

Hydrology

Hydrology Calculations

The following calculations are based on Albuquerque's Development Process Manual, Section 22.2

Runoff Rate:

Treatment Type Areas	Subbasin	Area (ac)	Area (ac)	Area (ac)	Area (ac)	Total (ac)
Subbasin North	0	0.0678	0.0678	0.9944	1.1300	
Subbasin South	0	0.0510	0.0510	1.5980	1.7000	
Subbasin West	0	0.2795	0.0850	0.5355	0.8500	
Subbasin East	0	0.3000	0.2100	0.1800	0.6000	
Subbasin North East	0	0.0240	0.0240	0.0720	0.1200	

Water Quality

Required Water Quality volume for first flush of 0.34"

Subbasin	Required Volume (Cu. Ft.)	Drains to	Volume Provided (Cu. Ft.)
Subbasin North	1,227	North Pond	1,230
Subbasin South	1,972	South Pond	1,970
Subbasin West	661	West Pond	665
Subbasin East	222	Ponds 1-4 (Total Area)	4,545 Retained
Subbasin North East	89	North East Pond	1,290 Retained
Total	4,171	WQ Ponding TOTAL	11,175

Volume

Calculations for 100yr-10day Volume for subbasins East and Northeast

From table A-8 in the COA DPM, the values of excess precipitations for each treatment type in zone 3 are:

E_{A1}	0.66"
E_{A2}	0.92"
E_{A3}	1.29"
E_{A4}	2.36"

The weighted excess precipitation for each treatment type is calculated as following:

$$\text{Weighted } E = \frac{E_{A1} \cdot A_{A1} + E_{A2} \cdot A_{A2} + E_{A3} \cdot A_{A3} + E_{A4} \cdot A_{A4}}{A_{A1} + A_{A2} + A_{A3} + A_{A4}}$$

The weighted E was multiplied by each subbasin area to get 360 min (6 hr) volume. Then, the following equation (a-9) was used to get the 10-day volume:

$$V_{10\text{days}} = V_{6\text{hr}} + A_{\text{sub}} \cdot (P_{10\text{days}} - P_{6\text{hr}}) / 12 \text{ in ft}$$

P values were taken from table A-2, for Zone 3:

$P_{6\text{hr}} = 4.90$
$P_{10\text{days}} = 2.60$

The calculated V10-day for subbasins North East and East:

Subbasin	V360 (Cu. Ft.)	V10days (Cu. Ft.)
Subbasin East	3226.71	4729.5
Subbasin North East	809.34	1410.5

A-HYMO - Input

* PROJECT NAME: LEGACY NAA APARTMENTS PHASE 2
 * JOB NO. - 03231
 * DATE: Jan. 19 2018
 * INPUT FILE NAME: NAAHF.hym
 * OUTPUT FILE NAME: NAAHF.out
 * MODIFIED BY: NRIIT F. ON JAN. 19 2018
 * BASIN 117.2-NORTH WAS REPLACED WITH SUBBASINS NORTH & WEST
 * BASIN 117.3-SOUTH WAS REPLACED WITH SUBBASIN SOUTH

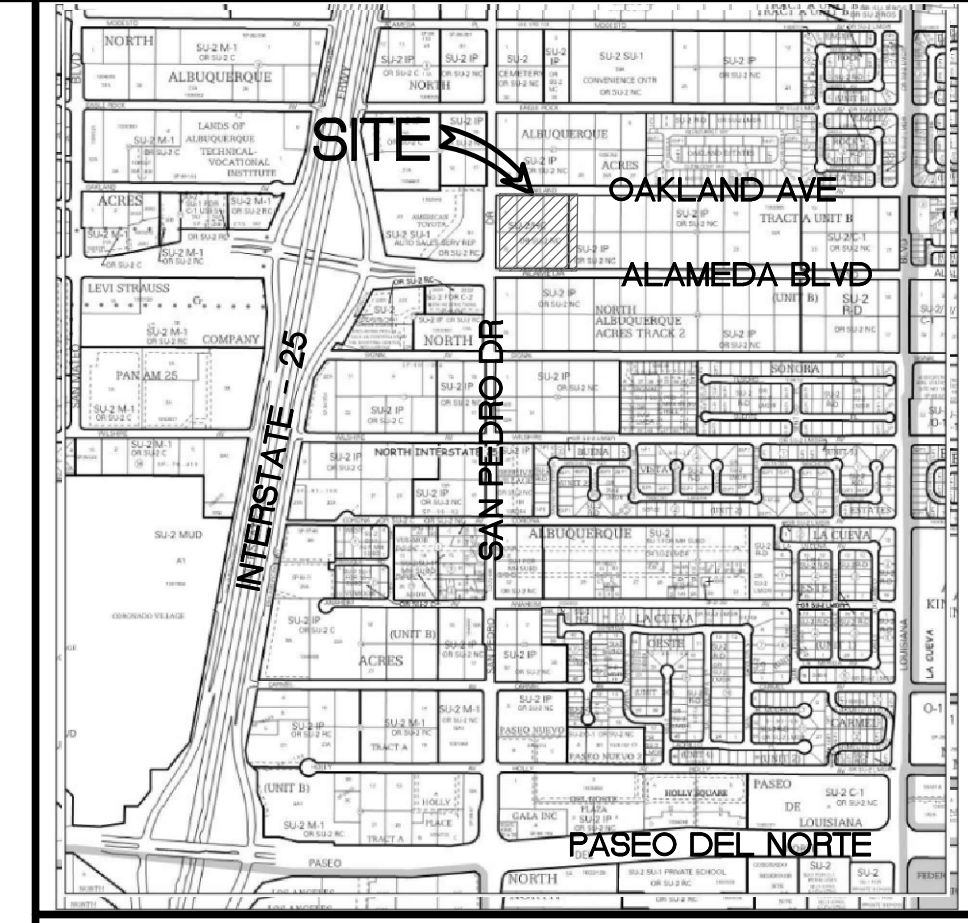
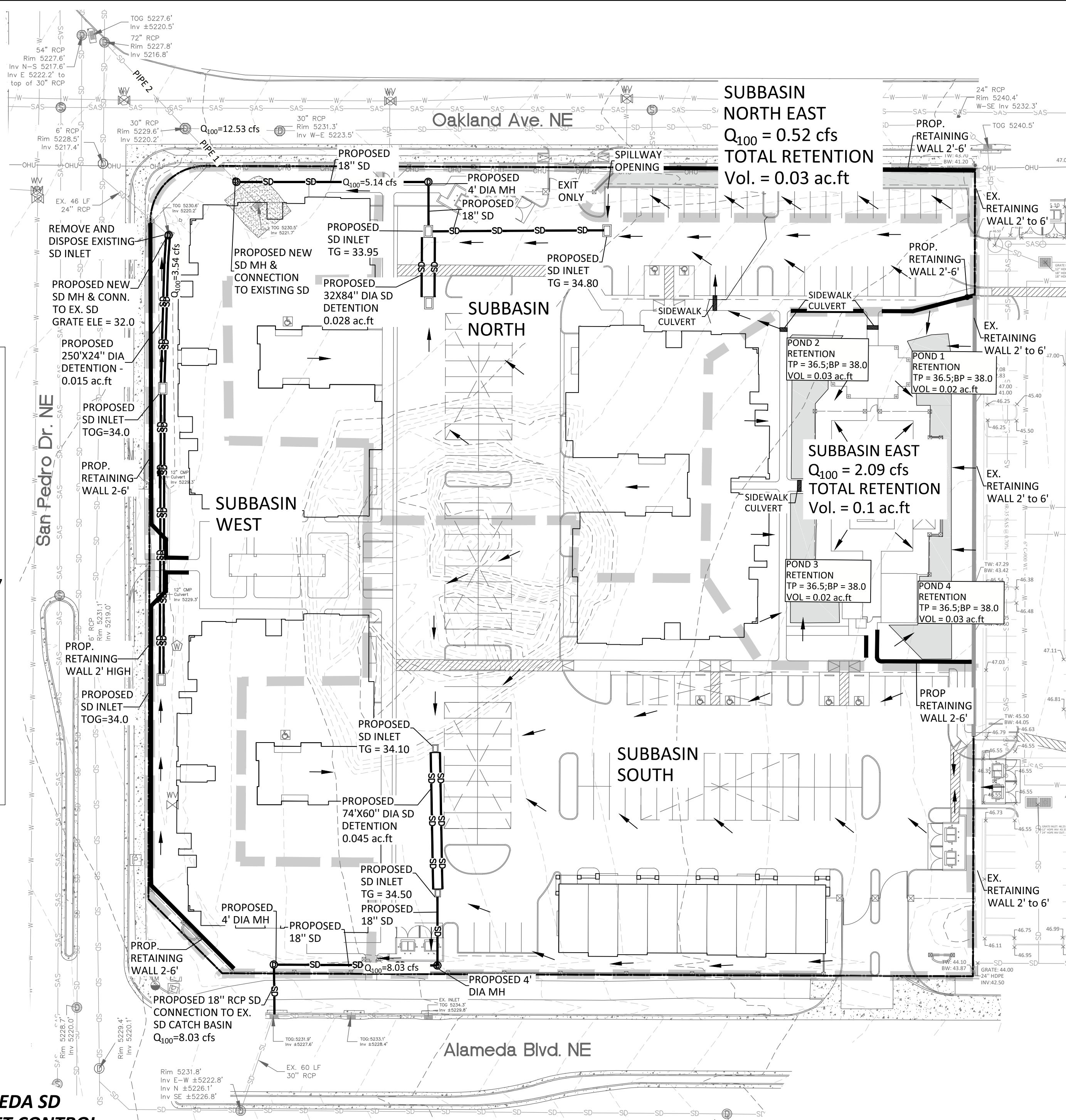
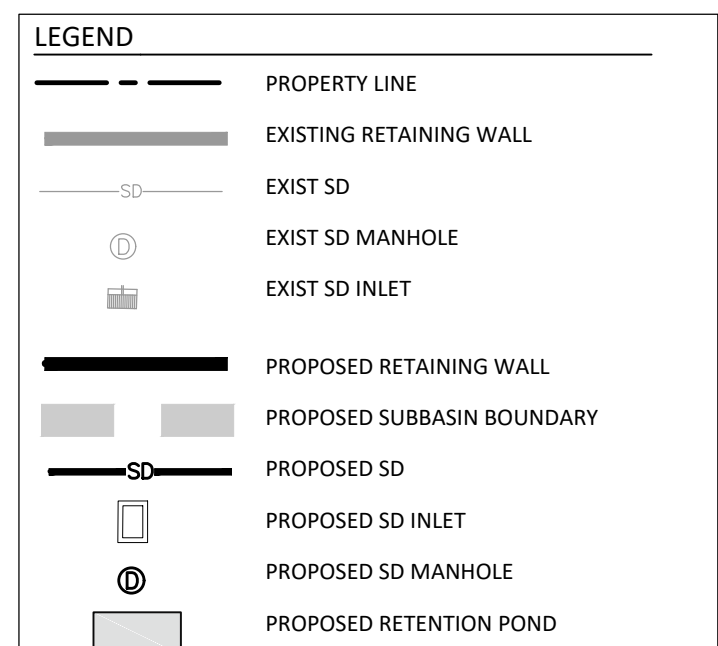
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***** SUBBASIN EAST
COMPUTE NM HYD ID=6 HYD NO=BasinEast DA=0.00094 SQ MI
PER A=0 PER B=50 PER C=20 PER D=30
TP=0.1333 HR MASS RAIN=1
ID=6 CODE=20
PRINT HYD
***** SUBBASIN NORTH EAST
COMPUTE NM HYD ID=7 HYD NO=BasinNorthEast DA=0.00019 SQ MI
PER A=0 PER B=20 PER C=20 PER D=60
TP=0.1333 HR MASS RAIN=1
ID=7 CODE=20
PRINT HYD
***** SUBBASIN SOUTH
COMPUTE NM HYD ID=8 HYD NO=BasinSouth DA=0.0026 SQ MI
PER A=0 PER B=30 PER C=6 PER D=88
TP=0.1333 HR MASS RAIN=1
ID=8 CODE=20
PRINT HYD
***** SUBBASIN WEST
COMPUTE NM HYD ID=5 HYD NO=BasinWest DA=0.00133 SQ MI
PER A=0 PER B=27 PER C=10 PER D=63
TP=0.1333 HR MASS RAIN=1
ID=5 CODE=20
PRINT HYD
***** SUBBASIN NORTH
COMPUTE NM HYD ID=3 HYD NO=BasinNorth DA=0.0017 SQ MI
PER A=0 PER B=30 PER C=3 PER D=94
TP=0.1333 HR MASS RAIN=1
ID=3 CODE=20
PRINT HYD
***** RESPEC CALCULATIONS
***** SUBBASIN NORTH
COMPUTE NM HYD ID=3 HYD NO=BasinNorth DA=0.0017 SQ MI
PER A=0 PER B=30 PER C=3 PER D=94
TP=0.1333 HR MASS RAIN=1
ID=3 CODE=20
PRINT HYD
***** SUBBASIN SOUTH
COMPUTE NM HYD ID=4 HYD NO=BasinSouth DA=0.0026 SQ MI
PER A=0 PER B=30 PER C=6 PER D=88
TP=0.1333 HR MASS RAIN=1
ID=4 CODE=20
PRINT HYD
***** SUBBASIN WEST
COMPUTE NM HYD ID=5 HYD NO=BasinWest DA=0.00133 SQ MI
PER A=0 PER B=27 PER C=10 PER D=63
TP=0.1333 HR MASS RAIN=1
ID=5 CODE=20
PRINT HYD
    
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A-HYMO - Output

HYMO PROGRAM SUMMARY TABLE (HYMO_97) - VERSION: 1997.02c - RUN DATE (MON, DAY/YR) = 02/13/2018
 INPUT FILE = NAAHF.TXT USER NO. = AHYMO-C-9803e010NM12B-AH

COMMAND	HYDROGRAPH IDENTIFICATION	FROM ID	TO ID	AREA (SQ MI)	PEAK DISCHARGE (CFS)	RUNOFF VOLUME (AC-FT)	RUNOFF PEAK (INCHES)	TIME TO PEAK (HOURS)	CFS PER ACRE	PAGE	NOTATION
**	PROJECT NAME: LEGACY APARTMENTS PHASE 2										
**	JOB NO. = 03231										
**	DATE: Jan. 19 2018										
**	INPUT FILE NAME: NAAHF.hym										
**	OUTPUT FILE NAME: NAAHF.out										
**	RAINFALL TYPE= 2										
**	***** COMPUTE SAN PEDRO STORM DRAIN PROJECT (THOMPSON REPORT)										
**	***** BASIN 117.2-NORTH										
**	COMPUTE NM HYD SPSPD.BASIN.	1	1	.00348	8.67	.360	1.94076	1.500	3.894	PER IMP=	50.00
**	***** RESPEC CALCULATIONS										
**	***** SUBBASIN NORTH										
**	COMPUTE NM HYD BasinNorth	3	3	.00170	5.13	.240	2.64497	1.500	4.717	PER IMP=	88.00
**	***** SUBBASIN SOUTH										
**	COMPUTE NM HYD BasinSouth	4	4	.00260	8.03	.381	2.75109	1.500	4.828	PER IMP=	94.00
**	***** SUBBASIN WEST										
**	COMPUTE NM HYD BasinWest	5	5	.00133	3.54	.154	2.17270	1.500	4.164	PER IMP=	63.00
**	***** SUBBASIN EAST										
**	COMPUTE NM HYD BasinEast	6	6	.00094	2.09	.079	1.56591	1.500	3.477	PER IMP=	30.00
**	***** SUBBASIN NORTH EAST										
**	COMPUTE NM HYD BasinNorthEast	7	7	.00019	.52	.022	2.14977	1.500	4.316	PER IMP=	60.00
**	** EAST POND RATING CURVE										
**	ROUTE RESERVOIR POND1	6	8	.00094	.01	.016	.31302	7.950	.011	AC-FT=	.069
**	** NORTH EAST POND RATING CURVE										
**	ROUTE RESERVOIR POND2	7	9	.00019	.01	.013	1.30599	2.650	.061	AC-FT=	.017
**	ADD HYD NorthEast-Northeast	3410	11	.00283	5.14	.269	1.78040	1.500	2.836	Subbasin North + West = 8.68 cfs, Allowable = 8.64 cfs (DPM)	



Background
 Phase 2 of the Legacy NAA Apartments account for 4.44 acres within the City of Albuquerque, Bernalillo County, New Mexico. This property is located east of San Pedro Drive between Alameda Boulevard and Oakland Avenue. There is a shaded Zone X floodplain that affects a small part of the northern portion of the site.

The site does not currently receive any offsite flows but has previously received flows from the adjacent properties to the east. The adjacent site is currently under construction and no longer discharges onto the project area (C18D064B). This area is included in the North Albuquerque Acres Master Drainage Plan (NAAMPD). The northern half of the property is allowed to discharge to the San Pedro storm drain and the southern half is allowed to discharge to the Alameda storm drain per the modified Design Analysis Report "Alameda Blvd. - San Pedro to Wyoming" (DARASPW) by Thompson Engineering Consultants (#7663.91, January 2012)

Methodology
 Hydrology Calculations for the site are performed in accordance with the Albuquerque Development Process Manual (DPM) Section 22 using AHYMO to calculate peak flow rates in order to ensure all flow paths are sufficient to carry flows effectively throughout the site. The water quality pond volume was calculated by multiplying the first flush runoff value of 0.34" by the impervious area of each sub basin. All hydrologic and hydraulic calculations can be found on this sheet.

Existing Conditions
 The existing property slopes from east to west at approximately 3%. The site is currently developed and was previously used as a parking space for the Toyota dealership across San Pedro Drive (C18D083). The site runoff is currently free discharging to the northwest into an existing storm drain in San Pedro.

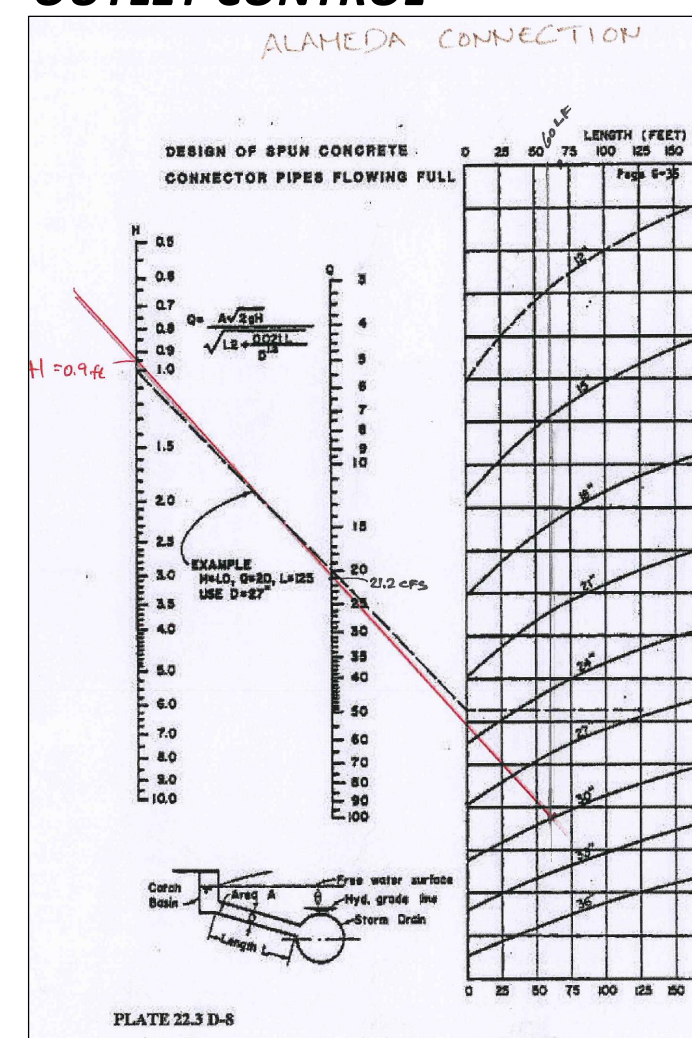
Proposed Conditions
 The DARSPD uses a developed impervious area of 50%, which is consistent with the assumption in the NAAMPD. One subbasin was created to model the allowable flow rate for the northern half of the property. Subbasin 117.20-NORTH is 2.23 acres and generates 8.67 cfs. The 8.67 cfs represents the allowable flow rate to the San Pedro storm drain - See A-HYMO calcs. The DARASPW revises the NAAMPD allowable discharge for the southern half of the property to 3.82 cfs per acre. The southern portion of the site is 2.21 acres. therefore, the allowable flow rate to the Alameda storm drain is 8.44 cfs.

Five proposed subbasins were created to model the developed flow rate for the proposed site. Subbasin North is 1.13 acres and generates 5.13 cfs. Subbasin North discharges to the San Pedro storm drain. Subbasin West is 0.85 acres and generates 3.54 cfs. Subbasin West discharges to the San Pedro storm Drain. Therefore, there is a total developed flow rate to the San Pedro storm drain of 8.67 cfs, which is in compliance with the allowable flow rate, 8.67 cfs. Subbasin South is 1.7 acres and generates 8.03 cfs. Subbasin South discharges to the Alameda storm drain. The developed flow rate is below the allowable, 8.44 cfs.

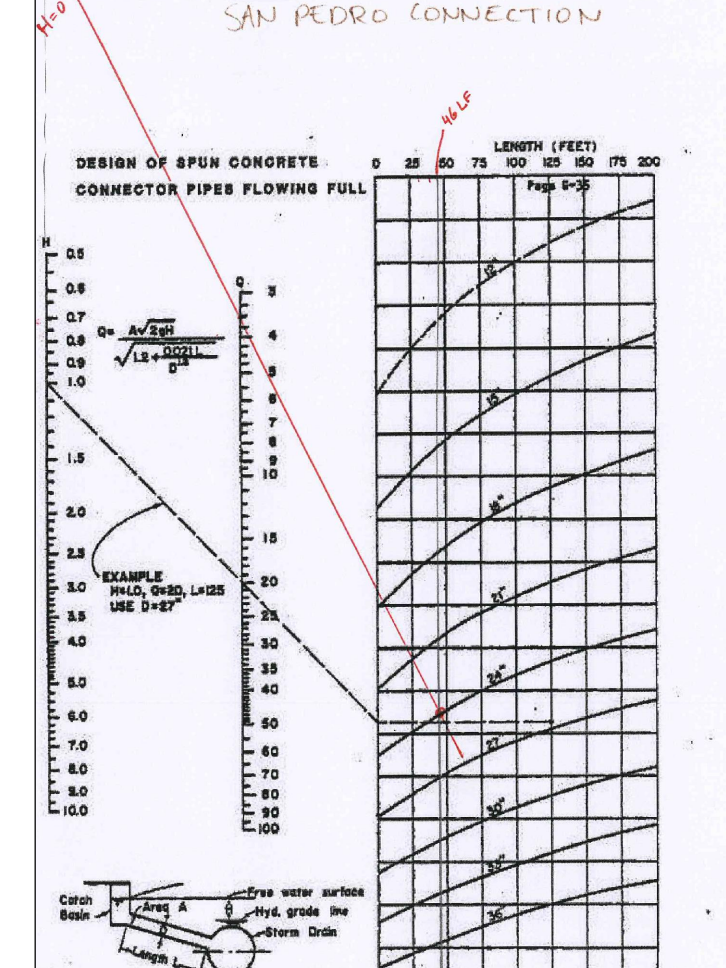
Subbasin East generates 2.09 cfs. The total 100-yr 10-day volume is 0.1 acre feet (4,729 cubic feet) and will be retained at ponds 1-4 with total capacity of 0.1 acre feet (4,945 cubic feet), the ponds will be connected by sidewalk culverts to allow interaction. An emergency spillway is proposed on the north west side of the basin to allow discharge to the parking lot storm drain. Subbasin North East generates 0.52 cfs. The total 100-yr 10-day volume is 1,410 cubic feet. The pond's volume capacity is 0.03 acre feet (1290 cubic feet) and the excess volume will be discharged through an emergency spillway on the south west corner of the basin and into the parking lot storm drain. The total discharge of subbasins North, East and North East, 8.68 cfs, has a negligible effect on the overall peak discharge to San Pedro storm drain, as the allowable is 8.67 cfs - see A-HYMO calcs for pond routing. Overall, the northern basin discharge has no effect on the allowable peak discharge, since the south subbasin discharge is less than the allowable and the total developed discharge flows to the same drainage system at San Pedro storm drain.

Alameda SD HGL shows elevation of 5230 ft (COA 7663.91). According to outlet control analysis, the developed site addition will be 0.9 ft to HGL (See graph). Total HGL=5230.95, lower than grate elevation, 5231.90. San Pedro SD HGL shows elevation of 5230 ft (COA 5304.91), the developed site has no effect on the HGL. (See graph). Oakland SD HGL shows elevation of 5234.5 ft (COA 742484), pipe is at inlet control. See Manning's calcs for pipe's capacity.

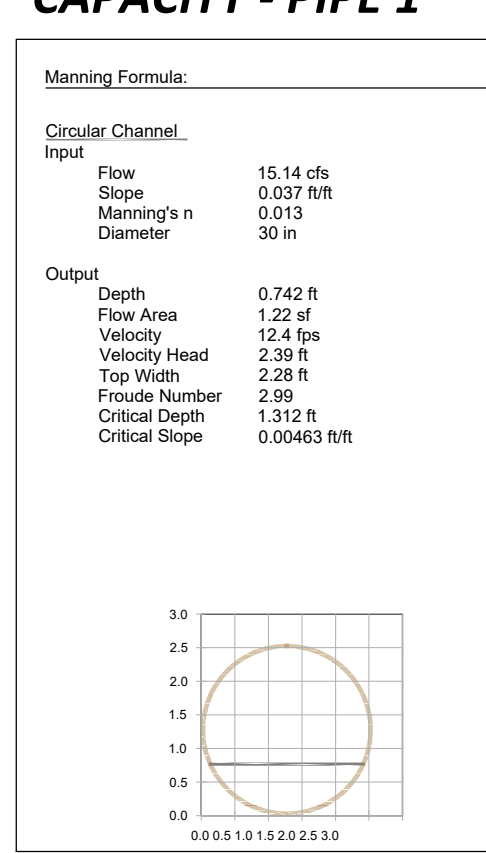
ALAMEDA SD OUTLET CONTROL



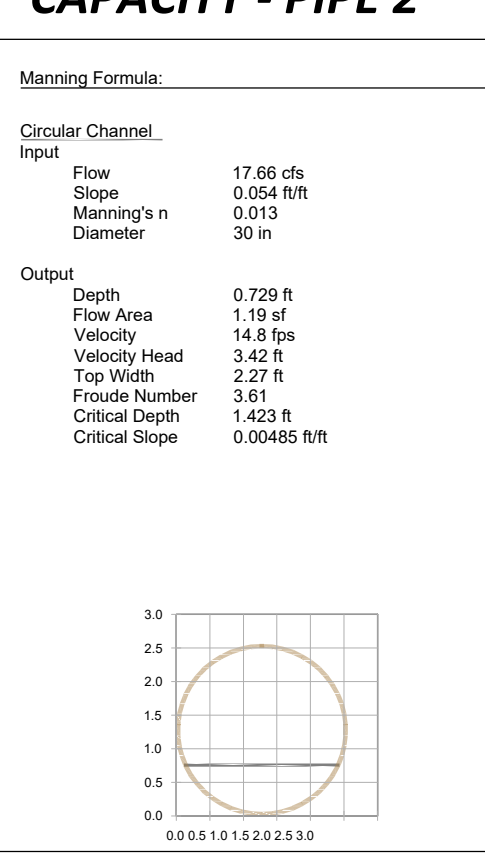
SAN PEDRO SD OUTLET CONTROL



OAKLAND PIPE'S CAPACITY - PIPE 1



OAKLAND PIPE'S CAPACITY - PIPE 2



5971 JEFFERSON ST NE
 ALBUQUERQUE, NM 87109
 PHONE: 505.566.4187

RESPEC
 WATER & NATURAL RESOURCES

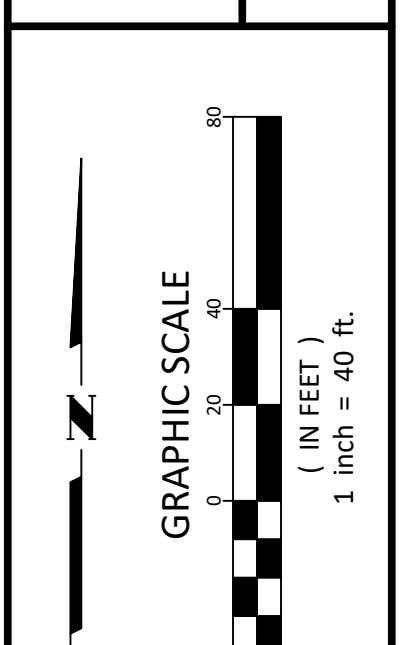
DESIGNED: NF
 DRAWN: NF
 CHECKED: RB
 DATE: 2/14/18

STAMP

NOT FOR CONSTRUCTION

LEGAL DESCRIPTION:
 LOTS 1, 2, 3, & 30.31 & 32,
 TRACT A, UNIT B NORTH
 ALBUQUERQUE ACERS

LEGACY NAA
 APARTMENTS II
 CONCEPTUAL DRAINAGE PLAN



SHEET NUMBER:
C-1