DRAINAGE REPORT

for

Bob Turner Ford

Prepared by

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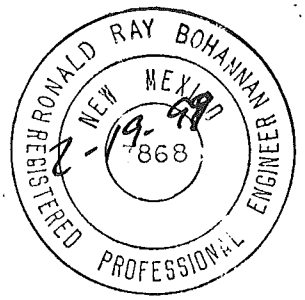


Location

Bob Turner Ford is located at the northwest corner of Montano and Renaissance Boulevard. It is the proposed location of a car dealership and service shop. The site is identified as Tract 1C of the North Renaissance Center and contains approximately 12.22 acres. The purpose of this report is to provide the drainage analysis and management plan for the subdivision.

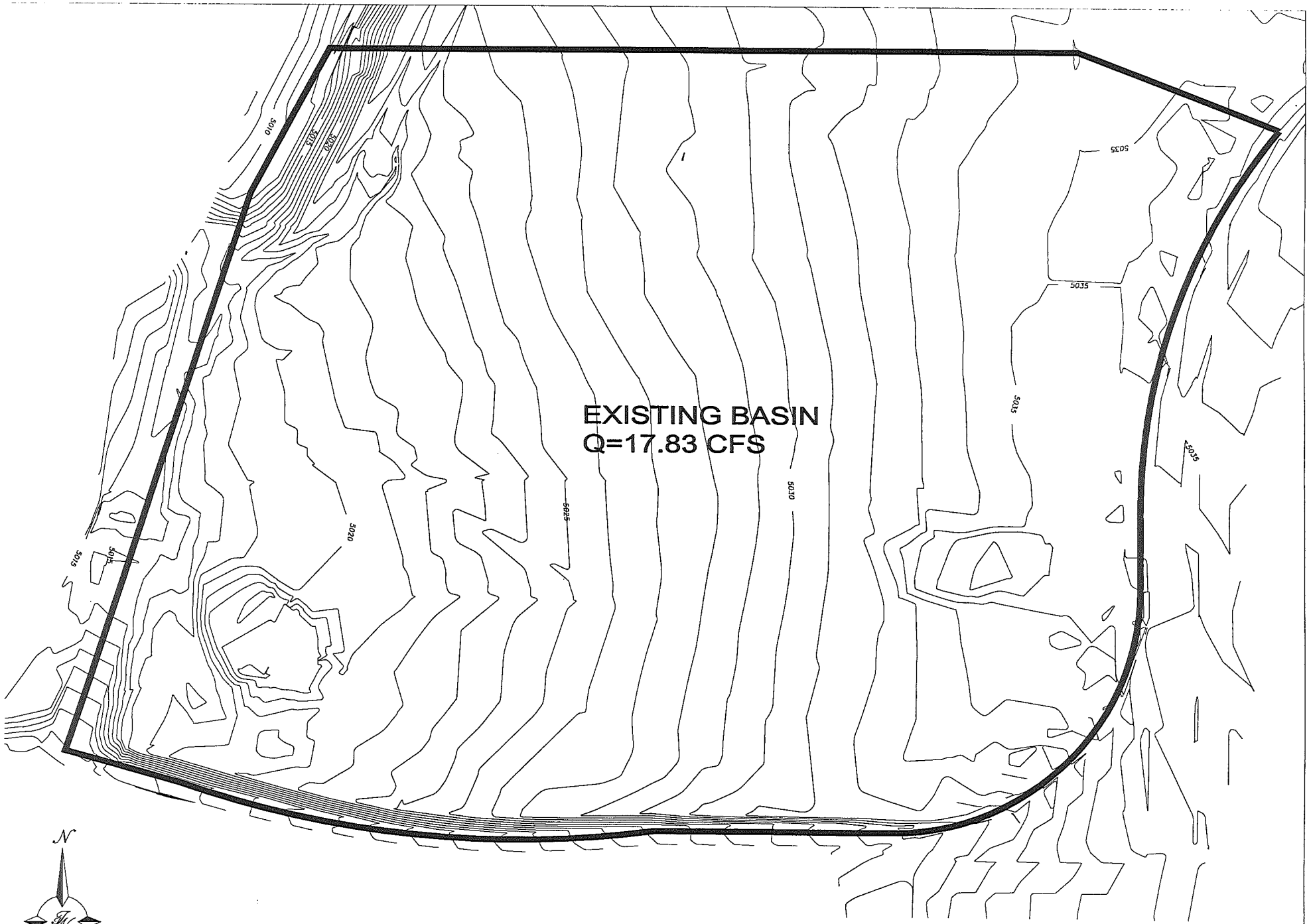
Existing Drainage Conditions

The site is currently undeveloped. The runoff from the site sheet flows from east to west. There is a temporary desilting pond located in the southwest corner of the site. Runoff from the site enters the desilting pond and then overflows to an existing concrete rundown located on the west side of the site. The concrete rundown drains to the existing Montano Renaissance Detention Pond. There are no offsite flows entering the site from the south or the east as Montano and Renaissance Boulevards capture any flows from those directions. The natural topography of the site prevents any flows from entering the site from the west. The north side of the site will have a berm and temporary detention pond to divert any offsite flows from entering the site. When the site to the north is developed the detention pond will be removed.

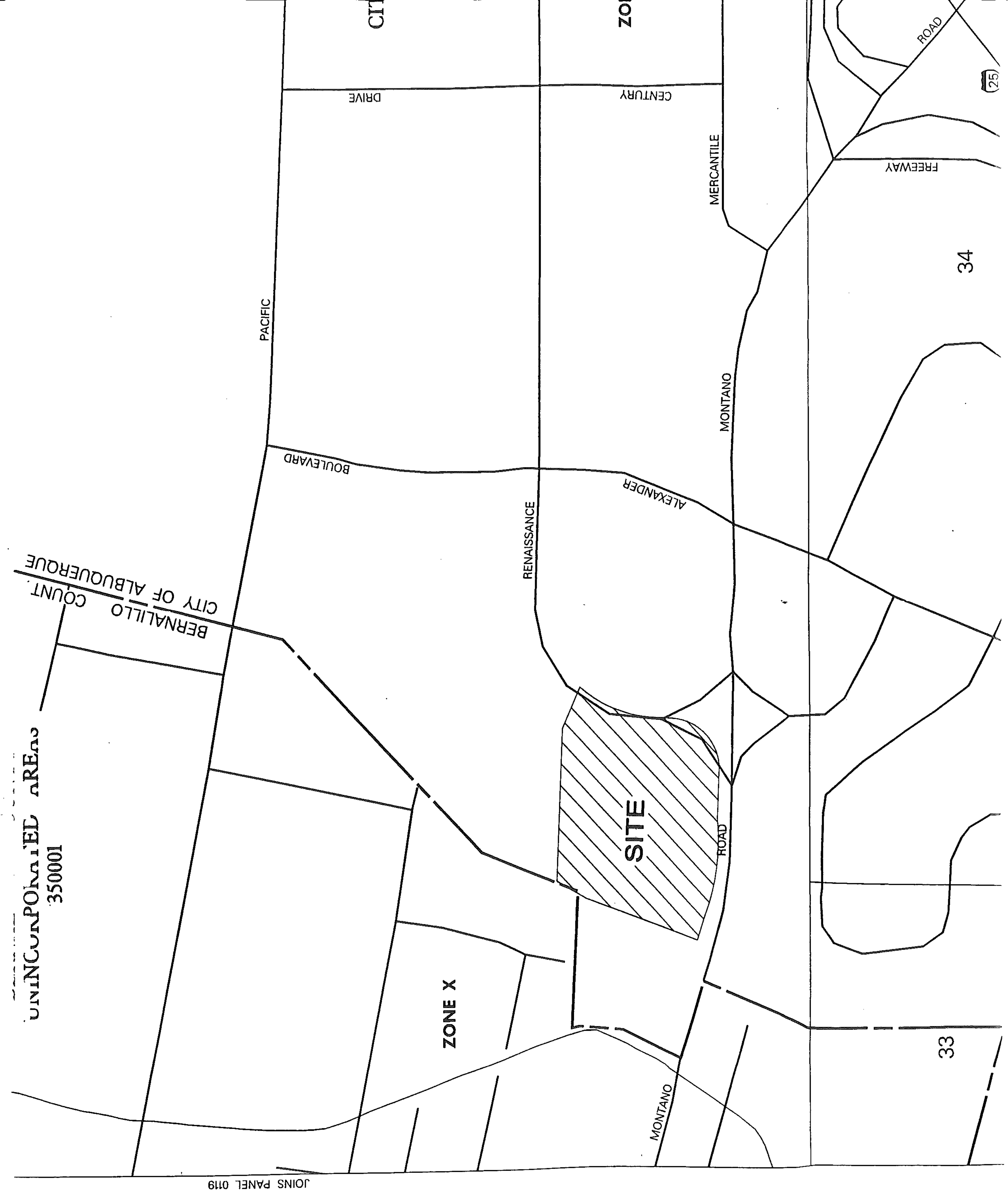
FEMA Map and Soil Conditions

The site is located on FIRM Map 35001C0138 D as shown on the attached excerpt. The map shows that the site does not lie within any 100 year flood plains.

The site contains one soil type from the Soil Conservation Service Soil Survey of Bernalillo County. The soil is a Bluepoint-Kokan Association which is a loamy fine sand that has slow runoff, rapid permeability, and a moderate to severe hazard of water erosion.



UNDEVELOPED BASIN LAYOUT



FEMA MAP 35001C0138

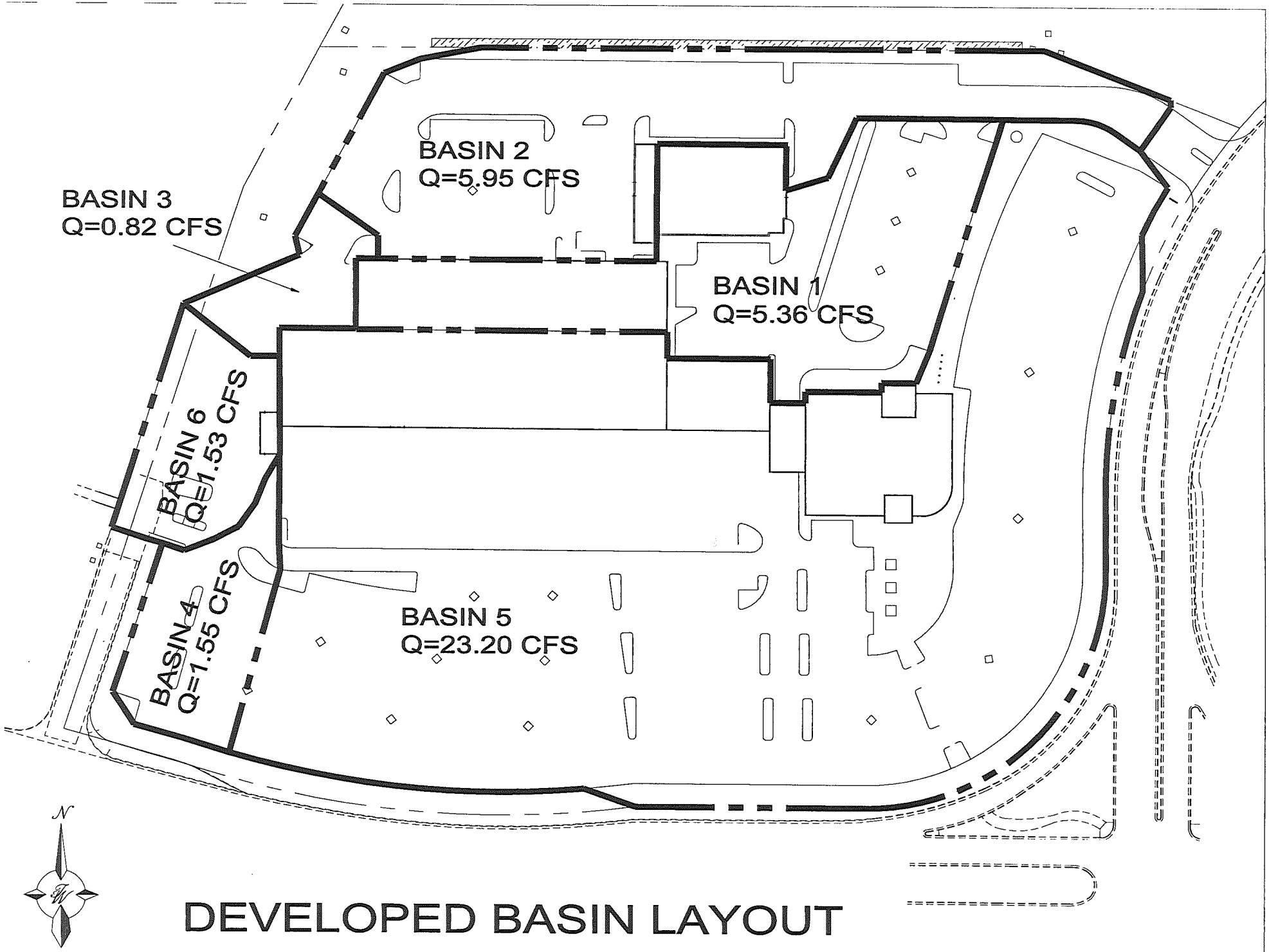
On-Site Drainage Management Plan

The site is located in the Renaissance Center and must follow the guidelines of the Renaissance Master Drainage Plan. The site is allowed to discharge 0.1 cfs per acre. There are approximately 11.09 acres discharging to the existing storm drain system. This is an allowable discharge of 1.11 cfs.

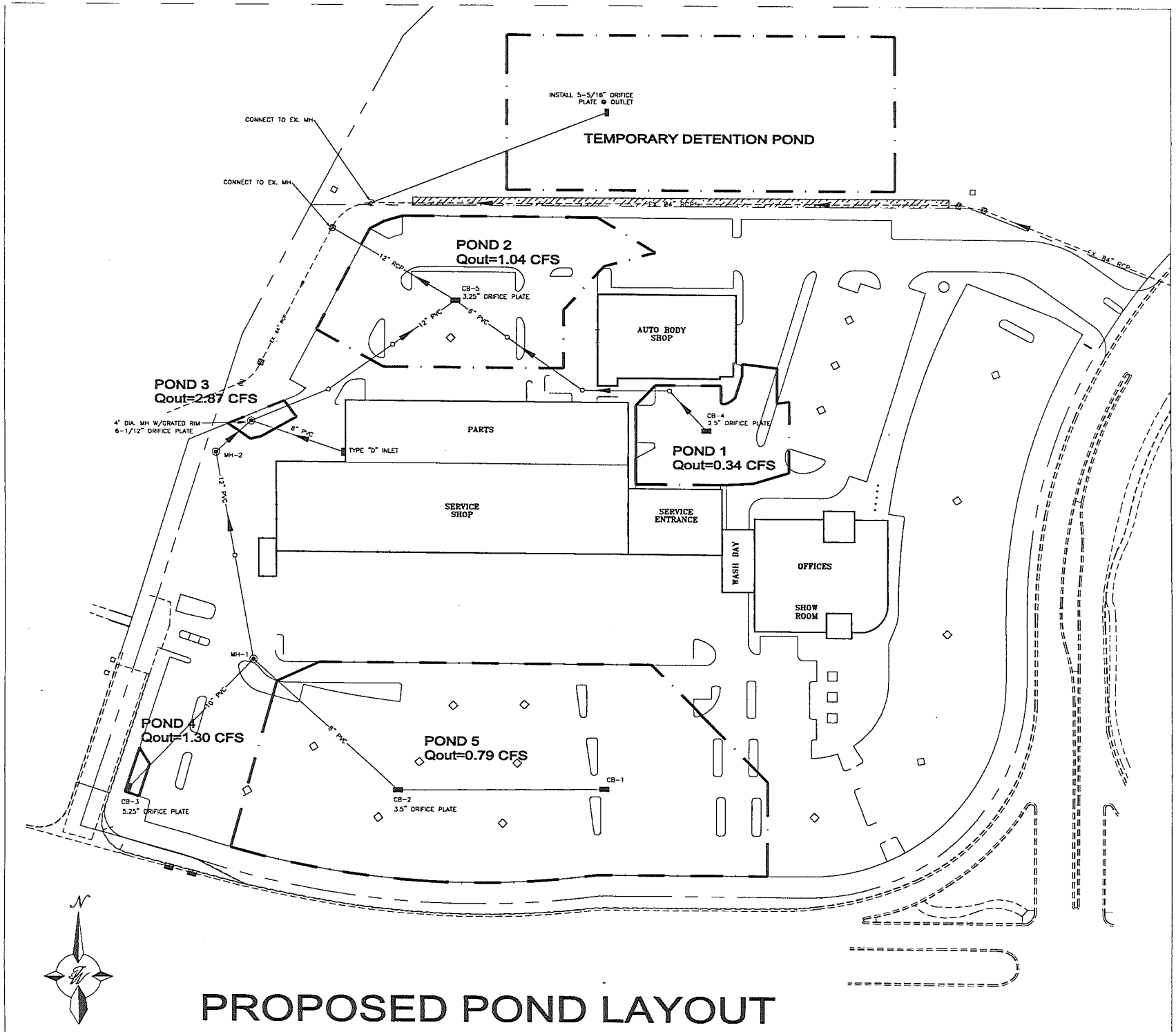
There are six proposed basins on the site. Five of the basins will drain to parking lot ponds and the drainage will be released at controlled discharge rates. The runoff will be conveyed via a new storm drain system to an existing 84" storm drain line. The existing 84" line will carry the runoff to the existing Montano Detention Pond. Basin 6 will continue the existing drainage pattern and drain to the Montano Detention Pond via an existing concrete rundown located on the west side of the site.

The proposed on-site storm drain system will convey the allowable discharge rate to the existing 84" storm drain. Basin 1 has a developed discharge rate of 5.36 cfs. This basin will drain to a parking lot pond (Pond 1) that will limit the runoff with a 2.5" orifice plate to 0.34 cfs. Basin 5 has a developed discharge rate of 23.20 cfs and will drain to Pond 5. This pond will control the discharge to 0.79 cfs with a 3.5" orifice plate. The developed discharge rate of 1.55 cfs for Basin 4 will drain to Pond 4. The discharge from the pond will be released at a rate of 1.3 cfs via a 5.25" orifice plate. Pond 5 and Pond 4 will both drain to Pond 3. Basin 3, with a discharge rate of 1.53 cfs, also drains to Pond 3. A 6-1/12" orifice plate will limit the flow from the pond to 2.87 cfs. Pond 3 drains to Pond 2. Basin 2 also drains to Pond 2 with a developed discharge rate of 5.95 cfs. Pond 2 limits the flow leaving the site to 1.04 cfs via a 3.25" orifice plate. The site is designed to discharge 1.04 cfs which is less that the allowable discharge of 1.11 cfs.

There is a temporary detention pond located north of the site. This pond will capture the flows entering the site from Tract 1B of the North Renaissance Center. The pond will limit the



DEVELOPED BASIN LAYOUT



PROPOSED POND LAYOUT

release to the allowable 0.1 cfs/acre. The tract contains approximately 10.03 acres. This is an allowable discharge rate of 1.00 cfs. The pond will discharge 0.93 cfs which is less than the 1.00 cfs allowed. The pond will also act as a parking area for the Bob Turner Ford site.

Summary

There are six proposed basins on the site. Five of the proposed basins drain to parking lot ponds and a proposed storm drain system that will limit the flows to the allowable discharge rate. The sixth basin consists of the entrance to the site and will drain west via an existing concrete rundown to the Montano Detention Pond.

RUNOFF CALCULATIONS

The site is @ Zone 2

LAND TREATMENT

Proposed
B = 90%
D = 10 %

Existing
B = 100%

DEPTH (INCHES) @ 100-YEAR STORM

P_{60} = 2.01 inches

P_{360} = 2.35 inches

P_{1440} = 2.75 inches

DEPTH (INCHES) @ 10-YEAR STORM

P_{60} = 2.01 x 0.667
= 1.34 inches

P_{360} = 1.57

P_{1440} = 1.83

Drainage Basins

Undeveloped

BASIN	AREA (SF)	AREA (AC)	AREA (MI^2)
1	532174.41	12.2170	0.019089

Proposed

BASIN	AREA (SF)	AREA (AC)	AREA (MI^2)
1	69928.25	1.6053	0.002508
2	77687.12	1.7835	0.002787
3	10531.80	0.2418	0.000378
4	19955.36	0.4581	0.000716
5	303870.56	6.9759	0.010900
6	19799.54	0.4545	0.000710
Total	501772.63	11.5191	0.017999

Runoff Calculation Results

Undeveloped

BASIN	Q-100 CFS	Q-10 CFS	V-100 AC-FT	V-10 AC-FT
1	17.83	10.63	0.792	0.455

Proposed

BASIN	Q-100 CFS	Q-10 CFS	V-100 AC-FT	V-10 AC-FT
1	5.36	3.95	0.305	0.208
2	5.95	4.39	0.338	0.231
3	0.82	0.61	0.046	0.031
4	1.55	1.14	0.087	0.059
5	23.20	17.13	1.323	0.905
6	1.53	1.13	0.086	0.059
Total	38.41	28.35	2.185	1.493

VOLUME CALCULATIONS

POND 1

Ab - Bottom Of The Pond Surface Area
At - Top Of The Pond Surface Area
D - Water Depth
Dt - Total Pond Depth
C - Change In Surface Area / Water Depth

Volume = $Ab * D + 0.5 * C * D^2$
C = (At - Ab) / Dt

Ab =	6.80
At =	13,851.28
Dt =	1.38
C =	10032.23

ACTUAL ELEV.	DEPTH (FT)	VOLUME (AC-FT)	Q (CFS)
24.55	0	0	0.000
27.50	2.95	0.0005	0.277
27.70	3.15	0.0051	0.286
27.90	3.35	0.0189	0.296
28.10	3.55	0.0420	0.305
28.30	3.75	0.0743	0.313
28.50	3.95	0.1158	0.322
28.70	4.15	0.1665	0.330
28.88	4.33	0.2200	0.337

Orifice Equation
Q = CA SQRT(2gH)

C =	0.6
Diameter (in	2.5
Area (ft^2)=	0.034088
g =	32.2
H (Ft) =	Depth of water above center of orifice
Q (CFS)=	Flow

VOLUME CALCULATIONS

POND 2

Ab - Bottom Of The Pond Surface Area
At - Top Of The Pond Surface Area
D - Water Depth
Dt - Total Pond Depth
C - Change In Surface Area / Water Depth

Volume = $Ab * D + 0.5 * C * D^2$
C = (At - Ab) / Dt

Ab =	6.80
At =	32,989.54
Dt =	1.50
C =	21988.49

ACTUAL ELEV.	DEPTH (FT)	VOLUME (AC-FT)	Q (CFS)
13.85	0	0	0.000
26.50	12.65	0.0020	0.981
26.70	12.85	0.0121	0.989
26.90	13.05	0.0424	0.997
27.10	13.25	0.0929	1.005
27.30	13.45	0.1636	1.012
27.50	13.65	0.2545	1.020
27.70	13.85	0.3656	1.027
27.90	14.05	0.4969	1.035
28.00	14.15	0.5701	1.038

Orifice Equation
Q = CA SQRT(2gH)

C =	0.6
Diameter (in	3.25
Area (ft^2)=	0.05761
g =	32.2
H (Ft) =	Depth of water above center of orifice
Q (CFS)=	Flow

VOLUME CALCULATIONS

POND 3

Ab - Bottom Of The Pond Surface Area
At - Top Of The Pond Surface Area
D - Water Depth
Dt - Total Pond Depth
C - Change In Surface Area / Water Depth

Volume = Ab * D + 0.5 * C * D^2
C = (At - Ab) / Dt

Ab =	2.82
At =	1,176.39
Dt =	0.68
C =	1725.84

ACTUAL ELEV.	DEPTH (FT)	VOLUME (AC-FT)	Q (CFS)
15.3	0	0	0.0000
26.04	10.74	0.0007	3.1472
26.14	10.84	0.0009	3.1621
26.24	10.94	0.0015	3.1770
26.34	11.04	0.0025	3.1919
26.44	11.14	0.0039	3.2066
26.54	11.24	0.0057	3.2213
26.64	11.34	0.0079	3.2360
26.72	11.42	0.0099	3.2476

<u>Orifice Equation</u>
Q = CA SQRT(2gH)

C =	0.6
Diameter (in	6.083333
Area (ft^2)=	0.201842
g =	32.2
H (Ft) =	Depth of water above center of orifice
Q (CFS)=	Flow

VOLUME CALCULATIONS

POND 4

Ab - Bottom Of The Pond Surface Area
At - Top Of The Pond Surface Area
D - Water Depth
Dt - Total Pond Depth
C - Change In Surface Area / Water Depth

Volume = Ab * D + 0.5 * C * D^2
C = (At - Ab) / Dt

Ab =	6.80
At =	533.67
Dt =	0.50
C =	1053.74

ACTUAL ELEV.	DEPTH (FT)	VOLUME (AC-FT)	Q (CFS)
17.94	0	0	0.00
20.94	3	0.0005	1.21
21.04	3.1	0.0006	1.23
21.14	3.2	0.0010	1.25
21.24	3.3	0.0016	1.27
21.34	3.4	0.0025	1.29
21.44	3.5	0.0036	1.31

Orifice Equation
Q = CA SQRT(2gH)

C =	0.6
Diameter (in	5.25
Area (ft^2)=	0.15033
g =	32.2
H (Ft) =	Depth of water above center of orifice
Q (CFS)=	Flow

VOLUME CALCULATIONS

POND 5

Ab - Bottom Of The Pond Surface Area
At - Top Of The Pond Surface Area
D - Water Depth
Dt - Total Pond Depth
C - Change In Surface Area / Water Depth

Volume = Ab * D + 0.5 * C * D^2
C = (At - Ab) / Dt

Ab =	13.60
At =	91,993.08
Dt =	1.00
C =	91979.48

ACTUAL ELEV.	DEPTH (FT)	VOLUME (AC-FT)	Q (CFS)
18.85	0	0	0.000
24.00	5.15	0.0016	0.720
24.20	5.35	0.0439	0.734
24.40	5.55	0.1707	0.748
24.60	5.75	0.3819	0.762
24.80	5.95	0.6776	0.775
25.00	6.15	1.0577	0.788

Orifice Equation
Q = CA SQRT(2gH)

C =	0.6
Diameter (in	3.5
Area (ft^2)=	0.066813
g =	32.2
H (Ft) =	Depth of water above center of orifice
Q (CFS)=	Flow

Pipe Capacity

Pipe	D	Slope	Area	R	Q Provided	Q Required	Velocity
	(in)	(%)	(ft^2)		(cfs)	(cfs)	(ft/s)
CB1 to CB2	8	1	0.35	0.17	1.43	NA	0.00
CB2 to MH1	8	1	0.35	0.17	1.43	0.79	2.26
CB3 to MH1	10	0.6	0.55	0.21	2.01	1.30	2.38
MH1 to MH2	12	0.6	0.79	0.25	3.27	2.09	2.66
MH2 to CB5	12	0.6	0.79	0.25	3.27	2.87	3.65
CB4 to CB5	6	3.81	0.20	0.13	1.30	0.34	1.73
CB5 to Existing 84"	12	0.6	0.79	0.25	3.27	1.04	1.32

Manning's Equation:

$Q = 1.49/n * A * R^{(2/3)} * S^{(1/2)}$

A = Area
R = D/4
S = Slope
n = 0.011

AHYMO SUMMARY TABLE (AHYMO194) - AMAFCA Hydrologic Model - January, 1994 RUN DATE (MON/DAY/YR) =02/19/1999
INPUT FILE = A:UND-POND.DAT USER NO.= R_BOHANN.I01

COMMAND	HYDROGRAPH IDENTIFICATION	FROM ID NO.	TO ID NO.	AREA (SQ MI)	PEAK DISCHARGE (CFS)	RUNOFF VOLUME (AC-FT)	RUNOFF (INCHES)	TIME TO PEAK (HOURS)	CFS PER ACRE	NOTATION
START										TIME= .00
RAINFALL TYPE= 2										RAIN24= 2.750
COMPUTE NM HYD	100.10	-	1	.01567	14.64	.650	.77808	1.632	1.460	PER IMP= .00
ROUTE RESERVOIR	501.10	1	10	.01567	.91	.651	.77852	2.631	.091	AC-FT= .503
FINISH										

AHYMO SUMMARY TABLE (AHYMO194) - AMAFCA Hydrologic Model - January, 1994 RUN DATE (MON/DAY/YR) =02/16/1999
INPUT FILE = A:9795E.DAT USER NO.= R_BOHANN.I01

COMMAND	HYDROGRAPH IDENTIFICATION	FROM ID NO.	TO ID NO.	AREA (SQ MI)	PEAK DISCHARGE (CFS)	RUNOFF VOLUME (AC-FT)	RUNOFF (INCHES)	TIME TO PEAK (HOURS)	CFS PER ACRE	NOTATION
START										TIME= .00
RAINFALL TYPE= 2										RAIN24= 2.750
COMPUTE NM HYD	100.10	-	1	.01909	17.83	.792	.77808	1.632	1.460	PER IMP= .00
START										TIME= .00
RAINFALL TYPE= 1										RAIN6= 1.930
COMPUTE NM HYD	110.10	-	1	.01909	10.63	.455	.44688	1.633	.870	PER IMP= .00
FINISH										

AHYMO SUMMARY TABLE (AHYMO194) - AMAFCA Hydrologic Model - January, 1994 RUN DATE (MON/DAY/YR) =02/16/1999
INPUT FILE = A:9795P.DAT USER NO.= R_BOHANN.I01

COMMAND	HYDROGRAPH IDENTIFICATION	FROM ID NO.	TO ID NO.	AREA (SQ MI)	PEAK DISCHARGE (CFS)	RUNOFF VOLUME (AC-FT)	RUNOFF (INCHES)	TIME TO PEAK (HOURS)	CFS PER ACRE	NOTATION
START										
RAINFALL TYPE= 2										TIME= .00
										RAIN24= 2.750
COMPUTE NM HYD	100.10	-	1	.00251	5.36	.305	2.27657	1.598	3.337	PER IMP= 90.00
COMPUTE NM HYD	100.20	-	1	.00279	5.95	.338	2.27656	1.598	3.335	PER IMP= 90.00
COMPUTE NM HYD	100.30	-	1	.00038	.82	.046	2.27686	1.598	3.399	PER IMP= 90.00
COMPUTE NM HYD	100.40	-	1	.00072	1.55	.087	2.27671	1.598	3.373	PER IMP= 90.00
COMPUTE NM HYD	100.50	-	1	.01090	23.20	1.323	2.27651	1.598	3.326	PER IMP= 90.00
COMPUTE NM HYD	100.60	-	1	.00071	1.53	.086	2.27673	1.598	3.375	PER IMP= 90.00
START										
RAINFALL TYPE= 1										TIME= .00
										RAIN6= 1.930
COMPUTE NM HYD	110.10	-	1	.00251	3.95	.208	1.55658	1.600	2.463	PER IMP= 90.00
COMPUTE NM HYD	110.20	-	1	.00279	4.39	.231	1.55658	1.600	2.462	PER IMP= 90.00
COMPUTE NM HYD	110.30	-	1	.00038	.61	.031	1.55658	1.600	2.507	PER IMP= 90.00
COMPUTE NM HYD	110.40	-	1	.00072	1.14	.059	1.55658	1.600	2.487	PER IMP= 90.00
COMPUTE NM HYD	110.50	-	1	.01090	17.13	.905	1.55658	1.600	2.456	PER IMP= 90.00
COMPUTE NM HYD	110.60	-	1	.00071	1.13	.059	1.55658	1.600	2.489	PER IMP= 90.00
FINISH										

```
**************************************************************
*                      BOB TURNER FORD                       *
**************************************************************
*                    PONDING CALCULATIONS                    *
**************************************************************
*       100-YEAR, 24-HR STORM  (UNDER PROPOSED CONDITIONS)   *
**************************************************************
*
START                TIME=0.0
*
********************
* BASIN 1          *
********************

RAINFALL             TYPE=2 RAIN QUARTER=0.0 IN
                     RAIN ONE=2.01 IN RAIN SIX=2.35 IN
                     RAIN DAY=2.75 IN DT=0.0333 HR
COMPUTE NM HYD       ID=1 HYD NO=100.1 AREA=0.002508 SQ MI
                     PER A=0.00 PER B=10.00 PER C=0.00 PER D=90.00
                     TP=-0.24 HR MASS RAINFALL=-1
PRINT HYD            ID=1 CODE=1
*
ROUTE RESERVOIR      ID=10 HYD NO=501.1 INFLOW ID=1 CODE=24
                     OUTFLOW(CFS)     STORAGE(AC-FT)     ELEVATION(FT)
                       0.00              0.0000             24.55
                       0.277             0.0005             27.50
                       0.286             0.0051             27.70
                       0.296             0.0189             27.90
                       0.305             0.0420             28.10
                       0.313             0.0743             28.30
                       0.322             0.1158             28.50
                       0.330             0.1665             28.70
                       0.337             0.2200             28.88
PRINT HYD            ID=10 CODE=1
*
********************
* BASIN 4          *
********************
*
COMPUTE NM HYD       ID=4 HYD NO=100.4 AREA=0.000716 SQ MI
                     PER A=0.00 PER B=10.00 PER C=0.00 PER D=90.00
                     TP=-0.24 HR MASS RAINFALL=-1
PRINT HYD            ID=4 CODE=1
*
ROUTE RESERVOIR      ID=40 HYD NO=500.4 INFLOW ID=4 CODE=24
                     OUTFLOW(CFS)     STORAGE(AC-FT)     ELEVATION(FT)
                       0.00              0.0000             17.94
                       1.21              0.0005             20.94
                       1.23              0.0006             21.04
                       1.25              0.0010             21.14
                       1.27              0.0016             21.24
                       1.29              0.0025             21.34
                       1.31              0.0036             21.44
PRINT HYD            ID=40 CODE=1
*
********************
* BASIN 5          *
********************
*
COMPUTE NM HYD       ID=5 HYD NO=100.5 AREA=0.010900 SQ MI
                     PER A=0.00 PER B=10.00 PER C=0.00 PER D=90.00
                     TP=-0.24 HR MASS RAINFALL=-1
PRINT HYD            ID=5 CODE=1
*
ROUTE RESERVOIR      ID=50 HYD NO=500.5 INFLOW ID=5 CODE=24
                     OUTFLOW(CFS)     STORAGE(AC-FT)     ELEVATION(FT)
                       0.000             0.0000             18.85
```

AHYMO SUMMARY TABLE (AHYMO194) - AMAFCA Hydrologic Model - January, 1994 RUN DATE (MON/DAY/YR) =02/18/1999
INPUT FILE = a:pond.dat USER NO.= R_BOHANN.I01

COMMAND	HYDROGRAPH IDENTIFICATION	FROM ID NO.	TO ID NO.	AREA (SQ MI)	PEAK DISCHARGE (CFS)	RUNOFF VOLUME (AC-FT)	RUNOFF (INCHES)	TIME TO PEAK (HOURS)	CFS PER ACRE	NOTATION	
START										TIME=	.00
RAINFALL TYPE= 2										RAIN24=	2.750
COMPUTE NM HYD	100.10	-	1	.00251	5.36	.305	2.27657	1.598	3.337	PER IMP=	90.00
ROUTE RESERVOIR	501.10	1	10	.00251	.34	.304	2.27622	2.664	.209	AC-FT=	.206
COMPUTE NM HYD	100.40	-	4	.00072	1.55	.087	2.27671	1.598	3.373	PER IMP=	90.00
ROUTE RESERVOIR	500.40	4	40	.00072	1.30	.087	2.27663	1.698	2.845	AC-FT=	.003
COMPUTE NM HYD	100.50	-	5	.01090	23.20	1.323	2.27651	1.598	3.326	PER IMP=	90.00
ROUTE RESERVOIR	500.50	5	50	.01090	.79	1.188	2.04443	2.997	.113	AC-FT=	.972
COMPUTE NM HYD	100.30	-	3	.00038	.82	.046	2.27686	1.598	3.399	PER IMP=	90.00
ADD HYD	104.30	40& 3	43	.00109	2.11	.133	2.27671	1.632	3.007		
ADD HYD	105.30	43&50	53	.01199	2.86	1.321	2.06562	1.632	.373		
ROUTE RESERVOIR	502.30	53	24	.01199	2.87	1.321	2.06536	1.632	.373	AC-FT=	.001
COMPUTE NM HYD	100.20	-	2	.00279	5.95	.338	2.27656	1.598	3.335	PER IMP=	90.00
ADD HYD	101.20	10& 2	12	.00530	6.26	.643	2.27640	1.598	1.847		
ADD HYD	102.30	24&12	23	.01729	9.10	1.964	2.12999	1.632	.822		
ROUTE RESERVOIR	501.20	23	13	.01729	1.04	1.592	1.72646	12.121	.094	AC-FT=	.499
FINISH											