CITY OF ALBUQUERQUE

February 2, 2007

Shahab Biazar, P.E.
Advanced Engineering and Consulting, LLC
4416 Anaheim Ave NE
Albuquerque, NM 87113

Re: Ellen Equipment/Pond Removal Grading and Drainage Plan
Engineer's Stamp dated 1-22-07 (E15/D15)

Dear Mr. Biazar,

Based upon the information provided in your submittal dated 1-23-07, the above referenced plan is approved for Grading Permit and Paving Permit.

Upon completion of the project, provide an Engineer Certification of this Grading Plan and a certification of the Sitio Business Park (E15/D14) noting the modification to the orifice plate.

Building Permit approval is not required for this work.

If you have any questions, you can contact me at 924-3695.

Sincerely,

Curtis A. Cherne, E.I.
Engineering Associate, Planning Dept.
Development and Building Services

C: file

P.O. Box 1293

Albuquerque

New Mexico 87103

www.cabq.gov

Table 7
Hydraulic Capacities
TF-14 Series

Section Length = 8'			TF-14					
Section Number	Trench Depth		Flat Site Flow Capacity			Storage Capacity 8 Ft Section		
	CM	In.	CFS	LPS	GPM	Ft³	Gal	L
8	17.8	7.00	1.30	37.3	591	2.54	19.0	71.9
8N	20	8.00	1.80	51.04	809	3.2	24.0	90.8
	20	8.00	-	-	-	3.48	26.0	98.4
9	23	9.00	2.30	75.7	1038	3.9	29.0	110
10	25	10.00	2.80	91.3	1274	4.55	34.0	129
11	28	11.00	3.40	107.1	1516	5.2	39.0	148
12	30	12.00	3.90	123.2	1762	5.88	44.0	167
12N	30	12.00	3.90	123.2	1762	5.88	23.0	87
13	33	13.00	4.50	139.5	2012	6.55	49.0	185
14	36	14.0	5.00	155.9	2264	7.22	54.0	204
15	38	15.0	5.60	172.5	2519	7.89	59.0	223
16	41	16.0	6.20	189.1	2775	8.6	63.0	238
16N	41	16.0	-	-	-	8.82	66.0	250
17	43	17.0	6.80	205.8	3034	9.0	68.0	257
18	46	18.0	7.30	222.6	3293	9.76	73.0	276
19	48	19.0	7.90	239.4	3553	10.4	78.0	295
20	51	20.0	8.50	256.3	3815	11.1	83.0	314
20N	51	20.0	8.50	256.3	3815	11.3	86.0	326
21	53	21.0	9.10	273	4077	11.8	88.0	333
22	56	22.0	9.70	290	4340	12.4	93.0	352
23	58	23.0	10.3	307	4604	13.1	98.0	371
24	61	24.0	10.8	324	4868	13.6	103	390
24N	61	24.0	-	-	-	14.2	106	401
25	64	25.0	11.4	341	5133	14.4	108	409
26	66	26.0	12.0	358	5398	15.1	113	428
27	69	27.0	12.6	376	5664	15.8	118	447
27N	69	27.0	-	-	-	16.0	120	454

Notes:

1. Trench Depth is the distance from top of grate (finished surface) to the invert at the deep end of each 8 foot section.
2. The active hydraulic area is that between the grate seat and the invert in both Flow Capacity and Storage Capacity.
3. Flow capacity is calculated at the deep end using Manning's Equation with a roughness factor of n = 0.013.
4. To calculate flow for sloped sites, $\mathbf{Q_{SLOPED} = Q_{FLAT} * 10 * (S_S + S_C)^{0.5}}$ for all units. $S_C = 0.01 = 1.0\%$ for all sections. Do not use equation for storage capacity.

$V = AL$

$A = \frac{V}{L} =$

$Q_{slope} = 5 \times 10 \cdot (.001 + .01)^{1/2}$

$= 5.24$ cfs

Grate Inflow in Sag/Sump Conditions

When the head of water above the grate exceeds 4 inches, grate inflow is calculated using **Equation 5** for orifice inflow conditions.

Equation 5 – Grate Inflow in Orifice Conditions

$$Q_O = 0.67\ A_G\ (2gH)^{0.50}$$

Q_O = Orifice Inflow (CFS)
g = Gravitational Constant (32.16 Ft /S^2)
A_G = Grate Inlet Area (Ft^2) from **Table 3, page 7**
H = Fluid Height Over Grate (Ft)

DRAINAGE REPORT
FOR

ELLEN EQUIPMENT
(POND REMOVAL)

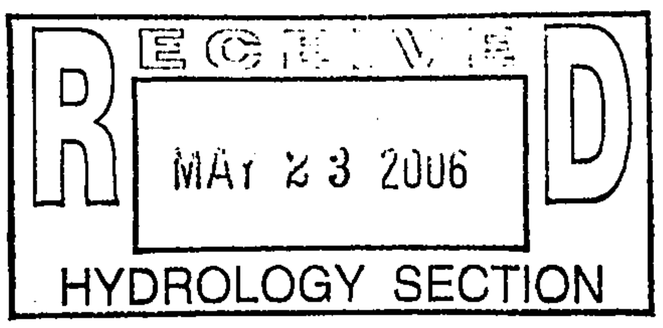
Prepared by:

ADVANCED
ENGINEERING
and CONSULTING, LLC

4416 Anaheim Ave., NE
Albuquerque, New Mexico 87113

May, 2006

Shahab Biazar
PE NO. 13479



Location

Ellen Equipment is TRACT 48 AND 49, MRGCD MAP NO. 29, & LOT 63, 64 AND 65, CALAVERO ADDITION located at 6613 Edith Boulevard. See attached Zone Atlas page number E-15 for exact location.

Purpose

The purpose of this drainage report is to present a grading and drainage solution in order to remove exiting retention pond on site. We are requesting rough grading approval and building permit approval.

Existing Drainage Conditions

The site drains east to west. The site, under the existing conditions, generates a runoff of 22.09 cfs. The runoff On-site is retained on site within existing retention pond located on the west side of the Lot. No offsite enters this site. No offsite runoff enters the site. The runoff to the east is intercepted by Edith Boulevard and Edith Storm Drain System (Storm Drain Built According to the Edith Drainage Master Plan prepared by Boyle Engineering). The site does not fall within a designated 100-year floodplain. The runoff from Edith which is not intercepted by the storm drain system drains south to Osuna Boulevard. The site to the

north was designed by our office under the City Drainage number E15/D14 and drains east to west to a proposed detention basin. Then the runoff is discharged to the exiting pond to the north at a flow rate of 6.87 cfs.

Proposed Conditions and On-Site Drainage Management Plan

We are proposing to remove the exiting retention pond and modifying it to a detention pond by routing the runoff through the site located to the north (Sitio Business Park, City Drainage Number E15/D14). A 12" pipe will be extended from the last inlet to the south located at the back of Sitio Business Park to this site. Therefore, the runoff from the Ellen Equipment site will be routed out to the existing detention pond located on the north side of Sitio Business Park. Both ponds from Sitio Business Park and Ellen Equipment site will act as one pond. Therefore, a new calculation is preformed running both ponds simultaneously. The proposed orifice plate to control the discharge from Sitio Business Park will be changed from 12" to an 11" orifice opening to assure that the runoff does not increase from the originally designed pond. By changing the orifice plat the discharge will change to 6.81 cfs which is slightly lower than previously approved discharge of 6.87 cfs.

6.99

Edith Boulevard Drainage

Edith Boulevard was analyzed under the Sitio Business Park (E15/D14) the project located to the North of Ellen Equipment. Northeast corner of the Sitio Business Park is

located near the highpoint on Edith Boulevard where then runoff drains to the north and to the south. Therefore, the runoff on Edith Boulevard, fronting this project and Sitio Business Park drains south to Osuna Boulevard. From the high point (on Edith Boulevard) to Osuna Boulevard, Edith Boulevard will only generate 8.73 cfs under the fully developed conditions. Edith Boulevard has a drainage capacity of 38.55 cfs fronting Sitio Business Park and 63.17 cfs runoff capacity at the south end of Edith by Osuna Boulevard. See street flow capacity spread sheets located in this report (from City Drainage Number E15/D14).

Emergency Conditions

In the case of an emergency (if the inlet got clogged) the runoff will pond on site and then will overflow into the Alameda Lateral (same as the existing conditions) located on the west side of the property.

Calculations

City of Albuquerque, Development Process Manuel, Section 22.2, Hydrology Section, was used for runoff calculations. See section this report for drainage calculations as well as AHYMO input and output files.

RUNOFF CALCULATIONS

(INPUT DATA FOR AHYMO CALCULATIONS)

The site is @ Zone 2

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

See the summary output from AHYMO calculations.

Also see the following summary tables.

RUNOFF CALCULATION RESULTS

BASIN	AREA (SF)	AREA (AC)	AREA (MI^2)
ON-SITE	237021.21	5.4413	0.008502

EXISTING

BASIN	Q-100 CFS	Q-10 CFS	TREATMENT A, B, C, D
ON-SITE	22.09✓	13.70	0%, 20%, 10%, 70%

PROPOSED

BASIN	Q-100 CFS	Q-10 CFS	TREATMENT A, B, C, D
ON-SITE	24.27✓	15.71	0%, 10%, 0%, 90%

3 making more parking lot, where? and removing landscape

SUMMARY OUTPUT FILE

AHYMO PROGRAM SUMMARY TABLE (AHYMO_97) - - VERSION: 1997.02d RUN DATE (MON/DAY/YR) =05/17/2006
INPUT FILE = 458 USER NO.= AHYMO-I-9702c01000R31-AH

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	PAGE = 1 NOTATION
START										TIME= .00
RAINFALL TYPE= 1										RAIN6= 2.350
COMPUTE NM HYD	101.00	-	1	.00850	22.09	.791	1.74507	1.500	4.059	PER IMP= 70.00
START										TIME= .00
RAINFALL TYPE= 1										RAIN6= 1.570
COMPUTE NM HYD	101.00	-	1	.00850	13.70	.471	1.03961	1.500	2.518	PER IMP= 70.00
START										TIME= .00
RAINFALL TYPE= 1										RAIN6= 2.350
COMPUTE NM HYD	101.00	-	1	.00850	24.27	.899	1.98165	1.500	4.460	PER IMP= 90.00
START										TIME= .00
RAINFALL TYPE= 1										RAIN6= 1.570
COMPUTE NM HYD	101.00	-	1	.00850	15.71	.559	1.23171	1.500	2.888	PER IMP= 90.00
FINISH										

$V_{100\text{-}360}$ declining

need $V_{100\text{-}10\,day}$ 2-1-07

$$V_{10} = V_{360} + A_D \times \frac{(P_{10\,days} - P_{360})}{12\ in/ft}$$

$$= 0.899\ ac\text{-}ft + \left(5.44 \times .9 \times \frac{3.75\ in - 2.35\ in}{12\ in/ft}\right)$$

$$= 1.54\ ac\text{-}ft$$

VOLUME CALCULATIONS

DETENTION POND

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 = $Ab * D + 0.5 * C * D^2$

$C = (At - Ab) / Dt$

ELLEN EQUIPMENT			SITIO BUSINESS PARK*				
POND A			POND B				
Ab = 600.00			Ab = 13.59				
At = 59,732.96			At = 33,417.40				
Dt = 3.50			Dt = 1.50			POND A + B	
C = 16895.13			C = 22269.21				
ACTUAL ELEV.	DEPTH (FT)	VOLUME (AC-FT)	ACTUAL ELEV.	DEPTH (FT)	VOLUME (AC-FT)	VOLUME (AC-FT)	Q (CFS)
4995.20	0.00	0.0000	4995.20	0.00	0.0000	0.0000	0.00
4996.15	0.00	0.0000	4996.15	0.95	0.0003	0.0003	2.23
4996.05	0.85	0.0117	4997.00	1.80	0.0006	0.0123	3.68
4996.80	1.10	0.0273	4997.75	2.55	0.0008	0.0281	4.60
4997.30	1.35	0.0671	4998.25	3.05	0.0010	0.0680	5.12
4998.05	1.60	0.1311	4999.00	3.80	0.0012	0.1323	5.81
4998.30	1.85	0.2194	4999.25	4.05	0.0172	0.2367	6.02
4998.55	2.10	0.3319	4999.50	4.30	0.0652	0.3972	6.23
4998.80	2.35	0.4687	4999.75	4.55	0.1452	0.6139	6.43
4999.05	2.60	0.6297	5000.00	4.80	0.2571	0.8868	6.62
4999.30	2.85	0.8150	5000.25	5.05	0.4010	1.2159	6.81
4999.55	3.10	1.0245	5000.50	5.30	0.5768	1.6013	6.99

$V_{req} = 0.87$ ac-ft

pond top < 4999.5

** DESIGNED UNDER THE CITY DRAINAGE # E15/D14*

Orifice Equation

Q = CA SQRT(2gH)

C =	0.6
Diameter (in)	11
Area (ft^2)=	0.65995262
g =	32.2
H (Ft) =	Depth of water above center of orifice
Q (CFS)=	Flow

SUMMARY OUTPUT FILE

AHYMO PROGRAM SUMMARY TABLE (AHYMO_97) - - VERSION: 1997.02d RUN DATE (MON/DAY/YR) =05/17/2006
INPUT FILE = 458PD USER NO.= AHYMO-I-9702c01000R31-AH

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										PAGE =	1
RAINFALL TYPE= 1										TIME=	.00
COMPUTE NM HYD	101.00	-	10	.00850	24.27	.899	1.98165	1.500	4.460	RAIN6=	2.350
START										PER IMP=	90.00
RAINFALL TYPE= 1										TIME=	.00
COMPUTE NM HYD	102.00	-	20	.00953	27.21	1.007	1.98165	1.500	4.460	RAIN6=	2.350
ADD HYD	103.00	10&20	30	.01803	51.48	1.906	1.98162	1.500	4.460	PER IMP=	90.00
ROUTE RESERVOIR	501.10	30	40	.01803	6.81	1.907	1.98246	2.133	.590	AC-FT=	1.219
FINISH											

5.44 acres

$\frac{4.90\,(2.12) + 54\,(1.13) =}{5.44} = 2$ $E_{4\text{ft}} = 1.92(5.44\text{ ac}) = \frac{10.45}{12} = 0.87$ ac-ft

$\checkmark_{\text{rfd}} = 0.87$ ac-ft >

$t_c = 1.2\text{ hr}$

$Q_{10\text{yr}\,\text{PIM}} = \frac{1.48}{.1013}(.7858\text{ft}^2)(.25)^{2/3}(.1061)^{1/2}$

$A = \pi r^2 = \pi .5^2 =$
$= .785\text{ ft}^2$
$r = \frac{d}{4} = \frac{12}{4} = 3'' = .25\text{ ft}$

$Q = 1.1\text{ cfs}$

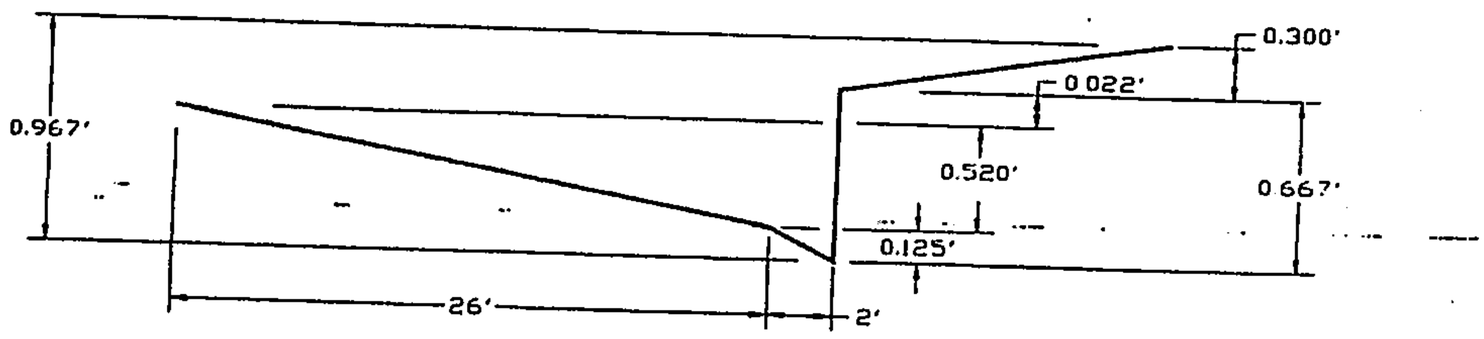
FINDING STREET CAPACITY

Q = 1.49 / n A (A/P)^(2/3) S^½

n = 0.017

SLOPE = 0.00375

86 ROW - 56 FF STREET CROSS-SECTION HALF STREET DETAIL



HALF STREET CALCULATION

@Y ≤0.125

A1 = ½ Y (Y / 0.0625) = 8 Y²

P1 = SQRT[Y² + (Y / 0.0625)²] + Y = SQRT(257 Y²) + Y

FULL STREET FLOW

Y (FT)	A	P	(A/P)^2/3	Q	2Q	V	Fr	D*V	D2
0.0250	0.0050	0.4258	0.0517	0.00	0.00	0.28	0.31	0.01	0.00
0.0500	0.0200	0.8516	0.0820	0.01	0.02	0.44	0.35	0.02	0.01
0.1250	0.1250	2.1289	0.1511	0.10	0.20	0.81	0.05	0.10	0.00

@ 0.125 < Y ≤0.265 & Y1 = Y - 0.125

A2 = A1 + ½ Y1(Y1 / 0.02) + 2 Y1 = A1 + 25 Y1² + 2 Y1

P2 = P1 + SQRT[Y1² + (Y1 / 0.01)²] + Y1 = P1 + SQRT(2501 Y1²) + Y1

0.2000	0.4156	6.0797	0.1672	0.37	0.74	0.89	0.35	0.18	0.04
0.2500	0.7656	8.6302	0.1989	0.82	1.63	1.06	0.38	0.27	0.06
0.3500	1.8406	13.7312	0.2619	2.58	5.16	1.40	0.42	0.49	0.10
0.6450	7.9250	28.7791	0.4233	17.96	35.91	2.27	0.50	1.46	0.23

@ 0.645 < Y ≤0.6667 & Y2 = Y - 0.645

A3 = A2 + 16 Y2

P3 = P2 + Y2

0.6500	8.0050	28.7841	0.4261	18.26	36.51	2.28	0.50	1.48	0.24
0.6600	8.1650	28.7941	0.4316	18.86	37.73	2.31	0.50	1.52	0.24
0.6667	**8.2717**	**28.8008**	**0.4353**	**19.27**	**38.55**	**2.33**	**0.50**	**1.55**	**0.25**

@ 0.6667 < Y ≤0.9667 & Y3 = Y - 0.6667

A4 = A3 + 16 Y3 + ½ (Y3) (Y3 / 0.02) = A3 + 16 Y3 + 25 Y3²

P4 = P3 + SQRT(Y3² + (Y3 / 0.02)²) = P3 + SQRT(2501 Y3²)

0.7000	8.8328	30.4676	0.4380	20.71	41.42	2.34	0.49	1.64	0.25
0.7505	9.7887	32.9931	0.4448	23.31	46.62	2.38	0.48	1.79	0.26
0.8556	12.1870	38.2492	0.4665	30.43	60.86	2.50	0.48	2.14	0.29
0.9667	15.3227	43.8053	0.4964	40.72	81.44	2.66	0.48	2.57	0.33

From City Drainage # B15/D14

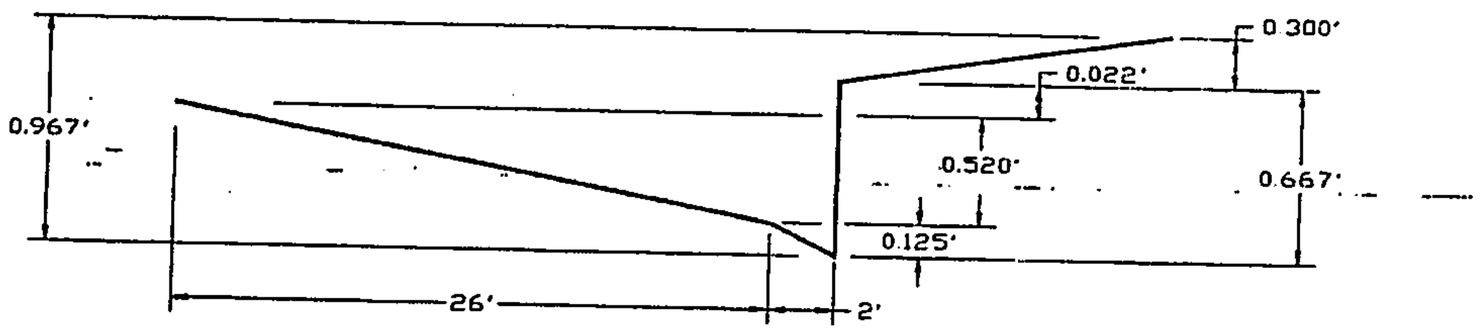
FINDING STREET CAPACITY

Q = 1.49 / n A (A/P)^(2/3) S^½

n = 0.017

SLOPE = 0.01007

86 ROW - 56 FF STREET CROSS-SECTION HALF STREET DETAIL



HALF STREET CALCULATION

@Y ≤0.125

A1 = ½ Y (Y / 0.0625) = 8 Y²

P1 = SQRT[Y² + (Y / 0.0625)²] + Y = SQRT(257 Y²) + Y

FULL STREET FLOW

Y (FT)	A	P	(A/P)^2/3	Q	2Q	V	Fr	D*V	D2
0.0250	0.0050	0.4258	0.0517	0.00	0.00	0.45	0.51	0.01	0.01
0.0500	0.0200	0.8516	0.0820	0.01	0.03	0.72	0.57	0.04	0.02
0.1250	0.1250	2.1289	0.1511	0.17	0.33	1.33	0.04	0.17	0.00

@ 0.125 < Y ≤0.265 & Y1 = Y - 0.125

A2 = A1 + ½ Y1(Y1 / 0.02) + 2 Y1 = A1 + 25 Y1² + 2 Y1

P2 = P1 + SQRT[Y1² + (Y1 / 0.01)²] + Y1 = P1 + SQRT(2501 Y1²) + Y1

0.2000	0.4156	6.0797	0.1672	0.61	1.22	1.47	0.58	0.29	0.09
0.2500	0.7656	8.6302	0.1989	1.34	2.67	1.74	0.61	0.44	0.13
0.3500	1.8406	13.7312	0.2619	4.23	8.46	2.30	0.68	0.80	0.21
0.6450	7.9250	28.7791	0.4233	29.42	58.85	3.71	0.81	2.39	0.49

@ 0.645 < Y ≤0.6667 & Y2 = Y - 0.645

A3 = A2 + 16 Y2

P3 = P2 + Y2

0.6500	8.0050	28.7841	0.4261	29.92	59.83	3.74	0.82	2.43	0.49
0.6600	8.1650	28.7941	0.4316	30.91	61.83	3.79	0.82	2.50	0.50
0.6667	**8.2717**	**28.8008**	**0.4353**	**31.58**	**63.17**	**3.82**	**0.82**	**2.55**	**0.51**

@ 0.6667 < Y ≤0.9667 & Y3 = Y - 0.6667

A4 = A3 + 16 Y3 + ½ (Y3) (Y3 / 0.02) = A3 + 16 Y3 + 25 Y3²

P4 = P3 + SQRT(Y3² + (Y3 / 0.02)²) = P3 + SQRT(2501 Y3²)

0.7000	8.8328	30.4676	0.4380	33.94	67.88	3.84	0.81	2.69	0.52
0.7505	9.7887	32.9931	0.4448	38.20	76.39	3.90	0.79	2.93	0.55
0.8556	12.1870	38.2492	0.4665	49.87	99.74	4.09	0.78	3.50	0.61
0.9667	15.3227	43.8053	0.4964	66.73	133.45	4.35	0.78	4.21	0.69

From City Drainage # E15/D14

Trench Drain Flow Calculations

Orifice Equation: $Q=CA\sqrt{(2gh)}$

Q = ? cfs (maximum runoff)

C = 0.6

g = 32.20

h = 4.80'

A= 1.18 sf

$Q = 0.60 \times 1.18\sqrt{(2 \times 32.2 \times 4.80)}$

Q = 12.45 cfs (maximum capacity)

The actual poding depth from AHYMO output file is at 5000.25' & h=4.05'.

Therefore,

$Q = 0.60 \times 1.18\sqrt{(2 \times 32.2 \times 4.05)}$

Q = 11.43 cfs (actual flow)

12" SD Flow Calculations

Orifice Equation: $Q=CA\sqrt{(2gh)}$

Q = ? cfs (maximum runoff)

C = 0.6

g = 32.20

h = 4.80'

A= 0.7854 sf

$Q = 0.60 \times 1.18\sqrt{(2 \times 32.2 \times 0.7854)}$

Q = 8.29 cfs (maximum capacity)

The actual poding depth from AHYMO output file is at 5000.25' & h=4.05'.

Therefore,

$Q = 0.60 \times 0.7854\sqrt{(2 \times 32.2 \times 4.05)}$

Q = 7.61 cfs (actual flow)