CITY OF
Albuquerque

June 25, 1998

Elvidio Diniz, P.E.
Resource Technology, Inc.
1720 Randolph Road SE Suite B
Albuquerque, NM 87106

M14

RE: BERNALILLO COUNTY PUBLIC WORKS ([redacted]-D13). DRAINAGE REPORT (12-10-97) AND CONCEPTUAL GRADING & DRAINAGE PLAN FOR BUILDING PERMIT. ENGINEER'S STAMP DATED MAY 14, 1998.

Dear Mr. Diniz:

Based on the information provided on your earlier December 10, 1997 submittal and on your June 1, 1998 submittal, the above referenced project is approved for Building Permit.

Prior to Certificate of Occupancy approval, an Engineer's Certification will be required.

If I can be of further assistance, please feel free to contact me at 924-3984.

Sincerely,

John P. Murray, P.E.
Hydrology

c: Andrew Garcia
File

DRAINAGE INFORMATION SHEET

PROJECT TITLE: Bernalillo County Yard ZONE ATLAS/DRNG. FILE #: M14 ~~[illegible]~~-D13

DRB #: _____ EPC#: _____ WORK ORDER #: 583381

LEGAL DESCRIPTION: _____

CITY ADDRESS: 2400 Broadway Blvd. SE.

ENGINEERING FIRM: Resource Tech. Inc. CONTACT: Elvidio Diniz

ADDRESS: 1720 B Randolph SE PHONE: 243 7300

OWNER: Bernalillo County CONTACT: Frank Williams

ADDRESS: 2400 Broadway Blvd. SE PHONE: 848 1572

ARCHITECT: — CONTACT: _____

ADDRESS: _____ PHONE: _____

SURVEYOR: — CONTACT: _____

ADDRESS: _____ PHONE: _____

CONTRACTOR: — CONTACT: _____

ADDRESS: _____ PHONE: _____

TYPE OF SUBMITTAL:

✓ DRAINAGE REPORT - Previously submitted

____ DRAINAGE PLAN

✓ CONCEPTUAL GRADING & DRAINAGE PLAN

____ GRADING PLAN

____ EROSION CONTROL PLAN

____ ENGINEER'S CERTIFICATION

____ OTHER _____

PRE-DESIGN MEETING:

____ YES

✓ NO

____ COPY PROVIDED

CHECK TYPE OF APPROVAL SOUGHT:

____ SKETCH PLAT APPROVAL

____ PRELIMINARY PLAT APPROVAL

____ S. DEV. PLAN FOR SUB'D. APPROVAL

____ S. DEV. PLAN FOR BLDG. PERMIT APPROVAL

____ SECTOR PLAN APPROVAL

____ FINAL PLAN APPROVAL

____ FOUNDATION PERMIT APPROVAL

✓ BUILDING PERMIT APPROVAL

____ CERTIFICATE OF OCCUPANCY APPROVAL

____ GRADING PERMIT APPROVAL

____ PAVING PERMIT APPROVAL

____ S.A.D. DRAINAGE REPORT

____ DRAINAGE REQUIREMENTS

____ SUBDIVISION CERTIFICATION

____ OTHER _____ (SPECIFY)

RECEIVED
Jun 1
~~MAY 29~~ 1998
HYDROLOGY SECTION

DATE SUBMITTED: May 27, 1998

BY: Elvidio Diniz

Resource Technology, Inc.
1720 - B Randolph Rd. SE Albuquerque, NM 87106
Telephone: (505) 243-7300
FAX: (505) 243-7400

May 14, 1998

John Murray, P.E.
Drainage Engineer
Hydrology Division
P.O. Box 1293
Albuquerque, NM 87103

RE: Bernalillo County Public Works (~~E14~~ M14-D13) - Drainage Report for Building Permit
COA Project No. 583381
RTI File No. 96-100

Dear John:

The following letter and drawings are in response to Lisa Manwill's letter dated January 6, 1998, regarding the above submittal. My comments are addressed in the same order as Ms. Manwill's letter, as follows:

1. As per City Drainage Ordinance, ponds greater than or equal to 18 inches in depth, with side-slopes 2:1 or less will be within a 4 foot high fenced area. The ponds along Broadway Boulevard have been decreased to 17.5 inches of ponding depth.

2. The South Broadway Sector Drainage Management Plan, Developed Conditions Report, September 1990, by Bohannon-Huston specifies a discharge rate of 94 cfs for Drainage Area SJH200 which includes approximately two acres of the newly acquired area; and a discharge rate of 82 cfs for Drainage Area SJH202 which includes most of the project site and Wheeler Avenue to the south of the site. Based on our calculations, the proportional runoff contribution from the project site is approximately 50 cfs in Drainage Area SJH202. Furthermore, Bohannon-Huston, in their report, had assumed free discharge from these drainage areas. We propose 57.5 cfs as the fully developed 100-year flow rate from the entire project site, which is 22.2 acres in area; this compares to the total area of 87.7 acres for Drainage Areas SJH200 and SJH202 and the allowable discharge of 176 cfs.

3. The proposed ponds are now shown also on the Utility Plan. Please note that we have eliminated Ponds 2 and 3 in our Drainage Report and enlarged Pond 5 to include the Ponds 2 and 3 volumes. The net impact at Broadway Boulevard is unchanged but now there are no known utilities (either public or private) under any of the proposed ponds; however, the private storm drain outlet from Pond 1 to the existing inlet at the southwest corner of the site is located under the overflow ponding/parking area for Pond 7.

RECEIVED
Jun 1
~~MAY 29~~ 1998
HYDROLOGY SECTION

4. The maintenance agreement and covenant for the detention ponds will be provided by the County at a later date upon their review of the standard form as given in the DPM. An acceptable version will be sent to you as soon as we receive a copy.

Please feel free to contact me if you have any questions or comments.

Sincerely,

RESOURCE TECHNOLOGY, INC.

Elvidio V. Diniz, P.E.
President and Principal Engineer

EVD/ljc

Enclosure

C:\LORIE\96-100\MURRAY.LT1

DRAINAGE INFORMATION SHEET

M14/D13

PROJECT TITLE: Bernalillo County Public Works ZONE ATLAS/DRNG. FILE #: [redacted]

DRB #: _____ EPC#: _____ WORK ORDER #: _____

LEGAL DESCRIPTION: _____

CITY ADDRESS: 2400 Broadway Blvd. SE

ENGINEERING FIRM: Resource Technology Inc. CONTACT: Francis Gonzales

ADDRESS: 1720 Randolph Rd. SE Suite B PHONE: 243-7800

OWNER: Bernalillo County CONTACT: Frank Williams

ADDRESS: 2400 Broadway Blvd. SE PHONE: 848-1572

ARCHITECT: _____ CONTACT: _____

ADDRESS: _____ PHONE: _____

SURVEYOR: _____ CONTACT: _____

ADDRESS: _____ PHONE: _____

CONTRACTOR: _____ CONTACT: _____

ADDRESS: _____ PHONE: _____

TYPE OF SUBMITTAL:

✓ DRAINAGE REPORT

____ DRAINAGE PLAN

____ CONCEPTUAL GRADING & DRAINAGE PLAN

____ GRADING PLAN

____ EROSION CONTROL PLAN

____ ENGINEER'S CERTIFICATION

____ OTHER _____

PRE-DESIGN MEETING:

✓ YES

____ NO

____ COPY PROVIDED

RECEIVED
DEC 10 1997
HYDROLOGY SECTION

CHECK TYPE OF APPROVAL SOUGHT:

____ SKETCH PLAT APPROVAL

____ PRELIMINARY PLAT APPROVAL

____ S. DEV. PLAN FOR SUB'D. APPROVAL

____ S. DEV. PLAN FOR BLDG. PERMIT APPROVAL

____ SECTOR PLAN APPROVAL

____ FINAL PLAN APPROVAL

____ FOUNDATION PERMIT APPROVAL

✓ BUILDING PERMIT APPROVAL

____ CERTIFICATE OF OCCUPANCY APPROVAL

____ GRADING PERMIT APPROVAL

____ PAVING PERMIT APPROVAL

____ S.A.D. DRAINAGE REPORT

____ DRAINAGE REQUIREMENTS

____ SUBDIVISION CERTIFICATION

____ OTHER _____ (SPECIFY)

DATE SUBMITTED: Dec. 10, 1997

BY: Francis Gonzales

BERNALILLO COUNTY PUBLIC WORKS

2400 BROADWAY SE DRAINAGE IMPROVEMENTS

DRAINAGE REPORT

Submitted To:

City of Albuquerque
Hydrology Section

Submitted By:

Resource Technology, Inc.

1720-B Randolph Rd. SE
Albuquerque, NM 87106

RECEIVED
DEC 10 1997
HYDROLOGY SECTION

RTI Project No. 96-100

December 1997

BERNALILLO COUNTY PUBLIC WORKS

2400 BROADWAY SE DRAINAGE IMPROVEMENTS

DRAINAGE REPORT

Submitted By:

Resource Technology, Inc.
1720-B Randolph Road SE
Albuquerque, NM 87106

Submitted To:

City of Albuquerque
Hydrology Section

RTI Project No. 96-100

December 1997

TABLE OF CONTENTS

PURPOSE 1

INTRODUCTION 1

FIELD SURVEYS 3

HYDROLOGIC ANALYSIS 3
- Existing Conditions 3
- Proposed Conditions 5

HYDRAULIC ANALYSIS 8

PROPOSED POND ANALYSIS 9
- Pond 1 9
- Pond 2 10
- Pond 3 10
- Pond 4 11
- Pond 5 11
- Pond 6 12
- Pond 7 12
- Pond 8 13

APPENDIX Supporting Calculations

2400 BROADWAY SE DRAINAGE IMPROVEMENTS

PURPOSE

This report updates a previous (1994) drainage report prepared by Resource Technology, Inc. (RTI) for the original 18.2-acre County Yards at 2400 Broadway SE. Since that report was prepared the area of the County Yards has been enlarged to 22.2 acres by the purchase of four additional acres on the north west corner of the original yards. See Figure 1.

This report covers drainage issues on the total 22.2 acres (Project Site). Bernalillo County intends to control on-site drainage to the fullest extent possible so as to reduce off-site downstream drainage problems. Accordingly, a large number of detention ponds are investigated and proposed.

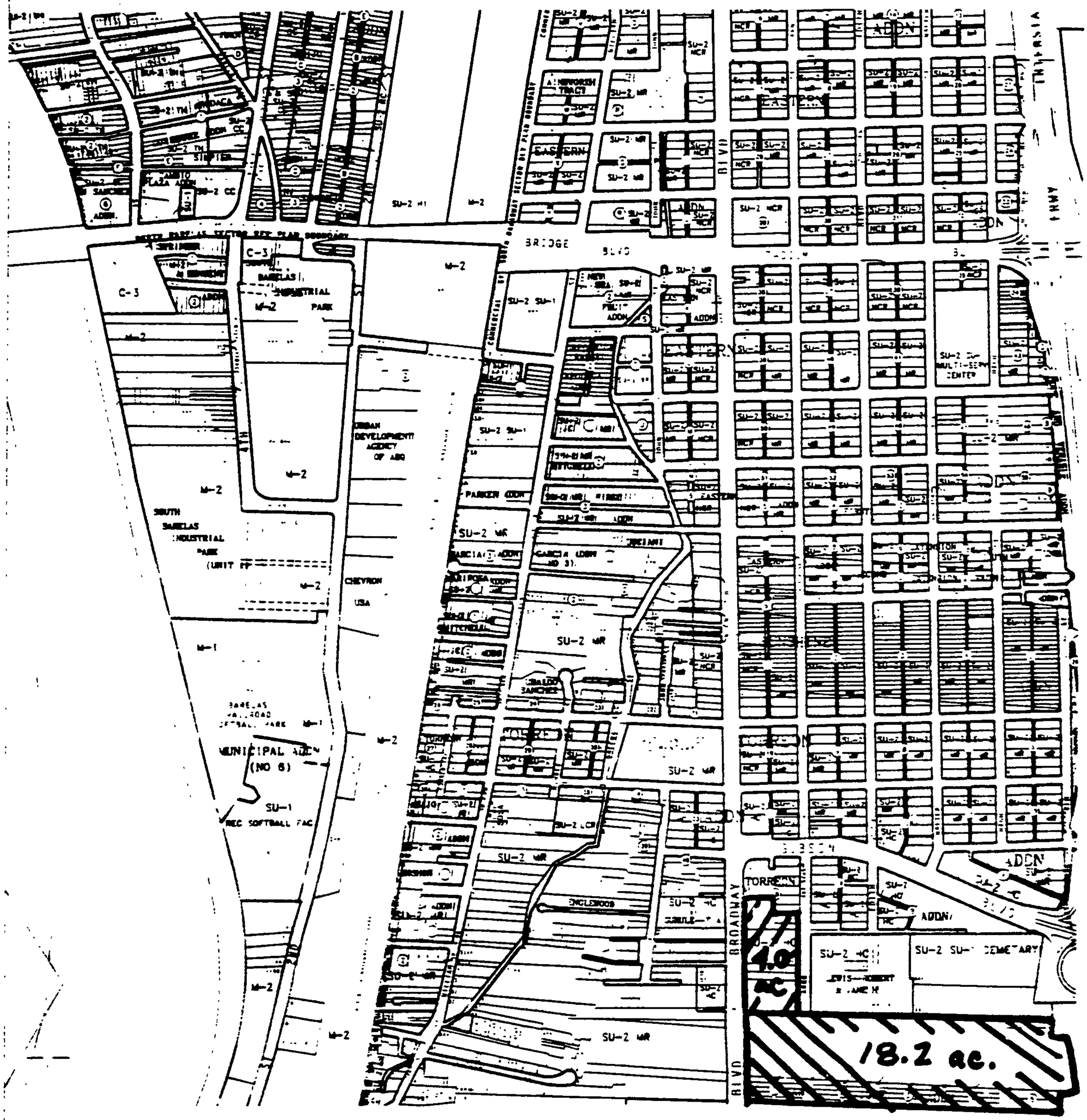
RTI has developed a Site Plan for the Project Site as shown on Plate 1. This Site Plan identifies proposed land use changes to the original County Yards area, as well as proposed new buildings and related facilities on the recently acquired area. The new area had previously been developed with commercial activities but is currently vacant. All the buildings on that four-acre area have been razed but some in-ground concrete slabs and utilities remain. The drainage facilities proposed in this report are intended to serve all of the land use improvements shown on the Site Plan.

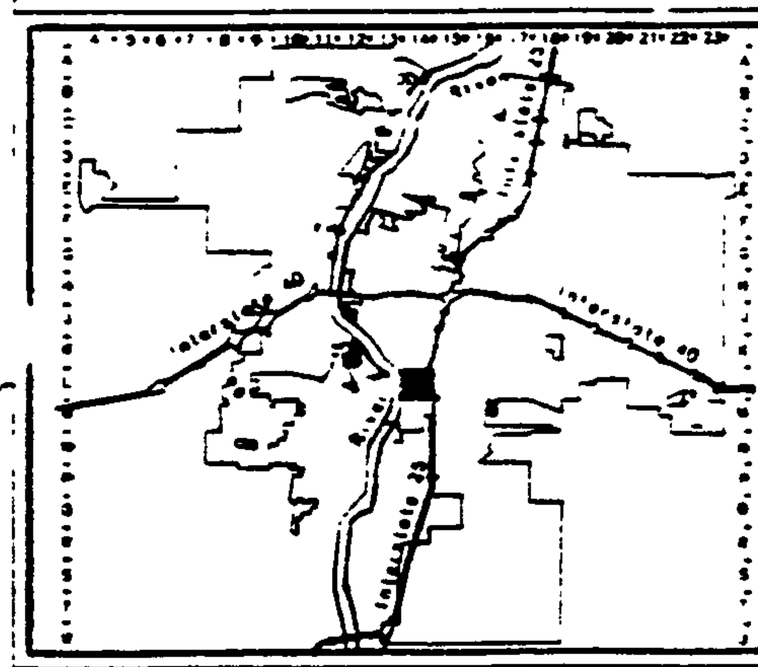
This report also documents design procedures and decisions made by RTI in collaboration with the Bernalillo County Public Works Department and any affected parties involved at the Project Site. In addition, RTI conducted interviews and meetings with all County Departments to identify their drainage concerns or problems; and other issues, such as land use, were also discussed.

INTRODUCTION

A detailed hydrologic analysis was conducted in 1992 by Wilson and Company, under contract with Bernalillo County, for the original County Yard facility located at 2400 Broadway SE. That study resulted in a Drainage Report embracing development proposed for this site under a previous Land Use Master Plan created by DCSW (1990). The Wilson Drainage Report was submitted to and approved by the City of Albuquerque Hydrology Section on October 30, 1993.

The Wilson Drainage Report had proposed a number of detention ponds on the original property to help reduce the rate of discharge from the site. RTI determined that several of these ponds could be enlarged or reconfigured in order to detain more runoff volume. Therefore, RTI has designed the proposed drainage structures at the locations shown on the Wilson Drainage Report, where possible, with modifications as necessary to improve drainage characteristics on the site and to accommodate existing (and proposed) conditions shown on the RTI Site Plan (Plate 1).





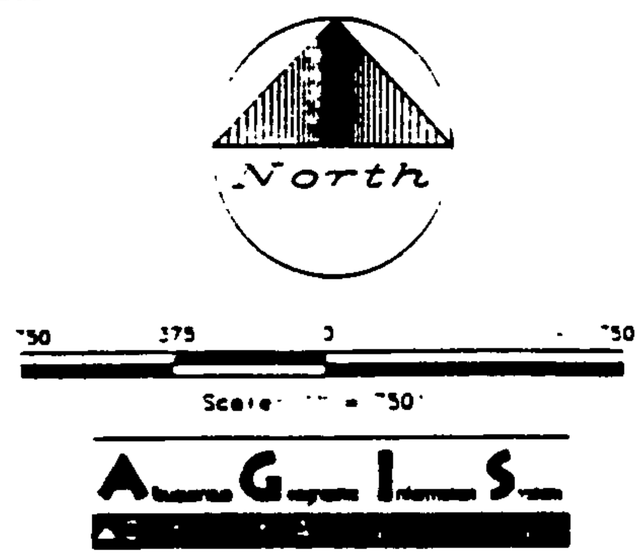


FIGURE 1

LEGAL DESCRIPTION

T10N

R3E

SEC 29

UNIFORM PROPERTY CODE

1-014-056

L-14-Z

© Planning Department July 04, 1993

Several modifications, since the Wilson Report was issued, have been incorporated into the RTI detention pond designs for the original County Yards area. This was necessary to accommodate proposed construction plans by other County Departments. One modification was the proposed addition of three new buildings on the recently acquired area. Accordingly, three new ponding areas connected together and located on the west side of the new four-acre tract are now labeled as Pond 4. The detention structure proposed in the Wilson Report (Pond 4 in that report) was eliminated because it could not be constructed in the proposed location -- several buildings presently utilized by the Parks and Recreation Department still remained in the proposed ponding area.

An additional pond (Pond 8) will be located on the southwest corner of the materials storage area. Pond 8 was not included in the Wilson Report but it is proposed by RTI to accommodate runoff from the east side of the original County Yard and to reduce flows near the Vehicle Maintenance Shop. In adding Pond 8 it is possible to remove the former Pond 4 proposed in the Wilson Report.

FIELD SURVEYS

In August 1996, an aerial topographic site survey was conducted for RTI by Bohannan Huston, Inc. to map out the existing facilities. Plates 2A and 2B show the topographic data (where surveyed) and the corresponding drainage areas. After evaluation of this information it was decided that the watershed basins delineated by Wilson and Company were appreciably different and not applicable for the current project design. Therefore, drainage basins, runoff volumes and peak flow rates were re-developed in the RTI design.

RTI also conducted field surveys to gather information associated with new construction that has been completed at the site since the aerial survey was conducted in August 1996 and to add details not identifiable on the aerial photographs. These changes are also shown on Plates 2A and 2B.

HYDROLOGIC ANALYSIS

Existing Conditions

According to County personnel, the most significant drainage problem occurs in front (north side) of the Vehicle Maintenance Shop. This street flow, with no confining curbs, is a major nuisance during and after rain events. Due to the low existing finished floor elevation of the Vehicle Maintenance Shop, runoff will encroach onto the shop floor. Asphalt berms have been placed in front of this building to relieve this problem but large surface flows in this area continue to cause flooding.

Significant runoff will also accumulate behind the Vehicle Maintenance Shop in the most southwest corner of the project site, spill out of the small existing basin and flow onto the City of Albuquerque Testing Laboratory (Testing Lab) property.

Existing ponding areas consist of an off-site natural retention area at the northeast side of the site which accommodates the upstream drainage basin located east of the site; and an existing small concrete walled pond south of the Purchasing Warehouse which holds approximately 800 cu.ft. of runoff. Another existing pond is located just southeast of the Vehicle Maintenance Shop along the south fence line. This pond is an unlined pit which is approximately 30 feet by 30 feet and three feet deep.

The existing condition drainage basins and the corresponding 10-year and 100-year peak flow rates from each basin are shown on Plates 2A and 2B. Table 1 summarizes the pertinent hydrologic data for each basin.

The site is divided into eight drainage basins. Basin A drains directly to Broadway Boulevard through the existing driveway in the middle of the site, between the existing south side driveway and the proposed far north driveway. Basin B drains to Broadway Boulevard through the existing southern driveway. Basin B has been divided into two sub-basins for the purpose of determining the flow rates along the main driveway, at a location where the flow path is restricted.

Basins C, D and G all drain out to an existing undersized storm drain system, and overflow across the Testing Lab property. Although part of this flow is picked up by the inlet located behind the Vehicle Maintenance Shop, the majority of flow from Basin D discharges to Broadway Boulevard as surface flow.

Basin E flows to the existing main drive and combines with Basin B which flows out through the southern driveway. Basin F, which is off-site, is retained within its own boundaries and, therefore, does not drain through the site, as shown on Plate 2B. Consequently, there is no off-site runoff onto the Project Site. Basin H sheet flows across the basin surface and drains onto Broadway Boulevard.

Approximately fifty percent of the property is impervious in its existing condition, composed of pavements and roofs, and considered a Type D land treatment classification. The remaining area is typically used for stockpiling of construction and maintenance materials and equipment. These areas are heavily traveled and well compacted with minimal infiltration. Therefore, a Type C land treatment classification is used in the flow calculations for this undeveloped area. The Development Process Manual, Volume 2, Design Criteria for the City of Albuquerque, was followed to calculate peak runoff. The peak flow and 24-hour volume calculations for existing conditions are summarized in the following table.

No retention ponding is allowed.

TABLE 1
EXISTING CONDITIONS

BASIN	AREA ac	ZONE	LAND TREATMENT	PEAK DISCHARGE cfs		V_{1440} ac-ft	
				10-Year	100-Year	10-Year	100-Year
A	2.12	2	D	6.66	9.96	0.28	0.44
B East	0.37 5.59 1.50	2	B C D	14.62	25.39	0.45	0.86
B West	1.74	2	D	5.46	8.17	0.23	0.37
B Total	9.20	-	-	20.08	33.56	0.68	1.23
C	0.33	2	D	1.04	1.55	0.04	0.07
D	1.98 1.75	2	C D	8.88	14.42	0.32	0.55
E	1.13 1.41	2	C D	6.36	10.16	0.24	0.46
F*	5.03	2	A	1.91	7.87	0.05	0.22
G	0.13 0.15 0.38	2	B C D	1.57	2.55	0.06	0.10
H	1.0 3.0	2	C D	11.13	17.22	0.45	0.72
TOTAL**				55.72	89.42	2.07	3.57

*Includes flows from 30-inch culvert under I-25. Basin F flows are retained within the basin therefore not contributing to the flow to the site.
**Does not include Basin F.

Proposed Conditions

This drainage plan is based on the proposed Site Plan, Plate 1, in which Bernalillo County plans to construct various drainage improvements. The newly acquired area will be used for additional facilities and storage of materials and equipment. With the proposed improvements, including 0.018 acres of landscaping, the impervious (paved and rooftop) area on the site will decrease resulting in a flow rate decrease from 17.22 cfs to 15.83 cfs.

The Project Site is divided into eleven proposed drainage basins; flow from each drainage basin was routed to the existing storm drain system in Broadway Boulevard.

Once the proposed drainage basins were determined, the peak discharges and 24-hour volumes were calculated for the 10-year and 100-year event. A summary of the calculations is given in Table 2.

Plates 3A and 3B show the future condition drainage areas; Plate 3A also includes a table summarizing the pertinent hydrologic data for each area.

Basin PA is larger than existing conditions Basin A and its flows will combine with Basin PJ flows to be detained in Pond I and eventually released into the storm drain inlet near the Testing Lab. Basin PB, comprised mostly of the Materials Storage Area, will be confined to the local area because all flows are diverted to Pond 8, reducing the existing flows through the main driveway which will continue to drain to Pond 7. Basin PC will remain the same as existing Basin C.

Basins PD and PI will detain the 100-year flow volume within their respective drainage basins, to be released into the storm drain inlet near the Testing Lab. Overflow from Basin PE East (out of Pond 2) will combine with runoff from Basin PE West in Pond 3 which will detain the 100-year flow volume within Basin PE West. Flow volumes beyond the 100-year storm event will over-flow to the main driveway and combine with Basin PK and PG and discharge to the storm drain system. Basin PK has also been divided into two sub-basins for the purpose of determining the flow at the restricted area within the basin. Drainage from Basin PH will collect in Pond 4 with controlled releases through an inlet connection to the storm drain system along Broadway Boulevard.

TABLE 2
PROPOSED CONDITIONS

BASIN	AREA ac	ZONE	LAND TREATMENT	PEAK DISCHARGE cfs		V_{1440} ac-ft	
				10-Year	100-Year	10-Year	100-Year
PA	2.61	2	D	8.19	12.26	0.35	0.55
PB	5.33	2	C	9.11	16.69	0.23	0.50
PC	0.33	2	D	1.04	1.55	0.04	0.07
PD	0.25 1.96	2	C D	6.58	9.98	0.27	0.44
PE East	0.33 1.00	2	C D	3.70	5.73	0.15	0.24
PE West	0.35	2	D	1.10	1.64	0.05	0.07
PE Total	1.68	2		4.80	7.37	0.20	0.31
PF*	5.03	2	A	1.91	7.87	0.05	0.22
PG	0.05 0.09 0.51	2	A C D	1.77	2.76	0.07	0.12
PH	0.18 1.54 2.31	2	A C D	9.96	15.83	0.38	0.63
PI	0.86 0.09	2	C D	1.75	3.12	0.05	0.10
PJ	0.15 0.50	2	A D	1.63	2.58	0.07	0.11
PK East	1.84	2	D	5.78	8.65	0.25	0.39
PK West	2.26	2	D	7.10	10.61	0.30	0.47
PK Total	4.10			12.88	19.26	0.55	0.86
TOTAL**				75.39	118.03	2.96	4.86

*Basin PF flows are retained within the basin therefore not contributing to the flow to the site.
** Does not include Basin F.

HYDRAULIC ANALYSIS

Because it is already evident that the storm sewer and street flow capacities in Broadway Boulevard are overextended, a hydraulic analysis of Broadway Boulevard was not conducted. Instead, RTI attempted to detain on-site runoff as much as possible by constructing detention ponds wherever a location was available.

Plates 3A and 3B illustrate the future condition watershed basins for this site. The existing condition 100-year peak flow from the middle driveway (on the north side of the Public Works facility) into Broadway Boulevard is 9.96 cfs compared to 12.2 cfs for proposed conditions. The increase in the total discharge of 2.24 cfs is a result of the addition of 0.49 acres into Basin PA.

Basin PB drains into proposed Pond 8 located at the southwest corner of the basin. Existing Basin B consists of 9.2 acres. Basin PB was reduced to 5.33 acres. The remaining 3.87 acres is now within proposed Basin PK. Basin PD consists of a 2.21 acre area; the existing Basin D is 3.73 acres. Basin D was decreased due to the subdivision into proposed Basin PI, which is located directly west of Basin PD. Basins PD and PI have proposed ponds located within their boundaries which will accommodate the 100-year storm event from the adjacent contributing area and controlled outflow from upstream ponds will not cause these ponds to overflow. Basin PE has been reduced from the existing 2.54 acres to 1.68 acres. This reduced area is due to the increase in Basin PA which includes a portion of Basin E.

Basin PF remains the same as the existing Basin F. All of the runoff will be retained off-site within the basin in an existing depression located at the northwest comer of Basin PF. This depression has an approximate volume of 0.25 ac-ft which is enough for the 0.22 ac-ft 100-year runoff for existing and proposed conditions produced by Basin F. Basin PG also remains essentially the same as the existing Basin G with only a slight increase of area and flow. Basin PJ is located in the far west area of the existing Basin B.

Basin PH is comprised of the newly acquired 4.0 acre area at the far northwest corner of the site. Under existing conditions this drainage area sheet flows to Broadway Boulevard. The proposed Basin PH will continue to flow west, but will be directed to proposed Pond 4.

Cumulative peak flow at Broadway Boulevard from Basins PA, PB, PE, PG, PJ and PK has been reduced from the existing conditions because some of this flow has been diverted into Ponds 1, 2, 3, 7 and 8.

Basins PD and PI drain the southern portion of the County Yard and flow into Ponds 5 and 6. The discharge rates and volumes from Basins C and G, located the near the Vehicle Maintenance Shop, was not changed.

The discharge rate from Pond 6 into the existing storm drain system is minimal due to the existing condition and clogging of the drain inlet. This storm drain will be restored as part of this project. The proposed 12-inch discharge pipe will exceed the total proposed inflow into Pond 6. Only pipe

discharge from Pond 5 and Basin PI is contributed into Pond 6, which has the storage capacity to accommodate the 100-year storm flow (with no overflow) onto the Testing Lab property.

The 100-year flow rate from Basin H has been slightly reduced from 17.22 cfs to 15.83 cfs, the total discharge volume has also been reduced from 0.72 ac-ft to 0.63 ac-ft. Pond 4 has been located and sized for accommodating 0.29 ac-ft. This is nearly half of the proposed 100-year runoff volume.

PROPOSED POND ANALYSIS

Table 3 summarizes all of the proposed pond operations; and the following paragraphs describe individual ponds.

TABLE 3
INDIVIDUAL POND DISCHARGE DATA
FOR 10-YEAR AND 100-YEAR STORM EVENT

Pond No.	Pond Vol. (ac-ft)	Contri-buting Basins	Drainage Area (acres)	Inflow minus Outflow				Over Flow			
				Q_{10} (cfs)	V_{10} (cfs)	Q_{100} (cfs)	V_{100} (cfs)	Q_{10} (cfs)	V_{10} (cfs)	Q_{100} (cfs)	V_{100} (cfs)
1*	0.11	PJ, PA	3.26	8.01	0.29	13.03	0.66	4.26	0.18	13.03	0.55
2	0.123	PE east	1.33	1.89	0.11	3.92	0.24	0	0	2.02	0.12
3	0.166	PE west	0.35	2.46	0.09	3.00	0.12	0	0	0	0
4	0.29	PH	4.03	8.15	0.28	14.02	0.63	0	0	14.02	0.35
5	0.51	PD	2.21	9.44	0.34	12.84	0.43	0	0	0	0
6	0.13	PI	0.95	0	0	0.81	0.03	0	0	0	0
7*	0.062	PG, PK	4.75	12.84	0.47	20.21	0.98	10.3	0.40	20.21	0.92
8	0.57	PB	5.33	9.11	0.23	16.69	0.50	0	0	0	0

*Without including the surcharge storage on the parking lot and pond, Pond 1 detains 44% the 2-year storm event. Basins PA and PJ contribute a 2-year runoff volume of 0.250 ac-ft. Pond 7 retains approximately 17% of the 2-year storm events from contributing basins PG and PK.

Pond 1

Pond 1 is located adjacent to and partially within the parking area west of the existing Public Works Department building. Pond 1 consists of two small ponds connected by an 8-inch PVC pipe, but separated by the existing County Yard sign. In order to increase detention volume, parts of the existing landscaped area west of the parking lot will be excavated. Drainage into this pond will be

detained and allowed to discharge to an existing drop inlet on the north driveway of the City of Albuquerque Testing Lab. This inlet is connected to the storm drain system within Broadway Boulevard. Total detention volume for this pond will be approximately 0.11 acre-feet and the water will pond to a depth of 1.5 feet, without the parking lot surcharge storage.

Excess ponding from the excavated areas will extend east onto the adjacent parking area and pond to a depth of approximately six inches on the parking lot before spilling into the middle driveway which is also the emergency overflow. A railroad tie retaining wall was required to increase the designed detention area. Two-foot wide curb cuts at 6-foot intervals are proposed in the concrete curb along the western side of the parking lot to allow surface flow to drain into the ponding area.

This pond was originally proposed in the July 1994 Drainage Report by RTI and is still considered an appropriate design. County officials felt it was acceptable to utilize this area as long as the landscaped island was not disturbed.

Pond 2

The detention volume of Pond 2, located in the parking lot west of the County Warehouse, has been increased by the addition of a reinforced concrete block wall varying in height from one-half to two-and-a-half feet high instead of a curb along the western and southern extent of the ponding area. Calculated water storage volume is approximately 0.123 acre-feet and the water will pond to a maximum depth of 1.5 feet. Contributing drainage area is about 1.33 acres. An asphalt berm will be added to the north end of the pond within the existing parking area, extending from the end of the retaining wall, in order to function as a water barrier without blocking traffic flow. This berm will prevent ponding of water near the Purchasing Supply Warehouse.

Ponded water will discharge through an 8-inch opening in the block wall to Pond 3 which is adjacent. The calculated maximum discharge rate from Pond 2 is 1.8 cfs through use of the orifice equation (see Appendix). It is important that warning signs be posted along the wall to warn people parking there of the potential flooding hazard; therefore, this area should only be used as secondary or overflow parking.

Excess water that accumulates beyond the capacity of Pond 2 will spill south into the street by overflowing through the driveway at the southeast corner of Pond 2. The existing smaller retention pond located at the southwest corner of the parking lot will be allowed to remain and become incorporated into the RTI design.

Pond 3

Pond 3 is located adjacent to and west of Pond 2. It will detain runoff from the Purchasing Supply Warehouse, the surrounding asphalt area, and discharge from Pond 2. Pond 3 will also be surrounded by a one-and-a-half to two-and-a-half foot high block wall along the western and southern sides to increase detention volume. The curved alignment of the block wall on the southern side of the pond was designed to be in compliance with the proposed roadway alignment shown on the Site Plan.

This pond will detain approximately 0.166 acre-feet of water to a depth of 2.5 feet and discharge through an 8-inch diameter pipe at the west corner of the pond. The pipe will discharge to Pond 5 just southwest of Pond 3. The maximum discharge rate of the opening in the block wall under completely submerged conditions was calculated to be 2.47 cfs (see Appendix).

Pond 3 has the capacity to detain the 100-year storm event and the outflow from Pond 2. Once the capacity of the pond and the outflow pipe are reached, any overflow will spill through a 14-foot wide weir located along the west side of Pond 3 at the northwest end of the retaining wall.

Pond 4

Pond 4, which consists of three ponding areas connected by 8-inch pipes, will now serve the new area (future location of the Public Works Administration building, Parks and Recreation, and Building Maintenance and Operations facilities). This area was not originally part of the July 1994 Drainage Report by RTI. These ponds will detain runoff from a contributing area of about 4.03 acres. Construction of the ponds will be similar to that for Pond 1, and they will also be located on the west side of the drainage area. Total retention volume of this pond will be approximately 0.29 acre-feet and water will pond to a depth of 1.5 feet. Discharge will occur through an 8-inch pvc pipe connected to an existing storm inlet located in Broadway Boulevard immediately west of the pond. Overflow from the pond will extend onto the proposed entrance driveway before spilling into Broadway Boulevard through a 7-foot weir on each ponding area located along the adjacent driveways. The pond design proposed is similar in operation and appearance to the other ponds proposed along the west side of the property, adjacent to Broadway Boulevard.

Pond 5

Pond 5 is located east of the Vehicle Maintenance Shop and west of the proposed Sheriffs Radio Shop. The pond will be vertical-sided, 2.75 feet deep, supported by a railroad tie retaining wall.

Overall detention volume will be 0.51 acre-feet from a local contributing area of about 2.21 acres, and an upstream release from Pond 8 (maximum flow rate is 3.0 cfs) and Pond 3 (maximum flow rate is 2.47 cfs). An 8-inch PVC outlet pipe will connect Pond 5 with Pond 6 to the west. The maximum discharge from this pipe was calculated to be 2.61 cfs (see Appendix). Further details on this outlet pipe are available in the Pond 8 description. Overflow from the pond will spill through a 20-foot wide weir located at the southwest corner of the pond, and flow parallel to the southern property line to Pond 6. This weir width was calculated using the weir equation and a peak flow of 15.45 cfs (see Appendix).

The top edge of the pond that is adjacent to vehicle traffic will have metal bollards to create a traffic barrier. The bollards will allow surface drainage into the pond and prevent the nearby vehicle traffic from damaging the pond.

Pond 6

Pond 6 required careful consideration of both existing and proposed vehicular traffic to ensure that access to the vehicle maintenance facility was not affected by the pond. As a result, a triangular configuration was utilized to maximize detention volume without impeding vehicle access into and out of the building. This pond will be four feet deep with 2H:1V sides and detain 0.13 acre-feet of runoff from approximately 0.95 acres. A newly constructed drop inlet will be connected by a 12 - inch PVC pipe to the existing storm drain inlet at the northern edge of the pond. Because of the existing outlet elevation limitations, the inlet had to be located on the side slope of the pond. The grate will be higher than the pond bottom, so that approximately two feet of depth will be available in the pond for sediment volume, if needed. The discharge rate from this pipe is 4.78 cfs (see Appendix). Through a series of connections located on the Testing Lab property, this existing inlet drains into the storm drainage system in Broadway Boulevard. An 8-inch pipe from Pond 5 will also drain to Pond 6 as described above. Runoff from the contributing basin and upstream ponds discharging down line to Pond 6 are controlled so that the 100-year storm event will be controlled, assuming that the existing storm drain system has the capacity.

A reinforced concrete block retaining wall will be constructed along the western and southern sides of the pond, along the fence line, in order to better control overflow into the Testing Lab facility. An overflow weir will be constructed at the southern end of the west side block wall, to allow for a controlled discharge of 5.59 cfs out of the pond if necessary. The weir width will be 14 feet with an overflow depth of 0.5 feet. This depth was required due to limitations on weir width because of the proximity of the Testing Laboratory building. The eastern side of this pond will also be protected by metal bollards to allow drainage inflow and to prevent vehicles from driving into or damaging the pond.

Bernalillo County will have to acquire a drainage easement from the City of Albuquerque to provide for this emergency overflow from Pond 6. The City of Albuquerque will determine what type of drainage easement is required for the discharge in question.

Pond 7

Pond 7 will be similar to Pond 1 in that a railroad tie retaining wall will form the sides. This pond will be 1.5 feet deep and detain 0.062 acre-feet. This detention volume is less than the 10-year runoff volume produced from the contributing basins; consequently, any additional volume will overflow onto the middle driveway. A new drop inlet will be constructed to drain water from the pond. An 8-inch diameter outflow pipe will connect with a catch basin located on Broadway Boulevard which discharges directly to the 72-inch storm drain in Broadway Boulevard. The discharge rate of the 8-inch line will be 1.81 cfs into the storm drain. Additional ponding will accumulate in the adjacent parking area east of the detention pond.

This pond will incorporate a 28-foot long overflow weir at the north side of the pond. Maximum depth over the weir will be 0.5 feet in order to minimize the flow over the sidewalk. An asphalt berm, constructed at the south end of the parking lot, will act as a water barrier to increase detention

volume and protect the Testing Lab from this runoff. The railroad tie retaining wall at the south end will be 0.5 feet higher than the west wall to prevent flow into the Testing Lab facility.

Pond 8

Pond 8 was added in order to reduce the amount of runoff down the southern driveway from reaching Broadway Boulevard. Located southeast of the County Warehouse, it will detain runoff from most of the open storage area on the eastern side of the site. An earthen diversion berm and dirt swale located on the east side of the loop road around the warehouse will channel flow into the pond, a rip-rap rundown is included in the pond design to prevent erosion of the pond slope at the inlet.

Pond 8 will be an earthen pond approximately 3.5 feet deep and detain runoff from approximately 5.3 acres. The 100-year storm will be controlled by Pond 8 without considering the pipe outflow. The pond will drain through an 8-inch diameter pipe that discharges into Pond 5. Allowing for the pipe outflow and sediment storage provision (see below), the capacity of Pond 8 is substantially increased beyond the 100-year storm event. Calculated maximum discharge from this pipe is 3.0 cfs. A 22-foot grouted rip-rap overflow weir is included as part of this pond to allow for excess flow beyond the design capacity or if large sediment accumulation significantly reduces pond volume during a storm event (see Appendix).

Total detention volume is about 0.57 acre-feet. This pond is actually sized large enough to detain all 100-year runoff plus a ten percent loss of volume due to sediment accumulation from the eastern portion of the site beyond the County Warehouse. This design decision was instituted due to the large expanse of stockpiled material and unpaved area that is subjected to heavy equipment traffic in this area. It is likely that even small storm events will generate sediment due to the nature of the surface.

Summary

A summary of the pond data is presented on Table 4, on the following page.

A total of eight ponds are proposed on the Project Site ranging in volume from approximately 2,700 to 25,000 cu.ft. The resulting decrease in 100-year peak flow rates at Broadway Boulevard is 54 percent, from 87.87 cfs to 47.26 cfs (total of four discharge points, shown on Table 5).

TABLE 4
POND DATA

		POND & OUTLET DATA					OVERFLOW WEIR DATA			
Pond #	**Enclosure Type**	**Pond Area (ac)**	**Pond Volume (ac ft)**	**Ponding Depth (ft)**	**Outlet Type**	**Peak Outlet Discharge (cfs)**	**Weir Type**	**Weir Coeff.**	**Weir Width (ft)**	**Weir Overflow Depth (ft)**
1	RR Tie	0.07	0.110	1.5 (a)	8" PVC	1.81	Asphalt Berm			(b)
2	CMU	0.14	0.123	1.5	8" PVC	1.81	Asphalt Paving			(b)
3	CMU	0.13	0.166	2.5 Fence	8" PVC	2.47	CMU Retaining Wall	2.2	14	0.33
4	RR Tie	0.20	0.29	1.5	8" PVC	1.81	RR Tie Wall	2.2	21	0.5
5	RR Tie	0.18	0.44	2.75 Fence	8" PVC	2.61	RR Tie Wall	2.2	20	0.5
6	CMU + 2:1 side slopes	0.04	0.13	4.0 Fence	12" PVC	4.78	CMU Retaining Wall	2.2	14	0.5
7	RR Tie	0.04	0.06	1.5 (a)	8" PVC	1.81	RR Tie Wall	2.2	28	0.5
8	Earthen Pond 3:1 side slopes	0.21	0.57	3.5	8" PVC	3.00	Grouted Rip Rap	2.2	22	0.5

Notes: (a) Additional ponding on parking lot.
(b) Parking lot sheet flow.

TABLE 5
POND ROUTING FOR 100-YEAR DEVELOPED CONDITIONS

Discharge Point (see Sheet 3A)	Location of Discharge Point	INFLOW TO POND		OUTFLOW FROM POND		Total Overflow cfs
		From	Q_{100} cfs	Feature	Q_{100} cfs	
1	Pond 1	Basin PJ Basin PA	2.58 12.26	8-inch pipe from Pond 1 to drain inlet in Broadway Blvd. Pond 1 Impact*	1.81 0	
	Subtotal		14.84		1.81	13.03
2	Pond 4	Basin PH	15.83	8-inch pipe from Pond 4 to drain inlet in Broadway Blvd. Pond 4 Impact*	1.81 0	
	Subtotal		15.83		1.81	14.02
3	Pond 7	Basin PG Basin PK	2.76 19.26	8-inch pipe from Pond 7 to drain inlet in Broadway Blvd. Pond 7 Impact*	1.81 0	
	Subtotal		22.02		1.81	20.21
4	Pond 8	Basin PB	16.69	8-inch pipe from Pond 8 to Pond 5 Pond 8 Impact*	3.00 13.69	
	Subtotal		16.69		16.69	0
	Pond 2	Basin PE east	5.73	8-inch pipe from Pond 2 to Pond 3 Pond 2 Impact*	1.81 1.9	
	Subtotal		5.73		3.71	
	Pond 3	Basin PE west Pond 2 overflow 8-inch pipe from Pond 2	1.64 2.02 1.81	8-inch pipe Pond 3 to Pond 5 Pond 3 Impact*	2.47 3.00	
	Subtotal		5.47		5.47	0
	Pond 5	Basin PD 8-inch pipe from Pond 3 8-inch pipe from Pond 8	9.98 2.47 3.0	8-inch pipe from Pond 5 to Pond 6 Pond 5 Impact*	2.61 12.84	
	Subtotal		15.45		15.45	0

*Assumed peak flow reduction as a result of ponding.

TABLE 5 (contd.)
POND ROUTING FOR 100-YEAR DEVELOPED CONDITIONS

Discharge Point (see Sheet 3A)	Location of Discharge Point	INFLOW TO POND		OUTFLOW FROM POND		Total Overflow cfs
		From	Q_{100} cfs	Feature	Q_{100} cfs	
4 (cont.)	Pond 6	Basin PI 8-inch pipe from Pond 5	3.12 2.47	12-inch pipe from Pond 6 to drain inlet in Broadway Boulevard Pond 6 Impact*	4.78 0.81	
	Subtotal		5.59		5.59	0
Total						47.26

*Assumed peak flow reduction as a result of ponding.

APPENDIX

Supporting Calculations

RESOURCE TECHNOLOGY, INC.
ENGINEERS & ENVIRONMENTAL SCIENTISTS
2129 Osuna Road, NE Suite 200
Albuquerque, NM 87113
Phone: (505) 345-3115
Fax: (505) 345-4132

CHECKED _____ DATE _____
APPROVED _____ DATE _____
TITLE _____

PROJECT NO. _____
SHEET _____ OF _____
BY _____ DATE _____

2400 Broadway
Existing and Proposed
Conditions

HYDROLOGY CALCULATIONS

for

100-yr, 10-yr, 2-yr
Storm Event

As per Section 22.2, Hydrology of the Developement Process Manual Vol 2, Design Criteria, June 1993

Existing Conditions

Existing Q's Using Section 22.2, Hydrology of the Developement Process Manual Volume 2, Design Criteria for the City of Albuquerque, NM Jan., 1993

General Site Conditions:

Total Area of Basins A thru H = 27.6 acres
This site is Located in Precipitation Zone 2
The site has historically discharged to Broadway Blvd.

Basin A:

A = 92,485 sf = 2.12 ac
L = 785 ft
S = 1.7 %
~~t_c =~~ < 12 min

All type D impervious

Peak discharge: $Q_p = Q_{pA} A_A + Q_{pB} A_B + \ldots$

Method 1: $Q_p = 4.70\,(2.12) = 9.96$ cfs

Method 2: $Q_p = (C_A \cdot I \cdot A_A) + (C_B \cdot I\, A_B) + \ldots$ (Table A-10, A-11)
$= (0.93)(5.05)(2.12) = 9.96$ cfs Rational Method

Weighted E_i: $E_w = \dfrac{E_A A_A + E_B A_B + \ldots}{A_A + A_B + \ldots}$ (Table A-8)

$E_w = \dfrac{2.12\,(2.12)}{2.12} = 2.12$ in.

Volume of Runoff $V_{360} = E_w\,(A_A + A_B + A_C + \ldots)/12$

24 hr. Storm: $V_{1440} = V_{360} + A_D * (\underbrace{P_{1440} - P_{360}}_{\text{(Table A-2)}})/12$ in/ft

$V_{360} = 2.12\,(2.12)/12 = 0.37$ ac ft

$V_{1440} = 0.37 + 2.12\,(2.75 - 2.35)/12 = 0.44$ ac ft

$= 19{,}195$ ft^3

Basin B

A = 400,810 sf = 9.20 ac.
L =
S =
tc =

Land Treatment A = -
B = 0.37 ac
C = 5.59 ac
D = 3.24 ac

$Q = (0.45)(5.05)(0.37) + (0.62)(5.05)(5.59) + (0.93)(5.05)(3.24)$
$= 0.84 + 17.50 + 15.22$
$= 33.56$ cfs

$E_W = \frac{0.78(0.37) + (1.13)(5.59) + (2.12)(3.24)}{9.20} = 1.46$ in

$V_{360} = 1.46(9.20)/12 = 1.12$ ac ft

$V_{1440} = 1.12 + 3.24(0.4)/12 = 1.23$ ac ft

$= 53,492$ cf

Basin C

A = 14,290 sf = 0.33 ac
L =
S =
tc =

Land Treatment
all type D impervious

$Q = (0.93)(5.05)(0.33) = 1.55$ cfs

$E_W = E_D = 2.12$ in

$V_{360} = 2.12(0.33)/12 = 0.058$ ac ft

$V_{1440} = 0.058 + 0.33(.4)/12 = 0.069$ ac ft

$= 3,006$ cf

B_{west} : A = 1.74 a

$Q = (0.93)(5.05)(1.74) = 8.17$ cfs

Beast
33.56 − 8.17 = 25.39 cfs

RESOURCE TECHNOLOGY, INC.
ENGINEERS & ENVIRONMENTAL SCIENTISTS
2129 Osuna Road, NE Suite 200
Albuquerque, NM 87113
Phone: (505) 345-3115
Fax: (505) 345-4132

CHECKED _____ DATE _____
APPROVED _____ DATE _____
TITLE 2400 Broadway

PROJECT NO. _____
SHEET 3 OF 6
BY FG DATE _____

Basin B west : Area = 1.74 ac treatment D

$$E_w = \frac{(2.12)(1.74)}{1.74} = 2.12 \text{ in}$$

$$V_{360} = 2.12\,(1.74)/12 = 0.3074 \text{ ac ft}$$

$$V_{1440} = 0.3074 + 1.74\,(0.4)/12 = 0.3654 \text{ ac ft}$$

$$= 15{,}916 \text{ cf}$$

Basin D:

A = 162,691 sf = 3.73 ac
L =
S =
t_c =

Land treatment C = 1.98 ac
Land treatment D = 1.75 ac

$Q = (0.62)(5.05)(1.98) + (0.93)(5.05)(1.75) =$
$= 6.20 + 8.2$
$= 14.42$ cfs

$E_w = \frac{(1.13)(1.98) + (2.12)(1.75)}{3.73} = 1.59$ in

$V_{360} = 1.59(3.73)/12 = 0.49$ ac ft

$V_{1440} = 0.49 + 1.75(0.4)/12 = 0.55$ ac ft
$= 24,070$ cf

Basin E:

A = 110,080 sf = 2.54 ac
L
S
t_c

Land treatment C = 1.13 ac
Land Treatment D = 1.41 ac

$Q = (0.62)(5.05)(1.13) + (0.93)(5.05)(1.41)$
$= 3.54 + 6.62$
$= 10.16$ cfs

$E_w = \frac{(1.13)(1.13) + (2.12)(1.41)}{2.54} = 1.93$ in

$V_{360} = 1.93(2.54)/12 = 0.41$ ac ft

$V_{1440} = 0.41 + 1.41(0.4)/12 = 0.46$ ac ft
$= 19,907$ ft^3

Basin F

A = 219,115 sf = 5.03 ac All Land Treatment A
L = 800'
S = 3.97%
$t_c \leq$ 12 min

$Q = (0.31)(5.05)(5.03) = 7.87$ cfs

$E_W = 0.53$ in.

$V_{360} = 0.53\,(5.03)/12 = 0.22$ ac ft

$V_{1440} = 0.22 + 0 = 0.22$ ac ft

$= 9{,}583$ ft^3

Basin G

A = 28,560 sf = 0.66 ac Land Treatment B = 0.13ac
L C = 0.15 ac
S D = 0.38ac
t_c

$Q = (0.45)(5.05)(0.13) + (0.62)(5.05)(0.15) + (0.93)(5.05)(0.38)$
$= 2.55$ cfs.

$$E_W = \frac{0.78(0.13) + (1.12)(0.15) + (2.12)(0.38)}{0.66} = 1.63 \text{ in}$$

$V_{360} = 1.63\,(0.66)/12 = 0.09$ ac ft

$V_{1440} = 0.09 + 0.38\,(.4)\,12 = 0.10$ ac ft

$= 4{,}457$ ft^3

RESOURCE TECHNOLOGY, INC.
ENGINEERS & ENVIRONMENTAL SCIENTISTS
2129 Osuna Road, NE Suite 200
Albuquerque, NM 87113
Phone: (505) 345-3115
Fax: (505) 345-4132

CHECKED _____ DATE _____ PROJECT NO. _____

APPROVED _____ DATE _____ SHEET 6 OF 6

TITLE _____ BY _____ DATE _____

Basin H

A = 174,234 sf = 4.00 ac Land Treatment C = 1.0
L D = 3.0
S
t_c

$Q = (0.62)(5.05)(1.0) + (0.93)(5.05)(3.0)$
$= 3.13 + 14.1$
$= 17.22$ cfs

$E_w = \frac{(1.13)(1.0) + 2.12(3.0)}{4.0} = 1.87$ in

$V_{360} = 1.87(4.0)/12 = 0.62$ ac ft

$V_{1440} = 0.62 + 3.0(0.4)/12 = 0.72$ ac ft
$= 31,544$ ft^3

RESOURCE TECHNOLOGY, INC.
ENGINEERS & ENVIRONMENTAL SCIENTISTS
2129 Osuna Road, NE Suite 200
Albuquerque, NM 87113
Phone: (505) 345-3115
Fax: (505) 345-4132

CHECKED _____ DATE _____ PROJECT NO. _____

APPROVED _____ DATE _____ SHEET 1 OF 6

TITLE 2400 Broadway - 100 yr BY VG DATE _____

1 Acre = 43,560 ft²

Proposed Conditions

To Broadway

Basin PA (RTI)

Land Treat. All type D.

A = 113,830 sf = 2.61 ac

Q = (0.93)(5.05)(2.61) = 12.26 cfs

$E_w = \frac{(2.12)(2.61)}{2.61} = 2.12$ in

$V_{360} = 2.12\,(2.61)/12 = 0.46$ ac-ft

$V_{1440} = 0.46 + 2.61\,(2.75 - 2.35)/12 = 0.55$ ac-ft

= 23,958 cf

Pond 8

Basin PB.

Land Treat All type C

A = 232,327 sf = 5.33 ac

Q = (0.62)(5.05)(5.33) = 16.69 cfs

E_w = 1.13 in

$V_{360} = (1.13)(5.33)/12 = 0.50$ ac-ft

$V_{1440} = 0.50 + 0 = 0.50$ ac-ft = 21,780 cf

To 24"48" DF

Basin PC

Land Treatment All type D

A = 13,839 sf = 0.33 ac

Q = (0.93)(5.05)(0.33) = 1.55 cfs

E_w = 2.12 in

$V_{360} = 2.12\,(0.33)/12 = 0.056$ ac-ft

$V_{1440} = 0.056 + 0.32\,(2.75 - 2.35)/12 = 0.0667$ ac ft = 2904 cf

Pond 5

Basin PD:

Land Treat:

A = 96,962 sf = 2.21 ac

Type C: 11,085 sf = 0.25 ac
Type D: 85,377 sf = 1.96 ac

$Q = (0.62)(5.05)(0.25) + (0.93)(5.05)(1.96) = 9.98$ cfs

$E_w = \frac{(1.13)(0.25) + (2.12)(1.96)}{2.21} = 2.01$ in

V_{360} 2.01 (2.21)/12 = 0.37 ac ft

V_{1440} 0.37 + 1.96 (2.75 - 2.35)/12 = 0.435 af = 18,963 cf

Pond 2

Basin PE: (EAST)

Land Treatment

A = 58,075 = 1.33 ac.

Type C = 14,400 = 0.33 ac
Type D = 43,675 = 1.00

$Q = (0.62)(5.05)(0.33) + (0.93)(5.05)(1.00) = 5.73$ cfs

$E_w = \frac{(1.13)(0.33) + (2.12)(1.00)}{1.33} = 1.87$ in

V_{360} = 1.87 (1.33)/12 = 0.21 ac ft

V_{1440} = 0.21 + 1.00 (2.75 - 2.35)/12 = 0.24 ac ft = 10,600 ft³

Vacant Lot

Basin PF:

A = 219,115 sf = 5.03 ac

ALL Type A

$Q = (0.31)(5.05)\ 5.03 = 7.87$ cfs

$E_w = (0.53)(5.03)/5.03 = 0.53$ in

V_{360} = 0.53 (5.03)/12 = 0.22 ac ft

V_{1440} = 0.22 + 0 = 0.22 ac ft = 9,583 cf

RESOURCE TECHNOLOGY, INC.
ENGINEERS & ENVIRONMENTAL SCIENTISTS
2129 Osuna Road, NE Suite 200
Albuquerque, NM 87113
Phone: (505) 345-3115
Fax: (505) 345-4132

CHECKED _____ DATE _____ PROJECT NO. _____
APPROVED _____ DATE _____ SHEET 3 OF 6
TITLE 2406 Broadway - 100 yr BY _____ DATE _____

1 ac = 43,560 sf

Pond 1

Basin PG.

A = 28,331 sf = 0.65 ac

Type A = 2000 sf = 0.05 ac
Type C = 3900 sf = 0.09 ac
Type D = 22,431 sf = 0.51 ac

$Q = (0.31)(5.05)(0.05) + (0.62)(5.05)(0.09) + 0.93(5.05)0.51$

$= 0.078 + 0.282 + 2.39 = 2.76$ cfs

$E_W = \frac{(0.53)(0.05) + (1.13)(0.09) + (2.12)(0.51)}{0.65} = 1.86$ in

$V_{360} = 1.86(0.65)/12 = 0.10$ ac ft

$V_{1440} = 0.10 + 0.51(2.75 - 2.35)/12 = 0.12$ ac ft = 5227 cf

Pond 1 ✓

Basin PH J

A = 28,396 sf = 0.65 ac

Typ A = 6400 sf = 0.15 ac
Type D = 21,996 sf = 0.50 ac

$Q = (0.31)(5.05)(0.15) + (0.93)(5.05)(0.5)$

$= 0.235 + 2.35 = 2.58$ cfs

$E_W = \frac{(0.53)(0.15) + 2.12(0.50)}{0.65} = 1.75$ in

$V_{360} = 1.75(0.65)/12 = 0.09$ ac · ft

$V_{1440} = 0.09 + 0.5(2.75 - 2.35)/12 = 0.11$ ac ft = 4646 cf

Pond 6

Basin PI

A = 41,527 sf = 0.95 ac

Type C = 37,627 sf = 0.86 ac
Type D = 3900 sf = 0.09 ac

$Q = (0.62)(5.05)(0.86) + (0.93)(5.05)(0.09) = 3.12$ cfs

$E_W = 1.13(0.86) + 2.12(0.09)/0.95 = 1.22$ in

$V_{360} = 1.22(0.95)/12 = 0.097$ ac ft

$V_{1440} = 0.097 + 0.09(2.75 - 2.35)/12 = 0.1$ ac = 4338 cf

RESOURCE TECHNOLOGY, INC.
ENGINEERS & ENVIRONMENTAL SCIENTISTS
2129 Osuna Road, NE Suite 200
Albuquerque, NM 87113
Phone: (505) 345-3115
Fax: (505) 345-4132

CHECKED _____ DATE _____ PROJECT NO. _____

APPROVED _____ DATE _____ SHEET 4 OF 6

TITLE 2400 Broadway - 100 yr BY FG DATE _____

Revised Basin ~~PJ~~ PH (previous PJ and PL)

A = 141,908 + 33,334 = 175,242 sf = 4.0 ac

Type A = 8000 sf = 0.18 ac
type C = 65,547 = 1.50 ac
type D = 100,400 = 2.31 ac

Q = (0.31)(5.05)(0.18) + (0.62)(5.05)(1.50) + (0.93)(5.05)(2.31)

Q = 15.83 cfs

$$E_w = \frac{(0.53)(0.18) + (1.13)(1.50) + 2.12(2.31)}{4.0} = 1.6719 \text{ in}$$

V_{360} = 1.67 (4.0)/12 = 0.5573 ac-ft.

V_{1440} = 0.5573 ac + 2.31(0.4)/12 = 0.6343 ac ft

= 27,630 cf.

RESOURCE TECHNOLOGY, INC.
ENGINEERS & ENVIRONMENTAL SCIENTISTS
2129 Osuna Road, NE Suite 200
Albuquerque, NM 87113
Phone: (505) 345-3115
Fax: (505) 345-4132

CHECKED _____ DATE _____ PROJECT NO. _____
APPROVED _____ DATE _____ SHEET 5 OF 6
TITLE 2400 Broadway - 100 yr BY FG DATE _____

Pond 4A

Basin PJ (ADD Basin PL)

A = 141,998 sf = 3.26 ac

Type A = 8000 sf = 0.18 ac
Type C = 33,600 sf = 0.77 ac
Type D = 100,400 = 2.31 ac
0.28 + 2.41

Q = (0.31)(5.05)(0.18) + (0.62)(5.05)(0.77) + (0.93)(5.05)(2.31)
= 13.54 cfs

$E_w = \frac{0.53(0.18) + 1.13(0.77) + 2.12(2.31)}{3.26} = 1.80$

V_{360} = 1.80 (3.26)/12 = 0.49 ac ft

V_{1440} = 0.49 + 2.31(2.75 - 2.35)/12 = 0.57 ac ft = 24,698

Pond 3 to broadway

Basin PK Total (See PK East + PK West for subbasin Qs)

A = 178,596 sf = 4.10 ac All type D

Q = (0.93)(5.05)(4.10) = 19.26 cfs

E_w = 2.12 in

V_{360} = 2.12(4.10)/12 = 0.7243 ac ft

V_{1440} = 0.724 + 4.10 (2.75 - 2.35)/12 = .861 ac ft = 37,505 cf

Pond 4B

Basin PL (ADD to Basin PJ to make one Basin)

A = 33,334 sf = 0.77 ac All type C

Q = (0.62)(5.05)(0.77) = 2.41 cfs

E_w = 1.13

V_{360} = 1.13(0.77)/12 = 0.073 ac ft

V_{1440} = 0.073 + 0.77(2.75 - 2.35)/12 = 0.098 ac ft = 4276

Basin PK total A = 178,596 sf = 4.10 ac

All Type D

Q = 19.26 cfs

V_{1440} = 0.861 acft = 37,505 cf

Sub Basin PK west and PK east:

PK East = A = 80,150 sf = 1.84 ac

Q = (0.93)(5.05)(1.84) = 8.65 cfs

Ew = 2.12 in

V_{360} = 2.12 (1.84)/12 = 0.3251 ac-ft

V_{1440} = 0.3251 + 1.84 (0.4)/12 = 0.3864 ac ft

= 16,832 cf

PK west = A = 98,446 sf = 2.26 ac

Q = (0.93)(5.05)(2.26) = 10.61 cfs

Ew = 2.12 in

V_{360} = 2.12 (2.26)/12 = 0.3993 ac-ft

V_{1440} = 0.3993 + 2.26 (0.4)/12 = 0.4746 ac ft

= 20,673 cf

RESOURCE TECHNOLOGY, INC.
ENGINEERS & ENVIRONMENTAL SCIENTISTS
2129 Osuna Road, NE Suite 200
Albuquerque, NM 87113
Phone: (505) 345-3115
Fax: (505) 345-4132

CHECKED _____ DATE _____ PROJECT NO. _____

APPROVED _____ DATE _____ SHEET 1 OF 3

TITLE 2400 Brdwy · 10yr Exist BY TS DATE _____

10 yr. - Return Period

$P_{1440} = (2.75)(0.667) = 1.8343$

$P_{360} = (2.35)(0.667) = 1.5675$

0.2668

Existing Conditions

Basin A Area = 2.12 ac All type D

$Q_p = (3.14)(2.12) = 6.66$ cfs

$E_w = 1.34$ in

$V_{360} = 1.34(2.12)/12 = 0.2367$ ac ft

$V_{1440} = 0.2367 + 2.12(0.2668)/12 = 0.2838$ ac ft

= 12,364 cf

Basin B total Area = 9.20 ac type B = 0.37 ac
C = 5.59 ac
D = 3.24 ac

$Q_p = (0.95)(0.37) + (1.71)(5.59) + (3.14)(3.24)$
= 20.08 cfs.

$E_w = \dfrac{(0.28)(0.37) + (0.52)(5.59) + (1.34)(3.24)}{9.20} = 0.7991$ in

$V_{360} = 0.7991(9.20)/12 = 0.6127$ ac ft

$V_{1440} = 0.6127 + 3.24(0.2668)/12 = 0.6847$ ac ft

= 29,826 cf

Basin C Area: 0.33 ac All type D

$Q_p = (3.14)(0.33) = 1.04$ cfs.

$E_w = 1.34$ in.

$V_{360} = 1.34(0.33)/12 = 0.0369$ ac-ft

$V_{1440} = 0.0369 + (0.33)(0.2668)/12 = 0.0442$ ac ft

= 1927 cf.

RESOURCE TECHNOLOGY, INC.
ENGINEERS & ENVIRONMENTAL SCIENTISTS
2129 Osuna Road, NE Suite 200
Albuquerque, NM 87113
Phone: (505) 345-3115
Fax: (505) 345-4132

CHECKED _____ DATE _____ PROJECT NO. _____

APPROVED _____ DATE _____ SHEET 2 OF 3

TITLE 2400 Bridway - 10yr Exist BY PS DATE _____

Basin D Area = 3.73 ac type C = 1.98 ac
type D = 1.75 ac

$Q_p = (1.71)(1.98) + (3.14)(1.75) = 8.88$ cfs

$E_w = \frac{(0.52)(1.98) + (1.34)(1.75)}{3.73} = 0.9047$ in

$V_{360} = 0.9047(3.73)/12 = 0.2812$ ac ft

$V_{1440} = 0.2812 + 1.75(0.2668)/12 = 0.3201$ ac ft

$= 13{,}945$ cf

Basin E Area = 2.54 ac type C = 1.13 ac
type D = 1.41 ac

$Q_p = (1.71)(1.13) + (3.14)(1.41) = 6.36$ cfs

$E_w = \frac{(0.52)(1.13) + (1.34)(1.41)}{2.54} = 0.9752$ in

$V_{360} = 0.9752(2.54)/12 = 0.2064$ ac-ft

$V_{1440} = 0.2064 + (1.41)(0.2668)/12 = 0.2377$ ac ft

$= 10{,}356$

Basin F Area 5.03 ac All type A

$Q = (0.38)(5.03) = 1.91$ cfs

$E_w = 0.13$ in

$V_{360} = 0.13(5.03)/12 = 0.0545$ ac ft

$V_{1440} = 0.0545 + 0 = 0.0545$ ac ft

$= 2{,}373$ cf

Basin G Area: 0.66 ac type B = 0.13 ac
type C = 0.15 ac
type D = 0.38 ac

$Q = (0.95)(0.13) + (1.71)(0.15) + (3.14)(0.38) = 1.57$ cfs.

$E_w = \frac{(0.28)(0.13) + (0.52)(0.15) + (0.38)(1.34)}{0.66} = 0.9448$ in

$V_{360} = 0.9448(0.66)/12 = 0.0520$ ac ft

$V_{1440} = 0.0520 + (0.38)(0.2668)/12 = 0.0604$ ac ft
$= 2,633$ cf

Basin H Area = 4.00 ac type C = 1.0
D = 3.0

$Q = (1.71)(1.0) + (3.14)(3.0) = 11.13$ cfs

$E_w = \frac{(0.52)(1.0) + (1.34)(3.0)}{4.0} = 1.1350$ in

$V_{360} = 1.1350(4.00)/12 = 0.3783$ ac ft

$V_{1440} = 0.3783 + (3.0)(0.2668)/12 = 0.4450$ ac ft
$= 19,386$ cf

Basin B West Area = 1.74 ac all type D

$Q = (3.14)(1.74) = 5.46$ cfs

$E_w = 1.34$ in

$V_{360} = (1.34)(1.74)/12 = 0.19$ ac ft

$V_{1440} = 0.1943 + (1.74)(0.2668)/12 = 0.2330$ ac ft
$= 10,149$ cf

RESOURCE TECHNOLOGY, INC.
ENGINEERS & ENVIRONMENTAL SCIENTISTS
2129 Osuna Road, NE Suite 200
Albuquerque, NM 87113
Phone: (505) 345-3115
Fax: (505) 345-4132

CHECKED _____ DATE _____ PROJECT NO. _____

APPROVED _____ DATE _____ SHEET 1 OF 9

TITLE 2400 Brdwy : 10 yr Prop. BY FG DATE _____

10 yr - Return Period

Proposed Conditions

$P_{1440} = (2.75)(0.667) = 1.8343$

$P_{360} = (2.35)(0.667) = 1.5675$

Basin PA : Area = 2.61 ac All Type D

$Q_p = (3.14)(2.61) = 8.19$ cfs

$E_w = \frac{(1.34)(2.61)}{2.61} = 1.34$ in

$V_{360} = 1.34(2.61)/12 = 0.2915$ ac ft

$V_{1440} = 0.2915 + 2.61(0.2668)/12 = 0.3495$ ac ft

$= 15{,}225$ cf

Basin PB Area = 5.33 ac. All type C

$Q_p = (1.71)(5.33) = 9.11$ cfs

$E_w = \frac{(1.12)(5.33)}{(5.33)} = 1.13$ in

$V_{360} = 0.52(5.33)/12 = 0.231$ ac ft

$V_{1440} = 0.231 + 0 = 0.231$ ac ft $= 10{,}060$ cf

Basin PC Area = 0.32 ac All type D treatment

$Q_p = (3.14)(0.32) = 1.005$ cfs

$E_w = (1.34)(0.32)/(0.32) = 1.34$ in

$V_{360} = 1.34(0.32)/12 = 0.0357$ ac·ft

$V_{1440} = 0.0357 + 0.32(0.2668)/12 = 0.0428$ ac ft

$= 1866$ cf

RESOURCE TECHNOLOGY, INC.
ENGINEERS & ENVIRONMENTAL SCIENTISTS
2129 Osuna Road, NE Suite 200
Albuquerque, NM 87113
Phone: (505) 345-3115
Fax: (505) 345-4132

CHECKED _____ DATE _____ PROJECT NO. _____

APPROVED _____ DATE _____ SHEET 2 OF 9

TITLE 2400 Broadway - 10 yr Prop. BY FG DATE _____

Basin PD Area = 2.21 ac

0.25 - type C
1.96 - type D

$Q_P = (1.71)(0.25) + (1.96)(3.14) = 6.58$ cfs

$E_W = \frac{(0.52)(0.25) + (1.34)(1.96)}{2.21} = 1.247$ in

$V_{360} = 1.247(2.21)/12 = 0.2297$ ac·ft

$V_{1440} = 0.2297 + 1.96(0.2668)/12 = 0.2733$ ac-ft

$= 11,904$ cf

Basin PE (EAST) Area = 1.33 ac

0.33 type C
1.00 type D

$Q_P = (1.71)(0.33) + (3.14)(1.00) = 3.70$ cfs

$E_W = \frac{(0.52)(0.33) + (1.34)(1.00)}{1.33} = 1.1365$ in

$V_{360} = 1.1365(1.33)/12 = 0.1260$ ac ft

$V_{1440} = 0.1260 + 1.00(0.2668)/12 = 0.1482$ ac ft

$= 6456$ cf

Basin PE (WEST) Area = 0.35 ac all type D.

$Q_P = (3.14)(0.35) = 1.10$ cfs

$E_W = \frac{(1.34)(0.35)}{0.35} = 1.34$ in

$V_{360} = 1.34(0.35)/12 = 0.0391$ ac·ft

$V_{1440} = 0.0391 + 0.35(0.2668)/12 = 0.0469$ ac ft

$= 2041$ cf

Basin PE Area = 5.03 ac All type A (Same as Existing)

$Q = (0.38)(5.03) = 1.91$

$E_W = 0.13$

$V_{360} = (0.13)(5.03)/12 = 0.0545$ ac ft = 2,374 cf

$V_{360} = V_{1440}$

Basin PG Area = 0.65

0.05 type A
0.09 type C
0.51 type D

$Q = (0.38)(0.05) + (1.71)(0.09) + (3.14)(0.51) = 1.774$ cfs

$E_W = \frac{(0.13)(0.05) + (0.52)(0.09) + (0.51)(1.34)}{0.65} = 1.1334$ in

$V_{360} = 1.1334\ (0.65)/12 = 0.0614$ ac ft

$V_{1440} = 0.0614 + 0.51\ (0.2668)/12 = 0.0727$ ac ft

= 3.167 cf

Basin ~~PH~~ PJ Area = 0.65 ac

0.15 - type A
0.50 - type D

$Q = (0.38)(0.15) + (0.50)(3.14) = 1.63$ cfs

$E_W = \frac{(0.13)(0.15) + (1.34)(0.50)}{0.65} = 1.0608$ in

$V_{360} = 1.0608\ (0.65)/12 = 0.0575$ ac ft

$V_{1440} = 0.0575 + 0.50\ (0.2668)/12 = 0.0686$ ac ft

= 2987 cf

Basin PI Area = 0.95 ac

type C = 0.86 ac
type D = 0.09 ac

$Q = (1.71)(0.86) + (0.09)(3.14) = 1.75$ cfs

$E_W = \frac{(0.52)(0.86) + (1.34)(0.09)}{0.95} = 0.5977$ in

$V_{360} = 0.5977\ (0.95)/12 = 0.0473$ ac ft

$V_{1440} = 0.0473 + 0.09\ (0.2668)/12 = 0.0493$ ac ft

= 2148 cf.

Basin ~~PJ~~ PH Area = 4.03 type A = 0.18
C = 1.54
D = 2.31

$Q = (0.38)(0.18) + (1.71)(1.54) + (3.14)(2.31) = 9.96$ cfs

$E_w = \frac{(0.13)(0.18) + (0.52)(1.54) + (1.34)(2.31)}{4.03} = 0.9726$

$V_{360} = 0.9726(4.03)/12 = 0.3266$ ac ft

$V_{1440} = 0.3266 + (2.31)(0.2668)/12 = 0.3780$ ac ft
= 16,464 cf

Basin PK East Area = 1.84 ac All type D

$Q = (3.14)(1.84) = 5.78$ cfs

$E_w = \frac{(1.34)(1.84)}{1.84} = 1.34$

$V_{360} = 1.34(1.84)/12 = 0.2055$

$V_{1440} = 0.2055 + 1.84(0.2668)/12 = 0.2464$ ac ft
= [illegible] cf

Basin PK west Area = 2.26 All type D

$Q = (3.14)(2.26) = 7.10$ cfs

$E_w = \frac{(1.34)(2.26)}{2.26} = 1.34$

$V_{360} = 1.34(2.26)/12 = 0.2524$ ac ft

$V_{1440} = 0.2524 + (2.26)(0.2668)/12 = 0.3026$ ac ft
= 13182 cf

18-200
12-
300

RESOURCE TECHNOLOGY, INC.
ENGINEERS & ENVIRONMENTAL SCIENTISTS
2129 Osuna Road, NE Suite 200
Albuquerque, NM 87113
Phone: (505) 345-3115
Fax: (505) 345-4132

CHECKED _____ DATE _____ PROJECT NO. _____
APPROVED _____ DATE _____ SHEET 1 OF 2
TITLE 2400 Broadway - 2yR BY FO DATE _____

Determine if 2 year Storm event is Contained in Ponds not containing the 10 yr and 100 yr storm events.

Pond # 1 : Basin ~~PA~~ PJ and PA

Pond # 7 : Basin PG and PK

Pond 1:

PA : Area = 2.61 ac type D

PH : Area = 0.65 ac = 0.15 type A
0.50 type D

Totals : 3.11 ac type D

0.15 ac. type A

3.26 ac

$P_{1440} = 2.75(0.434) = 1.1935$

$P_{360} = 2.35(0.434) = 1.0199$

$Q = (0.00)(0.15) + (1.86)(3.11) = 5.78$ cfs

$E_w = \frac{(0.00)(0.15) + (0.79)(3.11)}{3.26} = 0.7537$ in

$V_{360} = 0.7537(3.26)/12 = 0.2047$ ac ft

$V_{1440} = 0.2048 + 3.11(\underbrace{1.1935 - 1.0199}_{0.1736})/12$

$= 0.2498$ acf $= 10,880$ cf

Vol Pond # 1 = 0.11 ac ft <- 1/2 the 2 yr Volume

44% of 2-yr vol.

RESOURCE TECHNOLOGY, INC.
ENGINEERS & ENVIRONMENTAL SCIENTISTS
2129 Osuna Road, NE Suite 200
Albuquerque, NM 87113
Phone: (505) 345-3115
Fax: (505) 345-4132

CHECKED _____ DATE _____ PROJECT NO. _____

APPROVED _____ DATE _____ SHEET 2 OF 2

TITLE 2400 Broadway - 2 yR BY FG DATE _____

Pond # 7 Basin PG and PK

PG: Area = 0.65 ac

0.05 type A
0.09 type C
0.51 type D

PK: Area = 4.1 ac all type D

4.75 ac

$Q = (0.00)(0.05) + (0.60)(0.09) + (4.86)(4.61) = 8.63$ cfs

$E_W = \frac{(0.00)(0.5) + (0.15)(0.09) + (0.79)(4.61)}{4.75} = 0.7696$

$V_{360} = 0.7696(4.75)/12 = 0.3046$ ac ft

$V_{1440} = 0.3046 + 4.61(0.1736)/12 = 0.3713$ ft

$= 16{,}173$ cf

Pond #7 vol = 0.062 ac ft (2700 cf)

* Pond #7 retains approx 17% of 2 year storm event vol.

RESOURCE TECHNOLOGY, INC.
ENGINEERS & ENVIRONMENTAL SCIENTISTS
2129 Osuna Road, NE Suite 200
Albuquerque, NM 87113
Phone: (505) 345-3115
Fax: (505) 345-4132

CHECKED _____ DATE _____
APPROVED _____ DATE _____
TITLE _____

PROJECT NO. _____
SHEET _____ OF _____
BY _____ DATE _____

2400 Broadway
Developed Conditions

POND CALCULATIONS AND DESIGN

RESOURCE TECHNOLOGY, INC.
ENGINEERS & ENVIRONMENTAL SCIENTISTS
2129 Osuna Road, NE Suite 200
Albuquerque, NM 87113
Phone: (505) 345-3115
Fax: (505) 345-4132

CHECKED _____ DATE _____ PROJECT NO. _____

APPROVED _____ DATE _____ SHEET 1 OF 5

TITLE 2400 Broadway BY FG DATE _____

1 acft = 43560 cf

Pond Design

Pond ID #'s and locations are taken from the Drainage Report, Bernalillo County 2400 Broadway SE Complex Masterplan. Oct 23, 1992. where applicable.

Pond Design info has been included from the Design Analysis Report, March 1994 by RTI.

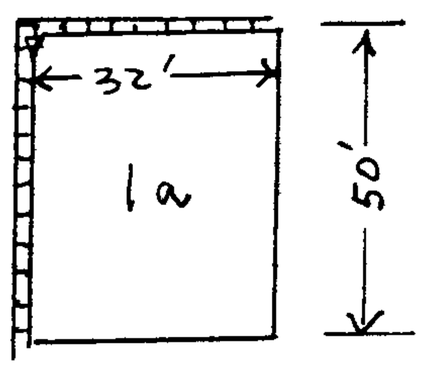
Pond # 1

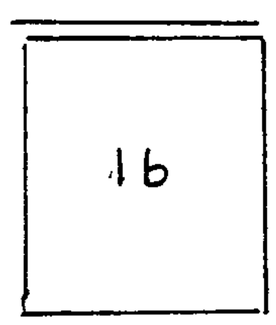
Pond Area = 50 x 32 = 1600 sf (2 ponds) = 3200 sf
= 0.07 ac

Pond Depth = 1.5'

Pond Volume: 18" vertical wall : R.R. tie Retaining Wall

3200 sf x 1.5' = 4800 cf = 0.11 acft





Same as above

RESOURCE TECHNOLOGY, INC.
ENGINEERS & ENVIRONMENTAL SCIENTISTS
2129 Osuna Road, NE Suite 200
Albuquerque, NM 87113
Phone: (505) 345-3115
Fax: (505) 345-4132

CHECKED _____ DATE _____ PROJECT NO. _____

APPROVED _____ DATE _____ SHEET 2 OF 5

TITLE _____ BY FG DATE _____

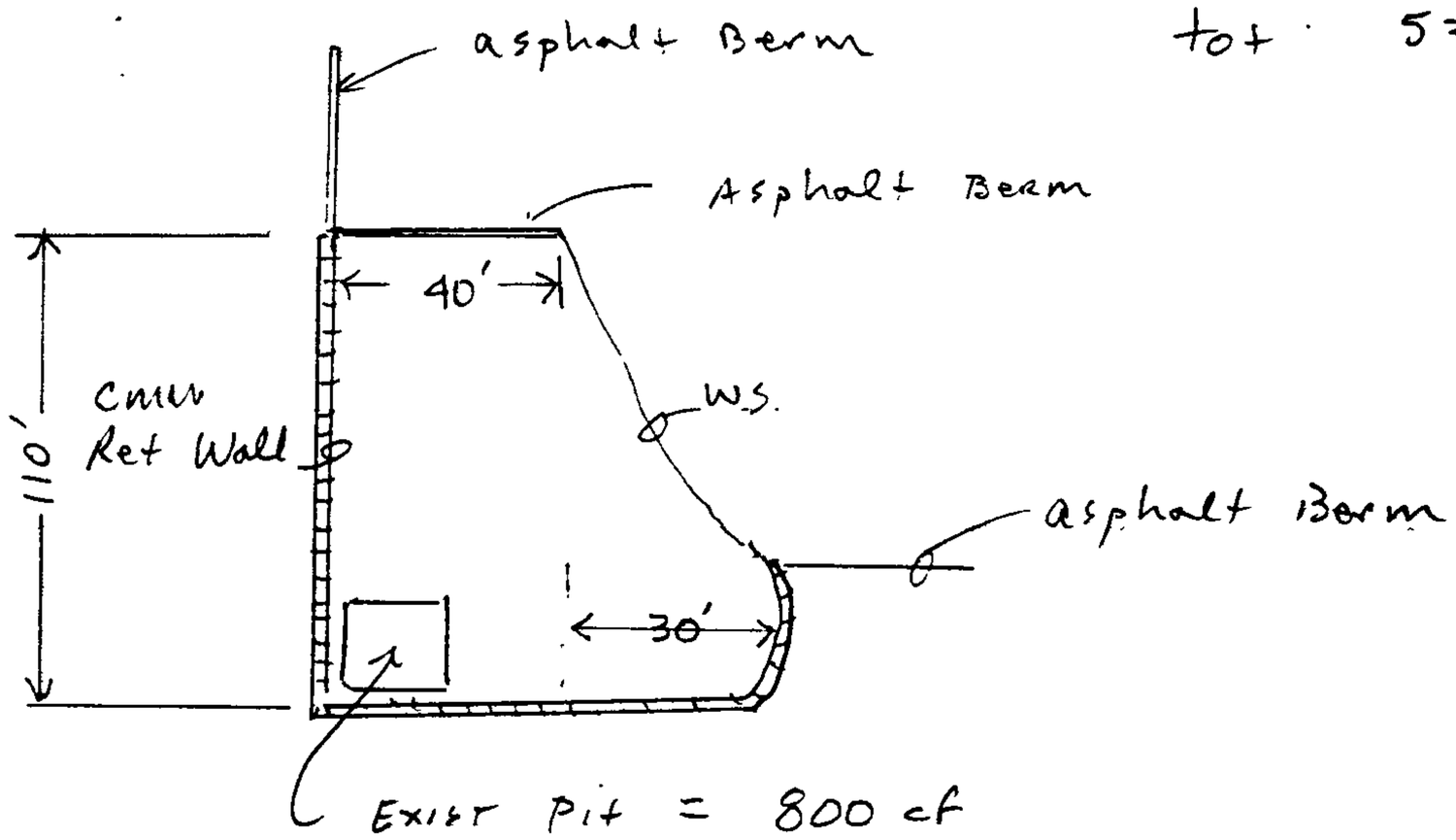
POND 2

Pond Area: 40 x 110 = 4400 + ½(30 x 110) = 6050 sf
= 0.139 ac

Pond Depth: 1.5' avg = ½(1.5) = 0.75

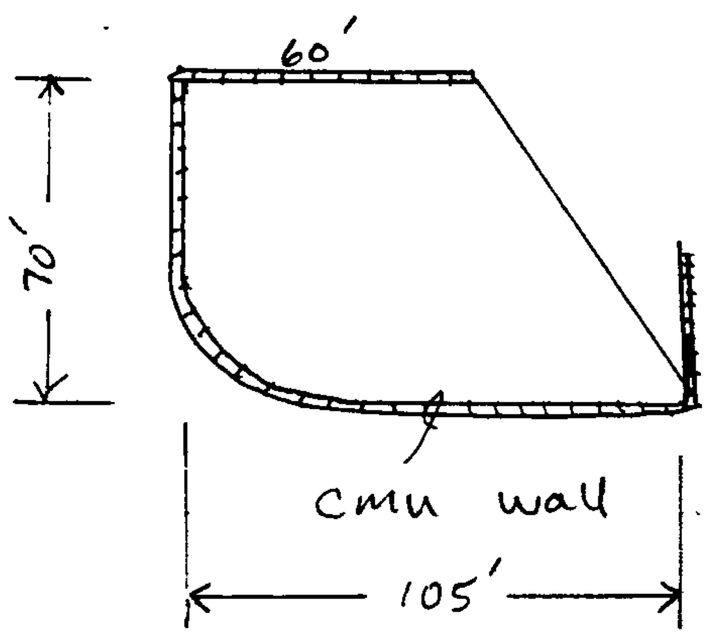
Pond Vol: ½(1.5 x 6050) = 4538 cf = 0.104 acft
Exist Pond: 800 cf = 0.018

tot 5338 cf = 0.123 ac ft



POND 3

Pond Area =



Pond Area = (60 x 70) + ½(45 x 70)
= 5775 sf = 0.133

Pond depth = 2.5' avg = ½(2.5) = 1.25

Pond Vol = ½(2.5 x 5775)

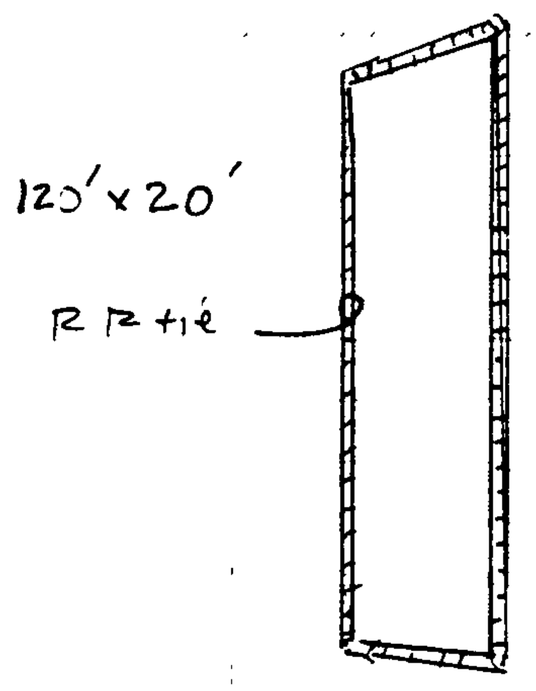
= 7218 cf = 0.166 acft

RESOURCE TECHNOLOGY, INC.
ENGINEERS & ENVIRONMENTAL SCIENTISTS
2129 Osuna Road, NE Suite 200
Albuquerque, NM 87113
Phone: (505) 345-3115
Fax: (505) 345-4132

CHECKED _____ DATE _____
APPROVED _____ DATE _____
TITLE _____

PROJECT NO. _____
SHEET 3 OF 5
BY FG DATE _____

Pond 4b



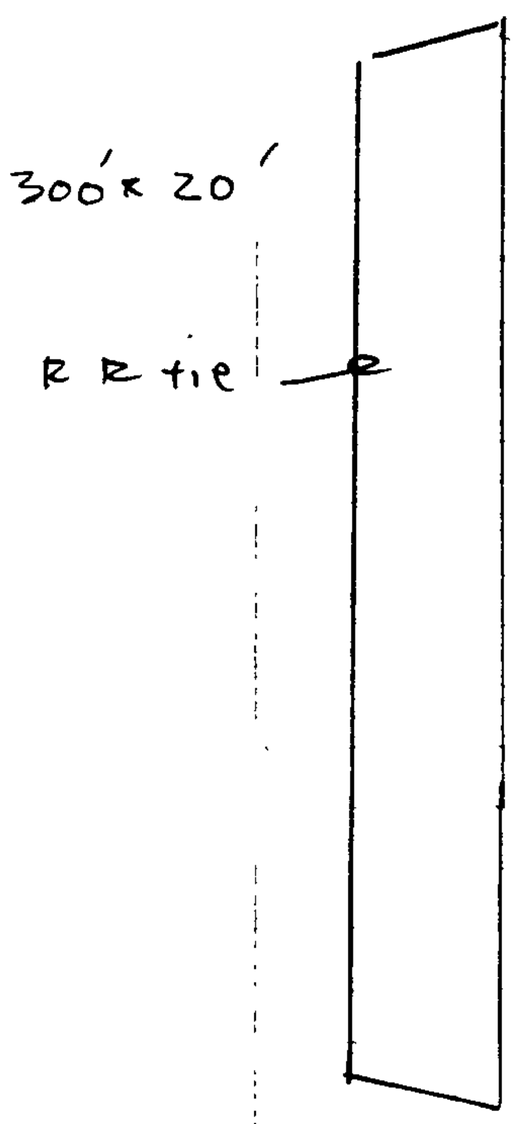
Pond Area 120 x 20 = 2400 sf = 0.055 ac ft

Pond depth = 1.5'

Pond Vol = 1.5 (2400) = 3600 cf

= 0.083 ac ft

Pond 4a



Pond Area: 300 x 20 = 6000 sf = 0.138

Pond depth = 1.5'

Pond Vol = 1.5 (6000) = 9000 cf

= 0.207 ac ft

RESOURCE TECHNOLOGY, INC.
ENGINEERS & ENVIRONMENTAL SCIENTISTS
2129 Osuna Road, NE Suite 200
Albuquerque, NM 87113
Phone: (505) 345-3115
Fax: (505) 345-4132

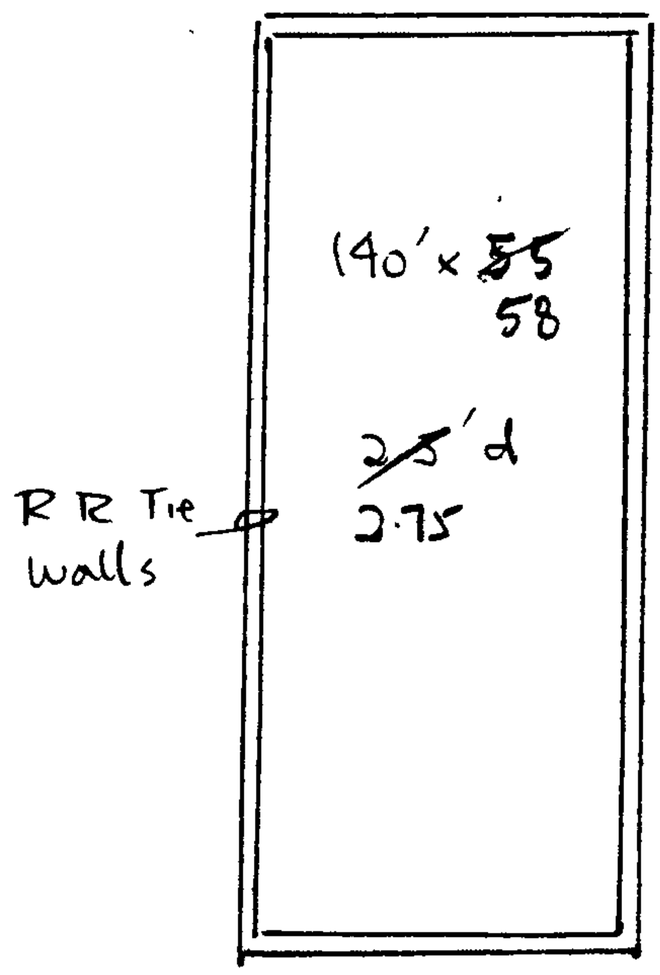
CHECKED _____ DATE _____ PROJECT NO. _____

APPROVED _____ DATE _____ SHEET 4 OF 5

TITLE _____ BY FB DATE _____

Contrib. Basin = 0.435 = 18,9.3

Pond 5



Pond Area: 140' x 58' = 8120 sf

Pond depth = 2.75'

Pond Vol = 2.75 x 8120 = 22,330 cf

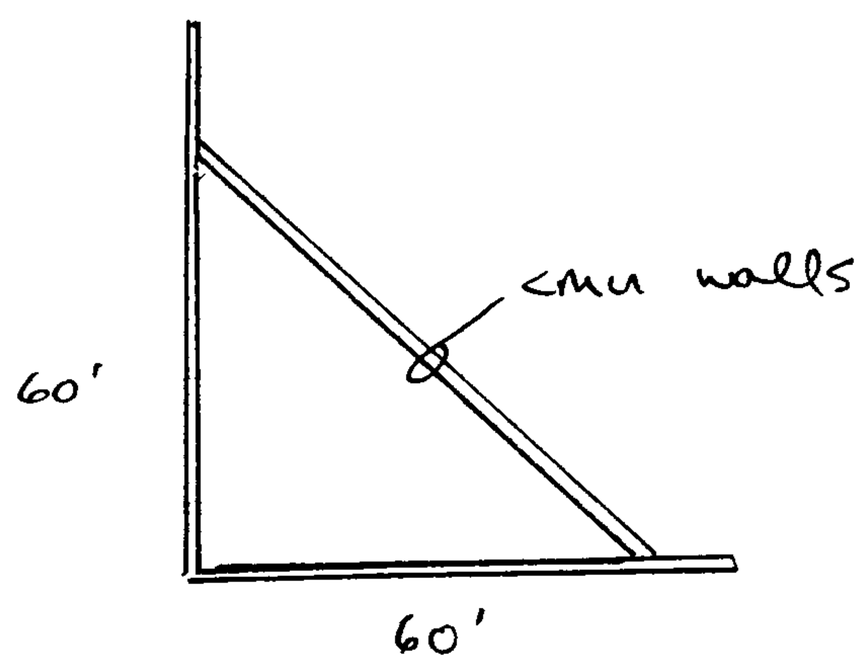
= 0.512 ac-ft

Retention Vol Adj = ~~0.49~~ 0.51 ac-ft

= ~~21,341~~ cf

= 22,000

Pond # 6



Pond Area: (60 x 60)/2 = 1800 sf

= 0.041

Pond depth = 4'

Pond Volume 4(1800) = 7200 cf *

= 0.165 ac-ft

* 1/2 of volume is Retention Since outlet is 2' above Pond bottom

Revised 11/5/97 use orig Vol. 0.13 ac-ft

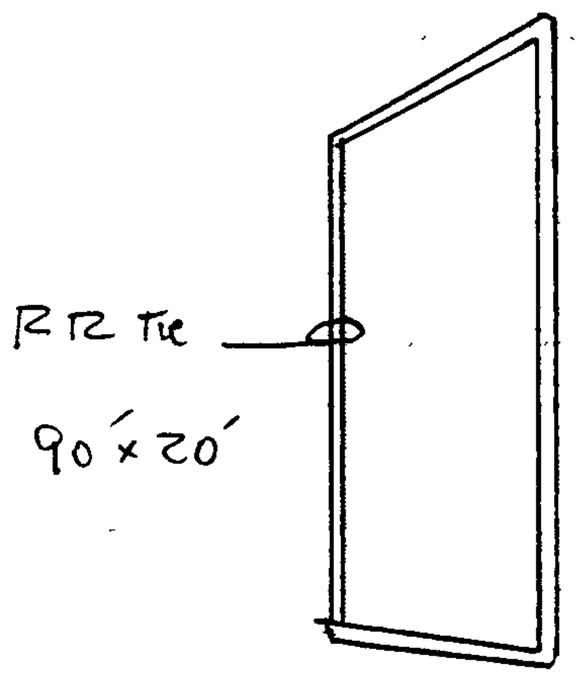
RESOURCE TECHNOLOGY, INC.
ENGINEERS & ENVIRONMENTAL SCIENTISTS
2129 Osuna Road, NE Suite 200
Albuquerque, NM 87113
Phone: (505) 345-3115
Fax: (505) 345-4132

CHECKED _____ DATE _____ PROJECT NO. _____

APPROVED _____ DATE _____ SHEET 5 OF 5

TITLE _____ BY FG DATE _____

Pond # 7



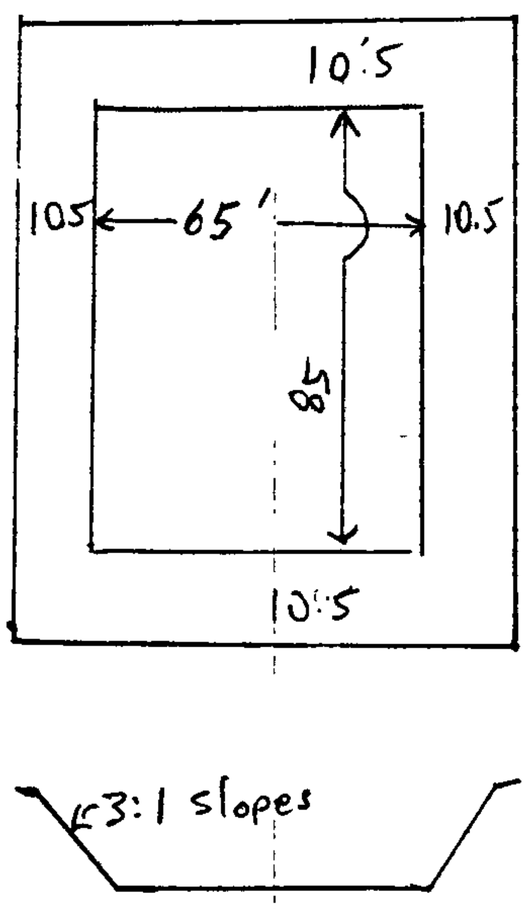
Pond Area: 90 x 20 = 1800 sf
= 0.0413 ac

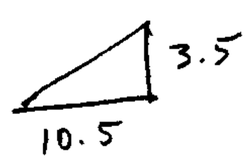
Pond depth = 1.5'

Pond Vol = 1.5 (1800) = 2700 cf
= 0.062 ac-ft

Pond 8

V_{1440} = 0.50 ac-ft





Pond Area: 86' x 106 = 9116 sf
= 0.209 ac

Pond Depth = 3.5'

Pond Volume: (65 x 85) 3.5 = 19,337 cf
+ ½ (300 x 3.5 x 10.5) = 5512 cf

= 24,850 cf

= 0.57 Ac-Ft

$A = \pi r^2$

RESOURCE TECHNOLOGY, INC.
ENGINEERS & ENVIRONMENTAL SCIENTISTS
2129 Osuna Road, NE Suite 200
Albuquerque, NM 87113
Phone: (505) 345-3115
Fax: (505) 345-4132

CHECKED _____ DATE _____ PROJECT NO. _____

APPROVED _____ DATE _____ SHEET 1 OF 6

TITLE 2400 Broadway Drainage BY FG DATE _____

Pond Pipe Discharge Equations: Section 3 · Hydraulic Dc. DPM.

$Q = CA\sqrt{2gh}$

8" pipe = 0.67'/2 = 0.33'

$A = (4''/12)^2 \cdot \pi = 0.35\ ft^2$

Q = discharge (cfs)
C : coefficient
A : Area of opening (ft)
g : 32.2 ft/sec
h : depth water (ctr of opening)

Control is 10 yr water surface reservoir elev.

Pond 2 (use 8" outflow Pipe and 1.5' deep pond)

Q = ____
C = 0.595 (see attached table)
A = 0.35 ft²
g = 32.2 ft/sec
h = 1.5' − 0.33 = 1.17'

$Q = (0.59)(0.35)\sqrt{2(32.2)(1.17)} = 1.8$ cfs

Pond 3 (use 8" outflow Pipe + 2.5' deep pond)

Q = ____
C = 0.598 (see attached table)
A = 0.35 ft²
g = 32.2
h = 2.5' − 0.33 = 2.17'

$Q = (0.598)(0.35)\sqrt{2(32.2)(2.17)} = 2.47$ cfs

Pond 4 (use 12" outflow pipe + 1.5' deep pond)

12" pipe = 1.0/2 = 0.5'

Q =
C = 0.591
A = 0.79
g = 32.2
h = 1.5 − 0.4 = 1.1 ft

$A = (0.5)^2 \cdot \pi = 0.79'$

h/2 = 0.79/2 = 0.4

$Q = (0.591)(0.79)\sqrt{2(32.2)(1.1)} = 3.93$ cfs

Pond 5 (use 8" outflow Pipe and 2.75' deep Pond)

Q =
C = 0.598
A = 0.35 ft
g = 32.2 ft/s
h = 2.75' − 0.33 = 2.17'

$Q = (0.598)(0.35)\sqrt{2(32.2)(2.17)} = 2.61$ cfs

Pond 6 (use 8" outflow pipe & 4' deep pond* the constructed drop inlet will be 2' higher then the pond bottom)

Q =
C = 0.596
A = 0.35 ft
g = 32.2 ft/s
h = 2' − 0.33' = 1.67'

$Q = (0.596)(0.35)\sqrt{2(32.2)(1.67)} = 2.16$ cfs

Pond 7 (use 8" outflow pipe and 1.5' deep pond)

Q
C = 0.595
A = 0.35
g = 32.2
h = 1.5' − 0.33 = 1.17'

$Q = (0.595)(0.35)\sqrt{2(32.2)(1.17)} = 1.81$ cfs

Pond 8 (use 8" outflow pipe and 3.5' deep Pond)

C = 0.598
A = 0.35 ft²
g = 32.2 ft/s
h = 3.5' − 0.33 = 3.17'

$Q = (0.598)(0.35)\sqrt{2(32.2)(3.17)} = 3.01$ cfs

Submerged Orifices

$C = 0.598$

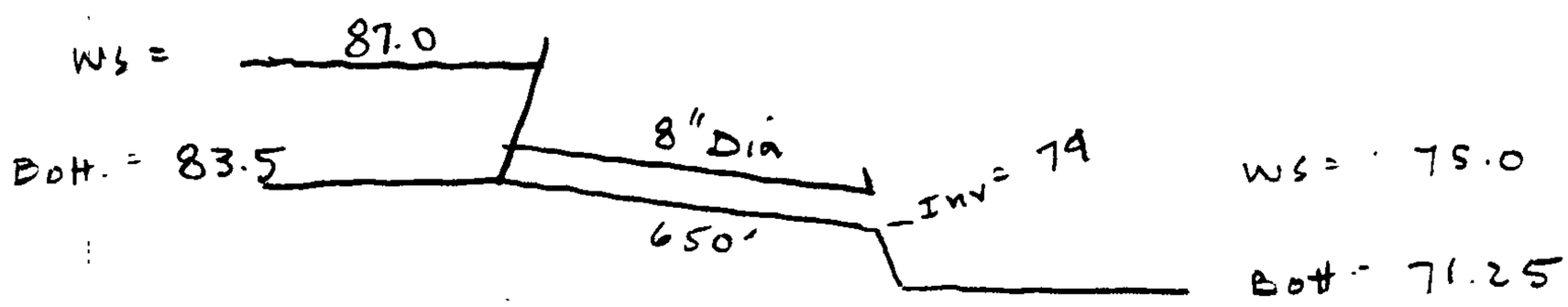
neglect entrace Loss:

$Q = Ca\sqrt{2g\,\Delta h}$ $\Delta h = h_1 - h_2 = 87 - 75 = 12.0$

$Q = 0.598\,(0.3553)\sqrt{2(32.2)(12.0)} = 5.9$ cfs > orifice eq.

Culverts:

Pond 8 to Pond 5 : Entrance and Exit Submerged
Assume critical slope



$$V = \sqrt{\frac{H}{(1 + K_e/2g) + (n^2 L / 2.21 R^{4/3})}}$$

pg 21-42
STD Hand Book for C.E. 3rd ed

$H = 87.0 - 75.0 = 12.0$

$K_e = 0.9$ (sharp edged projecting inlet)

$n = 0.010$ PVC pipe

$L = 650'$

$R =$ area flow / wetted per $= \pi R^2 / 2\pi R = \frac{1}{2} r = 0.33/2 = 0.167'$

$$V = \sqrt{\frac{12.0}{(1 + 0.9/2(32.2\ ft/s)) + 0.010^2 (650)/2.21\,(0.167)^{4/3})}}$$

$$= \frac{12}{1.0140 + 0.3198} = \frac{12}{1.3338} = 8.99\ ft/s$$

$Q = V \cdot A = 8.99\ \frac{ft}{s} \times 0.3553\ ft^2 = 3.2$ cfs > orifice of 3.0 cfs

Use 3.0 cfs

RESOURCE TECHNOLOGY, INC.
ENGINEERS & ENVIRONMENTAL SCIENTISTS
2129 Osuna Road, NE Suite 200
Albuquerque, NM 87113
Phone: (505) 345-3115
Fax: (505) 345-4132

CHECKED _____ DATE _____
APPROVED _____ DATE _____
TITLE _____

PROJECT NO. _____
SHEET 4 OF 6
BY FG DATE _____

Alt's

Pond 6 (Use 12" outflow pipe + 4' deep pond

$Q = ?$
$C = 0.596$
$A = 0.79$
$g = 32.2$
$h = 2 - 0.4 = 1.6$ ft

$$Q = (0.596)(0.79)\sqrt{2(32.2)(1.6)} = 4.78 \text{ cfs}$$

Pond 4 Use 8" outflow pipe + 1.5' deep pond

$Q = ?$
$C = 0.595$
$A = 0.35$ ft^2
$g = 32.2$ ft/s
$h = 1.5 - 0.33 = 1.17'$

$$Q = (0.595)(0.35)\sqrt{2(32.2)(1.17)} = 1.81 \text{ cfs}$$

Pond 1 Use 8" outflow pipe + 1.5' deep

Q
$C = 0.595$
$A = 0.35$ ft^2
$g = 32.2$ ft/s
$h = 1.5 - 0.33 = 1.17'$

$$Q = (0.595)(0.35)\sqrt{2(32.2)(1.17)} = 1.81 \text{ cfs}$$

RESOURCE TECHNOLOGY, INC.
ENGINEERS & ENVIRONMENTAL SCIENTISTS
2129 Osuna Road, NE Suite 200
Albuquerque, NM 87113
Phone: (505) 345-3115
Fax: (505) 345-4132

CHECKED _____ DATE _____ PROJECT NO. _____

APPROVED _____ DATE _____ SHEET 5 OF 6

TITLE _____ BY FO DATE _____

Increase Pond depth to

Pond # 5 : 0.51 ac-ft = 22,000 cf

Area = 140 x 55 x 3.0 = 23,100

140 x 55 x 2.5 = 19,250

140 x 55 x 2.75 = 21,175 = 0.49

140 x 55 x

discharge 2.5' = 2.47 cfs

discharge 2.75 : $Q = (0.598)(0.35)\sqrt{2(32.2)(2.42)} = 2.61$ cfs

3.00 = $Q = (0.598)(0.35)\sqrt{2(32.2)(2.67)} = 2.74$ cfs

Table 4-3. Smith's Coefficients of Discharge for Circular and Square Orifices with Full Contraction

Diameter of circular orifices, feet							Head, feet	Side of square orifices, feet						
0.02	0.04	0.07	0.1	0.2	0.6	1.0		0.02	0.04	0.07	0.1	0.2	0.6	1.0
.....	0.637	0.624	0.618				0.4	.....	0.643	0.628	0.621			
0.655	0.630	0.618	0.613	0.601	0.593		0.6	0.660	0.636	0.623	0.617	0.605	0.598	
0.648	0.626	0.615	0.610	0.601	0.594	0.590	0.8	0.652	0.631	0.620	0.615	0.605	0.600	0.597
0.644	0.623	0.612	0.608	0.600	0.595	0.591	1	0.648	0.628	0.618	0.613	0.605	0.601	0.599
0.637	0.618	0.608	0.605	0.600	0.596	0.593	1.5	0.641	0.622	0.614	0.610	0.605	0.602	0.601
0.632	0.614	0.606	0.604	0.599	0.597	0.595	2	0.637	0.619	0.612	0.608	0.605	0.604	0.602
0.629	0.612	0.605	0.603	0.599	0.598	0.596	2.5	0.634	0.617	0.610	0.607	0.605	0.604	0.602
0.627	0.611	0.604	0.603	0.599	0.598	0.597	3	0.632	0.616	0.609	0.607	0.605	0.604	0.603
0.623	0.609	0.603	0.602	0.599	0.597	0.596	4	0.628	0.614	0.608	0.606	0.605	0.603	0.602
0.618	0.607	0.602	0.600	0.598	0.597	0.596	6	0.623	0.612	0.607	0.605	0.604	0.603	0.602
0.614	0.605	0.601	0.600	0.598	0.596	0.596	8	0.619	0.610	0.606	0.605	0.604	0.603	0.602
0.611	0.603	0.599	0.598	0.597	0.596	0.595	10	0.616	0.608	0.605	0.604	0.603	0.602	0.601
0.601	0.599	0.597	0.596	0.596	0.596	0.594	20	0.606	0.604	0.602	0.602	0.602	0.601	0.600
0.596	0.595	0.594	0.594	0.594	0.594	0.593	50	0.602	0.601	0.601	0.600	0.600	0.599	0.599
0.593	0.592	0.592	0.592	0.592	0.592	0.592	100	0.599	0.598	0.598	0.598	0.598	0.598	0.598

6/6

RESOURCE TECHNOLOGY, INC.
ENGINEERS & ENVIRONMENTAL SCIENTISTS
2129 Osuna Road, NE Suite 200
Albuquerque, NM 87113
Phone: (505) 345-3115
Fax: (505) 345-4132

CHECKED _____ DATE _____ PROJECT NO. _____

APPROVED _____ DATE _____ SHEET 1 OF 2

TITLE 2400 Broadway BY FO DATE _____

Weir Calculations. Based on 100 yr storm event and Ponds at maximum capacity.

Weir Equation $Q = CLH^{3/2}$

$$L = \frac{Q}{CH^{3/2}}$$

Q = flow (cfs)
C = Weir Coef = 2.2
H = Water depth weir

✓ Pond # 1 Q = 13.03 cfs
(Asphalt Berm) no weir used

✓ Pond # 2 Q = 2.02 cfs
(Asphalt Berm) no weir used

Pond # 3 Q = 5.47 cfs
H = 0.33

$$L = \frac{5.47}{2.2\,(0.33)^{3/2}} = 13.1'$$

Use 14' weir

~~Pond 4a Q = 13.54 H = 0.5'~~

$$\cancel{L = \frac{13.54}{2.2\,(0.5)^{3/2}} = 17.4'}$$

~~Use 18' weir~~

~~Pond 4b Q = 2.29 H = 0.5~~

$$\cancel{L = \frac{2.29}{2.2\,(0.5)^{3/2}} = 29'}$$

~~use 3' weir~~

Pond 4 total Q = 15.83
H = 0.5'

$$L = \frac{15.83}{2.2\,(0.5)^{3/2}} = 20.35' \text{ weir}$$

Use 21' weir

RESOURCE TECHNOLOGY, INC.
ENGINEERS & ENVIRONMENTAL SCIENTISTS
2129 Osuna Road, NE Suite 200
Albuquerque, NM 87113
Phone: (505) 345-3115
Fax: (505) 345-4132

CHECKED _____ DATE _____
APPROVED _____ DATE _____
TITLE _____

PROJECT NO. _____
SHEET 1 OF 2
BY FG DATE _____

Pond 5 $Q = 15.45$ cfs
$H = 0.5'$

$$L = \frac{15.45}{2.2(0.5)^{3/2}} = 19.8'$$

Use 20' weir

Pond 6 $Q = 5.59$ cfs
$H = 0.33$

$$L = \frac{5.59}{2.2(0.33)^{3/2}} = 13.4'$$

Use 14' min weir

Pond 7 $Q = 22.02$ cfs
$H = 0.5$

$$L = \frac{22.02}{2.2(0.5)^{3/2}} = 28.3'$$

Use 28' weir

Pond 8 $Q = 16.69$ cfs
$H = 0.5'$

$$L = \frac{16.69}{2.2(0.5)^{3/2}} = 21.45'$$

Use 22' weir

****
***** CHANNEL LINING ANALYSIS *****
****

DESIGNER: F. Gonzales

DATE: 11-25-1997

PROJECT: 2400 Broadway

PROJECT NO.: 96-100

STATION:

TO STATION:

DRAINAGE AREA: 0.0 Acres

DESIGN FREQUENCY: %100 Years

CHANNEL DESCRIPTION:

CHANNEL SLOPE: 0.017 ft/ft

Bottom Width: 0.10 ft

Left Side Slope: 60.0

Right Side Slope: 0.0

Lining	Permissible Shear (lb/sf)	Discharge (cfs)	Hydraulic Radius (ft)	Manning Coefficient
Concrete	99.00	12.3	0.15	0.013

Normal Depth (ft)	Area (sf)	Velocity (ft/sec)	Calculated Shear (lb/sf)	Remarks
* 0.30 = 3.6 in	2.89	4.25	0.32	Stable

(1) Check for channel bends

* Check for flow along Curb + Gutter from Basin PA = 12.3 cfs

RESOURCE TECHNOLOGY, INC.
ENGINEERS & ENVIRONMENTAL SCIENTISTS
2129 Osuna Road, NE Suite 200
Albuquerque, NM 87113
Phone: (505) 345-3115
Fax: (505) 345-4132

CHECKED _____ DATE _____ PROJECT NO. _____

APPROVED _____ DATE _____ SHEET 1 OF 1

TITLE 2400 Broadway Drainage BY _____ DATE _____

Summary of Hydrograph Data

Basin ID's for 100 yr Storm Event

Basin ID	PA	PB	PC	PD	PE EAST	PE WEST	PG	PH	PI	PJ	PK
Q_P (cfs)	12.26	16.69	1.50	9.98	5.73	1.64	2.76	15.83	3.12	2.58	19.26
τ_B (min)	42.0	45.6	42.0	43.0	44.0	42.0	43.6	62.0	47.0	44.0	42
t_P (min)	11.4	16.4	11.4	11.9	12.6	11.4	12.5	13.5	16.0	12.5	11.4
Peak (min)	15	0	15	13.3	11.3	15	11.8	8.7	0	11.5	15
Hyd. Vol * Ac Ft	0.71	0.50	To Stm Drain	0.50	0.15	0.12	0.03	0.68	0.16	0.02	0.47

* Hydrograph Volumes w/contributing pipe inflows and pipe outflows considered

Basin ID's for 10-yr Storm Event

Basin ID	PA	PD	PE EAST	PE WEST	PG	PH	PI	PJ	PK
Q_P (cfs)	8.19	6.58	3.70	1.10	1.77	9.96	1.75	1.63	12.88
t_B (min)	39	40	41	39	41	41	40	42	39
t_P (min)	11.4	12	12.6	11.4	12.5	13.5	16	12.5	11.4
Peak (min)	15	13	11.3	15	11.8	8.6	1.4	11.5	15
Hyd. Vol * Ac. ft	0.23	**	0.11	**	0.04	0.28	**	0.06	0.42

* Hydrograph Volumes w/ contributing pipe inflow and pipe outflows considered

Note: **Basin PB, PC accomodate 100-yr flow, 10-yr not evaluated.

BERNALILLO COUNTY PUBLIC WORKS

2400 BROADWAY SE DRAINAGE IMPROVEMENTS

DRAINAGE REPORT

Return to file M 14/D13

Resource Technology, Inc.
2129 Osuna Road NE, Suite 200
Albuquerque, New Mexico 87113

RTI Project No. 93-150C

July 1994

BERNALILLO COUNTY PUBLIC WORKS

2400 BROADWAY SE DRAINAGE IMPROVEMENTS

DRAINAGE REPORT

Submitted by:

Resource Technology, Inc.
2129 Osuna Rd. NE, Suite 200
Albuquerque, NM 87113

Submitted to:

City of Albuquerque
Hydrology Section

July 1994

RTI Proj. No. 93-150C

JUL 20 1994

2400 BROADWAY SE DRAINAGE IMPROVEMENTS

PURPOSE

The purpose of this report is to document design procedures and decisions made by Resource Technology, Inc. in collaboration with Bernalillo County Public Works and any affected parties involved at the project site.

INTRODUCTION

A detailed hydrologic analysis was previously conducted, by Wilson and Company under contract with Bernalillo County, for the County Yard facility located at 2400 Broadway SE. This study resulted in a Drainage Masterplan embracing development proposed for this site under a previous Land Use Masterplan. The Drainage Masterplan was submitted to and approved by the City of Albuquerque Hydrology Department. Resource Technology, Inc. (RTI) has designed the proposed drainage structures shown on the Wilson Masterplan with modifications as necessary to improve drainage characteristics on the site and to accommodate existing (and proposed) conditions.

The Wilson Masterplan had proposed a number of detention ponds on the property to help reduce the amount of discharge from the site during the 100-year storm event. RTI determined that several of these ponds could be enlarged or reconfigured in order to detain more runoff volume. Consequently, two detention ponds were also added in order to further reduce runoff from the site.

Every attempt was made to minimize disturbance to existing structures such as curbs, trees, utilities, asphalt pavement and buildings located within the project areas. The design process also attempted to incorporate, as much as possible, the proposed improvements approved by the City of Albuquerque in the Drainage Masterplan. The design provided for more runoff detention volume than previously anticipated where possible, while minimizing impacts to the site and its associated structures.

Several changes were incorporated into the RTI detention pond design to accommodate proposed construction plans by two other County Departments. One change was to relocate both the Sheriff's Department Radio Repair facility and the proposed County Records Storage Building. The proposed locations of these structures have been switched in order to allow more parking area for vehicles under repair at the Sheriff's Department facility. Additionally, one of the detention structures proposed by Wilson & Company (Pond 4) will not be constructed at this time because several buildings presently utilized by the Parks and Recreation Department still remain in the proposed ponding area.

Originally the Wilson Masterplan included seven detention structures. Resource Technology, Inc. has maintained this plan and included two more structures, one of which is an enlargement of a parking lot pond, bringing the total to eight. The following discussion will reference the Wilson & Company pond numbers as shown on the Drainage Masterplan. Table 1 presents the pertinent information and associated design parameters for each detention pond.

FIELD SURVEYS

The design of the drainage structures utilized much of the data generated by Wilson & Company for the proposed conditions at the County Yard. A supplemental topographic site survey was conducted by RTI to assess existing conditions. Plates 1A and 1B compare the old and new topographic data (where surveyed) and the corresponding drainage areas. After evaluation of this information it was decided that the watershed basins delineated by Wilson and Company were not appreciably different and still applicable for the current project design. Therefore, drainage basins, runoff volumes and peak flow rates developed from their report were utilized in the RTI design. This was discussed with and accepted by County Public Works officials after review of the topographic survey conducted by RTI.

RTI's field survey also gathered information associated with new construction that has been completed at the site since the previous site survey was conducted by Bohannan-Huston in 1990. These changes are also shown on Plates 1A and 1B.

In addition to the design of the detention structures, RTI developed a Utility Plan locating all known utilities present on the site. The information was amassed from numerous sources which included: 1) as built surveys from the City of Albuquerque, 2) information from Gas Company of New Mexico records, 3) Gas Company of New Mexico field location, 4) RTI field collected survey information and 5) a preliminary Utility Plan prepared by County Public Works personnel. As such, there can be no assurance that this Utility Plan is complete and totally accurate. The source data may be in error and/or some data may have been impossible to find under the scope of this project. The existing Utility Plan is shown on Plate 2.

POND DESIGN

Pond 1, located in the parking area west of Building A, the Public Works Department building, retains water from approximately 0.65 acres. In order to try and increase retention volume, parts of the landscaped area west of the parking lot will be partially excavated. Drainage into this pond will be retained and allowed to infiltrate into the soil by creating two separate gravel infiltration beds located on either side of the existing landscaped island. Total retention volume for this pond will be approximately 0.09 acre-feet and the water will pond to a depth of 1.5 feet. Overflow from the excavated areas will extend onto the adjacent parking area and pond to a depth of approximately six inches on the parking lot before spilling into the main driveway. Also, an earthen dike was required along the sidewalk to confine the designed retention area. Two-foot wide curb cuts at 6-foot intervals, must be made in the concrete curb along the western side of the parking lot to allow surface

TABLE 1
2400 BROADWAY DRAINAGE IMPROVEMENTS
POND DATA

		CONTRIBUTING AREA DATA					POND & OUTLET DATA					OVERFLOW WEIR DATA			
	Enclosure Type	Drainage Area (acres)	Contributing 100-yr Qp (cfs)		Contributing 100-yr Volume (acft)		Pond Area (ac)	Pond Volume (acft)	Ponding Depth (ft)	Discharge Type	Peak Discharge (cfs)	Weir Type	Weir Coef	Weir Width (ft)	Weir Overflow Depth (ft)
			Basin	Cumm.	Basin	Cumm.									
1	Earth Embankment	0.65	2.7		0.12		0.07	0.094	1.5	none	none	(b) *			
2	CMU Retaining Wall	1.15	5.0		0.26		0.12	0.125	0.78 (avg) 1.5 (max)	8" PVC	1.79	Asphalt Berm	2.2	25	0.22
3	CMU Retaining Wall	1.0	3.4	5.2	0.12	0.38	0.11	0.096	0.75 (avg) 1.78 (max)	8" PVC	2.0	CMU Retaining Wall	2.2	13	0.33
4	Concrete Curb and Gutter	(a) *													
5	RR Tie Retaining Wall	3.5	7.5	16.5	0.33	0.72	0.22	0.32	1.5	8" PVC	2.4	RR Tie Wall	2.2	40	0.33
6	CMU Retaining Wall, Earth Pond 2:1 side slopes	0.8	3.8	20.3	0.17	0.89	0.05	0.13	4.0	8" PVC	1.7	CMU Retaining Wall	2.2	22	0.5
7	RR Tie Retaining Wall	0.4	1.6		0.07		0.07	0.13	1.5	8" PVC	5.3	RR Tie Wall	2.2	12	0.3
8	Earthen Pond 3:1 side slopes	5.5	16.3		0.41		0.22	0.50	3.0	8" PVC	1.6	Grouted Rip Rap	2.2	40	0.33

*** NOTES:** (a) Not constructed at this time.
(b) Parking lot sheet flow

flow to drain into the ponding area. Originally this area was not considered in the proposed design but County officials felt it was acceptable to utilize this area as long as the landscaped island was not disturbed.

Pond 2, located in the parking lot west of the County warehouse remains in its original configuration as proposed in the Wilson Masterplan. However, detention volume has been increased by the addition of a reinforced concrete block wall varying in height from one-half to two and a half feet high instead of a curb along the western and southern extends of the ponding area. Calculated water storage volume is approximately 0.125 acre-feet and the water will pond to a maximum depth of over 2 feet and an average depth of nine inches when full. Contributing drainage area is about 1.15 acres. Asphalt berms were added within the existing parking area, extending from the ends of the retaining wall, in order to function as water barriers without blocking traffic flow. These berms will allow for some additional water storage by allowing water to pond to a greater depth. Ponded water will discharge through an eight-inch diameter opening in the block wall to Pond 3 which is adjacent. The calculated discharge rate from Pond 2 is 1.8 cfs through use of the orifice equation (see Appendix). It is recommended that warning signs be posted along the wall to warn people parking there of the potential flooding hazard.

Excess water that accumulates beyond the capacity of Pond 2 will spill out into the street by overflowing the top of the asphalt berm on the southern end of Pond 2. The existing smaller retention pond located at the southwest corner of the parking lot will be allowed to remain and become incorporated into the RTI design.

Pond 3 is located adjacent and west of Pond 2. It will detain runoff from the Purchasing Supply Warehouse, the surrounding asphalt area, an area north of Pond 2, and discharge from Pond 2. The area north of Pond 2 will also drain into Pond 3 due to existing topography and to minimize hazards to existing structures. Pond 3 will also be surrounded by a one and a half to two and a half-foot high block wall along the western and southern sides to increase detention volume. The curved alignment of the block wall on the southern side of the pond was designed to be in compliance with the proposed roadway alignment shown in the Drainage Masterplan. This pond will detain approximately 0.1 acre-feet of water and discharge through an eight-inch diameter opening at the southwest corner of the pond. The maximum discharge rate of the opening in the block wall under completely submerged conditions was calculated to be 2.0 cfs (see Appendix). The overflow weir, also located at the southwest corner of the proposed retaining wall, will allow excess flow to spill out once the capacity of the pond and the discharge port are reached. Use of the weir equation produced a length of thirteen feet utilizing an overflow depth of 0.33 feet, a weir coefficient of 2.2 and a 100-year peak discharge of 4.7 cubic feet per second (see Appendix).

The formal design of Pond 4 was not carried out, although a conceptual layout is shown on the current plan. This pond cannot be constructed for some time due to the presence of several temporary and permanent buildings that occupy the site at present. Once the facilities occupying this site are removed, the design and construction of Pond 4 can be completed.

Pond 5 required some careful planning and coordination between several different County agencies to ensure that their needs were met. As discussed previously, the locations of the Radio Repair facility and the Records Storage Building were exchanged to accommodate the parking needs of the Sheriff's Department. A meeting between representatives of the Public Works Department, Resource Technology, Inc. and the County Clerk's Office was held on January 24, 1994 to discuss the needs for the Records Storage Facility. After this discussion it was concluded that the location of Pond 5 was acceptable and that it could, in fact, be enlarged.

Consequently, the RTI design calls for the north-south leg of the pond to be extended approximately another 50 feet beyond the limits previously proposed in order to increase storage volume. It will be a vertical sided pond, 1.5 feet deep, supported by a railroad tie retaining wall. Vertical members will be placed in oversized holes and back filled with lean concrete in order to reduce the potential of failure from soil pressure on the wall (see Appendix).

Overall detention volume will be 0.32 acre-feet from a contributing area of about 3.5 acres. An 8-inch PVC discharge pipe will connect this pond with Pond 6 to the west. The discharge for this pipe was calculated to be 2.4 cfs (see Appendix). Overflow from the pond will be allowed to spill out through a 40-foot wide overflow weir located at the southwest corner of the pond, and flow parallel to the southern property line into Pond 6. This weir width was calculated using the same variables as previously discussed for the weir equation and a peak flow of 16.5 cfs (see Appendix).

The bottom of the completed pond will be reseeded with native grasses to create a prairie-like landscape and cottonwood trees, as approved by the County Parks Recreation Department, will be planted. The top edge of the pond that is adjacent to vehicle traffic will have pinned concrete curb bumpers to create a traffic barrier. Two-foot wide gaps between each bumper will allow drainage into the pond.

Pond 6 required careful consideration of both existing and proposed buildings to ensure that the proposed extension of the vehicle maintenance facility was not affected by the pond. As a result, a triangular configuration was utilized to maximize detention volume without impeding vehicle access into and out of the building. This pond will be four feet deep with 2H:1V side slopes and detain 0.13 acre-feet of runoff from approximately 0.8 acres. A newly constructed drop inlet will be connected by an eight-inch PVC pipe to an existing storm drain inlet on the northern edge of the pond. Because of elevation limitations, the inlet had to be located on the side slope of the pond. The grate will be higher than the pond bottom, so approximately two-feet of water will be retained in the pond. The discharge rate from this pipe is 1.7 cfs (see Appendix). Through a series of connections on the City Testing Lab property, this existing inlet drains into the storm drainage system on Broadway SE.

A reinforced concrete block retaining wall will be constructed along the western and southern sides of the pond, along the fence line, in order to better control overflow into the City of Albuquerque's Testing Lab facility. An overflow weir will be constructed at the southern end of the block wall, to allow for a controlled discharge out of the pond if necessary. The weir width will be 22 feet with an overflow depth of 0.5 feet. This depth

was required due to limitations on weir width because of the proximity of the Testing Lab building. Overflow from both Ponds 6 and 5, which is adjacent, will flow over this weir (see Appendix). The eastern side of this pond will also be protected by pinned concrete parking bumpers with two foot spaces between to allow drainage inflow and to prevent vehicles from driving into the pond.

Bernalillo County will have to acquire a drainage easement from the City of Albuquerque to provide for this emergency overflow from Pond 6. The submittal process of this Revised Drainage Plan to the City of Albuquerque will determine what type of drainage easement is required for the discharge in question.

Pond 7 has been modified from the original Masterplan configuration to increase water depth. This pond will be similar to Pond 5 in that a railroad tie retaining wall will form the sides. This pond will be one and a half feet deep and detain 0.13 acre-feet from 0.4 acres. Although this detention volume is greater than the runoff volume produced from this basin, it is oversized to accommodate additional runoff due to existing flow paths. A new drop inlet will be constructed to drain water from the pond. An eight-inch diameter outflow pipe will be installed to connect with a drop inlet located on Broadway which discharges directly to the 72" storm drain in Broadway. The discharge rate of the 8-inch line will be 5.3 cfs into the inlet line. Additional ponding volume will be allowed to accumulate in the adjacent parking area east of the detention pond.

This pond will incorporate a twelve-foot long overflow weir on the southwest corner of the pond. Maximum water overflow depth over the weir will be 0.3 feet in order to minimize the flow over the sidewalk. An asphalt berm, constructed on the south end of the parking lot, will act as a water barrier to increase detention volume and protect the City Testing Lab from runoff. The railroad tie retaining wall will also be 0.5 higher on the south end than the rest of the wall to prevent flow into the City Testing Lab facility.

Presently, within Pond 7, there are four trees that must be removed in order to construct the pond. Discussions with RTI's Landscape Architect suggested that it would be easier to plant new trees than to attempt to excavate and rootball the existing trees.

Pond 8 was not included in the original Masterplan and was added by Resource Technology, Inc. This was done in order to reduce the amount of runoff reaching Broadway under the currently approved Masterplan. Located north of the County Warehouse, it will detain runoff from the majority of the open storage area on the eastern side of the site along with runoff from part of the warehouse roof. An existing swale on the east side of the warehouse will channel flow into the pond, a rip-rap rundown is included in the pond design to prevent erosion of the pond slope at the inlet end. Pond 8 will be an earthen pond approximately three feet deep and detain runoff from approximately 5.5 acres. The pond will drain through an eight-inch diameter pipe that discharges into the future driveway along the northern boundary of the site. Calculated maximum discharge from this pipe is 1.6 cfs. A 40-foot grouted rip-rap overflow weir is included as part of this pond to allow for excess flow beyond the design capacity or if large sediment flows significantly reduce pond volume during a storm event (see Appendix).

Total detention volume is about 0.5 acre-feet. This pond is actually sized large enough to retain all runoff, plus a twenty percent loss of volume due to sediment accumulation, from the eastern portion of the site beyond the warehouse. This design decision was instituted due to the large expanse of stockpiled material and open soil that is subjected to heavy equipment traffic in this area. It is likely that even small storm events will generate sediment due to the nature of the surface.

Table 2 which includes data taken from the Wilson Drainage Masterplan, shows the hydrologic data utilized in the design. Where necessary, RTI has adjusted some values to account for changes to flow routing or pond design. As a result of RTI's design and the addition of Pond 8, peak flow discharges and volumes into Broadway from the County Yard have been significantly reduced.

Plates 3A and 3B, taken from the Wilson Drainage Masterplan, illustrate the watershed basins used for this report. One hundred year peak flow from the driveway on the north side of the Public Works facility into Broadway is 9.8 cfs compared to 9.3 cfs in the Wilson report. Contributing area for this flow is Basin A_1, on the north side of the County Yard. Peak flow for this area under the Wilson report was 9.3 cfs while the RTI value is 8.2 cfs. This reflects changes in contributing basin area producing a reduced total runoff volume as shown in Table 2. Wilson calculated 0.37 ac-ft for this basin while RTI slightly reduced this to 0.34 ac-ft. The increase in the total discharge to 9.8 cfs is a result of the addition of the 1.6 cfs from the Pond 8 discharge pipe that drains into Basin A_1. The area that drains into Pond 8 currently drains into the main road running through the center of the County Yard.

Basin B_1 drains into Pond 1 directly in front of the Public Works building. No changes were made to the Wilson values for runoff rate and runoff volume for this basin. An increase in pond volume from 0.01 ac-ft to 0.09 ac-ft was achieved by excavating the grassed area west of the parking lot, and creating a new landscaped retention pond which was not included in the Wilson report.

Basins C_1, D_1, E_1, and G_1 are all within the central area of the County Yard facility. These basins drain to the main road within the complex which flows westward into Broadway. Peak flows from basins C_1 and D_1 have been adjusted by RTI as a result of changes in drainage areas and flow paths resulting from new building construction. Wilson showed the area due north of the County Warehouse as part of Basin D_1. Due to changes in flow patterns this area now drains to Basin C_1 thereby increasing the basin area and peak discharge. Basin C_1 discharge is now 22.5 cfs as compared to 21.4 cfs under the Wilson report and total runoff volume increased from 0.93 to 0.98 ac-ft. These changes in flow patterns and basin area reduced peak discharge from Basin D_1 from 6.6 cfs to 5.2 cfs. Total basin runoff decreased as well from 0.38 ac-ft to 0.32 ac-ft. Basins E1 and G_1 were not affected by changes in flow patterns or adjustments in impervious area.

Basin F_1 will no longer drain into the central road as shown on the Wilson report but drain to the north into Pond 8 as discussed previously.

Cumulative peak flow at Broadway from basins C_1, D_1, E_1, and G_1 has been reduced from 44.1 cfs on the Wilson plan to 30.2 cfs by RTI. Some of this flow may be diverted into Pond 7 due to the existence of an asphalt berm across the entrance to the County Yard.

TABLE 2

Comparisons of Wilson & Company and Resource Technology, Inc. Routing and Discharge Data

Pond	Basins	Peak Flows		V1440		Volume Ponded		Flow Inlet		Flow Outlet	
		Wilson & Co	RTI	Wilson & Co	RTI	Wilson & Co	RTI	Wilson & Co	RTI	Wilson & Co	RTI
		cfs		Ac-Ft		Ac-Ft		cfs		cfs	
	A_1	9.3	8.2	0.37	0.34	0	0			9.3	8.2
	Pond 8 discharge										1.6
Sub-total											9.8
#1	B_1	2.7	2.7	0.12	0.12	0.01	0.09	2.7	2.7	2.0	1.0 (overflow)
#2 & #3	C_1	21.4	22.5	0.93	0.98	0.07	0.09			21.4	22.5
	D_1	9.0	8.4	0.37	0.32	0.1	0.22	6.6	5.2	2.5	2.0
	E_1	0.5	0.5	0.02	0.02	0	0			0.5	0.5
	F_1	13.5	(a)	0.41	(a)	0	(a)			13.5	(a)
	G_1	4.2	4.2	0.18	0.18	0	0	0	0	4.2	4.2
Sub-total						0.17	0.40			44.1	30.2
#4	H_1	7.1	7.1	0.31	0.31	0.01	(b)	7.1	7.1	6.6	7.1
	I_1	1.9	1.9	0.08	0.08	0	0				
#5	J_1	7.5	7.5	0.33	0.33	0.15	0.32	16.0	16.5	10.3	2.4 pipe 14.1 weir
#6	K_1	3.8	3.8	0.17	0.17	0.22	0.13	14.1	17.9	7.5	1.7 pipe* 16.2 weir
Sub-total						0.38	0.45				16.2 weir overflow
#7	L_1	1.6	1.6	0.07	0.07	0.07	0.07	1.6	1.6		
	M_1	1.3	1.3	0.06	0.06	0.01	0.06	1.3	1.3	1.0	5.3 pipe*
Sub-total						0.08	0.13	2.9	2.9	1.0	5.3 (pipe)
#8	F_1	13.5	13.5	0.41	0.41	0	0.41		13.5		(c)
Total						0.63	1.4			61.9	56.2

Footnotes:
(a) Basin F_1 has been diverted to Pond 8
(b) Pond 4 will not be constructed at present time
(c) Included in Basin A, discharge
Pipe* - discharges to storm drain

Therefore, total discharge into Broadway at this location will be somewhat less than the computed value.

Basins H_1, I_1 and J_1 drain the southern portion of the County Yard and flow into Pond 5. Total discharge volumes and discharge rates were not altered from the Wilson report. Pond 5 detention volume was increased from 0.15 ac-ft to 0.32 ac-ft by increasing its area and depth. The discharge rate and volume from basin K_1, located in the southwest corner of the County Yard behind the vehicle maintenance shop, was not changed. However, changes have been made to the discharge rate from Pond 5 into Pond 6 and from Pond 6 into the existing storm drainage system. Wilson showed a discharge rate of 10.25 cfs from Pond 5 through an 18" diameter culvert. RTI reduced this discharge rate to 2.4 cfs by use of an 8" diameter pipe connected directly to Pond 6. An overflow weir was added to Pond 5 in the event that the inflow rate exceeded the storage capacity and discharge rate from the pond. This rate is 14.1 cfs and will flow overland into Pond 6.

The discharge rate from Pond 6 into the existing storm drainage system in the Wilson report is 7.5 cfs. This was adjusted to 1.7 cfs by RTI through the use of an 8" diameter discharge pipe. In addition, an overflow weir was added to this pond to account for flow that will exceed the storage capacity of Pond 6. This rate, by accounting for overflow from Pond 5 and non-stored runoff volume into Pond 6 was calculated to be 16.2 cfs across the overflow wier and onto the City Testing Lab property before reaching Broadway.

Basins L_1 and M_1 have not had any changes made to flow rate or total discharge volumes. Pond 7 has been increased in volume from 0.08 ac-ft to 0.13 ac-ft by increasing the pond capacity.

APPENDIX

RESOURCE TECHNOLOGY, INC.
ENGINEERS & ENVIRONMENTAL SCIENTISTS
2129 Osuna Road, NE Suite 200
Albuquerque, NM 87113
Phone: (505) 345-3115
Fax: (505) 345-4132

CHECKED _____ DATE _____
APPROVED _____ DATE _____
TITLE 2400 Broadway

PROJECT NO. 93-150C
SHEET 1 OF _____
BY LBS DATE 1/21/94

Weir Calculations

Obj: Determine weir lengths necessary for detention basins

Weir Equation: $Q = CLH^{3/2}$

$L = \frac{Q}{CH^{3/2}}$

Q = flow (cfs)
C = weir coef. 2.2
H = water depth 0.33 ft

Pond 3 $Q = 5.2$ cfs

$L = \frac{5.2}{2.2(0.33)^{3/2}} = 12.5$ designed length: 13'

Pond 5 $Q = 16.5$ cfs

$L = \frac{16.5}{2.2(0.33)^{3/2}} = 39.56'$ designed length: 40'

Pond 6 $Q = 3.8$ cfs + 14.1 (pond 5 overflow) − 1.7 (discharge pond 6)

$L = \frac{16.2}{2.2(0.33)^{3/2}} = 38.84'$ designed length: 40' ← too wide

$L = \frac{16.2}{2.2(0.5)^{3/2}} = 20.8'$ → design length: 22'

Pond 8 $Q = 16.32$ cfs

$L = \frac{16.32}{2.2(0.33)^{3/2}} = 39.13'$ designed length: 40'

Pond 7 $Q = 1.6$ $H = 0.333'$

$L = \frac{1.6}{2.2(0.333)^{3/2}} = 3.84'$ ~ designed length 4'

Pond 2 $Q = CLH^{3/2}$

$H^{3/2} = \frac{Q}{CL}$

$H^{3/2} = \frac{5.4}{2.2(25)}$ $H^{3/2} = 0.0982$

$Q = 5.4$ cfs
$L = 25$
$H = ?$

$H = 0.216$ ft

RESOURCE TECHNOLOGY, INC.
ENGINEERS & ENVIRONMENTAL SCIENTISTS
2129 Osuna Road, NE Suite 200
Albuquerque, NM 87113
Phone: (505) 345-3115
Fax: (505) 345-4132

CHECKED _____ DATE _____
APPROVED _____ DATE _____
TITLE 2400 Bway

PROJECT NO. 93-150C
SHEET _____ OF _____
BY LBS DATE 2/18/94

Flow over weir Pond 6

Overflow pond 5 (44% detained)

16.5 cfs Qp inflow
− 2.4 cfs outlet pipe
14.1 cfs over weir

inflow pond 6 + 3.8

Overflow pond 6 (23% detained)

+ 14.1 cfs Qp inflow (from Pond 5 weir)
− 1.7 cfs Qp outlet pipe
16.2 cfs over weir

calculate actual flow depth over weir $Q = CLH$

$Q = 16.2$
$L = 22$
$C = 2.2$

$$\frac{16.2}{(2.2)(22)} = H^{3/2}$$

$H = 0.48'$
$= 5.78''$

flow across City Testing Lab property = 16.2 cfs @ 5.78 inches deep

RESOURCE TECHNOLOGY, INC.
ENGINEERS & ENVIRONMENTAL SCIENTISTS
2129 Osuna Road, NE Suite 200
Albuquerque, NM 87113
Phone: (505) 345-3115
Fax: (505) 345-4132

CHECKED _____ DATE _____
APPROVED _____ DATE _____
TITLE 2400 Bridge way

PROJECT NO. 93-150C
SHEET 1 OF _____
BY LBS DATE 2/10/94

Pond Pipe
Discharge Equations, Qp's from Wilson Masterplan (1992)

equation: $Q = Ca\sqrt{2gh}$

where: Q = discharge (cfs)
a = x-sect area (ft^2)
g = gravity force (ft/sec^2)
h = head (ft)
C = Cv * Cc Cv = coef of velocity
= coef of discharge Cc = " " contraction

Pond 2

Q = ?
a = 0.35 ft^2
C = 0.59
h = 1.17'
g = 32.2

$a = \left(\frac{4''}{12}\right)^2 \times \pi = 0.35\ ft^2$ 8" PVC pipe outlet

h = 1.5 - 0.33' = 1.17

$Q = (0.59)(0.35)\sqrt{2(32.2)(1.17)}$

= 1.79 cfs

Pond 3

Q = ?
a = 0.35 ft^2 (same as above)
C = 0.59
h = 1.45
g = 32.2

h = 1.78 - 0.33' = 1.45'

$Q = (0.59)(0.35)\sqrt{2(32.2)(1.45)}$

= 1.995 cfs

→ 2.0 cfs

Table 4-3. Smith's Coefficients of Discharge for Circular and Square Orifices with Full Contraction

Diameter of circular orifices, feet							Head, feet	Side of square orifices, feet						
0.02	0.04	0.07	0.1	0.2	0.6	1.0		0.02	0.04	0.07	0.1	0.2	0.6	1.0
.....	0.637	0.624	0.618				0.4	.....	0.643	0.628	0.621			
0.655	0.630	0.618	0.613	0.601	0.593		0.6	0.660	0.636	0.623	0.617	0.605	0.598	
0.648	0.626	0.615	0.610	0.601	0.594	0.590	0.8	0.652	0.631	0.620	0.615	0.605	0.600	0.597
0.644	0.623	0.612	0.608	0.600	0.595	0.591	1	0.648	0.628	0.618	0.613	0.605	0.601	0.599
0.637	0.618	0.608	0.605	0.600	0.596	0.593	1.5	0.641	0.622	0.614	0.610	0.605	0.602	0.601
0.632	0.614	0.606	0.604	0.599	0.597	0.595	2	0.637	0.619	0.612	0.608	0.605	0.604	0.602
0.629	0.612	0.605	0.603	0.599	0.598	0.596	2.5	0.634	0.617	0.610	0.607	0.605	0.604	0.602
0.627	0.611	0.604	0.603	0.599	0.598	0.597	3	0.632	0.616	0.609	0.607	0.605	0.604	0.603
0.623	0.609	0.603	0.602	0.599	0.597	0.596	4	0.628	0.614	0.608	0.606	0.605	0.603	0.602
0.618	0.607	0.602	0.600	0.598	0.597	0.596	6	0.623	0.612	0.607	0.605	0.604	0.603	0.602
0.614	0.605	0.601	0.600	0.598	0.596	0.596	8	0.619	0.610	0.606	0.605	0.604	0.603	0.602
0.611	0.603	0.599	0.598	0.597	0.596	0.595	10	0.616	0.608	0.605	0.604	0.603	0.602	0.601
0.601	0.599	0.597	0.596	0.596	0.596	0.594	20	0.606	0.604	0.602	0.602	0.602	0.601	0.600
0.596	0.595	0.594	0.594	0.594	0.594	0.593	50	0.602	0.601	0.601	0.600	0.600	0.599	0.599
0.593	0.592	0.592	0.592	0.592	0.592	0.592	100	0.599	0.598	0.598	0.598	0.598	0.598	0.598

RESOURCE TECHNOLOGY, INC.
ENGINEERS & ENVIRONMENTAL SCIENTISTS
2129 Osuna Road, NE Suite 200
Albuquerque, NM 87113
Phone: (505) 345-3115
Fax: (505) 345-4132

CHECKED _____ DATE _____
APPROVED _____ DATE _____
TITLE _____

PROJECT NO. 93-150C
SHEET 4 OF _____
BY _____ DATE 2/16

iteration 4 $V = 10$ (assume)

$$Re = \frac{0.67(10)}{1.41\times10^{-5}} = 4.75\times10^{5}$$

$$f = 0.020$$

$$\frac{(10)^2}{2(32.2)} - \frac{0.020(235)(10)^2}{2(0.67)\,32.2} - 0.78\left(\frac{(10)^2}{2(32.2)}\right) - \frac{(10)^2}{2(32.2)} =$$

$$1.553 - 10.89 - 1.211 - 1.533 = -12.08$$

iteration 5 $V = 7$ ft/sec

$$Re = \frac{0.67(7)}{1.41\times10^{5}} = 3.33\times10^{5}$$

$$f = 0.0143$$

$$\frac{(7)^2}{2(32.2)} - \frac{0.0143(235)(7)^2}{2(0.67)\,32.2} - 0.78\frac{(7)^2}{2(32.2)} - \frac{(7)^2}{2(32.2)}$$

$$0.761 - 3.816 - 0.5935 - 0.761 = -4.41$$

$\therefore Q = V \cdot A$ $\quad A = (0.36)^2\pi = 0.342\ ft^2$

$2.4\ cfs = 7 \cdot 0.342$

Pond 5 discharge = 2.4 cfs when pond 6 is full

RESOURCE TECHNOLOGY, INC.
ENGINEERS & ENVIRONMENTAL SCIENTISTS
2129 Osuna Road, NE Suite 200
Albuquerque, NM 87113
Phone: (505) 345-3115
Fax: (505) 345-4132

CHECKED _____ DATE _____ PROJECT NO. _____
APPROVED _____ DATE _____ SHEET 3 OF _____
TITLE _____ BY _____ DATE 2/16

iterate $h_f = \frac{fLV^2}{2Dg_c}$ assume V

$D_e = 0.667$ ft
$V = 2$

then $\frac{V_2^2}{2g} - \underbrace{\frac{fLV^2}{2Dg_c}}_{\text{friction}} - K_{cnt}\frac{V^2}{2g_c} - K_{exit}\frac{V^2}{2g_c} = -4$ and $N_{re} = \frac{D_e V}{\nu}$

ν = kinematic viscosity @ 50°F $= 1.41 \times 10^{-5}$ ft²/sec

so: iteration ① $V = 2$ ft/sec $f = 0.0185$ $N_{re} = 9.461 \times 10^4$ $f = 0.0185$

$$\frac{(2)^2}{2(32.2)} - \frac{0.0185(235)(2)^2}{2(0.67)(32.2)} - 0.78\frac{(2)^2}{2(32.2)} - 3\frac{(2)^2}{2(32.2)}$$

$$0.062 - 0.403 - 0.0484 - 0.062 = -0.45$$

iteration ② assume $V = 20$ ft/sec $N_{re} = \frac{0.67(20)}{1.41\times10^{-5}} = 9.504\times10^5$

$$6.21 - \frac{0.013(235)(20)^2}{2(0.67)\,32.2} - 0.78(6.21) - 6.21$$ $f = 0.013$

$$6.21 - 28.32 - 5.43 - 6.21 = -33.75$$

iteration ③ assume $V = 5$ ft/sec $N_{re} = \frac{0.67(5)}{1.41\times10^{-5}} = 2.376\times10^5$

$$0.399 - \frac{0.0155(235)(5)^2}{2(0.67)\,32.2} - 0.303 - 0.388 =$$ $f = 0.0155$

$$0.399 - 2.11 - 0.303 - 0.388 = -2.41$$

RESOURCE TECHNOLOGY, INC.
ENGINEERS & ENVIRONMENTAL SCIENTISTS
2129 Osuna Road, NE Suite 200
Albuquerque, NM 87113
Phone: (505) 345-3115
Fax: (505) 345-4132

CHECKED _____ DATE _____
APPROVED _____ DATE _____
TITLE _____

PROJECT NO. 93-150C
SHEET 4 OF _____
BY _____ DATE 2/16

iteration 4 $V = 10$ (assume)

$$Re = \frac{0.67(10)}{1.41\times10^{-5}} = 4.75\times10^{5}$$

$$\frac{(10)^2}{2(32.2)} - \frac{0.020(235)(10)^2}{2(0.67)\,32.2} - 0.78\left(\frac{(10)^2}{2(32.2)}\right) - \frac{(10)^2}{2(32.2)} =$$

$f = 0.020$

$$1.553 - 10.89 - 1.211 - 1.533 = -12.08$$

iteration 5 $V = 7$ ft/sec

$$Re = \frac{0.67(7)}{1.41\times10^{5}} = 3.33\times10^{5}$$

$$\frac{(7)^2}{2(32.2)} - \frac{0.0143(235)(7)^2}{2(0.67)\,32.2} - 0.78\frac{(7)^2}{2(32.2)} - \frac{(7)^2}{2(32.2)}$$

$f = 0.0143$

$$0.761 - 3.816 - 0.5935 - 0.761 = -4.41$$

$\therefore Q = V \cdot A$ $\quad A = (0.36)^2\pi = 0.342\ ft^2$

$2.4\ cfs = 7 \cdot 0.342$

Pond 5 discharge = 2.4 cfs when pond 6 is full

RESOURCE TECHNOLOGY, INC.
ENGINEERS & ENVIRONMENTAL SCIENTISTS
2129 Osuna Road, NE Suite 200
Albuquerque, NM 87113
Phone: (505) 345-3115
Fax: (505) 345-4132

CHECKED _____ DATE _____
APPROVED _____ DATE _____
TITLE _____

PROJECT NO. 93-150C
SHEET 5 OF _____
BY _____ DATE _____

Pond 6 Discharge 8" PVC

Mannings Eqn - no pressure $V = \frac{1.49}{n} R^{2/3} \sqrt{S}$

where $R = 0.168$ $R = A/P$ A = area

Slope = P = wetted perimeter

$R = \frac{0.353 \text{ ft}^2}{2.104 \text{ ft}} = 0.168 \text{ ft}$

$V = \frac{1.49}{0.01} (0.168)^{2/3} \sqrt{0.0106}$ $n = 0.010$

$V = 4.73$ ft/sec Slope $= \frac{67.25 - 66.97}{50} = 0.0106$

$Q = V * A$

$Q = 4.73 * 0.353 = 1.67$ cfs

Pond 7 Discharge 8" PVC $R = 0.168$

$n = 0.010$

$V = \frac{1.49}{0.01} (0.168)^{2/3} \sqrt{0.1111}$ Slope $= \frac{4967 - 4965}{18} = 0.1111$

$V = 15.3$ ft/sec

$Q = V * A$

$= 15.3 * 0.353 = 5.4$ cfs

RESOURCE TECHNOLOGY, INC.
ENGINEERS & ENVIRONMENTAL SCIENTISTS
2129 Osuna Road, NE Suite 200
Albuquerque, NM 87113
Phone: (505) 345-3115
Fax: (505) 345-4132

CHECKED _____ DATE _____
APPROVED _____ DATE _____
TITLE _____

PROJECT NO. 93-150C
SHEET 6 OF _____
BY _____ DATE 2/16

Pond 8 Discharge

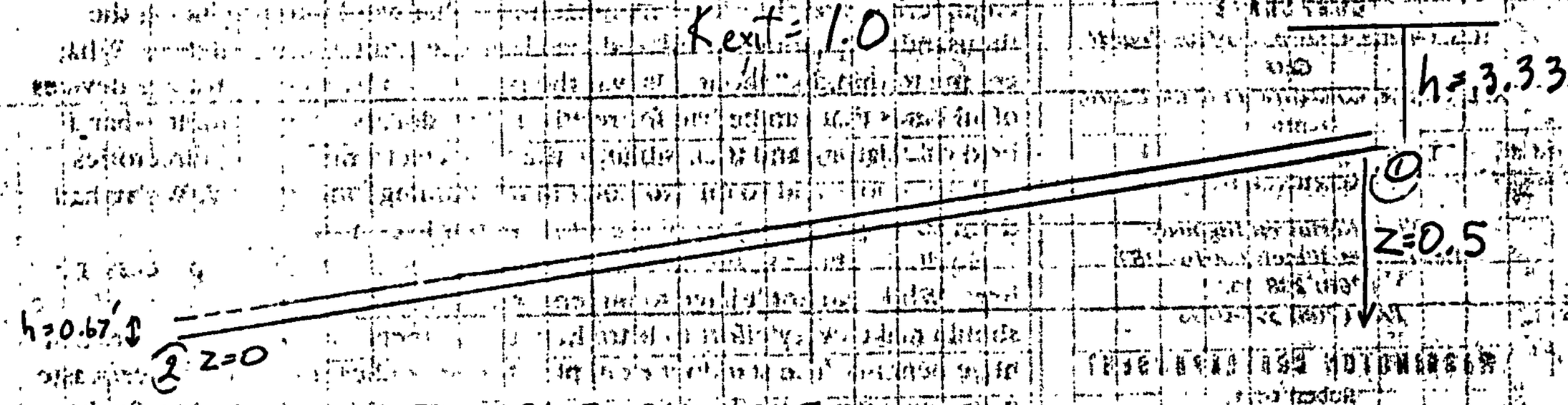
hf due to pipe length, bend, entrance, exit

$L = 22 + 300$

$K_{bend} = 0.8$ $f = 0.0143$ (from Pond 5 calcs)

$K_{ent} = 0.78$

$K_{exit} = 1.0$



$\Delta Z = 84.5 - 84 = 0.5$

$$\frac{P_1}{\gamma} + Z_1 + \frac{V_1^2}{2g} = \frac{P_2}{\gamma} + Z_2 + \frac{V_2^2}{2g} + \sum h_L$$

$$3.33 + 0.5 = 0.67 + \frac{V_2^2}{2g} + \sum h_L \quad \therefore \quad \frac{V_2^2}{2g} = 3.13 - \sum h_L$$

then $$\frac{V_2^2}{2g} + \frac{fLV^2}{2Dg_c} + K\frac{V^2}{2g_c} + \frac{KV^2}{2g_c} + \frac{KV^2}{2g_c} = 3.13$$

Iteration 1 $V = 5$ ft/sec $N_{Re} = \frac{0.67(5)}{1.41 \times 10^{-5}} = 2.376 \times 10^5$

$f = 0.0155$

$$\frac{25}{64.4} + \frac{0.0155(322)25}{2(0.67)32.2} + 0.8\frac{25}{2(32.2)} + 0.78\frac{25}{2(32.2)} + \frac{25}{2(32.2)} =$$

$$0.39 + 2.89 + 0.3425 + 0.305 + 0.39 = 4.2875$$

Pond 3 Discharge (cont)

Iteration 2 $V = 4$ ft/sec

$$R_{N2} = \frac{0.67(4)}{1.41\times10^{-5}} = 1.9007\times10^{5}$$

$$\frac{16}{64.4} + \frac{0.016(322)16}{2(0.67)32.2} + 0.8\frac{16}{2(32.2)} + 0.78\frac{16}{2(32.2)} + \frac{16}{2(32.2)} = \quad f = 0.016$$

$$0.248 + 1.91 + 0.1984 + 0.193 + 0.248 = 2.79$$

est $V = 4.5$ ft/sec

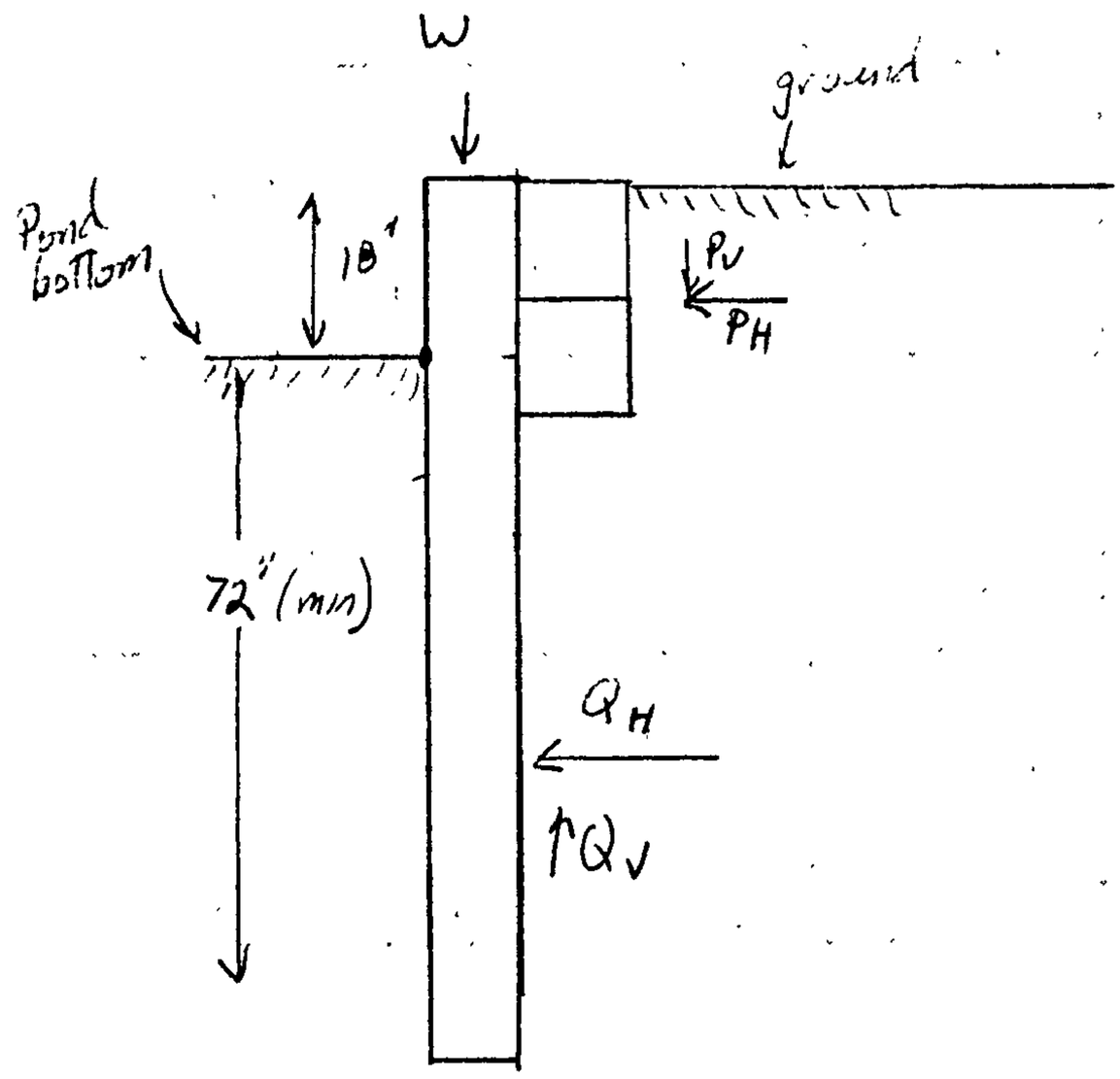
$$\therefore 4.5 \cdot \frac{(0.67)^2\pi}{4} = 1.59 \text{ cfs}$$

RESOURCE TECHNOLOGY, INC.
ENGINEERS & ENVIRONMENTAL SCIENTISTS
2129 Osuna Road, NE Suite 200
Albuquerque, NM 87113
Phone: (505) 345-3115
Fax: (505) 345-4132

CHECKED _____ DATE _____
APPROVED _____ DATE _____
TITLE 2400 Broadway

PROJECT NO. 93-150C
SHEET 1 OF 2
BY _____ DATE 2/7/94

RR the retaining wall design
Not to Scale



$+\uparrow \quad Q_V = W + P_V$

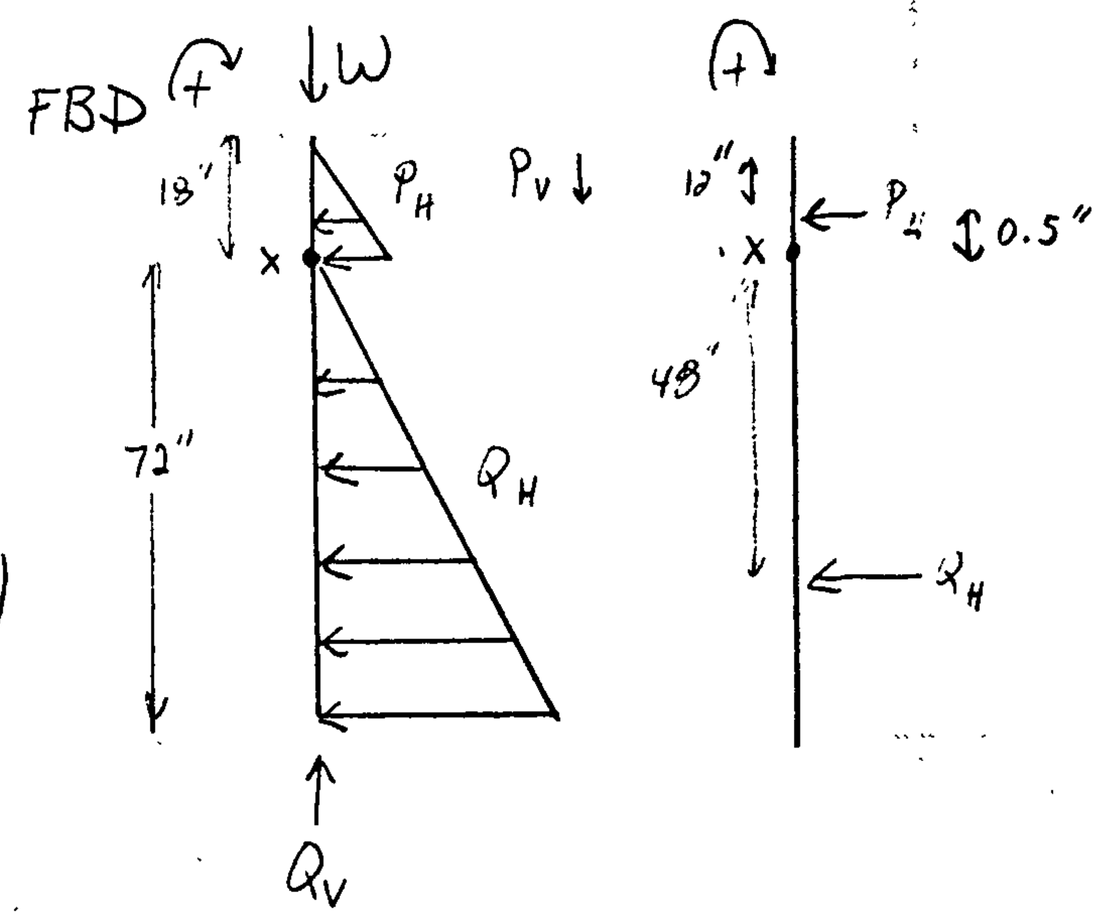
$\xrightarrow{+} \quad Q_H = P_H$

$\circlearrowleft + \quad \Sigma M_x \quad (Q_H \cdot 4') - (P_H \cdot 0.5') = 0$

assume $P_{soil} = 150\#/ft^2$ (saturated conditions)

$\therefore \quad \Sigma M_x \quad (Q_H \cdot 4) - (100 \times 0.5) = 0$

$Q_H = 62.5\#/ft$

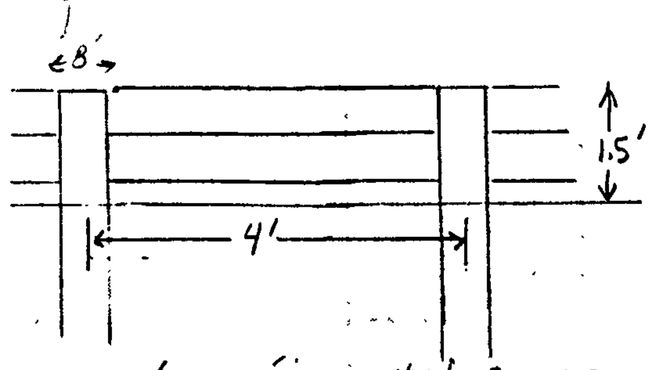


RESOURCE TECHNOLOGY, INC.
ENGINEERS & ENVIRONMENTAL SCIENTISTS
2129 Osuna Road, NE Suite 200
Albuquerque, NM 87113
Phone: (505) 345-3115
Fax: (505) 345-4132

CHECKED _____ DATE _____
APPROVED _____ DATE _____
TITLE RR tie retaining wall

PROJECT NO. 93-150C
SHEET 2 OF 2
BY LBS DATE 2/7/94

In terms of pressures on wall



above ground $1.5' \times 4' \times 150\,\#/ft^2 = 900\,\#$ force on wall above ground line

resistance below ground $(0.33 \times 6) \times 2 \times 150\,\#/ft^2 = 600\,\#$ resisting force on vertical piles

∴ because resisting force is less than exerted force from soil holes for vertical piles require overdrilling and backfilling with lean concrete

If a vehicle is parked at the edge of the pond overburden pressure must be accounted for as well.

$$+\circlearrowleft \quad (900 \times 0.5) - (600 \times 4) + (OB_H \times 1.5) = 0$$

$$450 - 2400 + 1.5\,OB_H = 0$$

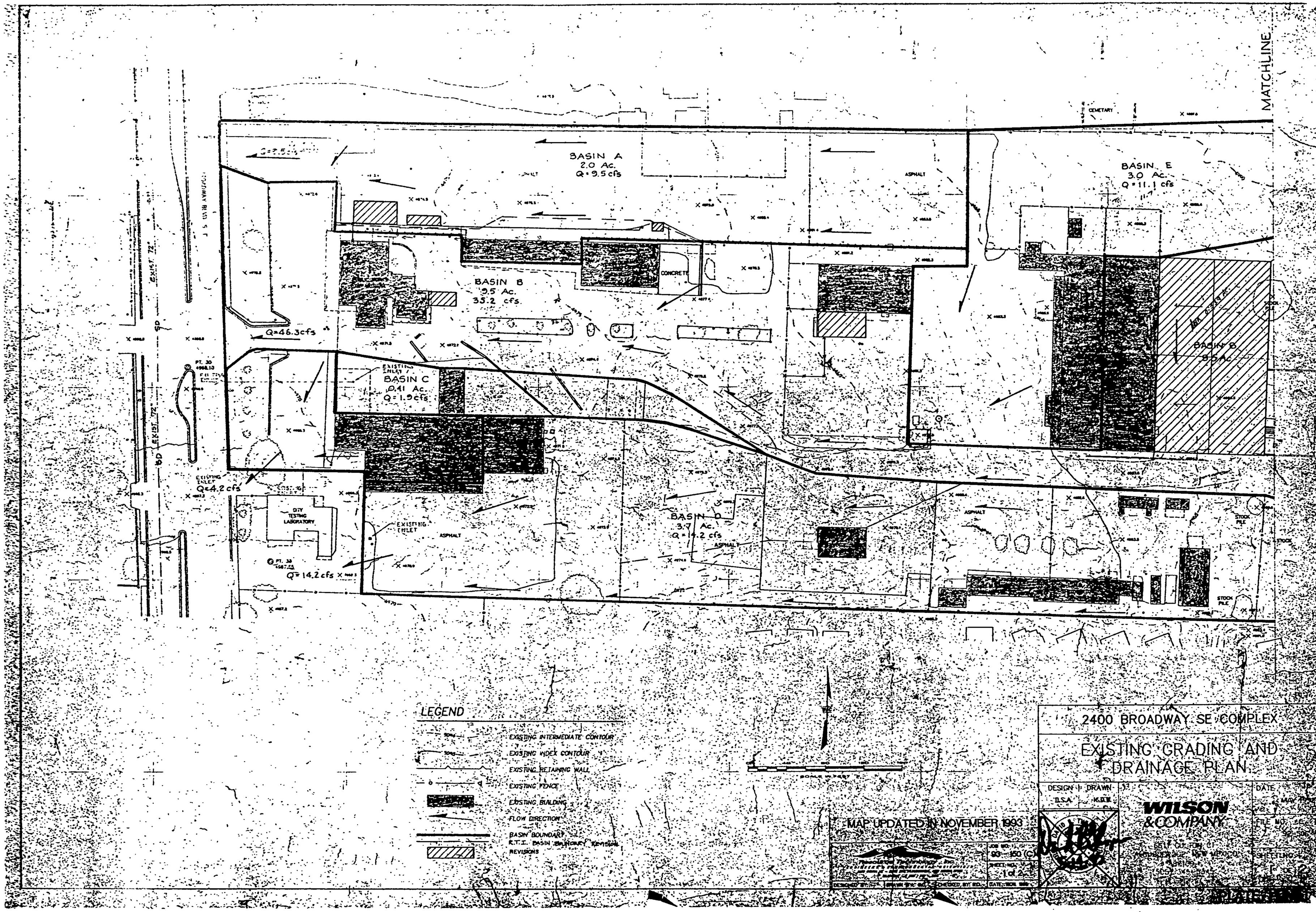
$$OB_H = \frac{1950}{1.5} = 1300\,\#$$ axle weight

If 1.2' diameter hole with lean concrete backfill used on vertical members

$$R = 1.2 \times 6 \times 150 = 1080\,\#$$

$$+\circlearrowleft \quad (1080 \times 0.5) - (900 \times 4) + (OB_H \times 1.5) = 0$$

$$OB_H = \frac{3060}{1.5} = 2040\,\#$$


MATCHLINE
CEMETARY
BASIN A
2.0 Ac.
Q=9.5cfs
BASIN E
3.0 Ac.
Q=11.1 cfs
ASPHALT
CONCRETE
BASIN B
9.5 Ac.
33.2 cfs
Q=46.3cfs
BASIN B
8.9 Ac.
EXISTING INLET
BASIN C
0.41 Ac.
Q=1.9cfs
EXISTING INLET
Q=4.2cfs
CITY TESTING LABORATORY
EXISTING INLET
ASPHALT
BASIN D
3.7 Ac.
Q=14.2 cfs
ASPHALT
STOCK PILE
Q=14.2cfs
LEGEND
EXISTING INTERMEDIATE CONTOUR
EXISTING INDEX CONTOUR
EXISTING RETAINING WALL
EXISTING FENCE
EXISTING BUILDING
FLOW DIRECTION
BASIN BOUNDARY
R.T.I. BASIN BOUNDARY REVISION
REVISIONS
MAP UPDATED IN NOVEMBER 1993
2400 BROADWAY SE COMPLEX
EXISTING GRADING AND DRAINAGE PLAN
DESIGN T.S.A.
DRAWN K.R.R.
DATE
WILSON & COMPANY
CITY OF ALBUQUERQUE
NEW MEXICO
SHEET 1 OF 2

BASIN E
3.0 Ac
Q = 11.1 cfs

RETENTION POND
VOL_{100} = .25 Ac.Ft.
W.S. Elev. = 93.9

OFFSITE
BASIN F
3.51 acres

BASIN B
9.5 acres

STOCK PILE

ASPHALT

MATCHLINE

LEGEND

- EXISTING INTERMEDIATE CONTOUR
- EXISTING INDEX CONTOUR
- EXISTING RETAINING WALL
- EXISTING FENCE
- EXISTING BUILDING
- FLOW DIRECTION
- BASIN BOUNDARY
- REVISIONS

MAP UPDATED IN NOVEMBER 1993

Resource Technology, Inc.
ENGINEERS & ENVIRONMENTAL SCIENTISTS

JOB NO. 93 - 150 (C)
SHEET NO. 2 of 2
DESIGNED BY: DRAWN BY: GC CHECKED BY: ED DATE: NOV. 1993

2400 BROADWAY SE COMPLEX

EXISTING GRADING AND DRAINAGE PLAN

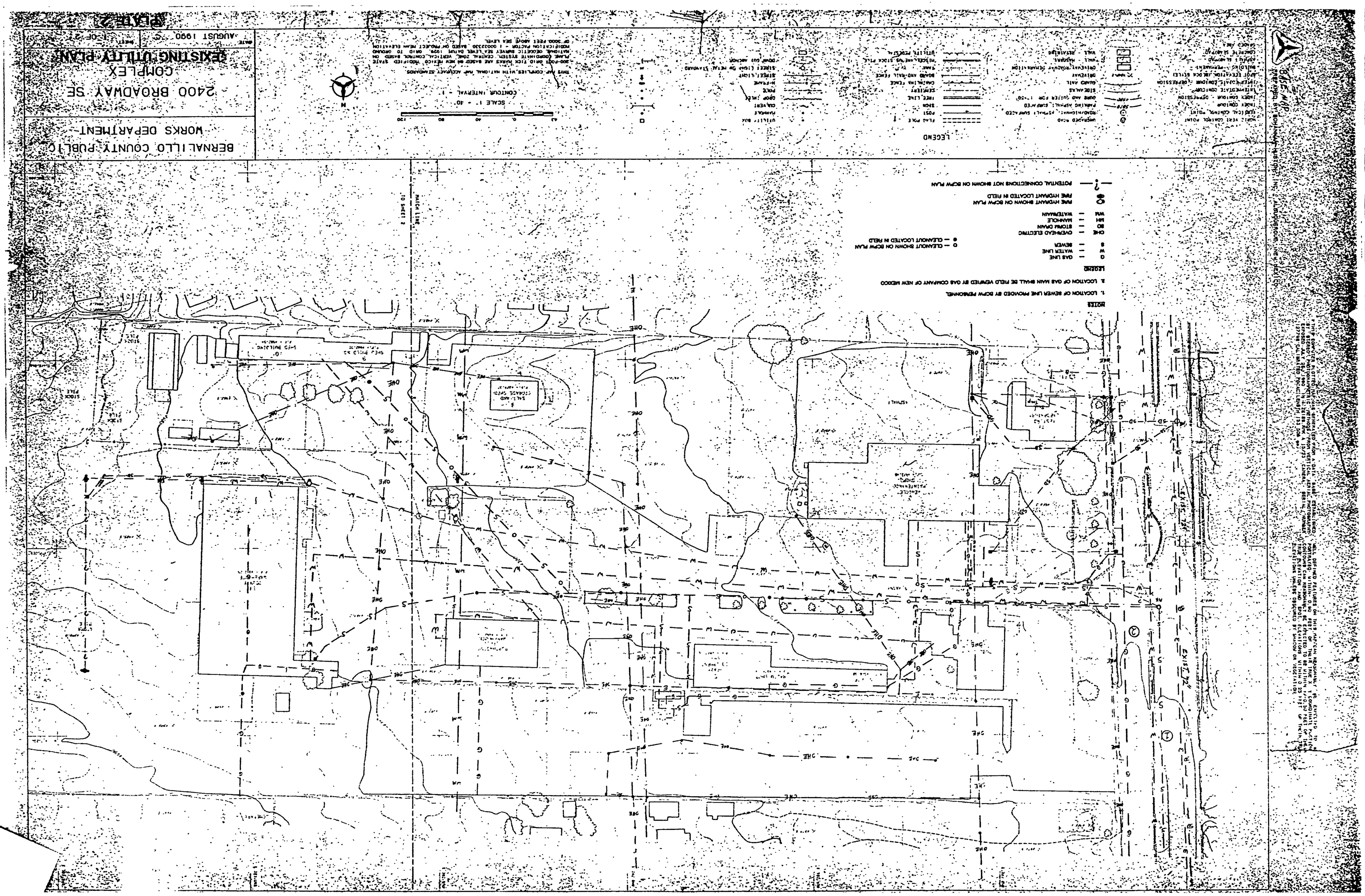
DESIGN: ED DRAWN: KLB DATE: MAY 1992

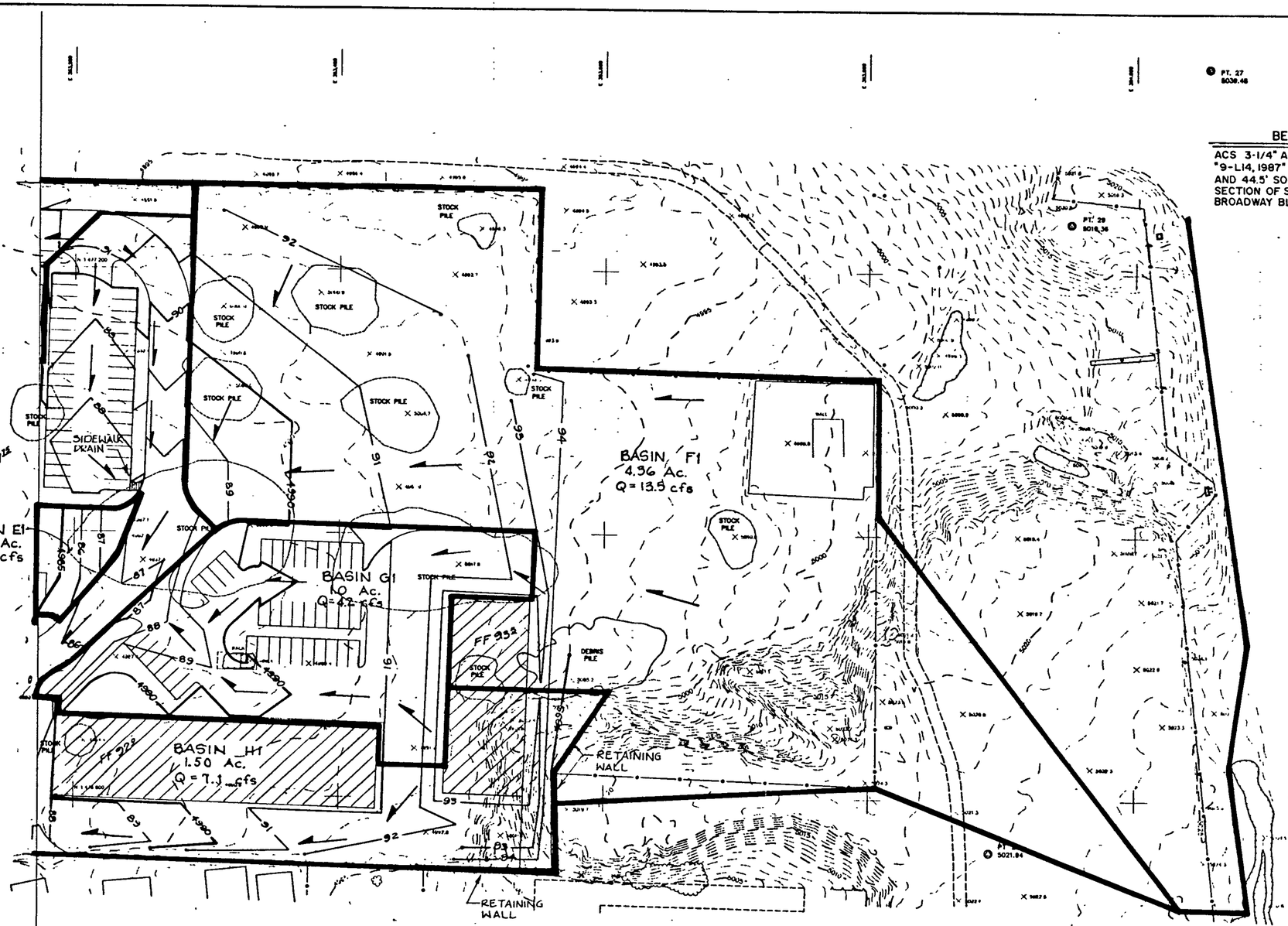
WILSON & COMPANY

FILE NO. 92-506

SHEET NO. 2 OF 2

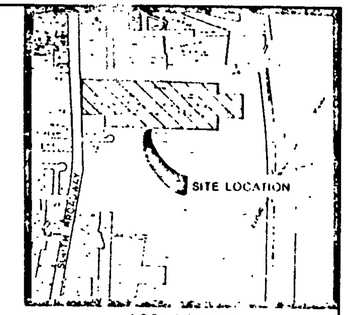
PLATE 1B


BERNALILLO COUNTY PUBLIC WORKS DEPARTMENT
2400 BROADWAY SE COMPLEX
EXISTING UTILITY PLAN
AUGUST 1990
PLATE 2
LEGEND
NOTES
1. LOCATION OF SEWER LINE PROVIDED BY BCPW PERSONNEL.
2. LOCATION OF GAS MAIN SHALL BE FIELD VERIFIED BY GAS COMPANY OF NEW MEXICO
SCALE 1" = 40'
CONTOUR INTERVAL = 1'
EXISTING 24"
SHEET 2
MATCH LINE TO SHEET 2



BENCH MARK

ACS 3-1/4" ALUMINUM CAP STAMPED "9-L14, 1987" LOCATED 7.8' WEST AND 44.5' SOUTH OF THE ℄ INTERSECTION OF STADIUM BLVD. SE AND BROADWAY BLVD. SE.



LOCATION MAP
ZONE ATLAS MAP L-14&15, M 14&15

FLOOD INSURANCE MAP
REFERENCE FLOOD INSURANCE STUDY
PANEL 34

SOILS MAP
REFERENCE SCS BERNALILLO COUNTY SOIL SURVEY
SHEET NO. 30,31,40,41

LEGAL DESCRIPTION

TRACT 1

Lots 1, 2, 3, 6, 7, 8, 9 and 10, Block 1; Lots 1 to 10 inclusive, Block 2; Lots 1 to 10 inclusive, Block 3; Lots 1 to 10 inclusive, Block 4; Lots 1 and 2, Block 5, San Jose Addition to the City of Albuquerque.

TRACT 2

All that portion of Small Holding Claim No. 1884 in Section 32 and 33, T 10 N, R 3 E, NMPM, Bernalillo County, which is bounded: on the North by land now or formerly of the Estate of F.B. Trataglia; on the South by the San Jose Addition; on the East by land of the Schweitzman Packing Company; on the West by the East line of South Broadway.

TRACT 3

Lots 4 and 5, Block 1, San Jose Additon to the City of Albuquerque.

TRACT 4

A certain tract or parcel of land lying and being situate within the NE 1/4 NE 1/4, Section 32, T 10 N, R 3 E, NMPM.

TRACT 5

A certain tract or parcel of land lying and being situate within the SE 1/4 SE 1/4, Section 29, T 10 N, R 3 E, NMPM.

LEGEND

- EXISTING INTERMEDIATE CONTOUR
- EXISTING INDEX CONTOUR
- PROPOSED INTERMEDIATE CONTOUR
- PROPOSED INDEX CONTOUR
- FLOW DIRECTION
- BASIN BOUNDARY
- LAND
- EXISTING BUILDING
- FUTURE BUILDING

SCALE IN FEET

2400 BROADWAY SE COMPLEX

DRAINAGE MASTER PLAN

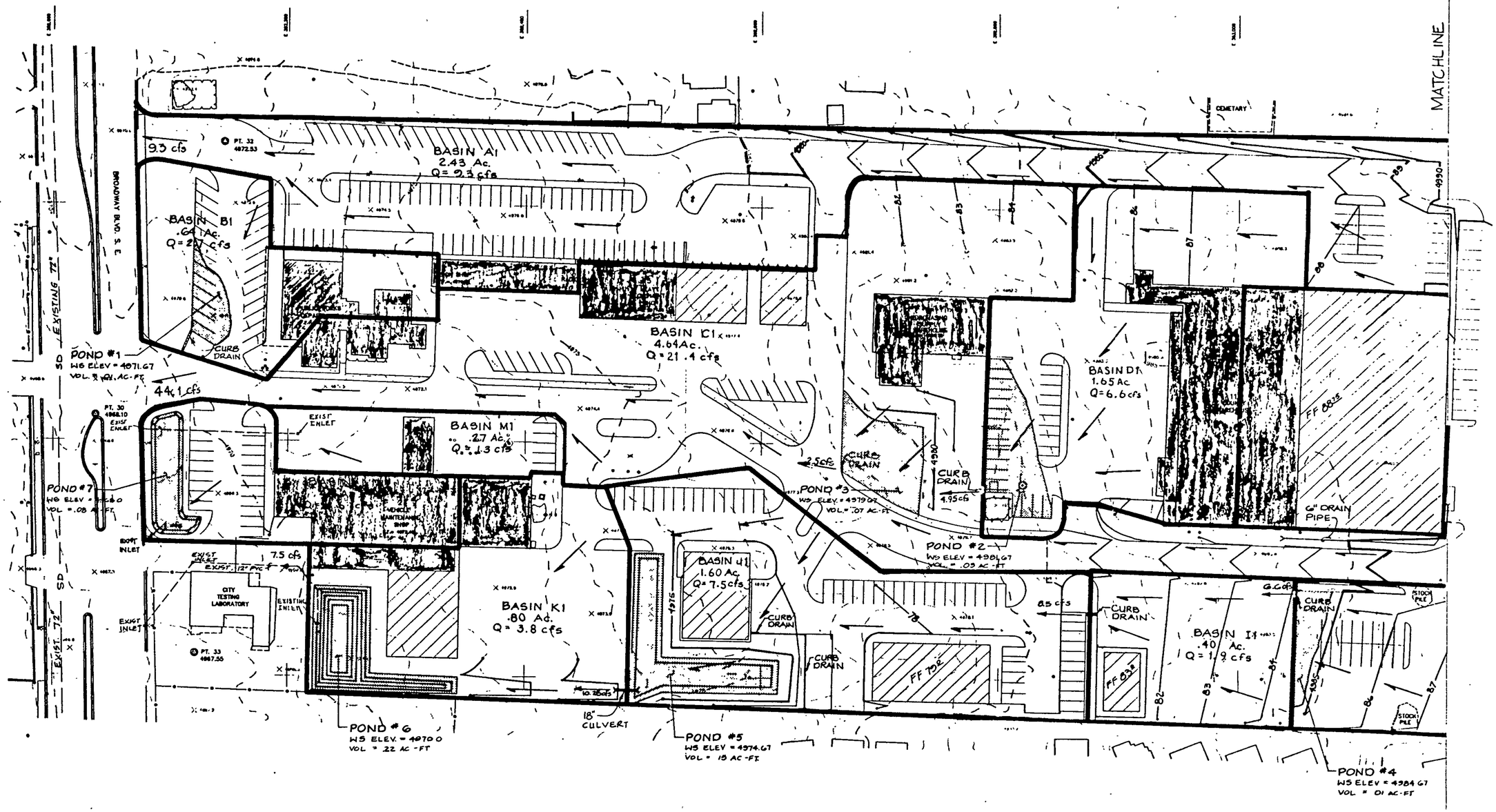
DESIGN	DRAWN	DATE
D.S.A.	K.D.B.	MAY 1992

WILSON & COMPANY
6611 GUTHRIE CT
ALBUQUERQUE, NEW MEXICO
87109
(505) 345-5345

FILE NO. 92-506

SHEET NO. 1 OF 2

PLATE 3A



LEGEND

- EXISTING INTERMEDIATE CONTOUR
- 5074 EXISTING INDEX CONTOUR
- 83 PROPOSED INTERMEDIATE CONTOUR
- 4985 PROPOSED INDEX CONTOUR
- FLOW DIRECTION
- BASIN BOUNDARY
- POND
- EXISTING BUILDING
- FUTURE BUILDING

N

0 40 80 160 160
SCALE IN FEET

2400 BROADWAY SE COMPLEX

DRAINAGE MASTER PLAN

DESIGN	DRAWN
D.S.A.	K.D.B.

WILSON & COMPANY
6011 GOLDFIELD
ALBUQUERQUE, NEW MEXICO
87109
(505) 345-5115

DATE MAY 1992

FILE NO. 92-506

SHEET NO 2 OF 2

City of Albuquerque
P.O. BOX 1293 ALBUQUERQUE, NEW MEXICO 87103

January 8, 1993

David Thompson, P.E.
Wilson & Company
6611 Gulton Court NE
Albuquerque, N.M. 87109

Re: ENGINEER"S CERTIFICATION FOR THE COUNTY CLERK WAREHOUSE (M-14/D13)
RECEIVED DECEMBER 18, 1992 FOR CERTIFICATE OF OCCUPANCY APPROVAL
STAMPED & DATED 12-17-92

Dear Mr. Thompson:

Based on the information provided in the submittal for the project referenced above, City Hydrology approves the Certificate of Occupancy for this project.

If I can be of further assistance, you may contact me at 768-2727.

Sincerely,

John P. Curtin

John P. Curtin, P.E.
PWD/Hydrology

xc: Alan Martinez

WPHYD+3431;jpc

City of Albuquerque
P.O. BOX 1293 ALBUQUERQUE, NEW MEXICO 87103

October 30, 1992

Dan Aguirre
Wilson & Company
6611 Gulton Court NE
Albuquerque, N.M. 87109

Re: DRAINAGE REPORT FOR THE BERNALILLO COUNTY COMPLEX AT 2400 BROADWAY SE
RECEIVED OCTOBER 26, 1992 FOR MASTER PLAN APPROVAL - (M-14/D13)
STAMPED & DATED 10-23-92

Dear Mr. Aguirre:

Based on the information provided in the submittal for the project referenced above, City Hydrology approves the Master Plan for this complex.

Any project that modifies this report will have to investigate all impacts of the modifications.

If I can be of further assistance, you may contact me at 768-2727.

Sincerely,

John P. Curtin

John P. Curtin, P.E.
PWD/Hydrology

xc: Alan Martinez, C.O.A./PWD/Hydrology
Bob Fogelsong, Bernalillo County PWD

WPHYD+3431;jpc

DRAINAGE REPORT

BERNALILLO COUNTY

2400 BROADWAY SE COMPLEX MASTERPLAN

Submitted to the
CITY OF ALBUQUERQUE
Hydrology Division

October 23 1992

WILSON
&COMPANY

DRAINAGE REPORT
BERNALILLO COUNTY, 2400 BROADWAY SE COMPLEX MASTERPLAN

SITE LOCATION

The site is located at 2400 Broadway SE. This site extends east from broadway to Interstate 25. The site is approximately 60% developed with various existing structures. The site slopes from east to west at slopes of 3% or less to Broadway Blvd. SE.

PURPOSE

This drainage masterplan is being developed for the Bernalillo County Yards for future development of the site. Following the proposed master plan the county will develop the site one building at a time. Each building will require the submittal of a final grading plan following the concepts given in this master plan. For example this year the county will be adding the second building of the county clerks warehouse. The grading plan will be prepared for the building using this masterplan as a guide so that the masterplan can eventually be fully implemented as development of the site is completed.

METHODOLOGY

For this site the Development Process Manual, Volume 2, Design Criteria for the City of Albuquerque was followed to calculate peak runoff. The method designated Part A in the August 1991 version of section 22.2 was used to determine the runoff for each basin. The site is located in precipitation Zone 2 as determined from Figure A.

EXISTING CONDITIONS

The site is comprised of approximately 18.5 acres. The site is divided into 7 subbasins for drainage. Basin A drains directly to Broadway Blvd. through the driveway at the northwest corner of the property. Basin B Which includes 9.5 of the total acres, drains to Broadway Blvd. Through the middle driveway. Basins C, D, and G all drain out through the City of Albuquerque Testing Laboratory. Although part of this flow is picked up by the inlet located behind the maintenace building the majority of the flow discharges to Broadway Blvd. as surface flow. Basin E flows to the main drive and combines with Basin B which flows out throgh the middle driveway. Basin F which is offsite drainage is retained within its own boundaries and therefore does not drain through the site. There is 1-1.5 acres of offsite drainage that will pass through the site. This area is included in Basin B. Approximately 60% of the property is impervious in its existing condition. The remaining area is historically used for stockpiling of construction and maintenance materials. This remaining area receives heavy use leaving the ground compacted with minimal infiltration. Therefore a type c soil classification is used for this undeveloped area in the flow calculations. A map of the existing conditions can be found enclosed on Plate 1, sheet 1 of 2 and sheet 2 of 2.

The peak flow and volume calculations for existing conditions are summarized in the following table.

BASIN	AREA ACRE	ZONE	TREATMENT	100-YEAR PEAK DISCHARGE/ACRE	PEAK DISCHARGE CFS	V_{1440} AC-FT
A	2.03	2	D	4.70 CFS/ACRE	9.5 CFS	.43
B	.37 5.59 3.57	2	B C D	2.28 3.14 4.70	35.2	1.26
C	.41	2	D	4.70	1.9	.08
D	1.91 1.75	2	C D	3.14 4.70	14.2	.47
E	1.9 1.1	2	C D	3.14 4.70	11.1	.40
F	3.51	2	A	1.56	*9.3	.20
G	.13 .43	2	B D	2.28 4.70	2.3	.09
TOTAL					74.20 CFS	2.73 AC-FT

*Includes flows from 30 in culvert under I-25. Basin F flows are retained within the basin therefore not contributing to the flow from the site

There are two existing inlets within the site. The first is located behind the maintenance building at the southwest corner of the property. A 12 inch storm sewer connects this inlet to an existing inlet in the driveway of the C.O.A. Testing Laboratory which is connected to an inlet in Broadway Blvd. The second inlet is located in front of the maintenance building near the main entrance to the site.

The total existing flow being discharged to Broadway Blvd. is 74.20 CFS with a volume of 2.73 AC-FT.

PROPOSED CONDITIONS

The drainage plan is based on the proposed site plan as presented in the "Masterplan, Bernalillo County Public Works Maintenance and Storage Yards", DCSW Architects, 3 July 1990. This plan proposes to construct various medians and new curb and gutter. A portion of the area previously used for storage of construction and maintenance materials will be developed with new buildings and parking lots. With the addition of the curb and gutter and medians the drainage basins were modified for the proposed conditions. The Proposed site will include increasing the paved and rooftop (impervious) areas in addition to the curb and gutter. The masterplan can be found enclosed on plate 2, Sheet 1 of 2 and 2 of 2.

Once the proposed drainage basins were determined the peak discharge and volumes where calculated for the 100 year event.

A summary of the calculations is as follows:

BASINS	AREA ACRE	ZONE	TREATMENT	100 YEAR PEAK DISCHARGE/ACRE	PEAK DISCHARGE CFS	V_{100} AC-FT
A1	.86 1.57	2	B D	2.17 CFS/ACRE 4.70	9.3 CFS	.37
B1	.13 .51	2	B D	2.17 4.70	2.7	.12
C1	.17 4.47	2	B D	2.17 4.70	21.4	.93
D1	.02 .68 .96	2	B C D	2.17 3.02 4.70	6.6	.26
E1	.11	2	D	4.70	.5	.02
F1	4.18 .18	2	C D	3.02 4.70	13.5	.41
G1	.21 .79	2	B D	2.17 4.70	4.2	.18
H1	1.50	2	D	4.70	7.1	.31
I1	.40	2	D	4.70	1.9	.08
J1	1.60	2	D	4.70	7.5	.33
K1	.80	2	D	4.70	3.8	.17
L1	.10 .30	2	B D	2.17 4.70	1.6	.07
M1	.27	2	D	4.70	1.3	.06
TOTAL					81.4 CFS	3.31 AC-FT

The total flow from the proposed conditions is 81.4 CFS. This is an increase of 7.2 CFS over existing conditions. The new Volume is 3.31 AC-FT, this is an increase of .58 ac-ft.

At the pre-design meeting held on October 5, 1992 Bob Foglesong of the County of Bernalillo and Fred Aguirre from the City of Albuquerque agreed that the masterplan could use the historic (existing) flow as the maximum discharge from the site. A copy of the pre-design meeting form is enclosed.

The existing flows are exceeded by the proposed development of the site. Therefore ponding must be incorporated into the masterplan to reduce this discharge. By routing Basins H1, I1, J1, and K1 through various ponds the peak discharge can be reduced to a total of 7.5 CFS for these basins. The ponds in these basins total .38 AC-FT. Ponds are also added in basins C1 and D1. The flow from D1 is then routed through these ponding areas to reduce the peak discharge. Therefore adding the hydrographs from Basins C1, D1, E1, F1, and G1 results in a peak discharge of 42 CFS. Basin B1 will also be added to this discharge after it is routed through a ponding area totalling 2 CFS.

The following table summarizes the routing and discharge at the outlets.

PONDS	BASINS	PEAK FLOW CFS	V_{1440} AC-FT	VOLUME PONDED AC-FT	FLOW INLET CFS	FLOW OUTLET CFS
	A1	9.3	.37	0		9.3
	SUB-TOTAL					**9.3**
#1	B1	2.7	.12	.01	2.7	2.0
	C1	21.4	.83	0		21.4
#2 & #3	D1	9.0	.37	.1	6.6	2.5
	E1	.5	.02	0		0.5
	F1	13.5	.41	0		13.5
	G1	4.2	.18	0		4.2
	SUB-TOTAL			**.11**		**44.10**
#4	H1	7.1	.31	.01	7.1	6.6
	I 1	1.9	.08	0		1.9
	J1	7.5	.33	0		7.5
#5				.15	16.0	10.3
	K1	3.8	.17	0		3.8
#6				.22	14.1	7.5
	SUB-TOTAL			**.38**		**7.5**
	L1	1.6	.07	0		1.6
	M1	1.3	.06	0		2.9
#7				.10	2.9	1.0
	SUB-TOTAL			**.10**		**1.0**
	TOTAL			**.59 AC-FT**		**61.9 CFS**

The total discharge from these basins to Broadway Blvd. is 44.1 CFS. Basin A1 will discharge all flows to Broadway Blvd. The Peak Discharge is 9.3 CFS. The remaining areas comprised of basins L1 and M1 will be routed through a ponding area adjacent to Broadway Blvd. leaving a peak discharge of 1.0 CFS.

The existing inlet located behind the Maintenance building will be removed but the system will be converted into the outlet for the pond located in this area. The other existing inlet located in front of the maintenance building will remain in place but the outlet will be modified to convey the flows from Basin M1 to pond #7. A sidewalk culvert will also be constructed between M1 & L1 to convey flows which do not get to the existing inlet.

The total discharge to Broadway Blvd after routing the flows through the proposed ponding areas is 62.0 CFS which is less than the Historical flow by 12 CFS. The proposed ponding area is equal to .6 AC-FT which is approximately equal to the increased volume due to development of the site. This will meet the requirements setforth in the pre-design meeting.

Plans to improve the drainage system in Broadway Blvd. will increase the capacity of the system. By reducing the flow from this site the burden on the Broadway drainage system will be reduced thus helping the system to work with greater efficiency.

COMP DSA
CK DBT
DATE 2-5-92

WILSON & COMPANY

LOC ALBUQUERQUE FILE 92-506
PROJ CNTT YARDS SHEET 1
SUBJ EXISTING FLOW CALCULATIONS OF 3

EXISTING Q'S USING SECTION 22.2, HYDROLOGY OF THE DEVELOPEMENT PROCESS MANUAL VOLUME 2, DESIGN CRITERIA FOR THE CITY OF ALBUQUERQUE, NM JAN., 1991.

SITE GENERAL CONDITIONS:

TOTAL AREA OF BASINS A THRU F = 22.7 AC
THE SITE IS LOCATED IN PRECIPITATION ZONE 2
THE SITE HAS HISTORICALLY DISCHARGED TO BROADWAY BLVD

BASIN A:

A = 88,610 SF - 2.03 AC
L = 785 F
S = 1.7%
t_c = <12 MIN

BASIN A IS 100% IMPERVIOUS
LAND TREATMENT D

$Q = (2.03\,AC)(5.05\,IN/HR)(.93) = \boxed{9.54\,CFS}$

$\bar{E}_W = \frac{2.03\,AC(2.08)}{2.03\,AC} = 2.08$

$V_{360} = \frac{2.08(2.03)}{12} = .35$

$V_{1440} = .35 + \frac{2.03(.4)}{12} = .43\,AC\text{-}FT = \boxed{18{,}193.56\,FT^3}$

BASIN B:

A = 415,126 SF - 9.53 AC
L = 1998
S = 2.0%
t_c < 12 MIN

LAND TREATMENT A
LAND TREATMENT B - .37 AC
LAND TREATMENT C - 5.59 AC
LAND TREATMENT D - 3.57 AC

$Q = (.37)(.43)(5.05) + 5.59(.60)(5.05) + 3.57(.93)(5.05)$

$\boxed{Q = 34.51\,CFS}$

$E_W = \frac{.37(.72) + 5.59(1.07) + 3.57(2.08)}{9.53} = 1.44$

$V_{360} = \frac{1.44(9.53)}{12} = 1.14\,AC\text{-}FT$

$V_{1440} = 1.14 + \frac{3.57(.46)}{12} = 1.26\,AC\text{-}FT = \boxed{54{,}842\,FT^3}$

COMP DSA
CK DBT
DATE 2-5-92

WILSON & COMPANY

LOC. ALBUQUERQUE FILE 92-506
PROJ CNTY. YRDS SHEET 2
SUBJ EXISTING FLOW CALCULATIONS OF 3

BASIN C:

A = 18,226 S.F. - .41 AC

LAND TREATMENT D = .41 AC

L = 446 FT

S = 1.35

$t_c \leq 12$

$Q = (.41)(.93)(5.05) = \boxed{1.93 \text{ CFS}}$

$E_w = 2.08$

$V_{360} = \frac{2.08(.41)}{12} = .07$ AC FT

$V_{1440} = .07 + \frac{.41(.40)}{12} = .084$ ACFT $\boxed{3644.5 \text{ FT}^3}$

BASIN D:

A = 159,508 SF - 3.66 AC

LAND TREATMENT C - 1.91 AC

LAND TREATMENT D - 1.75 AC

L = 1234

S = 1.94%

$t_c \leq 12$

$Q = (1.91)(.60)(5.05) + 1.75(.93)(5.05)$

$\boxed{Q = 14.01 \text{ CFS}}$

$E_w = \frac{1.91(1.07) + 1.75(2.08)}{3.66} = 1.34$

$V_{360} = \frac{1.34(3.66)}{12} = .41$

$V_{1440} = .41 + \frac{1.75(.40)}{12} = .47$ AC-FT $\boxed{= 20,400.6 \text{ FT}^3}$

BASIN E:

A = 130,920 S.F. - 3.00 AC

LAND TREATMENT C - 1.9 AC

LAND TREATMENT D - 1.1 AC

L = 834 FT

S = 1.92%

$t_c \leq 12$

$Q = (1.9)(.60)(5.05) + (1.1)(.93)(5.05)$

$\boxed{Q = 10.92 \text{ CFS}}$

WEIGHTED $E = \frac{(1.9)(1.07) + 1.1(2.08)}{3.0} = 1.44$

$V_{360} = \frac{1.44(3.00)}{12} = \frac{4.32}{12} = .36$ ACRE-FT

$V_{24} = .36 + 1.1 \text{ AC} \left(\frac{2.75 - 2.35}{12}\right) = .40$ AC-FT $= \boxed{17,424 \text{ FT}^3}$

EXISTING POND CAN HOLD 800 FT³

COMP DSA
CK DBT
DATE 2-5-92

WILSON & COMPANY

LOC ALBUQUERQUE FILE 92-506
PROJ CNTY YARDS SHEET 3
SUBJ EXISTING FLOW CALCULATIONS OF 3

BASIN F:

A = 153,236 SF = 3.51 AC

L = 780 FT

S = 3.97%

$t_c \leq 12$ MIN

LAND TREATMENT A - 3.51 AC

Q = (3.51)(.28)(5.05) + CULVERT FLOW (30 IN)

Q = 4.96 + 4.36 $\boxed{= 9.32}$

$Q_{CULVERT}$ = 1.44 AC (.6)(5.05) = 4.36 CFS

$E = \frac{4.95}{4.95}(.48)$

$V_{360} = \frac{.48(4.95)}{12} = .199$ AC-FT

$V_{1440} = .199 + 0 = .199$ AC-F = $\boxed{8{,}668.44 \text{ FT}^3}$

EXISTING AREA = 10,880 FT³ +

BASIN G:

A = .56 AC

$t_c \leq 12$ MIN

LAND TREATMENT B = .13 AC

D = .43 AC

Q = .13(.43)(5.05) + .43(.93)(5.05)

$\boxed{Q = 2.3 \text{ CFS}}$

$E_W = \frac{.13(.72) + .43(2.08)}{.56} = 1.76$

$V_{360} = \frac{1.76(.56)}{12} = .08$

$V_{1440} = .08 + \frac{.43(.40)}{12} = \boxed{.0943 \text{ AC-FT}}$

$\boxed{= 4109.16 \text{ FT}^3}$

BASIN F DOES NOT IMPACT THE SITE. FLOWS ARE CONTAINED ON THE BASIN AND DO NOT CURRENTLY ENTER THE SITE.

COMP DAN AGUIRRE

CK DRT

DATE 2-28-92

WILSON & COMPANY

LOC ALBUQUERQUE FILE 92-506

PROJ [illegible] SHEET

SUBJ [illegible] OF

PROPOSED CONDITIONS.

BASIN A: PRECIPITATION ZONE 2

A = 2.43 AC

LAND TREATMENT	PEAK DISCHARGE	E
A = 0		
B = .86 AC	2.17 CFS/AC	.72 IN.
C = 0		
D = 1.57 AC	4.70 CFS/AC	2.08 IN.

$Q = (.86\,AC)(2.17\,CFS/AC) + (1.57\,AC)(4.70\,CFS/AC) = \underline{9.3\ CFS}$

$E_W = \dfrac{(.86\,AC)(.72\,IN) + (1.57\,AC)(2.08\,IN)}{2.43} = \underline{1.60\ IN}$

$V_{360} = \dfrac{1.60\,IN}{12\,IN/FT} * 2.43 = \underline{.32\ AC\text{-}FT}$

$V_{1440} = .32\,AC\text{-}FT + \dfrac{(1.57\,AC)(.40\,IN.)}{12\,IN/FT} = \underline{.37\ AC\text{-}FT}$

BASIN B:

A = .64 AC

LAND TREATMENT	PEAK DISCHARGE	E
A = 0		
B = .13 AC	2.17 CFS/AC	.72 IN.
C = 0.		
D = .51 AC	4.70 CFS/AC	2.08 IN.

$Q = (.13\,AC)(2.17\,CFS/AC) + (.51\,AC)(4.70\,CFS/AC) = \underline{2.7\ CFS}$

$E_W = \dfrac{(.13\,AC)(.72\,IN) + (.51\,AC)(2.08\,IN)}{.64} = \underline{1.80\ IN.}$

$V_{360} = \dfrac{(1.80\,IN.)(.64\,AC)}{12\,IN/FT} = \underline{.10\ AC\text{-}FT}$

$V_{1440} = .10\,AC\text{-}FT + \dfrac{(.51\,AC)(.40\,IN)}{12\,IN/FT} = .12\ AC\text{-}FT$

COMP _____ **WILSON & COMPANY** LOC _____ FILE _____

CK _____ PROJ _____ SHEET _____

DATE _____ SUBJ _____ OF _____

BASIN C:

A = 4.13 AC

LAND TREATMENT	PEAK DISCHARGE	E
A = 0		
B = .17 AC	2.17 CFS/AC	.72 IN
C = 0		
D = 3.96 AC	4.70 CFS/AC	2.08 IN

$Q = (.17AC)(2.17\ CFS/AC) + (4.47AC)(4.70\ CFS/AC) = \underline{21.4\ CFS}$

$E_W = \dfrac{(.17AC)(.72IN) + (4.47AC)(2.08IN)}{4.64AC}$ 2.03 IN

$V_{360} = \dfrac{(2.03IN)(4.64AC)}{12\ IN/FT} = .79\ AC\text{-}FT$

$V_{1440} = .79\ AC\text{-}FT + \dfrac{(4.47AC)(.40IN)}{12\ IN/FT} = .93\ AC\text{-}FT$

BASIN D:

A = 2.17 AC

LAND TREATMENT	PEAK DISCHARGE	E
A = 0		
B = .02 AC	2.17 CFS/AC	.72 IN
C = .68 AC	3.02 CFS/AC	1.07 IN
D = 1.47 AC	4.70 CFS/AC	2.08 IN

$Q = (.02AC)(2.17\ CFS/AC) + (.68AC)(3.02\ CFS/AC) + (1.96\ AC)(4.7\ CFS/AC) = \underline{6.6\ CFS}$

$E_W = \dfrac{(.02AC)(.72IN) + (.68AC)(1.07IN) + (.96AC)(2.08IN)}{1.66AC} = \underline{1.65\ IN}$

$V_{360} = \dfrac{(1.65\ IN)(1.66AC)}{12\ IN/FT} = .23\ AC\text{-}FT$

$V_{1440} = .23\ AC\text{-}FT + \dfrac{(.96AC)(.40\ IN.)}{12\ IN/FT} = .26\ AC\text{-}FT$

COMP ____ CK ____ DATE ____

WILSON & COMPANY

LOC. ____ FILE ____ PROJ ____ SHEET ____ SUBJ ____ OF ____

BASIN E:

A = .11 AC LAND TREATMENT PEAK DISCHARGE E

D = .11 AC 4.70 CFS/AC 2.08 IN

$Q = (.11 AC)(4.70 CFS/AC) = \underline{.5 CFS}$

$V_{360} = \frac{(2.08 IN)(.11 AC)}{12 IN/FT} = \underline{.02 AC\text{-}FT}$

$V_{1440} = (.02 AC\text{-}FT) + \frac{.11 AC(.40 IN)}{12 IN/FT} = \underline{.024 AC\text{-}FT}$

BASIN F:

A = 4.36 AC LAND TREATMENT PEAK DISCHARGE E

A = 0

B = 0

C = 4.18 AC 3.02 CFS/AC 1.07 IN

D = .18 AC 4.70 CFS/AC 2.08 IN

$Q = (4.18 AC)(3.02 CFS/AC) + (.18 AC)(4.70 CFS/AC) = \underline{13.5 CFS}$

$E_W = \frac{(4.18 AC)(1.07 IN) + (.18 AC)(2.08 IN)}{4.36} = 1.11 IN$

$V_{360} = \frac{(1.11 IN)(4.36 AC)}{12 IN/FT} = .40 AC\text{-}FT$

$V_{1440} = .40 AC\text{-}FT + \frac{(.18 AC)(.40 IN)}{12 IN/FT} = .41 AC\text{-}FT$

BASIN G:

A = 1 AC LAND TREATMENT PEAK DISCHARGE E

A = 0

B = .21 AC 2.17 CFS/AC .72

C = 0

D = .79 AC 4.70 CFS/AC 2.08

$Q = (.21 AC)(2.17 CFS/AC) + (.79 AC)(4.70 CFS/AC) = 4.2 CFS$

$E_W = \frac{(.21 AC)(.72 IN) + (.79 AC)(2.08 IN)}{1 AC} = 1.79 IN$

$V_{360} = \frac{(1.79 IN)(1 AC)}{12 IN/FT} = .15 AC\text{-}FT$

$V_{1440} = (.15 AC\text{-}FT) + \frac{(.79 AC)(.40 IN)}{12 IN/FT} = .18 AC\text{-}FT$

COMP _____ **WILSON & COMPANY** LOC _____ FILE _____

CK _____ PROJ _____ SHEET _____

DATE _____ SUBJ. _____ OF _____

BASIN H:

A = 1.50 AC LAND TREATMENT PEAK DISCHARGE E

A = 0

B = 0

C = 0

D = 1.50 AC 4.70 CFS/AC 2.08 IN

$Q = (1.50 AC)(4.70 CFS/AC) = \underline{7.1 CFS}$

$V_{360} = \frac{(2.08 IN)(1.50 AC)}{12 IN/FT} = .26 AC\text{-}FT$

$V_{1440} = .26 AC\text{-}FT + \frac{(1.50 AC)(.40 IN)}{12 IN/FT} = .31 AC\text{-}FT$

BASIN I:

A = .40 AC LAND TREATMENT PEAK DISCHARGE E

A =

B =

C =

D = .40 AC 4.70 CFS/AC 2.08 IN

$Q = (.40 AC)(4.70 CFS/AC) = 1.9 CFS$

$V_{360} = \frac{(.40 AC)(2.08 IN)}{12 IN/FT} = .07 AC\text{-}FT$

$V_{1440} = .07 AC\text{-}FT + \frac{(.40 AC)(.40 IN)}{12 IN/FT} = .08 AC\text{-}FT$

BASIN J:

A = 1.60 AC LAND TREATMENT PEAK DISCHARGE E

D = 1.60 AC 4.70 CFS/AC 2.08 IN

$Q = (1.60 AC)(4.70 CFS/AC) = 7.5 CFS$

$V_{360} = \frac{(1.60 AC)(2.08 IN)}{12 IN/FT} = .28 AC\text{-}FT$

$V_{1440} = .28 AC\text{-}FT + \frac{(1.60 AC)(.40 IN)}{12 IN/FT} = .33 AC\text{-}FT$

COMP _____ **WILSON & COMPANY** LOC _____ FILE _____

CK _____ PROJ. _____ SHEET _____

DATE _____ SUBJ _____ OF _____

BASIN K:

A = .80 AC LAND TREATMENT PEAK DISCHARGE E

D = .80 AC 4.70 CFS/AC 2.08 IN

$Q = (.80\,AC)(4.70\,CFS/AC) = 3.8\,CFS$

$V_{360} = \frac{(.80\,AC)(2.08\,IN)}{12\,IN/FT} = .14\ AC\text{-}FT$

$V_{1440} = .14\,AC\text{-}FT + \frac{(.80\,AC)(.4\,IN)}{12\,IN/FT} = .17\,AC\text{-}FT$

BASIN L:

A = .40 AC LAND TREATMENT PEAK DISCHARGE E

B = .10 AC 2.17 CFS/AC .72 IN

D = .30 AC 4.70 CFS/AC 2.08 IN

$Q = (.10\,AC)(2.17\,CFS/AC) + (.30\,AC)(4.70\,CFS/AC) = 1.6\,CFS$

$E_W = \frac{(.10\,AC)(.72\,IN) + (.30\,AC)(2.08\,IN)}{.40\,AC} = 1.74\,IN$

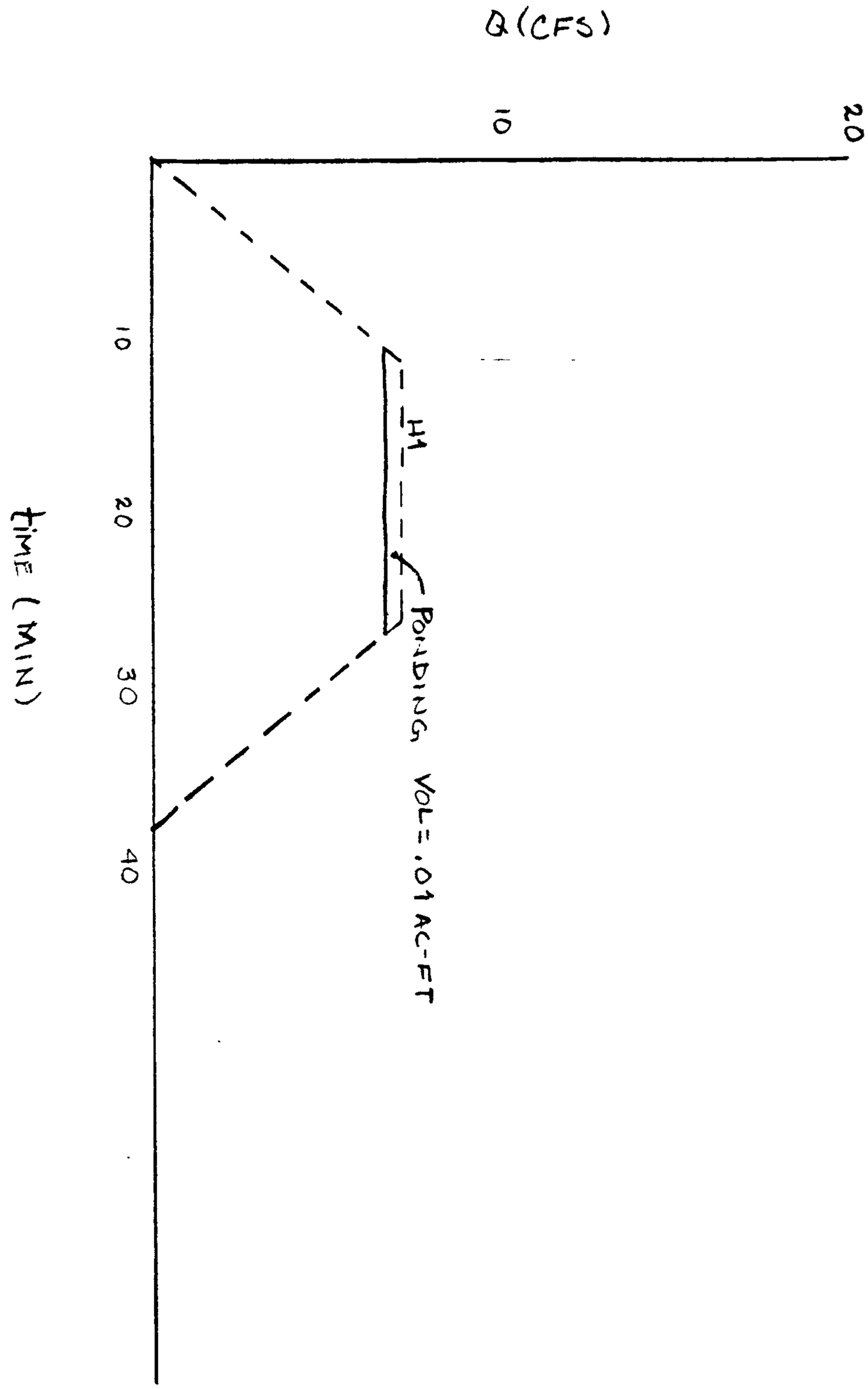
$V_{360} = \frac{(1.74\,IN)(.40\,AC)}{12\,IN/FT} = .06\ AC\text{-}FT$

$V_{1440} = .06 + \frac{(.30)(.40)}{12} = .07\,AC\text{-}FT$

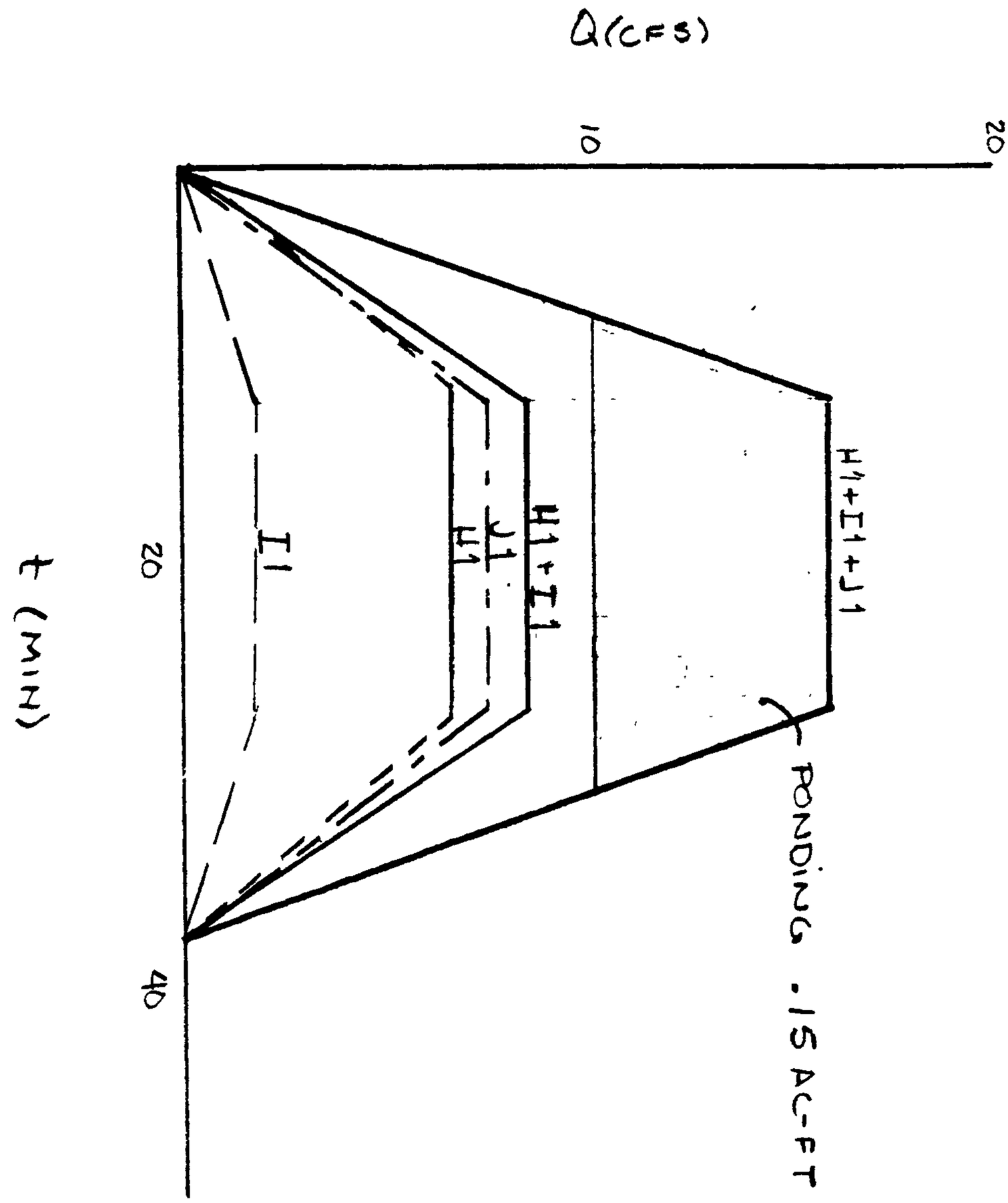
COMP DSA
CK DBT
DATE 5-5-92

WILSON & COMPANY

LOC ALBQ. FILE 92-506
PROJ COUNTY YARDS SHEET 1
SUBJ HYDROGRAPHS OF 3



COMP	DSA	**WILSON & COMPANY**	LOC	ALBQ	FILE 92-506
CK	DBT		PROJ	COUNTY YARDS	SHEET 2
DATE	5-5-92		SUBJ	HYDROGRAPHS	OF 3



COMP DSA

CK DBT

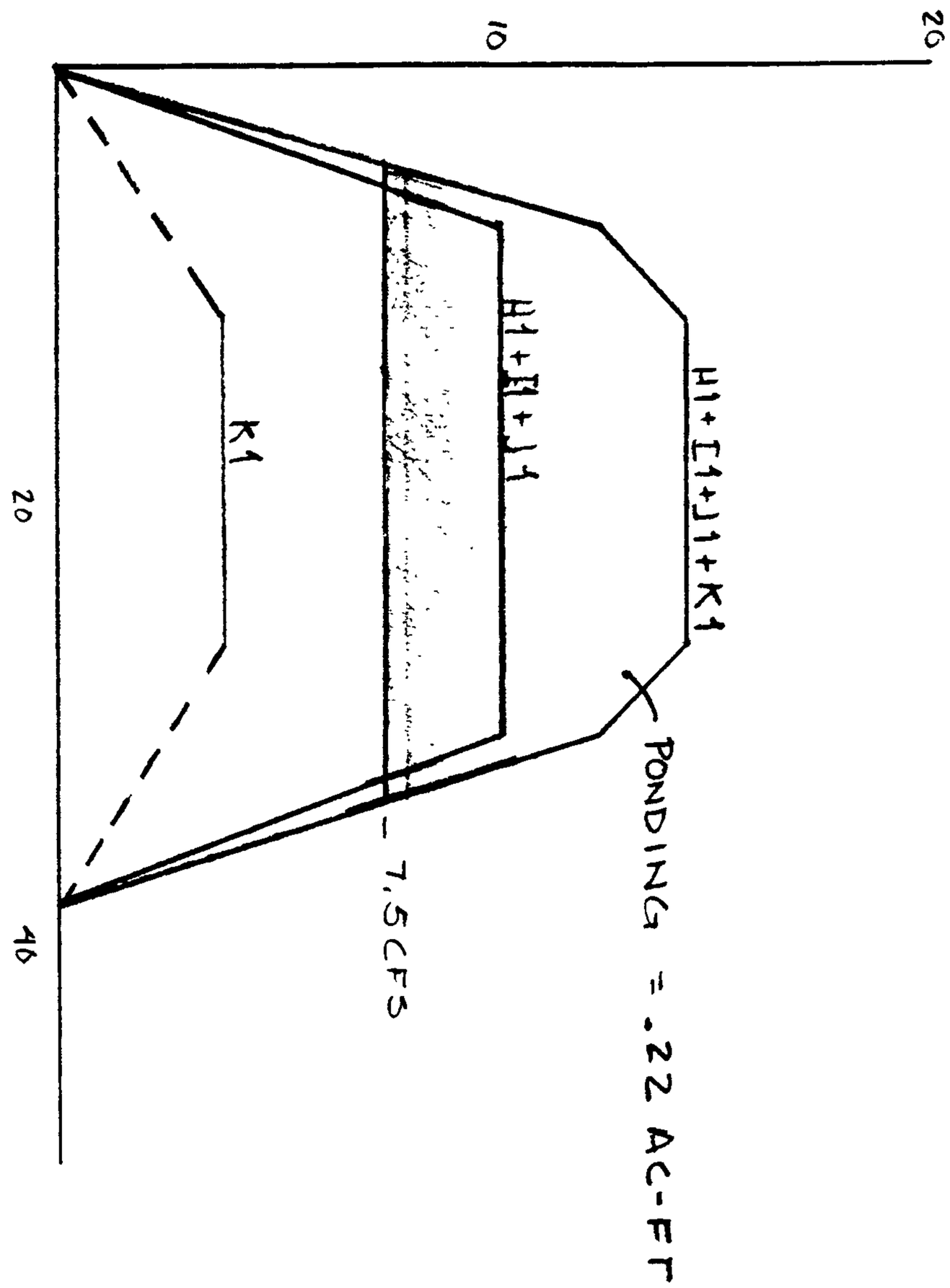
DATE 5-5-92

WILSON & COMPANY

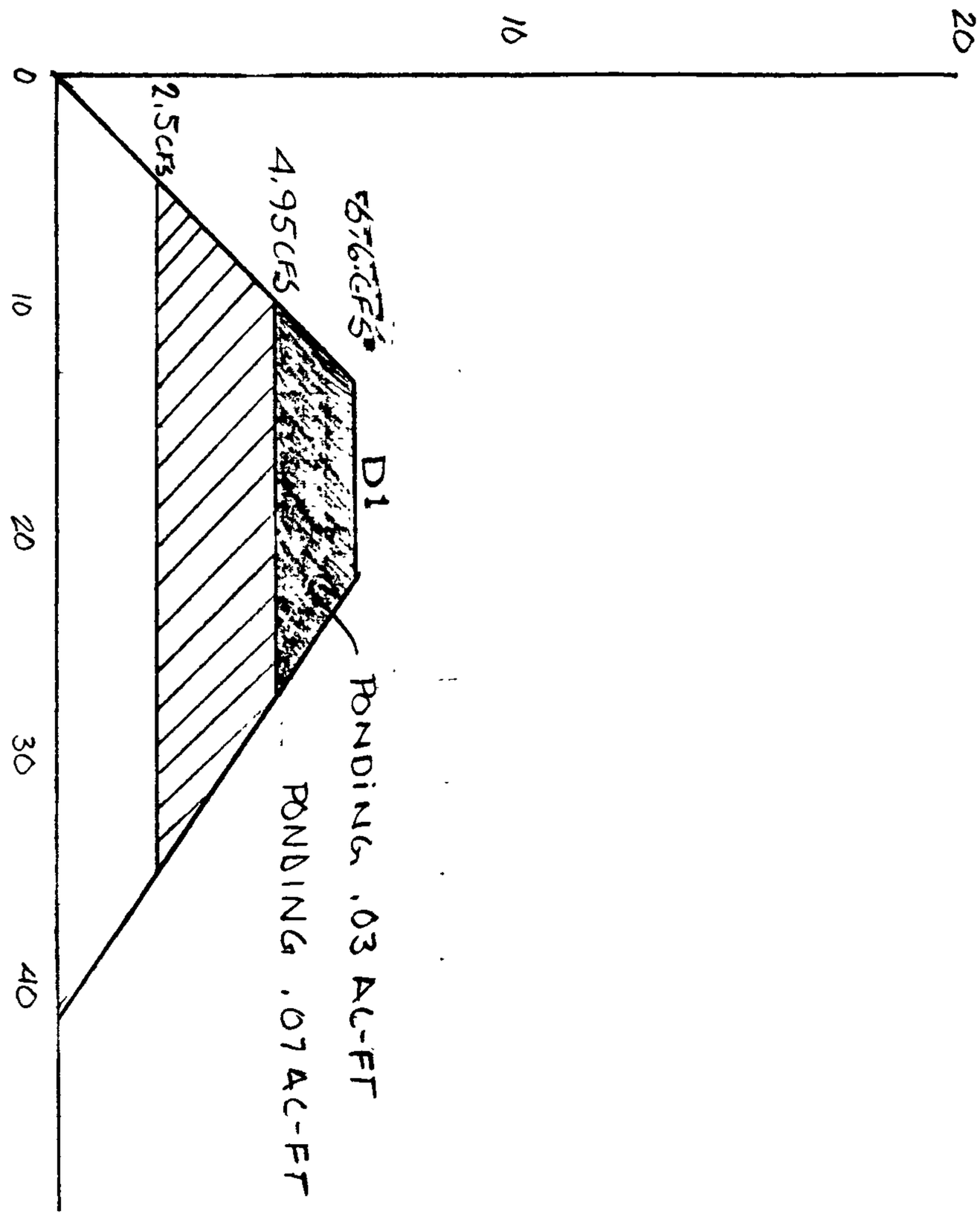
LOC. ALBQ FILE 92-506

PROJ COUNTY YARDS SHEET 3

SUBJ HYDROGRAPHS OF 3



COMP DSA	WILSON & COMPANY	LOC ALBQ	FILE 92-506
CK DBT		PROJ COUNTY YARDS	SHEET 1
DATE 5-5-92		SUBJ HYDROGRAPH	OF 3



COMP. DSA

CK DBT

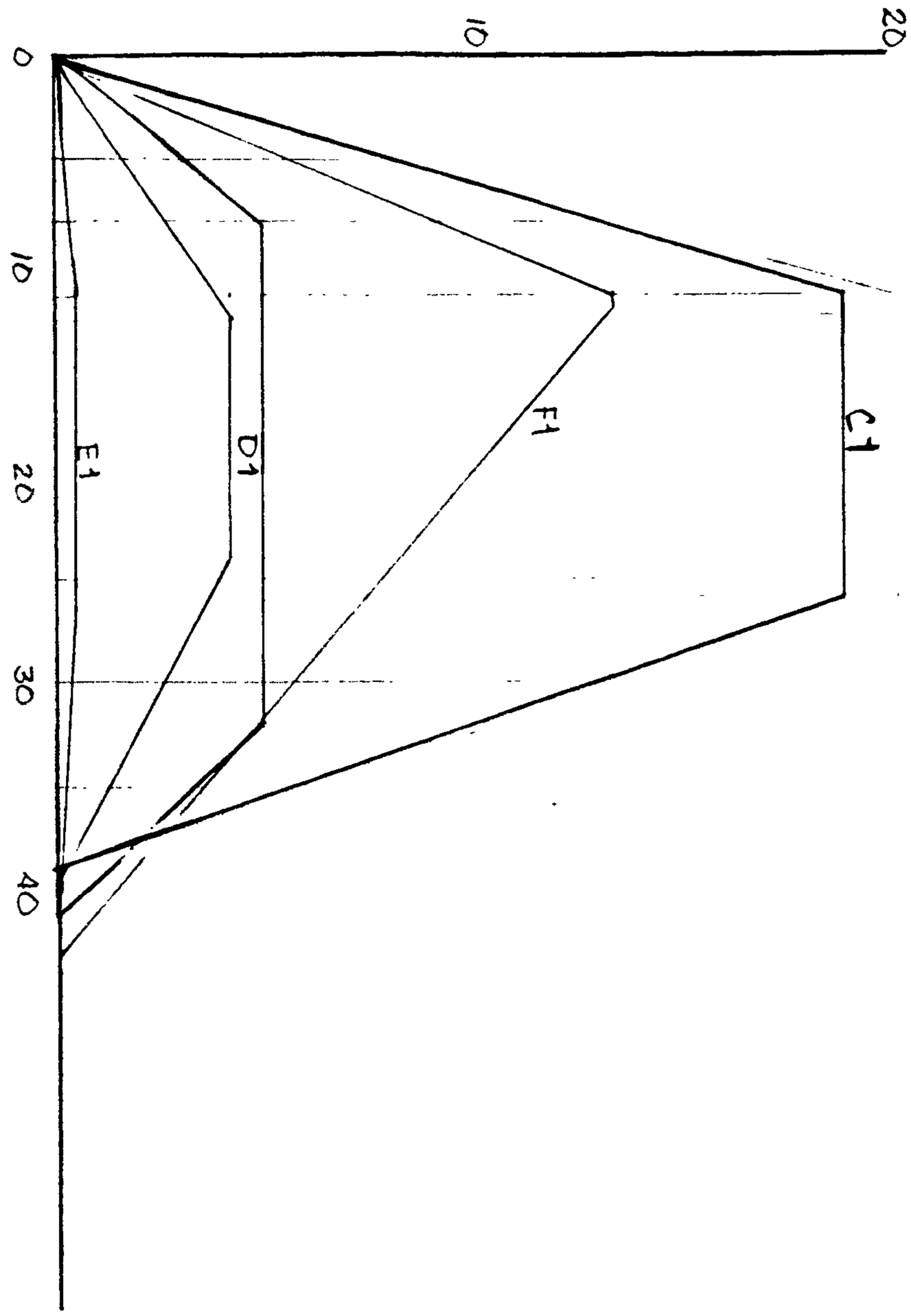
DATE 5-5-92

WILSON & COMPANY

LOC. ALBQ FILE 92-506

PROJ. COUNTY YARDS SHEET 2

SUBJ HYDROGRAPHS OF 3



COMP DSA

CK DBT

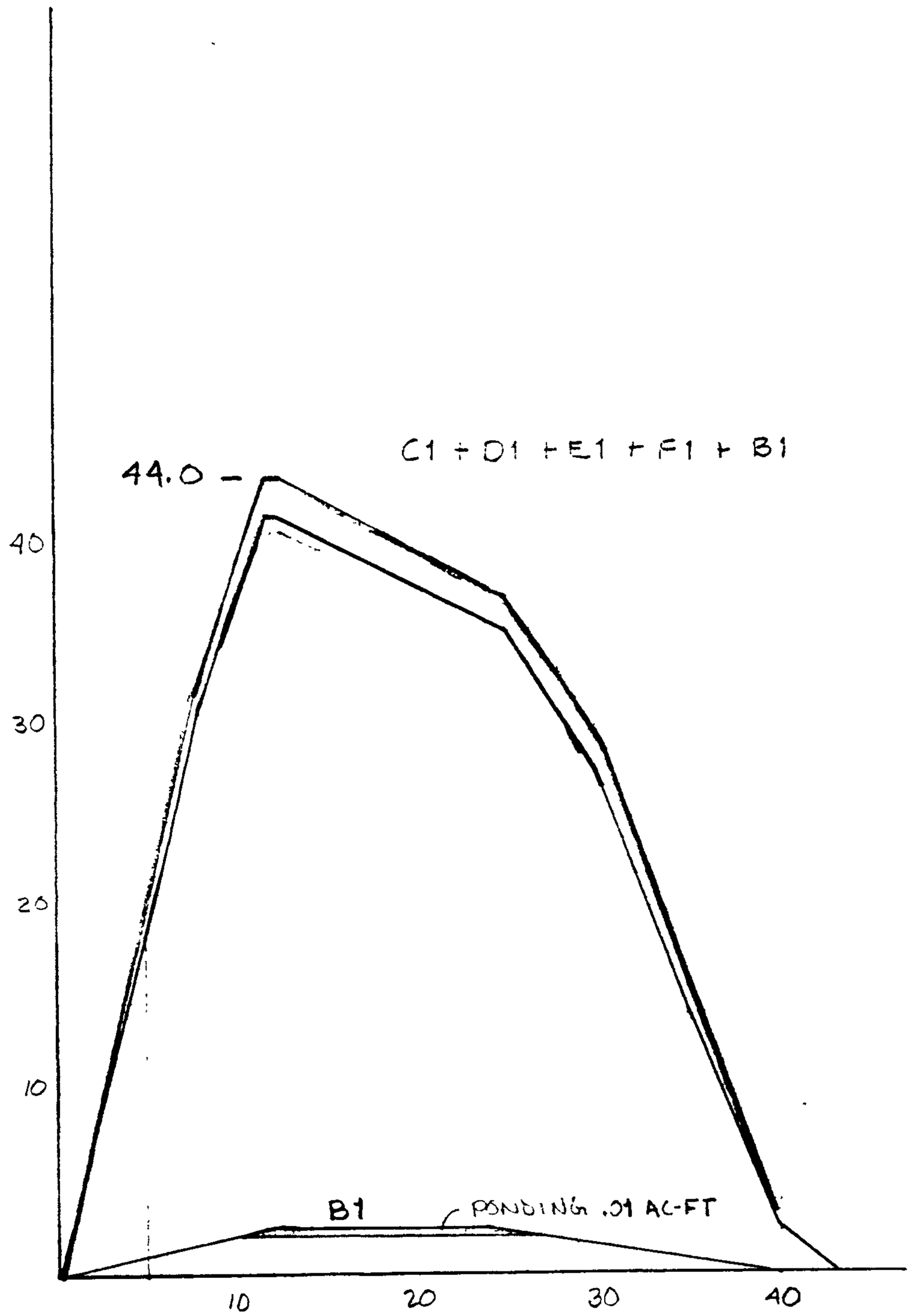
DATE 5-7-92

WILSON & COMPANY

LOC ALBQ FILE 92-506

PROJ COUNTY YARDS SHEET 3

SUBJ HYDROGRAPH OF 3



COMP DSA

CK DBT

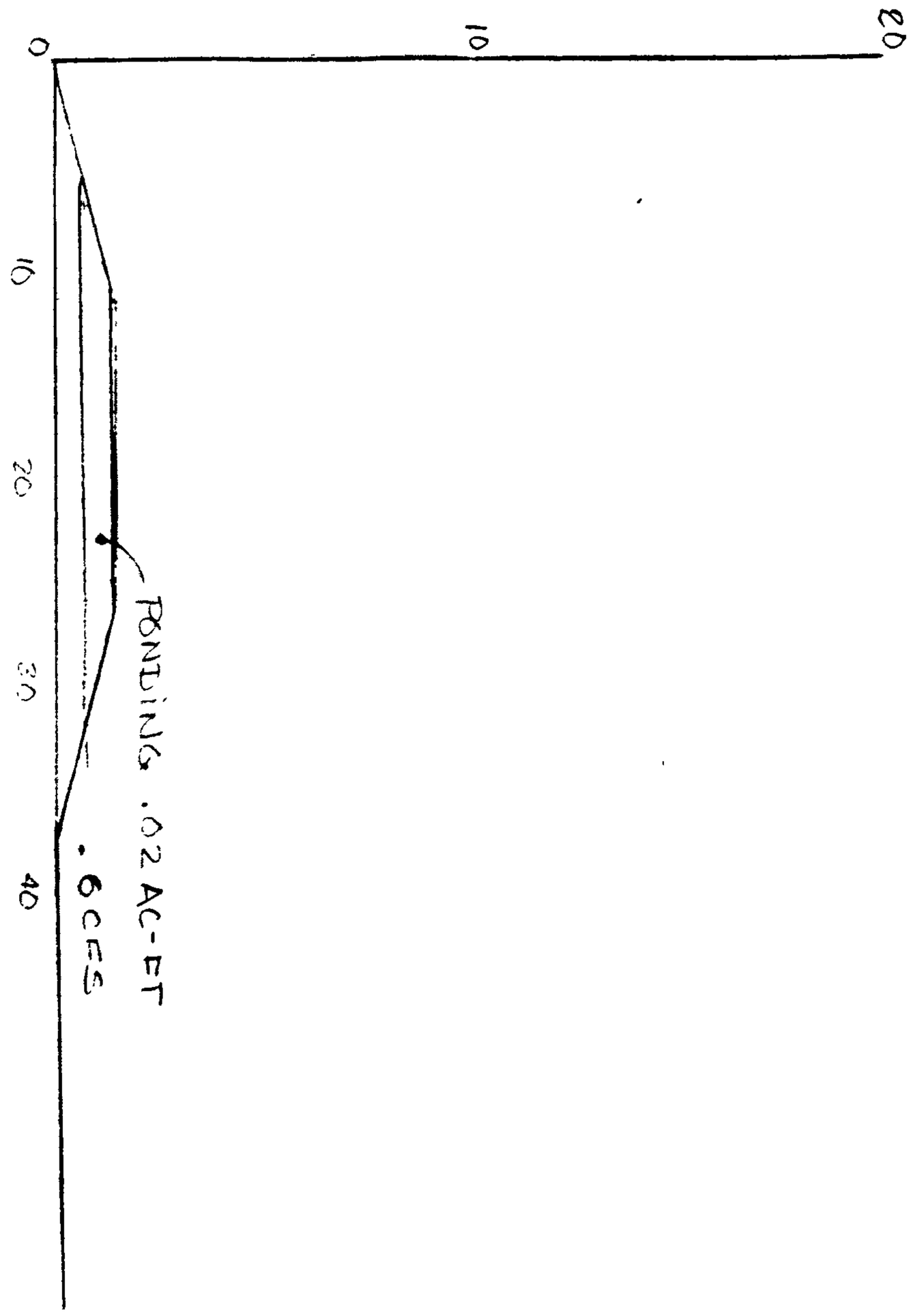
DATE 5-7-92

WILSON & COMPANY

LOC ALBQ FILE 92-506

PROJ COUNTY YARDS SHEET 1

SUBJ HYDROGRAPHS OF 2



COMP.

CK

DATE

WILSON & COMPANY

LOC

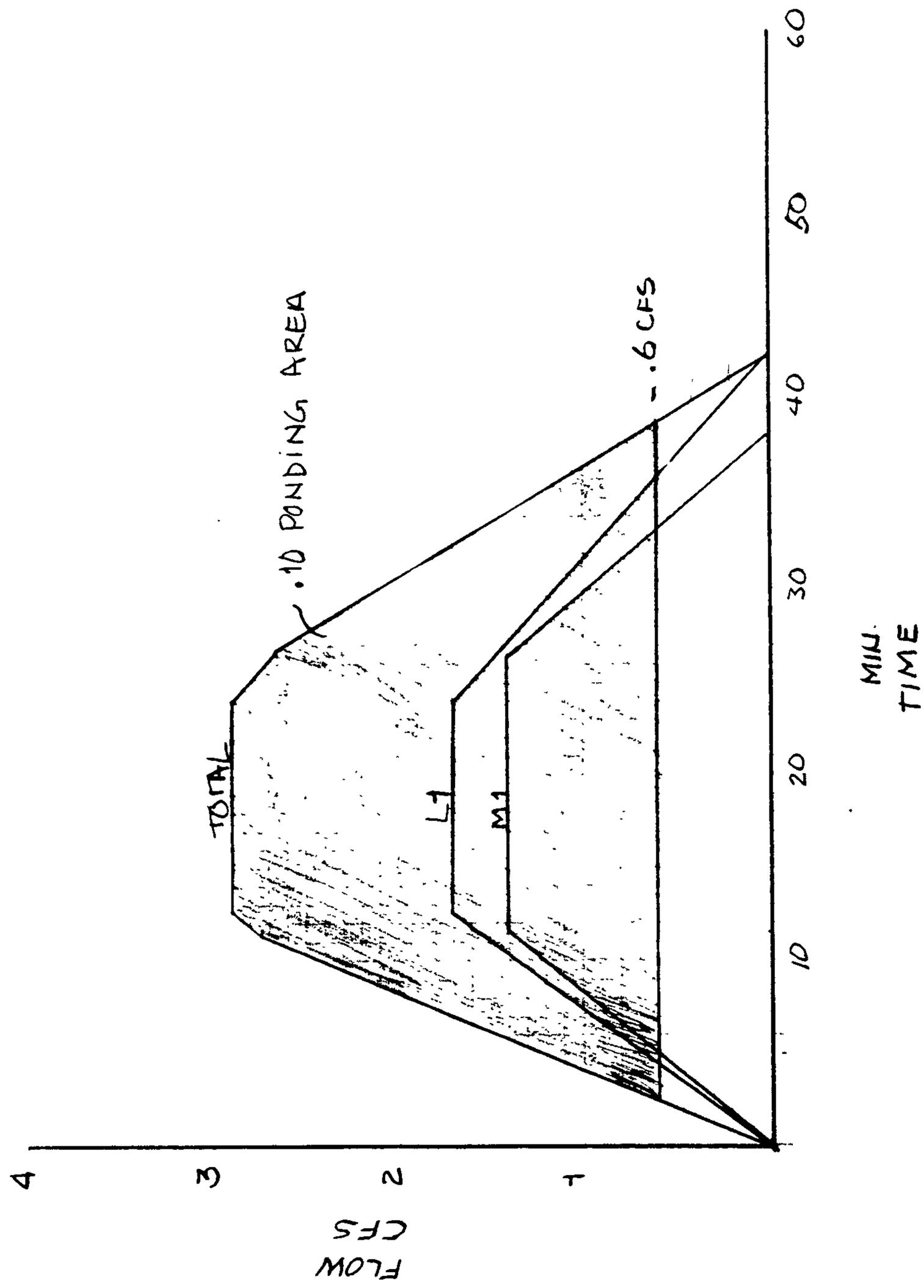
FILE

PROJ

SHEET

SUBJ

OF



CITY OF ALBUQUERQUE
PUBLIC WORKS DEPARTMENT
UTILITY DEVELOPMENT DIVISION/HYDROLOGY SECTION

PRE-DESIGN CONFERENCE

DRAINAGE FILE/ZONE ATLAS PAGE NO.: M14 DATE: 10/5/90

EPC NO.: _____ DRB NO.: _____ ZONE: _____

SUBJECT: MASTER PLAN (DRAINAGE) FOR BERNALILLO COUNTY YARD

STREET ADDRESS: 2400 BROADWAY

LEGAL DESCRIPTION: _____

APPROVAL REQUESTED:

____	PRELIMINARY PLAT	____	FINAL PLAT
____	SITE DEVELOPMENT PLAN	____	BUILDING PERMIT
____	GRADING/PAVING PERMIT	X	OTHER

DRAINAGE CONCEPT FOR OVERALL ~~MASTER~~ DRAINAGE SCHEME.

ATTENDANCE:

WHO	REPRESENTING
Bob Fogleson	County
Fred J. Aguirre	City

FINDINGS:

. The master plan can incorporate the historic (existing) flow rate for the allowable discharge from the site.

. The master plan can use the present DPM emergency rule for computing flowrates and volumes.

. This master plan should incorporate in its concept the future storm drain proposed in Broadway by the South Broadway Sector Plan. ~~in its concept~~

The undersigned agrees that the above findings are summarized accurately and are only subject to change if further investigation reveals that they are not reasonable or that they are based on inaccurate information.

SIGNED: [signature] SIGNED: [signature]

TITLE: _____ TITLE: _____

DATE: 10/5/90 DATE: 10/5/90

NOTE PLEASE PROVIDE A COPY OF THIS PRE-DESIGN FORM WITH THE DRAINAGE SUBMITTAL.

FILE COPY

City of Albuquerque

P.O. BOX 1293 ALBUQUERQUE, NEW MEXICO 87103

April 20, 1990

Miguel Trujillo
Miguel Trujillo & Associates
8504 Spain Road, NE
Albuquerque, New Mexico

RE: BERNALILLO COUNTY RADIO SHOP ADDITION
(M-14/~~D4~~ 13) ARCHITECT'S STAMP DATED MARCH 22, 1990

Dear Mr. Trujillo:

Based on the information provided on your submittal of April 16, 1990, no further requirements will be imposed by Hydrology.

Please be advised that any further development in this area will require a Master Drainage Plan for review.

If I can be of further assistance, please feel free to call me at 768-2650.

Cordially,

Fred J. Aguirre, P.E.
Hydrologist

BJM:BJM/bsj
(WP+1806)

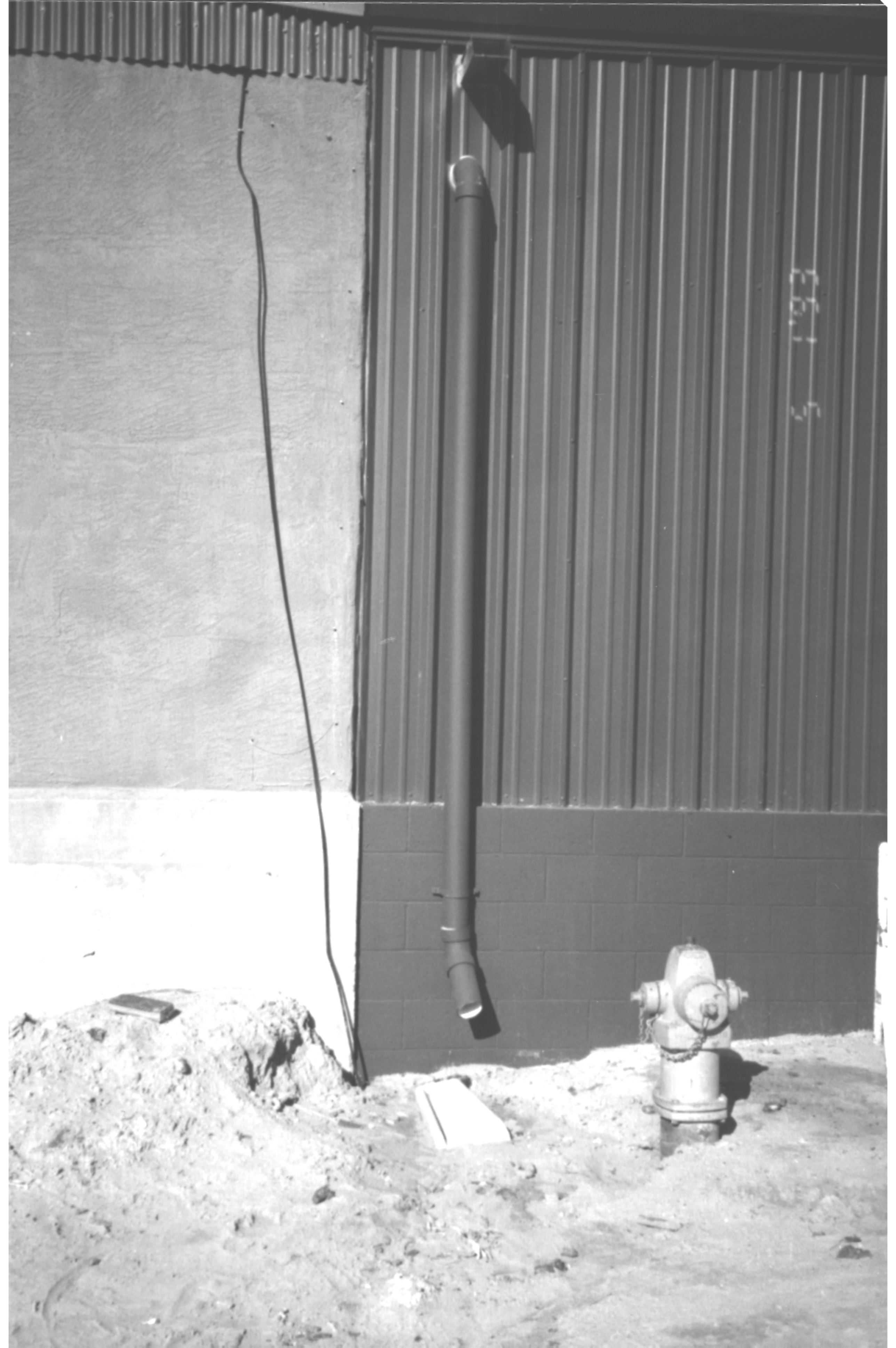
5 '93

County Clerk Warehouse

Outlet 8" S.D.

County Clerk Warehouse

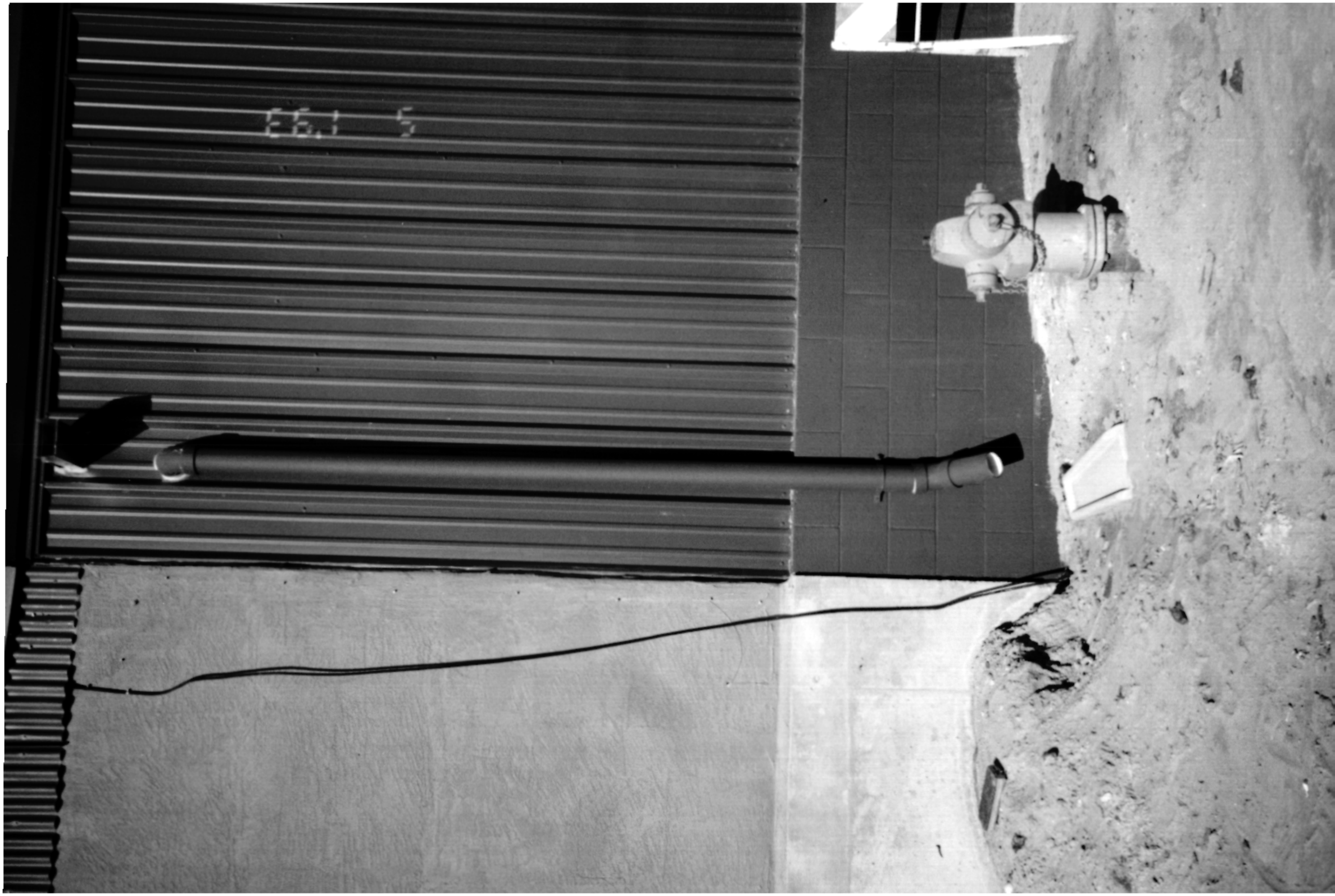
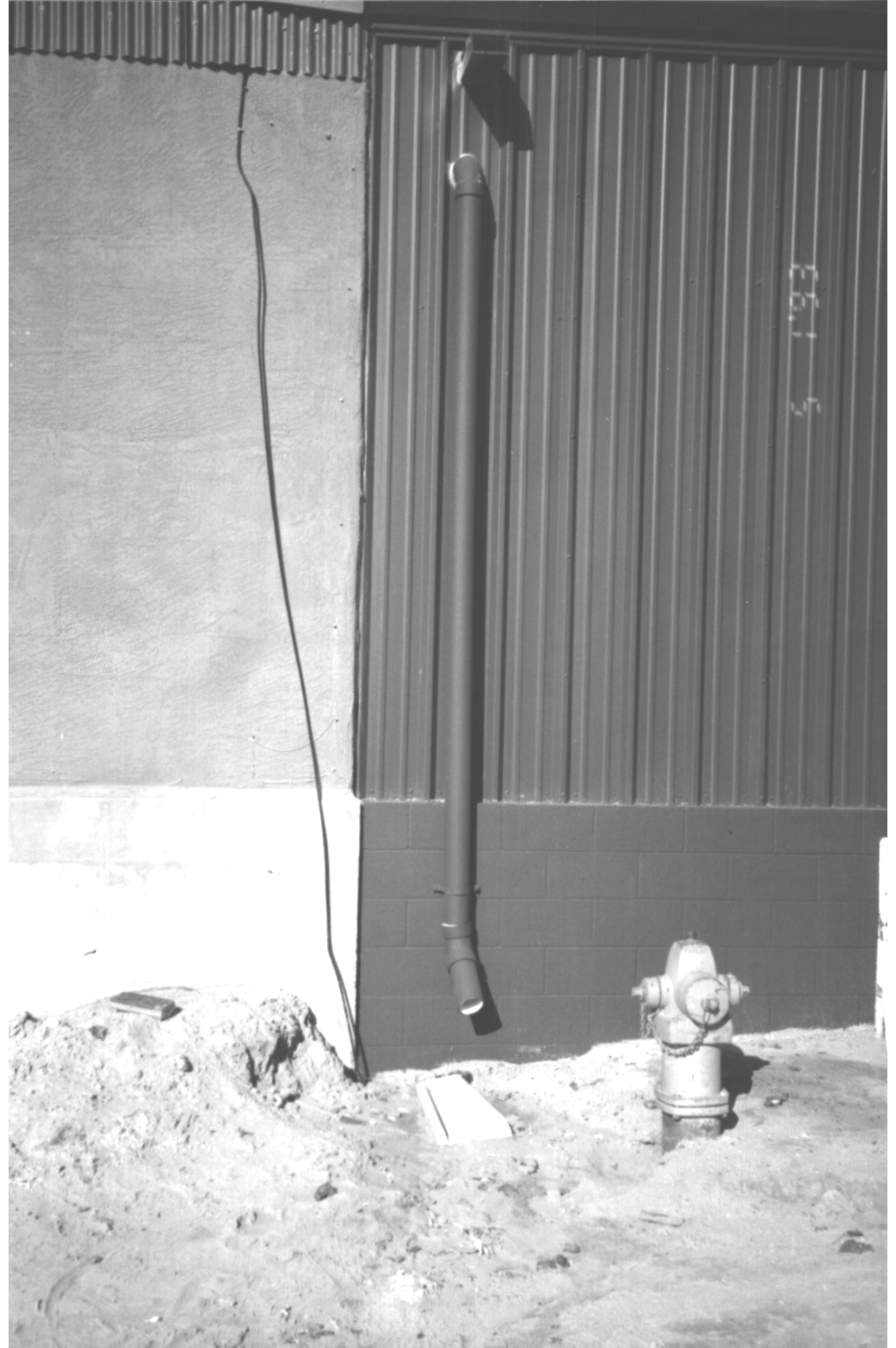
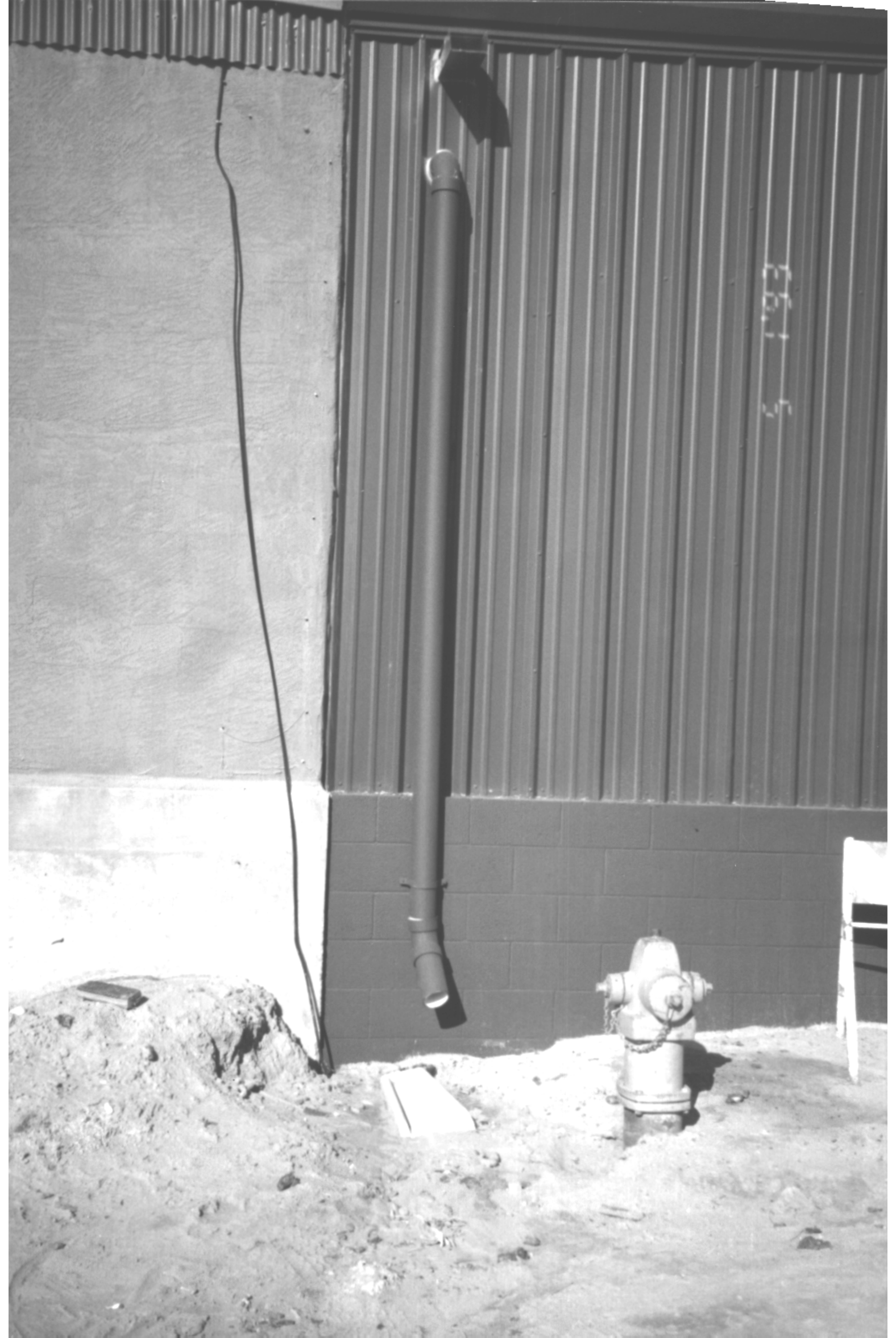
Inlet 8" S.D.



C. C. Warehse

Roof Drain

Between Old
& New Bldg


EE.1 5

5 '93