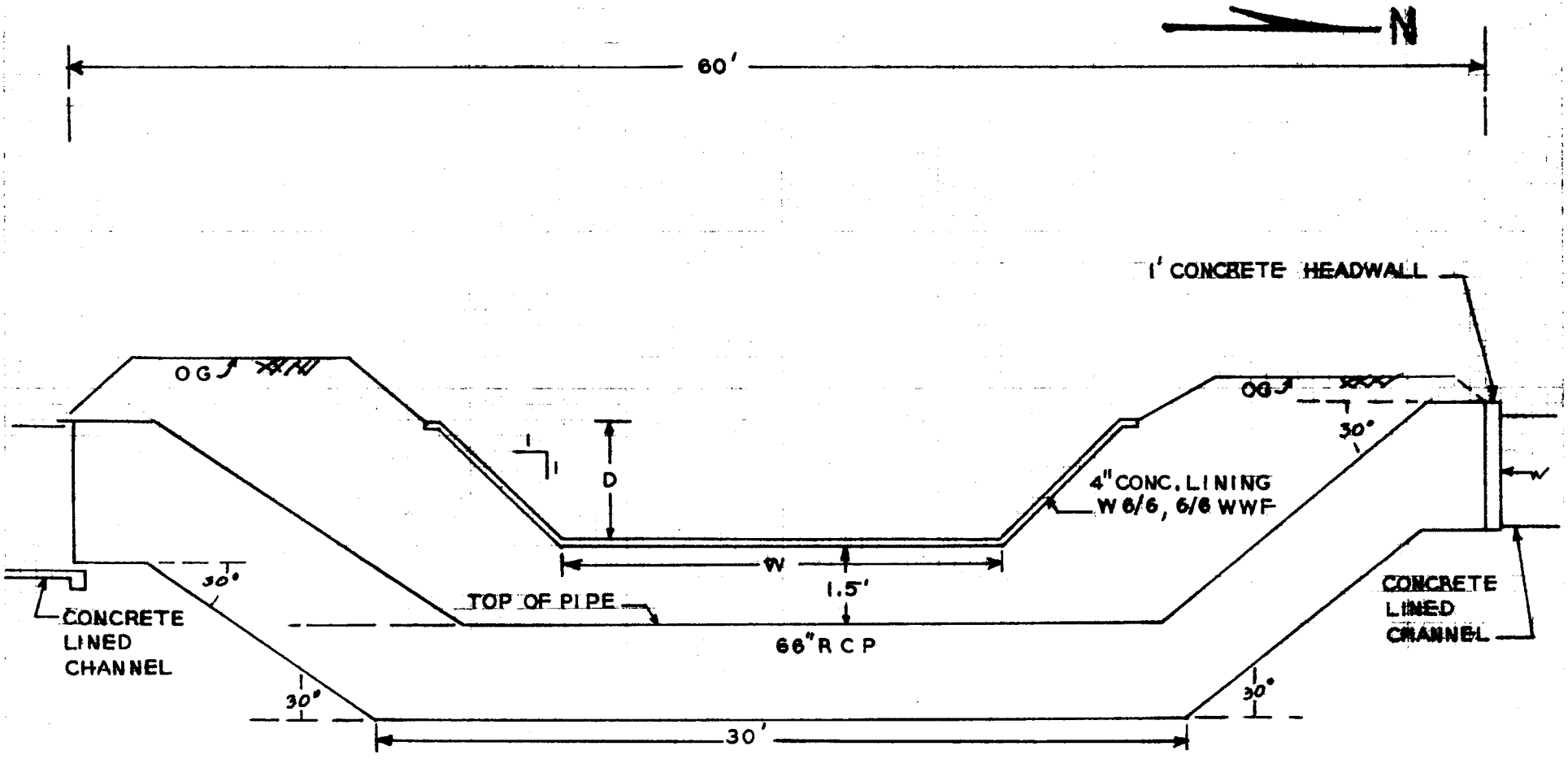
VERTICAL CONCRETE CHANNEL DETAIL

TO BE INSTALLED FROM 210' EAST of INTER. of COLONY HILLS CIRCLE & LAKEHURST DR. to COLONY HILLS CIRCLE (Length = 240')



ELEVATION

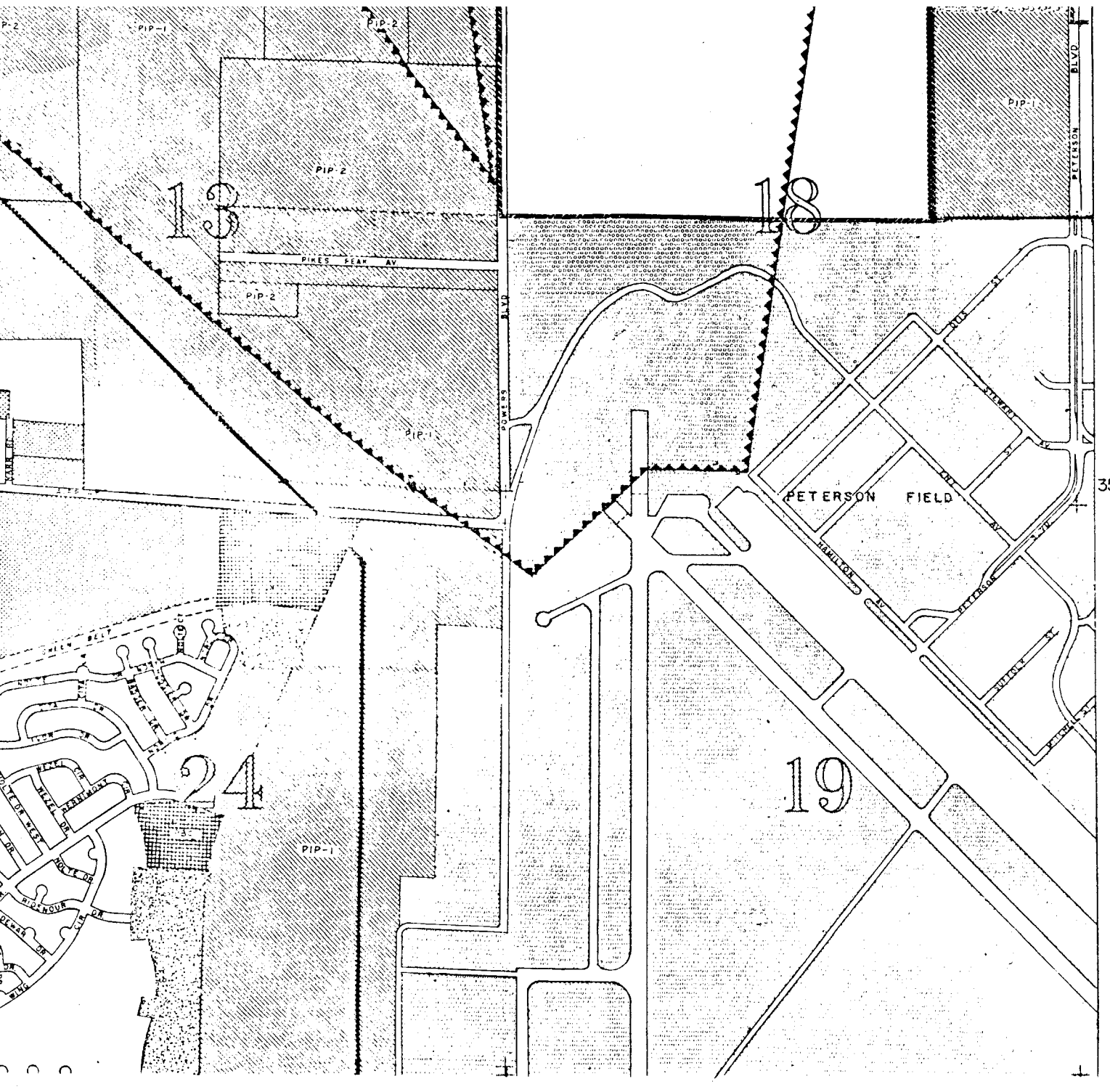
DEERFIELD HILLS
REINFORCED BOX CULVERT
AT COLONY HILLS CIRCLE



IRRIGATION CANAL CROSSING DETAIL

1. PLAN NOTATIONS REFER TO WXD
2. ACTUAL CONSTRUCTION DETAILS TO BE SUBMITTED FOR APPROVAL, PRIOR TO CONSTRUCTION.

NO SCALE



A-1		Garden Homes
R		Single Family Residential
R-1		9,000 Sq. Ft. Single Family Residential
R-1		6,000 Sq. Ft. Single Family Residential
R-2		One & Two Family Residential
R-4		Eight Family Residential
R-5		Multi-Family Residential
PUD		Planned Unit Development
MHP		Mobile Homes Park
MHS		Mobile Homes Subdivision
RVP		Recreational Vehicle Park
SU		Special Use No. 1, 2 and 3
PBC		Planned Business Center
C-4		Neighborhood Business
C-5		Intermediate Business
C-6		General Business
NBZ		Neighborhood Business Zone
PBP		Planned Business Park
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M-2		Heavy Industrial
PIP		Planned Industrial Park No. 1 and 2
APD		Airport Planned Development
UV	*	Use Variance
CU	•	Conditional Use

City Limits

Zone subject to Conditions of Record

High Rise Zone

Air Approach Zone

Navigation Preservation (Plan Development) Zone

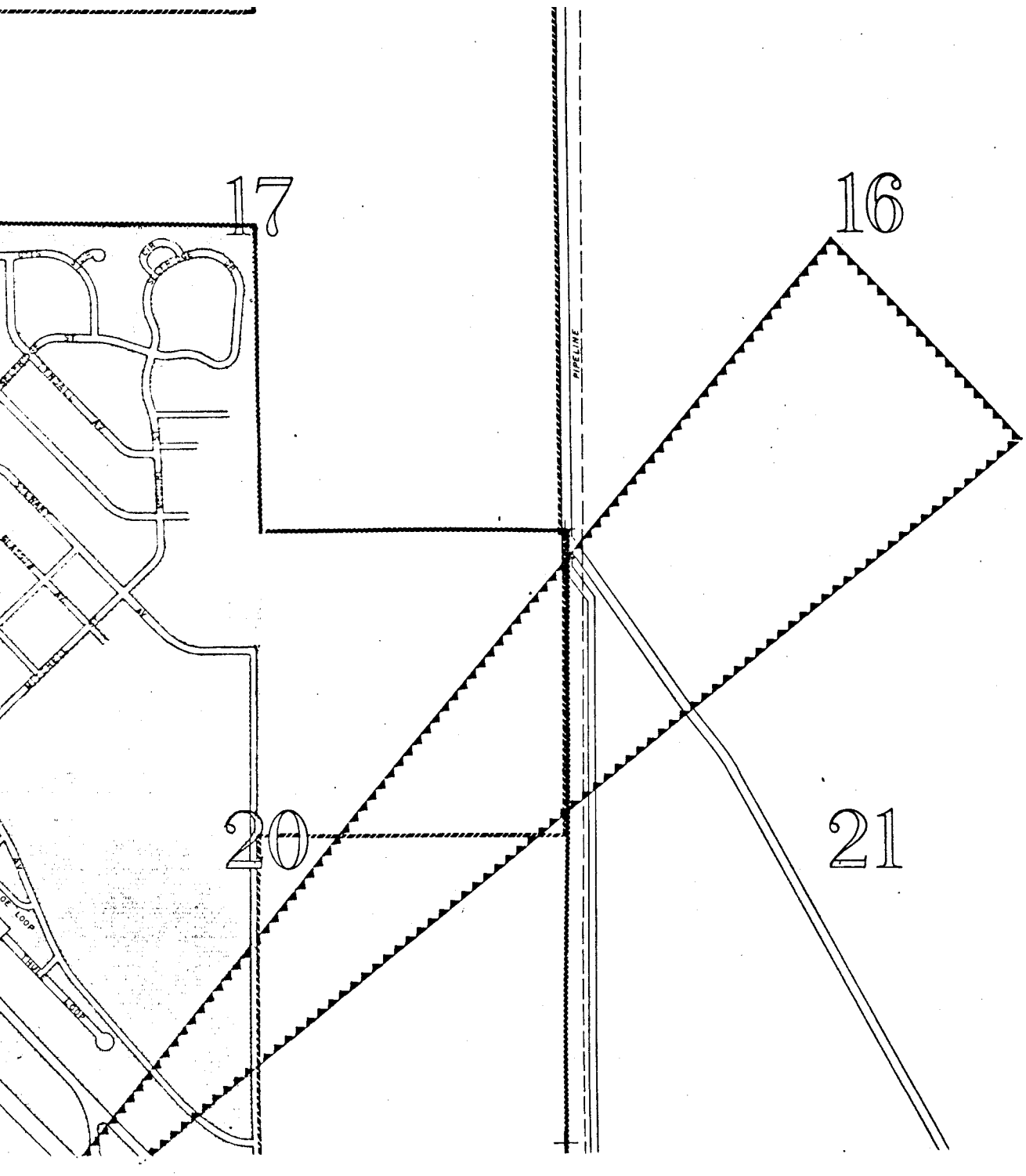
Hillside Area

CITY PLANNING DEPARTMENT
POST OFFICE BOX 1575 COLORADO SPRINGS, COLORADO

SCALE 1" = 1000'

Sheet 34 of 49

Revision Date
January 28, 1975



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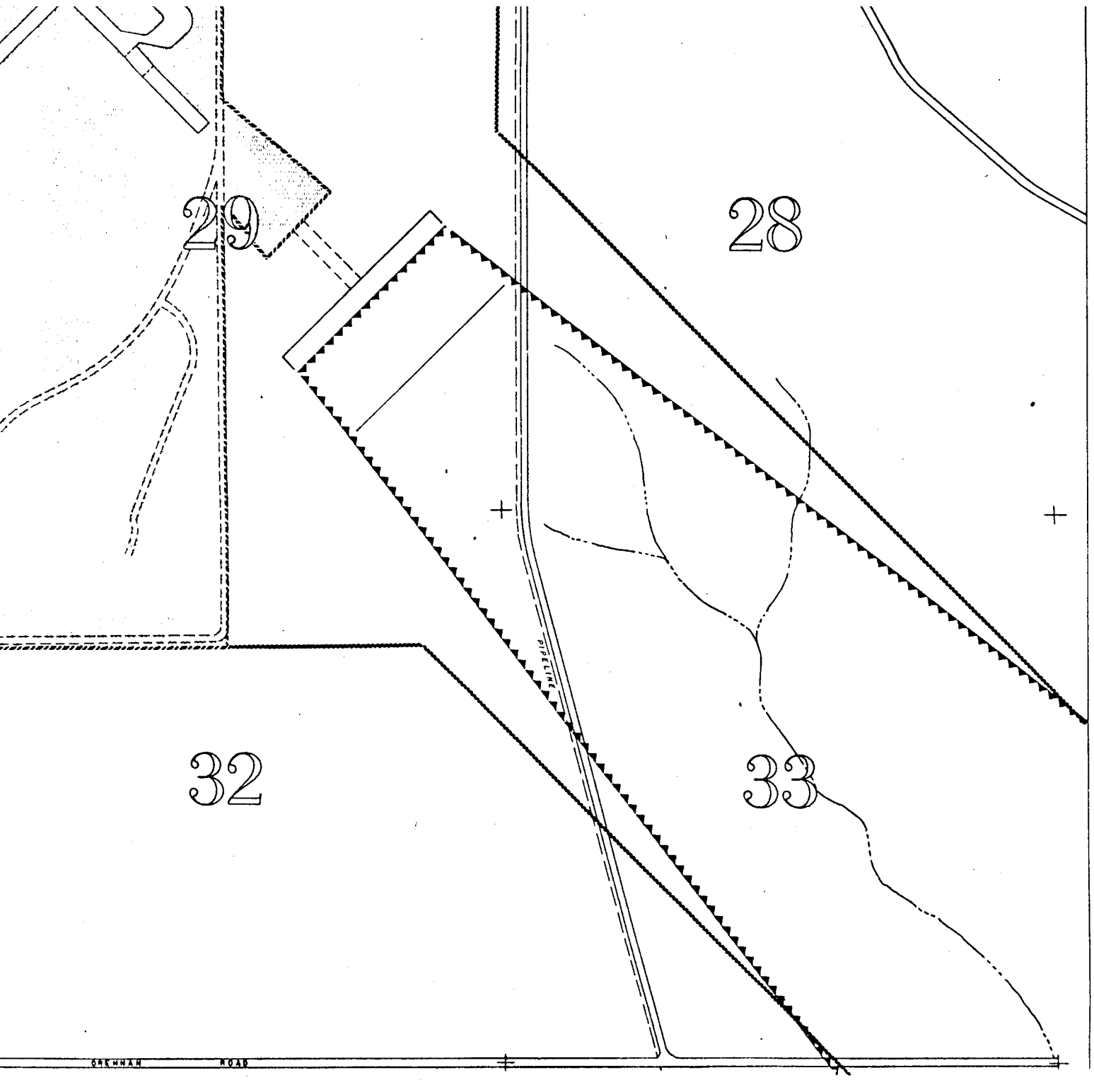
CITY PLANNING DEPARTMENT
POST OFFICE BOX 1575 COLORADO SPRINGS, COLORADO

SCALE: 1" = 1000' | Sheet 35 of 49 | Revision January 28,



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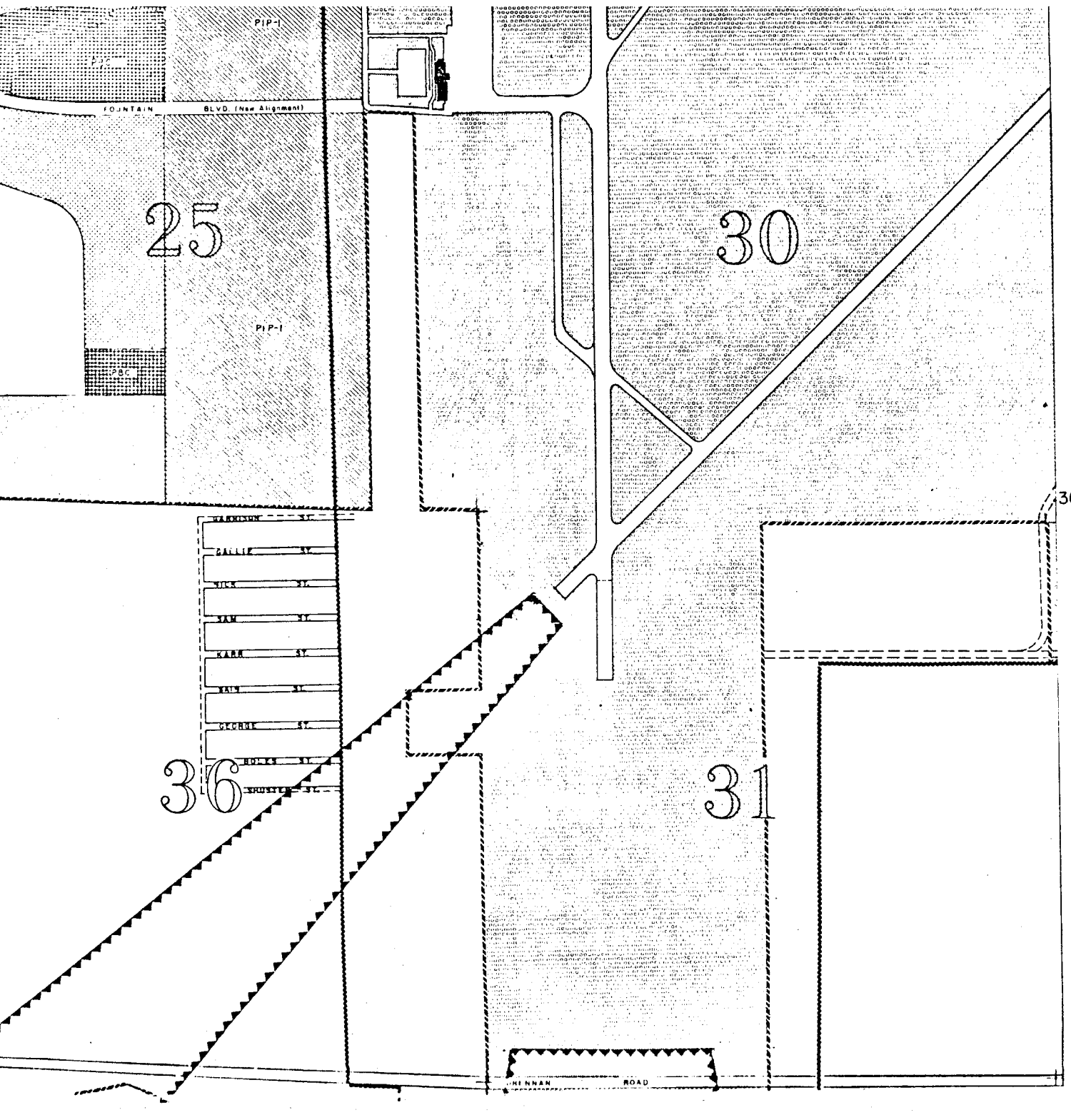
CITY PLANNING DEPARTMENT

POST OFFICE BOX 1575 COLORADO SPRINGS, COLORADO

SCALE 1" = 1000'

Sheet 36 of 49

Revision



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POST OFFICE BOX 1575 COLORADO SPRINGS, COLORADO

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Sheet 37 of 49

Revision Date
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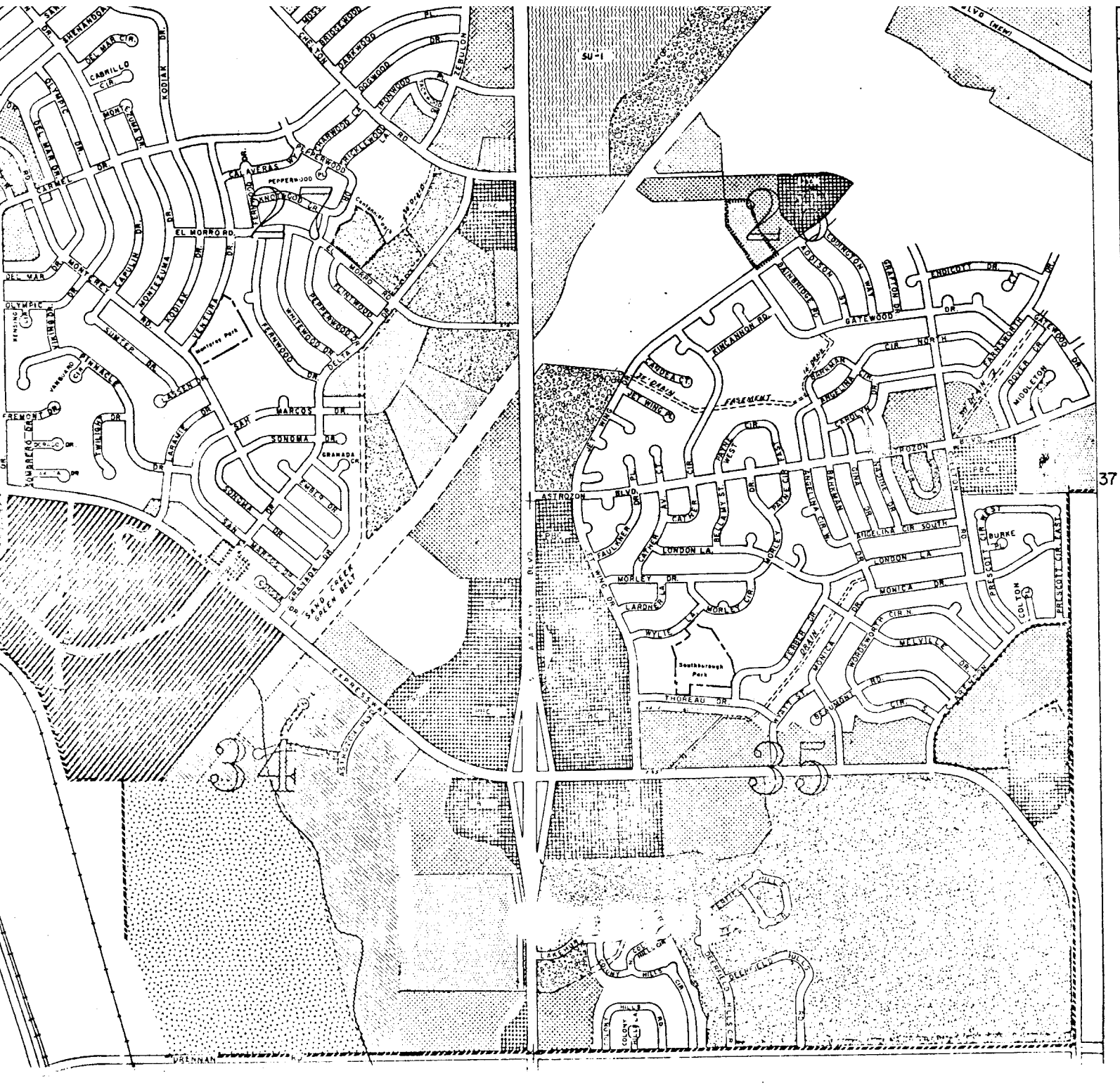

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Air Approach Zone

Navigation Preservation (Plan Development) Zone

Hillside Area

CITY PLANNING DEPARTMENT

POST OFFICE BOX 1575 COLORADO SPRINGS, COLO

SCALE 1" = 1000'

Sheet 38 of 49

Revised January

(R2) Stapleton series

SOIL SURVEY INTERPRETATIONS

MLRA: 49

LSL 12/71

The Stapleton series consist of moderately coarse textured soils becoming gravelly with depth. The surface layer, 4 to 8 inches thick, is a sandy loam. The subsoil, 6 to 10 inches thick, is a gravelly sandy loam. Underlying material is a light colored gravelly sandy loam or gravelly loamy sand extending to a depth of 60 " or more. ESTIMATED PHYSICAL AND CHEMICAL PROPERTIES

MAJOR SOIL HORIZONS (INCHES)	CLASSIFICATION			COARSE FRACT > 3 IN.	PERCENTAGE LESS THAN 3 INCHES PASSING SIEVE NO.				LL	PI	PERMEABILITY (in./hr)	AVAILABLE WATER CAPACITY (In. in)	SOIL REACTION (pH)	SALINITY (EC x 10^3 at 25°C)	SHRINK-SWELL POTENTIAL	POTENTIAL FROST ACTION
	USDA TEXTURE	UNIFIED	AASHO		4	10	40	200								
0 -60	Gravelly sandy loam	SM	A-2	< 1	100	50 - 80	30 - 55	15 - 30	NP	NP	6.3 - 20.0	0.07 - 0.09	6.1 - 7.3	0 - 2	low	

DEPTH TO ROCK OR HARDPAN: > 60 inches

FLOOD HAZARD: none

DEPTH TO SEASONAL HIGH WATER TABLE: > 60 inches

HYDROLOGIC GROUP: B

SUITABILITY AND MAJOR FEATURES AFFECTING SOIL AS RESOURCE MATERIAL

TOPSOIL: Poor - Excessive gravel	GRAVEL: Fair - Excessive fines
SAND: Fair - Excessive fines	ROADFILL: Good

DEGREE OF LIMITATION AND MAJOR SOIL FEATURES AFFECTING SELECTED USE

LOCAL ROADS AND STREETS: Slight if slopes are less than 8%, Moderate if 8 to 15%	SEPTIC TANK FILTER FIELDS: Slight if slopes are less than 8%, Moderate if 8 to 15%.
SHALLOW EXCAVATIONS: Slight if slopes are less than 8%, Moderate if 8 to 15%	SEWAGE LAGOONS: Severe: rapid permeability
DWELLINGS: Slight if slopes are less than 8%, Moderate if 8 to 15%	CORROSIVITY - PIPE AND CONCRETE
RECREATIONAL AREAS: Moderate - Rapid permeability	CORROSIVITY - STEEL
[illegible] tion, moderate to low seepage	

SCS-SOIL
1-71
FILE CODE SOILS-12

U. S. DEPARTMENT OF AC ILTURE
SOIL CONSERVATIO ERVICE

(R4) Eastonville series

SOIL SURVEY INTERPRETATIONS

MLRA: 49

L.S.L. 12/71

The Eastonville series consists of deep, dark colored, coarse textured soils usually on stream terraces. The surface layer, 6 to 12 inches thick, is a sandy loam. The subsoil, 25 to 40 inches thick, contains a little more clay than the surface layer. The material underlying the subsoil ranges from sandy loam to loamy sand or sand to a depth of 60 inches and more.

ESTIMATED PHYSICAL AND CHEMICAL PROPERTIES

MAJOR SOIL HORIZONS (INCHES)	CLASSIFICATION			COARSE FRACT. > 3 IN. %	PERCENTAGE LESS THAN 3 INCHES PASSING SIEVE NO. ---				LL	PI	PERMEABILITY (in./hr)	AVAILABLE WATER CAPACITY (In./In)	SOIL REACTION (pH)	SALINITY (EC x 10^3 @25°C)	SHRINK-SWELL POTENTIAL	POTENTIAL FROST ACTION
	USDA TEXTURE	UNIFIED	AASHO		4	10	40	200								
0-48"	Sandy loam	SM	A-2 or A-4	<1%	100	95-100	55-70	25-40	15-20	N.P.	2.0-6.0	.11-.13	6.0-7.3		low	
48-66	Loamy sand	SM	A-2	<1%	100	95-100	50-75	15-30	10-15	N.P.	6.0-20.0	.06-.08	7.4-8.4		low	

DEPTH TO BEDROCK OR PARDPAN: > 5'

DEPTH TO SEASONAL HIGH WATERTABLE > 5'

FLOOD HAZARD: Occasional -

HYDROLOGIC GROUP A

SUITABILITY AND MAJOR FEATURES AFFECTING SOIL AS RESOURCE MATERIAL

TOPSOIL: ~~Fair~~ Good	GRAVEL: Unsuitable : No gravel
SAND: Poor: excessive fines	ROADFILL: Good

DEGREE OF LIMITATION AND MAJOR SOIL FEATURES AFFECTING SELECTED USE

LOCAL ROADS AND STREETS: Slight	SEPTIC TANK FILTER FIELDS: Slight
SHALLOW EXCAVATIONS: Slight	SEWAGE LAGOONS: Severe: Rapid permeability below 48"
DWELLINGS: Slight	CORROSIVITY - UNCOATED STEEL:
RESERVOIR AREA: Moderately Severe: Rapid permeability, rapid below 48"	CORROSIVITY - CONCRETE:
RESERVOIR EMBANKMENT: Severe: High seepage	

SCS-SO
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FILE CODE SOILS-12

U. S. DEPARTMENT OF A ULTURE
SOIL CONSERVATIC SERVICE

(R5) Truckton series

MLRA: 49, 69

E.M.A. 12/71

SOIL SURVEY INTERPRETATIONS

The Truckton series consists of deep, dark soils which are sandy loam in texture throughout the profile. The surface layer is 5 to 8 inches thick. The subsoil is 10 to 26 inches thick. The light colored underlying material usually extends to a depth of 60 inches or more.

ESTIMATED PHYSICAL AND CHEMICAL PROPERTIES

MAJOR SOIL HORIZONS (INCHES)	CLASSIFICATION			COARSE FRACT. > 3 IN. %	PERCENTAGE LESS THAN 3 INCHES PASSING SIEVE NO. ---				LL	PI	PERMEABILITY (in./hr)	AVAILABLE WATER CAPACITY (In/In)	SOIL REACTION (pH)	SALINITY (EC x 10^3 @25°C)	SHRINK-SWELL POTENTIAL	POTENTIAL FROST ACTION
	USDA TEXTURE	UNIFIED	AASHO		4	10	40	200								
0-60	Sandy loam	SM or SC	A-2 or A-4	<1	100	100	60-70	30-40	20-40	2-8	2.0-6.0	0.11-0.13	6.7-7.8		low	

DEPTH TO BEDROCK OR HARDPAN: > 5'

DEPTH TO SEASONAL HIGH WATERTABLE > 5'

FLOOD HAZARD: None

HYDROLOGIC GROUP: (B)

SUITABILITY AND MAJOR FEATURES AFFECTING SOIL AS RESOURCE MATERIAL

TOPSOIL: Fair : Slope	GRAVEL: Unsuitable : No gravel.
SAND: Unsuitable : excessive fines	ROADFILL: Good

DEGREE OF LIMITATION AND MAJOR SOIL FEATURES AFFECTING SELECTED USE

LOCAL ROADS AND STREETS: Slight if slope is < 8%; Moderate if slope 8-15%; Severe if slope is over 15%.	SEPTIC TANK FILTER FIELDS: Slight if slope is < 8%; Moderate if slope is 8 to 15%; Severe if slope is over 15%.
SHALLOW EXCAVATIONS: Slight if slope is < 8%; Moderate if slope is 8 to 15%; Severe if slope is over 15%.	SEWAGE LAGOONS: Severe limitation; Moderately rapid permeability.
DWELLINGS: Slight if slope is less than 8%; Moderate if slope is 8 to 15%; Severe if slope is over 15%.	CORROSIVITY – UNCOATED STEEL:
RESERVOIR AREA: ~~Severe limitation;~~ Moderately rapid permeability	CORROSIVITY – CONCRETE:
RESERVOIR EMBANKMENT: Good compaction; moderate seepage	

SCS-SOIL
1-71
FILE CODE SOILS-12

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

(R7) Blakeland series

SOIL SURVEY INTERPRETATIONS

The Blakeland series consists of deep, dark, coarse-textured soils. The surface layer, about 6 to 20 inches thick, is a loamy sand or a light sandy loam. The subsoil, about 10 to 14 inches thick, is a loamy sand. Underlying material is a light colored loamy sand or sand extending to 60 inches or more.

MLRA: 49

ESTIMATED PHYSICAL AND CHEMICAL PROPERTIES

L.S.L. 1

MAJOR SOIL HORIZONS (INCHES)	CLASSIFICATION			COARSE FRACT. > 3 IN. %	PERCENTAGE LESS THAN 3 INCHES PASSING SIEVE NO. ---				LL	PI	PERMEABILITY (in./hr)	AVAILABLE WATER CAPACITY (in/in)	SOIL REACTION (pH)	SALINITY (EC x 10^3 @25°C)	SHRINK-SWELL POTENTIAL	POTENTIAL FROST ACTION
	USDA TEXTURE	UNIFIED	AASHO		4	10	40	200								
0-60	Loamy sand	SP or SM, SP-SM	A-2	<1	100	100	50-70	5-15	NP	NP	6.0-20.0	0.06-0.08	6.1-7.3	0-2	low	low

DEPTH TO BEDROCK OR HARDPAN: > 60 inches

FLOOD HAZARD: None

DEPTH TO SEASONAL HIGH WATERTABLE >60 inches

HYDROLOGIC GROUP A

SUITABILITY AND MAJOR FEATURES AFFECTING SOIL AS RESOURCE MATERIAL

TOPSOIL: Poor: loamy sand	GRAVEL: Unsuitable: no gravel
SAND: Fair: SP-SM, fines	ROADFILL: Good

DEGREE OF LIMITATION AND MAJOR SOIL FEATURES AFFECTING SELECTED USE

LOCAL ROADS AND STREETS: Slight: slope 8% or less; Moderate: slope over 8%	SEPTIC TANK FILTER FIELDS: Slight if slope is less than 8%; Moderate if slope is 8 to 15%. 1/
SHALLOW EXCAVATIONS: Severe: sandy textures	SEWAGE LAGOONS: Severe: rapid permeability
DWELLINGS: Slight if slope is 8% or less; Moderate on slopes 8 to 15%	CORROSIVITY - UNCOATED STEEL: low
RESERVOIR AREA: Rapid permeability	CORROSIVITY - CONCRETE: low
RESERVOIR EMBANKMENT: High seepage	

1/ Hazard of ground water pollution

SCS-SOIL
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FILE CODE SOILS-12

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

(XAO) Sandy alluvial

MLRA: 49

L.S.L. 12/71

SOIL SURVEY INTERPRETATIONS

The sandy alluvial land consists of coarse textured, stratified soil material on the slightly raised flood plains along major streams and smaller drainages. Texture of the entire profile ranges from sand to sandy ~~loam~~ loamy. Along some of the major streams gravel and cobble occur at depths below 40 inches. Water tables are usually below 5 feet.

ESTIMATED PHYSICAL AND CHEMICAL PROPERTIES

MAJOR SOIL HORIZONS (INCHES)	CLASSIFICATION			COARSE FRACT. > 3 IN. %	PERCENTAGE LESS THAN 3 INCHES PASSING SIEVE NO. ---				LL	PI	PERMEABILITY (in./hr)	AVAILABLE WATER CAPACITY (in./in)	SOIL REACTION (pH)	SALINITY (EC x 10^3 @25°C)	SHRINK-SWELL POTENTIAL	POTENTIAL FROST ACTION
	USDA TEXTURE	UNIFIED	AASHO		4	10	40	200								
0-60	gravelly sandy loam, gravelly loamy sand or gravelly sand	SP or SM, SP-SM	A-1 or A-2	< 1	50-90	30-50, spotty	15-30	5-20	NP	NP	0.6-20.0	.05-.12	6.6-8.4		low	

DEPTH TO BEDROCK OR HARDPAN: > 5 feet

FLOOD HAZARD: Frequent

DEPTH TO SEASONAL HIGH WATER TABLE > 5 feet

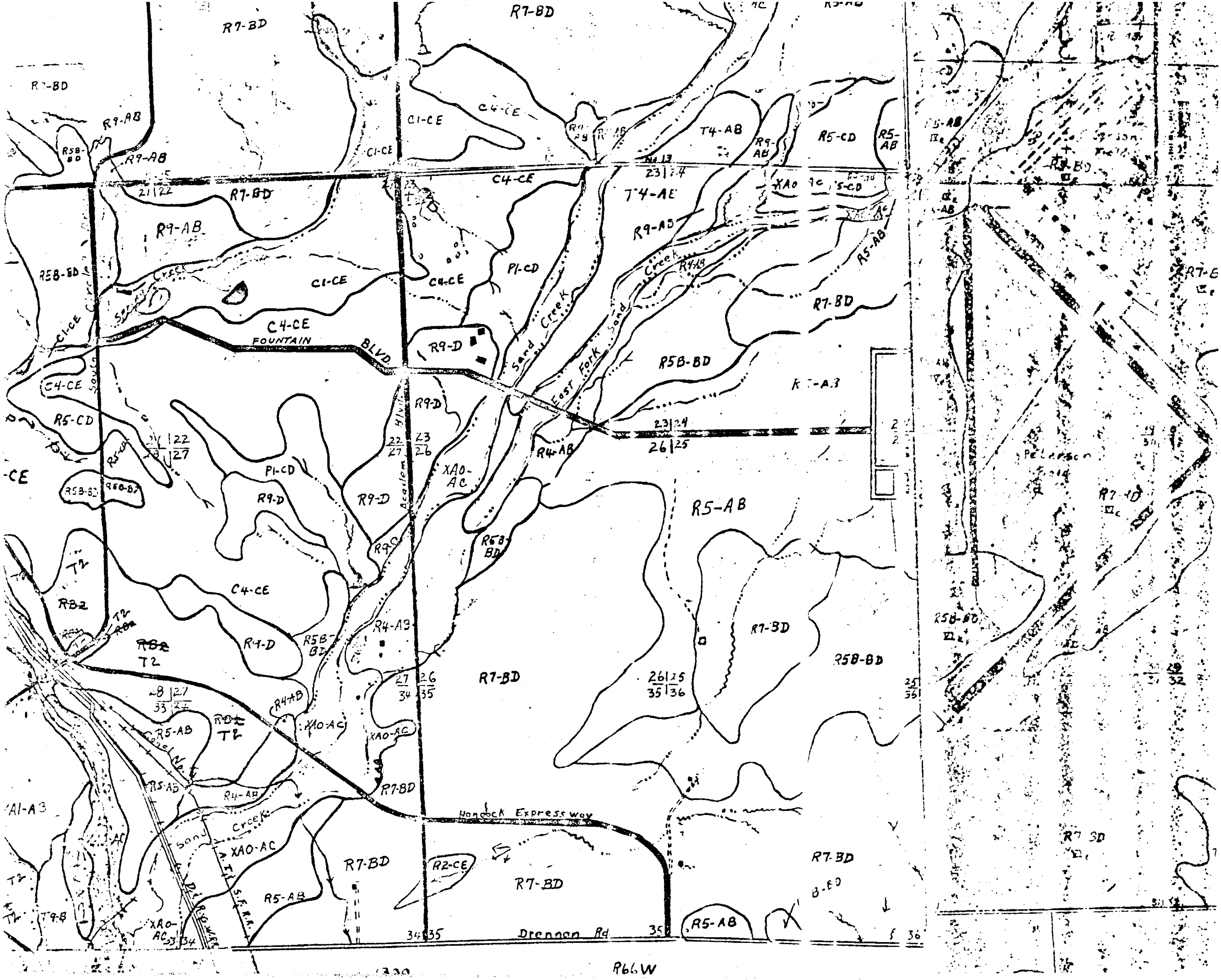
HYDROLOGIC GROUP B

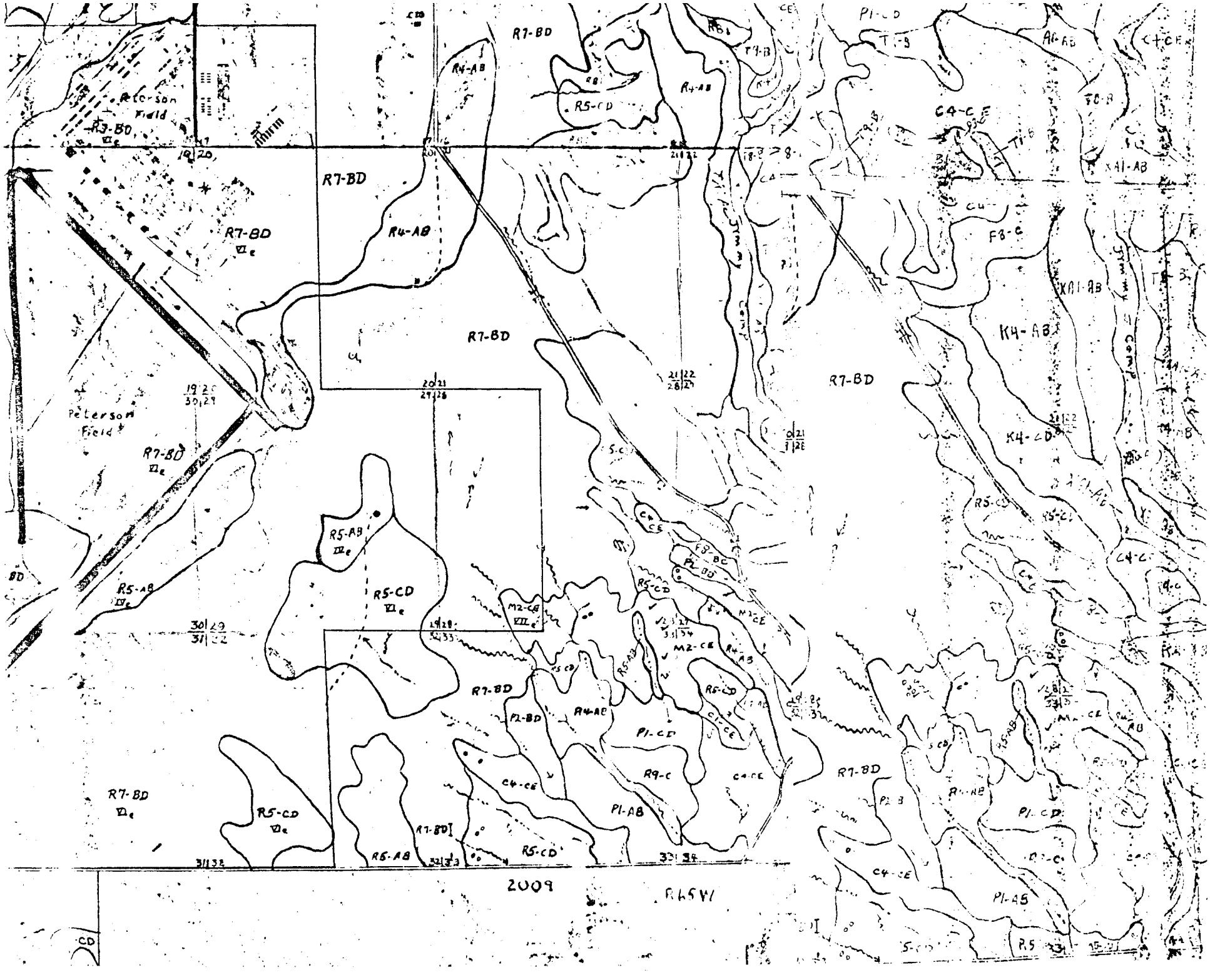
SUITABILITY AND MAJOR FEATURES AFFECTING SOIL AS RESOURCE MATERIAL

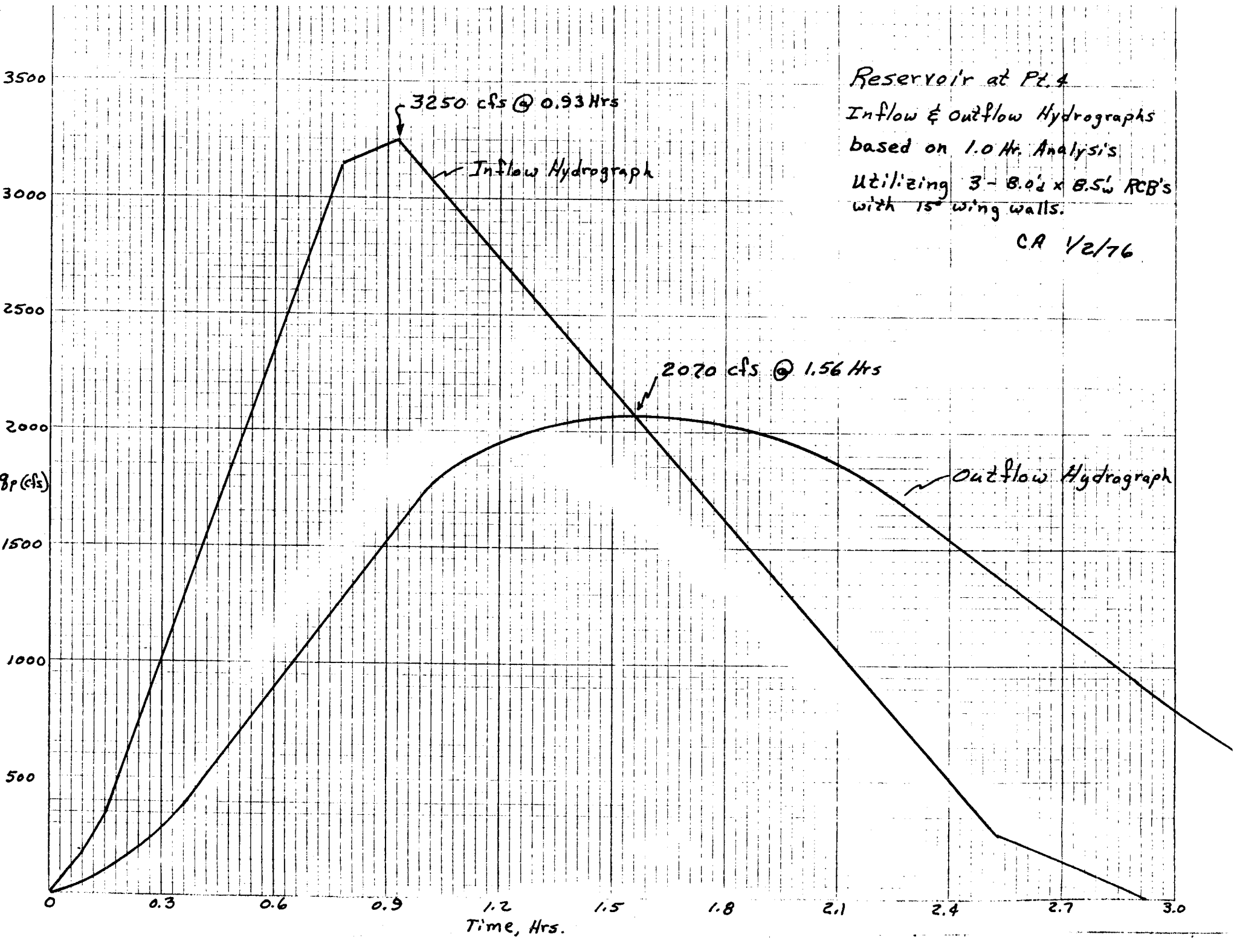
TOPSOIL: Poor: loamy sand and sand with gravel	GRAVEL: Poor to unsuitable : fines
SAND: Poor for concrete : fines	ROADFILL: Good

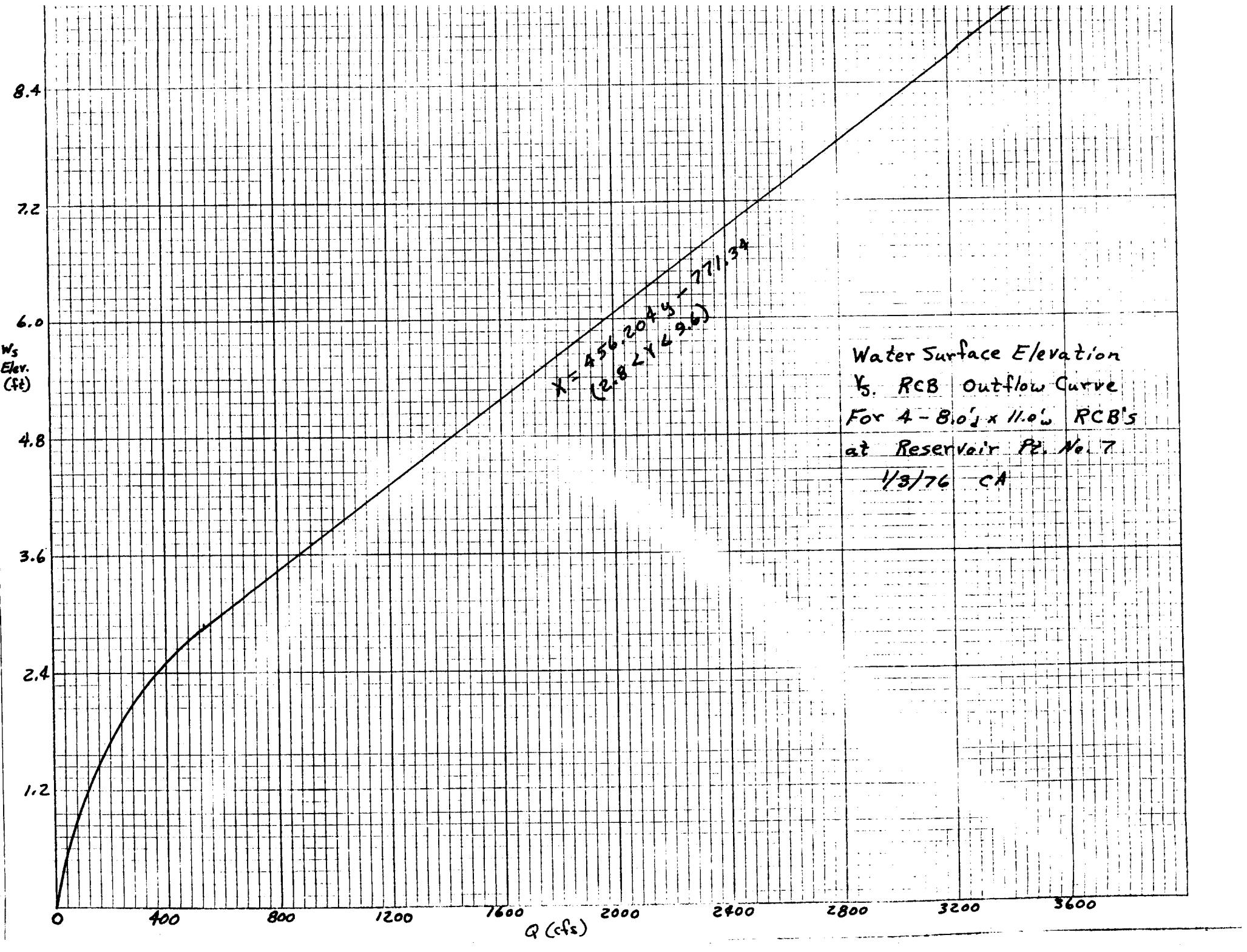
DEGREE OF LIMITATION AND MAJOR SOIL FEATURES AFFECTING SELECTED USE

LOCAL ROADS AND STREETS: Severe: subject to flooding	SEPTIC TANK FILTER FIELDS: Severe: subject to flooding
SHALLOW EXCAVATIONS: Severe: subject to flooding; sandy textures	SEWAGE LAGOONS: Severe: rapid permeability; subject to flooding
DWELLINGS: Severe: subject to flooding	CORROSIVITY - UNCOATED STEEL:
RESERVOIR AREA: ~~Severe~~ rapid permeability	CORROSIVITY - CONCRETE:
RESERVOIR EMBANKMENT: High erodibility	


R7-BD
R9-AB
R5B-BD
C1-CE
C4-CE
T4-AB
R5-CD
R5-AB
T4-AE
R9-AB
P1-CD
Sand Creek
East Fork Sand Creek
FOUNTAIN BLVD.
R9-D
R4-AB
R7-BD
R5B-BD
R5-AB
XAO-AC
T2
R5-CD
Academy Blvd
Hancock Expressway
Sand Creek
R2-CE
A.T.&S.F. R.R.
Drennan Rd
R66W
Peterson Field

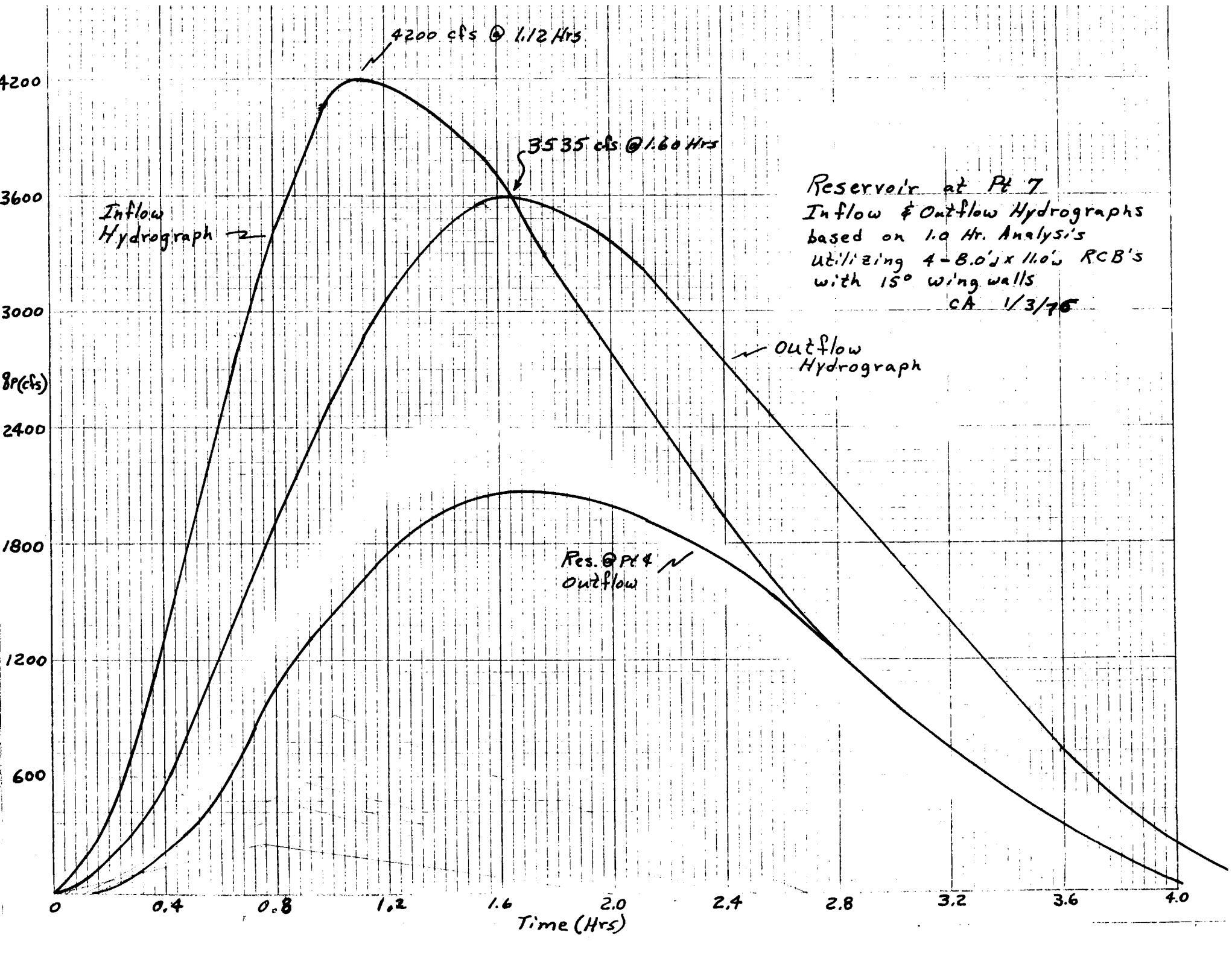

Peterson Field
R7-BD
R4-AB
R5-CD
R3-BD
R5-AB
M2-CE
C4-CE
P1-CD
P1-AB
R9-C
F8-C
K4-AB
K4-CD
XA1-AB
2009
R45W

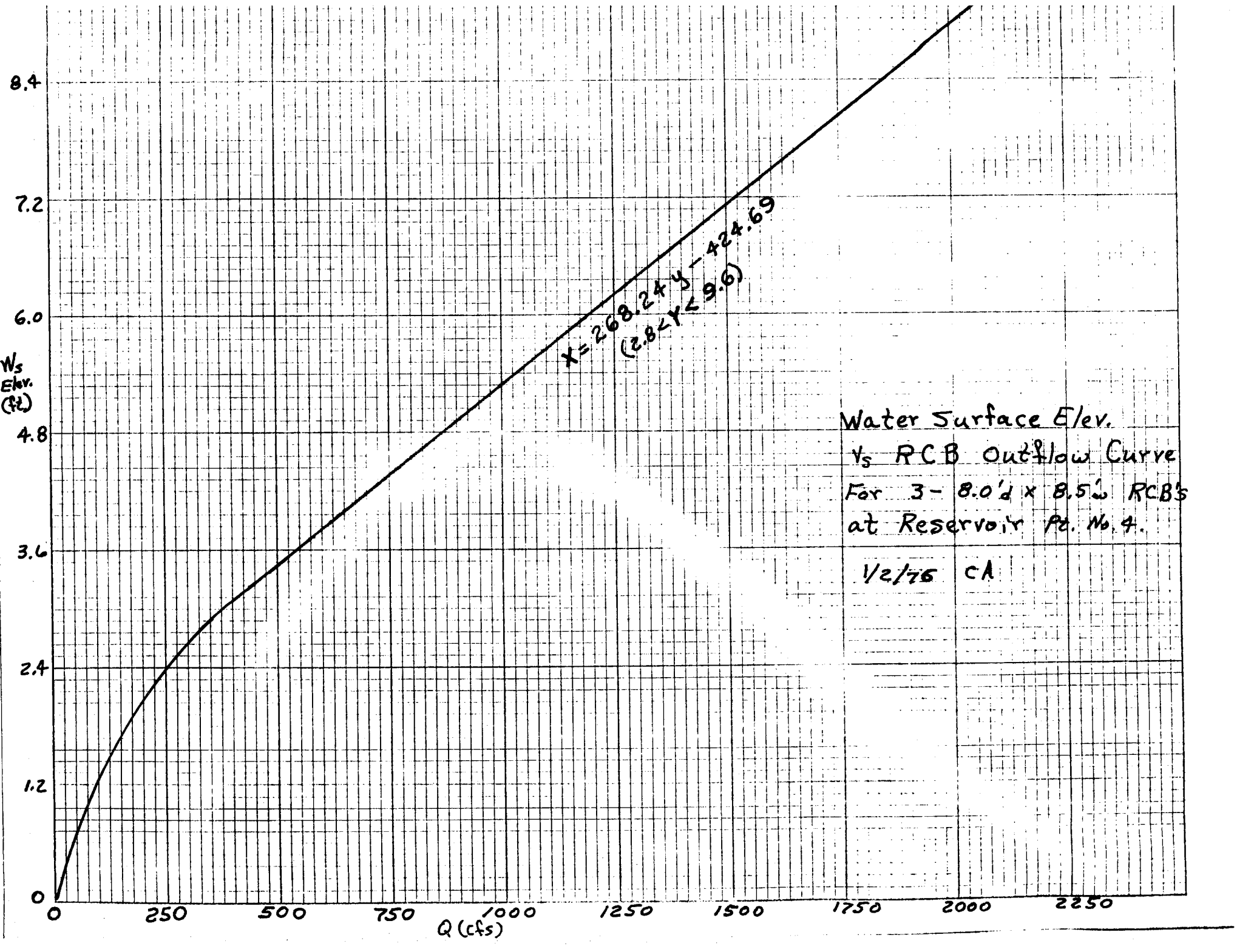

Reservoir at Pt. 4
Inflow & Outflow Hydrographs
based on 1.0 Hr. Analysis
Utilizing 3 - 8.0' x 8.5' RCB's
with 15° wing walls.
CA 1/2/76
3250 cfs @ 0.93 Hrs
Inflow Hydrograph
2070 cfs @ 1.56 Hrs
Outflow Hydrograph
Qp (cfs)
3500
3000
2500
2000
1500
1000
500
0
0.3
0.6
0.9
1.2
1.5
1.8
2.1
2.4
2.7
3.0
Time, Hrs.


8.4
7.2
6.0
4.8
3.6
2.4
1.2
Ws Elev. (ft)
0
400
800
1200
1600
2000
2400
2800
3200
3600
Q (cfs)
Water Surface Elevation
Vs. RCB Outflow Curve
For 4 - 8.0'h x 11.0'w RCB's
at Reservoir Pt. No. 7
1/3/76 CA

Reservoir at Pt. 4-1 Hr. Analysis, 3 - 8'd x 8.5'w Reinforced Concrete Boxes with 15° Wing Walls. (Maximum allowable depth before overtopping = 10.0 ft) 1/6/

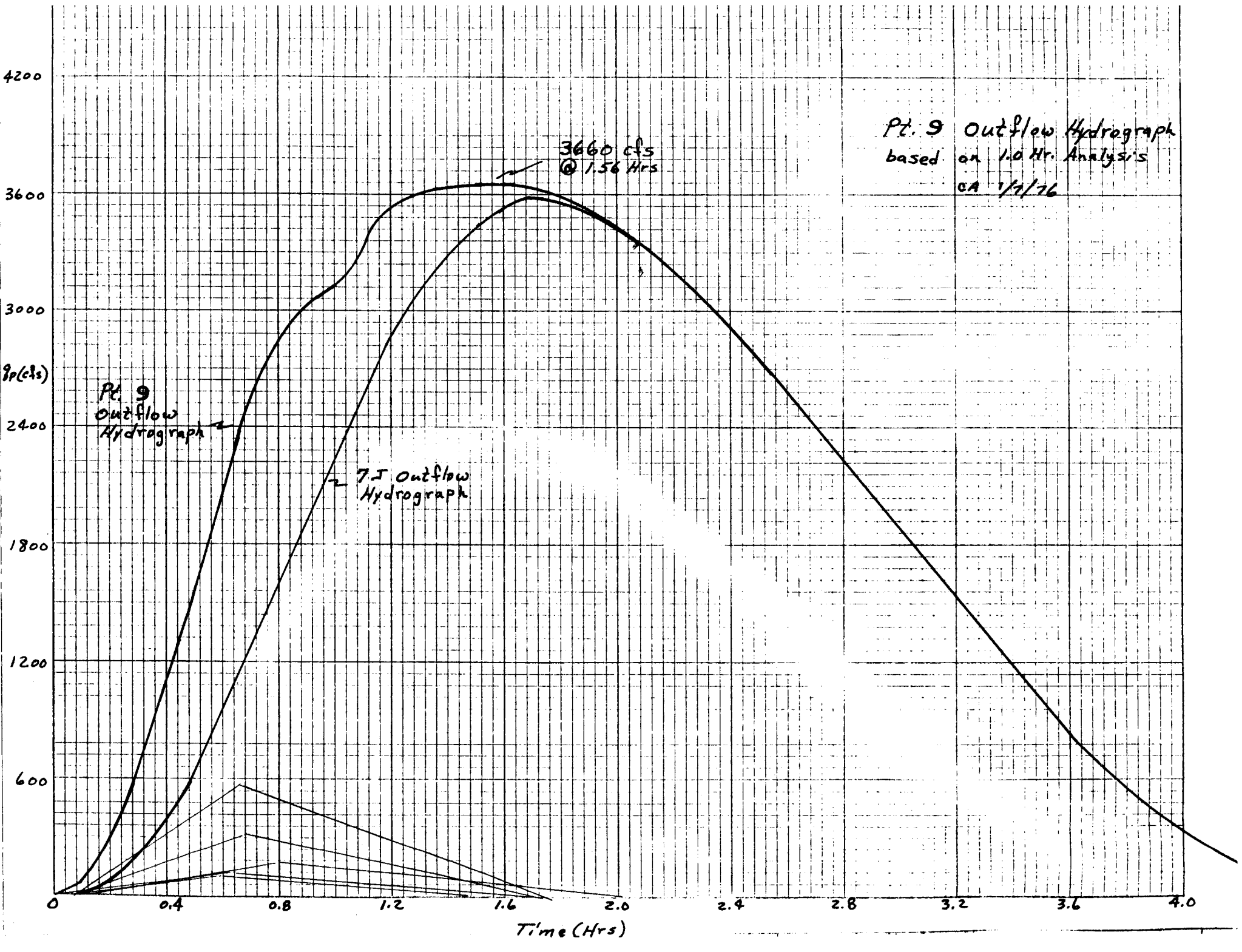
Time Ti, Hrs	Δ T Hrs	Inflow at Ti cfs	Ave. Inflow cfs	Ave. Inflow acre-ft.	Trial Reservoir Storage Elev.ft	Outflow at Ti cfs	Ave. Outflow cfs	Outflow Average Acre-ft.	Incremental Storage Acre-ft.	Total Storage Acre-ft.	Reservoir Elev. at end of T Ft.	Area of Wat Surface (acres)/Rem
0		0				0				0	0	0 A
	0.15		170	2.11			42.5	0.53	1.58			
0.15		340				85				1.58	1.25	2.5 A
	0.15		682.5	8.46			187	2.31	6.15			
0.30		1025				288.3				8.73	2.65	6.29 A
	0.30		1682.5	41.71			602	14.94	26.77			
0.60		2340				916				35.70	5.00	16.54 A
	0.18		2745	40.83			1104	16.42	24.39			
0.78		3150				1292				60.09	6.40	18.60 A
	0.15		3200	39.75			1446	17.93	21.82			
0.93		3250				1600				81.91	7.55	19.19 A
	0.15		3110	38.55			1720	21.32	17.23			
1.08		2970				1840				98.14	8.44	19.52 A
	0.12		2855	28.31			1905	18.88	9.42			
1.20		2740				1970				107.56	8.92	19.70 A
	0.12		2630	26.08			2011	19.94	6.14			
1.32		2520				2051				113.60	9.23	19.81 A
	0.12		2405	23.85			2074	20.57	3.28			
1.44		2290				2097				116.88	9.40	19.87 A
	0.06		2235	11.13			2102	10.42	0.71			
1.50		2180				2106				117.59	9.43	19.89 A
	0.06		2120	10.51			2106	10.45	0.06			
1.56		2060				2107				117.65	9.44	19.89 A
	0.12		1950	19.34			2098	20.80	-1.40			
1.68		1840				2089				116.25	9.37	19.86 A
	0.72		1170	69.62			1822	108.41	-38.79			
2.40		500				1555				77.46	7.38	19.12 A
	0.3		325	8.06			1374	34.06	-26.00			
2.70		150				1193				55.58	6.14	18.21 A
	0.21		75	1.30			1066	18.50	-17.19			

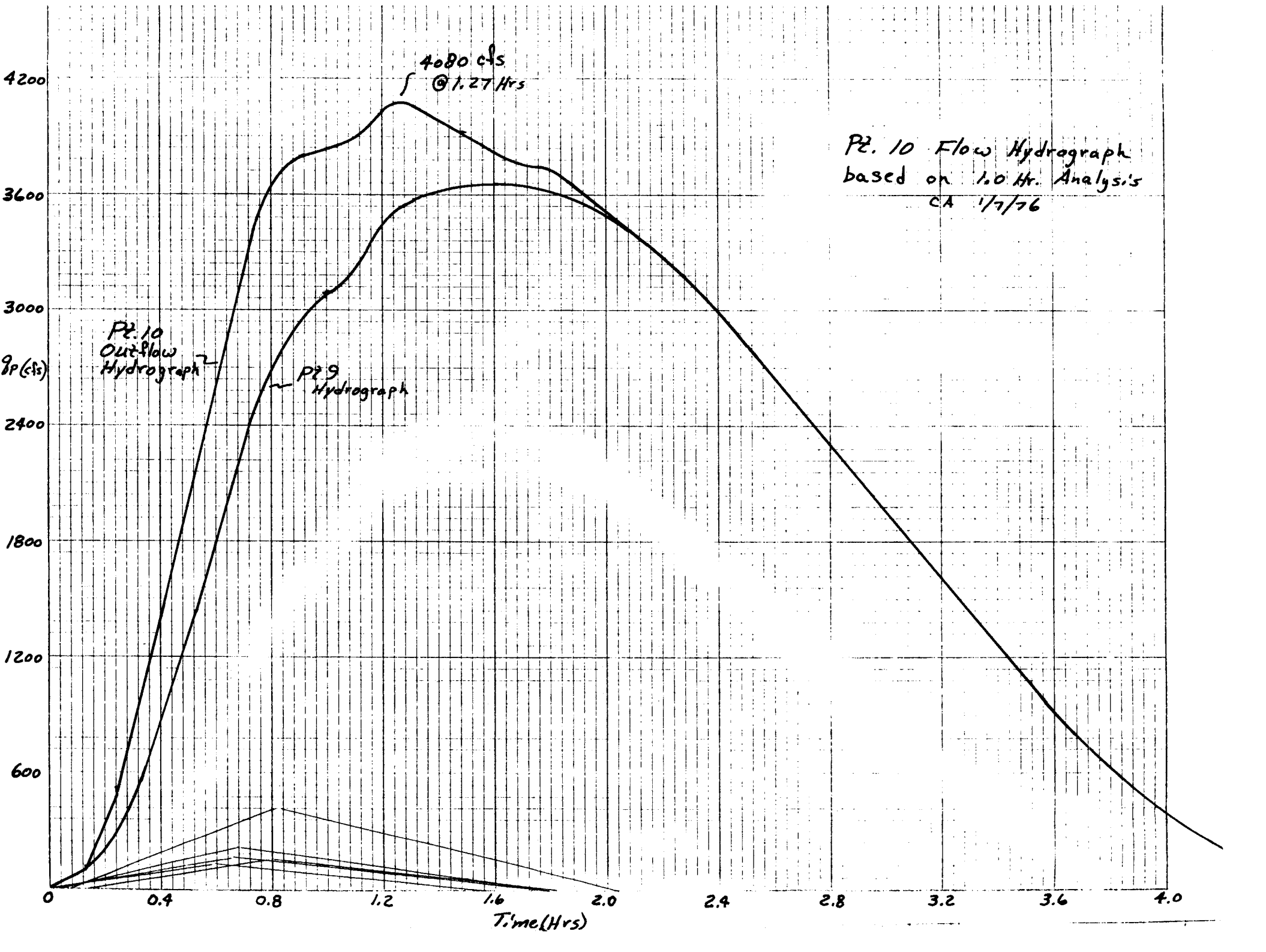

4200 cfs @ 1.12 Hrs
3535 cfs @ 1.60 Hrs
Inflow Hydrograph
Outflow Hydrograph
Res. @ Pt 4 Outflow
Reservoir at Pt 7
Inflow & Outflow Hydrographs
based on 1.0 Hr. Analysis
utilizing 4-8.0'w x 11.0'h RCB's
with 15° wing walls
CA 1/3/96
Qp(cfs)
4200
3600
3000
2400
1800
1200
600
0
0.4
0.8
1.2
1.6
2.0
2.4
2.8
3.2
3.6
4.0
Time (Hrs)

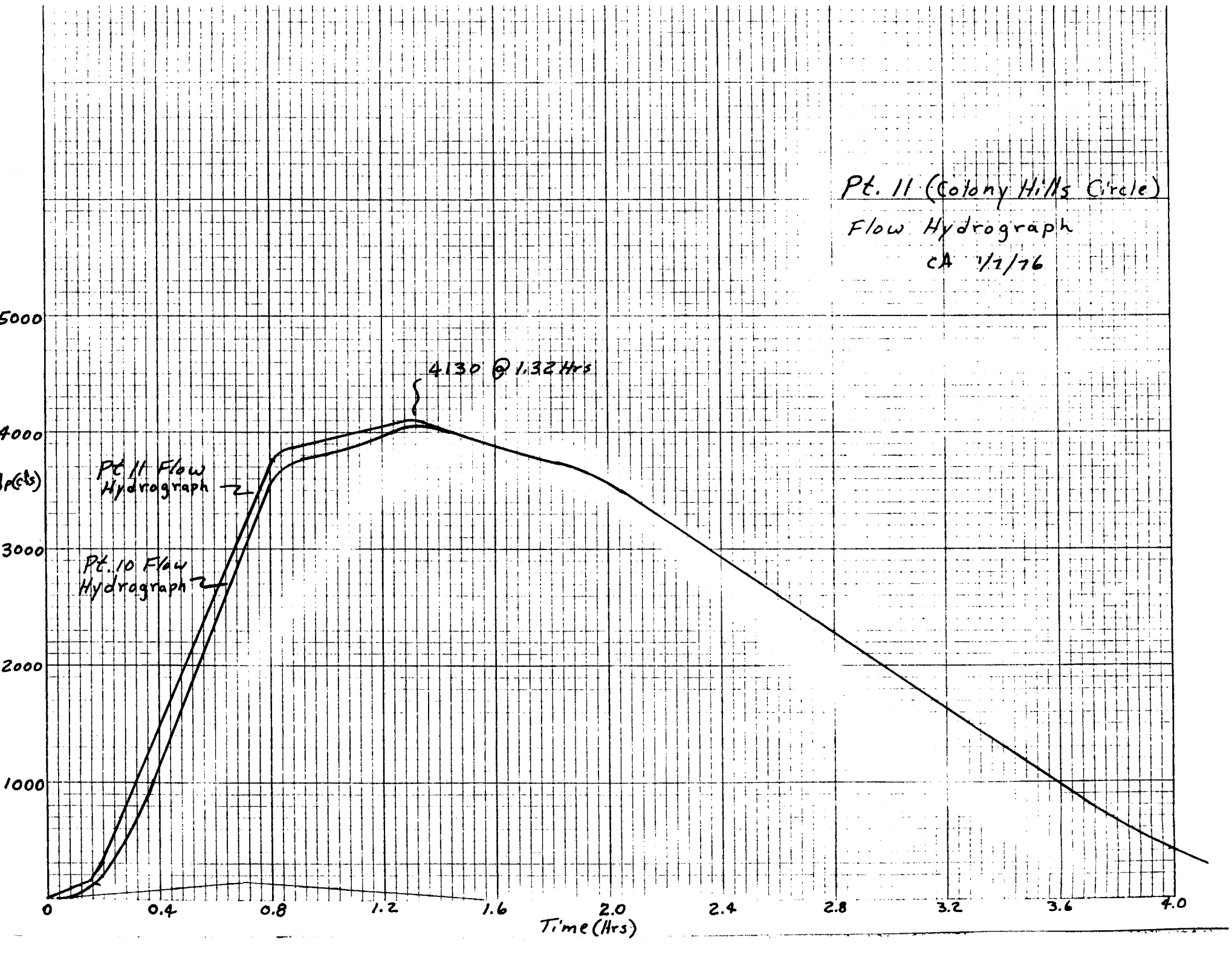

8.4
7.2
6.0
4.8
3.6
2.4
1.2
0
W_S Elev. (ft)
0
250
500
750
1000
1250
1500
1750
2000
2250
Q (cfs)
$X = 268.24^{Y} - 424.69$
$(2.8 < Y < 9.6)$
Water Surface Elev.
Y_S RCB Outflow Curve
For 3 - 8.0'd x 8.5'w RCB's
at Reservoir Pt. No. 4.
1/2/76 CA

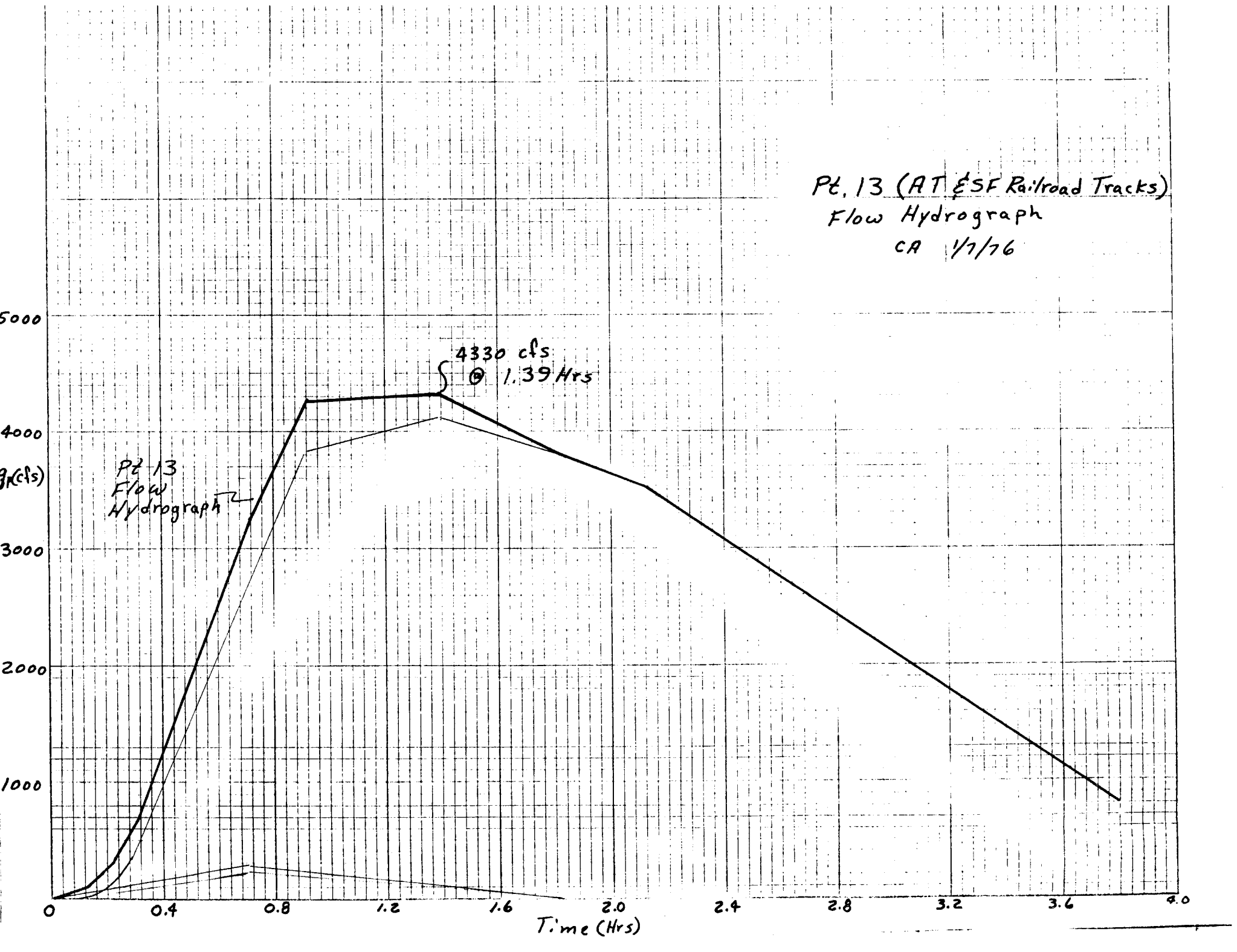
Reservoir at Pt 7 - 1 Hr. Analysis, 4 - 8'd x 11'w Reinforced Concrete Boxes with 15° Wing Walls. (Maximum allowable depth before overtopping = 10.0 ft) 1/6/7

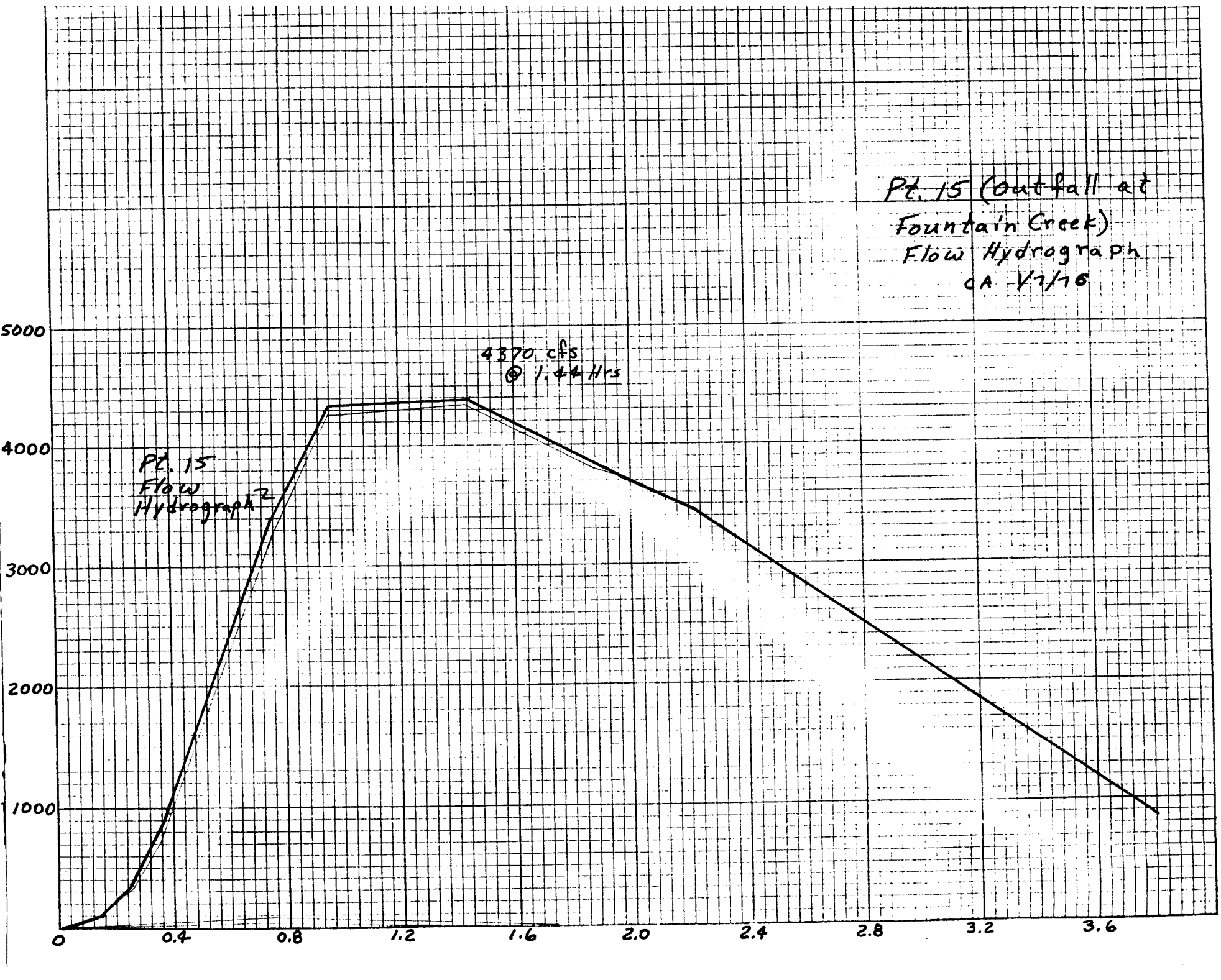
Time Ti, Hrs	Δ T Hrs	Inflow at Ti cfs	Ave. Inflow cfs	Ave. Inflow acre-ft.	Trial Reservoir Storage Elev.ft	Outflow at Ti cfs	Ave. Outflow cfs	Outflow Average Acre-ft.	Incremental Storage Acre-ft.	Total Storage Acre-ft.	Reservoir Elev. at end of T Ft.	Area of Water Surface (acres)/Remark
										0		0 A
0	0.2	0	190	3.14		0	89.6	1.48	1.66	1.66	1.29	2.58 A
0.2	0.2	380	840	13.88		179	363	6.0	7.88	9.54	2.89	7.30 A
0.4	0.4	1300	2335	77.19		547	1219	40.29	36.90	46.44	5.84	17.77 A
0.8	0.2	3370	3735	61.74		1891	2204	36.44	25.30	71.74	7.21	19.06 A
1.0	0.12	4100	4150	41.16		2518	2691	26.69	14.47	86.21	7.97	19.35 A
1.12	0.18	4200	4140	61.59		2865	3054	45.43	16.16	102.37	8.80	19.65 A
1.30	0.30	4080	3900	96.69		3243	3389	84.03	12.66	115.03	9.44	19.89 A
1.60	0.20	3720	3475	57.44		3535	3526	58.27	-0.83	114.20	9.40	19.875 A
1.80	0.20	3230	3020	49.92		3516	3437	56.80	-6.88	107.32	9.05	19.75 A
2.00	0.40	2810	2370	78.35		3357	3081	101.86	-23.51	83.81	7.84	19.30 A
2.40	0.40	1930	1585	52.40		2806	2457	81.21	-28.81	55.00	6.31	18.47 A
2.80	0.80	1240	795	52.56		2107	1421	93.92	-41.36	13.64	3.30	9.01 A
3.6		350				734						

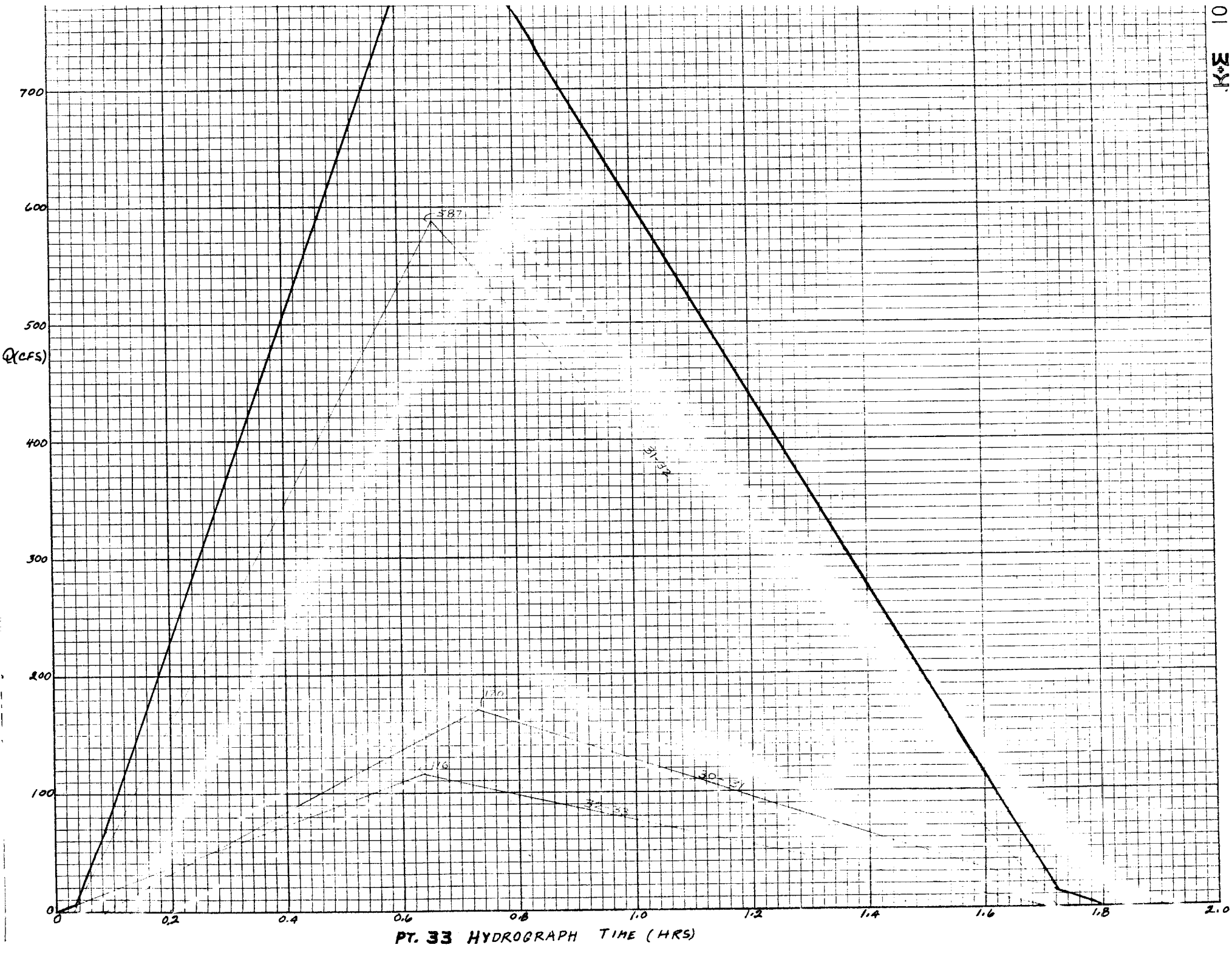

Pt. 9 Outflow Hydrograph
based on 1.0 Hr. Analysis
CA 7/1/76
3660 cfs
@ 1.56 Hrs
Pt. 9
Outflow
Hydrograph
7-I Outflow
Hydrograph
4200
3600
3000
2400
1800
1200
600
Qp(cfs)
0
0.4
0.8
1.2
1.6
2.0
2.4
2.8
3.2
3.6
4.0
Time (Hrs)

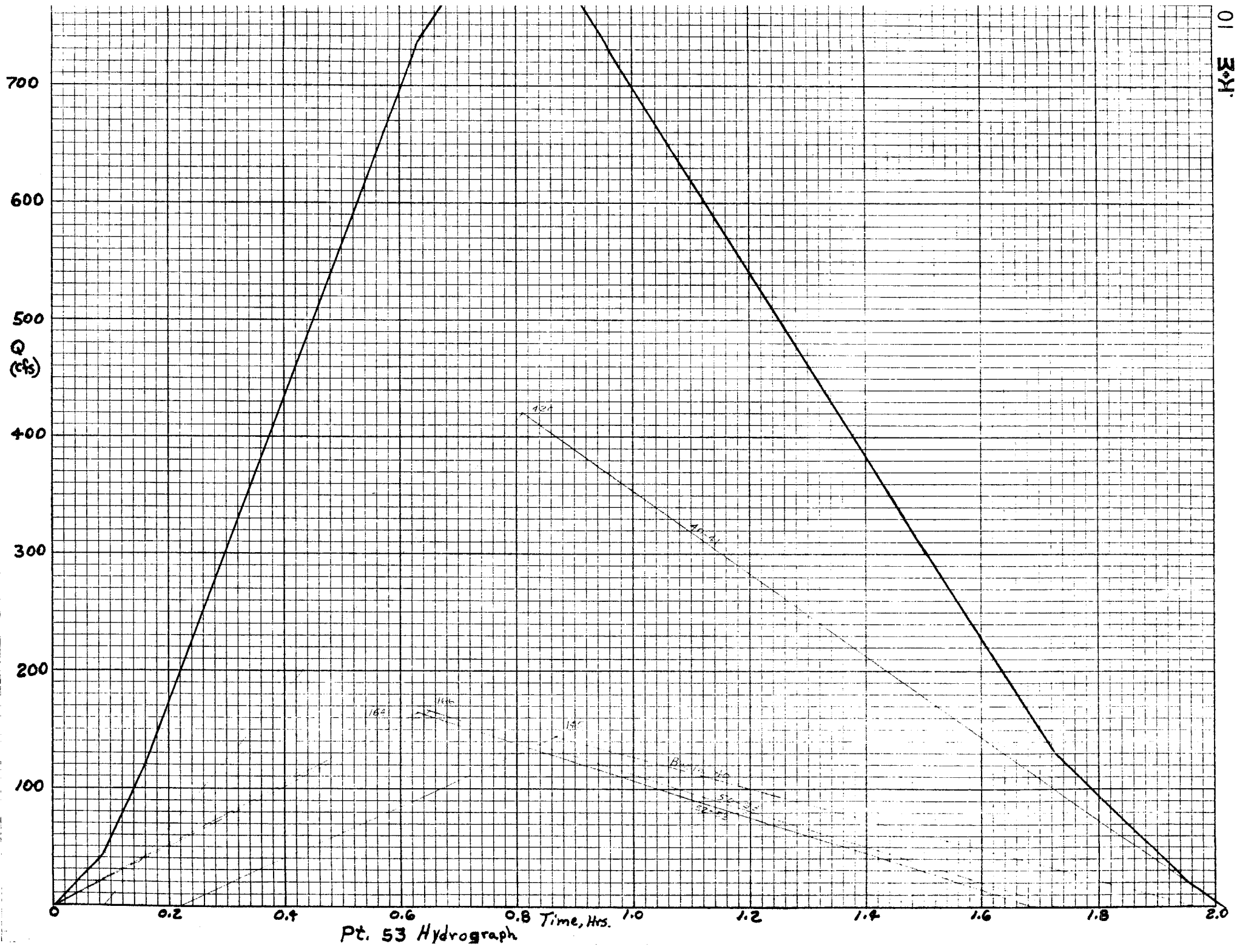

4080 cfs
@ 1.27 Hrs
Pt. 10 Flow Hydrograph
based on 1.0 Hr. Analysis
CA 1/7/76
Pt. 10
Outflow
Hydrograph
Pt 9
Hydrograph
4200
3600
3000
2400
1800
1200
600
Qp (cfs)
0
0.4
0.8
1.2
1.6
2.0
2.4
2.8
3.2
3.6
4.0
Time (Hrs)

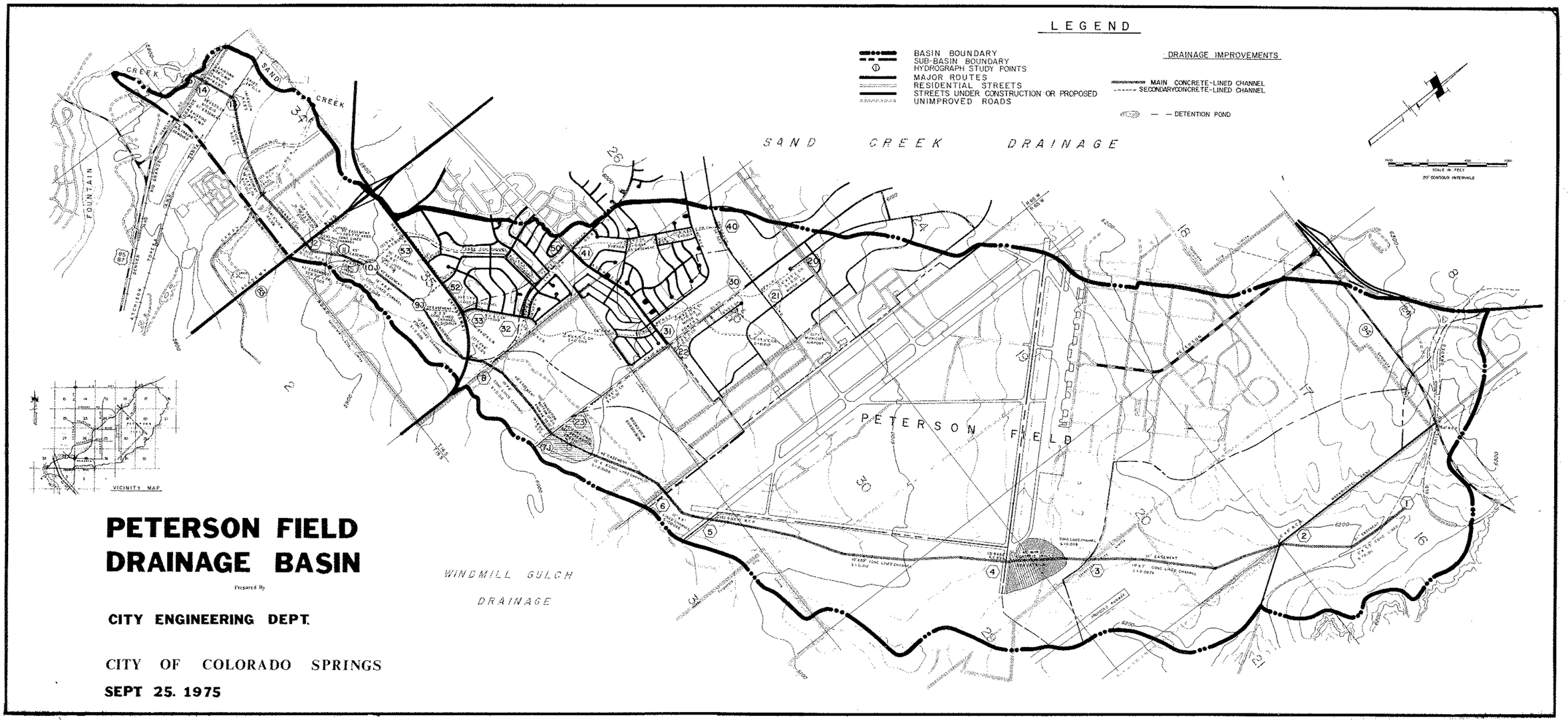

Pt. 11 (Colony Hills Circle)
Flow Hydrograph
CA 1/1/76
4130 @ 1.32 Hrs
Pt 11 Flow Hydrograph
Pt. 10 Flow Hydrograph
5000
4000
3000
2000
1000
0
0.4
0.8
1.2
1.6
2.0
2.4
2.8
3.2
3.6
4.0
Time (Hrs)


Pt. 13 (AT & SF Railroad Tracks)
Flow Hydrograph
CA 1/7/76
4330 cfs
@ 1.39 Hrs
Pt 13
Flow
Hydrograph
5000
4000
3000
2000
1000
0
0.4
0.8
1.2
1.6
2.0
2.4
2.8
3.2
3.6
4.0
Time (Hrs)


Pt. 15 (outfall at
Fountain Creek)
Flow Hydrograph
CA - 7/1/16
4370 cfs
@ 1.44 Hrs
Pt. 15
Flow
Hydrograph-2
5000
4000
3000
2000
1000
0
0.4
0.8
1.2
1.6
2.0
2.4
2.8
3.2
3.6


Q(CFS)
700
600
500
400
300
200
100
0
0
0.2
0.4
0.6
0.8
1.0
1.2
1.4
1.6
1.8
2.0
PT. 33 HYDROGRAPH TIME (HRS)


700
600
500
Q
(cfs)
400
300
200
100
0
0.2
0.4
0.6
0.8 Time, Hrs.
1.0
1.2
1.4
1.6
1.8
2.0
Pt. 53 Hydrograph



PETERSON FIELD DRAINAGE BASIN

Prepared By

CITY ENGINEERING DEPT.

CITY OF COLORADO SPRINGS

SEPT 25. 1975