

CITY OF ALBUQUERQUE



December 22, 2014

Asa Nilsson-Weber, P.E.
128 Monroe St NE
Albuquerque, NM 87108

**Re: Legends at High Desert-Emergency Overflow Supplemental Drainage
Calculations
Engineer's Stamp Date 12-09-14 (E23D003B)**

Dear Ms. Nilsson-Weber,

Based upon the information provided in your submittal received 12-10-14, the above referenced report is approved for the emergency overflow and for Building Permit on Lot 28 with the following condition:

Construction details for the domed grate inlet are to be included in the Building Permit set. An engineer's certification of the site and the inlet is required to obtain a Certificate of Occupancy.

PO Box 1293

If you have any questions, you can contact me at 924-3986.

Albuquerque

New Mexico 87103

www.cabq.gov

Sincerely,

Curtis Cherne, P.E.
Principal Engineer, Hydrology
Planning Dept.

C: e-mail

DECEMBER 9, 2014

SUPPLEMENTAL DRAINAGE CALCULATIONS

FOR

THE LEGENDS AT HIGH DESERT

Cortaderia St. & Academy Rd. NE

BY



ISAACSON & ARFMAN, P.A.

Consulting Engineering Associates

Thomas O. Isaacson, PE & LS [Ret.]

Fred C. Arfman, PE

Åsa Nilsson-Weber, PE

I&A Project No. 2044

DECEMBER 9, 2014

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Cortaderia St. & Academy Rd. NE



Åsa Nilsson-Weber 12-09-14

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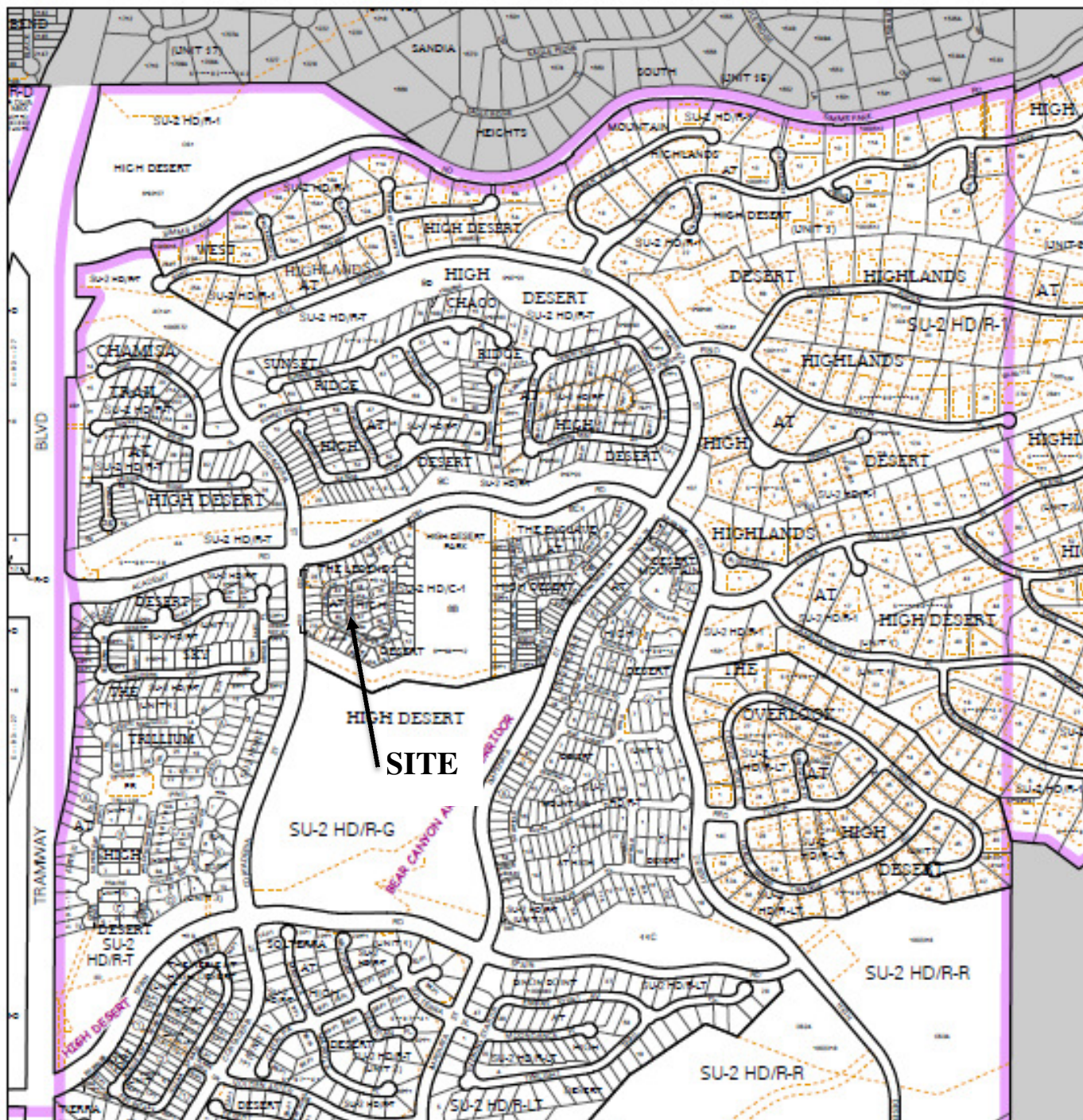
VICINITY MAP

PROJECT INFORMATION

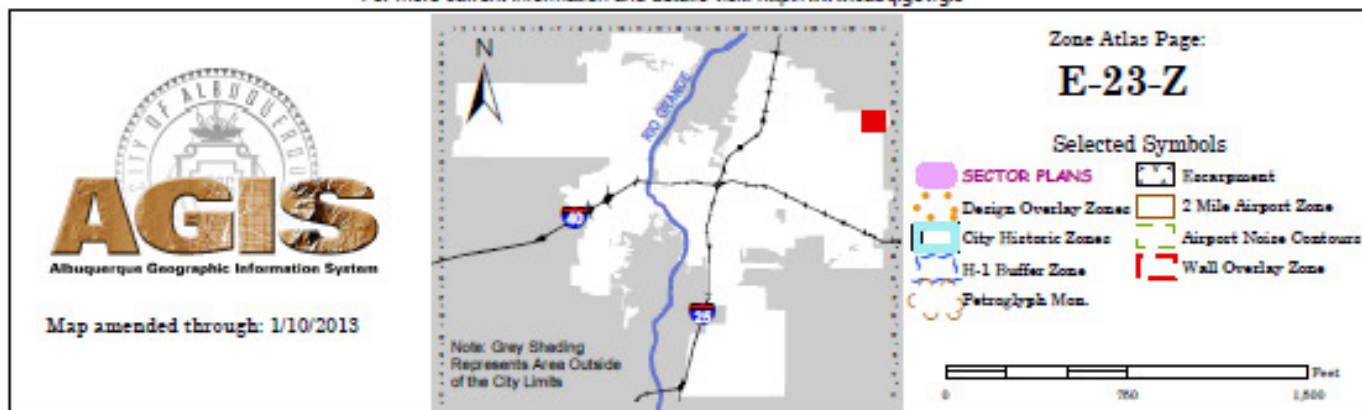
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- **Wall Opening Calculations**
- **Inlet Capacity Calculations**
- **Hydraflow Storm Sewer Calculations**
 - **12" storm drain calculations**
 - **18"–30" storm drain calculations**



For more current information and details visit: <http://www.cabq.gov/gis>



PROJECT INFORMATION

LEGAL DESCRIPTION: The Legends at High Desert

ENGINEER: Isaacson & Arfman, P.A.
128 Monroe Street NE
Albuquerque, NM 87108
(505) 268-8828
Attn: Åsa Nilsson-Weber

SURVEYOR: Cartesian Surveys, Inc.
(505) 896-3050
Attn: Will Plotner

DEVELOPER: Las Ventanas Homes, LLC
PO Box 10660
Albuquerque, NM 87184
(505) 362-6824
Attn: Scott Ashcraft

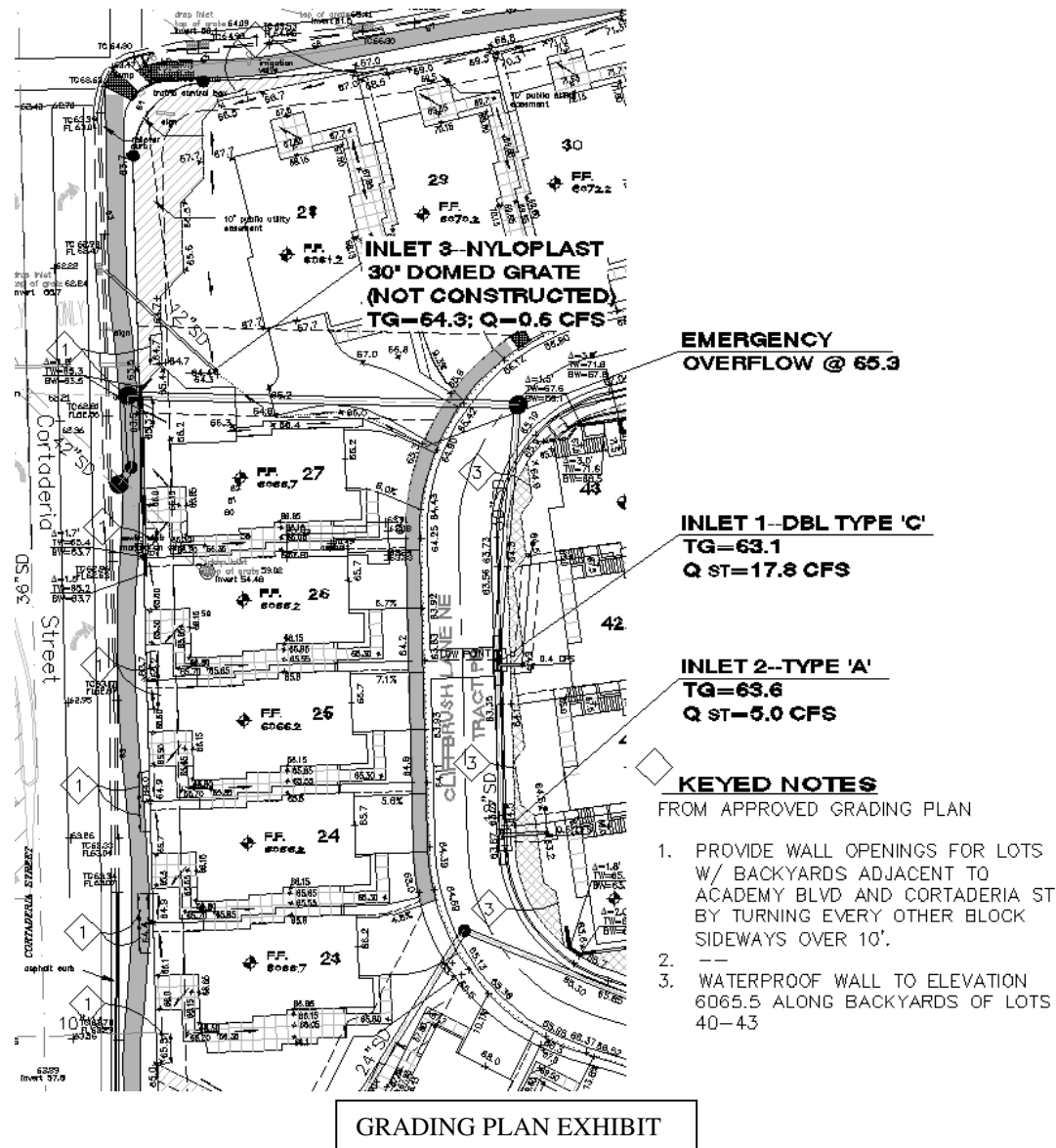
I. INTRODUCTION

The proposed site is located southeast of the intersection of Academy Rd and Cortaderia St. High Desert Park bounds the site to the south and to the east. The drainage report for the subdivision development was prepared by Isaacson & Arfman in September 2005.

This report will analyze the emergency overflow in case the sump inlet in Cliffbrush Ln. clogs.

II. EXISTING CONDITIONS

There is a double Type 'C' sump inlet (Inlet 1) and an upstream Type 'A' inlet (Inlet 2) in Cliffbrush Ln. The intent of the grading plan was to provide emergency overflow via a back-up inlet (Inlet 3) located on Lot 28 with a 12-inch pipe connecting to an inlet in Cortaderia St. along with wall openings in the Cortaderia St. perimeter wall. The 12-inch storm drain has been constructed, but the inlet and wall openings have not been constructed. The wall openings adjacent to Cortaderia St. and Academy Rd. for lots 23-34 have not been constructed either.



III. PROPOSED CONDITIONS

The inlets were analyzed for two scenarios with the grates being clogged to various degrees. The table below summarizes the inlet and wall opening capacities based on the overflow elevation of 65.3 for the emergency overflow condition (see Appendix A for calculations).

INLET CAPACITIES

SCENARIO 1 - Normal Condition

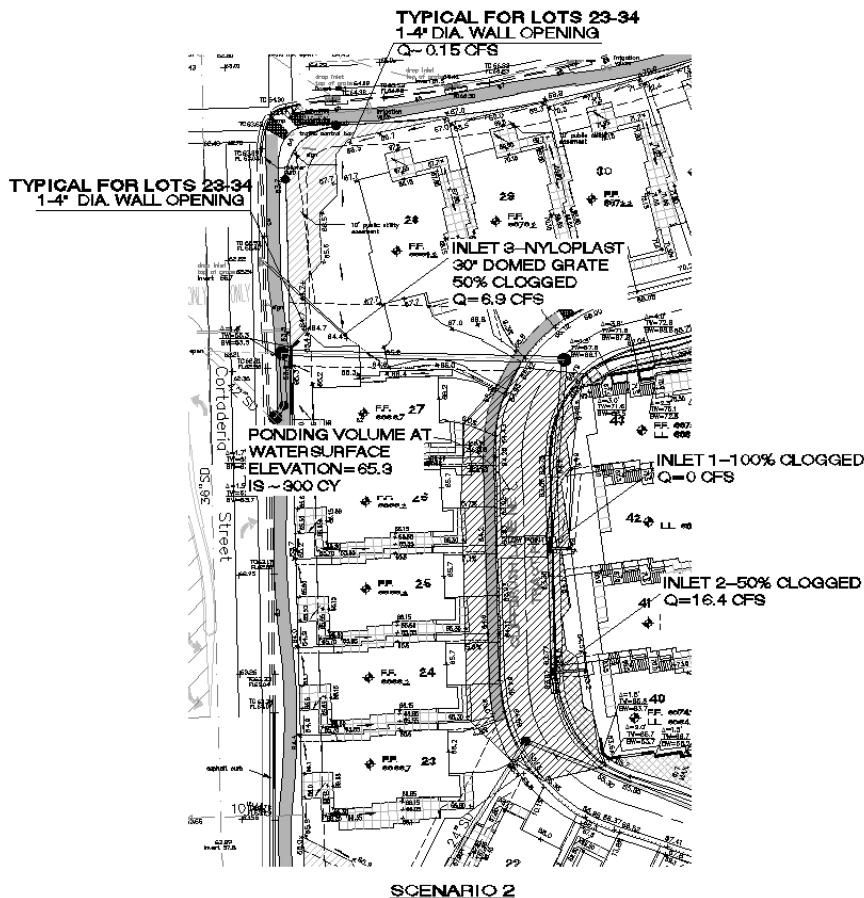
INLET 1 - 50% CLOGGED	17.8	cfs	(sump @ 0.5' head)
INLET 2 - 0% CLOGGED	5.5	cfs	(on grade)
	23.3	cfs	Actual=22.8 cfs

SCENARIO 2 -Emergency Overflow Condition

INLET 1 - 100% CLOGGED	0	cfs	
INLET 2 - 50% CLOGGED	16.4	cfs	(sump)
INLET 3 50% CLOGGED	6.9	cfs	(sump)
4" DIA. WALL OPENING - 50% CLOGGED	0.4	cfs	
	23.7	cfs	Actual=23.4 cfs

Scenario 1 shows the “normal condition” at a water depth of 0.5’ at the sump inlet.

Scenario 2 shows that if the street sump inlet (#1) is completely clogged, the flows will be captured by the upstream street inlet (#2), inlet (#3) and the wall opening on Lot 28—all emergency overflow inlets and wall opening assumed 50% clogged.

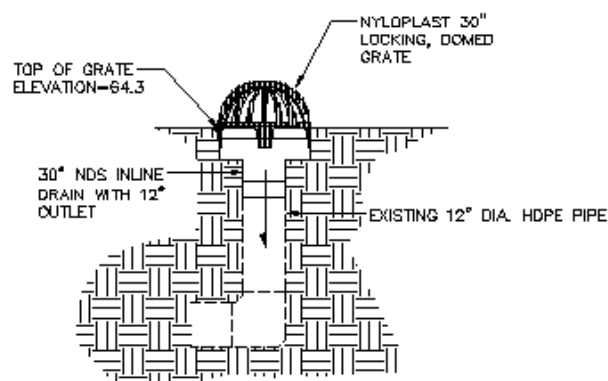
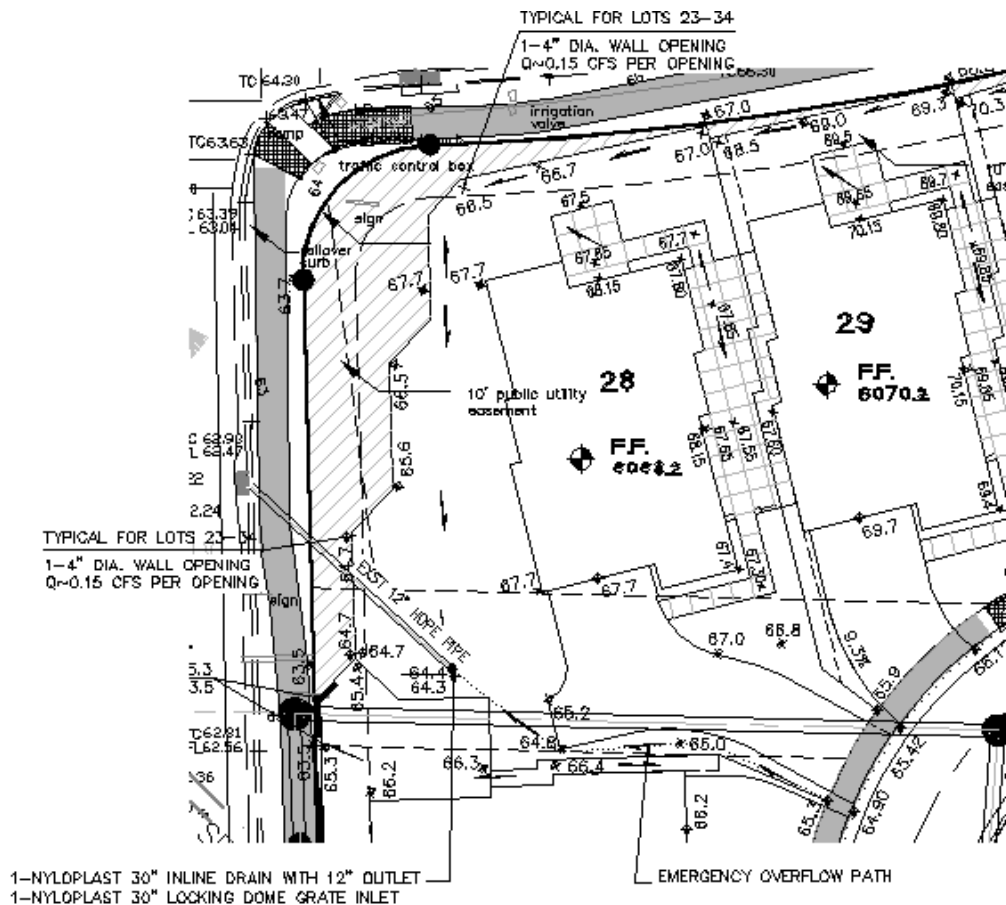


There is also a storage volume of approximately 8,000 cubic feet in the street should the water rise to the emergency overflow elevation of 65.3.

The 30" domed grate, emergency overflow path and 4" dia. wall opening on Lot 28 adjacent to the domed grate inlet (#3) shall be constructed prior to grading certification for lots 23-28.

The 4" dia backyard wall openings on lots 23-34 shall also be constructed on each lot prior to grading certification for each lot.

See below for an enlarged view of Lot 28 grading and inlet detail.



IN-LINE DRAIN WITH DOMED GRATE

IV. SUMMARY

In case the double type 'C' sump inlet in Cliffbrush Ln. would completely clog, the upstream Type 'A' inlet and the domed grate inlet on Lot 28 (both inlets assumed 50% clogged), the 4" diameter wall opening (assumed 50% clogged) along with ponding in the street would capture the flows.

The 30" domed grate inlet, emergency overflow path and 4" dia. wall opening on Lot 28 adjacent to the domed grate inlet (#3) shall be constructed prior to grading certification for lots 23-28.

The backyard wall openings (4" dia.) on lots 23-34 shall also be constructed on each lot prior to grading certification for that lot.

APPENDIX A

Calculations

- **Wall Opening Capacity Calculations**
- **Inlet Capacity Calculations**
- **Hydraflow Storm Sewer Calculations**
 - **12" storm drain calculations**
 - **18"-30" storm drain calculations**

LEGENDS AT HIGH DESERT

4" Dia. Wall opening--Applies to Lots 23-34. Actual Q=0.15 cfs per opening

Assumed 0.2' from midpoint of wall opening to wsel

ORIFICE EQUATION - WALL OPENING 4" dia. opening

$$Q = C * A * (2 * g * h)^{0.5}$$

Where

C	=	0.6	
A	=	0.3490659	sq.ft.
g	=	32.2	ft/sec^2
h	=	0.2	ft

depth of flow at opening from the center of culvert

Using orifice equation $Q = CA * (2gh)^{0.5}$

$$Q = 0.75 \text{ cfs per wall opening}$$

SUMP INLET CALCULATIONS

GRATE OPEN AREA:

(per COA std dwg #2220, single grate)

GROSS AREA FOR ONE GRATE = (25 in/12)(40 in/12) =	6.94 SF
LESS BEARING BARS = (0.5 in/12)(3.33 ft)(13) =	1.80 SF
LESS CROSS BARS = (0.5 in/12)(7)[(25 in/12)-(13)(0.5 in/12)] =	0.45 SF

GRATE OPEN AREA (assuming 0% clogging factor) = 4.69 SF

GRATE OPEN AREA (assuming 50% clogging factor) = 2.35 SF

ORIFICE EQUATION:

$$Q = CA(2gh)^{1/2}$$

Where:

C =	0.67	
A =	2.35 ft ²	50% clogging
A =	4.69 ft ²	0% clogging
g =	32.2 ft/sec ²	
h =	height of the water surface above the grate	

ELEVATION AT OVERFLOW=65.3

TOP GRATE INLET 1=63.1	HEAD INLET 1=	2.2'	Q=17.8 cfs street	0.4 cfs
TOP GRATE INLET 2=63.6	HEAD INLET 2=	1.7'	Q=5.0 cfs street	0.5 cfs
			Q=22.8 cfs total street	
			Q=23.7 cfs total SD (0.9 cfs from Lots 40-43)	
TOP GRATE INLET 3=64.3	HEAD INLET 3=	1.0'	Q=0.6 cfs (lot 28 yard)	

Assuming a 50% clogging factor

CAPACITY CALCULATIONS:

INLET #	1
LOCATION:	CLIFFBRUSH LN - NORTH TYPE DBL 'C' SUMP INLET
h =	0.50 ft
Q _(capacity) =	8.92 cfs
# Grates =	2
Total Q _(capacity) =	17.8 cfs with 50% clogging factor

INLET #	2
LOCATION:	CLIFFBRUSH LN - SOUTH ON-GRADE TYPE 'A' INLET ACTING AS A SUMP INLET IF INLET 1 IS 100% CLOGGED
h =	1.70 ft
Q _(capacity) =	16.44 cfs
# Grates =	1
Total Q _(capacity) =	16.4 cfs with 50% clogging factor

INLET #	3
LOCATION:	LOT 28 ESMT TYPE 'D' SUMP INLET (TG=64.3; WSEL=65.3)
h =	1.00 ft
Q _(capacity) =	13.80 cfs
	See Nyloplast Inlet Capacity Chart
Total Q _(capacity) =	6.9 cfs with 50% clogging factor

INLET CAPACITIES

SCENARIO 1 - Normal Condition

INLET 1 - 50% CLOGGED	17.8 cfs	(sump @ 0.5' head)
INLET 2 - 0% CLOGGED	5.5 cfs	(on grade)
	23.3 cfs	Actual=22.8 cfs

SCENARIO 2 -Emergency Overflow Condition

INLET 1 - 100% CLOGGED	0 cfs	
INLET 2 - 50% CLOGGED	16.4 cfs	(sump)
INLET 3 - 50% CLOGGED	6.9 cfs	(sump)
4" DIA. WALL OPENING -		
50% CLOGGED	0.4 cfs	
	<u>23.7 cfs</u>	Actual=23.4 cfs

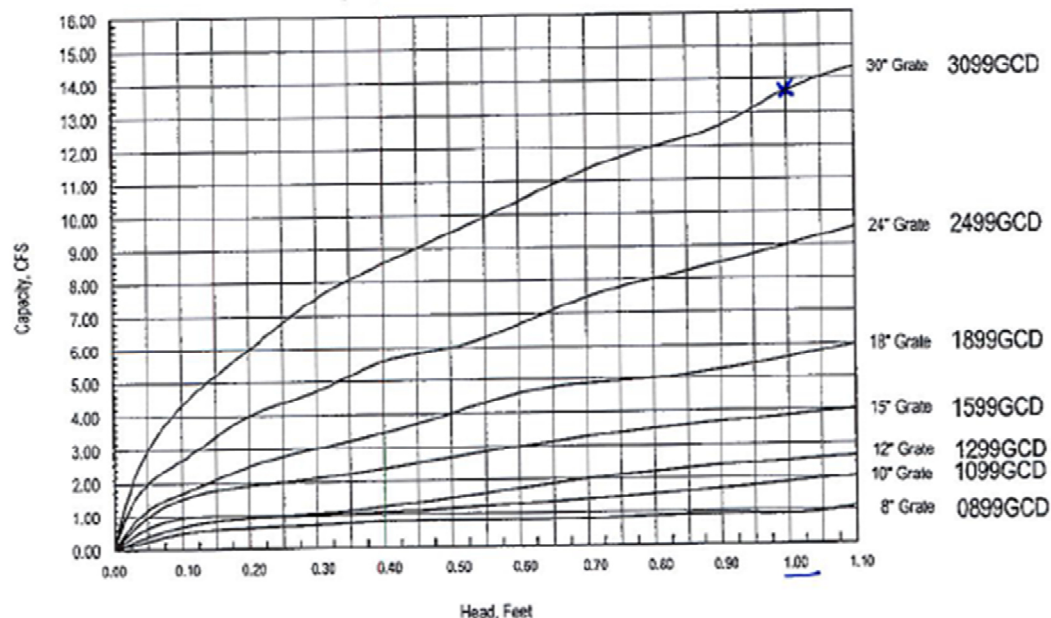
Ponding Volume in street @ wsel=65.3 is 300 cy

Nyloplast Dome Grate Inlet Capacity Chart

This chart is based on equations from the FAA Airport Drainage AC 150/5320-5B, 1970, Page 35. Certain assumptions have been made and no two installations will necessarily perform the same way. Safety factors should change with site conditions such that a safety factor 1.25 should be used for an inlet in pavement, and a safety factor of 2.0 should be used in turf areas.

Basin Outlet Pipe Size	Flow Rate CFS *
4"	0.229
6"	0.662
8"	1.441
10"	2.612
12"	4.152
15"	7.126
18"	12.163
24"	25.821
30"	52.173

Nyloplast Dome Grates 8" - 30"



* Maximum flow capacity before drain basin begins to backfill.
Calculation based on an average pipe slope of 1%.

$$H = 1.0'$$

$$Q = 13.8 \text{ cfs}$$

$$Q @ 50\% \text{ clogged} = 6.9 \text{ cfs.}$$

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DATE 07MAR00
APPD BY CJA
DATE 07MAR00
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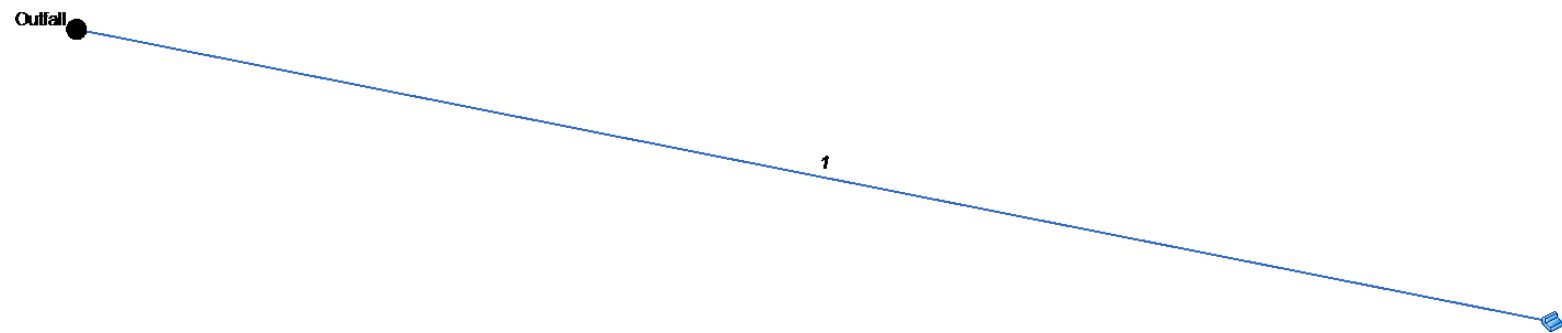
MATERIAL
PROJECT NO./NAME
GRATE / COVER
SCALE 1:2 SHEET 1 OF 1

Nyloplast

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TITLE
8" - 30" DOME INLET CAPACITY
DWG NO. 7001-110-000 REV C

1454 12-inch sd

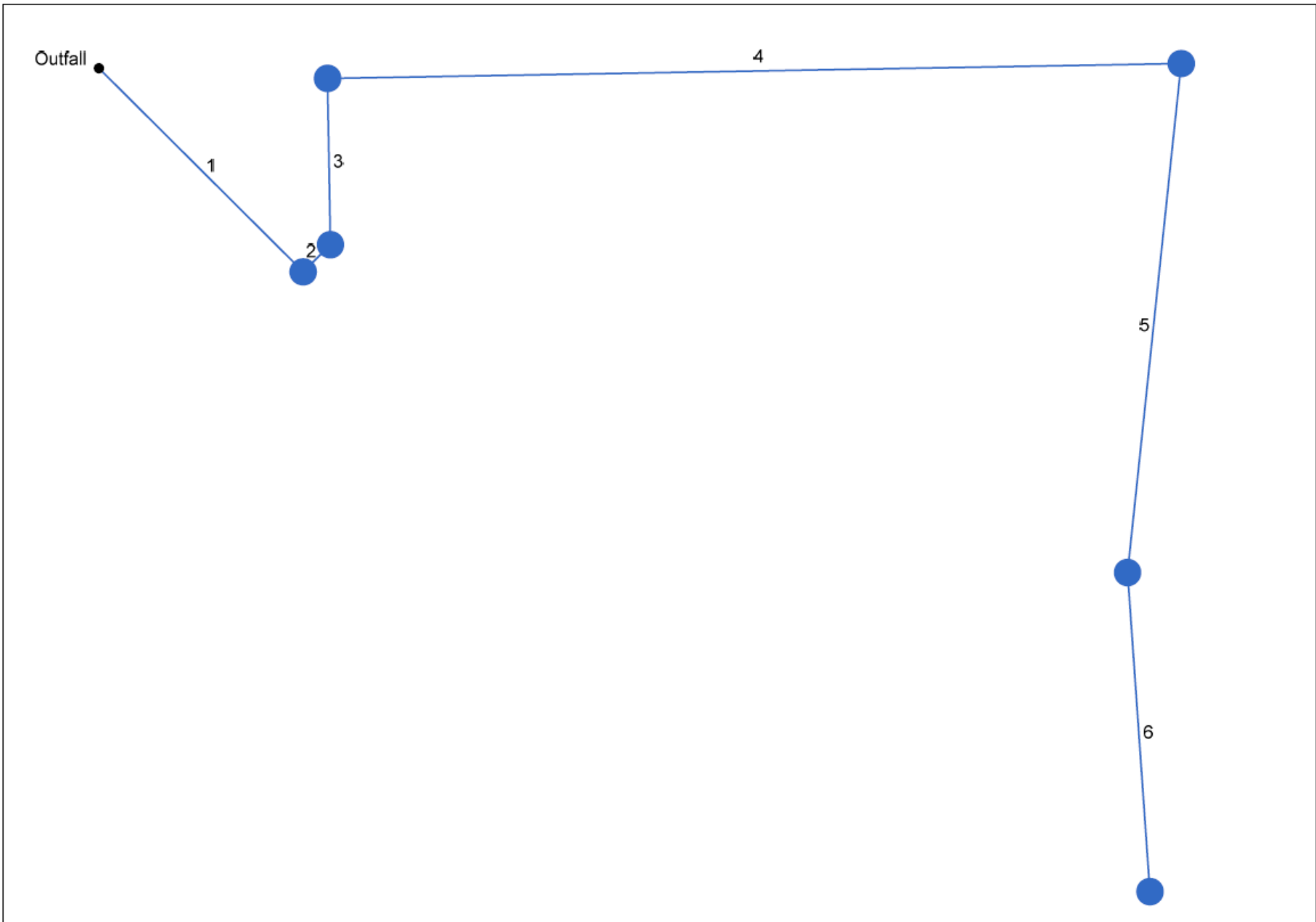


Storm Sewer Summary Report

Line No.	Line ID	Flow rate (cfs)	Line Size (in)	Line shape	Line length (ft)	Invert EL Dn (ft)	Invert EL Up (ft)	Line Slope (%)	HGL Down (ft)	HGL Up (ft)	Minor loss (ft)	HGL Junct (ft)	Dns Line No.	Junction Type
1		6.90	12	Cir	51.500	55.90	61.40	10.680	58.90	62.37	n/a	62.37 j	End	Generic
									Number of lines: 1			Run Date: 12/8/2014		
NOTES: Return period = 100 Yrs. ; j - Line contains hyd. jump.														

Storm Sewer Tabulation

Station		Len (ft)	Drng Area		Rnoff coeff (C)	Area x C		Tc		Rain (I) (in/hr)	Total flow (cfs)	Cap full (cfs)	Vel (ft/s)	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line		Incr (ac)	Total (ac)		Incr (min)	Total (min)	Inlet (min)	Syst (min)					Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
1	End	51.500	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	6.90	11.64	8.82	12	10.68	55.90	61.40	58.90	62.37	62.20	64.40	
1454 12-inch sd																Number of lines: 1				Run Date: 12/8/2014		
NOTES:Intensity = 127.16 / (Inlet time + 17.80) ^ 0.82 ; Return period =Yrs. 100 ; c = cir e = ellip b = box																						



Project File: 1454SDALT2NW.stm	Number of lines: 6	Date: 12/2/2014
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Storm Sewer Summary Report

Line No.	Line ID	Flow rate (cfs)	Line Size (in)	Line shape	Line length (ft)	Invert EL Dn (ft)	Invert EL Up (ft)	Line Slope (%)	HGL Down (ft)	HGL Up (ft)	Minor loss (ft)	HGL Junct (ft)	Dns Line No.	Junction Type
1	EX MH-MH2A	16.40	42	Cir	45.000	6052.87	6053.32	0.999	6056.60	6056.61	0.05	6056.66	End	Manhole
2	MH2A-3A	16.40	30	Cir	6.000	6053.42	6053.54	2.002	6056.66*	6056.67*	0.13	6056.80	1	Manhole
3	MH3A-4A	16.40	30	Cir	26.000	6053.64	6054.42	2.999	6056.80	6056.83	0.18	6057.01	2	Manhole
4	MH4A-1	16.40	30	Cir	133.000	6054.52	6057.49	2.233	6057.01	6058.86	n/a	6058.86 j	3	Manhole
5	INLET 1	16.40	30	Cir	80.000	6057.59	6058.39	1.000	6058.86	6059.76	0.28	6060.04	4	Generic
6	INLET 2	16.40	18	Cir	50.000	6058.59	6059.40	1.620	6060.09*	6061.31*	1.34	6062.65	5	Generic
									Number of lines: 6			Run Date: 12/2/2014		
NOTES: Return period = 100 Yrs. ; *Surcharged (HGL above crown). ; j - Line contains hyd. jump.														

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (l)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line		Incr	Total		Incr	Total	Inlet	Syst					Size	Slope	Dn	Up	Dn	Up	Dn	Up	
		(ft)	(ac)	(ac)	(C)			(min)	(min)	(in/hr)	(cfs)	(cfs)	(ft/s)	(in)	(%)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	
1	End	45.000	0.00	0.00	0.00	0.00	0.00	0.0	1.3	0.0	16.40	100.6	1.73	42	1.00	6052.87	6053.32	6056.60	6056.61	6062.21	6062.90	EX MH-MH2A
2	1	6.000	0.00	0.00	0.00	0.00	0.00	0.0	1.3	0.0	16.40	58.03	3.34	30	2.00	6053.42	6053.54	6056.66	6056.67	6062.90	6062.95	MH2A-3A
3	2	26.000	0.00	0.00	0.00	0.00	0.00	0.0	1.2	0.0	16.40	71.02	3.36	30	3.00	6053.64	6054.42	6056.80	6056.83	6062.95	6063.50	MH3A-4A
4	3	133.000	0.00	0.00	0.00	0.00	0.00	0.0	0.5	0.0	16.40	61.29	4.65	30	2.23	6054.52	6057.49	6057.01	6058.86	6063.50	6065.44	MH4A-1
5	4	80.000	0.00	0.00	0.00	0.00	0.00	0.0	0.1	0.0	16.40	41.02	6.26	30	1.00	6057.59	6058.39	6058.86	6059.76	6065.44	6063.08	INLET 1
6	5	50.000	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	16.40	13.37	9.28	18	1.62	6058.59	6059.40	6060.09	6061.31	6063.08	6063.59	INLET 2
																Number of lines: 6				Run Date: 12/2/2014		
NOTES: Intensity = 127.16 / (Inlet time + 17.80) ^ 0.82 ; Return period =Yrs. 100 ; c = cir e = ellip b = box																						