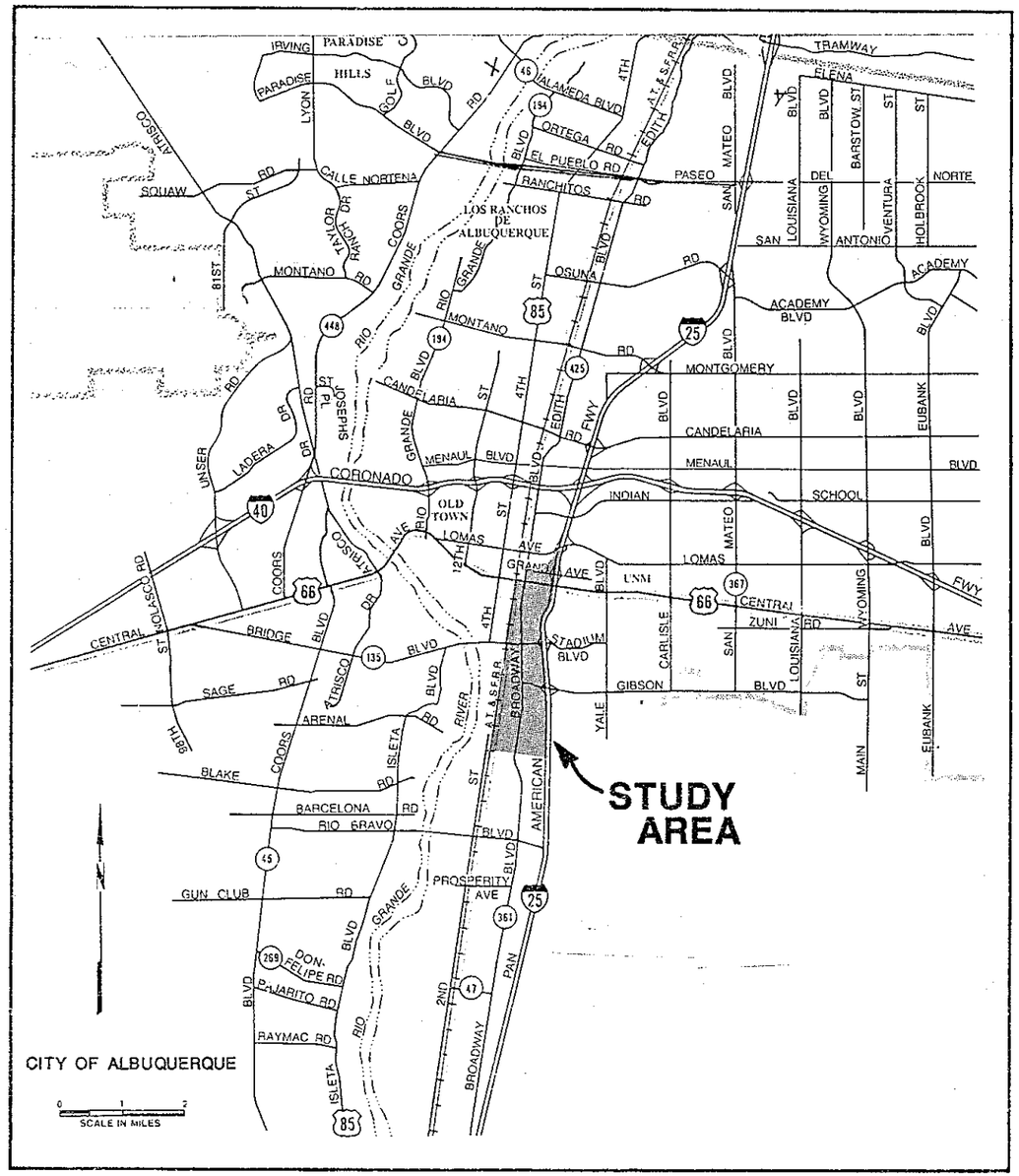
SOUTH BROADWAY SECTOR DRAINAGE MANAGEMENT PLAN

Developed Conditions Report

SEPTEMBER 1990

BOHANNAN-HUSTON, INC.
7500 JEFFERSON NE
ALBUQUERQUE, NM 87109



VICINITY MAP

ALBUQUERQUE
NEW MEXICO
1706

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1.0 INTRODUCTION

This report presents the results of the Existing and Developed Conditions study for the South Broadway Sector Drainage Management Plan, and is prepared for the City of Albuquerque under the authorization of the Architect/Engineer's Agreement #0259-01.

The South Broadway study area lies between Interstate 25 on the east, the Atchison, Topeka and Santa Fe Railroad on the West, Lomas on the north and the City Limits on the south. The City Limits on the south run east and west parallel to, and approximately 1700 feet south of, Woodward Road. This area was included in the Albuquerque Master Drainage Study, Volume I, prepared by Bohannan-Huston, Inc. in January of 1981. This current drainage study analyzes the area in more detail, paying particular attention to time varying pipe hydraulics and the Bell/Commercial storm water pumping station.

2.0 DESCRIPTION OF THE STUDY AREA

The study area (2.1 square miles) encompasses much more than the South Broadway neighborhood. The northern portion between Lomas and Central includes the southern tip of Martinez Town, although in the last ten years, its once residential character has been impacted by the growth of the St. Joseph's Hospital complex and construction of Senior Citizens housing.

Between Central and Coal lies the Huning/Highland addition, the first suburb to be built on the East Mesa. This area is currently being "gentrified" by rehabilitation of the Victorian houses in the area. The South Broadway neighborhood lies south of Coal, east and west of Broadway, and is almost entirely residential in nature; except for existing commercial uses located on Broadway.

The area south of Gibson and west of Broadway is known as the San Jose Barrio, historically an Hispanic farming community. The area is now primarily residential with scattered commerce and industry. The General Electric Plant in the area is one of Albuquerque's larger employers.

Topographically, the study area slopes from I-25 on the east down to the AT&SF Railroad on the west. The railroad forms a drainage barrier on the west resulting in flooding in the low lying areas just east of the tracks. The north to south slope is slight, with an overall slope of .2%.

3.0 HISTORY OF FLOODING

Construction of Interstate 25 and the South Diversion Channel has effectively diverted most off-site flows from entering the study area from the east. Thus, historic flooding from east-west arroyos passing through the study area is no longer a problem. Present flooding is caused by on-site runoff which collects against the railroad tracks in low lying areas. Approximately half of the study area lies east of Broadway. This portion is characterized by 2% to 3% slopes from east to west, and drains quickly and efficiently.

4.0 AGENCIES/JURISDICTION/PERMITS/AGREEMENTS

Two entities play the major roles in providing drainage for the area--the City of Albuquerque and the Middle Rio Grande Conservancy District (MRGCD). The only outfall for the area is the San Jose Drain, a conveyance facility owned and maintained by the MRGCD. In contrast, all storm sewers in the area were constructed and are maintained by the City, and all empty into the San Jose Drain.

While the drain was constructed to lower the water table in the adjoining agricultural land, an agreement was finalized in September,

1958 between the MRGCD, the Bureau of Reclamation and the City of Albuquerque to allow the City to discharge storm drainage into the San Jose Drain. Subsequently, additional agreements for City discharge into the drain have been consummated, though none as sweeping as the 1958 accord. A record of all agreements and permits concerning the San Jose Drain in the study area can be found in Appendix II, including the historic 1958 document.

It should be noted that the 1958 agreement does not specify an allowable discharge rate. Rather, the permit was attached to an engineering plan set, and authorized discharges as shown on the plan set. These discharges are shown as ditches or pipes emptying into the San Jose Drain. This was the procedure used for several other discharge agreements between the City and MRGCD. The referenced plan sets are archived in the MRGCD library.

Note that the record of permits found in Appendix II contains agreements between the MRGCD and NON-City entities, as well as permits for domestic water lines crossing the San Jose Drain. While these permits do not directly pertain to this drainage study, each one impacts the Drain, and should be considered if improvements to the drain are considered in the future.

The Albuquerque Metropolitan Arroyo Flood Control Authority (AMAFCA) South Diversion Channel crosses the southeast corner of the study area, as shown on Plate M-14 in Appendix I. The portion of the study area east of the South Diversion Channel drains into the Diversion Channel and leaves the study area. This area and the South Diversion Channel are not addressed in this report.

Bernalillo County has no drainage responsibilities in the study area.

5.0 SOURCES OF INFORMATION

Surface drainage patterns were determined from contours on City of Albuquerque topographic orthophoto mapping at a nominal scale of 1"=500'. Information on existing storm drainage facilities was obtained from various sources including:

- o South Broadway Neighborhoods Sector Development Plan, July, 1986.
- o City of Albuquerque Drainage Facilities maps.
- o As-Built drawings of drainage facilities.
- o Albuquerque Master Drainage Study, Volume I, January, 1981.
- o Volume II, Albuquerque Storm Water Pumping Stations.
- o Southeast Valley Drainage Management Plan, San Jose Drain and Vicinity, AMAFCA.
- o Bell Commercial Pump Station #37--Drainage Study, City of Albuquerque, July 15, 1987.
- o Bell Commercial Pump Station logs.
- o Field Reconnaissance by Bohannan-Huston, Inc. personnel.
- o Field Surveys by Albuquerque Surveying Company.
- o Fairbanks - Morse Pump Curves.

6.0 HYDROLOGY

The City of Albuquerque is currently rethinking its hydrologic approach, principally through a collaboration between the University of New Mexico Civil Engineering Department, AMAFCA and City of Albuquerque hydrology staff. While this new hydrology is being used for many drainage studies within the City area, consensus has not been reached and the new hydrologic approach has not been approved by the City. It is anticipated that use of the new hydrology would produce runoff results much different than those obtained in the AMDS report of 1981, the current guiding document for drainage planning in the South Broadway area.

Because of these considerations, the hydrologic approach used for the AMDS Volumes I, II and III has been chosen for this study. It is felt that this approach maintains continuity in drainage philosophy throughout the City and conforms to a hydrologic approach approved by the City of Albuquerque. Details of the hydrologic approach are presented in the following sections.

6.1 Precipitation. The AMDS reports use the following equation to generate a mass rainfall table:

R(T) = QxAxT**B where:

R(T) = Accumulate rainfall at time T (in inches)
Q = Total Rainfall from the storm (in inches)
T = Time elapsed (in hours)
A = Empirical coefficient - determined by linear regression or other means
B = Empirical exponent - determined by linear regression or other means

The following variables were used for the AMDS hydrology and for this study:

	A	B	Q	T
100-year	.85	.090521	2.4	6.0
10-year	.85	.090521	1.6	6.0

The resulting rainfall hyetograph reflects an event with high intensity in the early stages of the storm. It should be kept in mind that runoff is the result of many variables including total precipitation, hyetograph shape, runoff model, curve numbers, etc. It is the combined effect of all these variables that should be compared with field data and previous studies, rather than any single variable.

The modeled storm is the 6-hour event, the storm commonly used in the Albuquerque area for sizing storm sewers and channel capacities. Note that for design of reservoirs with detention times greater than 6 hours, the 24-hour storm should be used for analysis.

6.2 Rainfall-Runoff Model. The previous City study of the area, AMDS Volume I, used a combination of HYMO and RADS, modeling the runoff of basins east of Broadway with HYMO. RADS, developed by Bohannan-Huston, Inc., was written specifically to predict flooding in flat topography. It was used in the AMDS Volume I to generate runoff volumes for the South Broadway basins west of Broadway and to route both the RADS generated flows and HYMO generated flows. It is our opinion that the use of RADS for the basins between Broadway and the Railroad was inappropriate, as these basins have steep (2%) slopes from east to west and cannot be adequately modeled by RADS.

HYMO (Hydrologic Modeling), a computer program developed by the Agricultural Research Service of the U.S. Department of Agriculture, has been used by the Albuquerque engineering community for many years and has been approved by the City of Albuquerque for City hydrologic analysis. Because of the inappropriateness of RADS for the study area and because of City and BHI satisfaction with HYMO in the past, the HYMO model was chosen to model the entire study area.

In order to maintain continuity with the AMDS Volume I study and to allow comparison between the old and new studies, the new study used AMDS Volume I basin boundaries and basin identifications wherever possible. Basin characteristics from AMDS I for basins east of Broadway were also used where appropriate (area, land use, curve numbers, times to peak). However, as opposed to the rest of the AMDS volumes, Volume I combined the impervious and pervious portions of each basin using a composite curve number. In order to bring all the AMDS studies into conformity, this study modeled all basins using separate pervious and impervious modeling.

The hydrologic course of action for the project can be summarized as follows:

1. Runoff for basins previously modeled with RADS were remodeled using HYMO as in AMDS Volumes II-III studies.
2. Runoff for basins previously modeled with HYMO were preserved except that the impervious areas of each basin were modeled separately from the pervious areas.
3. Hydrographs for runoff entering the study area from the east were taken from the AMDS Volume II Restudy without making any adjustments. These hydrographs were generated with HYMO during the Restudy, and used the "Heggen" rainfall distribution. The times-to-peak of the Restudy runoff hydrographs will be later than for the hydrographs generated inside the study area because the Heggen rainfall distribution places the most intense rainfall later in the storm (see Appendix V). However, this mismatch in peaks was considered acceptable because (1) Restudy flows contribute little to the system discharge, (2) reanalysis of the AMDS Volume II using a more compatible rainfall would be a large effort and is outside the scope of the contract.

6.2.1 Runoff Hydrographs. A unit hydrograph approach is used by HYMO for generating runoff hydrographs for each subbasin. Three equations (found in the HYMO Users' Manual) define the rising limb and the recession of the hydrograph. The shape of the unit hydrograph is defined by two variables, the time to peak, T_p, and the recession constant, K. The HYMO program will compute the values of T_p and K or allow the user to specify them. The following equations were used to define these variables:

$$T_c = \frac{.0078 \times L^{.77}}{S^{.385}} \qquad \text{(Kirpich Equation)}$$

T_c = Time of concentration in minutes
L = Length of longest water pathway in feet
S = Slope of longest water pathway
Time to Peak $T_p = 2/3\ T_c$ in minutes
Recession Constant $K = 1/2\ T_p$ in minutes

Next, the depth of runoff in inches is found by applying the Soil Conservation Service (SCS) rainfall-runoff relationship:

$$Q = (P-(200/CN)+2)^2/(P+(800/CN)-8)$$

Where: Q = runoff in inches depth over the drainage area
P = accumulated rainfall in inches
CN = curve number

Storm outflow hydrographs are then computed by merging the accumulated depth of runoff with the unit hydrograph.

In the pervious/impervious approach, a runoff hydrograph is generated for the pervious and impervious portions of each basin separately, then added together to produce the outflow hydrograph for the basin.

Basin boundaries are shown on the Modeling Map in the back pocket of this report. Basin characteristics are tabulated in Table 1 on the following page along with the 10-year and 100-year peak discharges from each basin.

6.2.2 Routing. The South Broadway storm sewer system contains a pumping station and several cross-connections, features not normally modeled in storm sewers. Additionally, analysis of the system trunk lines using pressure flow is desired to see if significant additional capacity is present in the system. While HYMO can model routing of surface flow, street flow, channel flow and pipe flow, it cannot model pumps, pipe networks (interconnections) or pressure flow. Therefore,

we have chosen the Storm Water Management Model (SWMM) developed by the EPA for routing of the hydrographs generated by HYMO or taken from the Volume II Restudy. SWMM can handle not only the surface flow, street flow, channel flow and pipe flow, but also the pumps, pipe cross-connections and pressure flow.

The EXTRAN portion of SWMM is intended for application in systems where the assumption of steady flow, for purposes of computing back-water profiles, cannot be made. The program solves the full dynamic equations for gradually varied flow (St. Venant equations) using an explicit solution technique to step forward in time.

6.2.3 Existing Conditions Curve Numbers. HYMO uses the SCS Curve Number method to determine runoff volumes. The runoff curve numbers account for the combined effect of soil types, vegetative cover, land use and antecedent moisture content. For this project, Antecedent Moisture Conditions II, recommended by SCS, was used. In addition, it was assumed that all commercial and residential areas were free discharging (no on-site ponding).

In this analysis, pervious and impervious areas within a basin were considered separately. The impervious areas were assigned a curve number of 95 and their runoff calculated separately from the pervious areas. The SCS method allows for use of a curve number of 95 in "warmer climates." Additionally, the City of Albuquerque effort to revise its Hydrology procedure is now moving toward abstraction and infiltration values that will reduce the runoff from impervious areas and result in a volume equivalent to the runoff from a CN of 95 at the 6-hour storm.

For the pervious areas, the soil type was determined from the SCS Soil Survey of Bernalillo County. Land use and percentages of impervious areas were determined through windshield surveys and aerial photographs. Table 1 presents these basin characteristics. Note that characteristics for those basins previously modeled with HYMO in the AMDS Volume I study were not available.

6.2.4 Developed Conditions Curve Numbers. While most of the study area was fully developed at the time of the Existing Conditions analysis, further development is expected in 7 of the 28 basins. In keeping with the hydrologic assumptions detailed above, the percents of impervious areas were increased in these basins to reflect increased development. Table 2 presents the changes in basin hydrology for the 7 subbasins where development is expected. Free discharge is assumed from all developing areas.

6.2.5 Modeling Map. The modeling map for the study area can be found in the pocket at the end of this report. Subbasin boundaries, existing drainage facilities and analysis points are shown. Since only the trunk lines are modeled, these lines are accentuated on the map. Surface flow routing is also indicated.

6.2.6 Off-Site Flows. The area to the east of Interstate 25 was analyzed in the AMDS Restudy, Volume II. Possible flow paths into the South Broadway area were investigated during the Restudy with the following results

Analysis Point	Peak 100-Year Discharge (cfs)	Peak 10-Year Discharge (cfs)
APV1	52	20
APW1-SS3	23	9
APW1	0	0
APX1	0	0
APY1	0	0
APZ1SS-2	0	0
APAA1-1	6	0
APAA1-2	11	0
APAA1-3	40	14
APBB1	0	0
APDD1	13	0
APFF1	5	0
APCC1	SOUTH DIVERSION CHANNEL	
APGG1	TO SOUTH DIVERSION CHANNEL	
APHH1	TO SOUTH DIVERSION CHANNEL	

TABLE 1

BASIN HYDROLOGY FOR SOUTH BROADWAY

BASIN	AREA (SQ.MI.)	LENGTH OF LONGEST FLOWPATH	ELEV. @ TOP	ELEV. @ BOTTOM	SLOPE	% SOIL TYPE*A	% SOIL TYPE*B	LAND USE	CN	% IMPERV	IMPERV AREA	PERV AREA	Tc MIN	Tp HRS	K HRS	10-YR Qpk CFS	100-YR Qpk CFS
SJ-1	0.0795	3500	4968.0	4950	0.0051	65	35	RANGE-FAIR	60	30	0.02385	0.05564	31.8	0.3532	0.177	26	48
SJ-2	0.0989	2500	4959.0	4948	0.0044	30	70	RANGE-FAIR	65	35	0.0346	0.06426	26.0	0.2894	0.145	45	88
SJ-3	0.0237	1500	4965.0	4946.5	0.0123	35	65	RANGE-FAIR	64	35	0.0083	0.01541	11.8	0.1313	0.066	22	41
SJ-4	0.1881	2375	4964.0	4946.4	0.0074	28	72	RANGE-FAIR	66	35	0.033	0.0612	20.5	0.2276	0.114	54	105
SJ-5	0.0414	2500	4963.5	4944	0.0078	50	50	RANGE-FAIR	62	40	0.01654	0.02482	20.9	0.2322	0.116	26	48
SJN-6	0.0526	3500	4945.0	4939.8	0.0015	0	100	RANGE-FAIR	70	30	0.01578	0.03682	51.3	0.5697	0.285	12	26
SJH-701	0.0788	2250	4968.0	4944	0.0107	91	9	RANGE-FAIR	69	30	0.02364	0.05516	17.1	0.1898	0.095	46	96
SJ-7	0.0684	2550	4966.0	4943.9	0.0087	30	70	RANGE-FAIR	65	32	0.02188	0.0465	20.4	0.2264	0.113	36	70
SJ-8	0.0460	1125	4960.0	4939	0.0187	10	90	RANGE-POOR	78	20	0.00921	0.03682	10.0	0.1111	0.056	41	99
SJ-9SS	0.0419	1600	4942.0	4938.2	0.0024	0	100	RANGE-POOR	79	35	0.01467	0.02724	23.4	0.2603	0.130	27	58
SJ-9OL	0.0504	2300	4942.0	4936.8	0.0023	0	100	RANGE-POOR	79	35	0.01764	0.03276	31.6	0.3508	0.175	26	54
SJN-10	0.0167	1900	4942.5	4941	0.0008	0	100	RANGE-POOR	79	20	0.00333	0.01332	40.9	0.4540	0.227	5	12
SJN-710	0.0321	1700	5002.5	4938	0.0379	87	13	RANGE-POOR	69	4	0.00128	0.03083	10.0	0.1111	0.056	5	21
SJN-720	0.0409	2225	4996.0	4936.5	0.0267	90	10	RANGE-POOR	69	2	0.00082	0.04008	11.9	0.1321	0.066	3	20
SJN-730	0.0423	1750	4994.0	4945	0.028	70	30	RANGE-FAIR	62	40	0.01693	0.0254	10.0	0.1111	0.056	52	96
SJN-740	0.1302	2100	4941.0	4936	0.0024	0	100	RANGE-FAIR	70	40	0.0521	0.07814	28.9	0.3206	0.160	65	130
SJH-109	0.1042	3200	5017.0	4938.5	0.0245	85	15	RANGE-POOR	70	8	0.00834	0.09587	16.3	0.1806	0.090	20	65
SJH-100*	0.0970								54	60	0.0582	0.0388		0.1755	0.088	118	210
SJH-102*	0.1750								54	40	0.07	0.105		0.2112	0.106	121	215
SJH-105*	0.0710								54	35	0.02485	0.04615		0.1494	0.075	58	103
SJH-106*	0.0950								54	35	0.03325	0.06175		0.1799	0.090	66	117
SJH-150*	0.0750								54	35	0.02625	0.04875		0.1259	0.063	71	126
SJH-152*	0.1320								54	35	0.0462	0.0858		0.1476	0.074	109	194
SJH-153*	0.0620								54	40	0.0248	0.0372		0.1412	0.071	60	108
SJH-200*	0.0550								54	40	0.022	0.033		0.1453	0.073	53	94
SJH-202*	0.0820								54	10	0.0082	0.0738		0.1872	0.094	16	28
SJH-700*	0.0565								69	0	0	0.0565		0.1186	0.059	5	33
BH-134	0.0660	3700	5073.0	4868	0.0554				54	65	0.0429	0.0231	13.3	0.1476	0.074	101	180

* All basin data except percent impervious taken from original AMDS report.

TOTAL AREA
2.1026

TABLE 2

HYDROLOGIC COMPARISON
EXISTING VS. FULL DEVELOPMENT

		EXISTING DEVELOPMENT					FULL DEVELOPMENT				
BASIN	AREA (SQ.MI.)	CN	% IMPERV	IMPERV AREA	PERV AREA	100-YR Qpk CFS	CN	% IMPERV	IMPERV AREA	PERV AREA	100-YR Qpk CFS
SJ-8	0.0460	78	20	0.00921	0.03682	99	78	30	0.01381	0.03222	118
SJN-10	0.0167	79	20	0.00333	0.01332	12	79	30	0.005	0.01166	13
SJN-710	0.0321	69	4	0.00128	0.03083	21	69	40	0.01284	0.01927	78
SJN-720	0.0409	69	2	0.00082	0.04008	20	69	40	0.01636	0.02454	86
SJH-109	0.1042	70	8	0.00834	0.09587	65	70	40	0.04168	0.06253	169
SJH-202*	0.0820	54	10	0.0082	0.0738	28	54	30	0.0246	0.0574	84
SJH-700*	0.0565	69	0	0	0.0565	33	69	40	0.0226	0.0339	134

* All basin data except percent impervious taken from original AMDS report.

The Restudy hydrographs peak much later than the South Broadway basins. Routing these hydrographs to the South Broadway system would delay these peaks even more, and their impact on the model would be insignificant. As a consequence, only the major flows coming from east of I-25 were included in the model, APV1, APW1-SS3 and APAA1-3. Basins APGG1 and APHH1 were not included, as they discharge into the South Diversion Channel.

7.0 HYDRAULIC STRUCTURES

7.1 Storm Sewers. The EXTRAN block of the SWMM computer model uses Manning's Equation to calculate water depths and discharges. Either pressure or non-pressure flow can be modeled as well as reverse flow. When the hydraulic grade line rises to the level of a manhole rim, the node surcharges, and the discharge and volume leaving the sewer system is recorded.

Since the storm sewers are almost exclusively reinforced concrete pipe, a roughness value of 0.015 was used to reflect pipe friction as well as minor losses. Lines are assumed to be clean and in good repair. Sediment in lines is discussed in a later section of this report.

Where parallel conduits have cross-connections, such as the 72" and 36" sewers in Williams downstream of Thaxton and the dual 72" pipes between points M14331B and M14351, the pipes have been modeled as a single conduit with equivalent carrying capacity (not area) and soffit of the highest storm sewer. For example, the 72" and 36" pipes in Williams downstream of Thaxton are modeled as a single rectangular conduit 72" high by 67" wide.

7.2 Catch Basins. A rough estimate of catch basin (inlet) capacity was determined in this study. Capacity was evaluated on a per basin basis by counting the catch basins in each drainage basin and estimating a catch capacity of four cubic feet per second (cfs) per inlet. The results are presented on the following table and compared with 10-year and 100-year runoff for each basin. 18 out of 28 basins were found to have an inadequate number of catch basins for the 100-year event, and 12 basins out of 28 lacked inlet capacity for the 10-year storm.

Since the hydrologic study was performed on a macro basis for each basin, it is inappropriate to master plan the location of the required inlets. This placement should occur during project design or as development progresses in the study area. Additionally, several basins do not require a storm sewer system, as surface flow is adequate to handle runoff. The inlet capacity table makes recommendations as to which basins require timely upgrade, upgrade as development occurs, or no upgrade.

7.3 Street Flow. Street widths in the South Broadway area are often not typical. Therefore, all streets through which flow was to be routed, were measured. Figure 1 shows a generalized cross-section used to analyze street flow. Manning's Equation with a roughness of 0.017 was used to determine flow depths and capacities. Appendix III contains rating tables for individual streets generated with Manning's Equation.

Depths of street flow must be compared with City of Albuquerque criteria:

A. For 10-year flows, the allowable depth of flow is 0.5 feet.

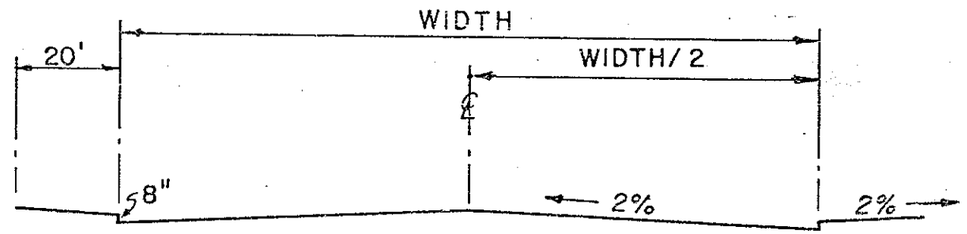
B. For 100-year flows, the allowable depth of flow is .2 feet above the top of the curb, but a maximum of .87 ft. at any location.

C. For arterials, one dry lane each direction is required during the 10-year discharge.

SOUTH BROADWAY INLET CAPACITY

BASIN	NO. OF INLETS	CFS PER INLET	INLET CAPACITY (CFS)	EXISTING 10-YR QPK CFS	EXISTING 100-YR QPK CFS
SJ-1	29	4	116	26	48
SJ-2	51	4	204	45	88
SJ-3	9	4	36	22	41 (3)
SJ-4	26	4	104	54	105
SJ-5	20	4	80	26	48
SJ-7	18	4	72	36	70
SJ-8	9	4	36	41 (3)	99 (1)
SJ-90L	1	4	4	26 (1)	54 (1)
SJ-9SS	17	4	68	27	58
SJN-6	15	4	60	12	26
SJN-10	10	4	40	5	12
SJN-710	0	4	0	5 (2)	21 (2)
SJN-720	1	4	4	3	20 (2)
SJN-730	0	4	0	52 (1)	96 (1)
SJN-740	0	4	0	65 (1)	130 (1)
SJH-109	1	4	4	20 (2)	65 (2)
SJH-100	19	4	76	118 (1)	210 (1)
SJH-102	36	4	144	121	215 (1)
SJH-105	21	4	84	58	103 (1)
SJH-106	34	4	136	66	117
SJH-150	26	4	104	71	126 (1)
SJH-152	57	4	228	109	194
SJH-153	22	4	88	60	108 (1)
SJH-200	5	4	20	53 (1)	94 (1)
SJH-202	2	4	8	16 (2)	28 (2)
SJH-700	0	4	0	5 (2)	33 (2)
SJH-701	6	4	24	46 (1)	96 (1)
BH-134	15	4	60	101 (3)	180 (3)

(1) REQUIRES TIMELY UPGRADE
(2) UPGRADE AS DEVELOPMENT OCCURS
(3) NO UPGRADE REQUIRED



GENERALIZED X-SECTION

STREET CROSS-SECTION

FIGURE I

D. 10-year flows or less cannot cross an arterial at an intersection.

Albuquerque's Long Range Major Street Plan identifies the following major streets in the South Broadway study area:

CLASSIFICATION	STREETS
Major Arterials	Grand, Central, Lead, Coal, Stadium, Gibson
Minor Arterials	Broadway
Collectors	Woodward

Flow in these streets is evaluated in Section 11.0 "Summary of Flood Damages for Existing Conditions".

7.4 San Jose Drain. The San Jose Drain is the only open channel component of the South Broadway study area storm drain system. The three major storm sewer lines of the system converge just north of Bethel Road and then dump into the San Jose Drain. The drain is concrete-lined from Bethel to Woodward Road, then continues as an earthen ditch to the study limits. From the study limits, the drain continues southward and then westward to the Riverside Drain, approximately two miles downstream of the limits.

The drain is analyzed in SWMM using Manning's Equation. Roughnesses of 0.017 and 0.04 were assigned for the concrete-lined and earthen portions.

7.5 Pumping Station. The Bell/Commercial pump station, named for the intersection of two streets, contains a sump pump and three large vertical turbine pumps with a total capacity of 167 cubic feet per second (cfs). The function and effectiveness of the pump station is a subject of concern, and is one of the primary questions to be answered during this investigation.

The SWMM program analyzes the pump station, turning the pumps on and off depending on the water level in the wet well. Section 13.0 presents the results of this analysis of the pumping station.

8.0 MODELING CONVENTIONS

A variety of identification labels are required to present findings and systematize modeling. The labels used in this study are explained in this section.

8.1 Basin Identification Numbers. A basin can be loosely defined as that land drained by a waterway having a unique outfall from the study area. In this study, 29 basins were identified, and a HYMO runoff model prepared for each (see Modeling Map). In an effort to maintain continuity with the preceding AMDS Volume I study, basin boundaries and labels were maintained whenever possible. The labeling logic follows:

SJ Labels--(San Jose) basins modeled with RADS in AMDS Vol. I
SJH Labels--(San Jose HYMO) basins modeled with HYMO in AMDS Volume I
SJN Labels--(San Jose New) basins in the San Jose area not previously defined by AMDS Volume I
BH Label--(Broadway HYMO) basin modeled with HYMO in AMDS Volume I and mistakenly routed to the Broadway Pump Station

All alpha-numeric basin labels were used in AMDS Volume I except the SJN designations.

8.2 **Analysis Point Identification Numbers.** Since the South Broadway model is built around the storm sewer system, manholes were chosen as analysis points. The existing City of Albuquerque manhole numbering system was retained for these analysis points. The City numbering system labels each manhole with a one to three digit number. Each number (1 to 999) is unique to its City Zone Atlas sheet number.

This report identifies analysis points with first the Zone Atlas designation and then the manhole number, e.g. M14332 or L14646. The Modeling Map shows all manholes. Plates 1 through 8 show the trunk lines modeled by SWMM with selected manholes and analysis points identified.

8.3 **Conduit Numbers.** The EXTRAN block of SWMM requires labels for all nodes (manholes) and conduits being modeled. Labeling of the manholes has already been explained in the preceding paragraph. The conduits were numbered from 1 to 101 roughly in ascending order from upstream to downstream. These conduit numbers are shown on the SWMM model schematic.

9.0 PUBLIC INFRASTRUCTURE

In order to show potential construction conflicts between the public utility infrastructure and proposed storm sewer facilities, the utility infrastructure is presented on the flood hazard maps. The following pipeline sizes are shown:

Sanitary Sewer (SAS)	12" or larger
Gas Line (G)	6" or larger
Water Line (W)	10" or larger
Storm Sewer (SD)	10" or larger

Gas line locations and sizes were obtained from the Gas Company of New Mexico. Sanitary sewer and water lines and sizes were taken from the City facilities maps. Storm sewer lines and sizes from the City facilities maps were updated with as-built drawings for the major lines of the South Broadway system.

To avoid clutter, a single dashed line represents the water, gas and sanitary sewer lines. If more than one utility exists in a given location, one line is shown but each utility denoted by a letter, G for gas, W for water, SAS for sanitary sewer. Storm sewer lines are shown separately with longer dashed lines and pipe diameters.

10.0 SUMMARY OF EXISTING FACILITIES

Appendix I contains the 1"=500' scale site maps of the study area. Shown on these maps are the 10-year and 100-year flood boundaries found in this study. The major existing utility infrastructure is presented along with the analysis points which reference the flowrates used to determine the floodplains.

Table 3 presents the hydraulic information describing peak flows at the analysis points for existing conditions. The discharge, velocity and flow depth for storm sewer pipes and surface flow are tabulated for the 10-year and 100-year storms. This table also provides the location of the analysis points. The information on Table 3 is taken from the SWMM model output, which is submitted separately along with this report. The input for the SWMM model is included in Appendix IV.

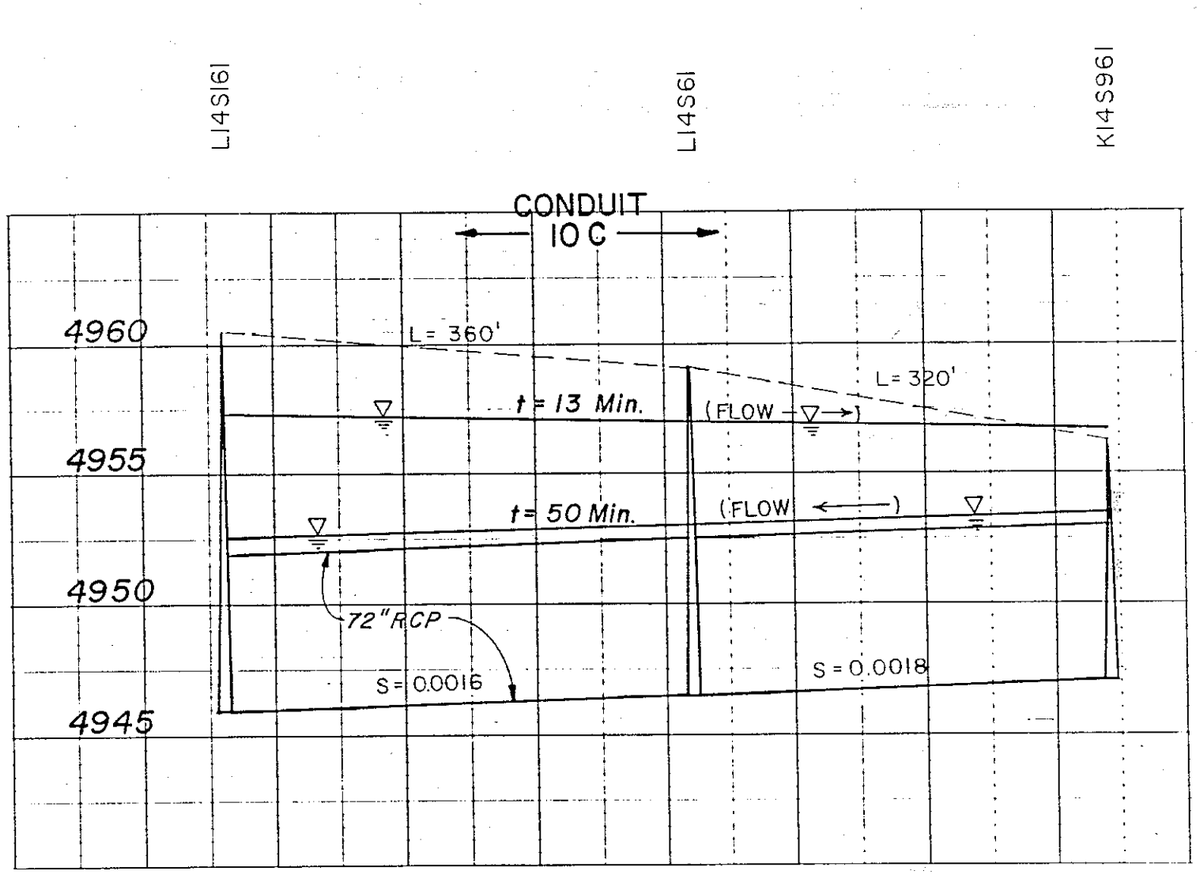
Additionally, profile sheets 1 through 8 show the 10-year and 100-year maximum hydraulic grade lines for the portions of the storm sewer system modeled with SWMM. It will be noted that at various reaches, it appears that the hydraulic grade line rises in the downstream direction. Figure 2 shows one such situation and explains the phenomenon. Manholes L14S161 and K14S961 serve as analysis points for the SWMM model. Analysis point L14S161 serves as a collection point

for Basin SJH106 runoff. During the first part of the storm (minute 13), the flow direction is actually upstream and produces the upper hydraulic grade line which slopes downward in an upstream direction. Maximum flow through the conduit occurs at minute 50 under the lower hydraulic grade line shown in Figure 2. Flow direction is downstream as is the slope of the hydraulic grade line. The hydraulic grade line plotted on Plates 1 through 8 thus show the maximum possible water rise at each manhole regardless of flow direction.

10.1 Facility Performance During 10-Year Storm. Map L-14 in Appendix I shows flooding from the 10-year storm for existing conditions in the vicinity of William Street and Trumbull Avenue. All other components of the storm sewer system proved adequate for handling a storm of this magnitude. Flow on arterial streets is acceptable under City criteria. The SWMM model showed that the sump pump (Pump #S), Pump #1 (14 cfs) and Pump #2 (40 cfs) were activated during the storm. Pump #3 (52 cfs) was not called upon by the water level sensor in the wet well.

10.2 Facility Performance During 100-Year Storm. Maps K-14, L-14 and M-14 show flooding predicted by the SWMM model for existing conditions during the 100-year storm. Flow depths in streets experiencing runoff concentrations are presented in Table 3. In flat areas where no appreciable flow pattern can be established, flood boundaries were determined from the volume of flood waters at the analysis points, assuming average flood depths of one foot. Flood hydrographs and volumes at analysis points are presented in Table 4.

All four pumps were activated during the 100-year storm. Pump performance is summarized in Table 6, Section 13.3. Despite the efforts of the pumps, the Bell/Commercial pump station was inundated during the 100-year storm, resulting in flooding of the immediate area of the pump station.



HYDRAULIC GRADE LINES
SHOWING FLOW REVERSAL

FIGURE 2

TABLE 3

HYDRAULIC PERFORMANCE OF EXISTING STRUCTURES AT ANALYSIS POINTS

ANALYSIS POINT NO.	LOCATION	SS DIAM.	Q10 (CFS)	D10	V10 (FPS)	Q100 (CFS)	D100	V100 (FPS)
J14993	Roma & Edith	48"	100	3.3	8.0	122	7.6	9.7
	Full Dev. w/Improvements					122	7.6	9.7
K1483	Marquette & Edith	48"	100	3.2	8.0	122	6.7	9.7
	Full Dev. w/Improvements					122	6.7	9.7
K1471	Broadway & Marquette	48"	100	3.6	8.0	101	5.7	8.0
	Full Dev. w/Improvements					101	5.7	8.0
K1471	Street Flo, Marquette	---	32	0.4	3.6	157	0.8	6.0
	Full Dev. w/Improvements					157	0.8	6.0
K1475	Broadway & Grand	48"	88	3.7	7.0	86	8.0	6.8
	Full Dev. w/Improvements					86	8.0	6.8
K15201	Copper & Locust	4'x4'	9	0.3	1.8	21	0.6	2.2
	Full Dev. w/Improvements					21	0.6	2.2
K14172	Broadway & Copper	60"	74	3.5	5.1	81	11.8	4.1
	Full Dev. w/Improvements					76	11.5	3.9
K14271	Broadway & Central	60"	171	7.6	6.0	235	13.6	12.0
	Full Dev. w/Improvements	84"				268	13.2	13.6
K14361	Broadway & Silver	60"	118	4.0	6.1	118	12.0	6.0
	Full Dev. w/Improvements	84"				174		4.5
K14361	Street Flo, Silver	---	0	0.0	0.0	120	0.9	4.6
	Full Dev. w/Improvements					0	0	0
K14661	Broadway & Iron	72"	232	10.6	8.2	261	13.8	9.2
	Full Dev. w/Improvements	84"				387	11.5	10.1
K14761	Broadway & Hazeldine	72"	209	10.2	7.4	244	12.3	8.6
	Full Dev. w/Improvements	84"				387	9.5	10.1
K14861	Broadway & Santa Fe	72"	227	8.8	8.0	303	10.7	10.7
	Full Dev. w/Improvements	84"				371	8.3	9.6
	Flow diverted to North Det. Res.							
K14864	Broadway & Pacific	72"	184	9.0	6.5	199	9.0	7.0
	Full Dev. w/Improvements					11	1.0	0.6
K14864	Street Flo, Pacific	---	11.8	0.3	3.3	246	1.0	8.0
	Full Dev. w/Improvements					0	0	0
K14961	Broadway & Cromwell	72"	184	9.0	6.5	141	5.0	5.7
	Full Dev. w/Improvements					18	1.2	1.3
K14961	Street Flo, Cromwell	---	0	0.0	0.0	56	0.5	5.7
	Full Dev. w/Improvements					0	0	0
L14161	Broadway & Lewis	72"	248	8.3	8.8	244	11.7	8.6
	Full Dev. w/Improvements					144	3.4	4.8
L14JB2	Broadway & Bell	72"	273	8.2	9.7	343	11.0	12.1
	Full Dev. w/Improvements					144	3.4	4.8
	Flow diverted to B/C Pump Station							
L14361	Broadway & Trumbull	72"	271	4.3	12.5	312	9.4	11.0
	Full Dev. w/Improvements					135	3.0	10.7
L14346	William and Trumbull	72"	197	8.6	7.0	203	8.6	7.2
	Full Dev. w/Improvements					89	8.6	3.1
L14346	Floods Immediate Area	---	75			168		
	Full Dev. w/Improvements					46	0.5	1.6
SANTAFE	Commercial & Pacific	---	0	0.0	0.0	20	Floods Area	
	Full Dev. w/Improvements	36"				25	5.2	3.5
SANTAFE	Street Flow	---	16	0.6	1.5	28	0.9	1.7
	Pipe flow only. See above.							
L14345	William & Trumbull	36"	6	3.1	1.0	6	6.2	1.0
	Full Dev. w/Improvements					10	7.4	1.4
L14349	William N. of Southern	36"	14	1.7	3.4	17	6.2	2.5
	Full Dev. w/Improvements					23	8.3	3.3
L14349	Floods Immediate Area	---	0			154		
	Full Dev. w/Improvements					0	0	0
L14644	William N. of Anderson	36"	60	9.3	9.4	70	9.3	9.9
	Full Dev. w/Improvements	72"				176	9.3	6.2
L14644	Floods Immediate Area	---	0			413		
	Full Dev. w/Improvements					3	0.1	0.1
114744C	William & Thaxton	72", 36"	215	7.3	6.1	203	9.2	5.7
	Full Dev. w/Improvements					196	9.2	5.6
L14841	William & Franklin	72", 36"	219	7.3	6.2	232	9.1	6.6
	Full Dev. w/Improvements					229	9.2	6.8
M1433B	William & Roma	72", 36"	198	6.2	5.6	287	7.8	8.1
	Full Dev. w/Improvements					310	7.8	9.5
M14131	Topeka & Wheeler	72", 36"	189	6.6	5.3	244	6.6	6.9
	Full Dev. w/Improvements					252	6.6	7.8
M14131	Floods Immediate Area	---	0			27		
	Full Dev. w/Improvements					13	2.1	0.4
M143	Topeka & San Jose	72", 36"	189	5.0	5.3	225	6.1	6.4
	Full Dev. w/Improvements					231	5.7	9.1
M14331B	Old San Jose Drain	2-72"	194	3.9	6.6	239	5.7	4.2
	Full Dev. w/Improvements					215	3.7	7.1
L14634	AT & SF RR @ Ogle	36"	4	0.9	2.3	30	5.7	4.2
	Full Dev. w/Improvements					1	0.1	0.3
L14634	Floods Immediate Area	---	0			389		
	Full Dev. w/Improvements					0	0	0
M14222	Williams & San Jose	36"	16	1.9	3.2	27	4.4	3.8
	Full Dev. w/Improvements					25	3.6	3.5
M14222	Floods Immediate Area	---	0			29		
	Full Dev. w/Improvements					0	0	0
M14331A	Old San Jose Drain	36"	16	1.9	3.2	27	4.4	3.8
	Full Dev. w/Improvements					25	3.2	3.5
M14342	Old San Jose Drain	2-72"	322	4.4	8.3	437	6.2	8.7
	Full Dev. w/Improvements					253	4.0	7.4
L14263	Broadway & Stadium	48"	10	1.3	3.3	15	1.7	2.9
	Full Dev. w/Improvements					15	1.7	2.9
	Diverted to MH 114361							
L14362	Broadway & Trumbull	48"	83	3.5	6.6	121	6.6	9.6
	Full Dev. w/Improvements					11	1.7	1.1
L14562	Broadway & Kathryn	60"	66	3.8	4.1	80	6.2	4.1
	Full Dev. w/Improvements	72"				29	2.3	1.6
L14562	Street Flo, Kathryn	---	0	0.0	0.0	218	1.0	7.9
	Full Dev. w/Improvements					0	0	0
L14764	Broadway & Anderson	60"	164	5.2	8.3	206	11.9	10.5
	Full Dev. w/Improvements	72"				141	7.5	5.1
L14766	Broadway & Thaxton	72"	160	3.8	8.3	139	8.1	4.9
	Full Dev. w/Improvements					126	7.1	4.5
L14864	Broadway & Gibson	72"	190	5.5	6.7	245	12.0	8.7
	Full Dev. w/Improvements					185	8.1	6.5
L14961	Broadway & Ethlyn	72"	200	5.4	7.1	338	10.4	12.0
	Full Dev. w/Improvements					253	7.2	8.9
M14261	Broadway & Alamo	54"	188	5.3	11.8	292	17.2	18.4
	Full Dev. w/Improvements					5	0.4	0.3
	Flow diverted south on Broadway to Bethel.							
M14251	Alamo & Maria Ct.	72"	192	5.2	7.0	239	7.3	8.4
	Full Dev. w/Improvements					9	0.5	0.4
	Flow diverted south on Broadway to Bethel.							
M14351	Old San Jose Drain	12'x6'CM	320	4.7	8.0	438	6.2	8.8
	Full Dev. w/Improvements					252	5	6.1
M14261 to M14352	New Bdwy. to Bethel	72"				331	4.7	11.7
M14352	S. Jose Drain & Bethel	TRAP CH	310	3.8	4.6	472	5.6	4.7
	Full Dev. w/Improvements					483	5.9	5.6
M14453	S. Jose Dr. & Descanso	TRAP CH	309	4.3	4.3	479	6.2	4.2
	Full Dev. w/Improvements					608	6.8	6.9
	Flow diverted to South Det. Res.							
M14334	Williams & Abajo	36"	6	2.4	1.5	12	1.7	2.8
	Full Dev. w/Improvements					1	0.2	0.2
M14521	Williams N. of Woodward	36"	9	3.3	1.3	12	1.7	2.8
	Full Dev. w/Improvements					14	6.1	2.1
WOODWARD	S. Jose Dr. & Woodward	TRAP CH	367	5.0	3.1	752	7.1	3.9
	Full Dev. w/Improvements					240	4.1	2.7
LIMITS	S. Jose Dr. & City Lim	TRAP CH	412	6.1	4.6	890	8.3	6.7
	Full Dev. w/Improvements					319	4.5	4.2

TABLE 4

ANALYSIS POINT SURFACE FLOW
100-YEAR STORM

FROM		993	644	562	71	349	634	864	961	BCPUMP	361	346	222	131	STAFE
TO		OUT	634	644	OUT	FLOOD	FLOOD	BC P	BC P	FLOOD	346	FLOOD	FLOOD	FLOOD	FLOOD
TIME (MIN)	TIME (HRS)														
0	0.00														
1.7	0.03						Discharges in cubic feet per second.								
3.3	0.06														
5.0	0.08														
6.7	0.11	2													
8.3	0.14	70	139	121											
10.0	0.17	86	275	139	6	17	236								
11.7	0.19	63	413	218	57	13	389	133	56	172	0				
13.3	0.22	29	311	137	144	25	296	246	17	223	120	0			
15.0	0.25	1	223	69	157	154	206	245	0	207	59	159			
16.7	0.28		173	7	137	3	168	217	0	193	6	158	9		
18.3	0.31		126		101		105	165	0	143		166	11		
20.0	0.33		104		73		93	124	0	101		168	16	25	
21.7	0.36		85		44		65	85	0	57		164	21	27	19
23.3	0.39		68		18		42	65		29		161	23	20	20
25.0	0.42		54		2		33	49		4		156	26	15	19
26.7	0.44		43				21	39				155	29	8	17
28.3	0.47		34				13	31				155	29	1	13
30.0	0.50		25				5	26				154	29		9
31.7	0.53		18				2	24				153	28		6
33.3	0.56		12					25				151	22		3
35.0	0.58		8					27				150	18		
36.7	0.61		5					28				150	16		
38.3	0.64		3					32				150	14		
40.0	0.67		0					34				149	12		
41.7	0.69							34				149	9		
43.3	0.72							34				148	6		
45.0	0.75							27				145	4		
46.7	0.78							22				143	1		
48.3	0.81							7				141			
50.0	0.83											135			
51.7	0.86											127			
53.3	0.89											93			
55.0	0.92											87			
56.7	0.94											70			
58.3	0.97											58			
60.0	1.00											55			
VOL. SURCHARGE (ACRE-FT)		0.6	4.9	1.4	1.7	0.5	3.8	3.8	0.1	2.6	0.6	8.8	0.7	0.3	0.3

10.3 Flow Comparisons with the Original AMDS. Table 3 shows a 100-year discharge of 752 cfs at Woodward Boulevard under existing conditions. This compares with a value of 362 cfs reported in the original Albuquerque Master Drainage Study Volume I. We believe the discrepancy is due to two factors, the original RADS algorithm and the original curve numbers.

As explained previously in the Hydrology section, the RADS model was prepared for flood modeling in flat areas. Discharges from individual cells are determined by the outlet weir of each cell and not by runoff hydrographs. We believe that the RADS model is not particularly appropriate for the South Broadway area, and that the cell discharges were lower than actual conditions.

Secondly, previous portions of the original AMDS basins were almost all assigned an SCS curve number of 54. When BHI reanalyzed the basins previously modeled with RADS, curve numbers were adjusted upward to be more consistent with SCS methodology. This further increased the basin by basin runoff from the area.

The hydrology used in this study is consistent with that used in other HYMO oriented AMDS analyses, and basin runoffs agree closely with the Rational Formula. In summary, we believe the runoff rates reported in this study are consistent with City of Albuquerque methods and are more reliable than the previous RADS-generated numbers.

11.0 SUMMARY OF FLOOD DAMAGES FOR EXISTING CONDITIONS

A summary of the flood damages for the 10-year and 100-year storms for existing conditions is presented in Table 5.

TABLE 5

FLOOD DAMAGES

TYPE	10-YEAR	100-YEAR
Acres Flooded (Including Streets)	3	63
Miles of Flooded Streets	0.2	2.3
Flooded Street Intersections	3	28
Residential Structures	10	90
Commercial Structures	2	10
Public Structures	0	0

In Section 14.0, drainage facilities will be proposed to alleviate these potential damages.

12.0 SEDIMENT BUILDUP IN STORM SEWERS

A survey was conducted for selected manholes to determine sediment buildup in the trunk lines of the storm sewer system. Results are summarized below:

MANHOLE	DEPTH OF SEDIMENT (Ft.)
L14S633	0.4
L14S934	2.0
L14S347	0.2

Only these three manholes were found to contain significant sediment out of the 65 manholes surveyed. While this suggests little sediment problem in the system, it should be added that a cleaning project is currently underway in the South Broadway area, and that significant sedimentation of system lines has been reported in the past. Note that manholes L14645, L14347, L14937 and L14747 on the 72" William Street line previously thought to be filled with sediment are actually access to catch basin overflows carrying water from the west side of the street over the 72" pipe to the 36" line on the east side of the street. There is no access to the 72" line from these manholes.

13.0 PERFORMANCE OF BELL/COMMERCIAL PUMP STATION

The Bell/Commercial pump station is the only storm sewer pumping facility in the study area. It receives flow from Basin SJ-2 (see modeling map) as well as surface flow escaping the Broadway storm sewer line at analysis points K14S864 and K14S961 during larger storms. The pump station contains four pumps with manufacturer's rating capacity of:

Pump #S--sump pump, 300 gpm, TDH = 40'
Pump #1--75 hp variable speed vertical turbine, 22 cfs
Pump #2--250 hp single speed vertical turbine, 56 cfs
Pump #3--600 hp single speed vertical turbine, 89 cfs

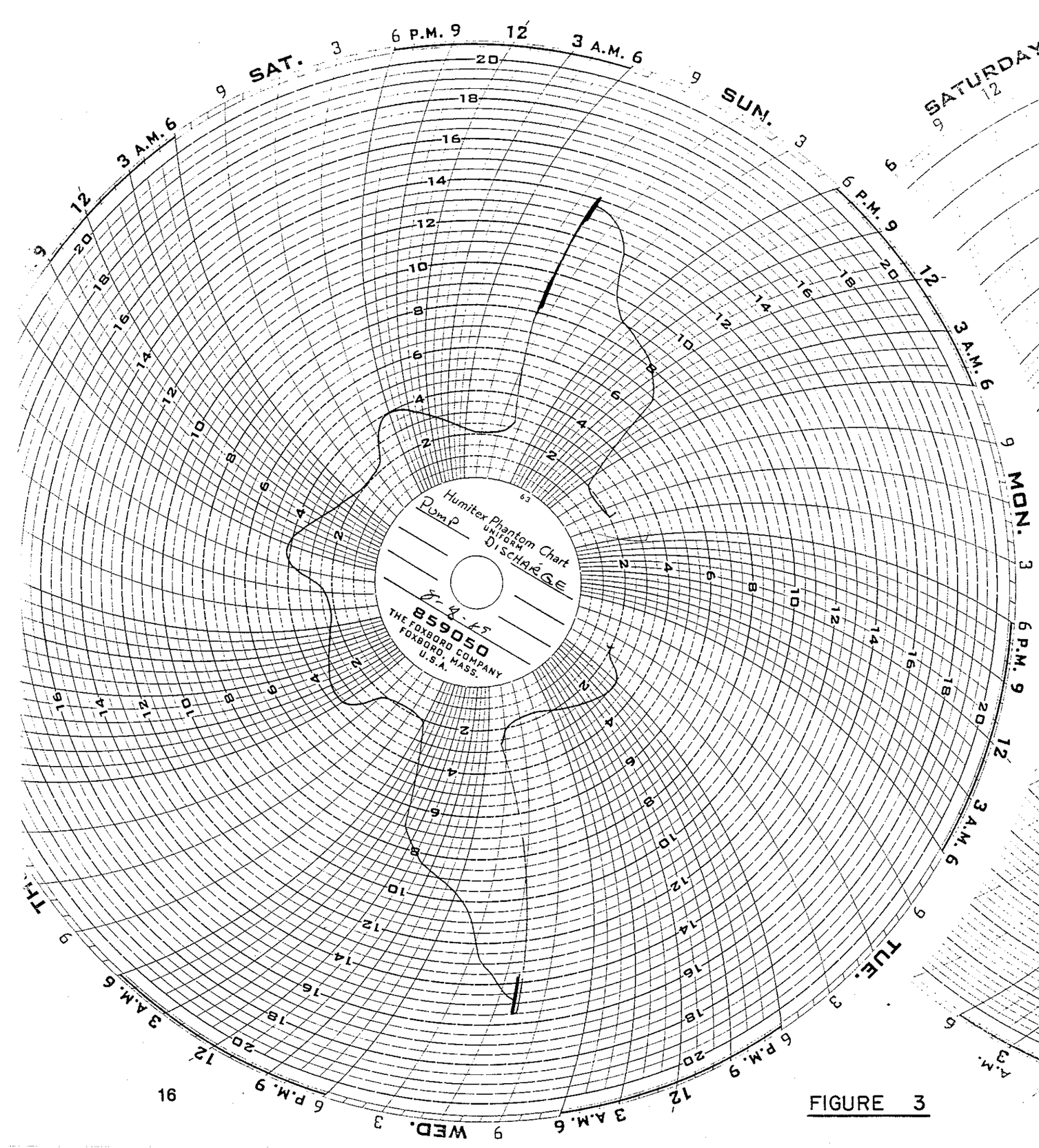
The City is currently sponsoring a rehabilitation project for the pump station which includes replacement of the sump pump with a larger 6 cfs capacity pump, a 10" sump discharge line and a new discharge header for the three large pumps.

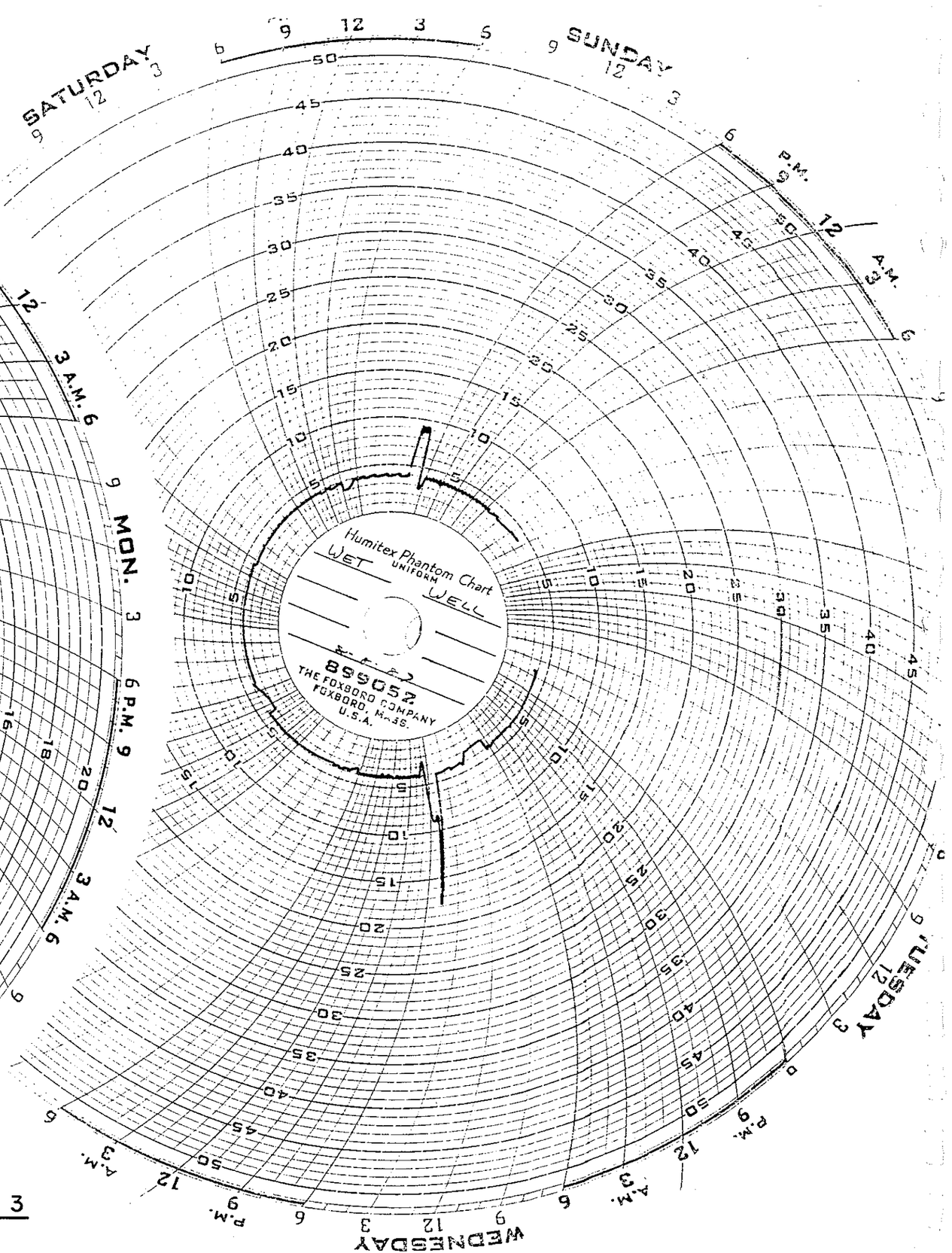
The necessity of this large pumping capacity (167 cfs) has been the subject of much debate within the City of Albuquerque, and is one of the primary questions to be answered during this investigation.

13.1 Pumping Logs. The pump station includes automatic recording logs of wet well water levels and discharge pumping pressures for the large pumps (all three large pumps have a common discharge header). BHI read all the logs from 1974 to the present and found many occasions where at least one of the large pumps had been activated by flood water in the wet well. Four of these log records are presented in Figures 3 through 6 for occurrences during the weeks of August 8, 1989, August 8, 1988, July 28, 1988 and September 18, 1985.

It is difficult to tell from the pump logs how many of the three pumps are activated. The wet well level on the 9-18-85 log shows a rise to 11.5 feet where a pump turn-on creates a short plateau. The ensuing peak to 14.3 feet and the quick drawdown probably denotes the activation of a second pump followed by a turn-off of the second pump and finally the turn-off of the first pump as the water level drops to 1 foot. However, the spike could also represent activation of a higher rpm from the variable speed Pump #1.

Before the reader invests great effort in analyzing the pump logs, the following caution should be noted. We found the logs to be useful only for general observations such as "a pump was activated." Specifics such as actual pressures, depths and run time lengths seem of dubious validity. Origin pen settings are inconsistent. Rises in wet well water surfaces of several days seem unrealistic for Albuquerque's short duration, high intensity thunderstorms.


SAT.
SUN.
MON.
TUE.
WED.
Humitex Phantom Chart
UNIFORM
DISCHARGE
Pump
859050
THE FOXBORO COMPANY
FOXBORO, MASS.
U.S.A.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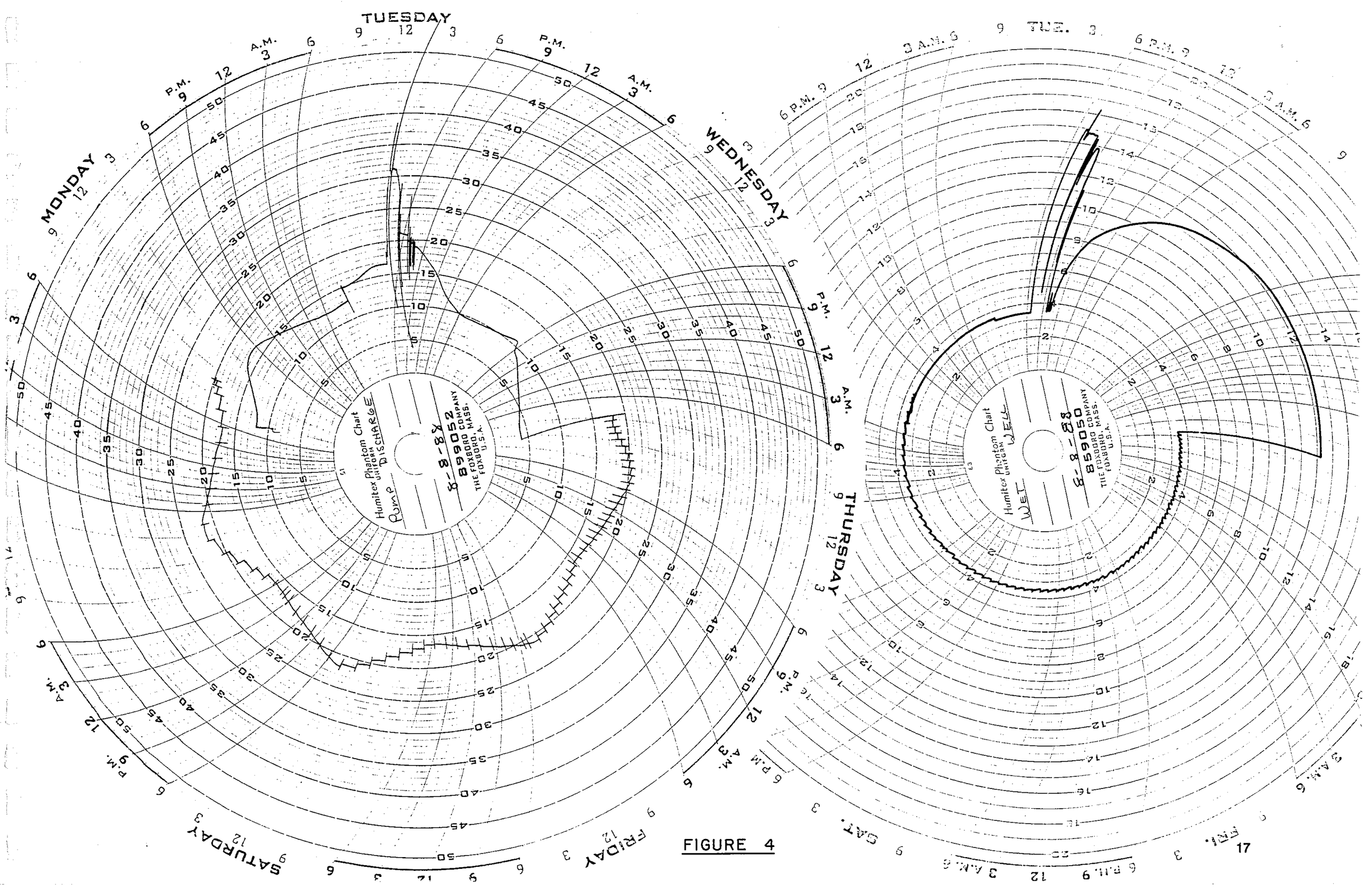
SUNDAY
MONDAY
TUESDAY
WEDNESDAY
Humitex Phantom Chart
UNIFORM
WET
WELL
859052
THE FOXBORO COMPANY
FOXBORO, MASS.
U.S.A.

FIGURE 3


MONDAY
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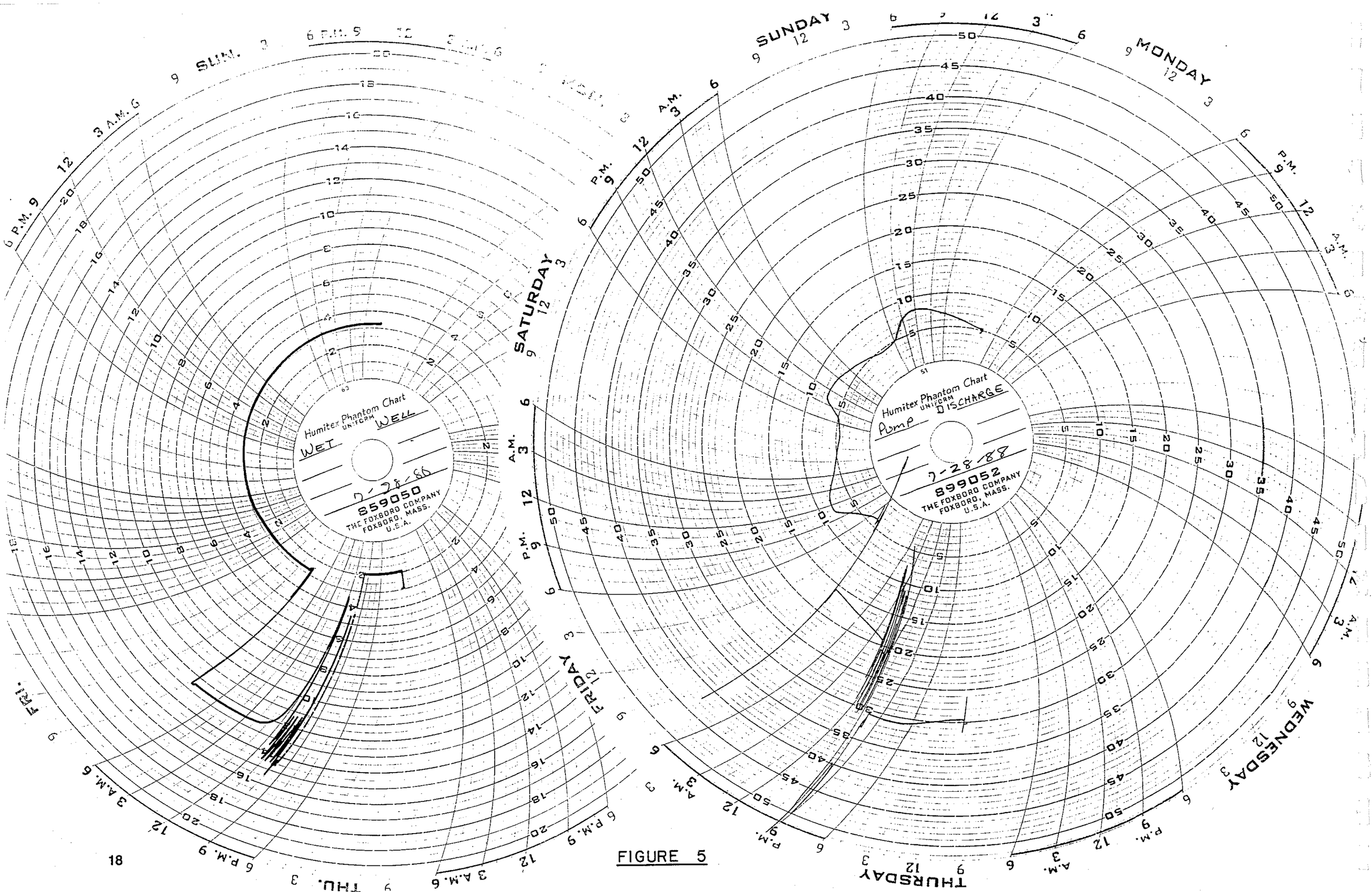
THURSDAY
FRIDAY
SATURDAY
TUE.
Humitex Phantom Chart
DISCHARGE
Pump
WET
THE FOXBORO COMPANY
FOXBORO, MASS.
U.S.A.

FIGURE 4


SUNDAY
MONDAY
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SUN.
THU.
Humitex Phantom Chart
UNIFORM
WELL
WET
7-28-88
859050
THE FOXBORO COMPANY
FOXBORO, MASS.
U.S.A.
Humitex Phantom Chart
UNIFORM
DISCHARGE
Pump
7-28-88
899052
THE FOXBORO COMPANY
FOXBORO, MASS.
U.S.A.

FIGURE 5

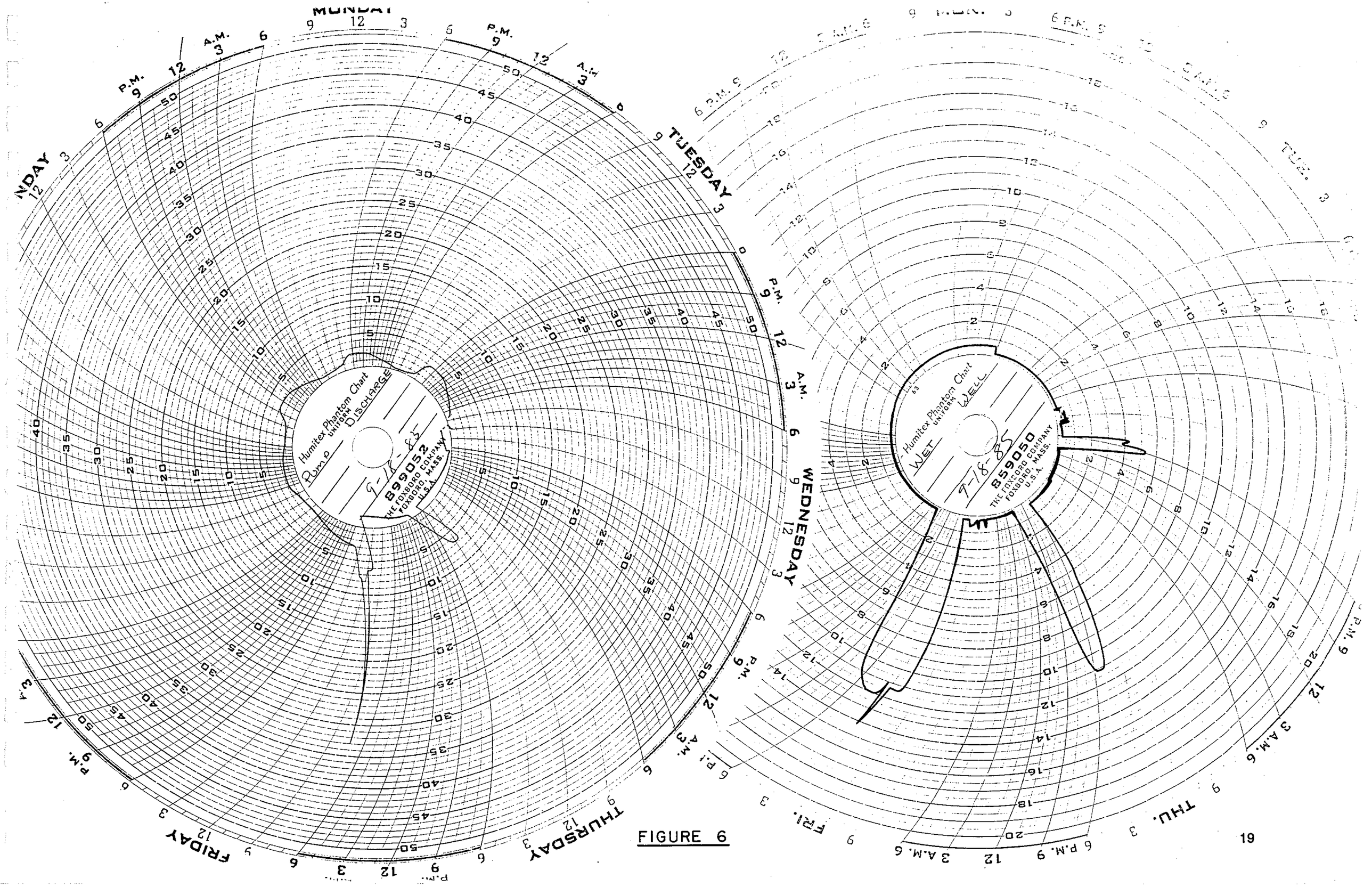

MONDAY
TUESDAY
WEDNESDAY
THURSDAY
FRIDAY
THU.
FRI.
Humitex Phantom Chart
UNIFORM
DISCHARGE
WET
9-16-85
9-18-85
899052
859050
THE FOXBORO COMPANY
FOXBORO, MASS.
U.S.A.

FIGURE 6

Despite the interpretation problems, the pump logs show definitively that the pumps are being activated and are functioning adequately if not properly. The pump tests carried on during this investigation further clarify the performance of the pumping station.

13.2 Pump Test. On November 14, 1989, BHI and City of Albuquerque personnel conducted a facilities test of the Bell/Commercial pumping station. After filling the wet well with water, each of the large pumps (Pumps #1, #2 and #3) was manually turned on and run for a varying duration. All pumps turned on and off upon demand. Pump #1, the variable speed pump, ran at a rate of 200 rpm despite demands for a higher rpm from the manual speed control. Pump #1 is designed to run at up to 700 rpm. This control failure was corrected the following week by City maintenance personnel.

The average discharge rates from the three large pumps are presented below. Test data can be found in Appendix III.

PUMP DISCHARGE TEST

Pump	Ave. Test Discharge (cfs)	Manufacturer's Design Discharge (cfs)
1	14.3 (200 rpm)	22
2	39.8	55
3	51.7	89

After the test, several questions were raised about the validity of the information gathered. First, calculations by City personnel revealed that the volume pumped in each test was insufficient to fill the 36" discharge line running from the pump station to Broadway. Therefore, the pumps were running against a head less than would occur in an actual flood situation, and measured discharges were probably higher than can be expected.

The second reservation pertains to the removal volume of the wet well. The pump tests involved measuring the drop in water surface in the wet well to determine the volume being pumped. This volume was divided by the pump run time to calculate the discharge. However, it was observed that, during pumping, an unknown quantity of water was entering the wet well from the wet well intake line, a 60" diameter buried conduit. This unaccounted volume could be quite significant, and would lead to an underestimation of the pumping capacity.

To better assess the validity of the pump test, manufacturer's pump curves were analyzed. Section 13.3 presents this effort.

13.2.1 Pump Pressures. A pressure gage was attached to the discharge header downstream of the confluence of Pumps #1, #2 and #3. The pressure reading for each individual pump plus all three pumps working simultaneously was 11 to 13 psi. The expected pressures were 27 to 33 psi to account for a 29' lift, 24' of pipe friction loss and 10' of minor losses plus some residual discharge pressure.

13.2.2 Water Level Sensors. Because of the extremely slow wet well filling time using a fire hydrant as water source, it was not feasible to test the water level sensors with actual conditions. However, water levels were simulated using back pressure on the "bubbler" water level sensors. The following results were obtained:

Existing Depth of Water in Wet Well (feet)

	Pump #1	Pump #2	Pump #3
Pump Turns On	3	13.3	14
Pump Turns Off	2.5	4	4

While the large gap between Pump #1 turn-on and Pump #2 turn-on can partially be reconciled by the variable speed nature of Pump #1, it appears that a more economical setting is attainable. We suggest the following settings:

Suggested Depth of Water in Wet Well (feet)

	Pump #1	Pump #2	Pump #3
Pump Turns On	3	11	14
Pump Turns Off	2.5	4	6

The larger separation between Pump #2 and Pump #3 turn-ons will delay startup of Pump #3 and decrease on-off cycling of these two pumps. The earlier shut-off of Pump #3 will also reduce on-off cycling of Pump #2.

13.3 Pump and System Curves. Manufacturer's pump curves are sometimes less than reliable for older pumps because wear to impellers and bearings often reduces the pump capacity. However, the uncertainty concerning the pump test results begs for additional input in analyzing the pump station. Figure 7 presents the pump curves of the three large pumps, plotting discharge versus pumping head. A combined pumps curve is also shown. (Manufacturer's information is found in Appendix 5).

To evaluate the appropriateness of the pumps, a system curve plotting system head vs. discharge is needed. For systems with wet wells, the system head is partially dependent on the water surface in the wet well, so various system curves are possible. Other system head components include pipe friction and minor losses such as bends, expansions valves and exit losses. One possible system curve using a constant wet well water depth of 17.2 feet is shown on Figure 7.

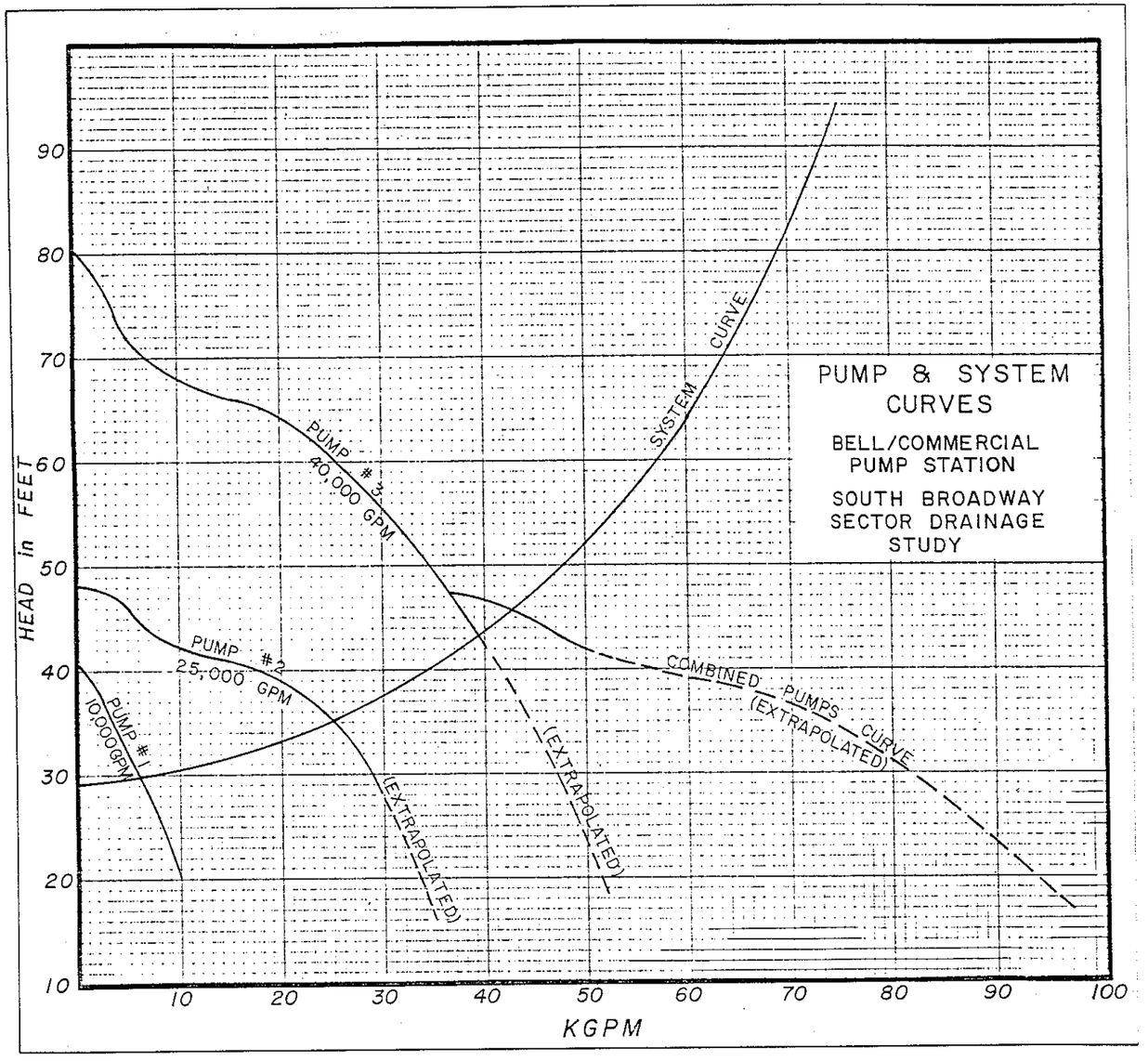


FIGURE 7

Scrutiny of Figure 7 reveals that the three pumps are not well matched in pumping pressures. Pump #1 cannot pump against a head greater than 40', while Pump #3 can pump against a head up to 80 feet. Once the system head builds up above 48 feet, Pump #2 will be pumping against a dead head. The intersection of the system curve and the combined pumps curve shows that the combined pumps discharge will not exceed 42,000 gpm even though the pumps have an individual additive capacity of 75,000 gpm. System operation with three pumps running will mean that Pump #1 pumps against a dead head while Pump #2 operates at an extremely low efficiency.

13.4 Pump Performances in the SWMM Model. SWMM models multiple pumps by placing the pumps between an upstream storage node and a downstream discharge node. The input parameters are the differences in water surfaces between the two nodes versus the pump discharges. No system head loss components such as bends, pipes, and valves are input rather, the user must calculate the system losses and corresponding pump discharges for the varying water surface differences.

Accordingly, a model was prepared (outside of SWMM) showing pump discharges versus the system head for a wet well with a rising water surface elevation. Calculations for water surface elevation 4939.7 and a summary of all other water surface elevation calculations are shown in Appendix 5. This model used the manufacture's pump curves, since the results of the pump test are questionable. The resulting pump discharges versus differences in water surfaces between the upstream and downstream nodes were placed in the SWMM mode. Table 6 presents pumping activity during the 10-year and 100-year storms as modeled in SWMM.

TABLE 6

PUMP ACTIVITY DURING THE 10-YEAR AND 100-YEAR STORMS
AS MODELED BY SWMM
FIRST HOUR OF STORM

	MAX. DISCHARGE (CFS)		PUMPING DURATION (MIN.)	
	10-yr	100-yr	10-yr	100-yr
Pump #S (Sump)	6	6	50	52
Pump #1	19	19	47	50
Pump #2	49	49	9	43
Pump #3	0	89	0	43

The wet well at the Bell/Commercial pump station is 25 feet deep, with the rim at the ground surface. During the 10-year storm, the water surface in the wet well rises to a maximum of 13.6 feet deep. During the 100-year storm, the wet well surcharges (25 feet deep or more) for approximately 28 minutes at a peak rate of 252 cfs.

13.5 Gravity By-Pass of Pump Station. At the intersection of Williams and Bell (manhole L14S152), approximately 300 feet upstream of the pump station, a 48" RCP carries Basin SJ-2 runoff westward down Bell toward the wet well. At the same manhole, a 24" RCP carries flow southward along Williams. The 24" pipe invert is set at the crown of the 48" pipe, so that flow is initially directed down the 48" RCP to the pump station. If the water level in the wet well rises above 17' of depth, water will start to overflow into the 24" pipe at manhole L14S152.

While 100-year runoff from Basin SJ-2 (88 cfs) in itself will not cause spill into the 24" pipe, the SWMM model shows that the combination of Basin SJ-2 runoff plus the overflow from Analysis Points K14S864 and K14S961 during the 100-year storm will raise the wet well level over 17 feet and cause spillage into the 24" RCP. However, the maximum possible discharge for the 24" by-pass is 42 cfs, a flowrate relatively small compared to the 100-year maximum 542 cfs inundating the pump station. The 24" by-pass was not modeled, as its contribution is considered secondary.

13.6 Pump Discharge Destination. The sump pump from the Bell/Commercial Pump Station discharges into Manhole L14252, and flow continues southward in the 36" line in William Street. The three large pumps discharge through a 36" force main to manhole JB#2 (Junction Box #2), where it empties into the 72" Broadway line. Since the computer model shows inadequate capacity in the 72" line upstream of JB#2, it was decided to investigate the effect of the pump station discharge on the upstream capacity. To achieve this, the computer model was rerun with the three large pumps discharging outside of the system.

The effect was to drop the hydraulic grade line upstream of JB#2 and substantially reduce the surcharging of the upstream system. The hydraulic grade line history of Manhole K14861 is representative of this effect:

HYDRAULIC GRADE LINE OF MANHOLE K14864
(MANHOLE SURCHARGES AT DEPTH OF 9')

Time (Min)	Depth WITH Pump Discharge	Depth WITHOUT Pump Discharge
3	.01	0.01
6	1.75	1.75
10	4.07	4.07
13	9.00	9.00
16	9.00	9.00
20	9.00	9.00
23	9.00	8.75
26	9.00	7.32
30	9.00	6.75
33	9.00	6.62
36	9.00	8.19
40	9.00	7.03
43	9.00	6.96
46	9.00	6.52
50	9.00	6.17
53	6.77	5.82
56	5.53	4.69

Note that without the pump discharge, the manhole surcharges for only 7 minutes, while WITH the pump discharge, the surcharge lasts 33 minutes. Other manholes upstream of JB#2 showed similar trends.

13.7 Summary of Pump Station Performance. Observation and analysis indicate that the Bell/Commercial Pump Station is undersized for the 100-year event. While all four pumps were found to be working, four problems were perceived:

A. The variable speed Pump #1 was found to run only at 200 rpms, and would not respond to automatic or manual speed change directives. This problem was corrected within a week of the pump test.

B. The automatic turn-on/turn-off settings could be changed to improve efficiency and economy. Suggestions for new settings are presented in Section 13.2.2 of this report.

C. Considerable flow reversal is being experienced through the check valve of Pump #3 when this pump is not running. The valve needs maintenance or replacement.

D. The discharge from the main pumps should not be to the Broadway line. An alternative discharge point is proposed in Section 14.0.

E. The pumping heads of the three major pumps were found to be mismatched. As a consequence, the combined capacities of the three pumps is less than 50,000 gpm instead of their potential 75,000 gpm. Also, Pump #1 (the 10,000 gpm pump) will be pumping against a dead head and Pump #2 (the 25,000 gpm pump will be pumping at extremely low efficiencies when pump #3 is operating. This situation should be corrected by keeping Pump #3 and replacing pumps #1 and #2 to a total capacity of 83,000 gpm (185 cfs). The replacement(s) should match the pumping head of the remaining pump(s).

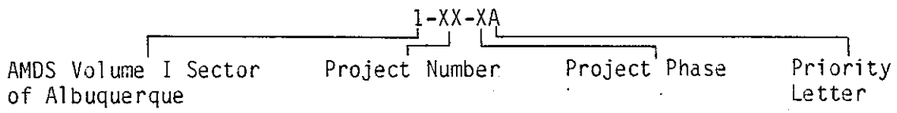
14.0 FLOOD ALLEVIATION MEASURES

Structural and Non-structural Measures. Both structural and non-structural measures should be considered for flood prevention and alleviation. Structural measures include storm sewers, channels, ponds, dams and pump stations. Their function is to remedy existing flooding problems.

14.1 Non-Structural Measures. Non-structural measures include ordinances, special zoning and policies which either recognize the existence of a flood threat and avoid it or prevent the creation of a flooding problem where none existed before. Examples are the Federal Insurance Administration's discouragement of building within the 100-year flood plain and the City of Albuquerque's past drainage policy which restricted creation of additional runoff due to land use changes.

The City of Albuquerque has found this restrictive drainage policy difficult to enforce. While City maintained detention facilities receive proper planning and maintenance, privately maintained facilities often lack adequate attention and become eye-sores and public nuisances. Additionally, runoff restriction is difficult to implement in an area that is already developed--the case for most of the study area. Therefore, this investigation concentrates on structural solutions to flooding.

14.2.1 Structural Measures. Six projects are proposed to alleviate flooding found in the Phase II study. The major components of these projects are shown on the 1"=500' mapping found in Appendix 1 in this report. A description of each project, a cost estimate and a brief discussion of the flooding being addressed is presented in Section 14.2.2 below. Projects are numbered according to the following scheme:



The order of the Project Numbers have no significance, however, the Project Phases represent the recommended sequencing of construction.

Assignment of priorities are discussed in Section 14.2.3, Project Priorities.

14.2.2 Improvement Projects. Area storm sewer lines flow from north to south, emptying eventually into the San Jose Drain, whose present capacity can accept approximately 350 cfs from the study area. Three north/south lines exist, the highest in elevation running in Broadway, with parallel lines in Williams and Commercial (lowest in elevation). All three lines are under capacity for existing and future conditions. When the Broadway storm sewer reaches capacity, the extra runoff flows westward to the Williams line which, in turn, dumps its excess runoff westward to the Commercial storm sewer.

Under fully developed conditions, runoff will increase greatly from the southern basins (SJN-710, SJN-720, SJH-109, SJH-202 and SJH-700), overwhelming the already overtaxed San Jose Drain. While it is possible to upgrade the capacity of the San Jose Drain, several problems would have to be overcome. First, the Middle Rio Grande Conservancy District, owner of the drain, has been historically reticent to accept additional storm runoff in its drains and irrigation ditches. Secondly, the San Jose Drain would have to be upsized for a length of 12,000 feet to its confluence with the Riverside Drain, a costly endeavor. Lastly, the planned San Jose outfall to the Rio Grande would also have to be upsized to pass the additional flow. This report investigates an upgrade to the San Jose Drain, but also proposes optional detention facilities in lieu of upgrading the drain.

The detention approach is to construct two reservoirs to attenuate flood peaks. The North Detention Reservoir, to be located just north of the intersection of Commercial and Pacific, will accept all the study area flows north of Santa Fe Avenue and release them to the Bell/Commercial Pump Station. Runoff generated between Santa Fe on the north and Bell on the south will also be directed to the Bell/Commercial station. A new outfall for the pump station will direct discharge to the Rio Grande just downstream of the Stadium bridge. The North Detention and its outlet to the River will be required regardless of the option chosen for the San Jose Drain, as the trunk lines running south to the drain do not have excess capacity to carry the required 185 cfs leaving the future Bell/Commercial pumps. Future planning for this outfall may have to consider treatment of this runoff before discharge. This possible treatment is not considered in this proposal.

The second detention pond, referred to as the South Detention Reservoir, has three possible locations, designated as Project 1-04-B Options 1, 2 and 3. The Option 1 pond is located at the northwest corner of Woodward and Broadway, and is the least expensive location; however, it is located within an environmentally sensitive area that is currently designated for environmental rehabilitation as part of the Federal Superfund program. Options 2 and 3 are located on either side of the San Jose Drain just south of the City limits, and lie adjacent to, but outside of the Superfund study area (see SWMM Model Schematic). These options are also located in the path of one of the proposed routes (Alternative 9) of the Gibson West Extension. If this proposed route were chosen, the Option 2 pond could easily be relocated further south, but the Option 3 pond might have to be abandoned because land is less available on the east side of the San Jose Drain.

Options 4 and 5 of Project 1-04-B propose upsizing of the San Jose Drain as an alternative to detention. The drain right-of-way width is 150 feet throughout the entire length, and widening is possible. Option 4 proposes an earthen section, while Option 5 is a concrete-lined channel. Both proposals require a comparable upsizing of the San Jose/Riverside Drains overflow project currently being studied for the City of Albuquerque.

The required infrastructure for the study area has been divided into six projects suited for staged construction. They are described in the following paragraphs:

Project 1-01-B

- o Install 3 to 4 new vertical turbine pumps with a working capacity of 185 cfs to replace existing Bell/Commercial pumps.
- o Build a 54" discharge line from the Bell/Commercial pump station to the Rio Grande.
- o Replace the existing 36" force main discharge line leaving the pump station with a 72" gravity line carrying Broadway flows TO the pump station.
- o Build 23 acre-ft North Detention Reservoir.
- o Build 36" discharge line from detention reservoir to the pump station.
- o Plug 72" line in Broadway just south of JB #2.

ESTIMATED COST: $2,232,000.00

Project 1-02-C

- o Build 84" line from Broadway to the North Detention Reservoir in Santa Fe Avenue.
- o Replace 60" existing line with 84" in Broadway from Santa Fe Avenue to Central.
- o At the intersection of Trumbull and Broadway, divert the 48" storm sewer into the 72" running west down Trumbull.
- o Plug 72" line in Broadway just south of Santa Fe Avenue.

ESTIMATED COST: $1,220,000.00

Project 1-03-D

- o Build a cross-connection between 36" and 72" RCP's at intersection of Anderson and Williams.

ESTIMATED COST: $13,000.00

Project 1-04-B Option 1

- o Build 33 acre-ft South Detention Reservoir.
- o Divert San Jose Drain into South Det. Res.
- o Divert 36" line in Woodward into South Det. Res.
- o Build 60" discharge line from South Det. Res. to the San Jose Drain.
- o Upgrade crossing structure to increase capacity to 625 cfs along the San Jose Drain and Wesmeco Drive.

ESTIMATED COST: $452,300.00

Project 1-04-B Option 2
West Side of San Jose Drain

- o Build 33 acre-ft South Detention Reservoir.
- o Divert San Jose Drain into South Det. Res.

- o Build 60" discharge line from South Det. Res. to the San Jose Drain.

- o Increase capacity to 1,140 cfs and concrete line the San Jose Drain from Woodward Road to South Det. Res.

- o Upgrade crossing structure to increase capacity to 625 cfs along the San Jose Drain at Wesmeco Drive.

- o Upgrade crossing structure to increase capacity to 1,000 cfs along the San Jose Drain at Woodward Road.

- o Upgrade crossing structure to increase capacity to 1,140 cfs along the San Jose Drain at AT&SF railroad spur crossing at the City Limits.

ESTIMATED COST: $941,200.00

Project 1-04-B Option 3

East Side of San Jose Drain

- o Build 33 acre-ft South Detention Reservoir.

- o Divert San Jose Drain into South Det. Res.

- o Build 60" discharge line from South Det. Res. to the San Jose Drain.

- o Increase capacity to 1,140 cfs (with freeboard) and concrete line the San Jose Drain from Woodward Road to South Det. Res.

- o Upgrade crossing structure to increase capacity to 625 cfs along the San Jose Drain at Wesmeco Drive.

- o Upgrade crossing structure to increase capacity to 1,000 cfs along the San Jose Drain at Woodward Road.

- o Upgrade crossing structure to increase capacity to 1,140 cfs along the San Jose Drain at AT&SF railroad spur crossing at the City Limits.

ESTIMATED COST: $941,200.00

Project 1-04-B Option 4

- o Increase capacity to 1,140 cfs and concrete line the San Jose Drain from Woodward Road to the City Limits.

- o Upgrade crossing structure to increase capacity to 625 cfs along the San Jose Drain at Wesmeco Drive.

- o Upgrade crossing structure to increase capacity to 1,000 cfs along the San Jose Drain at Wood- ward Drive.

- o Upgrade crossing structure to increase capacity to 1,140 cfs along the San Jose Drain at AT&SF railroad spur crossing at the City Limits.

- o Increase capacity of the San Jose Drain (dirt section) to 1,140 cfs from the City Limits to the Albuquerque Riverside Drain.

- o Upgrade crossing structures to increase capacity to 1,140 cfs along the San Jose Drain at Rio Bravo Boulevard.

- o Upgrade crossing structures to increase capacity to 1,140 cfs along the San Jose Drain at AT&SF railroad crossing by Second Street.

- o Upgrade crossing structures to increase capacity to 1,140 cfs along the San Jose Drain at Second Street.

- o Upgrade crossing structure to increase capacity to 1,140 cfs along the San Jose Drain at Barr Canal.

- o Upgrade San Jose/Riverside Drains Outfall.

ESTIMATED COST: $1,313,000.00

Project 1-04-B Option 5

- o Increase capacity to 1,140 cfs and concrete line the San Jose Drain from Woodward Road to the City Limits.

- o Upgrade crossing structure to increase capacity to 625 cfs along the San Jose Drain at Wesmeco Drive.

- o Upgrade crossing structure to increase capacity to 1,000 cfs along the San Jose Drain at Wood- ward Road.

- o Upgrade crossing structure to increase capacity to 1,140 cfs along the San Jose Drain at AT&SF railroad spur crossing at the City Limits.

- o Increase capacity to 1,140 cfs and concrete line the San Jose Drain from the City Limits to the Albuquerque Riverside Drain.

- o Upgrade crossing structures to increase capacity to 1,140 cfs along the San Jose Drain at Rio Bravo Boulevard.

- o Upgrade crossing structures to increase capacity to 1,140 cfs along the San Jose Drain at AT&SF railroad crossing by Second Street.

- o Upgrade crossing structures to increase capacity to 1,140 cfs along the San Jose Drain at Second Street.

- o Upgrade crossing structure to increase capacity to 1,140 cfs along the San Jose Drain at the Barr Canal.

- o Upgrade San Jose/Riverside Drains Outfall.

ESTIMATED COST: $5,028,000.00

Project 1-05-B

- o Replace 60" line in Broadway from Kathryn to Thaxton with 72" line.

- o Install 72" line in Broadway and Bethel from Alamo to the San Jose Drain.

- o Plug 54" line at intersection of Alamo and Broadway.

ESTIMATED COST: $835,000.00

Project 1-06-C

- o Build 24" line from the intersection of Walter Street and Cromwell Avenue to Walter Street and Pacific, connect to existing storm drain Manhole Number 5882.

- o Build 6' diameter Type 'C' manhole at intersection of Walter Street and Cromwell Avenue.

- o Build catch basins along Cromwell Avenue east of Walter Street, with 18" collector lines connecting to the proposed manhole at Walter Street and Cromwell Avenue.

ESTIMATED COST: $71,300.00

TOTAL COST,
ALL PROJECTS: $5,312,500.00 (using Option 2 of Project 1-04-B)

14.2.2 Improvement Projects (Continued). The five options of Project 1-04-B require some discussion. All options provide the same protection, but costs differ greatly:

Option	Description	Cost
1	"Superfund" Site Detention Pond	$421,000
2	Detention Pond S. of City Limits and W. of San Jose Drain	$941,000
3	Detention Pond S. of City Limits and E. of San Jose Drain	$941,000
4	Upsize San Jose Drain--Dirt Section	$1,313,000
5	Upsize San Jose Drain--Conc. Sect.	$5,028,000

Option 1 is easily the most economical, as it requires no upgrade to the San Jose Drain. However, the detention reservoir would be built on a EPA Superfund cleanup site, and thus carries potentially great liabilities. The general consensus from the City of Albuquerque is that the detention reservoir should not be located at the proposed site. Similarly, the consulting firm, Geoscience Consultants, Ltd., contracted to design the Superfund cleanup, recommended locating the detention reservoir outside of the Superfund Area. The EPA in Dallas, however, said that under certain conditions, the proposed site might be suitable for a detention facility. (A summary of conversations with various government officials and private consultants is shown in Appendix 5). At this time, it appears that the "Superfund" site is too problematic, and as such, we recommend that the alternative sites be considered if detention is chosen for flood control.

The Option 2 and 3 sites are located just south of the Superfund study area and are outside of the City Limits. Their close proximity to the Superfund site makes it imperative that a Class I Environmental Audit be performed on the sites to identify any potential problems.

An additional complication with these sites is that they lie within Bernalillo County drainage jurisdiction. The City of Albuquerque has received a letter from the Bernalillo County Public Works Department stating that if the detention facilities are located in the Option 2 and 3 locations, they would have to meet the requirements of the Bernalillo County Storm Drainage Ordinance, No. 90-6. This would mean additional hydrologic studies, as the hydrologic approach of the ordinance is substantially different that that used in this analysis.

14.2.3 Project Priorities. Table 7 summarizes the flood damages associated with each project. The flood damages were weighted with residential and commercial structures having a weight of 10, public buildings a weight of 7, street intersections and miles of streets a weight of 5 and acres flooded a weight of 1. These weights were then applied to the values in Table 5. Priorities were then assigned with Group A projects being those with the highest weighted flood damage totals and Group D projects having the lowest totals. In keeping with Albuquerque Master Drainage Studies, the following priorities were assigned:

PRIORITY GROUP	WEIGHTED FLOOD TOTALS
A	1000 and greater
B	200 to 999
C	100 to 199
D	0 to 99

TABLE 7

PROPOSED PROJECTS AND THEIR ASSOCIATED FLOOD DAMAGES

	ACRES FLOODED	MILES OF STREETS FLOODED	INTER-SECTIONS FLOODED	RESIDENTIAL STRUCTURES	COMMERCIAL STRUCTURES	PUBLIC STRUCTURES	WEIGHTED FLOOD TOTAL	PRIORITY	ZONE ATLAS MAP NO.
MULTIPLIER=	1	5	5	10	10	7			
PROJECT									
1-01-1B B/C Pump Station upgrade to 185 cfs with turbine pumps.									L14
1-01-2B 54" discharge line, L=2800' to Rio Grande. Replace existing 36" discharge with 72" gravity line from Broadway to Pump Station.									L14
1-01-3B Build North Det. Res. and 36" discharge line to B/C Pump Station.									K14, L14
PROJECT SUMMARY	7	0.6	7	17	2	0	235	B	
1-02-1C Build 84" RCP in Santa Fe from Broadway to N. Det. Res. and divert Broadway flow.									K14
1-02-2C Replace 72" with 84" in Broadway from Santa Fe to Central Ave.									K14
1-02-3C Divert 48" RCP into 72" RCP at Trumbull & Broadway.									L14
PROJECT SUMMARY	6	0.4	5	10	1	0	143	C	
1-03-1D Cross-connect 36" RCP with 72" RCP at intersection of Williams and Anderson.									L14
PROJECT SUMMARY	2	0.1	2	6	0	0	72.5	D	
1-04-1B All Options Build South Det. Res. Divert San Jose Drain into Reservoir. Divert 36" RCP in Woodward to Reservoir.									L14
PROJECT SUMMARY	35	0.9	9	34	5	0	474.5	B	
1-05-1B Install 72" RCP from San Jose Drain to Alamo in Bethel and Broadway.									L14
1-05-2B Replace 60" RCP with 72" RCP in Broadway from Kathryn to Gibson.									L14
PROJECT SUMMARY	13	0.3	5	23	2	1	296.5	B	
1-06-C Install 3 catch basins in Cromwell east of Walter.									K14
PROJECT SUMMARY	1	0.1	3	10	0	0	116.5	C	

These projects were incorporated into the SWMM computer model for existing conditions and are shown on the 1"=500' mapping in Appendix 1. The facility additions and changes and the resulting changes in hydraulic performance are presented in Table 3 along with the existing conditions components and performances for sake of comparison. Details of the cost estimates (in 1990 dollars) are not presented in this report, but are available from the City of Albuquerque. All flooding during the fully developed 100-year storm is alleviated by the improvements recommended in this report.

14.2.4 Potential Flooding Not Addressed by Projects. The storm sewers north of Grand drain south into the South Broadway Sector, but the surface flow north of Grand drains west and north out of the study area. The storm sewers were found to be inadequate to carry all the runoff north of Grand, and some amount of surface flow leaves the area and enters the Broadway Pumping Station drainage area. This flow was not analyzed in this report.

A local nuisance problem was identified after a July, 1990 storm. A large quantity of sediment was deposited along Romana Street between William and the San Jose Parish. It appears to be eroding from the Church grounds and washing down Romana. Since this appears to be a problem originating on private property, a project was not included to address the sedimentation.

Lastly, off-site flows crossing into the study area under I-25 should be addressed. They are listed by location and flowrate in Section 6.2.6 Off-Site Flows. Of the flows listed, APW-1-SS3, APW3, APX1 and APZ1 are carried by storm sewers and present no problems in the study area. Flows APCC1, APGG1 and APHH1 enter the South Diversion Channel and do not effect the study area. The remainder of these off-site flows discharge into streets and eventually are picked up by the Broadway trunk storm sewer.

While these flows are not large, (APV1 at 52 cfs for the 100-year storm is the largest), they occasionally cause nuisance flooding and deposit sediment in the streets. This report recommends extension of the Broadway storm sewer collector lines eastward to I-25 and collection of these flows before they enter the streets. Since these off-site flows are causing only nuisance problems, no specific projects are detailed in this report. Rather, the City Public Works should address these flows as nuisance flooding and maintenance reports accumulate. These areas of interest are shown on the Flood Boundary Maps K-14 and L-14 and are labeled "Possible Future Projects". They are located at the intersection of Grand and I-25, Pacific and I-25, Cromwell and I-25, Lewis and I-25 and Trumbull and I-25. Project recommendations for these nuisance problems are outside the scope of this study.

14.3 Cost Estimates. The cost estimates presented in Section 14.2.2 reflect construction costs only and do not include right-of-way or design costs. The estimates are preliminary in nature and only reflect major cost items; therefore, a 20% contingency was added for each project. Detailed cost estimates have been provided to the City of Albuquerque but are not included in this report. City unit prices were used wherever possible in compiling the cost estimates.

14.4 Project Objectives. Except for Project 1-06-C which is a local flooding problem, all the projects recommended here work together to alleviate flooding in the area. Projects 1-01-B and 1-02-C clear up flooding in the northern portion of the study area, but also divert drainage from the northern portion that currently reaches and overwhelms the southern portion of the study area.

Projects 1-03-D, 1-04-B and 1-05-B work together to safely collect drainage from the southern part of the study area and safely convey it to the Riverside Drain/Rio Grande outfall. Project 1-06-C solves a localized flooding problem on Walter Street between Cromwell and Pacific.

No zones of flooding remain after implementation of the six projects.

15.0 CONCLUSION

While much of the study area is protected from the 10-year and 100-year storms under existing conditions, several areas can be expected to experience major flooding during storms of these magnitudes. Even greater flooding problems are anticipated under future development, especially in the southern portion of the study area, where most future development will occur. Flood boundaries for existing conditions are shown on maps J-14, K-14, L-14 and M-14 in Appendix I.

10-year storm flooding can be expected in the vicinity of Trumbull between Williams and the railroad tracks. Otherwise, the existing system was found adequate for handling the 10-year event, including the Bell/Commercial pump station. Frequent nuisance flooding has been reported and observed on Walter Street between Cromwell and Pacific, caused by flow crossing under and collected on I-25. Improper street grading is the cause of the flooding.

Much more flooding is predicted for the 100-year storm in the South Broadway area. As can be seen on maps K-14, L-14 and M-14, the majority of the flooding occurs between Williams and Commercial in the low lying areas next to the AT&SF railroad tracks. The large storm sewer lines in Broadway and Williams are inadequate to carry the runoff. Additionally, the Bell/Commercial pump station is overwhelmed. Finally, the San Jose Drain is dangerously close to maximum capacity under existing development, and would be overwhelmed during a 100-year event at full development.

This report recommends six projects to alleviate the 100-year storm flooding under fully developed conditions. The cornerstones of the projects are two detention reservoirs, one discharging by gravity flow into the San Jose Drain and the other emptied by pumping from an upgraded Bell/Commercial Pumping Station directly to the Rio Grande. The estimated construction cost of the projects totals $5,312,500.00. The proposed projects are shown on the 1"=500' mapping found in Appendix 1 of this report.

The projects are planned for staged construction, so that an orderly and financially manageable progression of installation can be established. With completion of the six projects, 100-year flooding in the South Broadway Sector will be eliminated.

APPENDIX I

FLOOD BOUNDARY

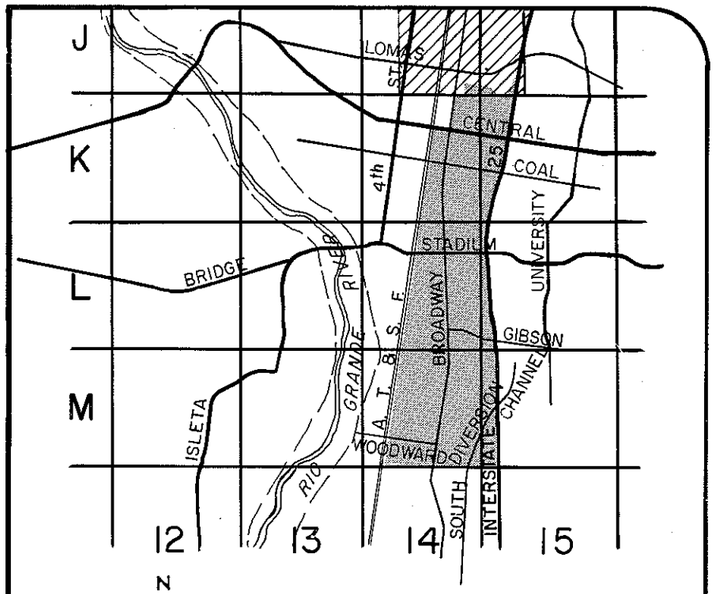
AND

EXISTING FACILITIES MAPS

J-14, K-14, L-14, M-14

J-14

J-15



MAP KEY

LEGEND

- STUDY AREA BOUNDARY
- ◇J14993 SWMM ANALYSIS POINT
- 10 YEAR FLOOD HAZARD AREA
- 100 YEAR FLOOD HAZARD AREA
- PROPOSED STORM SEWER

EXISTING UTILITIES

- ----SAS----- SANITARY SEWER, SIZE 12" or LARGER
- ------G------ GAS LINE, SIZE 6" or LARGER
- ------W------ WATER LINE, SIZE 10" or LARGER
- —12"SD——18"SD— STORM DRAIN LINE, SIZE 10" OR LARGER (DENOTES CHANGE IN PIPE SIZE)

NOTE: EXISTING UTILITIES ARE SHOWN ON ARTERIAL AND COLLECTOR STREETS AND WHERE DRAINAGE FACILITIES ARE PROPOSED.

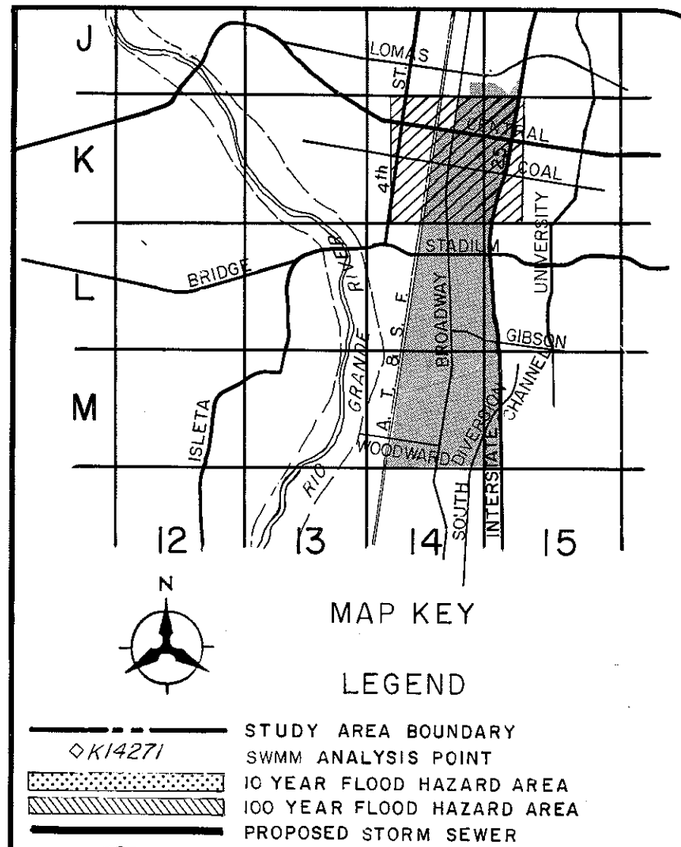
0 500 1000 1500 2000

SCALE IN FEET
1" = 500'

Orthophotography and topography by Bohannan-Huston, Inc. from aerial photograph dated 10-8-80

BOHANNAN HUSTON INC.

J-14



MAP KEY

LEGEND

- ◇K14271 — STUDY AREA BOUNDARY
- SWMM ANALYSIS POINT
- 10 YEAR FLOOD HAZARD AREA
- 100 YEAR FLOOD HAZARD AREA
- PROPOSED STORM SEWER
- DETENTION RESERVOIRS

EXISTING UTILITIES

- ----SAS---- SANITARY SEWER, SIZE 12" or LARGER
- ------G------ GAS LINE, SIZE 6" or LARGER
- -----W----- WATER LINE, SIZE 10" or LARGER
- —12"SD— —18"SD— STORM DRAIN LINE, SIZE 10" or LARGER (DENOTES CHANGE IN PIPE SIZE.)

NOTE: EXISTING UTILITIES ARE SHOWN ON ARTERIAL AND COLLECTOR STREETS AND WHERE DRAINAGE FACILITIES ARE PROPOSED.

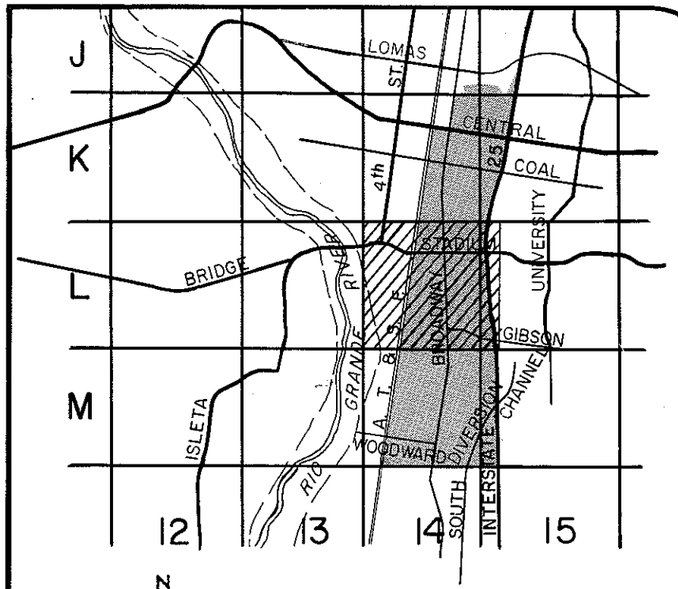
0 500 1000 1500 2000

SCALE IN FEET
1" = 500'

Orthophotography and topography by Bohannan-Huston, Inc. from aerial photograph dated 10-8-80

BOHANNAN HUSTON INC.

K-14



MAP KEY

LEGEND

- ◇ L14562 — STUDY AREA BOUNDARY
- SWMM ANALYSIS POINT
- 10 YEAR FLOOD HAZARD AREA
- 100 YEAR FLOOD HAZARD AREA
- PROPOSED STORM SEWER

EXISTING UTILITIES

- ----- SAS ----- SANITARY SEWER, SIZE 12" or LARGER
- ------G------ GAS LINE, SIZE 6" or LARGER
- ------W------ WATER LINE, SIZE 10" or LARGER
- —12"SD—●—18"SD— STORM DRAIN LINE, SIZE 10" or LARGER (DENOTES CHANGE IN PIPE SIZE)

NOTE: EXISTING UTILITIES ARE SHOWN ON ARTERIAL AND COLLECTOR STREETS AND WHERE DRAINAGE FACILITIES ARE PROPOSED.

0 500 1000 1500 2000

SCALE IN FEET
1" = 500'

Orthophotography and topography by Bohannan-Huston, Inc. from aerial photograph dated 10-8-80

BOHANNAN HUSTON INC.

L-14

PROJECT I-04-B
NOTE: THE FOLLOWING OPTS ARE SOUTH OF CITY LIMITS, NOT ON THIS MAP
OPTS 2 & 3
SAN JOSE DRAIN DIVERSION
33AC-FT DETENTION RESERVOIR
60" DISCHARGE
OPTS. 4 & 5
NOTE: OPT4 = DIRT SECTION
OPT5 = CONC. SECTION
INCREASE CAPACITY OF SAN JOSE DRAIN FROM CITY LIMITS TO ALBUQ. RIVERSIDE DRAIN
UPGRADE SAN JOSE DRAIN CROSSING STRUCTURES AT RIO BRAVO BLVD, AT&SF R/R, 2nd ST. & BARR CANAL

PROJECT I-05-1B
PLUG 54" RCP

PROJECT I-05-1B
INSTALL 72" RCP

30" RCP CULVERT

6x4 CBC

42" RCP CULVERT

3-12'x12' CBC

PROJECT I-04-B OPT.1
SAN JOSE DRAIN DIVERSION
DIVERT 36"
60" DISCHARGE

PROJECT I-04-B OPT.1
33AC-FT DETENTION RESERVOIR

PROJECT I-04-B OPTS 2,3,4&5
UPGRADE SAN JOSE DRAIN X-ING STRUCTURE AT
(A) WESMECO
(B) WOODWARD
(C) AT&SF RYD SPUR

36" CMP CULVERTS

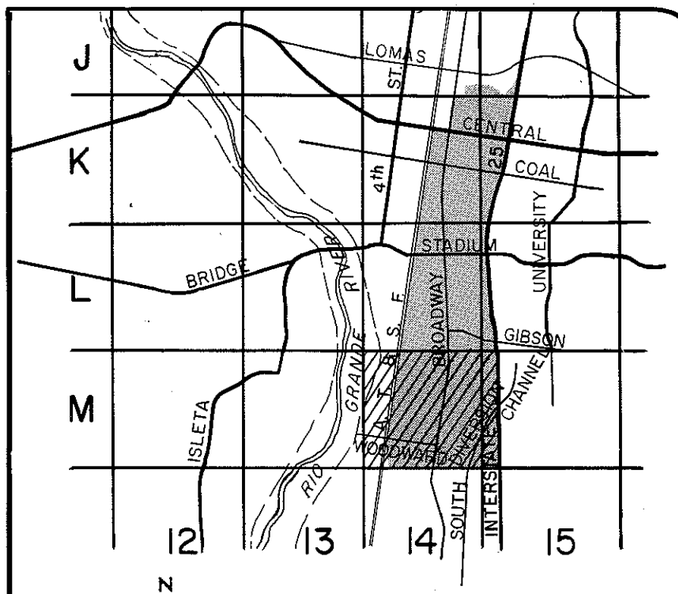
6X6 CBC

PROJECT I-04-B OPTS 2,3,4&5
INCREASE CAPACITY OF AND CONCRETE LINE SAN JOSE DRAIN

WOODWARD

LIMITS

DIST. = 1000' to 'BOGUS'



MAP KEY

N

LEGEND

- STUDY AREA BOUNDARY
- ◇M14351 SWMM ANALYSIS POINT
- 10 YEAR FLOOD HAZARD AREA
- 100 YEAR FLOOD HAZARD AREA
- PROPOSED STORM SEWER
- DETENTION RESERVOIRS

EXISTING UTILITIES

- -----SAS----- SANITARY SEWER, SIZE 12" or LARGER
- -----G----- GAS LINE, SIZE 6" or LARGER
- -----W----- WATER LINE, SIZE 10" or LARGER
- -12"SD—18"SD— STORM DRAIN LINE, SIZE 10" or LARGER (DENOTES CHANGE IN PIPE SIZE)

NOTE: EXISTING UTILITIES ARE SHOWN ON ARTERIAL AND COLLECTOR STREETS AND WHERE DRAINAGE FACILITIES ARE PROPOSED.

0 500 1000 1500 2000

SCALE IN FEET
1" = 500'

BOHANNAN HUSTON INC.

Orthophotography and topography by Bohannan-Huston, Inc. from aerial photograph dated 10-8-80

M-14

APPENDIX II

DRAINAGE PERMITS AND AGREEMENTS

SAN JOSE DRAIN

PERMITS AND/OR AGREEMENTS

SAN JOSE DRAIN
FROM BETHEL ROAD SOUTH TO CITY LIMITS

8/10/56 - License to maintain a 14 inch wash line to be discharged into the San Jose Drain in the City of Albuquerque at the intersection of Broadway, SE and Wesmeco Dr., SE. This wash line is located on MRGCD Map 44.

9/1957 - U.S. Atomic Energy Commission amended license 9/25/86, General Electric (rehab. of San Jose Drain).

8/22/58 - License and agreement between USBOR, MRGCD and City of Albuquerque to discharge as per Project #WS-NM-20, San Jose Drain Improvements.

4/27/59 - License to install and maintain an 8" cast iron water main under San Jose Lateral and along the west bank of San Jose Interior Drain between Stations 137+00 and 145+00, to serve AEC property.

4/23/65 - Atomic Energy Commission, Station 126+65, 12" sewer force main crossing.

4/27/65 - License to install and maintain City waterline crossings at Stations 13+15 and 29+40 San Jose Lateral, and 126+65 and 147+70 San Jose Interior Drain.

1/26/71 - Licenses with City to install and maintain a 30" drain system where San Jose Lateral crosses Bethel Dr.

A-2 Herk - City of Albuquerque - Model Neighborhood Drainage Improvement 8/25/71 - as per license and agreement between USBOR, MRGCD and City of Albuquerque dated 8/22/58 (Project #WS-NM-20) San Jose Drain Improvements.

6/6/73 - Texaco, Inc., Station 116+00±, drain inlet.

A-17 Herk - 3/14/77 Gordon Herkenhoff - San Jose Drain Improvements as per license and agreement between USBOR, MRGCD and City of Albuquerque dated 8/22/58.

12/23/82 - License to install and maintain a 14" waterline for line buried under 48"Ø RCP at San Jose Lateral Station 148+557, Map 50-TR:2A6.

12/23/82 - License to install and maintain a 14"Ø waterline for line buried under 72"Ø RCP at San Jose Lateral Station 179+62±, Map 49-TR:3B1.

12/23/82 - License to install and maintain a 14"Ø waterline for line buried under 72" RCP at San Jose Drain, Station 40+17±, Map 49, TR:IX.

12/23/82 - License to install and maintain a 14"Ø waterline for line buried under 60"Ø RCP at San Jose Drain, Station 39+22±, Map 50-TR:2A5.

3/6/85 - General Electric, Map 44-TR:64A4, Station 117+76±, storm drain and 6" drain pipe discharge structure.

11/24/86 - General Electric, Map 44-TR:64A4, Station 123+68±, storm drain and 6" drain pipe.

4/6/89 - American Investments, Inc., Map 45-TR:22A and 22CBKL, Station 95+50, 83"x128"x50' arch CMP crossing.

4/6/89 - American Investments, Inc., Map 45-TR:22A and 22C2BKL, Station 86+43±, 83"x128"x50' arch CMP crossing.

7-296
(Aug. 1951)

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION

Project Middle Rio Grande Division Albuquerque State New Mexico

LICENSE FOR ERECTION AND MAINTENANCE OF STRUCTURES

1. Pursuant to authority given by the Commissioner of the Bureau of Reclamation, thereunto duly authorized by the Secretary of the Interior, the undersigned hereby accepts a license to erect and **maintain a 14-inch wash line to be discharged into the San Jose Drain in the City of Albuquerque, at the intersection of Broadway S.E. and Wesmeco Drive, S.E. This wash line outlet is located on Middle Rio Grande Conservancy District Property Map No. 44.**

in connection with the Middle Rio Grande project, Bureau of Reclamation, constructed pursuant to the act of Congress approved June 17, 1902 (32 Stat., 388), and acts amendatory thereof or supplementary thereto, at a point **as described above.**

upon the terms and conditions hereinafter set forth:

2. The licensee shall be liable for any and all damages to the property of the United States, or of any third party or parties, by reason of the exercise of the privileges conferred by this license.

3. This license shall continue so long as in the opinion of the licensor it is considered to be expedient and not detrimental to the public interest, and shall be revocable by said officer upon ten days' written notice to the licensee. Upon such revocation the aforesaid structure or structures and all accessories shall be removed without delay at the expense of the **licensee**

4. The aforesaid structure or structures shall be so erected as not to obstruct in any manner the flow of water in the canals, laterals, or drain ditches of the United States, or to interfere in any manner whatsoever with the construction, operation, and maintenance of any part of the project.

5. In the erection of the aforesaid structure or structures the following specifications and conditions must be complied with: **as shown on the attached drawings No. Sheet 2 of 17, and 15 of 17. Elevation and inspection during construction will be furnished by the Bureau of Reclamation in accordance with the attached procedure.**

6. There are reserved to the United States from the scope of this license all uranium, thorium and other materials and the rights pertaining thereto, in and with respect to the lands herein involved, which materials and rights are designated in paragraph 1 of Executive Order 9908 dated December 5, 1947 (3 CFR, 1947 Supp.).

7. The United States shall not be liable for any damages caused to the licensee, his agents or employees or to such property of the licensee as may be authorized hereby to be installed and maintained by reason of any act or failure to act on the part of the United States in the operation or maintenance of the Project.

8. The issuance of this license constitutes in no way and to no extent any surrender or subordination by the Bureau of Reclamation of its jurisdiction or supervision over all or any part of the lands involved herein.

9. "Licensee warrants that no person or agency has been employed or retained to solicit or secure this contract upon an agreement or understanding for a commission, percentage, brokerage, or contingent fee, excepting bona fide employees or bona fide established commercial agencies maintained by the licensee for the purpose of securing business. For breach or violation of this warranty, the Government shall have the right to annul this contract without liability or in its discretion to require the licensee to pay, in addition to the contract price or consideration, the full amount of such commission, percentage, brokerage, or contingent fee."

10. "In connection with the performance of work under this license, the licensee agrees not to discriminate against any employee or applicant for employment because of race, religion, color, or national origin. The aforesaid provisions shall include, but not be limited to, the following: employment, upgrading, demotion, or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. The licensee agrees to post hereafter in conspicuous places, available for employees and applicants for employment, notices to be provided by the Project Manager setting forth the provisions of the non-discrimination clause. The licensee further agrees to insert the foregoing provision in all subcontracts hereunder, except subcontracts for standard commercial supplies or raw materials."

Dated at Albuquerque, N. M.
this 21 day of August, 1956
attest: Jane Galvin
City Clerk

Witness: _____

City of Albuquerque, Licensee
by: Chairman of the City Commission

Approved by: _____
Chief Engineer, Middle Rio Grande Conservancy District

Approved **August 10,** 1956

Date approved: _____

Charles H. Clark
Charles H. Clark Bureau of Reclamation.
Acting Project Manager

Interior - Reclamation - Denver, Colo.

August 14, 1956

Herkenhoff & Associates
302 Eighth Street NW
Albuquerque, New Mexico

Attention: Mr. Webster

Gentlemen:

Enclosed herewith copies of a license permitting the City of Albuquerque to install wash line as per revised plans. I have shown the wash line extending to the San Jose Drain as the San Jose Lateral has been abandoned for several years and the only other possible outlet in this area would be the location shown in red on the enclosure.

When the license has been properly executed, the original is to be retained by the licensee, one copy returned to this office for our files and one copy returned to the Bureau of Reclamation for their files.

Respectfully yours,

Hubert Ball, Chief Engineer
MIDDLE RIO GRANDE CONSERVANCY DISTRICT

HB/mam

encl.
cc - to
Bureau of Reclamation

302 E. Palace Ave., Suite 102
Santa Fe, New Mexico

302 Eighth Street, NW
Albuquerque, New Mexico

GORDON HERKENHOFF & ASSOCIATES, INC.

CONSULTING ENGINEERS

July 31, 1956

Mr. Hubert Ball, Ch. Engineer
Middle Rio Grande Conservancy Distr.
1930 Second SW
Albuquerque, New Mexico

Dear Mr. Ball:

Enclosed herewith are prints of the two drawings which indicate the location at which it is proposed to construct a well wash line for the City of Albuquerque, as well as the proposed details of construction.

This wash line will serve three of the existing San Jose Field water wells and is required preparatory to placing the City water system under automatic control operation.

If additional information is required previous to your issuance of written approval, we will be glad to meet with you at your convenience.

Very truly yours,

Gordon Herkenhoff & Associates, Inc.

Gordon Herkenhoff

GH/pc
Encl.

TELEPHONE SANTA FE 2-1036 ★ ALBUQUERQUE 7-0295

EXHIBIT HERK A-17
City of Albuquerque – License of 1958

San Jose Drain Improvements

Attached to "San Jose Drain Improvements", Sheets 1-18 of plan set by G. Herkenhoff, October, 1976

Exhibit Herk A-17 to license and agreement by and between the United States of America, the Middle Rio Grande Conservancy District and the City of Albuquerque, dated September 22, 1958.

APPROVED

Middle Rio Grande Conservancy District

By R. L. Nanninga

Date 3 March, 1977

APPROVED

Bureau of Reclamation
Upper Rio Grande Basins Project

By R.E. Schembera

Date March 7, 1977

APPROVED

City of Albuquerque, New Mexico

By E. T. Hensch

Date 3/4/77

Exhibit Herk A-17

PROCEDURE TO BE FOLLOWED IN INSTALLING
OR ERECTING STRUCTURES

All grades and elevations will be furnished by the Bureau of Reclamation's Resident Engineer, telephone No. 7-0311, Extension 285. The request for grades or elevations should be made at least five days before the beginning of construction. Inspection of construction to conform with approved plans included in the license will also be furnished by the Resident Engineer.

IMPORTANT

If the structure is not installed in accordance with furnished grades, elevations, and conformance with above plans, said license will be revoked in accordance with Clause 3 which provides for removal of structure at the expense of the licensee upon a ten-day written notice.

II
4

LICENSE AND AGREEMENT

This agreement made this 22nd day of September, 1958, pursuant to the Act of Congress approved June 17, 1902 (32 Stat. 388) and acts amendatory thereof and supplementary thereto, particularly the Act of August 5, 1939 (53 Stat. 1187), as amended by the Act of August 18, 1950 (64 Stat. 463), by and between the United States of America, hereinafter referred to as the Unites States and represented by the officer executing this agreement, the Middle Rio Grande Conservancy District, a municipal corporation of the State of New Mexico, hereinafter referred to as the District, and the City of Albuquerque, a municipal corporation of the State of New Mexico, hereinafter referred to as the City.

WITNESSETH:

WHEREAS, the District has, pursuant to lawful authority and contract, transferred to the United States certain of its works, including certain rights of way and the drains located thereon, as hereinafter described, located within the City of Albuquerque and the County of Bernalillo, and

WHEREAS, the City wishes to introduce into the said drains certain storm sewer outlets and culverts so that the waters flowing therein may be discharged into the said drains, and

WHEREAS, the parties hereto recognize that the said drains were not constructed for the purposes of evacuating flood or run-off waters arising within the City of Albuquerque or in the vicinity thereof nor was the District authorized to construct works to fulfill such purposes, and

WHEREAS, the parties hereto do agree, however, as a convenience to the City, to permit the City to introduce into said drains such waters, provided certain conditions as hereinafter set forth are complied with, and provided further that it is recognized that this license shall not be construed as establishing any precedent for the allowance by the United States of any other culverts or inlets, or the introduction of any other water into any of the drains or works of the District held by the United States.

NOW, THEREFORE, in consideration of the premises and the terms and conditions of this agreement, it is mutually agreed as follows:

1. The United States grants a license to the City to construct, operate and maintain certain drain and storm sewer inlets and culverts at points located on rights-of-way and structures of the United States, all as shown in exhibits to be attached hereto and by this reference made a part hereof. Said drain and storm sewer inlets and culverts shall be constructed and installed in accordance with plans and specifications approved by the United States and by the District. At such time as drawings showing the manner and fashion of the construction and installatinn of the inlets and/or ;culverts at a specific location are approved by the United States and by the District, they shall be labeled in alphabetical sequence "Exhibit _____ to License and Agreement by and between the United States of America, the Middle Rio Grande Conservancy District, and the City of Albuquerque, dated _____," attached hereto, and by this reference shall become a part hereof.

2. The City agrees to pay all construction and installation costs for said inlets and culverts, including the restoration of rights of way and structures of the United States to a condition satisfactory to the United States. The City agrees to maintain the inlet and culvert structures in good repair and working order. To this end, the City shall, at its own expense, keep trash and silt out of said inlets and culverts and shall keep the culverts clean at all times.

3. The City shall reimburse the United States for any and all increased operation and maintenance cost resulting from the introduction through said inlets and culverts of water into the drains of the United States. This shall include, but not be limited to, the cost of removing silt and other debris entering said drains through said inlets and culverts.

4. In the event the City fails to perform any of the conditions set forth in the agreement and the United States, with its funds, is put to any additional expense because of the installation of the inlet and culvert structures or the waters introduced therefrom, the City agrees to reimburse the United States for such expense. Bills for all amounts to be reimbursed by the City pursuant to this article, or any other article of this agreement, shall be submitted by the United States monthly, and the City agrees to pay said bills within 15 days from the receipt thereof.

5. The City hereby releases the United States, its officers, agents and

employees, and its successors and assigns from all damages which may result from the construction, operation or maintenance of said inlets and culverts across the rights of way of the United States, or the introduction of waters into the drains located thereon.

6. The City agrees to indemnify and save the United States, its officers, agents and employees, and its successors and assigns harmless from claims by third parties for injury or loss caused by or resulting from the construction, operation or maintenance of said inlets and culverts, or the introduction of water therefrom into the drains of the United States.

7. The rights and privileges conferred by this license shall terminate on June 30, 1959; Provided That the City may renew this license for one year by furnishing written notice at least 10 days in advance of the expiration date to the United States of its desire to renew the license under the same terms and conditions herein set forth; Provided, Further, That unless revoked, as provided in Paragraph 8 of this agreement, this license may be renewed by the City each year thereafter by providing similar notice to the United States. The written notice herein required shall show that the City has budgeted an adequate sum of money to cover the estimated liability of the City to the United States as provided for in this license. The provisions of this paragraph are expressly included to avoid a contention or determination that the liability of the City hereunder is invalid because of the provisions of the Bateman Act: (Sections 11-6-6 through 11-6-12, N.M.S. 1953 Anno.).

8. It is agreed that this license shall not ripen into any permanent right to introduce water into the drains of the United States nor give any permanent right for any definite period to change the course of the natural run-off of any water. The United States may revoke this license by giving the City 60 days' written notice of revocation. The City agrees that upon termination or cancellation of this license for any reason, it will, upon request of the United States, remove said inlets and culverts from said rights of way and drains.

9. This agreement shall be binding upon and inure to the benefit

of the successors and assigns of the parties hereto. To this end, the parties hereto recognize that at some future time, in accordance with applicable law, the works and facilities of the United States may be operated and maintained by the District and/or the title thereto may be reconveyed to the District. At such time, the payments and notices herein provided for shall be made to or by the District as its interests may appear.

10. No member of or delegate to Congress or Resident Commissioner shall be admitted to any share or part of this agreement or to any benefit that may arise herefrom, but this restriction shall not be construed to extend to this agreement if made with a corporation or company for its general benefit.

UNITED STATES OF AMERICA

By _____
Project Manager
Middle Rio Grande Project
Bureau of Reclamation

CITY OF ALBUQUERQUE

Attest: _____

By _____
Chairman City Commission

MIDDLE RIO GRANDE CONSERVANCY DISTRICT

Attest: _____
Secretary

By _____
Acting President

Amendment to License and Agreement dated September 22, 1958
Between the United States, the Middle Rio Grande Conservancy District
and the City of Albuquerque

This AMENDATORY AGREEMENT made this 20th day of March, 1959, pursuant to the Act of Congress approved June 17, 1902 (32 Stat. 388) and acts amendatory thereof and supplementary thereto, particularly the Act of August 4, 1939 (53 Stat. 1187), as amended by the Act of August 18, 1950 (64 Stat. 463), by and between the UNITED STATES OF AMERICA, hereinafter referred to as the United States and represented by the officer executing this agreement, the MIDDLE RIO GRANDE CONSERVANCY DISTRICT, a municipal corporation of the State of New Mexico, hereinafter referred to as the District, and the CITY OF ALBUQUERQUE, a municipal corporation of the State of New Mexico, hereinafter referred to as the City.

WITNESSETH:

WHEREAS, the United States and the District have heretofore, by a License and Agreement dated September 22, 1958, permitted the City to install certain storm sewer outlets and culverts into the drains owned by the United States, and

WHEREAS, the parties hereto wish to amend the aforesaid agreement as follows:

NOW, THEREFORE, in consideration of the premises and the terms and conditions as hereinafter set forth, it is mutually agreed that the aforesaid License and Agreement shall be amended as follows:

1. Wherever the word "drains" appears in reference to the works of the United States and the District, the words "drains, canals, laterals and acequias" shall be substituted therefor.

2. Neither the United States nor the District shall have any duty or obligation to the City to operate and maintain the said rights-of-way, or the drains, canals, laterals, acequias or any of its other works or facilities located thereon, solely for the purposes of evacuating such flood or run-off water. To this end, should such drains, canals, laterals or acequias or any of the other works and facilities be abandoned by the United States or the District, the rights conferred in the City by the License and Agreement, as amended, shall end, cease and determine.

3. The United States and the District do not warrant title to the premises and in the event of anyone other than the United States or the District owning or claiming title to, or any interest in, said premises, neither the United States nor the District shall be liable to the City for any loss or damage of any nature whatsoever by reason thereof.

4. The terms and conditions of that certain License and Agreement dated September 22, 1958, between the United States, the District and the City shall remain in full force and effect, except as herein changed or modified.

5. No Member of or Delegate to Congress or Resident Commissioner shall be admitted to any share or part of this agreement or to any benefit that may arise herefrom, but this restriction shall not be construed to extend to this agreement if made with a corporation or company for its general benefit.

UNITED STATES OF AMERICA

By _____
Acting Project Manager
Middle Rio Grande Project
Bureau of Reclamation

CITY OF ALBUQUERQUE

By _____

Title _____

ATTEST:

_____
Title: City Clerk

MIDDLE RIO GRANDE CONSERVANCY DISTRICT

By _____

Title _____

ATTEST:

_____
Title: Secretary-Treasurer

7-296
(9-66)

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION

Project **Middle Rio Grande** Branch **Albuquerque** State **New Mexico**

LICENSE FOR ERECTION AND MAINTENANCE OF STRUCTURES

1. Pursuant to authority given by the Commissioner of the Bureau of Reclamation, thereunto duly authorized by the Secretary of the Interior, the undersigned hereby accepts a license to ~~erect and~~ **install and maintain a 30-inch drain system**

in connection with the **Middle Rio Grande** Project, Bureau of Reclamation, constructed pursuant to the act of Congress approved June 17, 1902 (32 Stat., 388), and acts amendatory thereof or supplementary thereto, at a point **where San Jose Lateral crosses Bethel Drive**

upon the terms and conditions hereinafter set forth:

2. The licensee shall be liable for any and all damages to the property of the United States, or of any third party or parties, by reason of the exercise of the privileges conferred by this license.

3. This license shall continue so long as in the opinion of the licensor it is considered to be expedient and not detrimental to the public interest, and shall be revocable by said officer upon ten days' written notice to the licensee. Upon such revocation the aforesaid structure or structures and all accessories shall be removed without delay at the expense of the **licensee**.

4. The aforesaid structure or structures shall be so erected as not to obstruct in any manner the flow of water in the canals, laterals, or drain ditches of the United States, or to interfere in any manner whatsoever with the construction, operation, and maintenance of any part of the Project.

5. In the erection of the aforesaid structure or structures the following specifications and conditions must be complied with:

All construction to be in accordance with drawings 2 and 11 of 14 sheets of plans for Bethel Subdivision Paving. Construction shall be completed prior to March 1, 1971. All construction subject to inspection and acceptance by Bureau of Reclamation.

6. Covenant against Contingent Fees. Licensee warrants that no person or agency has been employed or retained to solicit or secure this contract upon an agreement or understanding for a commission, percentage, brokerage, or contingent fee, excepting bona fide employees or bona fide established commercial agencies maintained by the licensee for the purpose of securing business. For breach or violation of this warranty, the Government shall have the right to annul this contract without liability or in its discretion to require the licensee to pay, in addition to the contract price or consideration, the full amount of such commission, percentage, brokerage, or contingent fee.

7. Equal Opportunity Clause. The following provisions as set out in Section 202 of Executive Order No. 11246, dated September 24, 1965, as amended shall be applicable to this license.

"During the period of this license the licensee hereinafter referred to as the contractor, agrees as follows:

'(1) The contractor will not discriminate against any employee or applicant for employment because of race, creed, color, or national origin. The contractor will take affirmative action to ensure that applicants are employed, and that employees are treated during employment, without regard to their race, creed, color or national origin. Such action shall include, but not be limited to the following: employment, upgrading, demotion, or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. The contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices to be provided by the contracting officer setting forth the provisions of this nondiscrimination clause.

'(2) The contractor will, in all solicitations or advertisements for employees placed by or on behalf of the contractor, state that all qualified applicants will receive consideration for employment without regard to race, creed, color, or national origin.

'(3) The contractor will send to each labor union or representative of workers with which he has a collective bargaining agreement or other contract or understanding, a notice, to be provided by the agency contracting officer, advising the labor union or workers' representative of the contractor's commitments under Section 202 of Executive Order No. 11246 of September 24, 1965, and shall post copies of the notice in conspicuous places available to employees and applicants for employment.

'(4) The contractor will comply with all provisions of Executive Order No. 11246 of September 24, 1965, and of the rules, regulations, and relevant orders of the Secretary of Labor.

'(5) The contractor will furnish all information and reports required by Executive Order No. 11246 of September 24, 1965, and by the rules, regulations, and orders of the Secretary of Labor, or pursuant thereto, and will permit access to his books, records, and accounts by the contracting agency and the Secretary of Labor for purposes of investigation to ascertain compliance with such rules, regulations, and orders.

'(6) In the event of the contractor's noncompliance with the nondiscrimination clauses of this contract or with any of such rules, regulations, or orders, this contract may be cancelled, terminated or suspended in whole or in part and the contractor may be declared ineligible for further Government contracts in accordance with procedures authorized in Executive Order No. 11246 of September 24, 1965, and such other sanctions may be imposed and remedies invoked as provided in Executive Order No. 11246 of September 24, 1965, or by rule, regulation, or order of the Secretary of Labor, or as otherwise provided by law.

'(7) The contractor will include the provisions of Paragraphs (1) through (7) in every subcontract or purchase order unless exempted by rules, regulations, or orders of the Secretary of Labor issued pursuant to Section 204 of Executive Order No. 11246 of September 24, 1965, so that such provisions will be binding upon each subcontractor or vendor. The contractor will take such action with respect to any subcontract or purchase order as the contracting agency may direct as a means of enforcing such provisions including sanctions for noncompliance: Provided, however, That in the event the contractor becomes involved in, or is threatened with, litigation with a subcontractor or vendor as a result of such direction by the contracting agency, the contractor may request the United States to enter into such litigation to protect the interests of the United States.'"

Dated at Albuquerque, N.M.
this 13 day of March, 19 71

Richard H. Wilson
Licensee

Approved: ~~Witness:~~ John Stefan
Chief Engineer, MRGCD

Date: 29 Jan. 1971

Approved **January 26**, 19 **71**
Bureau of Reclamation
Project Superintendent

GPO 830-572

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION

MIDDLE RIO GRANDE PROJECT OFFICE
P. O. BOX 252
ALBUQUERQUE, NEW MEXICO 87103

IN REPLY
REFER TO:

August 31, 1971

Mr. John F. Arfman, Chief Engineer
Middle Rio Grande Conservancy District
Post Office Box 581
Albuquerque, New Mexico 87103

Dear Mr. Arfman:

We have approved Exhibit "A-2 Herk" and are returning herewith four copies of the supplement to license and agreement for the San Jose Drain improvements and crossings. Contained on sheets No. 40 through 53 are the project plans.

After you have approved the plans, please return one copy to this office for our file.

Sincerely yours,

D. J. Farr

Project Superintendent

Encl.

ATTACHED TO
"Model Neighborhood Area
Drainage Improvements
WSNM-20"
SAN JOSE IMPROVEMENTS
sheets 42 through 53
of Plan Set by G.
Herkenhoff date
June, 1971

Exhibit "A-2 Herk" to license and Agreement by and between the United States of America, the Middle Rio Grande Conservancy District and the City of Albuquerque, New Mexico, dated September 22, 1958.

APPROVED

CITY OF ALBUQUERQUE, NEW MEXICO

By Harold R. Dow Jr
Acting Director of Public Works
Date 8-25-71

APPROVED

BUREAU OF RECLAMATION
MIDDLE RIO GRANDE CONSERVANCY PROJECT

By D. J. Farr
Date 8-31-71

APPROVED

MIDDLE RIO GRANDE CONSERVANCY DISTRICT

By John F. Arfman
Date 31 August 1971

APPENDIX III

STREET FLOW RATING TABLES

AND

BELL/COMMERCIAL PUMP TEST

BROADWAY CAPACITY

MANNINGS N=.0170 SLOPE =.0057

POINT	DIST	ELEV	POINT	DIST	ELEV	POINT	DIST	ELEV
1	-44.00	1.07	4	0.00	0.48	7	44.00	1.07
2	-24.10	0.67	5	24.00	0.00			
3	-24.00	0.00	6	24.10	0.67			

WSEL FT.	DEPTH INC	FLOW AREA SQ.FT.	FLOW RATE (CFS)	WETTED PER (FT)	FLOW VEL (FPS)	TOPWID
0.1	0.1	0.5	0.4	10.2	0.9	10.0
0.2	0.2	2.0	2.8	20.4	1.4	20.1
0.3	0.3	4.5	8.3	30.6	1.8	30.1
0.4	0.4	8.0	17.9	40.8	2.2	40.1
0.5	0.5	12.5	33.2	49.0	2.7	48.1
0.6	0.6	17.3	57.0	49.2	3.3	48.2
0.7	0.7	22.2	82.7	52.4	3.7	51.2
0.8	0.8	27.8	107.2	62.3	3.9	61.1
0.9	0.9	34.4	138.6	72.3	4.0	71.1
1.0	1.0	42.0	177.4	82.2	4.2	81.0
1.1	1.1	47.9	209.2	89.2	4.4	88.0

EDITH CAPACITY

MANNINGS N=.0170 SLOPE =.0080

POINT	DIST	ELEV	POINT	DIST	ELEV	POINT	DIST	ELEV
1	-42.00	1.07	4	0.00	0.44	7	42.00	1.07
2	-22.10	0.67	5	22.00	0.00			
3	-22.00	0.00	6	22.10	0.67			

WSEL FT.	DEPTH INC	FLOW AREA SQ.FT.	FLOW RATE (CFS)	WETTED PER (FT)	FLOW VEL (FPS)	TOPWID
0.1	0.1	0.5	0.5	10.2	1.0	10.0
0.2	0.2	2.0	3.3	20.4	1.7	20.1
0.3	0.3	4.5	9.8	30.6	2.2	30.1
0.4	0.4	8.0	21.2	40.8	2.6	40.1
0.5	0.5	12.4	40.8	45.0	3.3	44.1
0.6	0.6	16.8	67.7	45.2	4.0	44.2
0.7	0.7	21.2	95.9	48.3	4.5	47.2
0.8	0.8	26.5	122.1	58.3	4.6	57.1
0.9	0.9	32.7	156.3	68.3	4.8	67.1
1.0	1.0	39.9	198.9	78.2	5.0	77.0
1.1	1.1	45.5	234.3	85.2	5.1	84.0

CROMWELL CAPACITY

MANNINGS N=.0170 SLOPE =.0200

POINT	DIST	ELEV	POINT	DIST	ELEV	POINT	DIST	ELEV
1	-36.00	1.07	4	0.00	0.32	7	36.00	1.07
2	-16.10	0.67	5	16.00	0.00			
3	-16.00	0.00	6	16.10	0.67			

WSEL FT.	DEPTH INC	FLOW AREA SQ.FT.	FLOW RATE (CFS)	WETTED PER (FT)	FLOW VEL (FPS)	TOPWID
0.1	0.1	0.5	0.8	10.2	1.7	10.0
0.2	0.2	2.0	5.3	20.4	2.6	20.1
0.3	0.3	4.5	15.6	30.6	3.5	30.1
0.4	0.4	7.7	36.2	32.8	4.7	32.1
0.5	0.5	10.9	64.5	33.0	5.9	32.1
0.6	0.6	14.1	98.8	33.2	7.0	32.2
0.7	0.7	17.4	131.6	36.3	7.6	35.2
0.8	0.8	21.4	158.3	46.3	7.4	45.1
0.9	0.9	26.4	197.4	56.3	7.5	55.1
1.0	1.0	32.4	249.1	66.2	7.7	65.0
1.1	1.1	37.2	293.3	73.2	7.9	72.0

KATHRYN CAPACITY

MANNINGS N=.0170 SLOPE =.0229

POINT	DIST	ELEV	POINT	DIST	ELEV	POINT	DIST	ELEV
1	-33.00	1.07	4	0.00	0.26	7	33.00	1.07
2	-13.10	0.67	5	13.00	0.00			
3	-13.00	0.00	6	13.10	0.67			

WSEL FT.	DEPTH INC	FLOW AREA SQ.FT.	FLOW RATE (CFS)	WETTED PER (FT)	FLOW VEL (FPS)	TOPWID
0.1	0.1	0.5	0.9	10.2	1.8	10.0
0.2	0.2	2.0	5.7	20.4	2.8	20.1
0.3	0.3	4.4	17.8	26.6	4.0	26.1
0.4	0.4	7.0	38.2	26.8	5.4	26.1
0.5	0.5	9.7	64.3	27.0	6.7	26.1
0.6	0.6	12.3	95.5	27.2	7.8	26.2
0.7	0.7	14.9	123.2	30.3	8.2	29.2
0.8	0.8	18.4	143.7	40.3	7.8	39.1
0.9	0.9	22.8	177.6	50.2	7.8	49.1
1.0	1.0	28.2	224.6	60.2	8.0	59.0
1.1	1.1	32.5	265.6	67.2	8.2	66.0

KATHRYN CAPACITY

MANNINGS N=.0170 SLOPE =.0229

POINT	DIST	ELEV	POINT	DIST	ELEV	POINT	DIST	ELEV
1	-36.00	1.07	4	0.00	0.32	7	36.00	1.07
2	-16.10	0.67	5	16.00	0.00			
3	-16.00	0.00	6	16.10	0.67			

WSEL FT.	DEPTH INC	FLOW AREA SQ.FT.	FLOW RATE (CFS)	WETTED PER (FT)	FLOW VEL (FPS)	TOPWID
0.1	0.1	0.5	0.9	10.2	1.8	10.0
0.2	0.2	2.0	5.7	20.4	2.8	20.1
0.3	0.3	4.5	16.7	30.6	3.7	30.1
0.4	0.4	7.7	38.8	32.8	5.0	32.1
0.5	0.5	10.9	69.1	33.0	6.3	32.1
0.6	0.6	14.1	105.8	33.2	7.5	32.2
0.7	0.7	17.4	140.8	36.3	8.1	35.2
0.8	0.8	21.4	169.4	46.3	7.9	45.1
0.9	0.9	26.4	211.2	56.3	8.0	55.1
1.0	1.0	32.4	266.6	66.2	8.2	65.0
1.1	1.1	37.2	313.8	73.2	8.4	72.0

PACIFIC CAPACITY

MANNINGS N=.0170 SLOPE =.0217

POINT	DIST	ELEV	POINT	DIST	ELEV	POINT	DIST	ELEV
1	-36.00	1.07	4	0.00	0.32	7	36.00	1.07
2	-16.10	0.67	5	16.00	0.00			
3	-16.00	0.00	6	16.10	0.67			

WSEL FT.	DEPTH INC	FLOW AREA SQ.FT.	FLOW RATE (CFS)	WETTED PER (FT)	FLOW VEL (FPS)	TOPWID
0.1	0.1	0.5	0.9	10.2	1.7	10.0
0.2	0.2	2.0	5.5	20.4	2.7	20.1
0.3	0.3	4.5	16.2	30.6	3.6	30.1
0.4	0.4	7.7	37.8	32.8	4.9	32.1
0.5	0.5	10.9	67.2	33.0	6.2	32.1
0.6	0.6	14.1	103.0	33.2	7.3	32.2
0.7	0.7	17.4	137.1	36.3	7.9	35.2
0.8	0.8	21.4	164.9	46.3	7.7	45.1
0.9	0.9	26.4	205.6	56.3	7.8	55.1
1.0	1.0	32.4	259.5	66.2	8.0	65.0
1.1	1.1	37.2	305.5	73.2	8.2	72.0

MARQUETTE CAPACITY

MANNINGS N=.0170 SLOPE =.0133

POINT	DIST	ELEV	POINT	DIST	ELEV	POINT	DIST	ELEV
1	-40.00	1.07	4	0.00	0.40	7	40.00	1.07
2	-20.10	0.67	5	20.00	0.00			
3	-20.00	0.00	6	20.10	0.67			

WSEL FT.	DEPTH INC	FLOW AREA SQ.FT.	FLOW RATE (CFS)	WETTED PER (FT)	FLOW VEL (FPS)	TOPWID
0.1	0.1	0.5	0.7	10.2	1.4	10.0
0.2	0.2	2.0	4.3	20.4	2.1	20.1
0.3	0.3	4.5	12.7	30.6	2.8	30.1
0.4	0.4	8.0	27.3	40.8	3.4	40.1
0.5	0.5	12.0	53.6	41.0	4.5	40.1
0.6	0.6	16.1	86.3	41.2	5.4	40.2
0.7	0.7	20.1	119.7	44.3	6.0	43.2
0.8	0.8	24.9	149.6	54.3	6.0	53.1
0.9	0.9	30.7	189.6	64.3	6.2	63.1
1.0	1.0	37.6	240.4	74.2	6.4	73.0
1.1	1.1	42.9	282.8	81.2	6.6	80.0

ROMA CAPACITY

MANNINGS N=.0170 SLOPE =.0057

POINT	DIST	ELEV	POINT	DIST	ELEV	POINT	DIST	ELEV
1	-34.00	1.07	4	0.00	0.28	7	34.00	1.07
2	-14.10	0.67	5	14.00	0.00			
3	-14.00	0.00	6	14.10	0.67			

WSEL FT.	DEPTH INC	FLOW AREA SQ.FT.	FLOW RATE (CFS)	WETTED PER (FT)	FLOW VEL (FPS)	TOPWID
0.1	0.1	0.5	0.4	10.2	0.9	10.0
0.2	0.2	2.0	2.8	20.4	1.4	20.1
0.3	0.3	4.5	8.6	28.6	1.9	28.1
0.4	0.4	7.3	19.3	28.8	2.6	28.1
0.5	0.5	10.1	33.1	29.0	3.3	28.1
0.6	0.6	12.9	49.6	29.2	3.8	28.2
0.7	0.7	15.8	64.7	32.3	4.1	31.2
0.8	0.8	19.4	76.2	42.3	3.9	41.1
0.9	0.9	24.0	94.5	52.3	3.9	51.1
1.0	1.0	29.6	119.3	62.2	4.0	61.0
1.1	1.1	34.1	140.8	69.2	4.1	68.0

SILVER CAPACITY

MANNINGS N=.0170 SLOPE =.0077

POINT	DIST	ELEV	POINT	DIST	ELEV	POINT	DIST	ELEV
1	-36.00	1.07	4	0.00	0.32	7	36.00	1.07
2	-16.10	0.67	5	16.00	0.00			
3	-16.00	0.00	6	16.10	0.67			

WSEL FT.	DEPTH INC	FLOW AREA SQ.FT.	FLOW RATE (CFS)	WETTED PER (FT)	FLOW VEL (FPS)	TOPWID
0.1	0.1	0.5	0.5	10.2	1.0	10.0
0.2	0.2	2.0	3.3	20.4	1.6	20.1
0.3	0.3	4.5	9.7	30.6	2.1	30.1
0.4	0.4	7.7	22.5	32.8	2.9	32.1
0.5	0.5	10.9	40.0	33.0	3.7	32.1
0.6	0.6	14.1	61.3	33.2	4.3	32.2
0.7	0.7	17.4	81.7	36.3	4.7	35.2
0.8	0.8	21.4	98.2	46.3	4.6	45.1
0.9	0.9	26.4	122.5	56.3	4.6	55.1
1.0	1.0	32.4	154.6	66.2	4.8	65.0
1.1	1.1	37.2	182.0	73.2	4.9	72.0

3.

FLOW CAPACITY OF TRUMBULL WEST OF L14346

MANNINGS N=.0170 SLOPE =.0023

POINT	DIST	ELEV	POINT	DIST	ELEV	POINT	DIST	ELEV
1	0.00	0.87	4	26.00	0.32	7	52.00	0.87
2	10.00	0.67	5	42.00	0.00			
3	10.10	0.00	6	42.10	0.67			

WSEL FT.	DEPTH INC	FLOW AREA SQ.FT.	FLOW RATE (CFS)	WETTED PER (FT)	FLOW VEL (FPS)	TOPWID
0.1	0.1	0.5	0.3	10.2	0.6	10.0
0.2	0.2	2.0	1.8	20.3	0.9	20.0
0.3	0.3	4.5	5.3	30.5	1.2	30.0
0.4	0.4	7.7	12.3	32.7	1.6	32.0
0.5	0.5	10.9	21.8	32.9	2.0	32.0
0.6	0.6	14.1	33.4	33.1	2.4	32.1
0.7	0.7	17.3	44.5	36.2	2.6	35.1
0.8	0.8	21.3	53.5	46.2	2.5	45.0
0.9	0.9	24.7	62.3	53.2	2.5	52.0

PUMP DISCHARGE TEST
BELL/COMMERCIAL PUMP STATION
11-14-89
LOREN MEINZ, KAPIL GOYAL, BUTCH GERBRANDT

	RUN TIME (SEC)	INITIAL READING	FINAL READING	Q** (CFS)		DESIGN Q (CFS)
PUMP #1						
TEST 1	34	17.7	18.7	14.6		
TEST 2	55	19.5	21.05	14.0		
			AVERAGE	14.3		22
PUMP #2						
TEST 1	23	17.7	21.15	74.4	OUTLIER	
TEST 2	23	20.9	22.9	43.1		
TEST 3	19	22.7	24.1	36.5		
			AVERAGE*	39.8		55
PUMP #3						
TEST 1	25	18.5	21.3	55.6		
TEST 2	55	18.8	24.1	47.8		
			AVERAGE	51.7		89

* DOES NOT INCLUDE TEST 1 RESULTS

** AREA OF WET WELL = 496 SQ. FT.

RUN TIMES WERE ADJUSTED TO REFLECT ACTUAL FULL PRESSURE PUMPING

APPENDIX IV

SWMM INPUT

FOR 10-YEAR EXISTING

AND 100-YEAR EXISTING

AND FULLY DEVELOPED STORMS

```
*   INPUT DATA,  S. BROADWAY AREA,  10-YEAR STORM,  3-12-90, BG
*   ALL SIGNIFICANT SURCHARGES HAVE BEEN TRANSFERED
*   INPUT FILE WS BROADTEN.IN
SW  1   0   0
MM  2   10   11   12
$ANUM
$EXTRAN
A1   'SWMM INPUT,  SOUTH BROADWAY'
A2    'INPUT HYDROGRAPHS FROM HYMO'
*
*   ISOL   KSUPER
B0    0      0
*
*   NTCYC DELT TZERO NSTART INTER JNTER REDO
B1  180    20.    0.    10        5      10     0
*
*  METRIC NEQUAL AMEN ITMAX SUBTL
B2  0       1      0      30     .05
*
*  NHPRT NQPRT   NPLT   LPLT   NJSW
B3    30     30         0     0    31
*
*  PRINTED HEADS
B4 'J14993' 'K1483'  'K1471'  'K1475'  'K14172' 'K15201' 'K14271'
   'K14361' 'K14661' 'K14761' 'K14861' 'K14864' 'K14961' 'L14161'
   'JB2'    'L14361' 'L14346' 'BCPUMP' '#BCPUMP' 'SANTAFE' 'L14349'
   'L14644' 'L14841' 'M1433B' 'M14131' 'M143' 'M14331B' 'L14531'
   'L14634' 'M14222'
*
*  PRINTED FLOWS
B5    '1'   '2'   '3'   '4'  '5'   '6'   '7A' '7B'  '8'  '9'
      '10A' '10B' '10C' '11' '13'  '14'  '17' '18'  '19' '20'
      '21A' '21B' '21C' '22' '23A' '23B' '24' '25'  '26' '27'
*
*       CONDUIT DATA
*  NCOND NJ1     NJ2     Q0 NKLASS AFULL DEEP WIDE LEN ZP1 ZP2 ROUGH STH SPHI
C1 '1' 'J14993' 'K1483' 0. 1     0.     4.    0. 350. 0.   0. .015   0.  0.
C1 '2' 'K1483'  'K1471'  0. 1    0.     4.    0. 704. 0.   0. .015   0.  0.
C1 '3' 'K1471' 'K1475' 0. 1      0.     4.   0. 360. 0.   0.   .015  0.  0.
C1 '4' 'K1475'  'K14172' 0. 1    0.     4.    0. 630.  0.  0. .015   0.  0.
C1 '5' 'K15201' 'K14172' 0. 2    0.     4.    4. 2215. 0.  0. .015   0.  0.
C1 '6' 'K14172' 'K14271' 0. 1    0.     5.    0.  390. 0.  0. .015   0.  0.
C1 '7A' 'K14271' 'K14361' 0. 1     0.     6.    0. 680. 0.   0. .015   0.  0.
C1 '7B' 'K14361' 'K14661' 0. 1    0.     6.    0.  1081. 0. 0. .015   0.  0.
C1 '8' 'K14661' 'K14761' 0. 1     0.     6.    0.  610. 0.  0. .015   0.  0.
C1 '9' 'K14761' 'K14861' 0. 1     0.     6.    0.  550. 0.  0. .015   0.  0.
C1 '10A' 'K14861' 'K14864' 0. 1   0.     6.    0.  360. 0.  0. .015   0.  0.
C1 '10B' 'K14864' 'K14961' 0. 1   0.     6.    0.  350. 0.  0. .015   0.  0.
C1 '10C' 'K14961' 'L14161' 0. 1   0.     6.    0.  680. 0.  0. .015   0.  0.
C1 '11' 'L14161' 'JB2'    0. 1    0.     6.    0.  325. 0.  0. .015   0.  0.
C1 '13' 'JB2'    'L14361' 0. 1    0.     6.    0.  720. 0.  0. .015   0.  0.
C1 '14' 'L14361' 'L14346' 0. 1    0.     6.    0.  900. 0.  0. .015   0.  0.
C1 '15' 'L14346' 'L14744C' 0. 1   0.     6.    0. 2500. 0.  0. .015   0.  0.
C1 '16' 'L14744C' 'L14841' 0. 2   0.     6.   5.6  250. 0.  0. .015   0.  0.
C1 '17' 'L14345' 'L14349' 0. 1    0.     3.    0.  460. 0.  0. .015   0.  0.
C1 '18' 'L14349' 'L14644' 0. 1    0.     3.    0. 1420. 0.  0. .015   0.  0.
C1 '19' 'L14644' 'L14744C' 0. 1   0.     3.    0.  520. 0.  0. .015   0.  0.
C1 '20' 'L14841' 'M1433B' 0. 2    0.     6.   5.6 1230. 0.  0. .015   0.  0.
C1 '21A' 'M1433B' 'M14131' 0. 2   0.     6.   5.6  450. 0.  0. .015   0.  0.
C1 '21B' 'M14131' 'M143'  0. 2    0.     6.   5.6  606. 0.  0. .015   0.  0.
C1 '21C' 'M143'  'M14331B' 0. 2   0.     6.   5.6  349. 0.  0. .015   0.  0.
C1 '22' 'L14531' 'L14634' 0. 1    0.     3.    0.  700. 0.  0. .015   0.  0.
C1 '23A' 'L14634' 'M14222' 0. 1     0.     3.    0. 3240. 0.  0. .015   0.  0.
C1 '23B' 'M14222' 'M14331A' 0. 1 0.     3.    0.  699. 0.  0. .015   0.  0.
C1 '24' 'M14331A' 'M14331B' 0. 1 0.     3.    0.  284. 0.  0. .015   0.  0.
C1 '25' 'M14331B' 'M14342' 0. 2   0.     6.   8.5  430. 0.   0. .015   0.  0.
C1 '26' 'L14263' 'L14362' 0. 1    0.     4.    0.  390. 0.  0. .015   0.  0.
C1 '27' 'L14362' 'L14562' 0. 1    0.     4.    0. 1040. 0.  0. .015   0.  0.
C1 '28' 'L14562' 'L14764' 0. 1    0.     5.    0.  990. 0.  0. .015   0.  0.
C1 '29' 'L14764' 'L14766' 0. 1    0.     5.    0.  350. 0.  0. .015   0.  0.
C1 '30' 'L14766' 'L14864' 0. 1    0.     6.    0.  390. 0.  0. .015   0.  0.
C1 '31' 'L14864' 'L14961' 0. 1    0.     6.    0.  540. 0.  0. .015   0.  0.
C1 '32' 'L14961' 'M14261' 0. 1    0.     6.    0. 1290. 0.  0. .015   0.  0.
C1 '33' 'M14261' 'M14251' 0. 1    0.   4.5    0.  740. 0.  0. .015   0.  0.
C1 '34' 'M14251' 'M14342' 0. 1    0.     6.    0.  950. 0.  0. .015   0.  0.
C1 '35' 'M14342' 'M14351' 0. 2    0.     6.   8.5  370. 0.  0. .015   0.  0.
C1 '36' 'M14351' 'M14352' 0. 3   55.     6.25 12. 300. 0.  0. .022   0.  0.
C1 '37' 'M14352' 'M14453' 0. 6    0.     9.    10. 600. 0.  0. .017   2.  2.
C1 '38' 'M14453' 'WOODWD' 0. 6    0.     9.    10. 1100. 0. 0. .017   2.  2.
C1 '39' 'M14334' 'M14521' 0. 1    0.     3.    0.  1101. 0. 0. .015   0.  0.
C1 '40' 'M14521' 'WOODWD' 0. 1    0.     3.    0.  1945. 0. 0. .015   0.  0.
C1 '41' 'WOODWD' 'LIMITS' 0. 6    0.     9.    10. 1700. 0. 0. .040   2.  2.
C1 '42' 'LIMITS' 'BOGUS'  0. 6    0.     9.    10. 1000. 0. 0. .040   2.  2.
*   CONDUIT 101 SIMULATES STREET FLOW IN COMMERCIAL FROM SANTA FE TO BELL
C1 '101' 'SANTAFE' '#BCPUMP' 0. 2 0.  .87    24. 1600. 0. 0.  .017   0.  0.
C1 '52' '#BCPUMP' 'BCPUMP' 0. 2   0.     4.    6.  250. 0.  0. .001   0.  0.
*
```

```
*    JUNCTION DATA
*     JUN    GRELEV    Z       QINST    Y
D1 'J14993' 4967.0   4959.4   0.     0.
D1 'K1483'  4969.5   4958.3   0.     0.
D1 'K1471'  4961.3   4955.6   0.     0.
D1 'K1475'  4963.0   4955.0   0.     0.
D1 'K14172' 4965.8   4954.0   0.     0.
D1 'K15201' 5030.6   5019.9   0.     0.
D1 'K14271' 4967.0   4953.4   0.     0.
D1 'K14361' 4964.2   4952.2   0.     0.
D1 'K14661' 4970.9   4950.24  0.     0.
D1 'K14761' 4965.9   4949.0   0.     0
D1 'K14861' 4959.4   4948.4   0.     0.
D1 'K14864' 4956.6   4947.6   0.     0.
D1 'K14961' 4956.7   4947.0   0.     0.
D1 'L14161' 4959.0   4946.0   0.     0.
D1 'JB2'    4962.0   4944.9   0.     0.
D1 'L14361' 4965.6   4943.8   0.     0.
D1 'L14345' 4946.2   4938.8   0.     0.
D1 'L14346' 4945.8   4937.2   0.     0.
D1 'BCPUMP' 4947.0   4922.0   0.     0.
D1 '#BCPUMP' 4950.   4946.0   0.     0.
D1 'SANTAFE' 4949.   4947.0   0.     0.
D1 'L14349' 4946.0   4937.7   0.     0.
D1 'L14644' 4944.8   4935.5   0.     0.
D1 'L14744C' 4944.4  4935.2   0.     0.
* INVERTS ESTIMATED FOR L14841 & M1433B
D1 'L14841' 4944.0   4934.8   0.     0.
D1 'M1433B' 4943.0   4933.8   0.     0.
D1 'M14131' 4940.0   4933.4   0.     0.
D1 'M143'   4939.0   4932.8   0.     0.
D1 'M14331B' 4940.0  4932.5   0.     0.
D1 'L14531' 4944.5   4938.19  0.     0.
D1 'L14634' 4943.0   4937.30  0.     0.
D1 'M14222' 4938.5   4934.1   0.     0.
D1 'M14331A' 4938.2  4933.2   0.     0.
D1 'M14342' 4940.0   4931.7   0.     0.
D1 'L14263' 4961.0   4954.8   0.     0.
D1 'L14362' 4966.0   4954.4   0.     0.
D1 'L14562' 4956.2   4950.0   0.     0.
D1 'L14764' 4963.2   4949.04  0.     0.
D1 'L14766' 4965.0   4948.5   0.     0.
D1 'L14864' 4968.0   4947.16  0.     0.
D1 'L14961' 4968.5   4946.24  0.     0.
D1 'M14261' 4965.5   4943.2   0.     0.
D1 'M14251' 4947.5   4934.4   0.     0.
D1 'M14351' 4944.0   4930.65  0.     0.
D1 'M14352' 4938.5   4929.36  0.     0.
D1 'M14453' 4937.7   4928.68  0.     0.
D1 'WOODWD' 4936.8   4927.7   0.     0.
D1 'M14334' 4936.2   4931.20  0.     0.
D1 'M14521' 4936.0   4930.0   0.     0.
D1 'LIMITS' 4933.5   4924.0   0.     0.
D1 'BOGUS'  4933.5   4922.6   0.     0.
*
*   STORAGE JUNCTION--WET WELL FOR BELL/COMMERCIAL PUMP STATION
*  JSTORE(I) ZTOP(I) ASTORE(J)  NUMST
E1 'BCPUMP'  4947.0   496.0       0.
*
*    PUMP DATA INPUT   NOTE THAT TESTED PERFORMANCE IS MUCH LESS THAN NEW PUMP RATING
*  IPTYP(I) NJUNC(N,1) NJUNC(N,2) PRATE(I,1) PRATE(I,2) PRATE(I,3) VRATE(I,1) VRATE(I,2) VRATE(I,3) VWELL(I) PON(I)  POFF(I)
*    SUMP PUMP
H1   3       'BCPUMP'    'L14345'   4.         5.0        6.0        30.        19.        8.         0.       1.     .5
*    10,000 GPM PUMP
H1   3       'BCPUMP'    'JB2'      11.        15.6       19.        30.        25.        19.8       0.       3.     2.5
*    25,000 GPM PUMP
H1   3       'BCPUMP'    'JB2'      47.        48.        49.        19.7       19.4       19.1       0.       13.3   4.
*    40,000 GPM PUMP
H1   3       'BCPUMP'    'JB2'      28.        32.        41.        19.        14.        8.         0.       14.    4.
*
*   OUTFALL CONDITION--FREE DISCHARGE
I1   'BOGUS'  1
J1   1
*
*
*  THE FOLLOWING BASINS DISCHARGE AT THE LISTED ANALYSIS POINTS:
*     BASIN     AP     BASIN    AP     BASIN       AP     BASIN    AP     BASIN    AP
*    SJ-1 =SANTAFE BH134 =J14993  APW1SS-3=K15201 SJH100=K14271 SJH102=K14661
*    SJH105 =K14861 SJH106=L14161 SJH150=L14362
*    SJH152 =L14764 SJH153=L14864 SJH200=L14961
*    SJH202 =M14261 SJ7 = M14342  SJ2=BCPUMP   SJ3 = L14349 SJ4= L14644
*    SJ5 =L14841    SJN6=M14222   SJH701=M1433B
*    SJN710=WOODWD SJN720=WOODWD  SJ90L =WOODWD SJH700=M14453 APV1 = K1475
*    APAA1=L14161  SJN730=LIMITS  SJ8 =  WOODWD  SJ9SS= M14453 SJN740=LIMITS
*    SJH109=WOODWD SJN10 =M14521
*
```

10-YEAR STORM INPUT
EXISTING DEVELOPMENT


```
*      INPUT HYDROGRAPHS
*  L14263 EQUALS AMDS RESTUDY APBB1.  FLOW IS ZERO.
K1 31
K2 'SANTAFE' 'J14993' 'K15201' 'K14271' 'K14661' 'K14861'
   'L14161' 'L14362' 'L14764' 'L14864' 'L14961' 'M14261'
   'M14342' 'BCPUMP' 'L14349' 'L14644' 'L14841' 'M14222' 'M1433B'
   'WOODWD' 'WOODWD' 'WOODWD' 'M14453'
   'K1475'  'L14161' 'LIMITS' 'WOODWD' 'M14453' 'LIMITS' 'WOODWD' 'M14521'
*
*   THE FIRST TWO LINES OF COLUMN LABELS IDENTIFY THE HYDROGRAPH SOURCE
*   THE 3RD & 4TH LINES OF COLUMN LABELS IDENTIGY THE HYDROGRAPH DESTINATIONS
*
*  TIME  SJ1    134   WIS   100   102   105   106   150   152   153   200   202   SJ7   SJ2   SJ3   SJ4   SJ5   SJN6   701
*SJN710SJN720 SJ9OLSJH700 APV1  APAA1SJN730 SJ8  SJ9SS SJN740SJH109 SJN10
*  TIME STFE    993   201   271   661   861   161   362   764   864   961   261   342   BCP   349   644   841   222    33B
* WD    WD     WD    453    75   161   LMT    WD    453   LMT    WD   521
K3 0.00  0.00   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
   0.00  0.0    0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
K3 0.02  0.0    0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
   0.00  0.0    0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
K3 0.04  0.0    2.0   0.0   1.0   0.0   1.0   0.0   2.0   2.0   1.0   1.0   0.0   0.0   0.0   1.0   0.0   0.0   0.0   0.0
   0.00  0.0    0.0   0.0   0.0   0.0   4.0   2.0   0.0   0.0   0.0   0.0
K3 0.06  0.0   10.0   0.0   6.0   2.0   6.0   3.0  14.0  11.0   8.0   6.0   1.0   0.0   0.0   4.0   1.0   0.0   0.0   1.0
   1.00  0.0    0.0   0.0   0.0   0.0  18.0  12.0   0.0   0.0   1.0   0.0
K3 0.08  0.0   31.0   0.0  19.0   9.0  17.0  10.0  35.0  33.0  21.0  17.0   2.0   2.0   1.0  10.0   3.0   1.0   0.0   5.0
   3.00  1.0    0.0   1.0   0.0   0.0  37.0  26.0   1.0   1.0   2.0   0.0
K3 0.10  0.0   58.0   0.0  42.0  22.0  32.0  21.0  56.0  62.0  39.0  31.0   4.0   5.0   2.0  16.0   7.0   3.0   0.0  12.0
   4.00  2.0    0.0   2.0   0.0   0.0  50.0  37.0   2.0   2.0   6.0   0.0
K3 0.12  1.0   83.0   0.0  69.0  42.0  46.0  36.0  69.0  89.0  53.0  44.0   8.0  10.0   5.0  20.0  14.0   7.0   0.0  21.0
   5.00  3.0    1.0   3.0   0.0   0.0  52.0  41.0   4.0   4.0  10.0   0.0
K3 0.14  2.0   98.0   0.0  93.0  65.0  56.0  50.0  71.0 106.0  60.0  52.0  11.0  16.0   9.0  22.0  23.0  11.0   0.0  31.0
   5.00  3.0    2.0   4.0   0.0   0.0  46.0  39.0   7.0   8.0  14.0   0.0
K3 0.16  4.0  101.0   0.0 111.0  87.0  58.0  60.0  64.0 109.0  60.0  53.0  14.0  22.0  14.0  20.0  32.0  15.0   0.0  39.0
   4.00  3.0    4.0   4.0   0.0   0.0  36.0  32.0  11.0  14.0  17.0   0.0
K3 0.18  6.0   95.0   0.0 118.0 105.0  55.0  66.0  52.0 102.0  54.0  49.0  15.0  28.0  20.0  17.0  41.0  20.0   0.0  44.0
   4.00  3.0    6.0   5.0   0.0   0.0  28.0  26.0  16.0  21.0  20.0   0.0
K3 0.20  9.0   82.0   0.0 117.0 117.0  48.0  66.0  42.0  89.0  46.0  42.0  16.0  32.0  27.0  14.0  48.0  23.0   1.0  46.0
   3.00  3.0    8.0   4.0   0.0   0.0  22.0  21.0  20.0  28.0  20.0   1.0
K3 0.22 12.0   69.0   0.0 108.0 121.0  40.0  62.0  34.0  74.0  38.0  35.0  15.0  35.0  33.0  11.0  52.0  25.0   1.0  45.0
   3.00  3.0   11.0   4.0   0.0   0.0  17.0  18.0  23.0  36.0  20.0   1.0
K3 0.24 15.0   57.0   0.0  95.0 119.0  33.0  55.0  27.0  61.0  31.0  29.0  14.0  36.0  38.0   0.0  54.0  26.0   1.0  42.0
   2.00  3.0   14.0   4.0   0.0   0.0  14.0  15.0  25.0  44.0  19.0   1.0
K3 0.26 18.0   47.0   0.0  82.0 113.0  28.0  48.0  22.0  51.0  26.0  24.0  12.0  35.0  42.0   0.0  53.0  26.0   2.0  38.0
   2.00  2.0   17.0   4.0   0.0   0.0  11.0  12.0  27.0  51.0  17.0   2.0
K3 0.28 20.0   40.0   0.0  70.0 103.0  23.0  41.0  18.0  43.0  21.0  20.0  11.0  33.0  44.0   0.0  50.0  25.0   2.0  33.0
   2.00  2.0   19.0   3.0   0.0   0.0  10.0  11.0  27.0  57.0  15.0   2.0
K3 0.30 22.0   33.0   0.0  60.0  91.0  20.0  35.0  15.0  36.0  18.0  17.0   9.0  30.0  45.0   0.0  46.0  23.0   3.0  29.0
   2.00  2.0   22.0   3.0   0.0   0.0   9.0  10.0  27.0  61.0  14.0   2.0
K3 0.32 24.0   28.0   0.0  51.0  80.0  17.0  30.0  14.0  30.0  15.0  14.0   8.0  27.0  45.0   0.0  42.0  21.0   4.0  25.0
   2.00  2.0   23.0   3.0   0.0   0.0   8.0   9.0  26.0  64.0  12.0   3.0
K3 0.34 25.0   24.0   0.0  44.0  70.0  14.0  26.0  13.0  26.0  13.0  12.0   7.0  24.0  44.0   0.0  37.0  19.0   5.0  22.0
   1.00  2.0   25.0   3.0   0.0   0.0   8.0   9.0  25.0  65.0  11.0   3.0
K3 0.36  26.0  21.0   0.0  38.0  62.0  12.0  23.0  12.0  23.0  12.0  11.0   6.0  21.0  42.0   0.0  33.0  17.0   5.0  20.0
   1.00  2.0   25.0   3.0   0.0   0.0   7.0   8.0  24.0  65.0  10.0   4.0
K3 0.38  26.0  20.0   0.0  33.0  54.0  11.0  20.0  11.0  21.0  11.0  10.0   5.0  19.0  39.0   0.0  29.0  15.0   6.0  17.0
   1.00  2.0   26.0   3.0   0.0   0.0   6.0   8.0  21.0  63.0   0.0   4.0
K3 0.40  26.0  18.0   0.0  29.0  48.0  11.0  17.0  10.0  20.0  10.0   0.0   5.0  17.0  36.0   0.0  26.0  13.0   7.0  15.0
   1.00  2.0   26.0   3.0   0.0   0.0   6.0   7.0  19.0  61.0   0.0   4.0
K3 0.42  25.0  17.0   0.0  26.0  42.0  10.0  15.0  10.0  18.0  10.0   0.0   4.0  15.0  33.0   0.0  23.0  12.0   8.0  14.0
   1.00  1.0   25.0   2.0   2.0   0.0   6.0   7.0  17.0  57.0   0.0   5.0
K3 0.44  24.0  16.0   1.0  24.0  38.0   9.0  14.0   0.0  17.0   0.0   0.0   4.0  14.0  30.0   0.0  21.0  10.0   9.0  12.0
   1.00  1.0   24.0   2.0   4.0   0.0   5.0   6.0  16.0  53.0   0.0   5.0
K3 0.46  23.0  15.0   2.0  23.0  34.0   9.0  13.0   0.0  16.0   0.0   0.0   3.0  12.0  27.0   0.0  19.0   0.0  10.0  11.0
   1.00  1.0   23.0   2.0   5.0   0.0   5.0   6.0  14.0  49.0   0.0   5.0
K3 0.48  21.0  14.0   3.0  21.0  30.0   8.0  12.0   0.0  15.0   0.0   0.0   3.0  11.0  25.0   0.0  17.0   0.0  10.0  11.0
   1.00  1.0   22.0   2.0   6.0   0.0   5.0   6.0  13.0  46.0   0.0   5.0
K3 0.50  20.0  13.0   3.0  20.0  27.0   8.0  12.0   0.0  14.0   0.0   0.0   3.0  10.0  23.0   0.0  15.0   0.0  11.0  10.0
   1.00  1.0   20.0   2.0   8.0   0.0   4.0   5.0  12.0  42.0   0.0   5.0
K3 0.52  18.0  13.0   4.0  19.0  25.0   7.0  11.0   0.0  13.0   0.0   0.0   3.0   9.0  21.0   0.0  14.0   0.0  11.0  10.0
   1.00  1.0   19.0   2.0  10.0   0.0   4.0   5.0  11.0  39.0   0.0   5.0
K3 0.54  17.0  12.0   4.0  18.0  24.0   7.0  10.0   0.0  13.0   0.0   0.0   3.0   9.0  19.0   0.0  13.0   0.0  12.0   0.0
   1.00  1.0   18.0   2.0  11.0   0.0   4.0   4.0  10.0  36.0   0.0   5.0
K3 0.56  16.0  11.0   5.0  17.0  23.0   7.0  10.0   0.0  12.0   0.0   0.0   2.0   8.0  18.0   0.0  12.0   0.0  12.0   0.0
   1.00  1.0   16.0   2.0  12.0   0.0   4.0   4.0   9.0  33.0   0.0   5.0
K3 0.58  15.0  11.0   5.0  15.0  22.0   6.0   9.0   0.0  11.0   0.0   0.0   2.0   8.0  16.0   0.0  11.0   0.0  12.0   0.0
   1.00  1.0   15.0   2.0  13.0   0.0   3.0   4.0   8.0  31.0   0.0   5.0
K3 0.60  14.0  10.0   6.0  14.0  21.0   6.0   9.0   0.0  11.0   0.0   0.0   2.0   8.0  15.0   0.0  11.0   0.0  12.0   0.0
   1.00  1.0   14.0   2.0  15.0   5.0   3.0   4.0   8.0  28.0   0.0   5.0
K3 0.62  13.0  10.0   6.0  13.0  20.0   6.0   9.0   0.0  10.0   0.0   0.0   2.0   7.0  14.0   0.0  10.0   0.0  12.0   0.0
   1.00  1.0   13.0   2.0  18.0  11.0   3.0   4.0   7.0  26.0   0.0   4.0
K3 0.64  12.0   9.0   6.0  13.0  19.0   5.0   8.0   0.0  10.0   0.0   0.0   2.0   7.0  13.0   0.0  10.0   0.0  12.0   0.0
   1.00  1.0    9.0   2.0  17.0  11.0   2.0   3.0   7.0  25.0   0.0   4.0
K3 0.66  11.0   8.0   7.0  13.0  18.0   5.0   8.0   0.0   9.0   0.0   0.0   2.0   7.0  12.0   0.0  10.0   0.0  12.0   0.0
   1.00  1.0    8.0   2.0  17.0  12.0   2.0   3.0   7.0  23.0   0.0   4.0
K3 0.68  10.0   8.0   7.0  13.0  17.0   5.0   8.0   0.0   9.0   0.0   0.0   2.0   7.0  11.0   0.0   9.0   0.0  12.0   0.0
   1.00  1.0    7.0   2.0  16.0  13.0   2.0   3.0   6.0  21.0   0.0   4.0
K3 0.70   9.0   7.0   7.0  12.0  16.0   5.0   8.0   0.0   9.0   0.0   0.0   1.0   6.0  10.0   0.0   9.0   0.0  12.0   0.0
   1.00  1.0    7.0   2.0  16.0  14.0   2.0   3.0   6.0  20.0   0.0   4.0
K3 0.72   8.0   6.0   8.0  12.0  16.0   4.0   7.0   0.0   8.0   0.0   0.0   1.0   6.0  10.0   0.0   9.0   0.0  12.0   0.0
   1.00  1.0    6.0   2.0  15.0  13.0   2.0   3.0   6.0  19.0   0.0   3.0
K3 0.74   8.0   6.0   8.0  11.0  15.0   4.0   7.0   0.0   8.0   0.0   0.0   1.0   6.0  10.0   0.0   8.0   0.0  11.0   0.0
   1.00  1.0    6.0   2.0  15.0  13.0   2.0   3.0   5.0  17.0   0.0   3.0
K3 0.76   7.0   5.0   8.0  11.0  15.0   4.0   7.0   0.0   8.0   0.0   0.0   1.0   6.0   9.0   0.0   8.0   0.0  11.0   0.0
   1.00  1.0    5.0   1.0  15.0  12.0   2.0   3.0   5.0  16.0   0.0   3.0
K3 0.78   7.0   5.0   9.0  10.0  14.0   4.0   7.0   0.0   8.0   0.0   0.0   1.0   6.0   9.0   0.0   8.0   0.0  10.0   0.0
   1.00  1.0    5.0   1.0  15.0  12.0   2.0   3.0   5.0  16.0   0.0   3.0
K3 0.80   7.0   5.0   9.0  10.0  13.0   4.0   7.0   0.0   7.0   0.0   0.0   1.0   5.0   9.0   0.0   7.0   0.0  10.0   0.0
   1.00  1.0    4.0   1.0  14.0  11.0   1.0   3.0   5.0  15.0   0.0   3.0
K3 0.82   6.0   4.0   9.0   9.0  13.0   4.0   7.0   0.0   7.0   0.0   0.0   1.0   5.0   8.0   0.0   7.0   0.0  10.0   0.0
   1.00  1.0    4.0   1.0  14.0  11.0   1.0   3.0   5.0  14.0   0.0   3.0
K3 1.00   4.0   4.0   5.0   7.0  11.0   3.0   6.0   0.0   6.0   0.0   0.0   1.0   4.0   8.0   0.0   7.0   0.0   9.0   0.0
   0.00   0.0   4.0   0.0   8.0   7.0   1.0   3.0   5.0  14.0   0.0   2.0
$ENDPROGRAM
```

```
*   INPUT DATA,  S. BROADWAY AREA,  100-YEAR STORM,  3-14-90, BG
*   ALL SIGNIFICANT SURCHARGES HAVE BEEN TRANSFERED
*   INPUT FILE IS BROADWAY.IN,  DIR: [H8920801.SWMM]
SW  1   0   0
MM  2   10   11   12
$ANUM
$EXTRAN
A1   'SWMM INPUT,  SOUTH BROADWAY'
A2    'INPUT HYDROGRAPHS FROM HYMO'
*
*   ISOL  KSUPER
B0    0      0
*
*   NTCYC DELT TZERO NSTART INTER JNTER REDO
B1  180    20.    0.    10        5      10     0
*
*  METRIC NEQUAL AMEN ITMAX SUBTL
B2  0       1      0      30     .05
*
*  NHPRT NQPRT  NPLT  LPLT  NJSW
B3    30     30        0     0    36
*
*  PRINTED HEADS
B4 'J14993' 'K1483'  'K1471'  'K1475'  'K14172' 'K15201' 'K14271'
   'K14361' 'K14661' 'K14761' 'K14861' 'K14864' 'K14961' 'L14161'
   'JB2'    'L14361' 'L14346' 'BCPUMP' '#BCPUMP' 'SANTAFE' 'L14349'
   'L14644' 'L14841' 'M1433B' 'M14131' 'M143' 'M14331B' 'L14531'
   'L14634' 'M14222'
*
*  PRINTED FLOWS
B5    '1'   '2'   '3'   '4'  '5'   '6'   '7A' '7B'  '8'  '9'
      '10A' '10B' '10C' '11' '13'  '14'  '17' '18'  '19' '20'
      '21A' '21B' '21C' '22' '23A' '23B' '24' '25'  '26' '27'
*
*       CONDUIT DATA
*  NCOND NJ1     NJ2     Q0 NKLASS AFULL DEEP WIDE LEN ZP1 ZP2 ROUGH STH SPHI
C1 '1' 'J14993' 'K1483' 0. 1     0.     4.    0. 350. 0.   0. .015   0.  0.
C1 '2' 'K1483'  'K1471'  0. 1    0.     4.    0. 704. 0.   0. .015   0.  0.
C1 '3' 'K1471' 'K1475' 0. 1      0.     4.    0. 360. 0.   0.   .015  0.  0.
C1 '4' 'K1475'  'K14172' 0. 1    0.     4.    0. 630.  0.  0.  .015  0.  0.
C1 '5' 'K15201' 'K14172' 0. 2    0.     4.    4. 2215. 0.  0.  .015  0.  0.
C1 '6' 'K14172' 'K14271' 0. 1    0.     5.    0.  390. 0.  0.  .015  0.  0.
C1 '7A' 'K14271' 'K14361' 0. 1    0.     6.    0. 680. 0.   0.  .015  0.  0.
C1 '7B' 'K14361' 'K14661' 0. 1    0.     6.    0.  1081. 0. 0.  .015  0.  0.
C1 '8' 'K14661' 'K14761' 0. 1     0.     6.    0.  610. 0.  0.  .015  0.  0.
C1 '9' 'K14761' 'K14861' 0. 1     0.     6.    0.  550. 0.  0.  .015  0.  0.
C1 '10A' 'K14861' 'K14864' 0. 1   0.     6.    0.  360. 0.  0.  .015  0.  0.
C1 '10B' 'K14864' 'K14961' 0. 1   0.     6.    0.  350. 0.  0.  .015  0.  0.
C1 '10C' 'K14961' 'L14161' 0. 1   0.     6.    0.  680. 0.  0.  .015  0.  0.
C1 '11' 'L14161' 'JB2'    0. 1    0.     6.    0.  325. 0.  0.  .015  0.  0.
C1 '13' 'JB2'    'L14361' 0. 1    0.     6.    0.  720. 0.  0.  .015  0.  0.
C1 '14' 'L14361' 'L14346' 0. 1    0.     6.    0.  900. 0.  0.  .015  0.  0.
C1 '15' 'L14346' 'L14744C' 0. 1   0.     6.    0. 2500. 0.  0.  .015  0.  0.
C1 '16' 'L14744C' 'L14841' 0. 2   0.     6.   5.6  250. 0.  0.  .015  0.  0.
C1 '17' 'L14345' 'L14349' 0. 1    0.     3.    0.  460. 0.  0.  .015  0.  0.
C1 '18' 'L14349' 'L14644' 0. 1    0.     3.    0. 1420. 0.  0.  .015  0.  0.
C1 '19' 'L14644' 'L14744C' 0. 1   0.     3.    0.  520. 0.  0.  .015  0.  0.
C1 '20' 'L14841' 'M1433B' 0. 2    0.     6.   5.6 1230. 0.  0.  .015  0.  0.
C1 '21A' 'M1433B' 'M14131' 0. 2   0.     6.   5.6  450. 0.  0.  .015  0.  0.
C1 '21B' 'M14131' 'M143'  0. 2    0.     6.   5.6  606. 0.  0.  .015  0.  0.
C1 '21C' 'M143'  'M14331B' 0. 2   0.     6.   5.6  349. 0.  0.  .015  0.  0.
C1 '22' 'L14531' 'L14634' 0. 1    0.     3.    0.  700. 0.  0.  .015  0.  0.
C1 '23A' 'L14634' 'M14222' 0. 1    0.    3.    0. 3240. 0.  0.  .015  0.  0.
C1 '23B' 'M14222' 'M14331A' 0. 1  0.     3.    0.  699. 0.  0.  .015  0.  0.
C1 '24' 'M14331A' 'M14331B' 0. 1  0.     3.    0.  284. 0.  0.  .015  0.  0.
C1 '25' 'M14331B' 'M14342' 0. 2   0.     6.   8.5  430. 0.  0.  .015  0.  0.
C1 '26' 'L14263' 'L14362' 0. 1    0.     4.    0.  390. 0.  0.  .015  0.  0.
C1 '27' 'L14362' 'L14562' 0. 1    0.     4.    0. 1040. 0.  0.  .015  0.  0.
C1 '28' 'L14562' 'L14764' 0. 1    0.     5.    0.  990. 0.  0.  .015  0.  0.
C1 '29' 'L14764' 'L14766' 0. 1    0.     5.    0.  350. 0.  0.  .015  0.  0.
C1 '30' 'L14766' 'L14864' 0. 1    0.     6.    0.  390. 0.  0.  .015  0.  0.
C1 '31' 'L14864' 'L14961' 0. 1    0.     6.    0.  540. 0.  0.  .015  0.  0.
C1 '32' 'L14961' 'M14261' 0. 1    0.     6.    0. 1290. 0.  0.  .015  0.  0.
C1 '33' 'M14261' 'M14251' 0. 1    0.   4.5    0.  740. 0.  0.  .015  0.  0.
C1 '34' 'M14251' 'M14342' 0. 1    0.     6.    0.  950. 0.  0.  .015  0.  0.
C1 '35' 'M14342' 'M14351' 0. 2    0.     6.   8.5  370. 0.  0.  .015  0.  0.
C1 '36' 'M14351' 'M14352' 0. 3   55.     6.25 12.  300. 0.  0.  .022  0.  0.
C1 '37' 'M14352' 'M14453' 0. 6    0.     9.   10.  600. 0.  0.  .017  2.  2.
C1 '38' 'M14453' 'WOODWD' 0. 6    0.     9.   10. 1100. 0.  0.  .017  2.  2.
C1 '39' 'M14334' 'M14521' 0. 1    0.     3.    0. 1101. 0.  0.  .015  0.  0.
C1 '40' 'M14521' 'WOODWD' 0. 1    0.     3.    0. 1945. 0.  0.  .015  0.  0.
C1 '41' 'WOODWD' 'LIMITS' 0. 6    0.     9.   10. 1700. 0.  0.  .040  2.  2.
C1 '42' 'LIMITS' 'BOGUS'  0. 6    0.     9.   10. 1000. 0.  0.  .040  2.  2.
*   CONDUIT 101 SIMULATES STREET FLOW IN COMMERCIAL FROM SANTA FE TO BELL
C1 '101' 'SANTAFE' '#BCPUMP' 0. 2 0.   .87    24. 1600. 0.  0.  .017  0.  0.
C1 '52' '#BCPUMP' 'BCPUMP' 0. 2   0.     4.    6.  250. 0.  0.  .001  0.  0.
*
*    JUNCTION DATA
*     JUN    GRELEV    Z       QINST    Y
D1 'J14993' 4967.0    4959.4   0.      0.
D1 'K1483'  4969.5    4958.3   0.      0.
D1 'K1471'  4961.3    4955.6   0.      0.
D1 'K1475'  4963.0    4955.0   0.      0.
D1 'K14172' 4965.8    4954.0   0.      0.
D1 'K15201' 5030.6    5019.9   0.      0.
D1 'K14271' 4967.0    4953.4   0.      0.
D1 'K14361' 4964.2    4952.2   0.      0.
D1 'K14661' 4970.9    4950.24  0.      0.
D1 'K14761' 4965.9    4949.0   0.      0
D1 'K14861' 4959.4    4948.4   0.      0.
D1 'K14864' 4956.6    4947.6   0.      0.
D1 'K14961' 4956.7    4947.0   0.      0.
D1 'L14161' 4959.0    4946.0   0.      0.
D1 'JB2'    4962.0    4944.9   0.      0.
D1 'L14361' 4965.6    4943.8   0.      0.
D1 'L14345' 4946.2    4938.8   0.      0.
D1 'L14346' 4945.8    4937.2   0.      0.
D1 'BCPUMP' 4947.0    4922.0   0.      0.
D1 '#BCPUMP' 4950.    4946.0   0.      0.
D1 'SANTAFE' 4949.    4947.0   0.      0.
D1 'L14349' 4946.0    4937.7   0.      0.
D1 'L14644' 4944.8    4935.5   0.      0.
D1 'L14744C' 4944.4   4935.2   0.      0.
* INVERTS ESTIMATED FOR L14841 & M1433B
D1 'L14841' 4944.0    4934.8   0.      0.
D1 'M1433B' 4943.0    4933.8   0.      0.
D1 'M14131' 4940.0    4933.4   0.      0.
D1 'M143'   4939.0    4932.8   0.      0.
D1 'M14331B' 4940.0   4932.5   0.      0.
D1 'L14531' 4944.5    4938.19  0.      0.
D1 'L14634' 4943.0    4937.30  0.      0.
D1 'M14222' 4938.5    4934.1   0.      0.
D1 'M14331A' 4938.2   4933.2   0.      0.
D1 'M14342' 4940.0    4931.7   0.      0.
D1 'L14263' 4961.0    4954.8   0.      0.
D1 'L14362' 4966.0    4954.4   0.      0.
D1 'L14562' 4956.2    4950.0   0.      0.
D1 'L14764' 4963.2    4949.04  0.      0.
D1 'L14766' 4965.0    4948.5   0.      0.
D1 'L14864' 4968.0    4947.16  0.      0.
D1 'L14961' 4968.5    4946.24  0.      0.
D1 'M14261' 4965.5    4943.2   0.      0.
D1 'M14251' 4947.5    4934.4   0.      0.
D1 'M14351' 4944.0    4930.65  0.      0.
D1 'M14352' 4938.5    4929.36  0.      0.
D1 'M14453' 4937.7    4928.68  0.      0.
D1 'WOODWD' 4936.8    4927.7   0.      0.
D1 'M14334' 4936.2    4931.20  0.      0.
D1 'M14521' 4936.0    4930.0   0.      0.
D1 'LIMITS' 4933.5    4924.0   0.      0.
D1 'BOGUS'  4933.5    4922.6   0.      0.
*
*   STORAGE JUNCTION--WET WELL FOR BELL/COMMERCIAL PUMP STATION
*  JSTORE(I) ZTOP(I) ASTORE(J)  NUMST
E1 'BCPUMP'  4947.0   496.0       0.
*
*    PUMP DATA INPUT   NOTE THAT TESTED PERFORMANCE IS MUCH LESS THAN NEW PUMP RATING
*  IPTYP(I) NJUNC(N,1) NJUNC(N,2) PRATE(I,1) PRATE(I,2) PRATE(I,3) VRATE(I,1) VRATE(I,2) VRATE(I,3) VWELL(I) PON(I) POFF(I)
*    SUMP PUMP
H1   3       'BCPUMP'    'L14345'   4.          5.0         6.0         30.         19.         8.        0.       1.      .5
*    10,000 GPM PUMP
H1   3       'BCPUMP'    'JB2'      11.         15.6        19.         30.         25.         19.8      0.       3.      2.5
*    25,000 GPM PUMP
H1   3       'BCPUMP'    'JB2'      47.         48.         49.         19.7        19.4        19.1      0.       13.3    4.
*    40,000 GPM PUMP
H1   3       'BCPUMP'    'JB2'      28.         32.         41.         19.         14.         8.        0.       14.     4.
*
*   OUTFALL CONDITION--FREE DISCHARGE
I1  'BOGUS'  1
J1   1
*
*
*      INPUT HYDROGRAPHS
*  THE FOLLOWING BASINS DISCHARGE AT THE LISTED ANALYSIS POINTS:
*     BASIN     AP     BASIN    AP    BASIN       AP    BASIN    AP     BASIN    AP
*    BH134 =J14993   APW1SS-3=K15201 SJH100=K14271 SJH102=K14661
*    SJH105 =K14861 SJH106=L14161   SJ4=L14644     SJH150=L14362 SJH152 =L14764
*    SJH153=L14864  SJH200=L14961   SJH202=M14261 SJ7 = M14342  SJ2 =   BCPUMP
*    SJ3 = L14349    K14864=BCPUMP    L14562=L14644 L14644 =L14634
*    L14961 =BCPUMP  SJN710=WOODWD SJN10 =M14521   SJN720=WOODWD SJ9OL =WOODWD
*    SJH700=M14453   SJ-1 =SANTAFE APV1=K1475      APAA1 =L14161 SJ8 =  WOODWD
*    SJ9SS= M14453   SJN740=LIMITS SJH109=WOODWD   SJN730=LIMITS SJH701=M1433B
*    SJN6 = M14222   SJ5 =L14841   L14361=L14346   L14161=BCPUMP
*
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100-YEAR STORM INPUT
EXISTING DEVELOPMENT


```
*  L14263 EQUALS AMDS RESTUDY APBB1.  FLOW IS ZERO.
K1 36
*   DESTINATION OF FLOW
K2 'J14993' 'K15201' 'K14271' 'K14661' 'K14861' 'L14161' 'L14644'
   'L14362' 'L14764' 'L14864' 'L14961' 'M14261' 'M14342' 'BCPUMP'
   'L14349' 'BCPUMP' 'L14644' 'L14634' 'BCPUMP' 'WOODWD' 'M14521'
   'WOODWD' 'WOODWD' 'M14453' 'SANTAFE' 'K1475' 'L14161' 'WOODWD'
   'M14453' 'LIMITS' 'WOODWD' 'LIMITS' 'M1433B' 'M14222' 'L14841'
   'L14346' 'BCPUMP'
*
*   THE FIRST TWO LINES OF COLUMN LABELS IDENTIFY THE HYDROGRAPH SOURCE
*   THE 3RD & 4TH LINES OF COLUMN LABELS IDENTIGY THE HYDROGRAPH DESTINATIONS
*
*   TIME BH134 APW1  SJ100 SJ102 SJ105 SJ106 SJ4   SJ150 SJ152 SJ153 SJ200 SJ202 SJ7   SJ2   SJ3   K14864L14562L14644L14961
* SJ710 SLN10 SJ720 SJ90L SJ700 SJ1   APV1  APAA1   SJ8  SJ9SS SJ740 SJ109 SJ730 SJ701 SJN6  SJ5   L14361
*  TIME   993   201   271   661   861   161   644   362   764   864   961   261   342  PUMP   349  PUMP   644   634  PUMP
*   WOD   521   WOD   WOD   453  STFE    75   161   WOD   453  LMIT   WOD  LMIT  33B    222   841   346
K3 0.00   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
   0.00   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
K3 0.02   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
   0.00   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
K3 0.04   3.0   0.0   1.0   0.0   2.0   1.0   0.0   4.0   3.0   2.0   2.0   0.0   0.0   0.0   1.0   0.0   0.0   0.0   0.0
   1.00   0.0   0.0   0.0   1.0   0.0   0.0   0.0   6.0   0.0   0.0   0.0   7.0   0.0   0.0   0.0   0.0
K3 0.06  19.0   0.0  10.0   4.0  10.0   5.0   1.0  25.0  20.0  14.0  11.0   1.0   1.0   0.0   7.0   0.0   0.0   0.0   0.0
   5.00   0.0   3.0   0.0   6.0   0.0   0.0   0.0  29.0   0.0   0.0   2.0  32.0   3.0   0.0   1.0   0.0
K3 0.08  55.0   0.0  34.0  16.0  30.0  17.0   5.0  63.0  59.0  38.0  30.0   4.0   4.0   1.0  18.0   0.0   0.0   0.0   0.0
  12.00   0.0   7.0   0.0  15.0   0.0   0.0   0.0  63.0   2.0   1.0   8.0  68.0  11.0   0.0   2.0   0.0
K3 0.10 104.0   0.0  75.0  40.0  58.0  39.0  14.0 101.0 112.0  69.0  57.0   8.0  10.0   4.0  30.0   0.0   0.0   0.0   0.0
  18.00   0.0  12.0   1.0  25.0   1.0   0.0   0.0  91.0   4.0   4.0  18.0  92.0  25.0   0.0   6.0   0.0
K3 0.12 148.0   0.0 123.0  75.0  83.0  65.0  27.0 124.0 160.0  95.0  80.0  14.0  19.0   9.0  38.0   0.0   0.0   0.0   0.0
  21.00   0.0  17.0   2.0  31.0   2.0   0.0   0.0  99.0   9.0   8.0  31.0  96.0  44.0   0.0  12.0   0.0
K3 0.14 175.0   0.0 167.0 116.0  99.0  90.0  45.0 126.0 188.0 108.0  93.0  20.0  30.0  17.0  41.0   0.0 121.0 139.0   0.0
  20.00   0.0  20.0   5.0  33.0   4.0   0.0   0.0  91.0  16.0  16.0  45.0  84.0  64.0   0.0  20.0   0.0
K3 0.16 180.0   0.0 198.0 155.0 103.0 108.0  63.0 112.0 194.0 107.0  94.0  24.0  43.0  27.0  38.0   0.0 140.0 275.0   0.0
  18.00   1.0  20.0   8.0  31.0   7.0   0.0   0.0  75.0  24.0  27.0  56.0  66.0  81.0   0.0  28.0   0.0
K3 0.18 167.0   0.0 210.0 187.0  97.0 117.0  80.0  92.0 181.0  96.0  86.0  27.0  54.0  39.0  33.0 133.0 218.0 412.0  59.0
  15.00   1.0  19.0  12.0  27.0  11.0   0.0   0.0  60.0  33.0  41.0  63.0  51.0  92.0   1.0  36.0   0.0
K3 0.20 145.0   0.0 206.0 207.0  85.0 116.0  93.0  73.0 156.0  80.0  74.0  28.0  62.0  51.0  27.0 133.0 218.0 412.0  59.0
  13.00   1.0  17.0  18.0  24.0  16.0   0.0   0.0  49.0  42.0  57.0  65.0  40.0  96.0   1.0  42.0   0.0
K3 0.22 120.0   0.0 190.0 215.0  70.0 109.0 101.0  58.0 129.0  65.0  61.0  27.0  68.0  62.0  22.0 246.0 135.0 318.0  12.0
  11.00   2.0  15.0  24.0  21.0  21.0   0.0   0.0  40.0  49.0  73.0  64.0  32.0  95.0   2.0  46.0 120.0
K3 0.24  99.0   0.0 167.0 211.0  58.0  97.0 105.0  47.0 106.0  53.0  50.0  25.0  70.0  72.0 249.0 252.0  71.0 232.0   0.0
  10.00   3.0  13.0  30.0  18.0  27.0   0.0   0.0  33.0  54.0  88.0  60.0  26.0  89.0   3.0  48.0  60.0
K3 0.26  81.0   0.0 142.0 198.0  48.0  83.0 103.0  38.0  88.0  44.0  41.0  22.0  69.0  80.0  15.0 252.0  71.0 232.0   0.0
   8.00   4.0  12.0  36.0  16.0  32.0   0.0   0.0  27.0  57.0 105.0  54.0  21.0  80.0   4.0  48.0  60.0
K3 0.28  68.0   0.0 121.0 180.0  40.0  71.0  99.0  31.0  73.0  36.0  34.0  19.0  65.0  86.0  13.0 220.0   8.0 177.0   0.0
   8.00   5.0  10.0  41.0  14.0  37.0   0.0   0.0  24.0  58.0 114.0  49.0  19.0  70.0   5.0  46.0   0.0
K3 0.30  57.0   0.0 103.0 158.0  33.0  61.0  91.0  26.0  61.0  30.0  29.0  16.0  54.0  88.0  11.0 164.0   0.0 127.0   0.0
   7.00   6.0   9.0  46.0  13.0  41.0   0.0   0.0  22.0  57.0 122.0  43.0  17.0  61.0   6.0  43.0   0.0
K3 0.32  48.0   0.0  88.0 138.0  28.0  52.0  82.0  24.0  51.0  25.0  24.0  14.0  48.0  88.0   9.0 164.0   0.0 127.0   0.0
   6.00   7.0   8.0  49.0  12.0  44.0   0.0   0.0  20.0  54.0 127.0  39.0  16.0  54.0   8.0  39.0   0.0
K3 0.34  41.0   0.0  75.0 121.0  24.0  45.0  74.0  22.0  44.0  22.0  20.0  12.0  43.0  86.0   9.0 117.0   0.0 104.0   0.0
   6.00   8.0   7.0  52.0  11.0  46.0   0.0   0.0  19.0  51.0 130.0  35.0  15.0  47.0  10.0  34.0   0.0
K3 0.36  36.0   0.0  65.0 106.0  21.0  39.0  66.0  20.0  39.0  20.0  18.0  10.0  38.0  82.0   8.0  86.0   0.0  85.0   0.0
   5.00   9.0   7.0  53.0  11.0  48.0   1.0   0.0  17.0  47.0 129.0  31.0  13.0  42.0  12.0  31.0   0.0
K3 0.38  33.0   0.0  56.0  93.0  19.0  34.0  59.0  19.0  36.0  19.0  17.0   0.0  34.0  77.0   7.0  64.0   0.0  68.0   0.0
   5.00   9.0   7.0  54.0  10.0  48.0   2.0   0.0  16.0  42.0 126.0  28.0  13.0  37.0  13.0  27.0   0.0
K3 0.40  31.0   0.0  49.0  82.0  18.0  29.0  52.0  17.0  33.0  17.0  16.0   0.0  31.0  71.0   7.0  48.0   0.0  54.0   0.0
   5.00  10.0   6.0  53.0   9.0  48.0   3.0   0.0  15.0  38.0 122.0  26.0  11.0  33.0  15.0  24.0   0.0
K3 0.42  29.0   1.0  43.0  72.0  17.0  26.0  47.0  16.0  31.0  16.0  15.0   0.0  28.0  65.0   6.0  48.0   0.0  54.0   0.0
   4.00  11.0   6.0  52.0   9.0  46.0   4.0   2.0  14.0  35.0 114.0  23.0  11.0  29.0  17.0  22.0   0.0
K3 0.44  27.0   2.0  40.0  64.0  16.0  24.0  42.0  15.0  29.0  15.0  14.0   0.0  25.0  60.0   6.0  39.0   0.0  43.0   0.0
   4.00  11.0   6.0  50.0   8.0  45.0   8.0   5.0  13.0  32.0 106.0  22.0  10.0  26.0  19.0  20.0   0.0
K3 0.46  25.0   3.0  38.0  57.0  15.0  22.0  38.0  14.0  27.0  14.0  13.0   0.0  23.0  54.0   6.0  31.0   0.0  34.0   0.0
   4.00  11.0   5.0  47.0   8.0  42.0  12.0   8.0  12.0  29.0  98.0  20.0   9.0  24.0  20.0  18.0   0.0
K3 0.48  24.0   5.0  35.0  51.0  14.0  21.0  34.0  13.0  26.0  13.0  12.0   0.0  21.0  50.0   5.0  31.0   0.0  34.0   0.0
   4.00  12.0   5.0  45.0   8.0  40.0  16.0  11.0  12.0  26.0  91.0  19.0   9.0  23.0  22.0  16.0   0.0
K3 0.50  22.0   6.0  33.0  46.0  13.0  20.0  31.0  12.0  24.0  13.0  12.0   0.0  19.0  46.0   5.0  26.0   0.0  25.0   0.0
   4.00  12.0   5.0  42.0   7.0  37.0  20.0  14.0  11.0  24.0  84.0  18.0   8.0  21.0  23.0  14.0   0.0
K3 0.52  21.0   8.0  32.0  43.0  12.0  19.0  28.0  12.0  23.0  12.0  11.0   0.0  17.0  42.0   5.0  26.0   0.0  25.0   0.0
   4.00  12.0   5.0  39.0   7.0  35.0  24.0  17.0  10.0  22.0  77.0  17.0   8.0  20.0  24.0  13.0   0.0
K3 0.54  20.0   9.0  30.0  41.0  12.0  18.0  26.0  11.0  22.0  11.0  10.0   0.0  16.0  38.0   5.0  24.0   0.0  18.0   0.0
   3.00  11.0   4.0  36.0   7.0  32.0  28.0  20.0   9.0  20.0  70.0  17.0   8.0  19.0  25.0  12.0   0.0
K3 0.56  19.0  10.0  28.0  39.0  11.0  17.0  24.0  10.0  21.0  11.0  10.0   0.0  15.0  35.0   4.0  62.0   0.0  12.0   0.0
   3.00  11.0   4.0  33.0   6.0  30.0  32.0  23.0   9.0  18.0  66.0  16.0   7.0  18.0  25.0  11.0   0.0
K3 0.58  18.0  11.0  27.0  37.0  11.0  16.0  23.0  10.0  20.0  10.0   0.0   0.0  15.0  33.0   3.0  97.0   0.0   8.0   0.0
   3.00  11.0   4.0  31.0   6.0  28.0  36.0  26.0   8.0  17.0  61.0  15.0   7.0  17.0  26.0  10.0   0.0
K3 0.60  17.0  13.0  26.0  35.0  10.0  15.0  22.0   0.0  19.0  10.0   0.0   0.0  14.0  30.0   3.0  63.0   0.0   5.0   0.0
   3.00  10.0   4.0  29.0   6.0  26.0  40.0  29.0   8.0  15.0  56.0  15.0   6.0  17.0  26.0  10.0   0.0
K3 0.62  16.0  14.0  24.0  33.0  10.0  15.0  21.0   0.0  18.0   0.0   0.0   0.0  14.0  28.0   3.0  63.0   0.0   5.0   0.0
   3.00  10.0   4.0  27.0   6.0  24.0  44.0  32.0   8.0  14.0  52.0  14.0   5.0  16.0  26.0   9.0   0.0
K3 0.64  15.0  15.0  23.0  32.0   9.0  14.0  20.0   0.0  17.0   0.0   0.0   0.0  13.0  26.0   3.0  29.0   0.0   3.0   0.0
   3.00   9.0   4.0  25.0   5.0  22.0  49.0  34.0   7.0  14.0  48.0  14.0   5.0  15.0  26.0   9.0   0.0
K3 0.66  14.0  16.0  22.0  31.0   9.0  13.0  19.0   0.0  16.0   0.0   0.0   0.0  12.0  24.0   3.0  39.0   0.0   0.0   0.0
   3.00   9.0   4.0  23.0   5.0  21.0  47.0  36.0   7.0  13.0  45.0  13.0   5.0  15.0  26.0   9.0   0.0
K3 0.68  14.0  17.0  21.0  29.0   8.0  13.0  19.0   0.0  15.0   0.0   0.0   0.0  12.0  22.0   3.0  34.0   0.0   0.0   0.0
   3.00   8.0   3.0  22.0   5.0  19.0  45.0  38.0   7.0  12.0  40.0  13.0   5.0  14.0  25.0   8.0   0.0
K3 0.70  13.0  18.0  20.0  28.0   8.0  12.0  18.0   0.0  15.0   0.0   0.0   0.0  12.0  21.0   2.0  34.0   0.0   0.0   0.0
   3.00   8.0   3.0  20.0   5.0  18.0  44.0  40.0   6.0  12.0  39.0  11.0   4.0  14.0  25.0   8.0   0.0
K3 0.72  13.0  19.0  19.0  27.0   8.0  12.0  17.0   0.0  14.0   0.0   0.0   0.0  11.0  20.0   2.0  34.0   0.0   0.0   0.0
   2.00   8.0   3.0  19.0   5.0  17.0  43.0  39.0   6.0  11.0  36.0  11.0   4.0  13.0  24.0   8.0   0.0
K3 0.74  12.0  20.0  19.0  26.0   7.0  11.0  17.0   0.0  13.0   0.0   0.0   0.0  11.0  19.0   2.0  27.0   0.0   0.0   0.0
   2.00   7.0   3.0  18.0   5.0  16.0  42.0  37.0   6.0  11.0  34.0  10.0   4.0  13.0  24.0   7.0   0.0
K3 0.76  11.0  20.0  18.0  25.0   7.0  11.0  16.0   0.0  13.0   0.0   0.0   0.0  10.0  19.0   2.0  27.0   0.0   0.0   0.0
   2.00   7.0   3.0  17.0   5.0  15.0  40.0  36.0   6.0  11.0  32.0  10.0   4.0  12.0  23.0   7.0   0.0
K3 0.78  11.0  20.0  17.0  24.0   7.0  10.0  15.0   0.0  12.0   0.0   0.0   0.0  10.0  18.0   2.0  21.0   0.0   0.0   0.0
   2.00   6.0   3.0  16.0   4.0  14.0  39.0  35.0   5.0  10.0  30.0  10.0   4.0  12.0  22.0   7.0   0.0
K3 0.80  11.0  21.0  16.0  23.0   6.0  10.0  15.0   0.0  12.0   0.0   0.0   0.0  10.0  17.0   2.0  14.0   0.0   0.0   0.0
   2.00   6.0   3.0  15.0   2.0  13.0  37.0  33.0   5.0  10.0  29.0  10.0   4.0  11.0  21.0   7.0   0.0
K3 0.82  10.0  21.0  16.0  22.0   6.0  10.0  14.0   0.0  12.0   0.0   0.0   0.0   9.0  10.0   2.0   0.0   0.0   0.0   0.0
   2.00   6.0   3.0  14.0   1.0  12.0  34.0  32.0   5.0  10.0  28.0   9.0   3.0  11.0  20.0   6.0   0.0
K3 1.00  10.0  13.0   1.0   1.0   6.0   1.0  14.0   0.0   1.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
   2.00   3.0   3.0  13.0   0.0  10.0  21.0  20.0   5.0   0.0  27.0   9.0   3.0   0.0   0.0   0.0   0.0
$ENDPROGRAM
```

```
*   INPUT DATA,  S. BROADWAY AREA,  100-YEAR STORM,  3-14-90, SG
***** DIVERTED ALL FLOWS NORTH OF THE PUMP STATION TO THE PUMP
*****      STATION AND MADE IT AN OUTFALL
***** ADDED NORTH POND - 5/29/90 DJG
***** ADDED SOUTH POND - 5/30/90 DJG
*   ALL SIGNIFICANT SURCHARGES HAVE BEEN TRANSFERED
SW  1   0   0
MM  2   10   11   12
$ANUM
$EXTRAN
A1   'SWMM INPUT,  SOUTH BROADWAY'
A2    'INPUT HYDROGRAPHS FROM HYMO'
*
*   ISOL  KSUPER
B0    0      0
*
*   NTCYC DELT TZERO NSTART INTER JNTER REDO
B1   360    20.    0.    10        5      10     0
*
*  METRIC NEQUAL AMEN ITMAX SUBTL
B2   0       1      0      30     .05
*
*  NHPRT NQPRT   NPLT   LPLT   NJSW
B3    30     30         0     0    34
*
*  PRINTED HEADS
B4 'J14993' 'K1483'  'K1471'  'K1475'  'K14172' 'K15201' 'K14271'
   'K14361' 'K14661' 'K14761' 'NPOND' 'K14864' 'K14961' 'L14161'
   'JB2'     'L14361' 'L14346' 'BCPUMP' 'WOODWD' 'SANTAFE' 'L14349'
   'L14644' 'L14841' 'M1433B' 'M14131' 'M143' 'M14331B' 'L14531'
   'L14634' 'M14222'
*
*  PRINTED FLOWS
B5    '1'    '2'    '3'    '4'   '5'    '6'    '7A' '7B'  '8'  '9'
      '10A' '10B' '10C' '11' '13'  '14'  '17' '18'  '19' '20'
      '21A' '21B' '21C' '22' '23A' '24'  '25' '404' '26' '101'
*
*       CONDUIT DATA
*  NCOND NJ1     NJ2     Q0 NKLASS AFULL DEEP WIDE LEN ZP1 ZP2 ROUGH STH SPHI
C1 '1' 'J14993' 'K1483' 0. 1      0.     4.    0. 350. 0.   0. .015   0.  0.
C1 '2' 'K1483'  'K1471'  0. 1     0.     4.    0. 704. 0.   0.  .015  0.  0.
C1 '3' 'K1471' 'K1475' 0. 1       0.    4.    0. 360. 0.   0.    .015  0.  0.
C1 '4' 'K1475'  'K14172' 0. 1     0.     4.    0. 630.  0.   0.  .015  0.  0.
C1 '5' 'K15201' 'K14172' 0. 2     0.     4.    4. 2215. 0.   0.  .015  0.  0.
C1 '6' 'K14172' 'K14271' 0. 1     0.     5.    0.  390. 0.   0.  .015  0.  0.
C1 '7A' 'K14271' 'K14361' 0. 1    0.     7.    0. 680. 0.   0.  .015   0.  0.
C1 '7B' 'K14361' 'K14661' 0. 1    0.     7.    0.  1081. 0. 0.  .015  0.  0.
C1 '8' 'K14661' 'K14761' 0. 1     0.     7.    0.  610. 0.   0.  .015  0.  0.
C1 '9' 'K14761' 'K14861' 0. 1     0.     7.    0.  550. 0.   0.  .015  0.  0.
C1 '10A' 'K14861' 'NPOND'  0. 1   0.     7.    0.  800. 0.   0.  .015  0.  0.
C1 '404' 'NPOND' 'SANTAFE' 0. 1   0.     3.    0   400. 0.   0.  .015  0.  0.
C1 '10B' 'K14864' 'K14961' 0. 1   0.     6.    0.  350. 0.   0.  .015  0.  0.
C1 '10C' 'K14961' 'L14161' 0. 1   0.     6.    0.  680. 0.   0.  .015  0.  0.
C1 '11' 'L14161' 'BCPUMP'  0. 1   0.     6.    0. 1400. 0.   0.  .015  0.  0.
C1 '13' 'JB2'    'L14361'   0. 1   0.     6.    0.  720. 0.   0.  .015  0.  0.
C1 '14' 'L14361' 'L14346'  0. 1   0.     6.    0.  900. 0.   0.  .015  0.  0.
C1 '15' 'L14346' 'L14644'  0. 1   0.     6.    0. 1980. 0.   0.  .015  0.  0.
C1 '16' 'L14744C' 'L14841' 0. 2   0.     6.   5.6  250. 0.   0.  .015  0.  0.
C1 '17' 'L14345' 'L14349'  0. 1   0.     3.    0.  460. 0.   0.  .015  0.  0.
C1 '18' 'L14349' 'L14644'  0. 1   0.     3.    0. 1420. 0.   0.  .015  0.  0.
C1 '19' 'L14644' 'L14744C' 0. 2   0.     6.   5.6  520. 0.   0.  .015  0.  0.
C1 '20' 'L14841' 'M1433B'  0. 2   0.     6.   5.6 1230. 0.   0.  .015  0.  0.
C1 '21A' 'M1433B' 'M14131' 0. 2   0.     6.   5.6  450. 0.   0.  .015  0.  0.
C1 '21B' 'M14131' 'M143'   0. 2   0.     6.   5.6  606. 0.   0.  .015  0.  0.
C1 '21C' 'M143'   'M14331B' 0. 2  0.     6.   5.6  349. 0.   0.  .015  0.  0.
C1 '22' 'L14531' 'L14634'  0. 1   0.     3.    0.  700. 0.   0.  .015  0.  0.
C1 '23A' 'L14634' 'M14222' 0. 1   0.     3.    0. 3240. 0.   0.  .015  0.  0.
C1 '23B' 'M14222' 'M14331A' 0. 1  0.     3.    0.  699. 0.   0.  .015  0.  0.
C1 '24' 'M14331A' 'M14331B' 0. 1  0.     3.    0.  284. 0.   0.  .015  0.  0.
C1 '25' 'M14331B' 'M14342' 0. 2   0.     6.   8.5  430. 0.    0. .015  0.  0.
C1 '26' 'L14263' 'L14362' 0. 1    0.     4.    0.  390. 0.   0.  .015  0.  0.
C1 '27' 'L14362' 'L14562' 0. 1    0.     4.    0. 1040. 0.   0.  .015  0.  0.
C1 '28' 'L14562' 'L14764' 0. 1    0.     6.    0.  990. 0.   0.  .015  0.  0.
C1 '29' 'L14764' 'L14766' 0. 1    0.     6.    0.  350. 0.   0.  .015  0.  0.
C1 '30' 'L14766' 'L14864' 0. 1    0.     6.    0.  390. 0.   0.  .015  0.  0.
C1 '31' 'L14864' 'L14961' 0. 1    0.     6.    0.  540. 0.   0.  .015  0.  0.
C1 '32' 'L14961' 'M14261' 0. 1    0.     6.    0. 1290. 0.   0.  .015  0.  0.
C1 '33' 'M14261' 'M14352' 0. 1    0.     6.    0. 1350. 0.   0.  .015  0.  0.
C1 '34' 'M14251' 'M14342' 0. 1    0.     6.    0.  950. 0.   0.  .015  0.  0.
C1 '35' 'M14342' 'M14351' 0. 2    0.     6.   8.5  370. 0.   0.  .015  0.  0.
C1 '36' 'M14351' 'M14352' 0. 3   55.  6.25 12. 300. 0.   0.  .022  0.  0.
C1 '37' 'M14352' 'M14453' 0. 6    0.     9.   10. 600. 0.   0.  .017  2.  2.
C1 '38' 'M14453' 'SPOND'  0. 6    0.     9.   10. 1100. 0.  0.  .017  2.  2.
C1 '39' 'M14334' 'M14521' 0. 1    0.     3.    0.  1101. 0. 0.  .015  0.  0.
C1 '40' 'M14521' 'SPOND'  0. 1    0.     3.    0.  1945. 0. 0.  .015  0.  0.
C1 '43' 'SPOND'  'WOODWD' 0. 1    0.     5.    0.  300.  0. 0.  .015  0.  0.
C1 '41' 'WOODWD' 'LIMITS' 0. 6    0.     9.   10. 1700. 0. 0.  .040  2.  2.
C1 '42' 'LIMITS' 'BOGUS'  0. 6    0.     9.   10. 1000. 0. 0.  .040  2.  2.
C1 '101' 'SANTAFE' '#BCPUMP' 0. 1 0.     3.    0.  1600. 0. 0.  .015  0.  0.
*
*    JUNCTION DATA
*     JUN    GRELEV    Z        QINST    Y
D1 'J14993' 4967.0    4959.4   0.      0.
D1 'K1483'  4969.5    4958.3   0.      0.
D1 'K1471'  4961.3    4955.6   0.      0.
D1 'K1475'  4963.0    4955.0   0.      0.
D1 'K14172' 4965.8    4954.0   0.      0.
D1 'K15201' 5030.6    5019.9   0.      0.
D1 'K14271' 4967.0    4953.4   0.      0.
D1 'K14361' 4964.2    4952.2   0.      0.
D1 'K14661' 4970.9    4950.24  0.      0.
D1 'K14761' 4965.9    4949.0   0.      0
D1 'K14861' 4959.4    4948.4   0.      0.
D1 'K14864' 4956.6    4947.6   0.      0.
D1 'K14961' 4956.7    4947.0   0.      0.
D1 'L14161' 4959.0    4946.0   0.      0.
D1 'JB2'    4962.0    4944.9   0.      0.
D1 'L14361' 4965.6    4943.8   0.      0.
D1 'L14345' 4946.2    4938.8   0.      0.
D1 'L14346' 4945.8    4937.2   0.      0.
D1 'NPOND'  4949.1    4941.5   0.      0.
D1 'BCPUMP' 4948.0    4940.0   0.      0.
D1 '#BCPUMP' 4950.    4940.5   0.      0.
D1 'SANTAFE' 4949.    4941.0   0.      0.
D1 'L14349' 4946.0    4937.7   0.      0.
D1 'L14644' 4944.8    4935.5   0.      0.
D1 'L14744C' 4944.4   4935.2   0.      0.
* INVERTS ESTIMATED FOR L14841 & M1433B
D1 'L14841' 4944.0    4934.8   0.      0.
D1 'M1433B' 4943.0    4933.8   0.      0.
D1 'M14131' 4940.0    4933.4   0.      0.
D1 'M143'   4939.0    4932.8   0.      0.
D1 'M14331B' 4940.0   4932.5   0.      0.
D1 'L14531' 4944.5    4938.19  0.      0.
D1 'L14634' 4943.0    4937.30  0.      0.
D1 'M14222' 4938.5    4934.1   0.      0.
D1 'M14331A' 4938.2   4933.2   0.      0.
D1 'M14342' 4940.0    4931.7   0.      0.
D1 'L14263' 4961.0    4954.8   0.      0.
D1 'L14362' 4966.0    4954.4   0.      0.
D1 'L14562' 4956.2    4950.0   0.      0.
D1 'L14764' 4963.2    4949.04  0.      0.
D1 'L14766' 4965.0    4948.5   0.      0.
D1 'L14864' 4968.0    4947.16  0.      0.
D1 'L14961' 4968.5    4946.24  0.      0.
D1 'M14261' 4965.5    4943.2   0.      0.
D1 'M14251' 4947.5    4934.4   0.      0.
D1 'M14351' 4944.0    4930.65  0.      0.
D1 'M14352' 4938.5    4929.36  0.      0.
D1 'M14453' 4937.7    4928.68  0.      0.
D1 'SPOND'  4936.8    4927.7   0.      0.
D1 'WOODWD' 4936.8    4927.5   0.      0.
D1 'M14334' 4936.2    4931.20  0.      0.
D1 'M14521' 4936.0    4930.0   0.      0.
D1 'LIMITS' 4933.5    4924.0   0.      0.
D1 'BOGUS'  4933.5    4922.6   0.      0.
*
*   STORAGE JUNCTION--NORTH POND
*  JSTORE(I) ZTOP(I) ASTORE(J)  NUMST
E1 'NPOND'  4949.0  130000.0       0.
E1 'SPOND'  4936.8  160000.0       0.
*
* DELETED PUMPS
*
*   OUTFALL CONDITION--FREE DISCHARGE
I1  'BOGUS'  1
I1  '#BCPUMP'  1
I1  'BCPUMP'  1
J1   1
J1   1
J1   1
*
*
*       INPUT HYDROGRAPHS
*  THE FOLLOWING BASINS DISCHARGE AT THE LISTED ANALYSIS POINTS:
*     BASIN     AP     BASIN    AP    BASIN      AP    BASIN    AP     BASIN    AP
*    BH134 =J14993  APW1SS-3=K15201 SJH100=K14271 SJH102=K14661
********* MOVED SJH150 TO L14361 (WAS L14362) 5/25/90 - DJG
*    SJH105 =K14861 SJH106=L14161   SJ4=L14644     SJH150=L14361 SJH152 =L14764
*    SJH153=L14864  SJH200=L14961   SJH202=M14261 SJ7 = M14342  SJ2 =   BCPUMP
*    SJ3 = L14349   SJ5 =L14841     L14562=L14644  L14644=L14634 L14263=L14346
*    SJN710=SPOND SJN10 =M14521    SJN720=WOODWD SJ9OL =SPOND
*    SJH700=M14453  SJ-1 =NPOND APV1=K1475       APAA1 =L14161 SJ8 =SPOND
*    SJ9SS= M14453  SJN740=LIMITS SJH109=SPOND   SJN730=LIMITS SJH701=M1433B
*    SJN6 = M14222
*
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100-YEAR STORM INPUT
FULL DEVELOPMENT
WITH IMPROVEMENTS


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*  L14263 EQUALS AMDS RESTUDY APBB1.  FLOW IS ZERO.
K1 34
*   DESTINATION OF FLOW
K2 'J14993' 'K15201' 'K14271' 'K14661' 'K14861' 'L14161' 'L14644'
   'L14361' 'L14764' 'L14864' 'L14961' 'M14261' 'M14342' 'BCPUMP'
   'L14349' 'L14841' 'L14644' 'L14634' 'L14346' 'SPOND'  'M14521'
   'WOODWD' 'SPOND'  'M14453' 'NPOND'  'K1475' 'L14161' 'SPOND'
   'M14453' 'LIMITS' 'SPOND'  'LIMITS' 'M1433B' 'M14222'
*
*   THE FIRST TWO LINES OF COLUMN LABELS IDENTIFY THE HYDROGRAPH SOURCE
*   THE 3RD & 4TH LINES OF COLUMN LABELS IDENTIFY THE HYDROGRAPH DESTINATIONS
*
*   TIME BH134 APW1  SJ100 SJ102 SJ105 SJ106 SJ4   SJ150 SJ152 SJ153 SJ200 SJ202 SJ7   SJ2   SJ3   SJ5   L14562L14644L14263
*  SJ710 SJN10 SJ720 SJ90L SJ700 SJ1   APV1  APAA1   SJ8 SJ9SS SJ740 SJ109 SJ730 SJ701 SJN6
*   TIME   993   201   271   661   861   161   644   361   764   864   961   261   342  PUMP   349   841   645   634   346
*    SPD   521   WOD   SPD   453  STFE    75   161   SPD   453  LMIT   SPD  LMIT  33A   222
K3  0.00   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
    0.00   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
K3  0.02   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
    0.00   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
K3  0.04   3.0   0.0   1.0   0.0   2.0   1.0   0.0   4.0   3.0   2.0   2.0   0.0   0.0   0.0   1.0   0.0   0.0   0.0   0.0
    5.00   0.0   2.0   0.0   6.0   0.0   0.0   0.0   7.0   0.0   0.0   1.0   7.0   0.0   0.0
K3  0.06  19.0   0.0  10.0   4.0  10.0   5.0   1.0  25.0  20.0  14.0  11.0   3.0   1.0   0.0   7.0   1.0   0.0   0.0   0.0
   23.00   0.0  14.0   0.0  32.0   0.0   0.0   0.0  35.0   0.0   0.0   7.0  32.0   3.0   0.0
K3  0.08  55.0   0.0  34.0  16.0  30.0  17.0   5.0  63.0  59.0  38.0  30.0  11.0   4.0   1.0  18.0   2.0   0.0   0.0   0.0
   51.00   0.0  36.0   0.0  76.0   0.0   0.0   0.0  76.0   2.0   1.0  23.0  68.0  11.0   0.0
K3  0.10 104.0   0.0  75.0  40.0  58.0  39.0  14.0 101.0 112.0  69.0  57.0  24.0  10.0   4.0  30.0   6.0   0.0   0.0   0.0
   72.00   0.0  62.0   1.0 115.0   1.0   0.0   0.0 108.0   4.0   4.0  52.0  92.0  25.0   0.0
K3  0.12 148.0   0.0 123.0  75.0  83.0  65.0  27.0 124.0 160.0  95.0  80.0  42.0  19.0   9.0  38.0  12.0   0.0   0.0   0.0
   78.00   0.0  80.0   2.0 134.0   2.0   0.0   0.0 118.0   9.0   8.0  89.0  96.0  44.0   0.0
K3  0.14 175.0   0.0 167.0 116.0  99.0  90.0  45.0 126.0 188.0 108.0  93.0  59.0  30.0  17.0  41.0  20.0   0.0   0.0   0.0
   71.00   0.0  86.0   5.0 130.0   4.0   0.0   0.0 108.0  16.0  16.0 125.0  84.0  64.0   0.0
K3  0.16 180.0   0.0 198.0 155.0 103.0 108.0  63.0 112.0 194.0 107.0  94.0  73.0  43.0  27.0  38.0  28.0   0.0   0.0   0.0
   57.00   1.0  81.0   8.0 112.0   7.0   0.0   0.0  88.0  24.0  27.0 153.0  66.0  81.0   0.0
K3  0.18 167.0   0.0 210.0 187.0  97.0 117.0  80.0  92.0 181.0  96.0  86.0  82.0  54.0  39.0  33.0  36.0   0.0   0.0   0.0
   45.00   1.0  70.0  12.0  90.0  11.0   0.0   0.0  70.0  33.0  41.0 167.0  51.0  92.0   1.0
K3  0.20 145.0   0.0 206.0 207.0  85.0 116.0  93.0  73.0 156.0  80.0  74.0  84.0  62.0  51.0  27.0  42.0   0.0   0.0   0.0
   36.00   2.0  57.0  18.0  72.0  16.0   0.0   0.0  56.0  42.0  57.0 169.0  40.0  96.0   1.0
K3  0.22 120.0   0.0 190.0 215.0  70.0 109.0 101.0  58.0 129.0  65.0  61.0  80.0  68.0  62.0  22.0  46.0   0.0   0.0   0.0
   29.00   2.0  47.0  24.0  58.0  21.0   0.0   0.0  45.0  49.0  73.0 161.0  32.0  95.0   2.0
K3  0.24  99.0   0.0 167.0 211.0  58.0  97.0 105.0  47.0 106.0  53.0  50.0  74.0  70.0  72.0  18.0  48.0   0.0   0.0   0.0
   23.00   3.0  39.0  30.0  47.0  27.0   0.0   0.0  37.0  54.0  88.0 145.0  26.0  89.0   3.0
K3  0.26 -81.0   0.0 142.0 198.0  48.0  83.0 103.0  38.0  88.0  44.0  41.0  64.0  69.0  80.0  15.0  48.0   0.0   0.0   0.0
   19.00   4.0  32.0  36.0  39.0  32.0   0.0   0.0  30.0  57.0 105.0 127.0  21.0  80.0   4.0
K3  0.28  68.0   0.0 121.0 180.0  40.0  71.0  99.0  31.0  73.0  36.0  34.0  55.0  65.0  86.0  13.0  46.0   0.0   3.8   0.0
   17.00   6.0  27.0  41.0  33.0  37.0   0.0   0.0  27.0  58.0 114.0 110.0  19.0  70.0   5.0
K3  0.30  57.0   0.0 103.0 158.0  33.0  61.0  91.0  26.0  61.0  30.0  29.0  48.0  60.0  88.0  11.0  43.0   0.0   0.0   0.0
   15.00   7.0  23.0  46.0  29.0  41.0   0.0   0.0  25.0  57.0 122.0  95.0  17.0  61.0   6.0
K3  0.32  48.0   0.0  88.0 138.0  28.0  52.0  82.0  24.0  51.0  25.0  24.0  41.0  54.0  88.0   9.0  39.0   0.0   0.0   0.0
   14.00   8.0  20.0  49.0  27.0  44.0   0.0   0.0  22.0  54.0 127.0  82.0  16.0  54.0   8.0
K3  0.34  41.0   0.0  75.0 121.0  24.0  45.0  74.0  22.0  44.0  22.0  20.0  35.0  48.0  86.0   9.0  34.0   0.0   0.0   0.0
   13.00   9.0  18.0  52.0  25.0  46.0   0.0   0.0  21.0  51.0 130.0  72.0  15.0  47.0  10.0
K3  0.36  36.0   0.0  65.0 106.0  21.0  39.0  66.0  20.0  39.0  20.0  18.0  31.0  43.0  82.0   8.0  31.0   0.0   0.0   0.0
   12.00  10.0  17.0  53.0  23.0  48.0   1.0   0.0  19.0  47.0 129.0  63.0  13.0  42.0  12.0
K3  0.38  33.0   0.0  56.0 -93.0  19.0  34.0  59.0  19.0  36.0  19.0  17.0  27.0  38.0  77.0   7.0  27.0   0.0   0.0   0.0
   11.00  11.0  16.0  54.0  21.0  48.0   2.0   0.0  18.0  42.0 126.0  55.0  13.0  37.0  13.0
K3  0.40  31.0   0.0  49.0  82.0  18.0  29.0  52.0  17.0  33.0  17.0  16.0  23.0  34.0  71.0   7.0  24.0   0.0   0.0   0.0
   10.00  12.0  14.0  53.0  20.0  48.0   3.0   0.0  17.0  38.0 122.0  49.0  11.0  33.0  15.0
K3  0.42  29.0   1.0  43.0  72.0  17.0  26.0  47.0  16.0  31.0  16.0  15.0  21.0  31.0  65.0   6.0  22.0   0.0   0.0   0.0
   10.00  12.0  14.0  52.0  18.0  46.0   4.0   2.0  15.0  35.0 114.0  43.0  11.0  29.0  17.0
K3  0.44  27.0   2.0  40.0  64.0  16.0  24.0  42.0  15.0  29.0  15.0  14.0  18.0  28.0  60.0   6.0  20.0   0.0   0.0   0.0
    9.00  13.0  13.0  50.0  17.0  45.0   8.0   5.0  14.0  32.0 106.0  39.0  10.0  26.0  19.0
K3  0.46  25.0   3.0  38.0  57.0  15.0  22.0  38.0  14.0  27.0  14.0  13.0  17.0  25.0  54.0   6.0  18.0   0.0   0.0   0.0
    8.00  13.0  12.0  47.0  16.0  42.0  12.0   8.0  14.0  29.0  98.0  37.0   9.0  24.0  20.0
K3  0.48  24.0   5.0  35.0  51.0  14.0  21.0  34.0  13.0  26.0  13.0  12.0  16.0  23.0  50.0   5.0  16.0   0.0   0.0   0.0
    8.00  13.0  11.0  45.0  15.0  40.0  16.0  11.0  13.0  26.0  91.0  35.0   9.0  23.0  22.0
K3  0.50  22.0   6.0  33.0  46.0  13.0  20.0  31.0  12.0  24.0  13.0  12.0  15.0  21.0  46.0   5.0  14.0   0.0   0.0   0.0
    7.00  13.0  11.0  42.0  14.0  37.0  20.0  14.0  12.0  24.0  84.0  33.0   8.0  21.0  23.0
K3  0.52  21.0   8.0  32.0  43.0  12.0  19.0  28.0  12.0  23.0  12.0  11.0  14.0  19.0  42.0   5.0  13.0   0.0   0.0   0.0
    7.00  13.0  10.0  39.0  14.0  35.0  24.0  17.0  11.0  22.0  77.0  31.0   8.0  20.0  24.0
K3  0.54  20.0   9.0  30.0  41.0  12.0  18.0  26.0  11.0  22.0  11.0  10.0  13.0  17.0  38.0   5.0  12.0   0.0   0.0   0.0
    7.00  13.0   9.0  36.0  13.0  32.0  28.0  20.0  11.0  20.0  70.0  30.0   8.0  19.0  25.0
K3  0.56  19.0  10.0  28.0  39.0  11.0  17.0  24.0  10.0  21.0  11.0  10.0  13.0  16.0  35.0   4.0  11.0   0.0   0.0   0.0
    6.00  13.0   9.0  33.0  12.0  30.0  32.0  23.0  10.0  18.0  66.0  28.0   7.0  18.0  25.0
K3  0.58  18.0  11.0  27.0  37.0  11.0  16.0  23.0  10.0  20.0  10.0   9.0  12.0  15.0  33.0   3.0  10.0   0.0   0.0   0.0
    6.00  12.0   9.0  31.0  11.0  28.0  36.0  26.0  10.0  17.0  61.0  27.0   7.0  17.0  26.0
K3  0.60  17.0  13.0  26.0  35.0  10.0  15.0  22.0   9.0  19.0  10.0   9.0  12.0  15.0  30.0   3.0  10.0   0.0   0.0   0.0
    5.00  12.0   8.0  29.0  11.0  26.0  40.0  29.0   8.0  15.0  56.0  26.0   6.0  17.0  26.0
K3  0.62  16.0  14.0  24.0  33.0  10.0  15.0  21.0   9.0  18.0   9.0   8.0  11.0  14.0  28.0   3.0   9.0   0.0   0.0   0.0
    5.00  11.0   8.0  27.0  10.0  24.0  44.0  32.0   8.0  14.0  52.0  24.0   5.0  16.0  26.0
K3  0.64  15.0  15.0  23.0  32.0   9.0  14.0  20.0   9.0  17.0   9.0   8.0  11.0  14.0  26.0   3.0   9.0   0.0   0.0   0.0
    4.00  11.0   7.0  25.0  10.0  22.0  49.0  34.0   8.0  14.0  48.0  23.0   5.0  15.0  26.0
K3  0.66  14.0  16.0  22.0  31.0   9.0  13.0  19.0   8.0  16.0   8.0   8.0  10.0  13.0  24.0   3.0   9.0   0.0   0.0   0.0
    4.00  10.0   7.0  23.0   9.0  21.0  47.0  36.0   7.0  13.0  45.0  22.0   5.0  15.0  26.0
```

```
K3  0.68  14.0  17.0  21.0  29.0   8.0  13.0  19.0   8.0  15.0   8.0   7.0  10.0  12.0  22.0  3.0  8.0  0.0  0.0  0.0
    4.00  10.0   7.0  22.0   9.0  19.0  45.0  38.0   7.0  12.0  40.0  21.0   5.0  14.0  25.0
K3  0.70  13.0  18.0  20.0  28.0   8.0  12.0  18.0   7.0  15.0   8.0   7.0   9.0  12.0  21.0  2.0  8.0  0.0  0.0  0.0
    4.00   9.0   6.0  20.0   9.0  18.0  44.0  40.0   7.0  12.0  39.0  20.0   4.0  14.0  25.0
K3  0.72  13.0  19.0  19.0  27.0   8.0  12.0  17.0   7.0  14.0   7.0   7.0   9.0  12.0  20.0  2.0  8.0  0.0  0.0  0.0
    4.00   9.0   5.0  19.0   8.0  17.0  43.0  39.0   7.0  11.0  36.0  20.0   4.0  13.0  24.0
K3  0.74  12.0  20.0  19.0  26.0   7.0  11.0  17.0   7.0  13.0   7.0   6.0   9.0  11.0  19.0  2.0  7.0  0.0  0.0  0.0
    4.00   8.0   5.0  18.0   7.0  16.0  42.0  37.0   6.0  11.0  34.0  19.0   4.0  13.0  24.0
K3  0.76  11.0  20.0  18.0  25.0   7.0  11.0  16.0   7.0  13.0   7.0   6.0   8.0  11.0  19.0  2.0  7.0  0.0  0.0  0.0
    4.00   8.0   5.0  17.0   7.0  15.0  40.0  36.0   6.0  11.0  32.0  18.0   4.0  12.0  23.0
K3  0.78  11.0  20.0  17.0  24.0   7.0  10.0  15.0   6.0  12.0   6.0   6.0   8.0  10.0  18.0  2.0  7.0  0.0  0.0  0.0
    3.00   7.0   5.0  16.0   7.0  14.0  39.0  35.0   6.0  10.0  30.0  17.0   4.0  12.0  22.0
K3  0.80  11.0  21.0  16.0  23.0   6.0  10.0  15.0   5.0  12.0   6.0   6.0   8.0  10.0  17.0  2.0  7.0  0.0  0.0  0.0
    3.00   7.0   5.0  15.0   6.0  13.0  37.0  33.0   6.0  10.0  29.0  17.0   4.0  11.0  21.0
K3  0.82  10.0  21.0  16.0  22.0   6.0  10.0  14.0   5.0  12.0   6.0   5.0   7.0  10.0  17.0  2.0  6.0  0.0  0.0  0.0
    3.00   6.0   4.0  14.0   6.0  12.0  34.0  32.0   5.0  10.0  28.0  16.0   3.0  11.0  20.0
K3  1.00   7.0  13.0  11.0  16.0   6.0   9.0  11.0   4.0   8.0   4.0   3.0   5.0   7.0  13.0  2.0  5.0  0.0  0.0  0.0
    3.00   4.0   3.0  10.0   5.0   9.0  21.0  20.0   4.0   7.0  21.0  12.0   3.0   7.0  14.0
K3  1.10   6.0  12.0  10.0  14.0   4.0   5.0   9.0   4.0   7.0   3.0   3.0   4.0   6.0  11.0  1.0  3.0  0.0  0.0  0.0
    2.00   3.0   3.0   9.0   4.0   8.0  18.0  18.0   4.0   5.0  19.0  10.0   3.0   6.0  11.0
K3  1.24   5.0   9.0   7.0  12.0   3.0   4.0   8.0   3.0   6.0   3.0   3.0   3.0   5.0   9.0  1.0  3.0  0.0  0.0  0.0
    2.00   2.0   3.0   8.0   4.0   7.0  12.0  13.0   3.0   4.0  16.0   8.0   2.0   5.0   8.0
K3  1.38   4.0   7.0   6.0  10.0   3.0   4.0   6.0   3.0   5.0   3.0   2.0   3.0   4.0   8.0  1.0  2.0  0.0  0.0  0.0
    2.00   2.0   2.0   6.0   4.0   6.0   8.0   9.0   3.0   4.0  13.0   7.0   2.0   5.0   7.0
K3  1.52   4.0   4.0   6.0   8.0   3.0   4.0   5.0   3.0   5.0   2.0   2.0   3.0   3.0   6.0  1.0  2.0  0.0  0.0  0.0
    2.00   1.0   2.0   5.0   3.0   4.0   5.0   5.0   3.0   3.0  12.0   6.0   2.0   4.0   6.0
K3  1.66   4.0   3.0   5.0   7.0   2.0   3.0   5.0   2.0   4.0  10.0   2.0   2.0   3.0   5.0  1.0  2.0  0.0  0.0  0.0
    2.00   1.0   2.0   4.0   3.0   4.0   4.0   4.0   3.0   3.0   8.0   6.0   2.0   4.0   5.0
K3  1.80   3.0   2.0   5.0   6.0   2.0   3.0   4.0   2.0   4.0   2.0   2.0   2.0   3.0   5.0  1.0  2.0  0.0  0.0  0.0
    1.00   1.0   2.0   3.0   3.0   3.0   3.0   3.0   2.0   3.0   7.0   5.0   2.0   4.0   4.0
K3  1.94   3.0   2.0   4.0   6.0   2.0   3.0   4.0   2.0   4.0   2.0   2.0   2.0   3.0   4.0  1.0  2.0  0.0  0.0  0.0
    1.00   1.0   2.0   3.0   3.0   3.0   3.0   2.0   2.0   2.0   6.0   5.0   2.0   3.0   3.0
K3  2.00   3.0   1.0   4.0   6.0   2.0   3.0   4.0   2.0   4.0   2.0   2.0   2.0   3.0   4.0  1.0  2.0  0.0  0.0  0.0
    1.00   1.0   2.0   3.0   2.0   3.0   2.0   1.0   2.0   2.0   6.0   5.0   2.0   3.0   3.0
$ENDPROGRAM
```

IV
7.

APPENDIX V

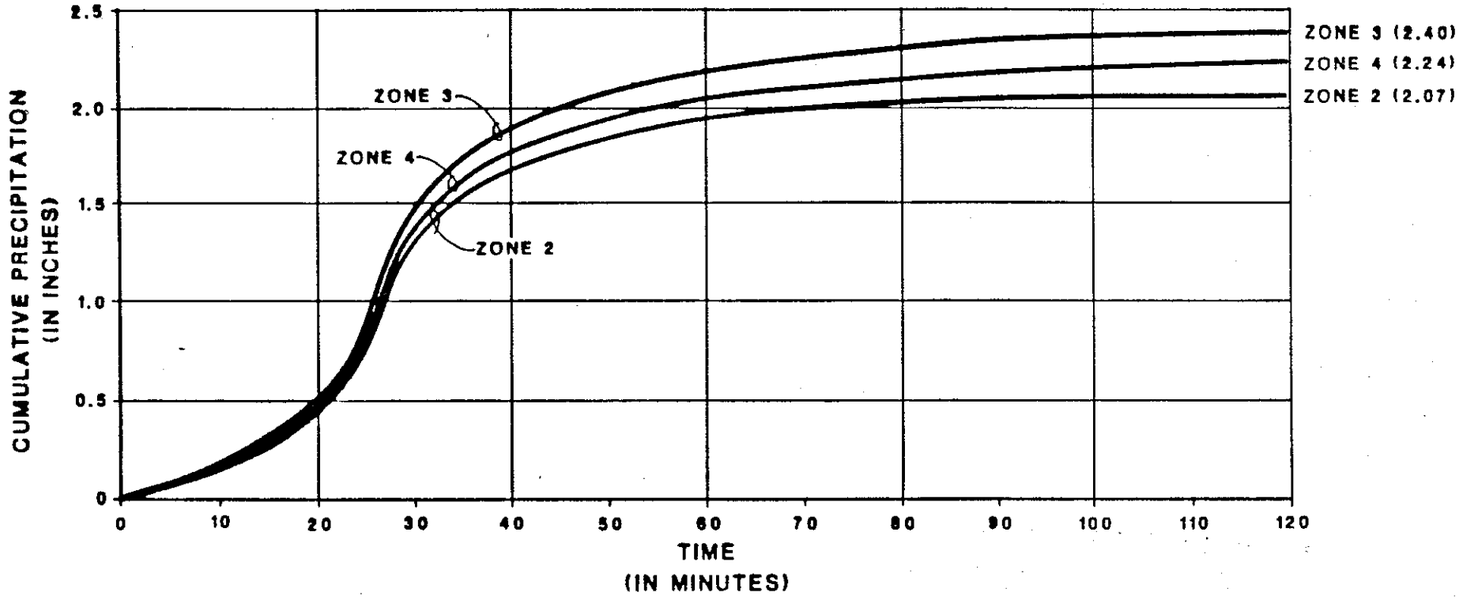
HEGGEN RAINFALL DISTRIBUTION

MANUFACTURER'S PUMP INFORMATION

SYSTEM CURVE CALCULATIONS

SUMMARY OF COMMENTS ON "SUPERFUND" SITE

HEGGEN RAINFALL DISTRIBUTION



100-YEAR, 6-HOUR RAINFALL ALBUQUERQUE AREA

ZONE 2 EAST OF RIO GRANDE, BELOW 5200' ELEV.

ZONE 3 NORTH OF CENTRAL AVE., ABOVE 5200' ELEV.

ZONE 4 SOUTH OF CENTRAL AVE., ABOVE 5200' ELEV.

MANUFACTURER'S PUMP INFORMATION
1 of 2

JUN 21 '90 9:38 FAIRBANKS MORSE KC #913-371-5000 P. 1/ 2

Fairbanks Morse
Pump Corporation

3601 Fairbanks Avenue
Kansas City, KS 66110-0129
913 371-5000
Telex: 249461 (RCA,
Cable: FAIRBANKS

FACSIMILE

TO: Allen Taylor - T.P. Pump
FROM: Corey Schiller
DATE: 6-21-90
RE: SN - 79618 - 195 - 237
Curves

NO. OF PAGES TO FOLLOW: 1

(If you don't receive all pages, please contact Sender at (913) 371-5000.)

PUMP #1

79618 - 18" 5710 C.W.
10,000 GPM - 22' TDH - 695 RPM
75HP - 720 RPM 18½" DIAMETER
CURVE ATTACHED FROM OLD PRICE
BOOK - I DO NOT HAVE ORIGINAL
CERTIFIED CURVE

PUMP #2

79619 - 20" 5710 C.W.
25,000 GPM - 30' TDH - 435 RPM
250HP - 3-60 - 4160 VOLT - 450 RPM
21" DIAMETER - I DO NOT HAVE
AN OLD CURVE - WILL HAVE TO USE
CURRENT BOOK CURVE

PUMP #3

79623 - 30" 5710 C.W. 40,000 GPM - 45' TDH
600 HP - 3-60 - 4160 V - 514 RPM 23" DIAMETER 495A:
- DO NOT HAVE ORIGINAL CURVE - WILL HAVE TO USE

S/N 79611-2

PUMP #1

FAIRBANKS, MORSE & CO.
Sales Engineering Data
MARCH, 1946.
695 R.P.M.
SEPT. 1948.

PUMP 18" Fig. 5710-20
IMPELLER L18B18
IMP. DIA. ____ R. P. M. 695
MAX. SUCTION LIFT 10 FT.
MAX. SOLIDS 3/4" DATE 3-1-49

TOTAL HEAD IN FEET

U. S. GALLONS PER MINUTE

PUMP 20" Fig. 5710-20
IMPELLER L20B1P
IMP. DIA. ____ R. P. M. 695
MAX. SUCTION LIFT 10 FT.
MAX. SOLIDS 1½" DATE 8-2-48

TOTAL HEAD IN FEET

U. S. GALLONS PER MINUTE

5700
PERFORMANCE

30"
711
5721
5741

440
RPM

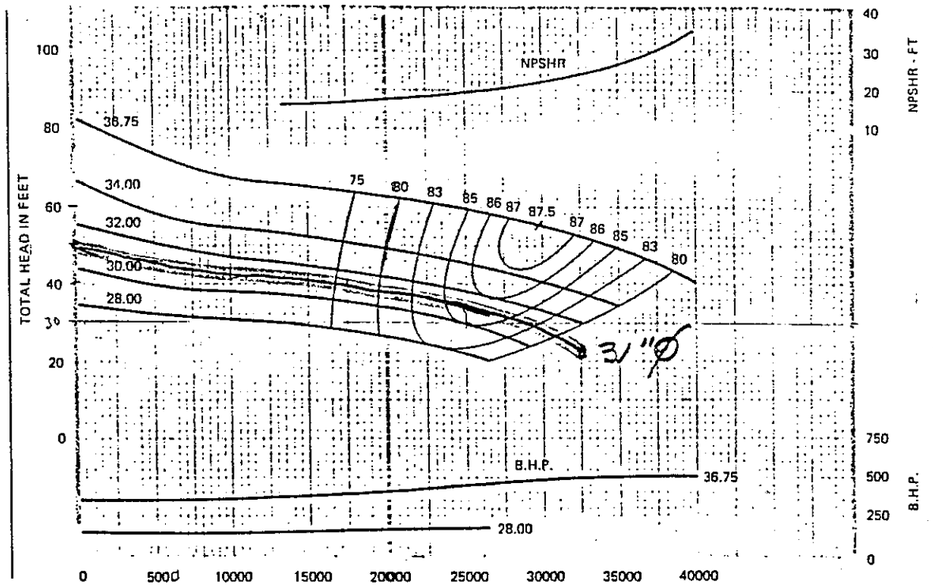
NO. VANES
2

SUCTION SIZE
30"

IMPELLER
L30A1D

EYE AREA
373 68 SQ. IN.

MAX SPHERE
11"



E

3.

796195

25,000 GPM

PUMP #2

5700
PERFORMANCE

30"
5711
5721
5741

505
RPM

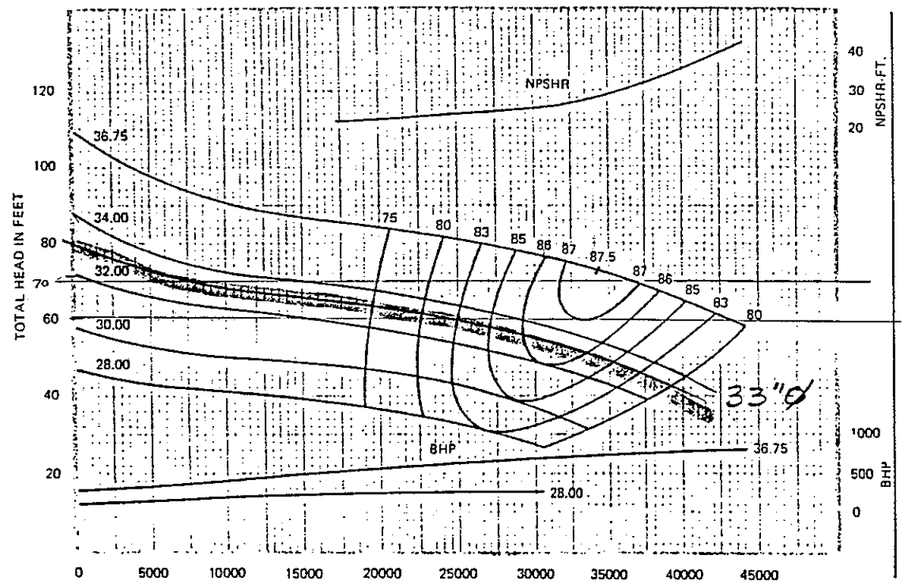
NO. VANES
2

SUCTION SIZE
30"

IMPELLER
L30A1D

EYE AREA
373.68 SQ. IN.

MAX. SPHERE
11"



796237

40,000 GPM

PUMP #3

SYSTEM CURVE CALCULATIONS

COMBINED PUMPS CURVE * VS. SYSTEM HEAD

	Wet Well WS	#1 Q GPM	#2 Q GPM	#3 Q GPM	TTL Q GPM	CFS	SYST. HEAD
	4924.9	0	0	0	0	0	30.1
Pump #1 Turn-on	4925.0	5000	—	—	5000	11	32.8
	4930.0	7000	—	—	7000	15.6	28.2
	4935.2	8500	—	—	8500	19	24.3
Pump #2 Turn-on	4935.3	3500	26000	—	29500	66	33.9
	4935.9	3500	26500	—	30000	68	31.6
Pump #3 Turn-on	4936.0	0	5000	38900	43000	96	46.2
	4941.0	0	6500	38500	45000	100	44.1
TOP OF WET WELL	4947.0	0	9000	40000	49000	109	42.5

*All discharges and system heads derived from spreadsheet model "SYSTHEAD.2020"

BOHANNAN-HUSTON INC.

PROJECT NAME S. Broadway SHEET ____ OF ____

PROJECT NO. ____ BY BG DATE 7-19-90

SUBJECT ____ CH'D ____ DATE ____

BELL/COMMERCIAL PUMP STATION

SYSTEM HEAD

IMPELLOR CL ELEV.=	4925.8
36" DISCHARGE LINE ELEV.=	4955.0
WET WELL MAX ELEV.=	4947.0
PUMP 1 TURN-ON WS ELEV.=	4929.0
PUMP 2 TURN-ON WS ELEV.=	4939.2
PUMP 3 TURN-ON WS ELEV.=	4939.8
ASSUMED WET WELL WATER SURFACE ELEV.=	4939.7 *

	FLOWRATE (GPM)		VELOCITY (FPS)	HEADLOSS (FT)	
FORCE MAIN ELEMENTS					
36" STEEL PIPE, L=1000' (N=.013)	32000	*	10.10	11.41	
22 1/2 DEG BEND, 36" DIA	32000		10.10	0.16	
45 DEG BEND, 36" DIA	32000		10.10	0.22	
90 DEG BEND, 36" DIA, LONG RADIUS	32000		10.10	0.35	
EXIT LOSS (SUDDEN EXP)	32000		10.10	0.79	
DISCHARGE HEADER ELEMENTS					
PUMP #1					
18" GATE VALVE	4500	*	5.68	0.20	
45 DEG BEND, 18" DIA	4500		5.68	0.07	
18" TO 36" REDUCER	4500		5.68	0.14	
PUMP #2					
30" GATE VALVE	27500	*	12.49	0.97	
30" TO 36", 45 DEG WYE	27500		12.49	-0.83	OR 1.00
PUMP #3					
30" GATE VALVE	0	*	0.00	0.00	
30" TO 36", 45 DEG WYE	0		0.00	0.00	OR 1.00
ELEVATION HEAD				15.30	
TOTAL SYSTEM HEADLOSSES				31.61	

* ENTER VARIABLES IN THESE CELLS

SUMMARY OF COMMENTS ON "SUPERFUND" SITE

The following is a summary of conversations with various government officials and private consultants concerning the proposed location for the South Detention Reservoir as outlined in the South Broadway Sector Drainage Management Plan. The site is located on the northwest corner of the intersection of Broadway Boulevard and Woodward Road.

Bob Enz - Geoscience Consultants, Ltd.:
Mr. Enz feels the detention reservoir should not be located at the proposed site for the following reasons:

1. All operable units within the Superfund Area will eventually have monitor wells installed, and building a detention reservoir will impede the monitoring and cleanup process in the area.
2. The EPA currently has 2 monitor wells within the proposed site and has requested that additional wells be drilled at the northwest corner of Wesmeco and Broadway just northwest of the proposed site. Mr. Enz believes additional monitor wells may be requested by the EPA within the proposed site.
3. Approval of a detention reservoir at the proposed site is not likely.

Sam Cummins - City of Albuquerque, Public Works Department:
Mr. Cummins recommends locating the detention reservoir outside of the Superfund Area for the following reasons:

1. The proposed location may interfere with EPA cleanup in the area.
2. The City does not want to assume the responsiblity for cleanup in the area and is hesitant to proceed with any action that may result in such.
3. There is concern over the posibility of water stored in the detention reservoir driving the contaminants in the area into the ground water.

Additionally, if the current site is chosen, the detention reservoir will need to be lined.

Kelly Summers - City of Albuquerque, Public Works Department:
Mr. Summers strongly recommends locating the detention reservoir outside of the Superfund Area for the following reasons:

1. The possibility of covering existing monitoring wells makes the proposed site undesireable.
2. The City does not want to assume the responsiblity for cleanup in the area and is hesitant to proceed with any action that may result in such.
3. The existing operable sites within the area make the proposed site undesireable.

Karen Jackson - City of Albuquerque, Legal Department:
Mrs. Jackson said that no detention reservoir shall be located at the proposed site unless it is approved by Robert Gurule from the Public Works Department at the City.

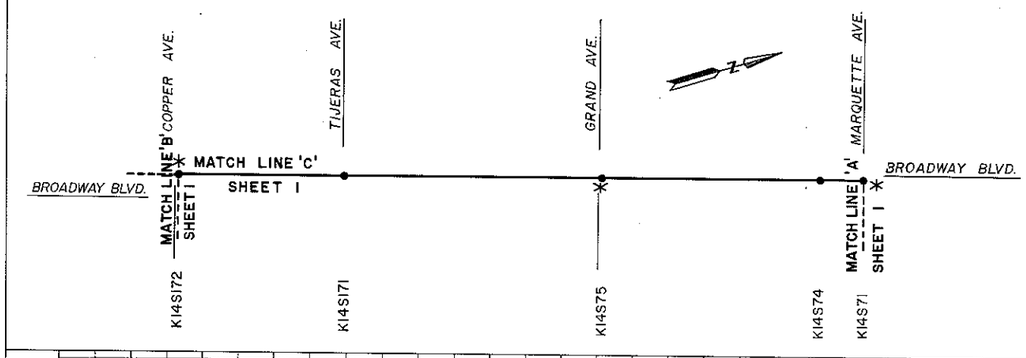
Tim Underwood - EPA Dallas: Mr. Underwood's initial response is that if the detention reservoir is lined and existing monitor wells are not disturbed the proposed site should not be a problem. He, however, requested further information before making a final decision on the matter.

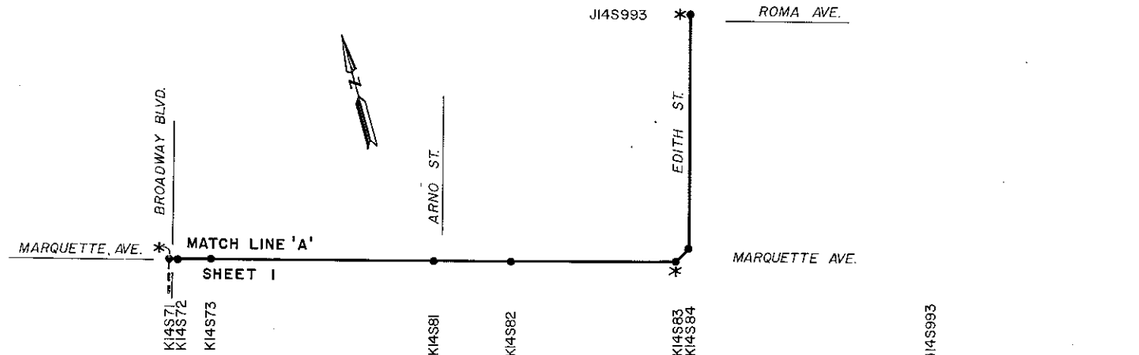
PLATES

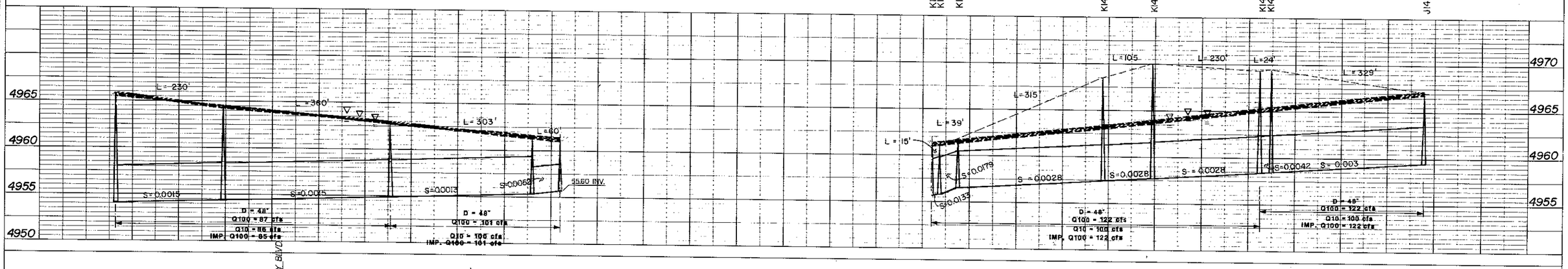
PLATES 1-9 STORM SEWER PROFILE SHEETS

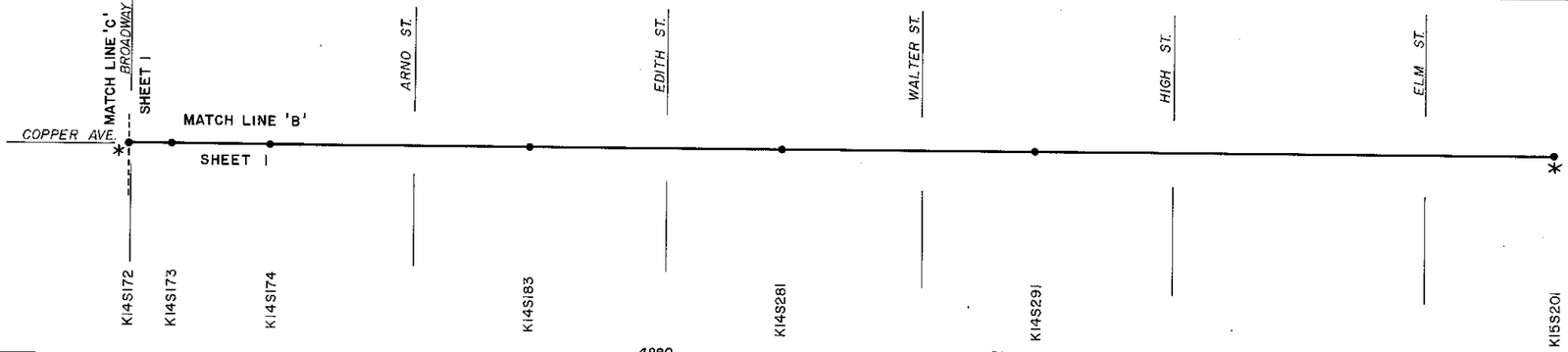
PLATE 10 MODELING MAP

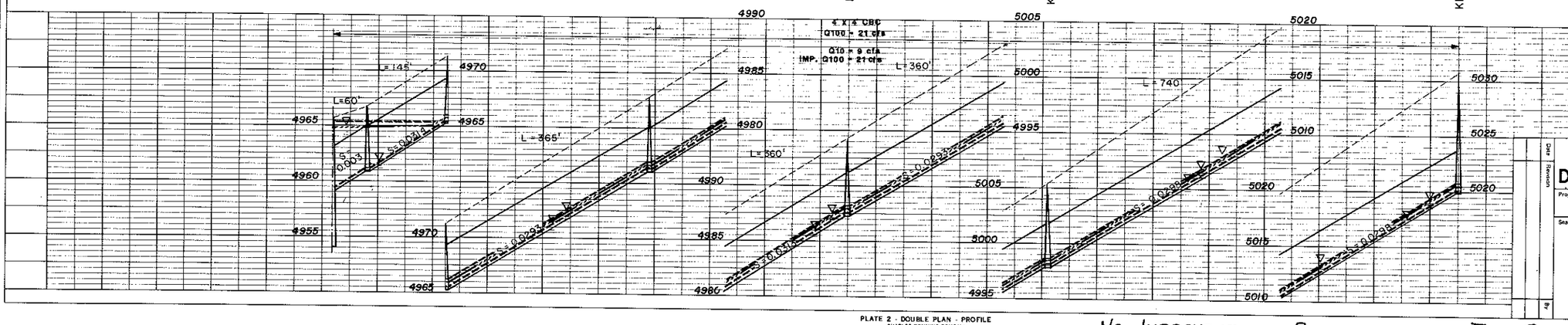
PLATE 11 SWMM MODEL SCHEMATIC











LEGEND

- = EXISTING GRADE
- = STORM DRAIN LINE & MANHOLE in PROFILE
- = STORM DRAIN LINE & MANHOLE in PLAN (*DENOTES ANALYSIS PT.)
- = 100 YEAR STORM HYDRAULIC GRADE LINE
- = 10 YEAR STORM HYDRAULIC GRADE LINE
- = 100 YEAR STORM HYDRAULIC GRADE LINE W/IMPROVEMENT

PLAN: SURVEYED, PLOTTED, GRADES CHECKED, R/W CHECKED, NOTE BOOK, NO, BY, DATE

PROFILE: SURVEYED, PLOTTED, GRADES CHECKED, B. M. NOTED, STRUCTURE NOTATIONS CHKD, NOTE BOOK, NO, BY, DATE

SOUTH BROADWAY DRAINAGE MANAGEMENT STUDY

EDITH ST., MARQUETTE AVE., BROADWAY BLVD., & COPPER AVE.

Map No. J14S, K14N

Job No. 89208.03 | Sheet 1 of 9

Drawn By: DHG | Date: NOV. '89

Checked By: HBG | Scale: HORIZ.: 1"=100' VERT.: 1"=5'

Date | Revision | By

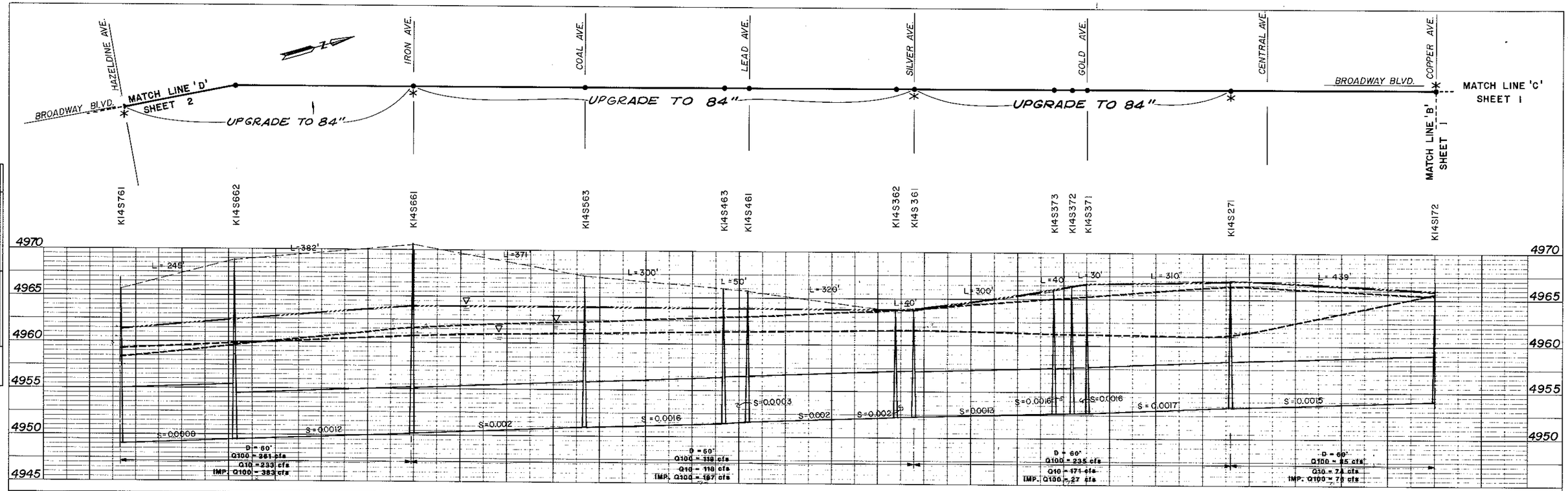
Project No.

Seal

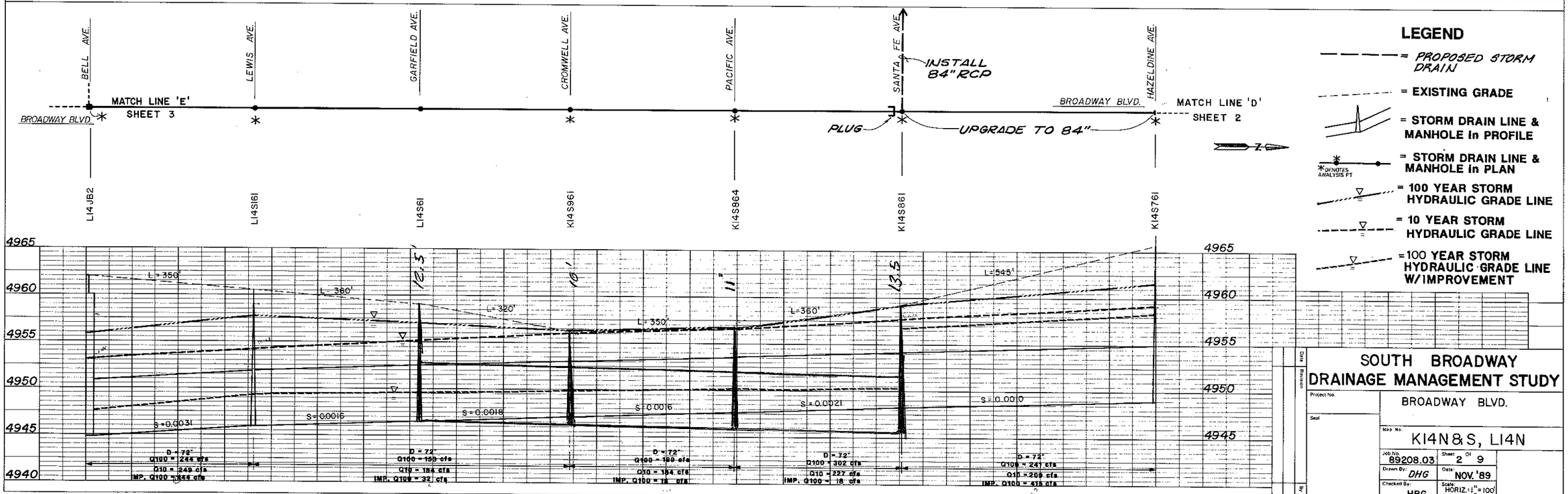
PLATE 2 - DOUBLE PLAN - PROFILE
CHARLES BRUNING COMPANY
MADE IN U.S.A.

NO IMPROVEMENTS RECOMMENDED ON THIS SHEET.

PLAN
SURVEYED:
PLOTTED:
DESIGN CHECKED:
R/T OF WAY CHECKED:
NOTE BOOK
NO.
DATE
BY



PROFILE
SURVEYED:
PLOTTED:
DESIGN CHECKED:
QUANTITIES CH'KD:
STRUCTURE NOTATNS CH'KD:
NOTE BOOK
NO.
DATE
BY



LEGEND

- = PROPOSED STORM DRAIN
- = EXISTING GRADE
- = STORM DRAIN LINE & MANHOLE in PROFILE
- = STORM DRAIN LINE & MANHOLE in PLAN (* DENOTES ANALYSIS PT)
- = 100 YEAR STORM HYDRAULIC GRADE LINE
- = 10 YEAR STORM HYDRAULIC GRADE LINE
- = 100 YEAR STORM HYDRAULIC GRADE LINE W/IMPROVEMENT

SOUTH BROADWAY DRAINAGE MANAGEMENT STUDY

BROADWAY BLVD.

Project No.

Seal

Map No. KI4N&S, LI4N

Job No. 89208.03 | Sheet 2 Of 9

Drawn By: DHG | Date: NOV. '89

Checked By: HBG | Scale: HORIZ.: 1" = 100' VERT.: 1" = 5'

Date | Revision | By

PLATE 2 - DOUBLE PLAN - PROFILE
CHARLES BRUNING COMPANY
MADE IN U.S.A.

WILLIAM ST. | JOHN ST. | MATCH LINE 'G' SHEET 3 | BROADWAY BLVD. | TRUMBULL AVE. | STADIUM BLVD. | BELL AVE. | MATCH LINE 'F' SHEET 3 | BROADWAY BLVD. | JOHN ST. | WILLIAM ST. | COMMERCIAL ST. | BELL

MATCH LINE 'H' SHEET 9 — TRUMBULL AVE.

MATCH LINE 'G' SHEET 3 — DIRECT EXISTING 48" RCP INTO MH L14S361 — L14S263 — BROADWAY BLVD.

MATCH LINE 'E' SHEET 2 — BELL AVE.

MATCH LINE 'F' SHEET 3 — REPLACE 36" FORCE MAIN w/72" GRAVITY LINE TO PUMP STATION

NEW OUTFALL TO RIVER

BELL / COMMERCIAL PUMP STATION

BUILD 36" RCP FROM NORTH DETENTION RESERVOIR TO B/C PUMP STATION

L14S346 | L14S353 | L14S351 | L14S361 | L14S361 | L14S261 | L14JB2 | MATCH LINE 'E' SHEET 2 | L14JB2 | L14S153 | L14S144

D = 72"
Q100 = 326 cfs
Q10 = 271 cfs
IMP. Q100 = 139 cfs

L=360' | L=50' | L=430' | S=0.0032 | S=0.0012 | S=0.0063

L= 373' | L= 370' | S=0.0016 | S=0.0003

D = 72"
Q100 = 343 cfs
Q10 = 273 cfs
IMP. Q100 = 32 cfs

4960 | 4955 | 4950 | 4945 | 4940

4950 | 4945 | 4940

D = 36"
Q100 = 112 cfs
Q10 = 50 cfs
IMP. Q100 = 144 cfs

L= 540' | S=0.0046 | L= 422' | S=0.0332

PRESSURE FLOW
HYDRAULIC GRADE LINE
NOT SHOWN

4945 | 4940 | 4935 | 4930 | 4925

ANDERSON AVE. | OGLE AVE. | ABILENE AVE. | SMITH AVE. | KATHRYN AVE. | LILY AVE. | SOUTHERN AVE. | TRUMBULL AVE. 'WEST' | TRUMBULL AVE. 'EAST' | STADIUM BLVD. | BELL AVE.

MATCH LINE 'J' SHEET 4 — WILLIAM ST.

BUILD CROSS-CONNECTION BETWEEN 36" & 72"

NOTE: SEE SHEET 9 OF 9 FOR INFORMATION ON 72" PIPE.

RETAIN 10" SUMP PUMP LINE

WILLIAM ST.

BELL / COMMERCIAL PUMP STATION

LEGEND

- = PROPOSED STORM DRAIN
- = EXISTING GRADE
- = STORM DRAIN LINE & MANHOLE In PROFILE
- = STORM DRAIN LINE & MANHOLE In PLAN
- = 100 YEAR STORM HYDRAULIC GRADE LINE
- = 10 YEAR STORM HYDRAULIC GRADE LINE
- = 100 YEAR STORM HYDRAULIC GRADE LINE W/IMPROVEMENT

DENOTES ANALYSIS PT.

L14S744a | L14S644 | L14S643 | L14S641 | L14S544 | L14S545 | L14S542 | L14S441b | L14S541 | L14S443 | L14S441a | L14S442 | L14S349 | L14S347 | L14S346 | L14S345 | L14S243 | L14S245 | L14S251 | L14S244 | L14S252

NOTE: FOR INFORMATION ON 72" PIPE, SEE SHEET 9 OF 9.

L=238' | L=70' | L=312' | L=214' | L=155' | L=264' | L=221' | L=215' | L=25' | L=597' | L=220' | L=180' | NOT IN MODEL, SHOWN FOR CLARIFICATION | L=95' | L=65' | L=155' | L=70' | L=110'

S=0.0008 | S=0.0008 | S=0.0008 | S=0.0008 | S=0.001 | S=0.0008 | S=0.0008 | S=0.0008 | S=0.0017 | S=0.001 | S=0.0012

4945 | 4940 | 4935 | 4930

D = 36"
Q100 = 70
Q10 = 50
IMP. Q100 = 75 cfs

D = 36"
Q100 = 17 cfs
Q10 = 14 cfs
IMP. Q100 = 32 cfs

D = 36"
Q100 = 6 cfs
Q10 = 6 cfs
IMP. Q100 = 10 cfs

PLAN — SURVEYED | PLOTTED | ASSIGNMENT CHECKED | R/W NOTED | STRUCTURE ROTATING CHKD | NOTE BOOK NO | DATE | BY

PROFILE — SURVEYED | PLOTTED | ASSIGNMENT CHECKED | R/W NOTED | STRUCTURE ROTATING CHKD | NOTE BOOK NO | DATE | BY

SOUTH BROADWAY DRAINAGE MANAGEMENT STUDY

BELL AVE., BROADWAY BLVD., TRUMBULL AVE., & WILLIAM ST.

Project No.

Seal

Map No. L14N & S

Job No. 89208.03 | Sheet 3 Of 9

Drawn By: DHG | Date: NOV' 89

Checked By: HBG | Scale: HORIZ.: 1"= 100' VERT.: 1"= 5'

Revision | Date

PLATE 2 - DOUBLE PLAN - PROFILE
CHARLES BRUNING COMPANY
MADE IN U.S.A.

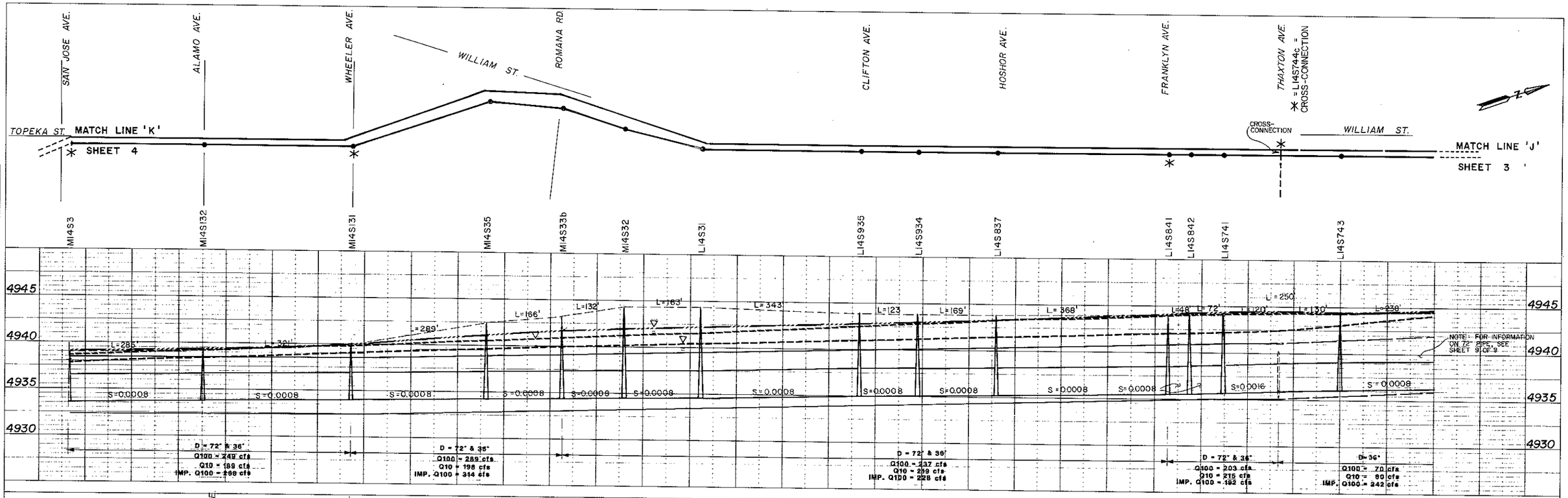
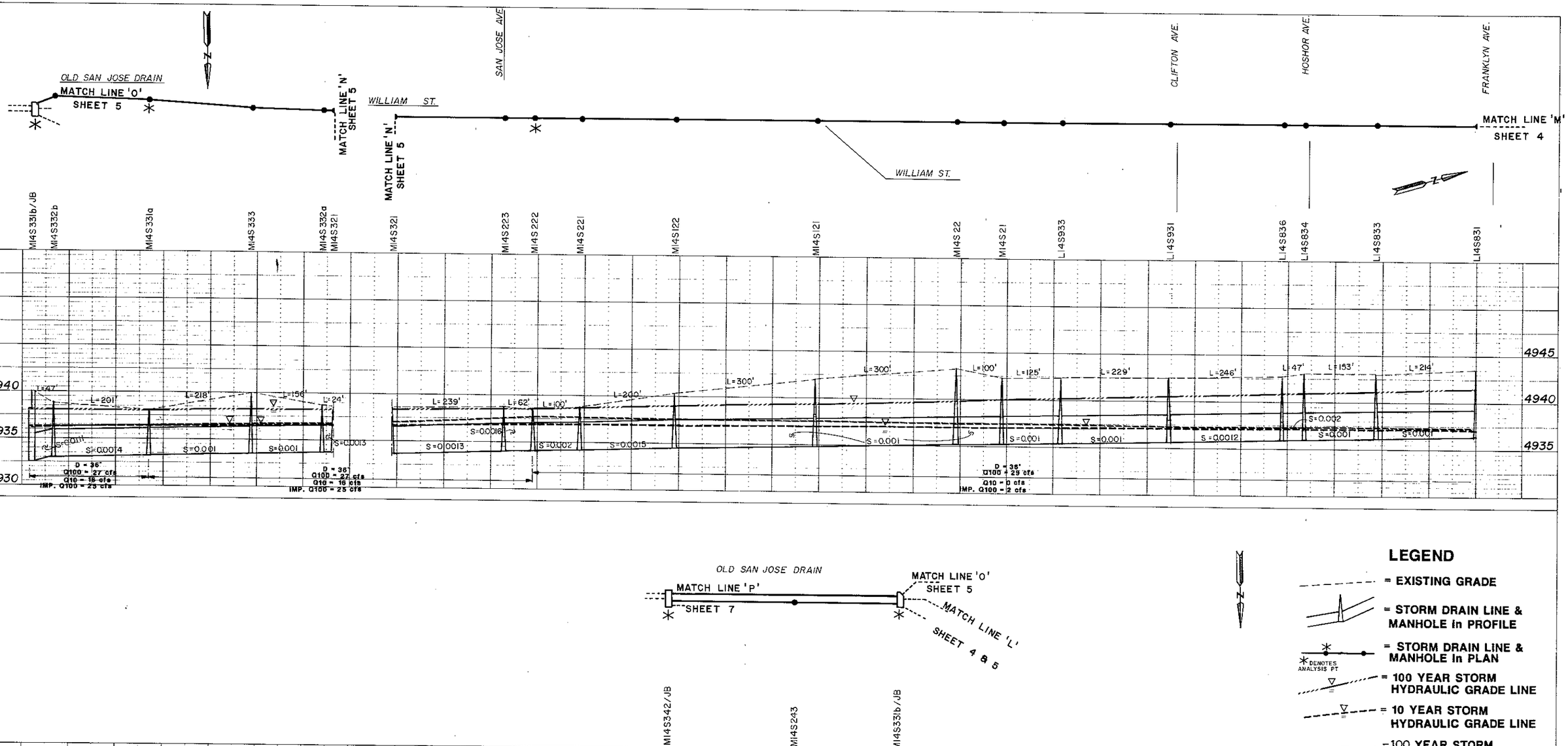


PLATE 2 - DOUBLE PLAN - PROFILE
CHARLES BRUNING COMPANY
MADE IN U.S.A.



PLAN — SURVEYED, PLOTTED, DRAWN, CHECKED, NOTE BOOK, NO, BY, DATE

PROFILE — SURVEYED, PLOTTED, DRAWN, CHECKED, NOTE BOOK, NO, BY, DATE

SOUTH BROADWAY
DRAINAGE MANAGEMENT STUDY

WILLIAM ST. &
THE OLD SAN JOSE DRAIN

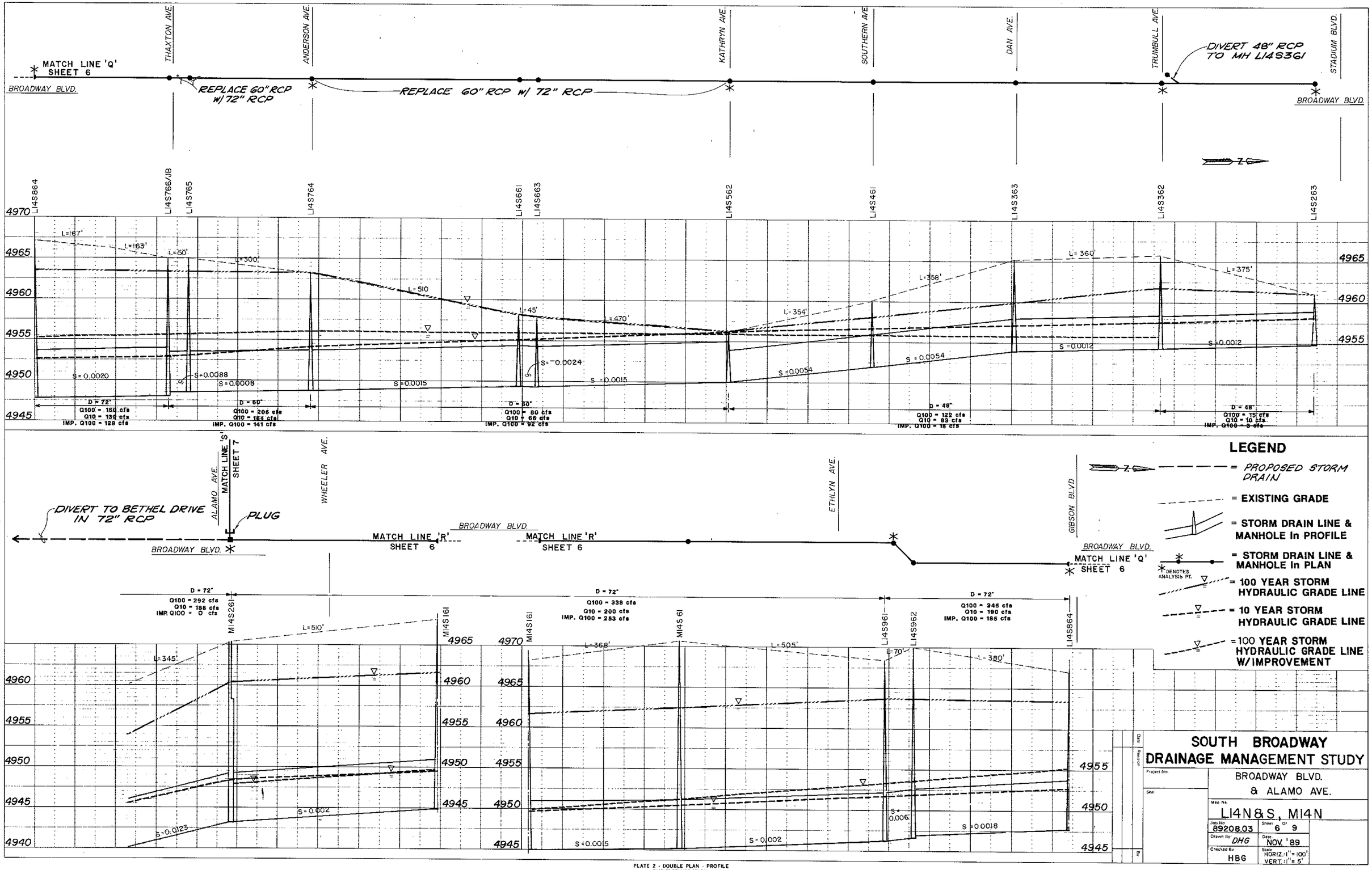
Map No. LI4S, MI4N

Job No. 89208.03 | Sheet 5 of 9
Drawn By: DHG | Date: NOV. '89
Checked By: HBG | Scale: HORIZ. 1" = 100' VERT. 1" = 5'

Project No. | Seal | Date | By | Revision

PLATE 2 - DOUBLE PLAN - PROFILE
CHARLES BRUNNING COMPANY
MADE IN U.S.A.

NO IMPROVEMENTS RECOMMENDED ON THIS SHEET.



SOUTH BROADWAY DRAINAGE MANAGEMENT STUDY

BROADWAY BLVD. & ALAMO AVE.

Map No. LI4N&S, MI4N

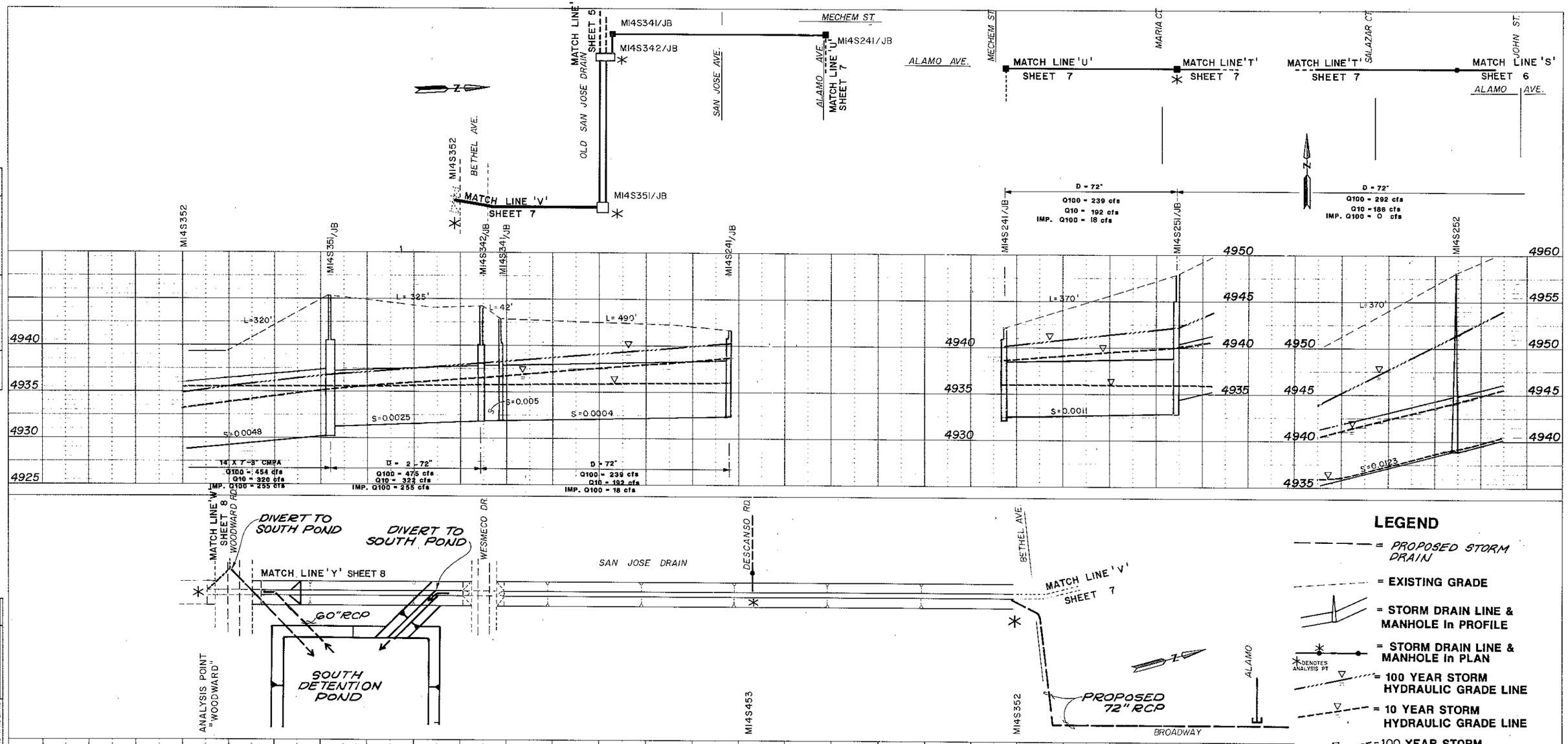
Job No. 89208.03 | Sheet 6 Of 9

Drawn By DHG | Date NOV. '89

Checked By HBG | Scale HORIZ.: 1"=100' VERT.: 1"=5'

Project No. | Seal | Date | Revision | By

PLATE 2 - DOUBLE PLAN - PROFILE
CHARLES BRUNING COMPANY
MADE IN U.S.A.



LEGEND

- = PROPOSED STORM DRAIN
- = EXISTING GRADE
- = STORM DRAIN LINE & MANHOLE In PROFILE
- = STORM DRAIN LINE & MANHOLE In PLAN (DENOTES ANALYSIS PT)
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- = 10 YEAR STORM HYDRAULIC GRADE LINE
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PLAN — SURVEYED, PLOTTED, ALIGNMENT CHECKED, AS-BUILT CHECKED, NOTE BOOK, NO

PROFILE — SURVEYED, PLOTTED, GRADES CHECKED, AS-BUILT CHECKED, STRUCTURE NOTATNS CHKD, NOTE BOOK, NO

DATE | BY

SOUTH BROADWAY DRAINAGE MANAGEMENT STUDY

ALAMO AVE., MECHEM ST., OLD SAN JOSE DRAIN & THE SAN JOSE DRAIN

Map No. MI4N & S

Job No. 89208.03 | Sheet 7 Of 9

Drawn By: DHG | Date: NOV. '89

Checked By: HBG | Scale: HORIZ.: 1"=100' VERT.: 1"= 5'

Project No. | Seal | Date | Revision | By

PLATE 2 - DOUBLE PLAN - PROFILE

SAN JOSE DRAIN

PLUG

MATCH LINE 'W' SHEET 7

WOODWARD RD.

DIVERT TO SOUTH POND

LATERAL

SAN JOSE

WILLIAM ST.

MATCH LINE 'X' SHEET 8

WOODWARD RD.

WESMECO DR.

MATCH LINE 'X' SHEET 8

WILLIAM ST.

ANALYSIS POINT "WOODWARD"

M14S642 M14S641 M14S631 M14S622 M14S621 M14S621 M14S521 M14S522 M14S421 M14S334

4940
4935
4930
4925

L=66' L=379' L=378' L=360' L=346' L=416' L=400' L=401' L=300'

S=0.00045 S=0.001 S=0.001 S=0.001 S=0.001 S=0.001 S=0.001 S=0.001

D = 36"
Q100 = 12 cfs
Q10 = 9 cfs
IMP. Q100 = 14 cfs

D = 36"
Q100 = 12 cfs
Q10 = 6 cfs
IMP. Q100 = 20 cfs

OPTION 4: UPGRADE DIRT SECTION OF SAN JOSE DRAIN

OPTION 5: UPGRADE SAN JOSE DRAIN -- CONCRETE SECTION

OPTION 2 DETENTION RESERVOIR

OPTION 3 DETENTION RESERVOIR

SAN JOSE LATERAL

RAILROAD

CITY LIMITS

ANALYSIS POINT "BOGUS"

1000'

ANALYSIS POINT "LIMITS"

WOODWARD RD.

FROM 36" WOODWARD LINE

SAN JOSE DRAIN MATCH LINE 'Y' SHEET 7

ANALYSIS POINT "WOODWARD"

OPTION 1: 60" RCP FROM DETENTION RESERVOIR

4940
4935
4930
4925
4920

TOP OF CHANNEL

NORMAL DEPTH = 8.3'

S=0.00144

TRAP CHANNEL
d = 9' b = 10'
Q100 = 890 cfs
Q10 = 432 cfs
IMP. Q100 = 319 cfs

TRAP. CHANNEL
d = 9' b = 10'
Q100 = 754 cfs
Q10 = 368 cfs
IMP. Q100 = 240 cfs ; OPTION 2

LEGEND

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- = STORM DRAIN LINE & MANHOLE in PLAN
- = 100 YEAR STORM HYDRAULIC GRADE LINE
- = 10 YEAR STORM HYDRAULIC GRADE LINE
- = 100 YEAR STORM HYDRAULIC GRADE LINE W/IMPROVEMENT

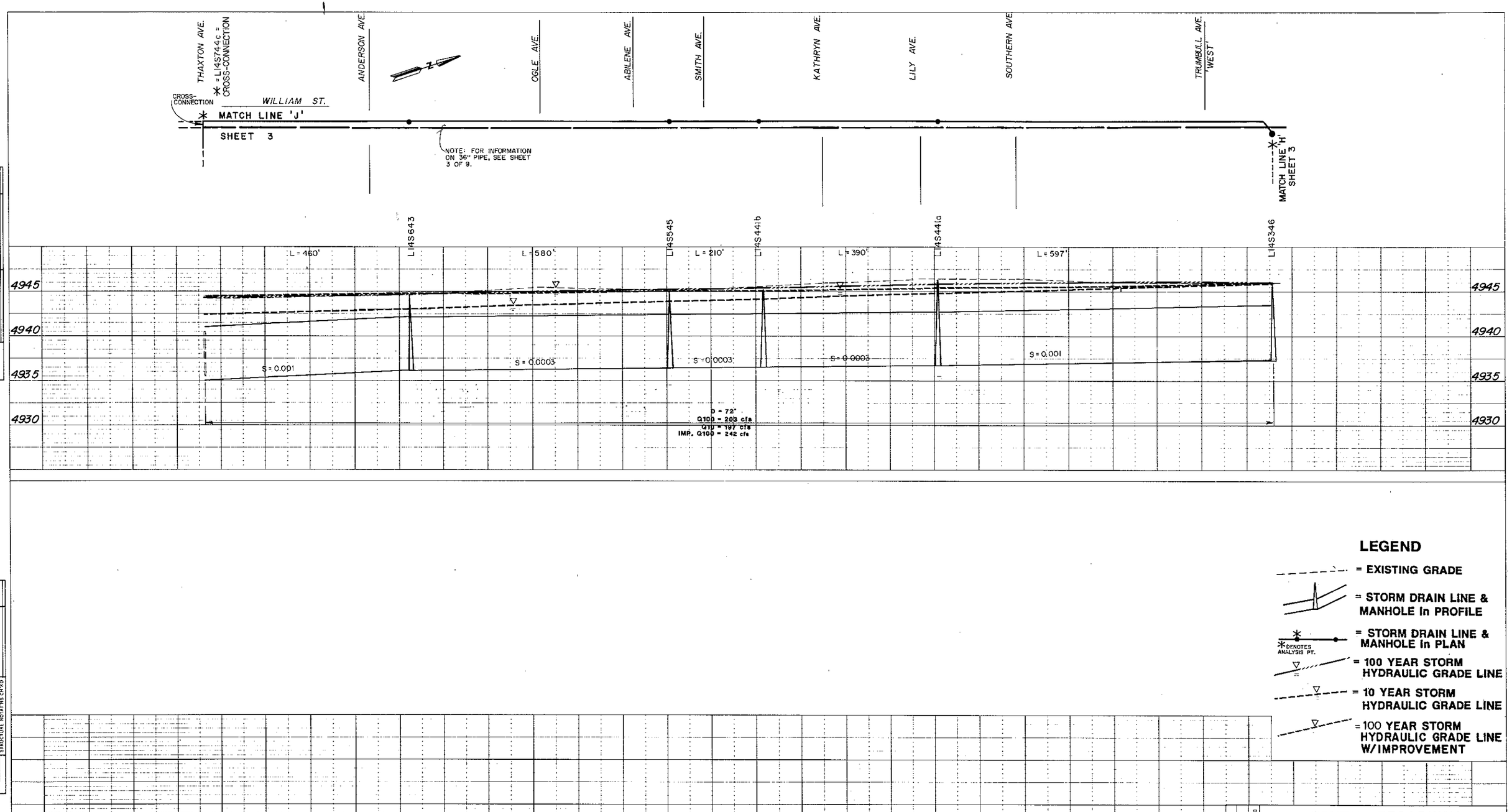
PLAN / PROFILE
SURVEYED
PLOTTED
CROSS CHECKED
NOTE BOOK
NO.
BY
DATE

SOUTH BROADWAY DRAINAGE MANAGEMENT STUDY

WILLIAM ST., WOODWARD RD., & THE SAN JOSE DRAIN

Project No
Seal
Map No. M14N&S
Job No 89208.03
Sheet 8 Of 9
Drawn By DHG
Date NOV. '89
Checked By HBG
Scale HORIZ.: 1"=100' VERT.: 1"= 5'

PLATE 2 - DOUBLE PLAN - PROFILE
CHARLES BRUNING COMPANY
MADE IN U.S.A.



PLAN — SURVEYED, PLOTTED, ALIGNMENT CHECKED, R/W CHECKED, NOTE BOOK, NO, BY, DATE

PROFILE — SURVEYED, PLOTTED, GRADES CHECKED, R/W NOTED, STRUCTURE NOTATING CHK'D, NOTE BOOK, NO, BY, DATE

SOUTH BROADWAY
DRAINAGE MANAGEMENT STUDY

Project No.

Seal

WILLIAM ST.

Map No. L14N & L14S

Job No. 89208.03 | Sheet 9 Of 9

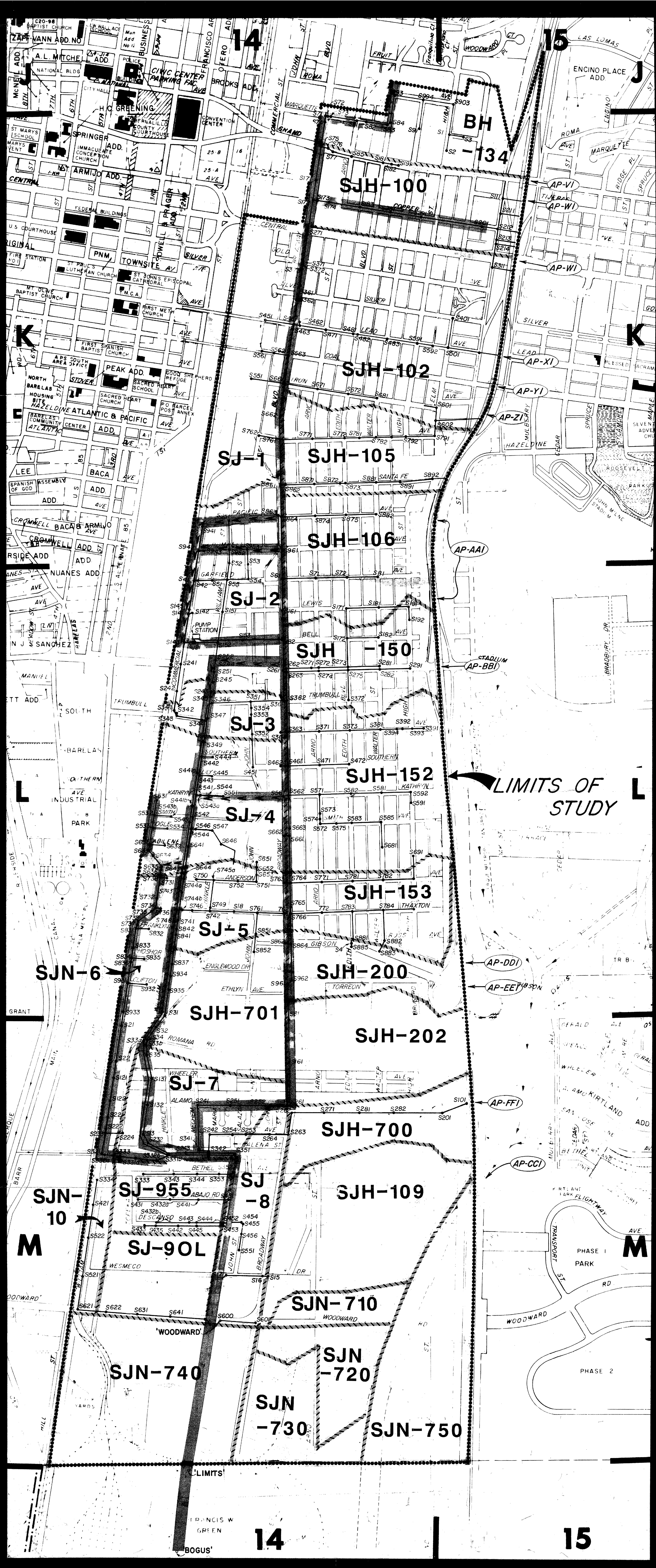
Drawn By: HB | Date: NOV. '89

Checked By: HBG | Scale: HORIZ.: 1" = 100' VERT.: 1" = 5'

Date / Revision / By

PLATE 2 - DOUBLE PLAN - PROFILE
CHARLES BRUNING COMPANY
MADE IN U.S.A.

No Improvements Recommended on This Sheet.



MODELING DATA FOR SOUTH BROADWAY STUDY AREA

ZONE ATLAS	MANHOLE# UP STRM.	INVERT	MANHOLE # DN. STRM.	INVERT	LENGTH (FT.)	DIA. (IN.)	SLOPE (FT/FT)	CAPACITY (CFS)	CITY JOB NUMBER
J14S									
J14S	S994	4970.30	S993	4959.42	305	24	0.03567	37.0	10-002-74
J14S	S993	4959.42	K14N/S84	4958.42	329	48	0.00304	68.6	10-002-74
J14S	S971	4956.14	K14N/S71	4955.60	360	36	0.00150	22.4	08-571-57
J15S									
J15S	S903	4981.04	J14S/S994	4970.30	358	15	0.03000	9.7	10-002-74
K14N									
K14N	S91	4980.59	J14S/S994	4970.30	322	24	0.03196	35.1	10-002-74
K14N	S993	4959.42	S84	4958.42	329	48	0.00304	68.6	10-002-74
K14N	S84	4958.42	S83	4958.32	24	48	0.00417	80.4	10-002-74
K14N	S83	4958.32	S82	4957.67	230	48	0.00283	66.2	10-002-74
K14N	S82	4957.67	S81	4957.38	105	48	0.00276	65.4	10-002-74
K14N	S81	4957.38	S73	4956.50	315	48	0.00279	65.8	10-002-74
K14N	S73	4956.50	S72	4955.80	39	48	0.01795	166.8	10-002-74
K14N	S72	4955.80	S71	4955.60	15	48	0.01333	143.8	10-002-74
K14N	S71	4955.60	S74	4955.29	60	36	0.00517	41.6	08-571-57
K14N	S74	4955.29	S75	4954.91	303	48	0.00125	44.1	08-392-39
K14N	S191	4983.00	S182	4981.46	50	24	0.03080	34.4	10-175-70
K14N	S182	4981.46	S181	4979.44	65	24	0.03108	34.6	10-175-70
K14N	S181	4972.51	S85	4964.09	279	30	0.03018	61.8	10-175-70
K14N	S85	4964.09	S77	4957.51	296	30	0.02223	53.0	10-175-70
K14N	S77	4957.51	S76	4956.79	32	30	0.02250	53.3	10-175-70
K14N	S76	4956.79	S75	4955.00	53	30	0.03377	65.3	10-175-70
K14N	S75	4954.91	S171	4954.37	360	48	0.00150	48.2	07-007-50
K14N	S171	4954.37	S172	4954.03	230	48	0.00148	47.9	07-007-50
K14N	S172	4954.03	S271	4953.39	439	60	0.00146	86.2	07-007-50
K14N	S271	4953.39	S371	4952.85	310	60	0.00174	94.2	07-007-50
K14N	S371	4952.85	S372	4952.80	30	60	0.00167	92.2	NA
K14N	S372	4952.80	S373	4952.74	40	60	0.00159	89.9	NA
K14N	S373	4952.74	S361	4952.36	300	60	0.00127	80.5	NA
K14N	S361	4952.36	S362	4952.28	40	60	0.00200	101.0	NA
K14N	S362	4952.28	S461	4951.64	320	60	0.00200	101.0	NA
K14N	S461	4951.64	K14S/S463	4951.55	350	60	0.00026	36.4	NA
K14N	S291	4997.86	S281	4987.33	360	4x4CBC	0.02925	312.8	08-391-39
K14N	S281	4987.33	S183	4976.05	360	4x4CBC	0.03133	323.7	08-391-39
K14N	S183	4976.05	S174	4965.41	365	4x4CBC	0.02915	312.3	08-391-39
K14N	S174	4965.41	S173	4960.86	145	4x4CBC	0.03138	324	08-391-39
K14N	S173	4960.86	S172	4959.06	60	4x4CBC	0.03000	316.8	08-391-39
K14N	S592	5001.47	S591	4997.85	181	15	0.02000	7.9	08-391-39
K14N	S591	4992.05	S483	4984.85	360	15	0.02000	7.9	08-391-39
K14N	S483	4982.61	S482	4976.85	360	18	0.01600	11.5	08-391-39
K14N	S482	4974.61	S481	4973.97	40	18	0.01600	11.5	08-391-39
K14N	S481	4973.97	S471	4968.85	360	18	0.01422	10.9	08-391-39
K14N	S471	4966.04	S462	4960.76	330	18	0.01600	11.5	08-391-39
K14N	S462	4960.76	S461	4959.95	45	18	0.01800	12.2	08-391-39
K14N	S451	4957.01	S461	4955.57	350	12	0.00411	2.0	08-541-54
K14S									
K14S	S951	4942.00	S952	4940.59	352	24	0.00401	12.4	10-002-71
K14S	S952	4940.59	S52	4939.92	174	24	0.00385	12.2	10-002-71
K14S	S52	4938.92	L14N/55	4937.75	215	30	0.00544	26.2	10-002-71
K14S	S681	4990.25	S672	4984.85	360	12	0.01500	3.8	08-391-39
K14S	S672	4980.25	S671	4974.85	360	12	0.01500	3.8	08-391-39
K14S	S671	4968.63	S661	4962.85	386	15	0.01497	6.9	08-391-39
K14S	S792	4990.80	S783	4988.10	180	48	0.01500	152.5	08-391-39
K14S	S783	4988.10	S782	4985.40	180	48	0.01500	152.5	08-391-39
K14S	S782	4981.40	S781	4978.70	180	48	0.01500	152.5	08-391-39
K14S	S781	4978.70	S772	4976.00	180	48	0.01500	152.5	08-391-39
K14S	S772	4974.31	S771	4968.85	364	48	0.01500	152.5	08-391-39
K14S	S771	4963.85	S761	4957.85	387	48	0.01550	155.0	08-391-39
K14S	S882	4974.83	S875	4967.31	360	15	0.02089	8.1	08-391-39
K14S	S875	4967.31	S874	4959.78	360	15	0.02092	8.1	08-391-39
K14S	S874	4959.78	S864	4950.85	400	18	0.02233	13.6	08-391-39
K14S	S461	4951.64	S463	4951.55	50	60	0.00180	95.8	08-392-39
K14S	S463	4951.55	S563	4950.98	300	60	0.00190	98.4	08-392-39
K14S	S563	4950.98	S661	4950.24	371	60	0.00199	100.8	08-392-39
K14S	S661	4950.24	S662	4949.48	382	60	0.00199	100.7	08-392-39
K14S	S662	4949.48	S761	4948.99	245	72	0.00200	164.2	08-392-39
K14S	S761	4948.99	S861	4948.43	545	72	0.00103	117.7	08-392-39
K14S	S861	4948.43	S864	4947.69	360	72	0.00206	166.4	08-392-39
K14S	S864	4947.69	S961	4947.13	350	72	0.00160	146.8	08-392-39
K14S	S961	4947.13	L14N/S61	4946.54	370	72	0.00160	146.8	08-392-39
K14S	S221?	5000.07	S892	4996.91	115	30	0.02748	58.9	10-002-71
K14S	S892	4996.91	S891	4990.81	216	30	0.02824	59.7	10-002-71
K14S	S891	4990.81	S881	4980.68	361	30	0.02806	59.6	10-002-71
K14S	S881	4980.68	S873	4972.25	358	30	0.02355	54.6	10-002-71
K14S	S873	4969.30	S872	4968.50	53	30	0.01509	43.7	10-002-71
K14S	S872	4968.50	S871	4963.90	307	30	0.01498	43.5	10-002-71
K14S	S871	4960.40	S862	4954.60	340	30	0.01706	46.4	10-002-71
K14S	S862	4953.85	S861	4953.20	40	30	0.01625	45.3	10-002-71
K14S	S941	4940.00	S942	4939.06	235	24	0.00400	12.4	10-002-71
K14S	S943	4941.00	S942	4939.06	47	18	0.04128	18.5	10-002-71
K14S	S942	4939.06	L14N/S41	4937.25	390	24	0.00464	13.4	10-002-71
K14S	S551	4958.50	S661	4957.87	350	12	0.00180	1.3	08-591-59
K14S	S762	4955.00	S761	4954.74	230	12	0.00113	1.0	08-541-54
K14S	S953	4943.45	S53	4943.22	190	12	0.00121	1.1	08-541-54
K14S	S53	4943.22	L14N/S54	4942.99	250	12	0.00092	0.9	08-541-54
K14S	S863	4954.16	S864	4950.85	NA	36	NA	NA	NO REC
K14S	S863	4952.31	S961	4947.13	400	48	0.01300	142.0	NO REC
K15N									
K15N	S3	NA	S1	NA	180	15	NA	NA	UNKNOWN
K15N	S2	NA	S1	NA	185	12	NA	NA	UNKNOWN
K15N	S1	NA	J15S/S903	4981.04	370	15	NA	NA	UNKNOWN
K15N	S121	5029.37	S111	5026.20	374	30	0.00849	32.8	08-391-39
K15N	S111	5026.20	S211	5024.50	200	30	0.00853	32.8	08-391-39
K15N	S211	5024.50	S212	5023.05	170	30	0.00853	32.8	08-391-39
K15N	S311	5025.51	S214	5025.15	300	30	0.00120	12.3	08-391-39
K15N	S214	5025.15	S213	5024.61	45	30	0.01200	38.9	08-391-39
K15N	S213	5024.61	S212	5023.05	130	30	0.01200	38.9	08-391-39
K15N	S212	5023.05	S201	5019.93	156	36	0.02000	81.8	08-391-39
K15N	S201	5019.93	K14N/S291	4997.86	740	4x4CBC	0.02982	273.0	08-391-39
K15N	S502	5029.05	S501	5021.85	360	15	0.02000	7.9	08-391-39
K15N	S401	5014.78	S501	5011.43	335	15	0.01000	5.6	08-391-39
K15N	S501	5011.43	K14N/S592	5007.85	179	15	0.02000	7.9	08-391-39
K15S									
K15S	S604	5017.39	S602	5011.05	376	48	0.01686	161.7	08-391-39
K15S	S601	NA	S602	5011.05	120	15	NA	NA	NO RECORD
K15S	S602	5011.05	S791	5007.85	200	48	0.01600	157.5	08-391-39
K15S	S791	5005.14	K14S/S792	4999.85	372	48	0.01422	148.5	08-391-39
L14N									
L14N	S 41	4937.25	S145	4935.93	330	30	0.00400	22.5	10-002-71
L14N	S145	4935.93	S141	4935.25	45	30	0.01511	43.7	10-002-71
L14N	S54	4942.99	S55	4942.68	260	12	0.00119	1.1	08-541-54
L14N	S55	4937.55	S151	4936.51	356	36	0.00292	31.2	10-002-71
L14N	S151	4936.51	S152	4935.40	365	36	0.00304	31.9	10-002-71
L14N	S152	4935.00	JB 1	4933.42	295	48	0.00536	91.1	10-002-71
L14N	S142	NA	S141	4935.25	49	18	NA	NA	10-002-71
L14N	S141	4935.25	S143	4933.62	345	36	0.00472	39.7	10-002-71
L14N	S143	4933.62	JB 1	4933.42	88.5	48	0.00226	59.2	10-002-71
L14N	JB 1	4932.42	Pump. Sta.	4931.00	46	60	NA	NA	10-002-71
L14N	JB 2	4955.00	S153	4941.00	422	36	0.03318	105.3	10-002-71
L14N	S153	4941.00	S144	4938.50	540	36	0.00463	39.3	10-002-71
L14N	S144	4938.50	Pump Sta.	4924.33	40	36	pres.flo.	NA	10-002-71
L14N	S342	4939.33	S341	4939.07	50	24	0.00520	14.1	10-002-71
L14N	S341	4939.07	S242	4938.47	150	24	0.00400	12.4	10-002-71
L14N	S242	4938.47	S241	4937.23	250	24	0.00496	13.8	10-002-71
L14N	S241	4937.23	S143	4934.41	355	30	0.00794	31.7	10-002-71
L14N	S152	4940.50	S252	4938.87	190	21	0.00858	12.7	08-541-54
L14N	S252	4938.87	S244	4938.74	110	24	0.00118	6.7	08-541-54
L14N	S244	4938.74	S251	4938.66	70	24	0.00111	6.5	08-541-54
L14N	S251	4938.65	S245	4938.39	155	24	0.00168	8.0	08-541-54
L14N	S245	4938.39	S243	4938.31	65	24	0.00123	6.9	08-541-54
L14N	S243	4938.31	S345	4938.24	95	24	0.00076	5.4	08-541-54
L14N	S345	4938.24	S347	4933.47	180	36	Siphon	NA	08-541-54
L14N	S347	4933.47	S348	4933.47	20	36	Siphon	NA	08-591-59
L14N	S348	4933.47	S349	4937.67	200	36	Siphon	NA	08-591-59
L14N	S349	4937.67	S442	4937.49	215	36	0.00084	16.7	08-591-59
L14N	S442	4937.49	S443	4937.32	215	36	0.00079	16.3	08-591-59
L14N	S443	4937.32	S541	4937.14	221	36	0.00081	16.5	08-591-59
L14N	S541	4937.14	L14S/542	4936.92	264	36	0.00083	16.7	08-591-59
L14N	S42	4942.36	S51	4942.15	180	12	0.00117	1.1	08-541-54
L14N	S51	4942.15	S55	4941.93	180	12	0.00122	1.1	08-541-54
L14N	S192	4994.00	S191	4993.79	175	12	0.00120	1.1	08-541-54
L14N	S191	4993.79	S181	4984.89	360	18	0.02472	14.3	08-541-54
L14N	S181	4984.89	S171	4976.00	360	18	0.02469	14.3	08-541-54
L14N	S182	4982.66	S172	4973.30	360	12	0.02600	5.0	08-541-54
L14N	S171	4975.75	S172	4972.55	360	21	0.00889	12.9	08-541-54
L14N	S172	4971.80	S273	4971.37	358	30	0.00120	12.3	08-541-54
L14N	S372	4981.80	S275	4972.87	360	12	0.02481	4.9	08-541-54
L14N	S291	4992.00	S282	4980.19	360	18	0.03281	16.5	08-541-54
L14N	S282	4980.19	S275	4972.37	360	18	0.02172	13.4	08-541-54
L14N	S275	4972.37	S274	4963.35	360	24	0.02506	31.0	08-541-54
L14N	S274	4959.38	S263	4955.58	355	30	0.01070	36.8	08-541-54
L14N	S281	4977.30	S273	4970.30	360	24	0.01944	27.3	10-132-60
L14N	S273	4970.30	S272	4961.31	360	24	0.02497	31.0	10-132-60
L14N	S272	4961.31	S271	4959.48	46	27	0.03978	53.5	10-132-60
L14N	S271	4959.48	S262	4955.79	273	36	0.01352	67.2	10-132-60
L14N	S262	4955.79	S263	4955.60	41	36	0.00463	39.4	10-132-60
L14N	S451	4949.30	S352	4947.28	360	24	0.00561	14.7	08-541-54
L14N	S352	4947.28	S355	4946.73	141	24	0.00390	12.2	26-2805-88
L14N	S355	4946.73	S354	4946.50	93	24	0.00247	9.8	08-541-54
L14N	S354	4946.50	No MH	4946.32	119	24	0.00151	7.6	08-541-54
L14N	S392	NA	S393	4993.68	95	30	NA	NA	08-541-54
L14N	S391	4997.70	S393	4995.68	95	30	0.02126	51.8	08-541-54
L14N	S393	4995.68	S394	4993.46	99	30	0.02242	53.2	08-541-54
L14N	S394	4993.45	S381	4989.64	170	30	0.02241	53.2	08-541-54
L14N	S381	4989.64	S373	4981.57	360	30	0.02242	53.2	08-541-54
L14N	S373	4981.57	S371	4971.67	360	30	0.02750	59.0	08-541-54
L14N	S371	4971.67	S363	4959.66	355	30	0.03383	65.4	08-541-54
L14N	S472	4977.21	S471	4968.21	360	12	0.02500	4.9	08-541-54
L14N	S471	4968.21	S461	4956.49	355	12	0.03301	5.6	08-541-54
L14N	S591	4987.00	S592	4984.89	150	12	0.01407	3.7	08-541-54
L14N	S592	4984.89	S581	4976.14	360	12	0.02431	4.8	08-541-54
L14N	S581	4976.14	S582	4968.04	360	12	0.02250	4.6	08-541-54
L14N	S582	4968.04	S571	4959.94	360	12	0.02250	4.6	08-541-54
L14N	S571	4959.69	S562	4951.35	355	15	0.02349	8.6	08-541-54
L14N	S81	4983.87	S72	4973.22	360	24	0.02958	33.7	08-391-39
L14N	S72	4973.22	S71	4963.57	360	24	0.02681	32.1	08-391-39
L14N	S71	4963.57	S61	4952.85	400	24	0.02680	32.1	08-391-39
L14N	S61	4946.54	S161	4945.97	360	72	0.00158	146.1	NO RECORD
L14N	S161	4945.97	JB 2	4944.89	350	72	0.00309	203.9	NO RECORD
L14N	JB 2	4944.89	S261	4944.78	370	72	0.00030	63.3	NO RECORD
L14N	S261	4944.78	S361	4944.16	373	72	0.00166	149.7	NO RECORD
L14N	S361	4944.16	S351	4943.75	379	72	0.00108	120.6	NO RECORD
L14N	S351	4943.75	S353	4940.79	NA	72	NA	NA	NO RECORD
L14N	S353	4940.79	S346	4937.37	480	72	0.00713	310.0	NO RECORD
L14N	S346	4937.37	S344	4937.30	NA	72	NA	NA	NO RECORD
L14N	S343	4939.59	S344	4937.30	358	24	0.00640	15.7	10-166A-70
L14N	S344	4937.30	S441a	4936.70	597	72	0.00101	116.4	NA
L14N	S441a	4936.70	S441b	4936.59	390	72	0.00028	61.4	NA
L14N	S441b	4936.59	L14S/S545	4936.53	210	72	0.00029	62.0	NA
L14N	S364	NA	S363	4953.89	70	NA	NA	NA	NA
L14N	S263	4954.80	S362	4954.35	375	48	0.00120	43.1	08-561-56
L14N	S362	4954.35	S363	4953.92	360	48	0.00119	43.0	08-561-56
L14N	S363	4953.89	S461	4951.96	358	48	0.00539	91.4	08-541-54
L14N	S461	4951.96	S562	4950.04	354	48	0.00542	91.7	08-541-54
L14N	S562	4950.04	L14S/S663	4949.58	470	60	0.00098	70.7	08-541-54
L14N	S462	NA	S461	4956.49	70	24	NA	NA	NA
L14N	S561	NA	S562	4951.35	70	24	NA	NA	10-110-58
L14N	S444	NA	S442	NA	75	12	NA	NA	NA
L14N	S445	NA	S443	NA	100	12	NA	NA	NA
L14N	S551	NA	S544	NA	125	24	NA	NA	NA
L14N	S544	NA	S543a	NA	105	24	NA	NA	NA
L14N	S543a	NA	S541	NA	30	24	NA	NA	NA
L14S									
L14S	S542	4936.92	S544	4936.79	155	36	0.00084	16.7	08-591-59
L14S	S544	4936.79	S641	4936.62	214	36	0.00079	16.3	08-591-59
L14S	S641	4936.62	S643	4936.38	288	36	0.00083	16.7	08-591-59
L14S	S643	4936.39	S644	4936.37	20	36	0.00100	18.3	08-591-59
L14S	S644	4936.37	S744a	4936.31	70	36	0.00086	16.9	08-591-59
L14S	S744a	4936.31	S743	4936.11	238	36	0.00084	16.8	08-591-59
L14S	S743	4936.11	S744c	4935.72	130	36	0.00160	23.1	08-591-59
L14S	S744c	4935.72	S741	4935.71	120	36	0.00008	5.2	08-591-59
L14S	S741	4935.71	S842	4935.64	72	36	0.00097	18.0	08-591-59
L14S	S842	4935.64	S841	4935.60	48	36	0.00083	16.7	08-591-59
L14S	S841	4935.60	S837	4935.30	368	36	0.00082	16.5	08-591-59
L14S	S837	4935.30	S934	4935.16	169	36	0.00083	16.6	08-591-59
L14S	S934	4935.16	S935	4935.06	123	36	0.00081	16.5	08-591-59
L14S	S935	4935.06	S31	4934.77	343	36	0.00085	16.8	08-591-59
L14S	Inlet	4900.99	S31	4900.00	198	18	0.00500	6.4	08-591-59
L14S	S31	4934.77	M14N/32	4934.64	163	36	0.00080	16.3	08-591-59
L14S	S681	4972.85	S585	4972.40	300	12	0.00150	1.2	08-541-54
L14S	S585	4972.40	S583	4962.30	360	12	0.02806	5.2	08-541-54
L14S	S583	4962.30	S575	4961.20	180	15	0.00611	4.4	08-541-54
L14S	S575	4961.20	S572	4960.09	180	15	0.00618	4.4	08-541-54
L14S	S572	4960.09	S574	4960.07	20	18	0.00100	2.9	08-541-54
L14S	S574	4960.07	S573	4960.01	47	18	0.00119	3.1	08-541-54
L14S	S573	4960.01	L14N/S571	4959.69	270	18	0.00119	3.1	08-541-54
L14S	S691	4980.85	S791	4980.50	230	15	0.00152	2.2	08-541-54
L14S	S791	4980.00	S782	4975.61	360	21	0.01219	15.2	08-541-54
L14S	S782	4975.61	S781	4971.22	360	21	0.01219	15.2	08-541-54
L14S	S781	4971.22	S771	4964.45	360	21	0.01881	18.8	08-541-54
L14S	S771	4964.45	S764	4957.78	350	21	0.01906	19.0	08-541-54
L14S	S883	4982.96	S882	4981.68	125	48	0.01024	126.0	08-541-54
L14S	S882	4981.68	S784	4976.00	315	42	0.01803	117.1	08-541-54
L14S	S885	4975.01	S4	4975.00	24	42	0.00042	17.8	08-541-54
L14S	S4	4975.00	S881	4974.70	20	42	0.01500	106.8	08-541-54
L14S	S881	4974.90	S783	4970.41	280	36	0.01604	73.2	08-541-54
L14S	S792	4986.06	S784	4979.65	360	21	0.01781	18.3	08-541-54
L14S	S784	4974.01	S783	4969.91	360	42	0.01139	93.1	08-541-54
L14S	S783	4969.91	S772	4962.53	360	42	0.02050	124.9	08-541-54
L14S	S772	4962.53	S766/JB	4955.25	350	42	0.02080	125.8	08-541-54
L14S	S651	4949.50	S652	4949.41	40	18	0.00225	4.3	08-166A-70
L14S	S652	4949.41	S653	4949.28	51	18	0.00255	4.6	08-166A-70
L14S	S653	4949.28	S751	4949.00	99	18	0.00283	4.8	08-166A-70
L14S	S751	4949.00	S752	4943.00	291	18	0.02062	13.1	08-166A-70
L14S	S752	4943.00	S745a	4940.50	250	18	0.01000	9.1	08-166A-70
L14S	S750	4941.22	S745a	4941.01	180	12	0.00117	1.1	08-541-54
L14S	S745a	4941.01	S749	4940.60	338	12	0.00121	1.1	08-541-54
L14S	S749	4940.60	S742	4940.59	12	12	0.00083	0.9	08-541-54
L14S	S531	4938.19	S532	4937.82	281	36	0.00132	21.0	08-704-70
L14S	S532	4937.82	S533	4937.66	161	36	0.00099	18.2	08-704-70
L14S	S533	4937.66	S631	4937.44	222	36	0.00099	18.2	08-704-70
L14S	S631	4937.44	S633	4937.37	67	36	0.00104	18.7	08-704-70
L14S	S633	4937.37	S634	4937.30	69	36	0.00101	18.4	08-704-70
L14S	S634	4937.30	S635	4937.17	129	36	0.00101	18.4	08-704-70
L14S	S635	4937.17	S636	4937.14	34	36	0.00085	16.9	08-704-70
L14S	S636	4937.14	S738	4937.00	141	36	0.00100	18.3	08-704-70
L14S	S738	4937.00	S732	4936.73	200	36	0.00135	21.2	08-704-70
L14S	S732	4936.73	S734	4936.64	111	36	0.00081	16.5	08-704-70
L14S	S734	4936.64	S735	4936.60	38	36	0.00105	18.8	08-704-70
L14S	S735	4936.60	S733	4936.45	152	36	0.00099	18.2	08-704-70
L14S	S733	4936.45	S737	4936.40	50	36	0.00100	18.3	08-704-70
L14S	S737	4936.40	S831	4936.31	86	36	0.00105	18.7	08-704-70
L14S	S831	4936.31	S833	4936.10	214	36	0.00098	18.1	08-704-70
L14S	S833	4936.10	S834	4935.95	153	36	0.00098	18.1	08-704-70
L14S	S834	4935.95	S836	4935.94	47	36	0.00021	8.4	08-704-70
L14S	S836	4935.94	S931	4935.65	246	36	0.00118	19.8	08-704-70
L14S	S931	4935.65	S933	4935.43	229	36	0.00096	17.9	08-704-70
L14S	S933	4935.43	S21	4935.30	125	36	0.00104	18.6	08-704-70
L14S	S543b	4939.00	S532	4937.50	175	24	0.00857	18.2	08-704-70
L14S	S534	4938.50	S533	4938.00	85	24	0.00588	15.0	08-704-70
L14S	S632	4938.50	S631	4938.00	90	24	0.00556	14.6	08-704-70
L14S	S731	4938.00	S738	4937.50	40	24	0.01250	21.9	08-704-70
L14S	S736	4937.50	S734	4937.50	35	24	0.00000	0.0	08-704-70
L14S	S832	4937.40	S831	4936.55	85	24	0.01000	19.6	08-704-70
L14S	S835	4937.00	S834	4936.50	85	24	0.00588	15.0	08-704-70
L14S	S932	4937.00	S931	4936.00	185	24	0.00541	14.4	08-704-70
L14S	S545	4936.53	S643	4936.35	580	72	0.00031	64.7	NA
L14S	S643	4936.35	S744c	4935.72	460	72	0.00137	135.8	NA
L14S	S852	NA	S851	NA	250	24	NA	NA	NA
L14S	S851	NA	S761	NA	249	24	NA	NA	NA
L14S	S762	4948.29	S761	4946.77	346	66	0.00439	192.9	08-541-54
L14S	S761	4946.77	S18	4936.42	341	66	0.03035	507.1	08-541-54
L14S	S18	4936.42	S742	4936.02	265	66	0.00151	113.1	08-541-54
L14S	S742	4936.02	S746	4935.74	190	66	0.00147	111.7	08-541-54
L14S	S746	4935.74	S744b	4935.73	NA	66	NA	NA	08-541-54
L14S	S662	NA	S661	4949.54	50	18	NA	NA	NA
L14S	S646	NA	S547	NA	125	15	NA	NA	TBk2100 p44
L14S	S547	NA	S546	4938.09	210	15	NA	NA	TBk2100 p44
L14S	S546	4938.09	S544	4937.89	30	15	0.00667	4.6	08-591-54
L14S	S763	NA	S764	4949.04	70	24	NA	NA	NA
L14S	S862	NA	S864	4947.16	70	24	NA	NA	NA
L14S	S663	4949.58	S661	4949.54	45	48	0.00098	39.0	08-541-54
L14S	S661	4949.54	S764	4949.04	510	48	0.00098	39.0	08-541-54
L14S	S764	4949.04	S765	4948.59	300	60	0.00150	87.4	08-541-54
L14S	S765	4948.59	JB/S766	4948.51	50	60	0.00150	87.4	08-541-54
L14S	JB/S766	4947.82	S864	4947.16	330	72	0.00200	163.8	08-561-56
L14S	S864	4947.16	S962	4946.40	380	72	0.00200	164.2	08-561-56
L14S	S962	4946.40	S961	4946.24	70	72	0.00229	175.5	08-561-56
L14S	S961	4946.24	M14N/S61	4945.23	505	72	0.00200	164.2	08-561-56
M14N									
M14N	Inlet	4939.16	S34	4938.56	100	15	0.00600	4.3	22-007-74
M14N	S34	4938.56	S33b	4934.53	28	15	0.14393	21.2	22-007-74
M14N	S32	4934.64	S33b	4934.53	132	36	0.00083	16.7	08-591-59
M14N	S33b	4934.53	S35	4934.40	166	36	0.00078	16.2	08-591-59
M14N	S35	4934.40	S131	4934.16	289	36	0.00083	16.7	08-591-59
M14N	S131	4934.16	S132	4933.90	321	36	0.00081	16.5	08-591-59
M14N	S132	4933.90	S3	4933.66	285	36	0.00084	16.8	08-591-59
M14N	S3	4933.66	S232	4933.54	149	36	0.00081	16.4	08-591-59
M14N	S232	4933.54	S331b/JB	4932.50	200	36	0.00520	41.7	08-591-59
M14N	S331b/JB	4932.50	S243	4932.16	218	72	0.00156	145.0	08-003-79
M14N	S243	4932.16	S342/JB	4931.74	269	72	0.00156	145.0	08-003-79
M14N	S342/JB	4931.74	S351/JB	4930.92	325	72	0.00252	184.4	08-003-79
M14N	S351/JB	4930.92	Outlet	4929.37	325	12x6MP	0.00477	331.0	08-003-79
M14N	S224	4934.65	S223	4934.00	203	24	0.00320	11.1	10-005-83
M14N	S33a	4934.4	S331b/JB	4932.50	NA	72	NA	NA	NA
M14N	S331b/JB	4932.50	S342	4931.74	487	72	0.00156	145.0	08-003-79
M14N	S342	4931.71	S351/JB	4931.19	333	72	0.00156	145.1	08-003-79
M14N	S61	4946.54	S161	4944.22	505	72	0.00459	248.8	08-561-56
M14N	S161	4944.22	S261/JB	4943.20	510	72	0.00200	164.2	08-561-56
M14N	S261/JB	4943.20	S252	4938.95	345	54	0.01232	189.2	08-561-56
M14N	S252	4938.95	S251/JB	4934.40	370	54	0.01230	189.0	08-561-56
M14N	S251/JB	4932.90	S241/JB	4932.50	370	72	0.00108	120.7	08-561-56
M14N	S241/JB	4932.16	S341/JB	4931.95	490	72	0.00043	76.0	08-561-56
M14N	S341/JB	4931.95	S342/JB	4931.74	42	72	0.00500	259.6	08-561-56
M14N	S21	4935.30	S22	4935.20	100	36	0.00100	18.3	08-704-70
M14N	S22	4935.20	S121	4934.90	300	36	0.00100	18.3	08-704-70
M14N	S121	4934.90	S122	4934.60	300	36	0.00100	18.3	08-704-70
M14N	S122	4934.60	S221	4934.30	200	36	0.00150	22.4	08-704-70
M14N	S221	4934.30	S222	4934.10	100	36	0.00200	25.9	08-704-70
M14N	S222	4934.10	S223	4934.00	62	36	0.00161	23.2	08-704-70
M14N	S223	4934.00	S321	4933.70	239	36	0.00126	20.5	08-704-70
M14N	S321	4933.70	S332a	4933.67	24	36	0.00125	20.4	08-704-70
M14N	S332a	4933.67	S333	4933.52	156	36	0.00096	17.9	08-704-70
M14N	S333	4933.52	S331a	4933.30	218	36	0.00101	18.4	08-704-70
M14N	S331a	4933.30	S332b	4933.02	201	36	0.00139	21.6	08-704-70
M14N	S332b	4933.02	S331b	4932.50	47	36	0.01106	60.8	08-704-70
M14N	S6	5011.45	S201	5003.07	387	48	0.02165	183.2	08-621-62
M14N	S201	5002.17	S282	4987.58	590	48	0.02473	195.8	08-621-62
M14N	S282	4986.45	S281	4978.38	400	48	0.02018	176.8	08-621-62
M14N	S281	4975.43	S271	4965.58	400	48	0.02463	195.4	08-621-62
M14N	S271	4964.32	S262	4954.74	386	48	0.02482	196.1	08-621-62
M14N	S262	4951.11	S263	4948.05	210	54	0.01457	205.8	08-621-62
M14N	S263	4946.77	S264	4943.05	254	54	0.01465	206.3	08-621-62
M14N	S264	4941.97	S253	4939.17	280	54	0.01000	170.4	08-621-62
M14N	S253	4939.17	S254	4938.03	120	54	0.00950	166.1	08-621-62
M14N	S254	4937.05	S242	4933.53	358	54	0.00983	169.0	08-621-62
M14N	S242	4932.85	S342	4931.40	126	54	0.01151	182.8	08-621-62
M14N	S333	4933.12	S343	4932.02	370	24	0.00297	10.7	10-001-70
M14N	S343	4932.02	S344	4931.18	280	30	0.00300	19.5	10-001-70
M14N	S344	4931.18	S353	4930.50	225	30	0.00302	19.5	10-001-70
M14N	S353	4930.50	S352	4930.14	120	42	0.00300	47.8	10-001-70
M14N	S352	4930.14	Outlet	4929.77	32	42	0.01156	93.8	10-001-70
M14N	S431	4932.07	S432a	4931.37	360	30	0.00194	15.7	10-001-70
M14N	S432a	4931.37	S441	4930.79	319	30	0.00182	15.2	10-001-70
M14N	S441	4930.79	S451	4929.89	391	36	0.00230	27.7	10-001-70
M14N	S451	4929.89	Flap Gate	4929.85	17	36	0.00235	28.0	10-001-70
M14N	S432b	4932.50	S443	4931.28	600	30	0.00203	16.0	22-338-69
M14N	S443	4931.20	S444	4931.12	79	30	0.00101	11.3	22-338-69
M14N	S444	4931.28	S452	4930.56	276	30	0.00261	18.2	22-338-69
M14N	S452	4930.56	Flap Gate	4930.50	24	30	0.00250	17.8	22-338-69
M14N	S433	4932.36	S435	4932.10	130	24	0.00200	8.8	10-001-70
M14N	S435	4932.10	S442	4931.29	270	30	0.00300	19.5	10-001-70
M14N	S442	4931.29	S445	4930.66	210	30	0.00300	19.5	10-001-70
M14N	S445	4930.66	S453	4929.84	273	36	0.00300	31.7	10-001-70
M14N	S453	4929.84	Outlet	4929.71	17	36	0.00765	50.6	10-001-70
M14N	S551	4931.28	S456	4930.53	250	24	0.00300	10.7	10-001-70
M14N	S456	4930.53	S455	4930.36	58	36	0.00293	31.3	10-001-70
M14N	S455	4930.36	S454	4930.33	8	36	0.00375	35.4	10-001-70
M14N	S454	4930.33	Flap Gate	4927.46	179	36	0.01603	73.2	10-001-70
M14N	S224	4934.45	S223	4933.80	203	24	0.00320	11.1	10-005-83
M14S									
M14N	S334	4931.20	S421	4930.90	300	36	0.00100	18.3	10-005-83
M14N	S421	4930.90	S522	4930.50	401	36	0.00100	18.3	10-005-83
M14N	S522	4930.50	S521	4930.10	400	36	0.00100	18.3	10-005-83
M14N	S521	4930.10	S621	4929.69	416	36	0.00099	18.1	10-005-83
M14N	S621	4929.69	S622	4929.31	346	36	0.00110	19.2	10-005-83
M14S	S622	4929.31	S631	4928.95	360	36	0.00100	18.3	10-005-83
M14S	S631	4928.95	S641	4928.57	378	36	0.00101	18.3	10-005-83
M14S	S641	4928.57	S642	4928.19	379	36	0.00100	18.3	10-005-83
M14S	S642	4928.19	Drain. Ch.	4927.89	66	36	0.00455	39.0	10-005-83
M14S	S601	NA	S600	NA	495	30	0.00360	21.3	NA
M14S	S600	NA	Drain. Ch.	4929.40	85	30	0.00360	21.3	NA
M14S	S15	NA	S16	NA	53	30	0.00210	16.3	NA
M14S	S16	NA	S17	NA	490	30	0.00210	16.3	NA
M14S	S17	NA	Drain. Ch.	NA	49	30	0.01720	46.6	NA

MODELING MAP

SOUTH BROADWAY MASTER
DRAINAGE STUDY

LEGEND

- STUDY AREA BOUNDARY
- SUBBASIN BOUNDARY
- SJ-2 BASIN IDENTIFICATION
- OVERLAND FLOW
- EXISTING STORM SEWER
- S345 MANHOLE IDENTIFICATION NUMBER
- SWMM MODEL - SHADED AREA

PLATE 10

BHI JOB NO
89208.02

DECEMBER 1989

0 500 1000 1500 2000
SCALE IN FEET
1" = 500'

PROJECT	PROPOSED IMPROVEMENT
1-01-1B	UPGRADE PUMPING STATION TO 185 c.f.s. CAPACITY
1-01-2B	REPLACE 36" FORCE MAIN W/ 72" GRAVITY LINE TO PUMP STATION BUILD FORCE MAIN TO RIO GRANDE
1-01-3B	BUILD 23 ac-ft DETENTION RESERVOIR. INSTALL 36" RCP.
1-02-1C	INSTALL 84" RCP.
1-02-2C	REPLACE 60" RCP W/ 84" RCP.
1-02-3C	DIVERT 48" RCP TO 72" RCP
1-03-1D	REPLACE 36" RCP W/ 72" RCP.
1-04-1B	BUILD 33 ac-ft DETENTION RESERVOIR. DIVERT SAN JOSE DRAIN INTO DETENTION RESERVOIR. DIVERT 36" WOODWARD LINE INTO DETENTION RESERVOIR. INSTALL 60" RCP DISCHARGE LINE FROM RESERVOIR TO SAN JOSE DRAIN.
1-05-1B	PLUG 54" RCP & INSTALL 72" RCP.
1-05-2B	REPLACE 60" RCP W/ 72" RCP.
1-06-C	BUILD 24" STORM DRAIN W/3 CATCH BASINS.

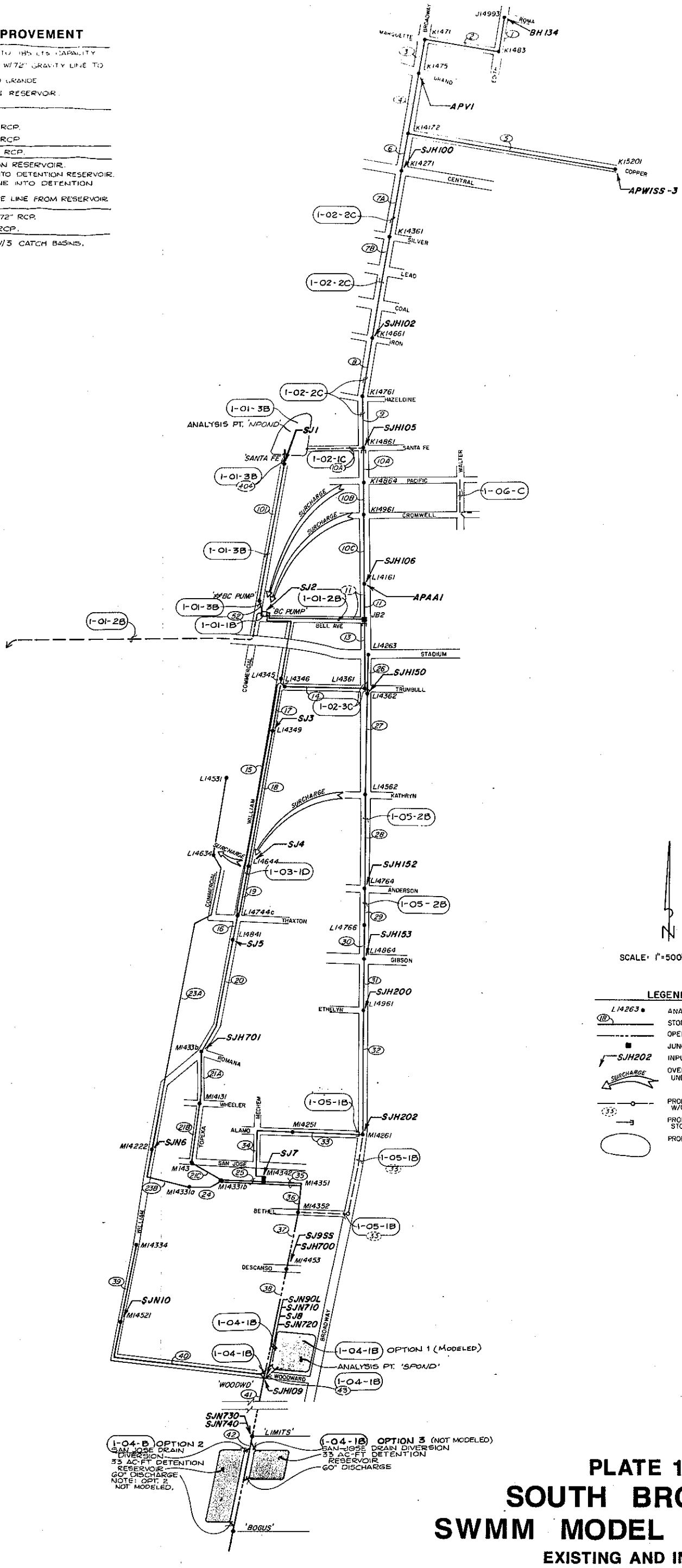


PLATE 11
SOUTH BROADWAY
SWMM MODEL SCHEMATIC
EXISTING AND IMPROVED
AUGUST 1990

BOHANNAN-HUSTON, INC.