

# CITY OF ALBUQUERQUE

Planning Department  
Alan Varela, Director



Mayor Timothy M. Keller

December 13, 2023

Fred C. Arfman, P.E.  
Isaacson & Arfman, P.A.  
128 Monroe St. N.E  
Albuquerque, NM 87108

**RE: Natural Grocers  
4625 Wyoming Blvd NE  
30-day Temporary C.O. - Accepted  
Engineer's Certification Date: 12/13/23  
Engineer's Stamp Date: 02/01/23  
Hydrology File: F19D013E**

Dear Mr. Arfman:

PO Box 1293

Based **solely** on the Certification received 12/13/2023, this letter serves as a “green tag” from Hydrology Section for a **30-day** Temporary Certificate of Occupancy to be issued by the Building and Safety Division.

Albuquerque

**PRIOR TO PERMANENT CERTIFICATE OF OCCUPANCY:**

NM 87103

1. Please Resubmit to [PLNDRS@cabq.gov](mailto:PLNDRS@cabq.gov) when ready with an updated engineer's certification with as-built topographic information.
2. Please provide the executed paper Drainage Covenant (latest revision) printed on one-side only with Exhibit A and a check for **\$25.00** made out to “**Bernalillo County**” for the underground stormwater quality facility per Article 6-15(C) of the DPM to Hydrology for review at Plaza de Sol.

[www.cabq.gov](http://www.cabq.gov)

If you have any questions, please contact me at 924-3995 or [rbrissette@cabq.gov](mailto:rbrissette@cabq.gov).

Sincerely,

Renée C. Brissette, P.E. CFM  
Senior Engineer, Hydrology  
Planning Department





# City of Albuquerque

Planning Department  
Development & Building Services Division

## DRAINAGE AND TRANSPORTATION INFORMATION SHEET (DTIS)

Project Title: \_\_\_\_\_ Hydrology File # \_\_\_\_\_

Legal Description: \_\_\_\_\_

City Address, UPC, OR Parcel: \_\_\_\_\_

Applicant/Agent: \_\_\_\_\_ Contact: \_\_\_\_\_

Address: \_\_\_\_\_ Phone: \_\_\_\_\_

Email: \_\_\_\_\_

Applicant/Owner: \_\_\_\_\_ Contact: \_\_\_\_\_

Address: \_\_\_\_\_ Phone: \_\_\_\_\_

Email: \_\_\_\_\_

(Please note that a DFT SITE is one that needs Site Plan Approval & ADMIN SITE is one that does not need it.)

**TYPE OF DEVELOPMENT:** PLAT (#of lots) \_\_\_\_\_ RESIDENCE  
DFT SITE ADMIN SITE

RE-SUBMITTAL: YES NO

**DEPARTMENT:** TRANSPORTATION HYDROLOGY/DRAINAGE

**Check all that apply under Both the Type of Submittal and the Type of Approval Sought:**

### TYPE OF SUBMITTAL:

ENGINEER/ARCHITECT CERTIFICATION  
PAD CERTIFICATION  
CONCEPTUAL G&D PLAN  
GRADING & DRAINAGE PLAN  
DRAINAGE REPORT  
DRAINAGE MASTER PLAN  
CLOMR/LOMR  
TRAFFIC CIRCULATION LAYOUT (TCL)  
ADMINISTRATIVE  
TRAFFIC CIRCULATION LAYOUT FOR DFT  
APPROVAL  
TRAFFIC IMPACT STUDY (TIS)  
STREET LIGHT LAYOUT  
OTHER (SPECIFY) \_\_\_\_\_

### TYPE OF APPROVAL SOUGHT:

BUILDING PERMIT APPROVAL  
CERTIFICATE OF OCCUPANCY TEMPORARY  
CONCEPTUAL TCL DFT APPROVAL  
PRELIMINARY PLAT APPROVAL  
FINAL PLAT APPROVAL  
SITE PLAN FOR BLDG PERMIT DFT  
APPROVAL  
SIA/RELEASE OF FINANCIAL GUARANTEE  
FOUNDATION PERMIT APPROVAL  
GRADING PERMIT APPROVAL  
SO-19 APPROVAL  
PAVING PERMIT APPROVAL  
GRADING PAD CERTIFICATION  
WORK ORDER APPROVAL  
CLOMR/LOMR  
OTHER (SPECIFY) \_\_\_\_\_

DATE SUBMITTED: \_\_\_\_\_



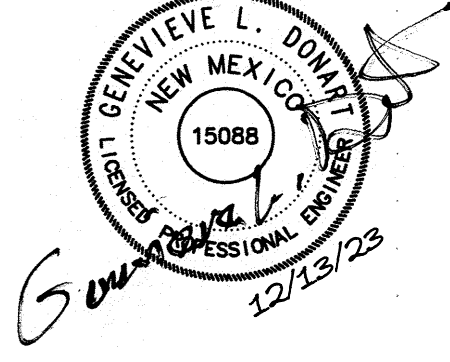
DRAINAGE CERTIFICATION

I, Genevieve L. Donart, NMPE, of the firm Isaacson & Arfman, P.A., hereby certify that this project has been graded and will drain in substantial compliance with and in accordance with the design intent of the approved plan dated 02/10/2023. I further certify that someone under my direct supervision personally visited the project site on 12/13/2023 and have determined by visual inspection that actual site conditions are similar to the approved plan and is true and correct to the best of my knowledge and belief.

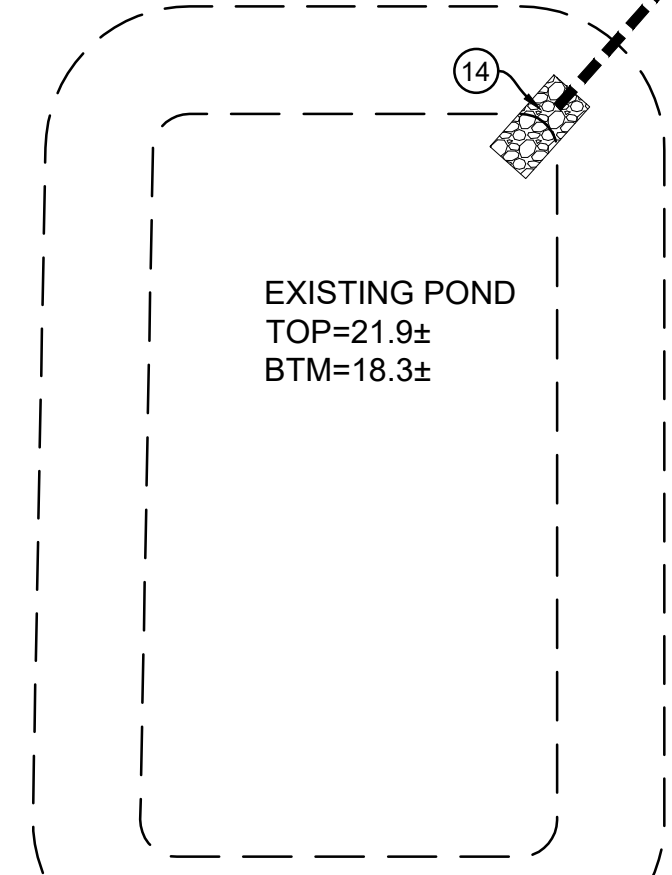
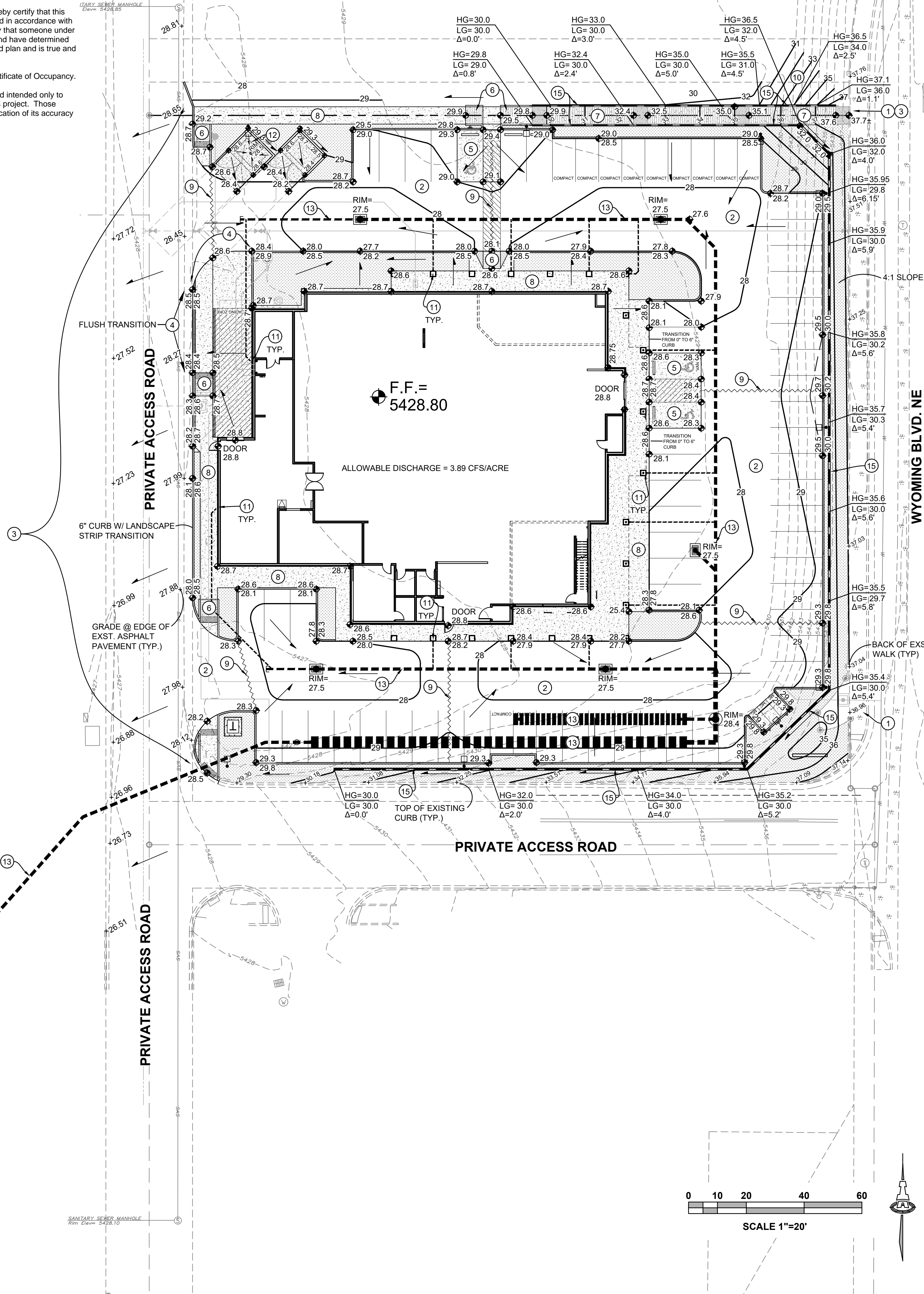
.This certification is submitted in support of a request for Temporary Certificate of Occupancy.

The record information presented hereon is not necessarily complete and intended only to verify substantial compliance of the grading and drainage aspects of this project. Those relying on this record document are advised to obtain independent verification of its accuracy before using it for any other purpose.

Genevieve L. DonartNMPE #15088



UTILITY SEWER MANHOLE  
Elev= 5428.85



SCALE 1"=20'

KEYED NOTES

- NO WORK SHALL BE PERFORMED IN THE PUBLIC R/W WITHOUT AN APPROVED WORK ORDER OR EXCAVATION PERMIT.
- NEW PAVING AT ELEVATIONS SHOWN.
- PROVIDE SMOOTH TRANSITION TO EXISTING PAVEMENT.
- TOP OF ASPHALT TO BE FLUSH WITH TOP OF CONCRETE THIS AREA.
- CONSTRUCT ADA COMPLIANT PARKING SPACES AND ACCESS AISLES AT ELEVATIONS SHOWN. TOP OF CONCRETE PARKING TO BE FLUSH WITH TOP OF CONCRETE WALK ADA ACCESS. TRANSITION TO 6" DIFFERENCE OVER 9' EACH SIDE AS SHOWN.
- CONSTRUCT ADA COMPLIANT CURB RAMP AT ELEVATIONS SHOWN.
- CONSTRUCT ADA COMPLIANT RAMP WITH INTERMEDIATE LANDINGS AS SHOWN.
- CONSTRUCT ADA COMPLIANT PEDESTRIAN ACCESS WALK AT ELEVATIONS SHOWN.
- HIGH POINT / GRADE BREAK LOCATION.
- GRADE ADJACENT PROPERTY TO ELEVATIONS AND LIMITS SHOWN (SAME OWNER).
- ALL CONCENTRATED ROOF DISCHARGE TO BE PIPED DIRECTLY TO STORM DRAIN. SEE STORM DRAIN PLAN (CG-102) FOR ADDITIONAL INFORMATION.
- CONCRETE DUMPSTER PAD SLOPED TO INTERIOR DRAIN INLET(S) CONNECTED TO SANITARY SEWER SYSTEM. SEE UTILITY PLAN FOR CONTINUATION.
- CONSTRUCT PRIVATE STORM DRAIN SYSTEM WITH UNDERGROUND STORMWATER QUALITY RETENTION AND STORMWATER DETENTION SYSTEM. SEE SHEET CG-102 FOR SIZES / SLOPES / INLET INFORMATION / MATERIALS.
- INSTALL 5' X 10' X 1' DEEP EROSION PROTECTION AT OUTLET. EROSION PROTECTION MUST BE PLACED TO PERMIT STORMWATER TO PASS SMOOTHLY. HAND PLACE AT PIPE OPENING.
- CONSTRUCT SITE RETAINING WALL(S) TO ACHIEVE GRADE DIFFERENCE SHOWN. HG = GRADE ON HIGH SIDE OF WALL; LG = GRADE ON LOW SIDE OF WALL. Δ = RETAINING. SEE STRUCTURAL PLANS FOR RETAINING WALL DETAILS.

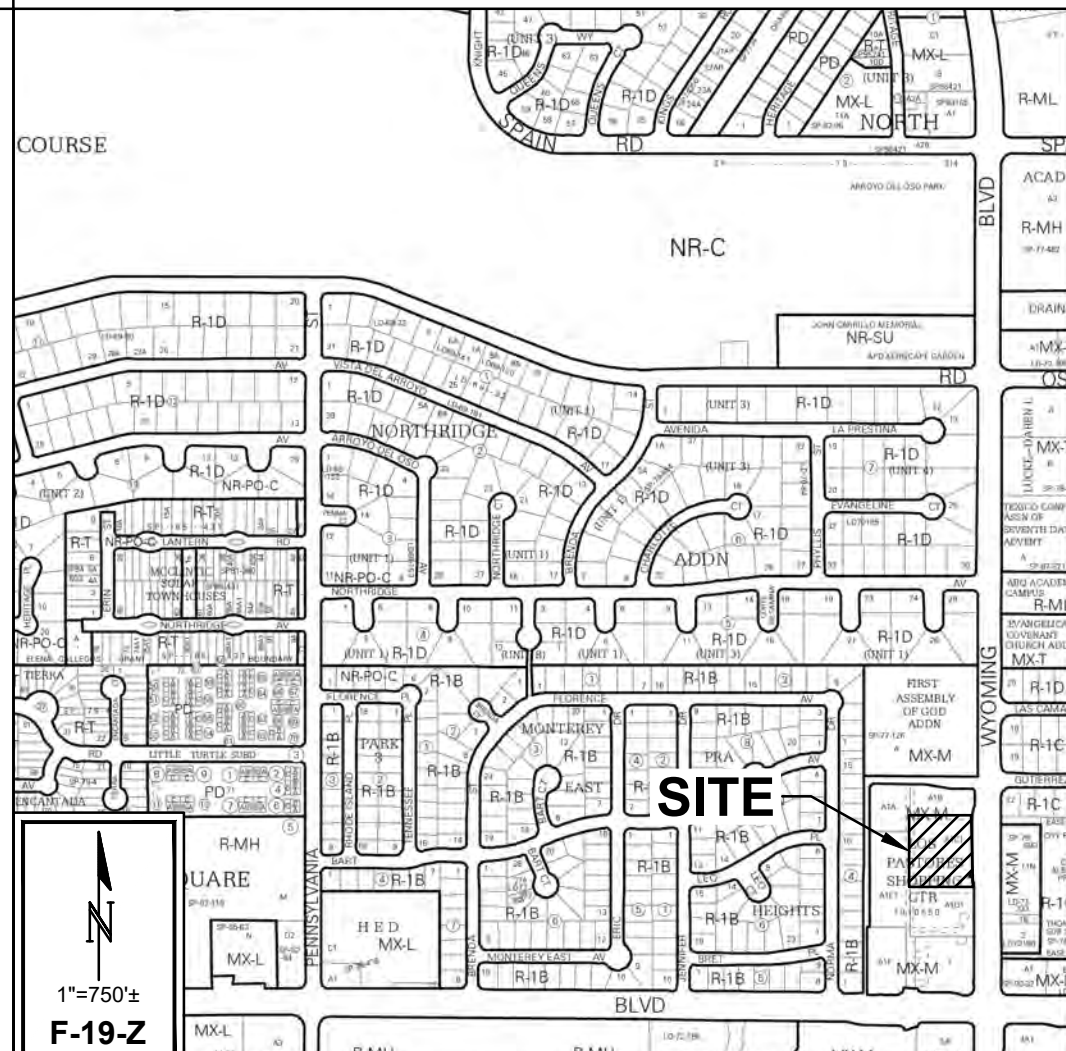
ADA COMPLIANCE

SIDEWALK(S) AND RAMP(S): TARGET CROSS SLOPE = 1% TO 1.5%. CROSS SLOPE SHALL NOT EXCEED 2%

ACCESSIBLE RAMP(S): TARGET LONGITUDINAL SLOPE = 7% LONGITUDINAL SLOPE SHALL NOT EXCEED 12:1 (8.3%).

ACCESSIBLE PARKING: TARGET SLOPE = 1% TO 1.5%. SLOPE SHALL NOT EXCEED 2% SLOPE IN ANY DIRECTION

VICINITY MAP



PROJECT INFORMATION

PROPERTY: THE SITE IS AN UNDEVELOPED (BUT PREVIOUSLY GRADED) COMMERCIAL PROPERTY LOCATED WITHIN THE CITY OF ALBUQUERQUE, VICINITY MAP F-19-Z. THE SITE IS BOUNDED ON THE NORTH BY AN UNDEVELOPED COMMERCIAL PROPERTY, ON THE EAST BY WYOMING BOULEVARD, ON THE SOUTH BY A PAVED PRIVATE ACCESS ROAD AND DEVELOPED COMMERCIAL PROPERTY, AND ON THE WEST BY A PAVED PRIVATE ACCESS ROAD AND UNDEVELOPED COMMERCIAL PROPERTIES.

PROPOSED IMPROVEMENTS: THE PROPOSED IMPROVEMENTS INCLUDE A COMMERCIAL BUILDING WITH ASSOCIATED ASPHALT PAVED ACCESS, PARKING, AND LANDSCAPING.

LEGAL: TRACT A-1-C-1 OF "LOS PASTORES SHOPPING CENTER" ALBUQUERQUE, BERNALILLO COUNTY, NEW MEXICO.

SITE AREA: 1.404 AC.

ADDRESS: 4625 WYOMING BOULEVARD N.E. ALBUQUERQUE, NM 87109

BENCHMARK: VERTICAL DATUM IS BASED UPON THE ALBUQUERQUE CONTROL MONUMENT "4-F19" ELEVATION = 5405.801 FEET (NAVD 1988).

OFF-SITE: NO OFF-SITE DRAINAGE AFFECTS THIS PROPERTY OTHER THAN WITHIN THE SHARED ROADWAY ON THE WEST SIDE.

FLOOD HAZARD: PER CITY OF ALBUQUERQUE MAP #35001 C0143G, EFFECTIVE 9/26/2008, THE SITE IS LOCATED WITHIN FLOODZONE 'X' DESIGNATED AS AREAS DETERMINED TO BE OUTSIDE 500-YEAR FLOODPLAIN, WYOMING BLVD. TO THE EAST, IS LOCATED WITHIN ZONE AO (DEPTH 1 FT) ADJACENT TO THIS PROPERTY.

DRAINAGE PLAN CONCEPT: PER THE APPROVED DRAINAGE MANAGEMENT PLAN LOS PASTORES SHOPPING CENTER, PREPARED BY TIERRA WEST, LLC AND DATED MAY, 2016, RUNOFF FROM THE PROPERTY FLOWS TO THE SOUTHWEST TO AN EXISTING DETENTION POND LOCATED ON AN ADJACENT PROPERTY WITH CONTROLLED DISCHARGE TO AN ALLEY AND INTO MONTGOMERY BLVD. .

THE PROPERTY LIES WITHIN DRAINAGE BASIN PR-1 (5.48 AC. WITH AN ALLOWABLE DISCHARGE RATE OF 21.32 CFS = 3.89 CFS/ACRE. THEREFORE THE MAX. ALLOWABLE DISCHARGE = 1.404 \* 3.89 = 5.46 CFS.

SEE CG-501 FOR ADDITIONAL DRAINAGE CALCULATIONS INCLUDING STORMWATER QUALITY REQUIREMENTS.



LEGEND

- 54.30 — EXISTING CONTOUR
- +5428.21 — EXISTING SPOT ELEVATION
- 28 — PROPOSED 1.0' CONTOUR
- 28.5 — PROPOSED 0.5' CONTOUR
- ◆ 27.3 — PROPOSED SPOT ELEVATION
- FLOW DIRECTION
- 5428.8 — FINISH FLOOR ELEVATION
- ~~~~~ GRADE BREAK

Isaacson & Arfman, Inc.  
Civil Engineering Consultants



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FRED C. ARFMAN  
NEW MEXICO  
7322  
LICENSED PROFESSIONAL ENGINEER  
02/01/2023  
Engineer

NATURAL GROCERS RETAIL  
4625 WYOMING BLVD N.E.  
ALBUQUERQUE, NM

CONSTRUCTION DOCUMENTS	
ISSUE:	DOCUMENTS
PROJECT NUMBER:	IA 2561
FILE:	
DRAWN BY:	BJB
CHECKED BY:	FCA
DATE:	02/01/2023

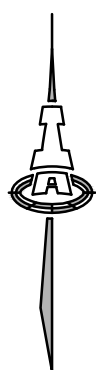
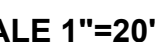
SHEET TITLE

GRADING & DRAINAGE PLAN

SHEET NUMBER

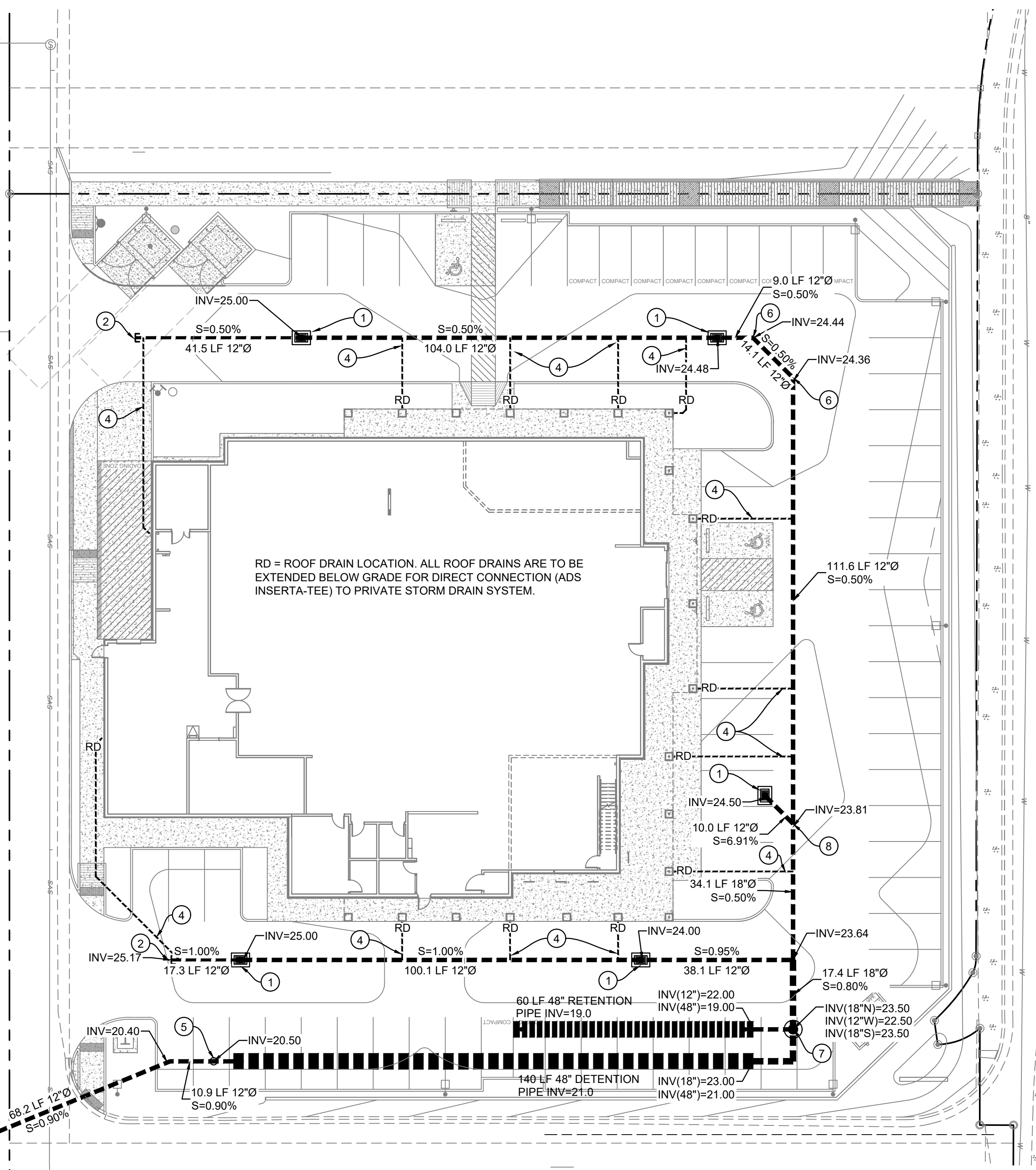
CG-101



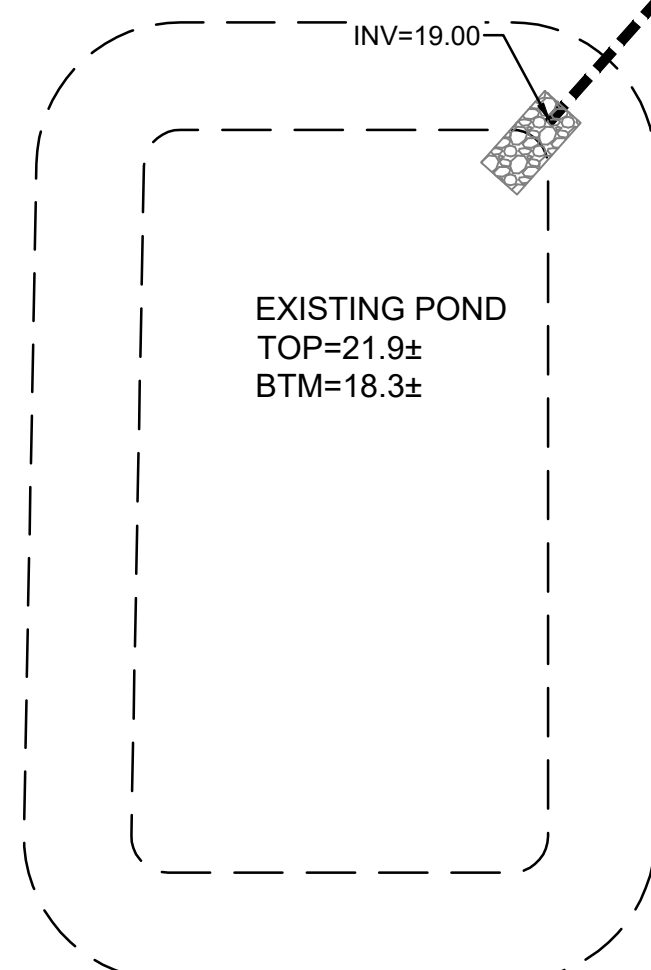


SANITARY SEWER MANHOLE  
Rim Elevation 5428.85

SANITARY SEWER MANHOLE  
Rise From 5428.10



AS THE ADJACENT PROPERTY DEVELOPS, THE OUTLET PIPE MAY BE REROUTED TO ACCOMMODATE FUTURE DESIGN LIMITS.



FINAL RETENTION / DETENTION DESIGN, DIMENSIONS, MATERIALS  
TO BE PROVIDED.

## KEYED NOTES

1. 1-18" NYLOPLAST BASIN, 2" SUMP AND LOCKING 2'x2' TRAFFIC RATED GRATE.
2. 1-12" END CAP.
3. 1-12" 22.5° BEND.
4. EXTEND ROOF DRAIN (FITTINGS AS REQUIRED) TO STORM DRAIN MAIN. CONNECT WITH ADS INSERTA-TEE.
5. 12"Ø CLEANOUT - SEE RETENTION / DETENTION SYSTEM DETAILS THIS SHEET. LOCKING SOLID, TRAFFIC RATED GRATE. PREINSTALL 9.1" ORIFICE PLATE AT INVERT ELEVATION SHOWN.
6. 1-12" 45° BEND.
7. 1-30" NYLOPLAST DRAIN BASIN WITH STORMWATER QUALITY PREINSTALLED TO THE WEST, 2" SUMP AND LOCKING SOLID TRAFFIC RATED GRATE. SEE RETENTION / DETENTION SYSTEM DETAILS THIS SHEET.
8. 1-12"x12" WYE.

## STORM DRAIN SYSTEM GENERAL NOTES

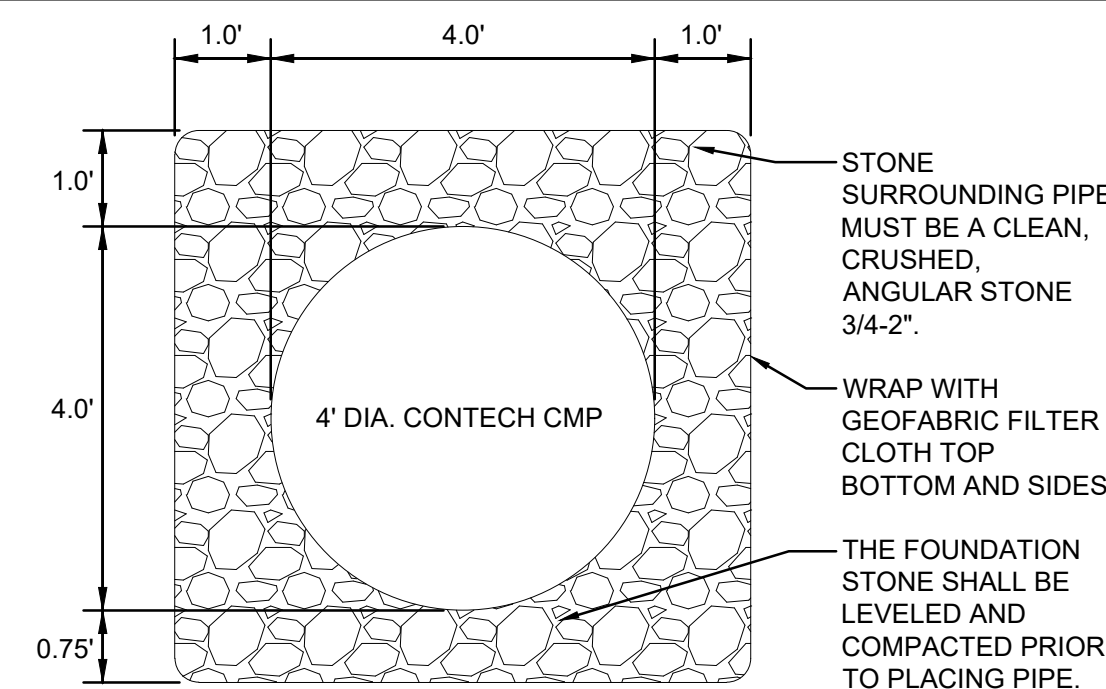
- A. INSTALL ALL STORM DRAIN INLETS, PIPE AND FITTINGS PER MANUFACTURER'S SPECIFICATIONS.
- B. ALL STORM DRAIN LINES AND FITTINGS TO BE ADS N-12WT WATERTIGHT.
- C. INSTALL PIPE WITH SLOPES AND INVERTS PER PLAN.
- D. STORM DRAIN SYSTEM WILL REQUIRE REGULAR MAINTENANCE TO ENSURE PROPER FUNCTIONING DURING STORM EVENTS. ENGINEER RECOMMENDS THAT PROPERTY OWNER PUT IN PLACE INSPECTION AND MAINTENANCE CRITERIA SCHEDULED TO OCCUR MONTHLY AND AFTER EACH STORM EVENT.
- E. STORM DRAIN PIPE LENGTHS NOTED ON PLAN ARE TO CENTER OF DRAIN BASIN AND MANHOLES.

## STORMWATER QUALITY RETENTION

REQUIRED RETENTION = 1,147 CF

PROPOSED SECTION = 4' DIA. PERFORATED CMP PIPE IN FABRIC  
WRAPPED GRAVEL  
PIPE AREA = 12.6 SF  
GRAVEL AREA = 21.8 SF

PIPE VOLUME = 12.6 CF PER LINEAR FOOT  
GRAVEL VOLUME = 21.8 CF \* 30% VOID = 6.5 CF PER LINEAR FOOT  
THEREFORE, PIPE + GRAVEL PROVIDES 19.1 CF PER LINEAR FOOT  
REQUIRED LENGTH = 1,147 / 19.1 = 60 LINEAR FEET



## STORMWATER DETENTION

DETENTION WILL BE PROVIDED TO LIMIT DISCHARGE FROM BASIN  
2 TO 4.1 CFS.

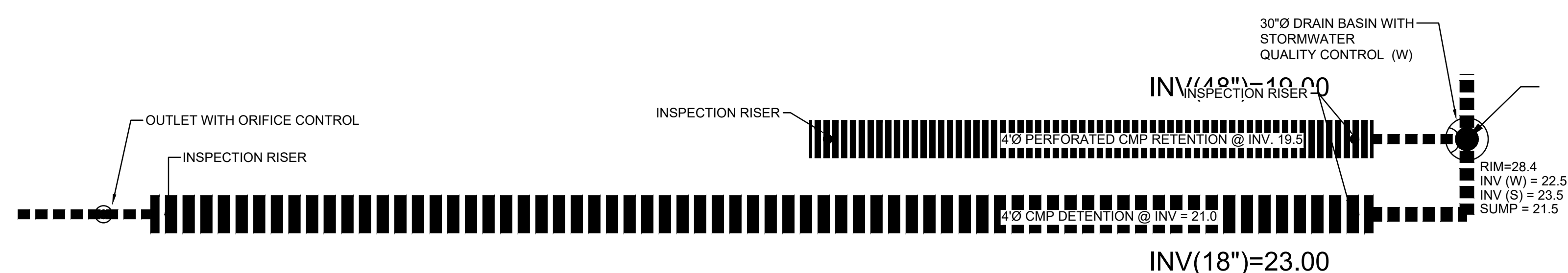
PER THE INFLOW/OUTFLOW HYDROGRAPH (CG-501) THE REQUIRED  
DETENTION VOLUME = 1,907 CF.

STORMWATER WILL BE DETAINED AS FOLLOWS:

12" DIA. STORM DRAIN MAIN : 200 LF @ 0.79 CF/LF = 158 CF  
18" DIA. STORM DRAIN MAIN : 59.5 LF @ 1.77 CF/LF = 105 CF  
4' DIA. CONTECH PIPE : 140 LF @ 12.6 CF/LF = 1,764 CF

TOTAL DETENTION VOLUME = 2,027 CF.

## ENLARGED STORMWATER QUALITY / DETENTION SYSTEM



City of Albuquerque  
Planning Department  
Development Review Services  
**HYDROLOGY SECTION**  
**APPROVED**  
DATE: 02/10/23  
BY: *Renée C. Brisset*  
HydroTrans # F19D0133E

THE APPROVAL OF THESE PLANS REPORT SHALL NOT BE CONSTRUED TO PERMIT VIOLATIONS OF ANY CITY ORDINANCE OR STATE LAW, AND SHALL NOT PREVENT THE CITY OF ALBUQUERQUE FROM REQUIRING CORRECTION, OR ERROR OR DIMENSIONS IN PLANS, SPECIFICATIONS, OR CONSTRUCTIONS. SUCH APPROVED PLANS SHALL NOT BE CHANGED, MODIFIED OR ALTERED WITHOUT AUTHORIZATION.

**Arfman & Arfman, Inc.**  
Civil Engineering Consultants

128 Monroe Street NE  
Albuquerque, NM 87108  
5-268-8828 | [www.arfman.com](http://www.arfman.com)



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Isaacson & Arfman, Inc.



Engineer

## NATURAL GROCERS RETAIL

**4625 WYOMING BLVD N.E.  
ALBUQUERQUE, NM**

No	Date	Description
CONSTRUCTION		
ISSUE: DOCUMENTS		
PROJECT NUMBER: IA 2561		
FILE: -		
DRAWN BY: BJB		
CHECKED BY: FCA		
DATE: 02/01/2023		

SHEET TITLE

## STORM DRAIN PLAN & DETAILS

SHEET NUMBER

CG-102





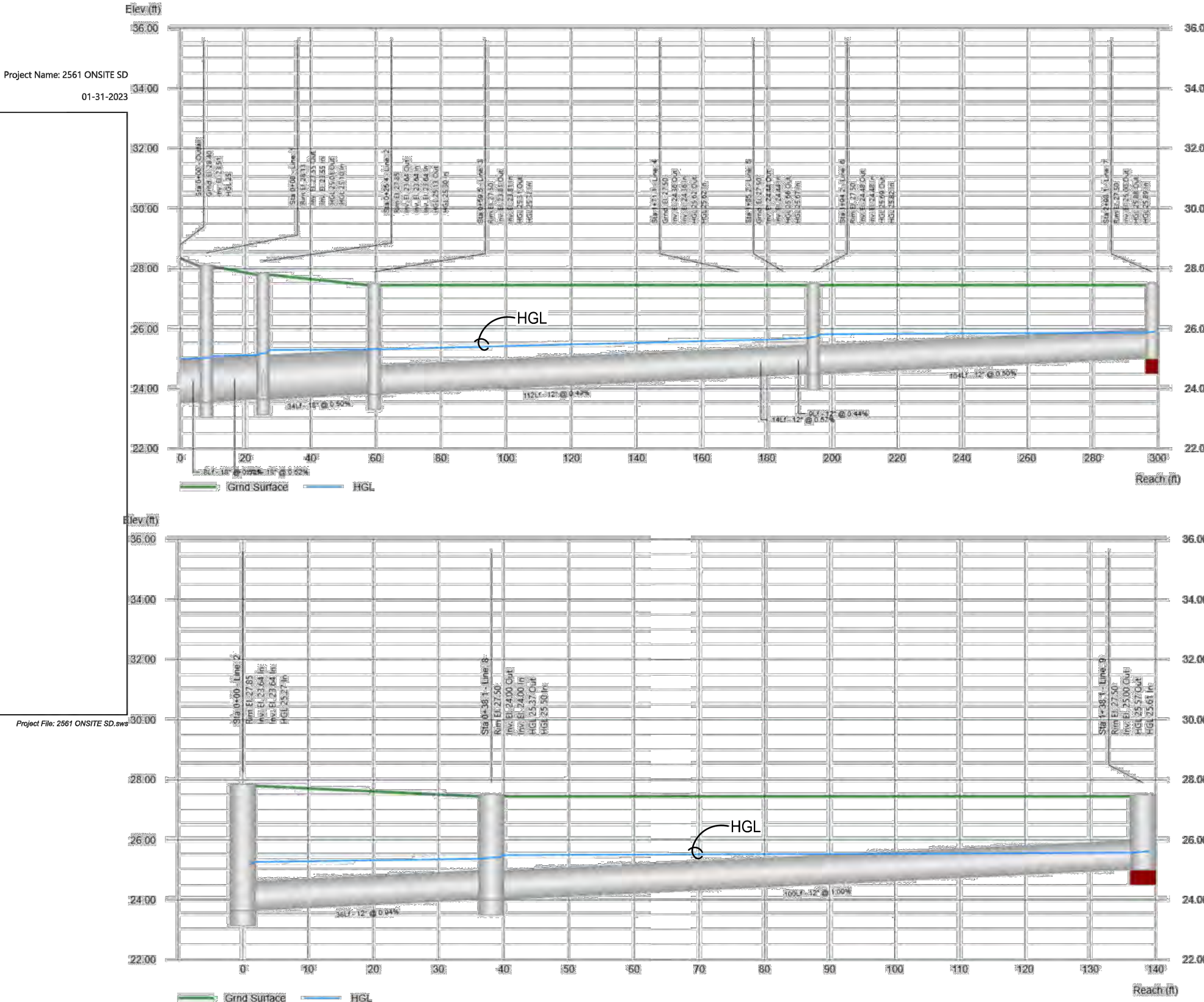
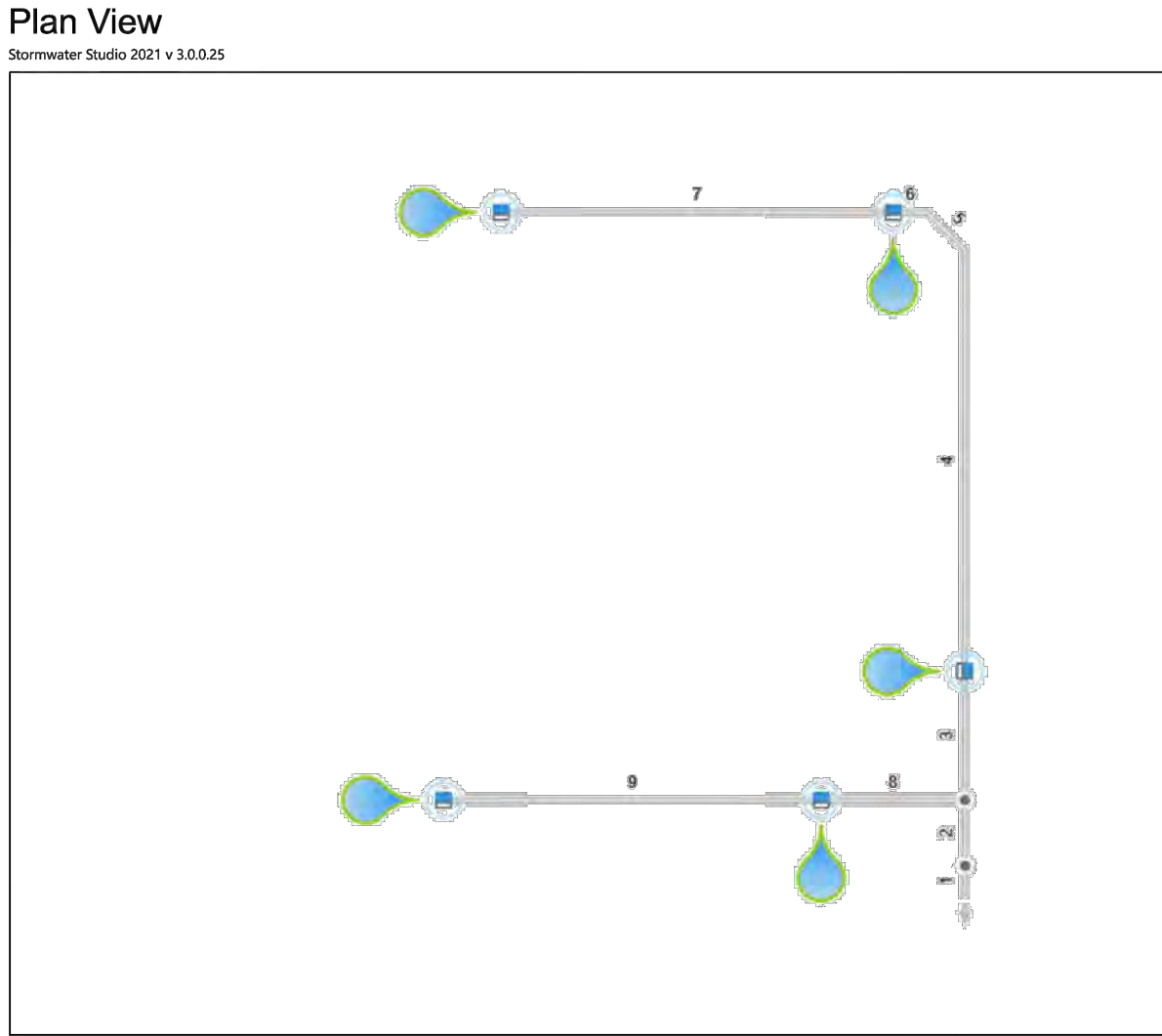




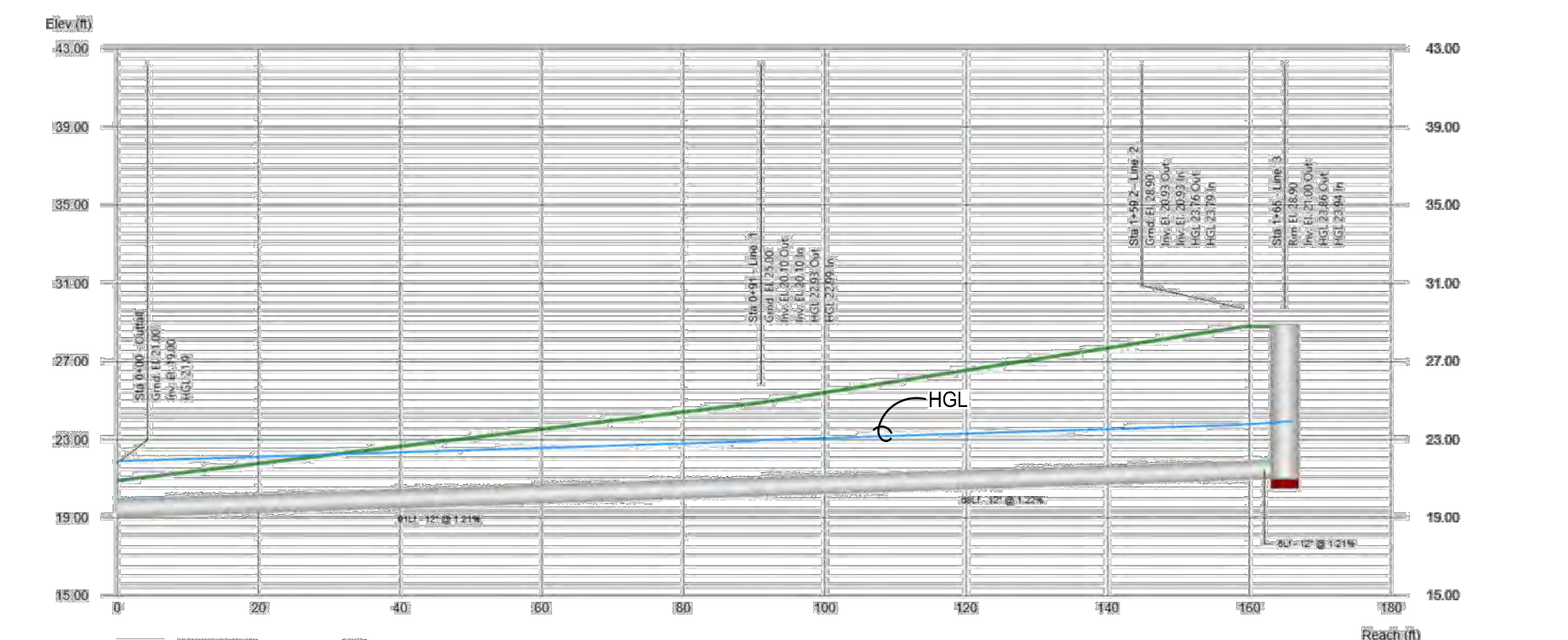
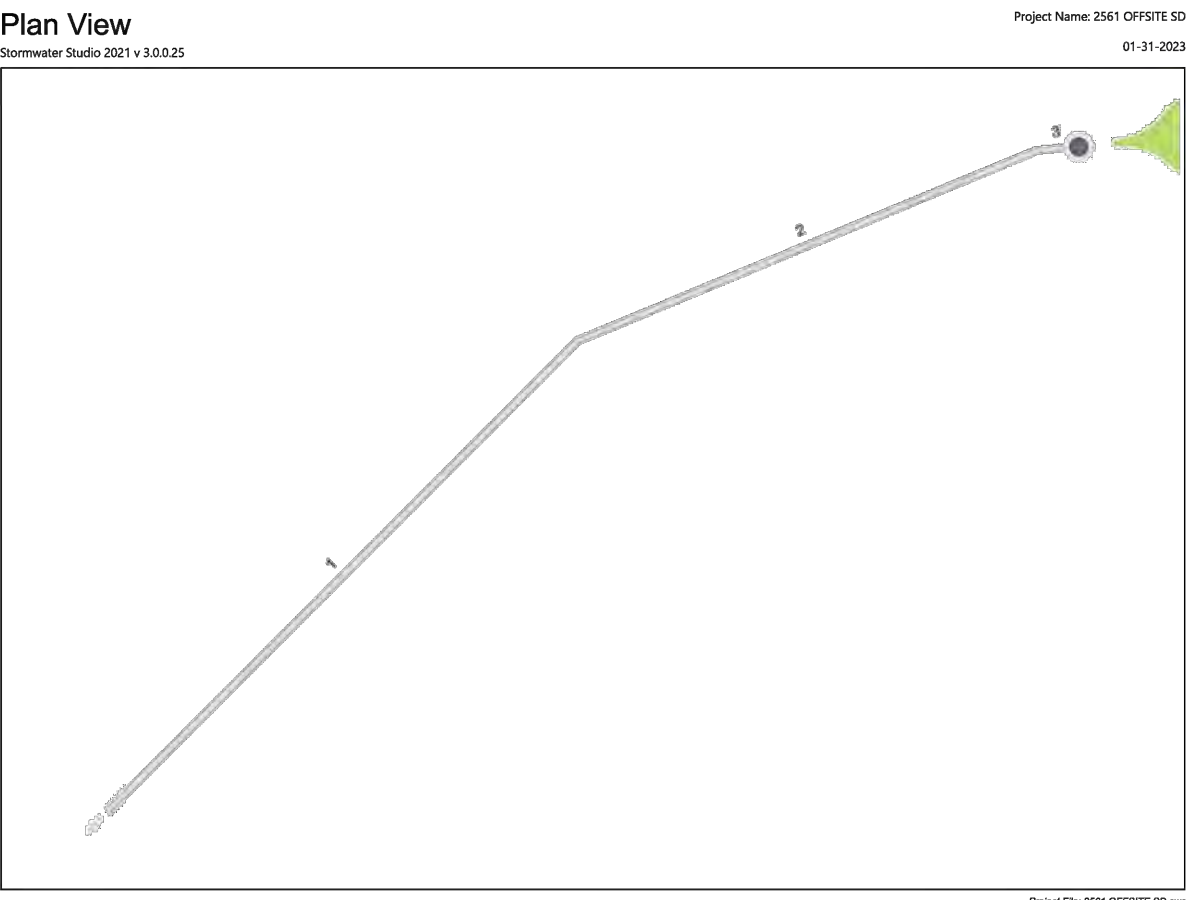


STORMWATER STUDIO (2021 V. 3.0.0.25) STORM DRAIN CALCULATIONS

ONSITE STORM DRAIN



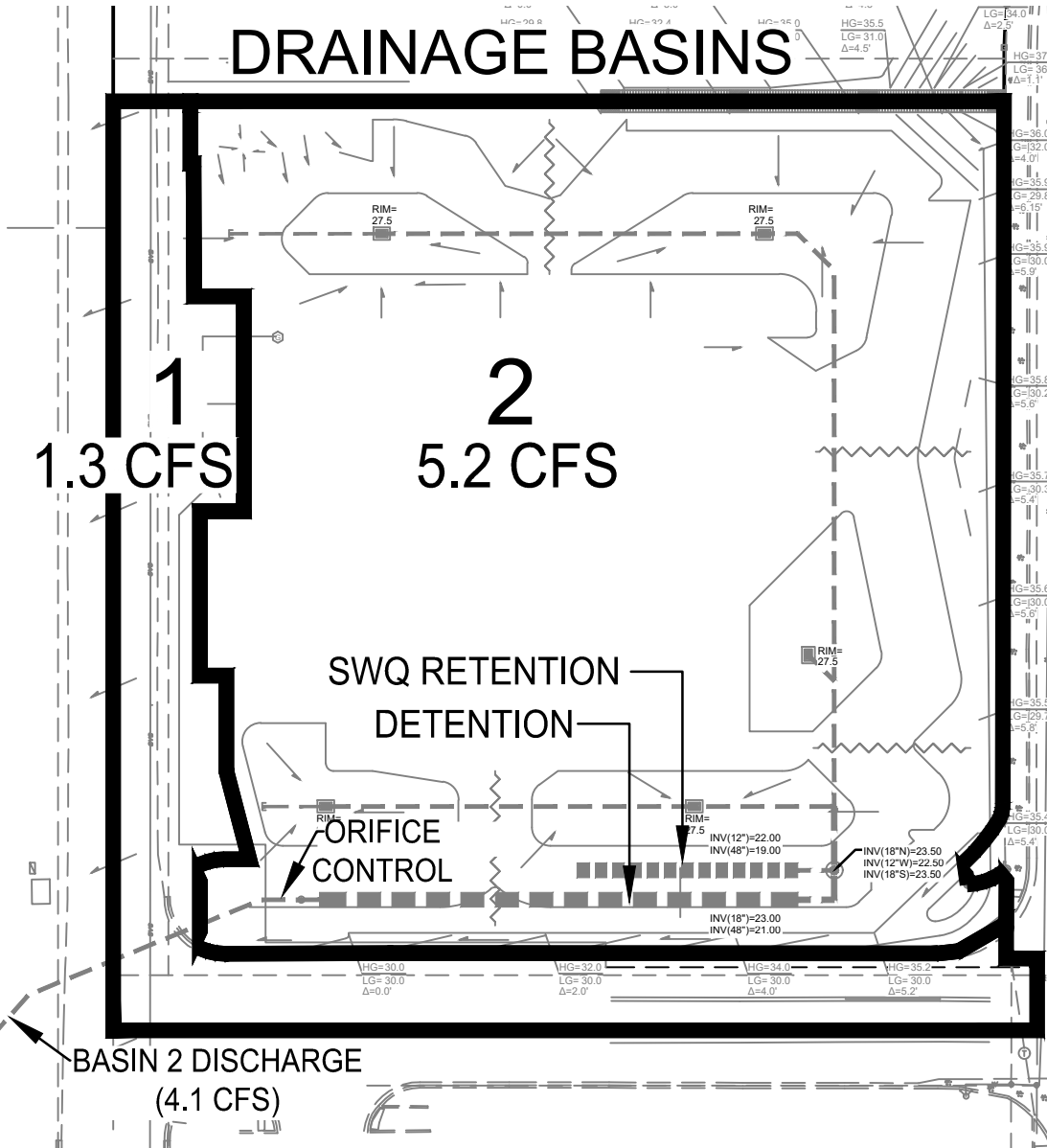
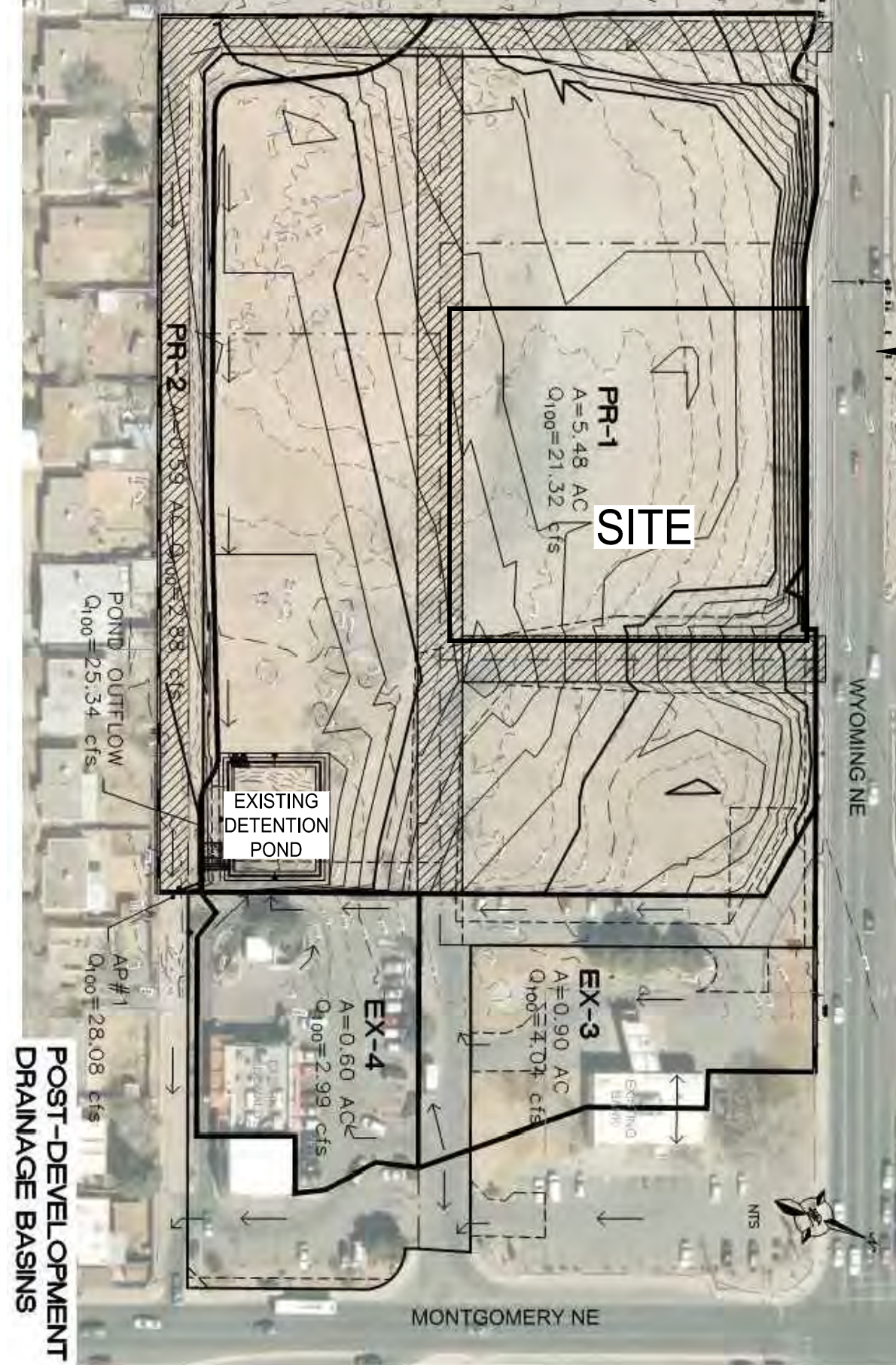
OFFSITE STORM DRAIN



Energy Grade Line Calculations (For Information Only - See CG-102 for final storm drain design)

Line No	Line Size (in)	Q (cfs)	Downstream					Length (ft)	Upstream					Pipe n Value	Energy Loss (ft)	HGL Elev (ft)	EGL Elev (ft)	Energy Loss (ft)
			Invert Elev (ft)	Depth (ft)	Area (sqft)	HGL Elev (ft)	Vel (ft/s)	Vel Head (ft)	Invert Elev (ft)	Depth (ft)	Area (sqft)	HGL Elev (ft)	Vel (ft/s)	Vel Head (ft)				
1	12	4.10	19.00	1.00	0.79	21.90	5.22	0.42	22.32	91.00	20.10	1.00	0.79	22.93	5.22	0.42	23.35	0.06
2	12	4.10	20.10	1.00	0.79	22.99	5.22	0.42	23.41	68.20	20.93	1.00	0.79	23.76	5.22	0.42	24.19	0.03
3	12	4.10	20.93	1.00	0.79	23.79	5.22	0.42	24.22	5.80	21.00	1.00	0.79	23.86	5.22	0.42	24.28	0.08

DRAINAGE MANAGEMENT PLAN EXCERPT



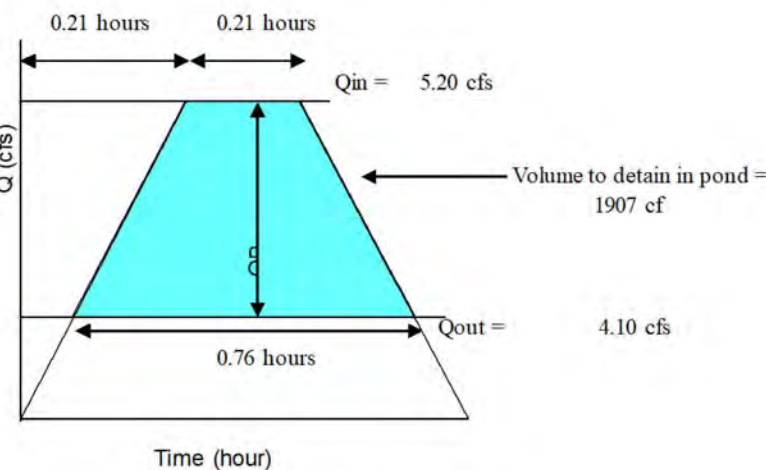
CALCULATIONS: 2561 NATURAL GROCERS - 01/23/2023  
HYDROGRAPH FOR SMALL WATERSHED  
DPM SECTION 22-2 \* PAGE A-13/14

Base time,  $t_b$ , for a small watershed hydrograph is:  
 $t_b = (2.107 * E * A / Q_p) - (0.25 * A_2 / A_1)$   
Where  
 $E = 2.10$  inches  
 $A = 1.13$  acres  
 $A_2 = 0.93$  acres  
 $Q_p = 5.2$  cfs  
 $t_b = 0.76$  hours

$E$  is the excess precipitation in inches (from DPM TABLE A-8).  $Q_p$  is the peak flow,  $A_2$  is the area (acres) of treatment  $D$ , and  $A_1$  is the total area in acres. Using the time of concentration,  $t_c$  (hours), the time to peak in hours is:

$t_p = (0.7 * t_c) + ((1.6 - (A_2 / A_1)) / 12)$   
Where  
 $t_c = 0.20$  hours  
 $t_p = 0.21$  hours

Continue the peak for  $0.25 * A_2 / A_1$  hours. When  $A_2$  is zero, the hydrograph will be triangular. When  $A_2$  is not zero, the hydrograph will be trapezoidal. see the graph below:



STORMWATER QUALITY

PER THE APPROVED DRAINAGE MANAGEMENT PLAN, STORMWATER QUALITY VOLUME (SWQV) FOR THIS PROPERTY IS BASED ON 0.34" PER SF IMPERVIOUS. THE EXISTING OFF-SITE POND INCLUDES SWQV FOR THE EXISTING PAVED PRIVATE ROADS WHICH INCLUDE THIS PROJECTS BASIN 1 (SEE ORIGINAL REPORT "PROPOSED CONDITIONS BASIN DATA TABLE" ON PAGE 47 OF 51).

BASIN 2 SWQV WILL BE PROVIDED ONSITE. THE IMPERVIOUS AREA FOR THIS BASIN = 40,492 SF OR 0.93 AC THEREFORE SWQV REQUIRED =  $40,492 * 0.34 / 12 = 1,147$  CF.

DRAINAGE SUMMARY

DRAINAGE PLAN CONCEPT: PER THE APPROVED DRAINAGE MANAGEMENT PLAN LOS PASTORES SHOPPING CENTER, PREPARED BY TERRA WEST, LLC AND DATED MAY, 2016, RUNOFF FROM THE PROPERTY FLOWS TO THE SOUTHWEST TO AN EXISTING DETENTION POND LOCATED ON THE ADJACENT PROPERTY TO THE WEST WITH CONTROLLED DISCHARGE TO AN ALLEY AND INTO MONTGOMERY BLVD.

THE PROPERTY LIES WITHIN DRAINAGE BASIN PR-1 (5.48 AC. WITH AN ALLOWABLE DISCHARGE RATE OF 21.32 CFS = 3.89 CFS/ACRE. THEREFORE THE MAX. ALLOWABLE DISCHARGE =  $1.404 * 3.89 = 5.46$  CFS.

BASIN 1 (EXISTING PRIVATE ROADS) FREE DISCHARGES 1.3 CFS. BASIN 2 (ONSITE) WILL GENERATE 5.2 CFS DURING THE 100-YR 6-HR DESIGN STORM. ALLOWABLE DISCHARGE FROM THIS BASIN =  $5.46 - 1.3$  (BASIN 1) = 4.1 CFS. PER THE ATTACHED INFLOW/OUTFLOW HYDROGRAPH, THE REQUIRED DETENTION VOLUME = 1,907 CF.

THEREFORE, THE PROPOSED UNDERGROUND SYSTEM WILL PROVIDE:

1,147 CF OF STORMWATER QUALITY RETENTION (SEE SWQV BELOW)  
1,907 CF OF STORMWATER DETENTION

MAXIMUM DISCHARGE FROM THE PROPERTY VIA THE PROPOSED STORM DRAIN DIRECTED TO THE EXISTING POND ON THE ADJACENT PROPERTY WILL BE LIMITED TO 4.1 CFS.

CALCULATIONS: 2561 NATURAL GROCERS - 01/23/2023

Based on Drainage Design Criteria for City of Albuquerque Section 22.2, DPM, Vol 2, dated Jan., 1993

100-YEAR, 6-HOUR CALCULATIONS

AREA OF SITE: 61171.308 SF = 1.404 ACRE

DEVELOPED FLOWS:		EXCESS PRECIP:	
Treatment SF	%	Precip. Zone	3
Area A = 0	0%	E <sub>a</sub> = 0.66	
Area B = 9176	15%	E <sub>b</sub> = 0.92	
Area C = 0	0%	E <sub>c</sub> = 1.29	
Area D = 51996	85%	E <sub>d</sub> = 2.36	
Total Area = 61171	100%		

On-Site Weighted Excess Precipitation (100-Year, 6-Hour Storm)

Weighted E =  $\frac{E_a A_a + E_b A_b + E_c A_c + E_d A_d}{A_a + A_b + A_c + A_d}$   
Developed E = 2.14 in.

On-Site Volume of Runoff: V<sub>360</sub> =

$E * A / 12$   
Developed V<sub>360</sub> = 10929 CF

On-Site Peak Discharge Rate:  $Q_p = Q_{pA} A_a + Q_{pB} A_b + Q_{pC} A_c + Q_{pD} A_d / 43,560$

For Precipitation Zone 3			
$Q_{pA} = 1.87$	$Q_{pC} = 3.45$		
$Q_{pB} = 2.60$	$Q_{pD} = 5.02$		
	Developed $Q_p = 6.5$ CFS		

BASIN NO.	1	DESCRIPTION	FREE DISCHARGE
Area of basin flows =	11790 SF		0.3 Ac.
The following calculations are based on Treatment %s as shown in table to the right			
Sub-basin Weighted Excess Precipitation:		LAND TREATMENT	
Weighted E = 2.33 in.		A = 0%	B = 2%
Sub-basin Volume of Runoff:		C = 0%	D = 98%
V <sub>360</sub> = 2290 CF		SWQ RETENTION FOR BASIN 1 IS PROVIDED IN OFFSITE POND	
Sub-basin Peak Discharge Rate:			
Q <sub>p</sub> = 1.3 cfs			
BASIN NO.	2	DESCRIPTION	TO DETENTION SYSTEM
Area of basin flows =	49381 SF		1.1 Ac.
The following calculations are based on Treatment %s as shown in table to the right			
Sub-basin Weighted Excess Precipitation:		LAND TREATMENT	
Weighted E = 2.10 in.		A = 0%	B = 18%
Sub-basin Volume of Runoff:		C = 0%	D = 82%
V <sub>360</sub> = 8645 CF		STORMWATER QUALITY VOL.	
Sub-basin Peak Discharge Rate:			
Q <sub>p</sub> = 5.2 cfs		1147 CF	

Calculate diameter of orifice required to reduce flow to 4.1 cfs; Depth of flow is to top of 48" dia. detention pipe; Orifice Equation:  $= CA * \text{Sq.rt.of } (2gh)$

Q = Discharge in cfs  
C = Discharge coefficient from Handbook of Hydraulics, King and Brater, 5th Edition  
A = Area of opening in square feet  
g = 32.2 ft/sec  
h = Depth of water measured from the center of the opening

ORIFICE EQUATION - GENERAL - SOLVE FOR A			
Where	Q	= 4.1 cfs	
	C	= 0.6	
	A	= 0.45 sq.ft.	
	g	= 32.2 ft/sec <sup>2</sup>	
	h	= 3.62 ft	depth of flow at opening from the center of culvert

Orifice Area  
Pipe Dia (in.) Area (pi\*r^2)  
9.1 0.45

Outlet orifice invert = 0.0  
Center of orifice = 0.38

Outlet max water elevation Head = 4  
3.62

Orifice diameter = 9.1 inches

0.76 orifice diameter, ft.  
0.0 invert at orifice  
0.38 center of orifice

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Civil Engineering Consultants

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FRED C. ARFMAN  
NEW MEXICO  
7322  
LICENSED PROFESSIONAL ENGINEER  
02/01/2023  
Engineer

NATURAL GROCERS RETAIL

4625 WYOMING BLVD N.E.  
ALBUQUERQUE, NM

CONSTRUCTION DOCUMENTS	
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PROJECT NUMBER:	IA 2561
FILE:	
DRAWN BY:	BJB
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No	Date	Description

SHEET TITLE

DRAINAGE CALCULATIONS

SHEET NUMBER

CG-501