

**NOTICE OF MEETING
HILLSIDE REVIEW BOARD
CITY OF ST. GEORGE
WASHINGTON COUNTY, UTAH**

Public Notice

Notice is hereby given that the Hillside Review Board of the City of St. George, Washington County, Utah, will hold a meeting at the reference site on **Wednesday, July 22, 2026**, commencing on site #1 at 8:30 am

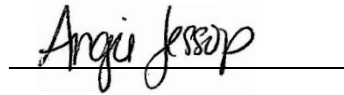
The agenda for the meeting is as follows:

Call to Order

Call for disclosure of conflicts of interest

1. **Mirabella at Sunbrook** - This is a request to obtain a hillside permit for the property generally located south of Sunbrook Dr and east of Luce Del Sol Dr in anticipation of construction of seven (7) three story condominium buildings, a private street and amenity areas. This property is in the hillside overlay. **Meeting time is approximately 8:30 am at approximately 280 S Luce Del Sol Dr. (See map below.)**
2. **Crown Point Lots 18, 19, 20 Hillside Disturbance Mitigation** – This is a request to consider a Hillside Development Permit to remove excess material from hillside placed during over excavation of 3 residential lots. **Meeting time is approximately 9:15 am at approximately 584 S Dixie Drive in the Northeast Cul de sac. (See map below.)**
3. **Minutes**

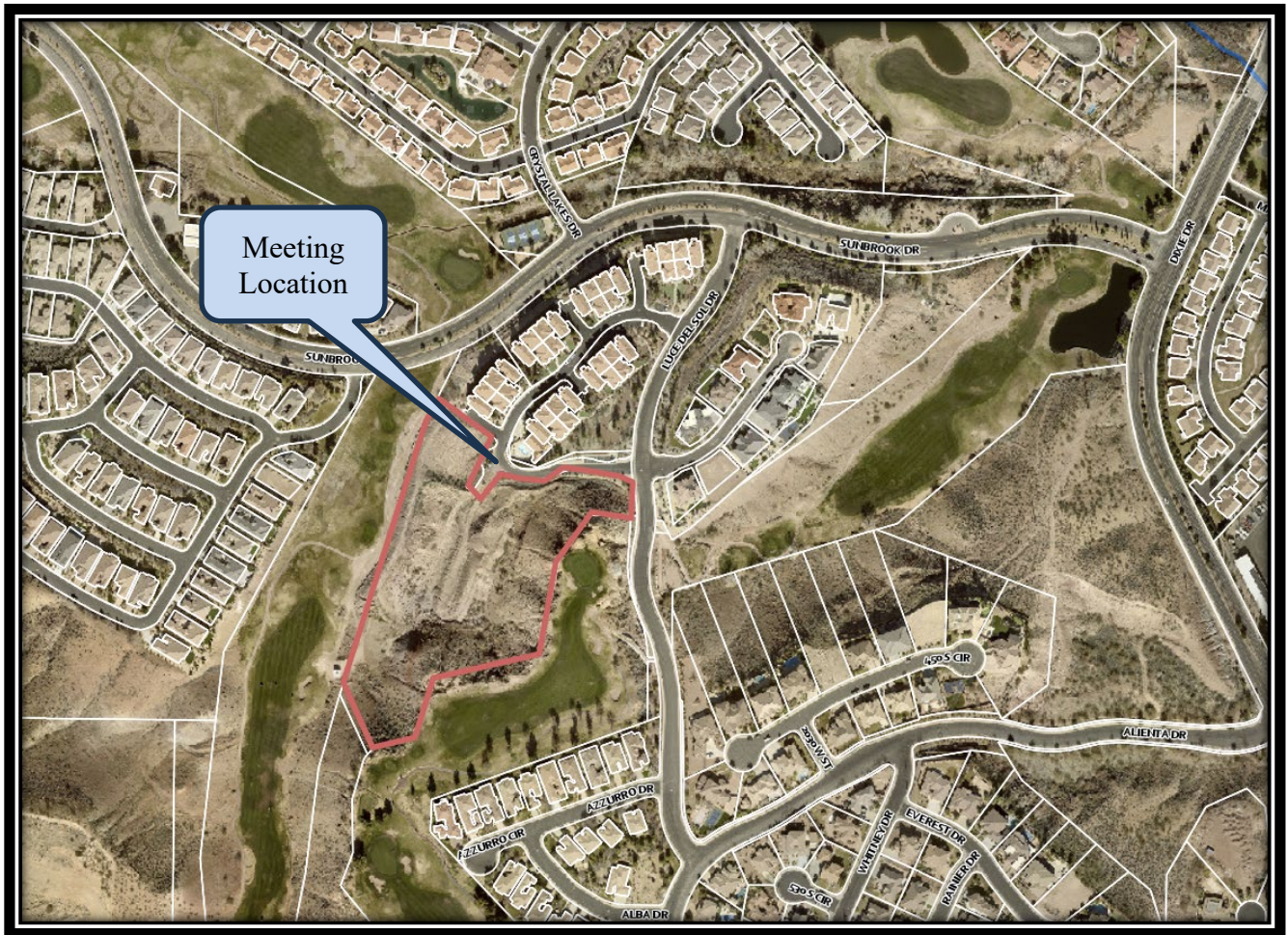
Consider a request to approve the meeting minutes from the May 27, 2026, meeting.

A handwritten signature in black ink, reading "Angie Jessop", is written over a horizontal line.

Angie Jessop – Development Services

REASONABLE ACCOMMODATION: The City of St. George will make efforts to provide reasonable accommodations to disabled members of the public in accessing City programs. Please contact the City Human Resources Office at (435) 627-4674 at least 24 hours in advance if you have special needs.

Meeting #1 Location



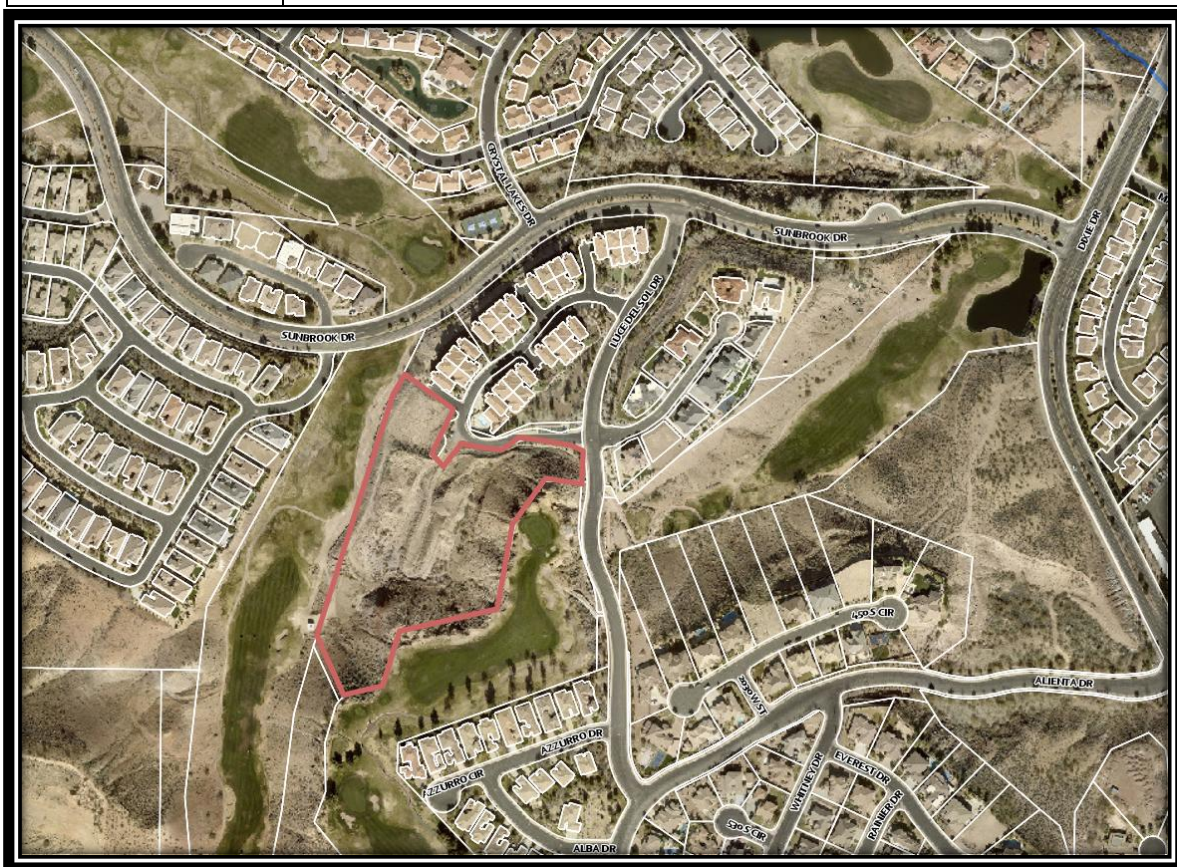
Meeting #2 Location



HILLSIDE REVIEW BOARD AGENDA REPORT:

07/22/2026

Mirabella at Sunbrook Hillside Development Permit (Case No. 2026-HS-004)	
Request:	Hillside Development Permit to allow disturbance of areas in the 20-30%, 30-40% and 40% and above slope areas. This application is required in order to develop the property into seven (7) three story condominium buildings, a private street and amenity areas.
Applicant:	Rosenburg Associates
Representative:	Jared Bates
Location:	Generally located south of Sunbrook Dr and east of Luce Del Sol Dr
General Plan:	LDR (Low Density Residential) & OS (Open Space)
Existing Zoning:	PD-R (Planned Development Residential)
Surrounding Zoning:	North PD-R (Planned Development Residential)
	South PD-R (Planned Development Residential)
	East PD-R (Planned Development Residential)
	West PD-R (Planned Development Residential)
Land Area:	7.62 Acres



BACKGROUND

Due to the age of this development, the background is difficult to reconstruct. The original Planned Development was approved in 1988. Golf course construction started in the fall of 1989 and the first dwelling units were available in 1991. Over the years there have been amendments to the PD in 1994, 1997, and 2004.

NARRATIVE



**Mirabella at Sunbrook
Hillside Development Review
Project Number: 1504-25-054**

This document has been prepared for Sun Hill Homes Development in support of the proposed Mirabella at Sunbrook development in St. George, Utah. The proposed subdivision is located within the Green Valley Hills 9-1992 Hillside Overlay Zone and requires hillside development review. The proposed project includes construction of 7, 3-story condominium buildings, a private street, and amenity areas. A geotechnical investigation prepared by AGEC on 4/21/26 provides detailed recommendations for excavations, placement of fill, grading and drainage, slope stability, and other construction criteria. As recommended by the geotechnical investigation, the construction of the proposed building improvements and other site excavation are to occur west of the toe of the hillside located along the east parcel boundary, outside of the 30%+ zones. Drainage swales will be constructed just west of the toe of the hillside to route flows away from proposed infrastructure to a stormdrain system along the east project boundary.

APPLICABLE ORDINANCE(S) *(Selected portions)*

10-13A-1: Density and Disturbance Standards

- A. The hillside development overlay zone (HDOZ) limits development densities and provides specific development incentives to transfer underlying zone densities from hillsides (sending areas) to less steep slopes or more safe development areas (receiving areas), within a development.

- B. For those portions of a proposed development with natural slopes twenty percent (20%) or less, development density follows the density and development standards in the underlying zone.
- C. For those portions of a proposed development with natural slopes from 31 to thirty percent (30%) of the parcel within this slope category.
- D. For those portions of a proposed development with natural slopes from thirty-one percent (31%) to forty percent (40%), development activity shall not disturb more than five percent (5%) of the area within this slope category.
- E. A proposed development may not disturb slopes in excess of forty percent (40%).

10-13A-2: Slope and Slope Areas Determined

- A. Slope shall be determined for each significant portion of development parcel.
- B. *Procedure:* The applicant shall map the location of the natural slope by using the following procedure:
 - 1. *Preparation of Contour Maps:* The applicant shall submit an accurate, current contour map, prepared and certified by a licensed professional engineer or surveyor, which shows all land contours at intervals no greater than five feet (5'), drawn at a one-inch equals one hundred feet (1" = 100') scale maximum.
 - 2. *Verification through Field Surveys:* The city engineer or designee may require the applicant to submit a field survey to verify the accuracy of the contour map.
- C. *Determination of Slope Areas:* Using the contour map, natural slopes shall be calculated using points identified as natural slopes of twenty percent (20%), thirty percent (30%), and forty percent (40%), and shall be located on the contour map and connected by a continuous line. That area bounded by said lines and intersecting property lines shall be used for determining project density. Small washes or outcrops, which have slopes distinctly different from surrounding property, and are not part of the contiguous topography, may be excluded from the slope determination.

EXHIBITS PROVIDED

1. Exhibit A – Survey
“Exhibit A” in the packet is the Survey.
2. Exhibit B – Slope Map
“Exhibit B” in the packet is an analysis of the slope.
3. Exhibit C – Grading Plan
“Exhibit C” in the packet is the Grading Plan.
4. Exhibit D – Landscape Plan
“Exhibit D” in the packet is the landscape plan.
5. Exhibit E – Drainage Study
“Exhibit E” in the packet is a letter provided by AGECC
6. Exhibit F – Geotechnical Investigation
“Exhibit F” in the packet is the Geotechnical report

RECOMMENDATION

Section 10-13A-8(B)(1) of the “Hillside Review Board Powers and Duties” states that the Hillside Board can make recommendations to “adopt, modify or reject a proposal” to the Planning Commission (PC).

MODEL MOTION

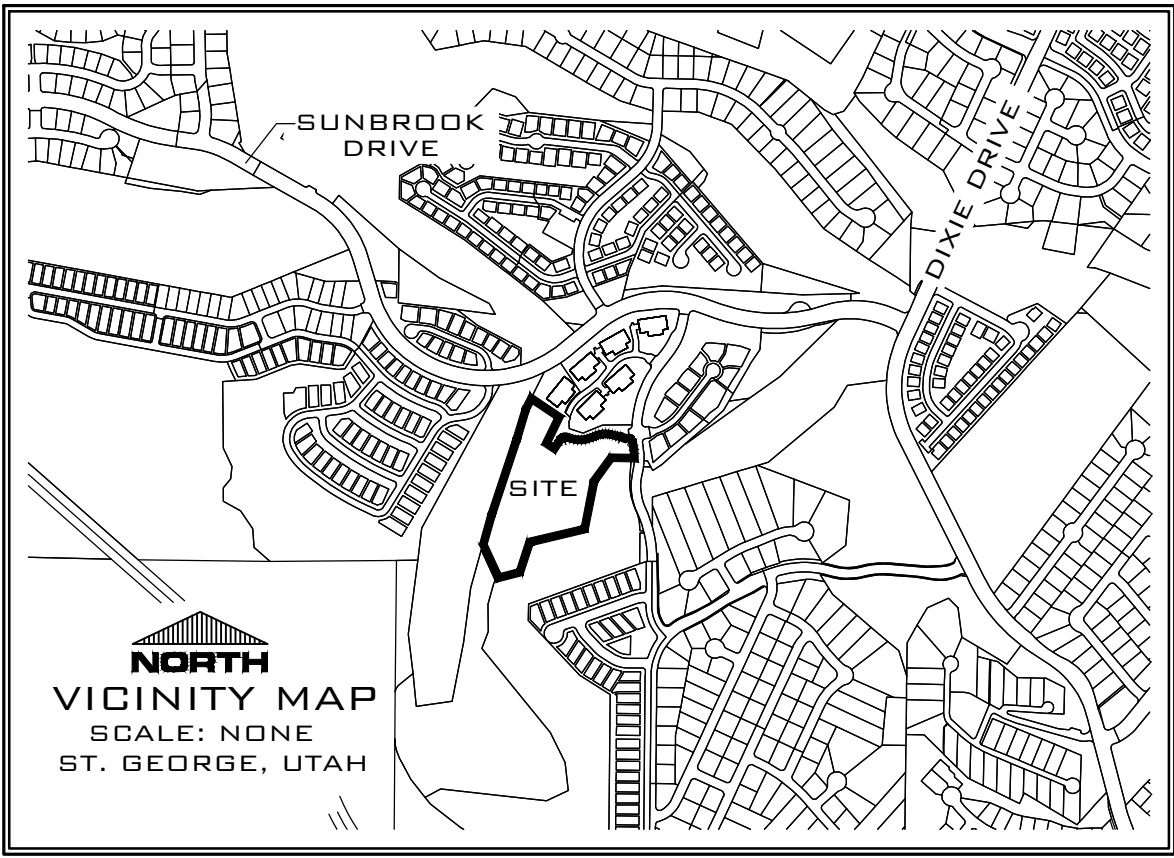
“I move that we recommend to the Planning Commission, approval of the Millabella at Sunbrook permit, application number 2026-HS-004, based on the findings and subject to the recommendations of the Hillside Review Board as listed in the staff report.”

FINDINGS

1. The proposed development generally aligns with the intent of the Hillside Development Overlay Zone in that it concentrates density in more buildable areas while limiting disturbance on steeper slopes.
2. Based on the materials provided, including the slope analysis and grading plans, the project appears to stay within the allowable disturbance thresholds for slopes between 20% and 40%, and avoids disturbance in areas exceeding 40% slope, consistent with City ordinance requirements.

EXHIBIT A

Survey Map



EASEMENTS AND SERVITUDES PER SCHEDULE B - SECTION 2:

ITEM 12: SUBJECT TO ANY RESERVATIONS, EXCEPTIONS AND EASEMENTS AS SET FORTH ON PATENT NO. 228402, FROM UNITED STATES OF AMERICA, RECORDED JANUARY 25, 1926, AS ENTRY NO. **00026457**, IN BOOK Y6, AT PAGES 339-340, OFFICIAL WASHINGTON COUNTY RECORDS. - NOTHING TO PLOT

ITEM 14: SUBJECT TO THE TERMS AND CONDITIONS AND RESERVATIONS AS SET FORTH IN BOUNDARY LINE ADJUSTMENT, RECORDED NOVEMBER 16, 2011, AS DOC NO. **20110035016**, AND CORRECTIVE GOLF CART PATH EASEMENT, IN FAVOR OF ST. GEORGE CITY, UTAH, A MUNICIPAL CORPORATION, RECORDED FEBRUARY 17, 2012, AS DOC NO. **20120005133**, OFFICIAL WASHINGTON COUNTY RECORDS. - PLOTTED

ITEM 15: GOLF CART PATH EASEMENT, IN FAVOR OF ST. GEORGE CITY, UTAH, A MUNICIPAL CORPORATION, RECORDED NOVEMBER 16, 2011, AS DOC NO. **20110035016**, AND CORRECTIVE GOLF CART PATH EASEMENT, IN FAVOR OF ST. GEORGE CITY, UTAH, A MUNICIPAL CORPORATION, RECORDED FEBRUARY 17, 2012, AS DOC NO. **20120005133**, OFFICIAL WASHINGTON COUNTY RECORDS. - PLOTTED

NOTES:

1. NO STRUCTURES EXIST ON SITE.

COMMITMENT FOR TITLE INSURANCE:

PREPARED PURSUANT TO SOUTHERN UTAH TITLE, REPORT NO. 230715, EFFECTIVE DATE: MARCH 12, 2024.

CURVE TABLE			
CURVE	LENGTH	RADIUS	DELTA
C1	16.30'	214.50'	4°21'14"
C2	46.34'	31.83'	83°24'53"
C3	140.23'	164.50'	48°50'33"
C4	102.05'	135.50'	43°09'06"
C5	32.43'	164.50'	11°17'44"
C6	22.50'	50.00'	25°46'59"
C7	14.59'	25.00'	33°26'16"
C8	21.98'	27.50'	45°47'42"
C9	6.96'	20.00'	19°55'39"
C10	40.62'	565.00'	4°07'10"
C11	50.31'	285.00'	10°06'51"

LINE TABLE			
LINE	LENGTH	DIRECTION	
L1	51.00'	S 56°20'34" E	
L2	37.79'	N 33°39'26" E	
L3	13.34'	N 88°03'11" E	



NARRATIVE:

THIS SURVEY WAS CONDUCTED PROVIDE AN ALTA/NSPS LAND TITLE SURVEY. THE BASIS OF BEARING IS AS NOTED.

SURVEYOR'S CERTIFICATE:

TO SUBURBAN LAND RESERVE, INC., A UTAH CORPORATION & SOUTHERN UTAH TITLE:

THIS IS TO CERTIFY THAT THIS MAP OR PLAT AND THE SURVEY ON WHICH IT IS BASED WERE MADE IN ACCORDANCE WITH THE TITLE MINIMUM STANDARD DETAIL REQUIREMENTS FOR ALTA/NSPS LAND TITLE SURVEYS, JOINTLY ESTABLISHED AND ADOPTED BY ALTA AND NSPS, AND INCLUDES ITEMS 5, AND 15 OF TABLE A THEREOF. THE FIELD WORK WAS COMPLETED ON MARCH 26, 2024.

DATE OF PLAT MAP: 4/15/2024

BRANDON E. ANDERSON
CERTIFICATE No. 4938716

LEGAL DESCRIPTION:

BEGINNING AT A POINT ON THE SOUTH RIGHT-OF-WAY LINE OF SUNBROOK DRIVE, AN 80.00 FOOT WIDE PUBLIC STREET, SAID POINT BEING NORTH 00°46'03" WEST 503.28 FEET ALONG THE SECTION LINE AND NORTH 90°00'00" WEST 377.44 FEET FROM THE EAST QUARTER CORNER OF SECTION 27, TOWNSHIP 42 SOUTH, RANGE 16 WEST, SALT LAKE BASE AND MERIDIAN, SAID POINT BEING ON THE 492.50 FOOT RADIUS CURVE, CONCAVE TO THE SOUTHEAST, THE RADIUS POINT OF WHICH BEARS SOUTH 08°35'44" EAST; THENCE RUNNING ALONG THE SAID SOUTH RIGHT-OF-WAY LINE AS FOLLOWS: THENCE SOUTHWESTERLY 128.17 FEET ALONG THE ARC OF SAID CURVE THROUGH A CENTRAL ANGLE OF 14°5'39" TO THE POINT OF REVERSE CURVATURE OF A 540.00 FOOT RADIUS CURVE, CONCAVE TO THE NORTH, THE RADIUS POINT OF WHICH BEARS (NORTH) SOUTH 23°30'23" EAST (WEST); THENCE WESTERLY 391.19 FEET ALONG THE ARC OF SAID CURVE THROUGH A CENTRAL ANGLE OF 41°30'23"; THENCE NORTH 72°00'00" WEST 238.51 FEET TO THE POINT OF CURVATURE OF A 511.50 FOOT RADIUS CURVE, CONCAVE TO THE SOUTHWEST; THENCE NORTHWESTERLY 15.43 FEET ALONG THE ARC OF SAID CURVE THROUGH A CENTRAL ANGLE OF 01°43'44" TO THE POINT OF COMPOUND CURVATURE OF A 25.00 FOOT RADIUS CURVE, CONCAVE TO THE SOUTHEAST, THE RADIUS POINT OF WHICH BEARS SOUTH 16°16'16" WEST; THENCE NORTHWESTERLY AND SOUTHWESTERLY 41.84 FEET ALONG THE ARC OF SAID CURVE THROUGH A CENTRAL ANGLE OF 05°53'39" EAST; THENCE SOUTH 10°22'20" WEST 4.42 FEET; THENCE NORTH 79°37'40" WEST 50.00 FEET; THENCE NORTH 10°22'20" EAST 4.35 FEET TO THE POINT OF CURVATURE OF A 15.00 FOOT RADIUS CURVE, CONCAVE TO THE SOUTHWEST; THENCE NORTHWESTERLY 24.80 FEET ALONG THE ARC OF SAID CURVE THROUGH A CENTRAL ANGLE OF 94°43'33" TO THE POINT OF COMPOUND CURVATURE OF A 500.50 FOOT RADIUS CURVE, CONCAVE TO THE SOUTH, THE RADIUS POINT OF WHICH BEARS SOUTH 05°38'47" WEST; THENCE 140.22 FEET ALONG THE ARC OF SAID CURVE THROUGH A CENTRAL ANGLE OF 16°03'08" TO THE POINT OF REVERSE CURVATURE OF 250.00 FOOT RADIUS CURVE, CONCAVE TO THE NORTHWEST; THENCE SOUTHWESTERLY 89.64 FEET ALONG THE ARC OF SAID CURVE THROUGH A CENTRAL ANGLE OF 07°01'25" TO THE POINT OF REVERSE CURVATURE OF A 250.00 FOOT RADIUS CURVE, CONCAVE TO THE SOUTHEAST, THE RADIUS POINT OF WHICH BEARS SOUTH 03°22'56" EAST; THENCE SOUTHWESTERLY 89.64 FEET ALONG THE ARC OF SAID CURVE THROUGH A CENTRAL ANGLE OF 20°32'41" TO THE POINT OF COMPOUND CURVATURE OF A 511.50 FOOT RADIUS CURVE, CONCAVE TO THE SOUTHEAST, THE RADIUS POINT OF WHICH BEARS SOUTH 23°55'37" EAST; THENCE SOUTHWESTERLY 60.23 FEET ALONG THE ARC OF SAID CURVE THROUGH A CENTRAL ANGLE OF 06°44'48" FROM WHICH THE RADIUS POINT BEARS SOUTH 30°40'25" EAST; THENCE LEAVING SAID SOUTH RIGHT-OF-WAY LINE SOUTH 12°29'40" WEST 44.92 FEET; THENCE NORTH 85°00'20" WEST 48.00 FEET TO A POINT ON SAID SOUTH RIGHT-OF-WAY LINE, SAID POINT BEING ON A 511.50 FOOT RADIUS CURVE, CONCAVE TO THE SOUTHEAST, THE RADIUS POINT OF WHICH BEARS SOUTH 28°30'29" EAST; THENCE ALONG SAID SOUTH RIGHT-OF-WAY LINE AS FOLLOWS: SOUTHWESTERLY 21.16 FEET ALONG THE ARC OF SAID CURVE THROUGH A CENTRAL ANGLE OF 02°22'14"; THENCE SOUTH 49°07'17" WEST 218.16 FEET TO THE POINT OF CURVATURE OF 692.10 FOOT RADIUS CURVE, CONCAVE TO THE NORTHWEST; THENCE SOUTHWESTERLY 163.53 FEET ALONG THE ARC OF SAID CURVE THROUGH A CENTRAL ANGLE OF 1°3'32'17" TO A POINT ON THE EAST BOUNDARY LINE OF SUNBROOK GOLF COURSE HOLE NO. 2, FROM WHICH THE RADIUS POINT BEARS NORTH 27°20'26" WEST; THENCE LEAVING SAID SOUTH RIGHT-OF-WAY LINE AND RUNNING ALONG SAID SUNBROOK GOLF COURSE BOUNDARY LINE AS FOLLOWS: SOUTH 24°23'50" WEST 16.09 FEET; THENCE SOUTH 15°34'08" WEST 158.00 FEET; THENCE SOUTH 16°53'37" WEST 423.25 FEET; THENCE SOUTH 14°11'06" WEST 155.06 FEET; THENCE SOUTH 26°18'22" EAST 190.71 FEET; THENCE NORTH 74°32'49" EAST 113.52 FEET; THENCE NORTH 16°47'54" EAST 166.09 FEET; THENCE NORTH 75°13'57" EAST 293.20 FEET; THENCE NORTH 09°49'09" EAST 295.00 FEET; THENCE NORTH 34°44'35" EAST 150.90 FEET; THENCE NORTH 90°00'00" EAST 104.70 FEET; THENCE SOUTH 02°28'30" WEST 107.50 FEET TO THE POINT OF CURVATURE OF A 325.00 FOOT RADIUS CURVE, CONCAVE TO THE NORTHEAST; THENCE SOUTHEASTERLY 159.91 FEET ALONG THE ARC OF SAID CURVE THROUGH A CENTRAL ANGLE OF 28°11'28" TO THE POINT OF REVERSE CURVATURE OF A 275.00 FOOT RADIUS CURVE, CONCAVE TO THE SOUTHWEST; THENCE NORTH 02°28'30" EAST 64°17'02" WEST; THENCE SOUTHEASTERLY 119.26 FEET ALONG THE ARC OF SAID CURVE THROUGH A CENTRAL ANGLE OF 24°50'55" TO THE POINT OF TANGENCY; THENCE NORTH 89°07'57" EAST 50.00 FEET TO THE POINT OF CURVATURE OF 325.00 FOOT RADIUS CURVE, CONCAVE TO THE SOUTHWEST; THENCE NORTHWESTERLY 140.95 FEET ALONG THE ARC OF SAID CURVE THROUGH A CENTRAL ANGLE OF 24°50'55" TO THE POINT OF REVERSE CURVATURE OF A 275.00 FOOT RADIUS CURVE, CONCAVE TO THE NORTHEAST, THE RADIUS POINT OF WHICH BEARS NORTH 64°17'02" EAST; THENCE NORTHWESTERLY 135.31 FEET ALONG THE ARC OF SAID CURVE THROUGH A CENTRAL ANGLE OF 28°11'28" TO THE POINT OF TANGENCY; THENCE NORTH 02°28'30" EAST 68.07 FEET; THENCE NORTH 90°00'00" EAST 66.11 FEET; THENCE LEAVING SAID GOLF COURSE BOUNDARY NORTH 00°52'03" WEST 289.99 FEET; THENCE NORTH 81°00'47" EAST 502.80 FEET TO A POINT ON THE SUNBROOK GOLF COURSE BOUNDARY LINE; THENCE ALONG SAID GOLF COURSE BOUNDARY LINE NORTH 53°10'50" EAST 196.99 FEET; THENCE NORTH 44°08'05" EAST 423.92 FEET TO THE SOUTH RIGHT-OF-WAY LINE OF SAID SUNBROOK DRIVE AND THE POINT OF BEGINNING.

LESS AND EXCEPTING: ANY LAND WITHIN DUCE DEL SOL ROAD, A DEDICATED PUBLIC STREET.

LESS AND EXCEPTING: BELLA VISTA AT SUNBROOK, ACCORDING TO THE OFFICIAL PLAT THEREOF, ON FILE IN THE OFFICE OF THE RECORDER OF WASHINGTON COUNTY, STATE OF UTAH.

LESS AND EXCEPTING: BELLA TERRAZZA @ SUNBROOK 2ND AMENDED AND EXTENDED, ACCORDING TO THE OFFICIAL PLAT THEREOF, ON FILE IN THE OFFICE OF THE RECORDER OF WASHINGTON COUNTY, STATE OF UTAH.

TOGETHER WITH AN UNDIVIDED INTEREST IN THE COMMON AREAS AS SET FORTH IN THE COVENANTS, CONDITIONS AND RESTRICTIONS AND ON THE OFFICIAL PLAT(S) THEREOF.

LESS AND EXCEPTING: BELLA TERRAZZA 2 @ SUNBROOK AMENDED, ACCORDING TO THE OFFICIAL PLAT THEREOF, ON FILE IN THE OFFICE OF THE RECORDER OF WASHINGTON COUNTY, STATE OF UTAH.

TOGETHER WITH AN UNDIVIDED INTEREST IN THE COMMON AREAS AS SET FORTH IN THE COVENANTS, CONDITIONS AND RESTRICTIONS AND ON THE OFFICIAL PLAT(S) THEREOF.

LESS AND EXCEPTING: POR OF NE1/4 SEC 27 T42S R16W AS FOL: BEG AT PT ON ELY LN OF BELLA VISTA AT SUNBROOK, SD PT IS 2246.71 FT S0°28'31" W ALG 1/4 SEC/L & 1891.34 FT S89°31'37" E FM NW COR SD 1/4 SEC; TH ELY ALG ARC OF 540.00 FT RAD CUR LFT 282.00 FT (LNG CHD BEARS N82°52'43" E 278.81 FT); TH ELY ALG ARC OF 492.50 FT RAD CUR RGT 128.14 FT (LNG CHD BEARS N75°22'19" E 127.78 FT); TH S43°36'18" W 423.90 FT; TH S54°36'18" W 196.99 FT; TH S82°26'15" W 105.95 FT TO SD ELY LN OF BELLA VISTA AT SUNBROOK; TH 4 CRSES ALG SD ELY LN AS FOL: N29°53'57" E 194.75 FT; N31°32'43" E 34.47 FT; N33°34'53" E 83.40 FT & N4°15'43" E 90.58 FT TO POB.

LESS AND EXCEPTING: POR OF SE1/4 SEC 27 T42S R16W AS FOL: BEG AT PT ON WLY R/W/L OF LUCE DEL SOL DR SD PT IS 2908.40 FT S0°28'23" W ALG 1/4 SEC/L & 1236.24 FT S89°31'37" E FM N1/4 COR SD SEC; TH 3 CRSES ALG SD W R/W/L AS FOL: SLY ALG ARC OF 285.00 FT RAD CUR RGT 68.68 FT (LNG CHD BEARS S6°51'05" W 68.51 FT); SLY ALG ARC OF 325.00 FT RAD CUR LFT 217.50 FT (LNG CHD BEARS S5°25'01" E 213.46 FT) & SLY ALG ARC OF 603.00 FT RAD CUR RGT 104.26 FT (LNG CHD BEARS S19°38'09" E 104.13 FT); TH N89°26'35" W 18.86 FT; TH NWLY ALG ARC OF 275.00 FT RAD CUR LFT 119.27 FT (LNG CHD BEARS N1°52'02" W 119.33 FT); TH NWLY ALG ARC OF 325.00 FT RAD CUR RGT 159.91 FT (LNG CHD BEARS N10°11'46" W 158.30 TH N3°53'58" E 107.50 FT; TH S88°33'45" E 16.94 FT TO POB.

LESS AND EXCEPTING: POR OF SE1/4 SEC 27 T42S R16W AS FOL: BEG AT PT ON E R/W/L OF LUCE DEL SOL DR SD PT IS 2918.92 FT S0°28'23" W ALG 1/4 SEC/L & 1286.15 FT S89°31'37" E FM N1/4 COR SD SEC; TH 2 CRSES ALG SLY LN OF BELLA VISTA AT SUNBROOK AS FOL: S87°46'48" E 171.86 FT & S27°46'09" E 321.21 FT; TH S87°46'09" E 321.21 FT TO SD E R/W/L; TH N1°56'34" E 155.06 FT; TH N1°56'34" E 423.25 FT; TH N16°59'36" E 158.00 FT; TH N26°19'18" E 216.09 FT TO SD SLY R/W/L OF SUNBROOK DR; TH NELY ALG ARC OF 692.10 FT RAD CUR LFT 99.74 FT (LNG CHD BEARS N59°57'20" E 99.65 FT) TO POB.

ALSO: POR OF E1/2 SEC 27 T42S R16W AS FOL: BEG AT PT ON SLY R/W/L OF SUNBROOK DR SD PT IS NWLY COR OF BELLA TERRAZZA & SUNBROOK AMD & EXT, SD PT BEING 2414.73 FT S0°28'23" W ALG 1/4 SEC/L & 847.26 FT S89°31'37" E FM N1/4 COR SD SEC; TH 8 CRSES ALG WLY & SLY LN OF SD BELLA TERRAZZA @ SUNBROOK AMD & EXT AS FOL: S34°09'48" E 182.48 FT; SWLY ALG ARC OF 218.50 FT RAD CUR LFT 135.47 FT (LNG CHD BEARS S36°36'31" W 133.31 FT); S46°29'35" E 39.24 FT; S22°30'42" W 22.07 FT; S1°51'07" E 37.08 FT; S71°51'07" E 76.62 FT; N67°34'00" E 109.43 FT & N89°08'13" E 153.44 FT TO W R/W/L OF LUCE DEL SOL DR; TH 6 CRSES ALG SD W R/W/L AS FOL: SLY ALG ARC OF 565.00 FT RAD CUR LFT 4.49 FT (LNG CHD BEARS S2°20'30" W 4.49 FT) TO PT DR RVSE COR SWLY ALG ARC OF 20.00 FT RAD CUR RGT 29.99 FT (LNG CHD BEARS S45°04'41" W 27.26 FT; S1°51'07" E 43.00 FT; TH SLY ALG ARC OF 30.00 FT RAD CUR RGT 30.00 FT (LNG CHD BEARS S48°59'08" E 27.26 FT) TO PT OF RVSE CURVE; SLY ALG ARC OF 565.00 FT RAD CUR LFT 40.62 FT (LNG CHD BEARS S8°04'53" E 40.61 FT) TO PT OF RVSE CURVE; & SLY ALG ARC OF 285.00 FT RAD CUR LFT 119.27 FT (LNG CHD BEARS S5°05'49" E 50.02 FT); TH N88°33'45" W 16.94 FT; TH N88°34'32" W 104.70 FT; TH S36°10'03" W 150.90 FT; TH S11°14'37" W 255.00 FT; TH S76°39'25" W 293.20 FT; TH S18°13'22" W 166.09 FT; TH S75°58'17" W 113.52 FT; TH S47°09'03" W 22.63 FT TO NLY LN OF PARCEL SG-6-2-27-232; TH N24°52'40" W 176.17 FT ALG SD R/W/L; TH N20°17'27" E 115.06 FT; TH N15°06'34" E 155.06 FT; TH N15°19'05" E 423.25 FT; TH N16°59'36" E 158.00 FT; TH N26°19'18" E 216.09 FT TO SD SLY R/W/L OF SUNBROOK DR; TH NELY ALG ARC OF 692.10 FT RAD CUR LFT 99.74 FT (LNG CHD BEARS N59°57'20" E 99.65 FT) TO POB.

LOCATED IN THE S.E. 1/4 SECTION 27 T.42S., R.16W., S.L.B.&M.

LEGEND:

- EXISTING CATCH BASIN
- EXISTING SEWER MANHOLE
- EXISTING WATER VALVE
- NOTHING SET OR FOUND
- FOUND SECTION MONUMENTATION AS SHOWN AND DESCRIBED
- FOUND SURVEY CONTROL MONUMENT - CLASS I
- FOUND SURVEY CONTROL MONUMENT - CLASS II

DATE:	4/15/2024
JOB NO.:	1014322-005
DRAWN BY:	B.E.A.
CHECKED BY:	B.E.A.
SCALE:	1"=60'
DWG:	SURVEY-ALTA
DATE	
REVISIONS	

ROSENBERG
A S S O C I A T E S
CIVIL ENGINEERS • LAND SURVEYORS

352 EAST RIVERBIDE DRIVE, SUITE A-2 ST. GEORGE, UTAH 84790
PH (435) 673-8586
FX (435) 673-8397
WWW.RADIVIL.COM

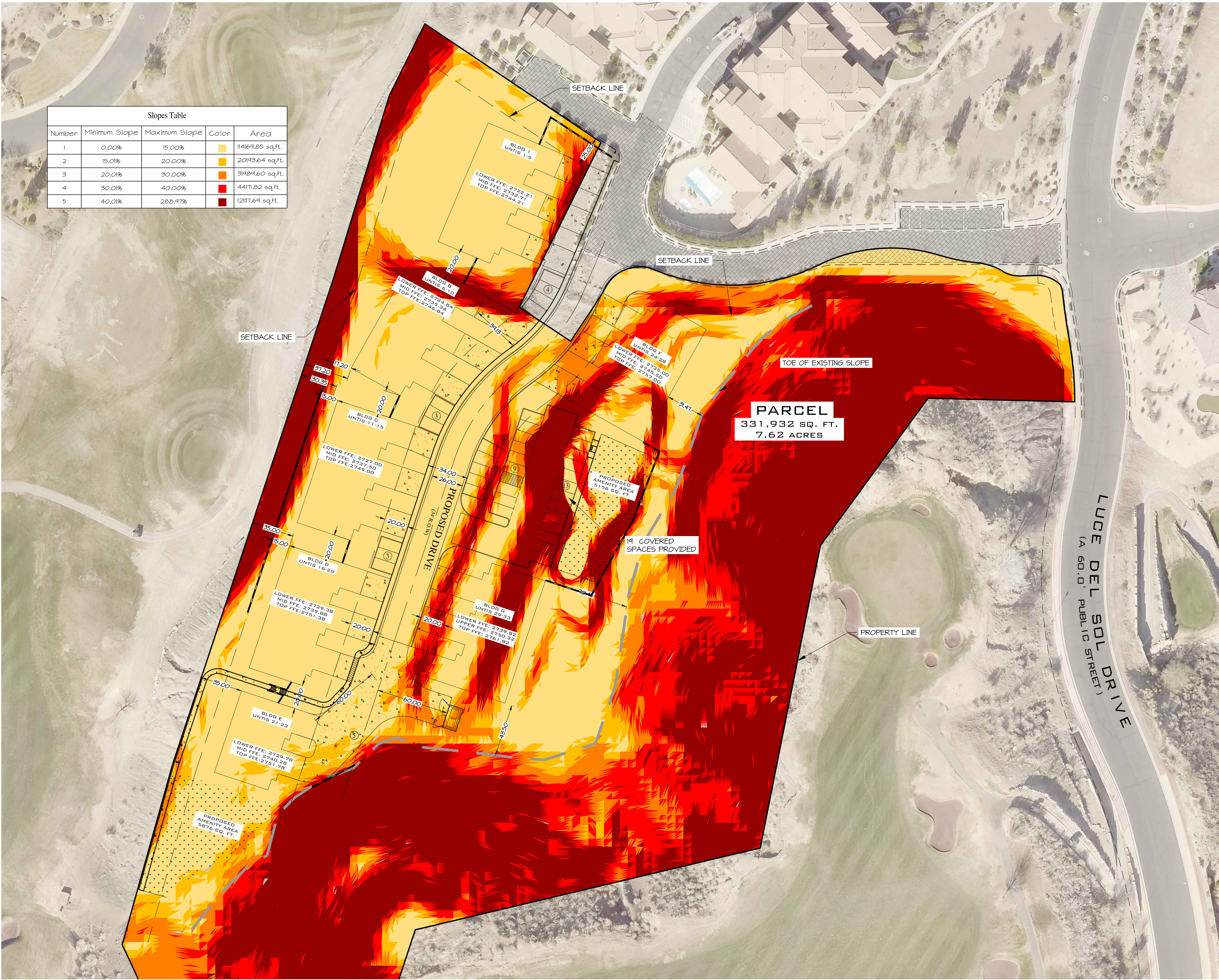
ALTA/NSPS LAND TITLE SURVEY
FOR
SUBURBAN LAND RESERVE

SHEET
1
OF 1 SHEETS

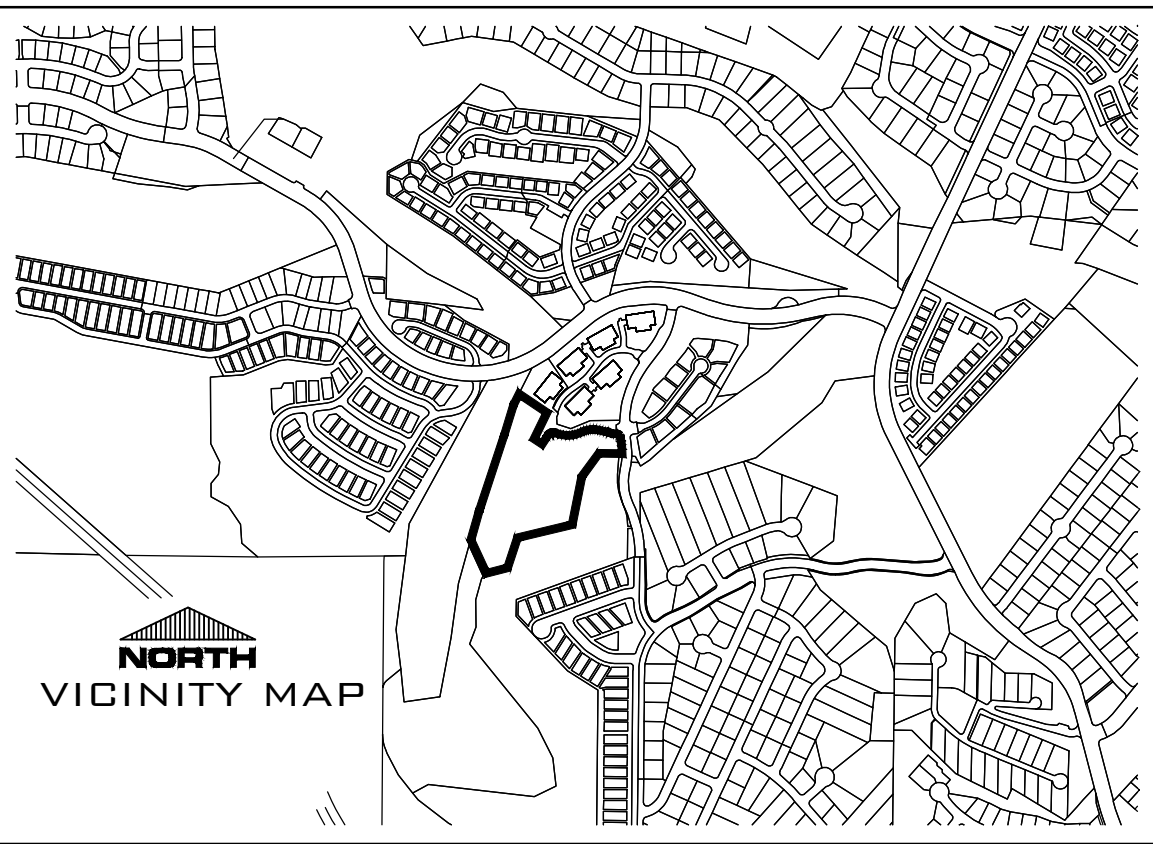
EXHIBIT B

Slope Map

MIRABELLA AT SUNBROOK



Slopes Table				
Number	Minimum Slope	Maximum Slope	Color	Area
1	0.00%	15.00%	Light Yellow	11464.25 sq.ft.
2	15.01%	20.00%	Yellow	20193.64 sq.ft.
3	20.01%	30.00%	Orange	31924.60 sq.ft.
4	30.01%	40.00%	Red-Orange	44171.22 sq.ft.
5	40.01%	200.00%	Dark Red	12117.69 sq.ft.

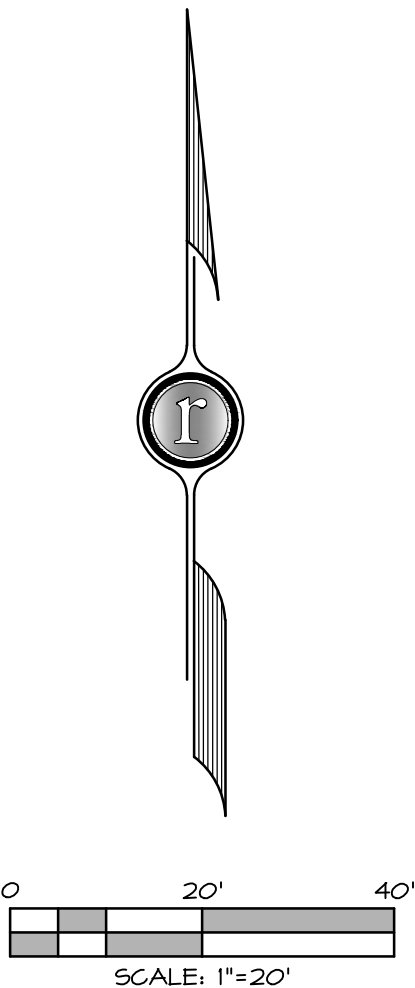


DATE:	9-10-25
JOB NO.:	#504-24-054
DESIGNED BY:	ET
CHECKED BY:	JWB
DWG:	HGN LAYOUT
DATE:	
REVISIONS:	

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SLOPE MAP
FOR
MIRABELLA AT SUNBROOK PH 3
SAINT GEORGE
UT



Know what's below.
Call before you dig.

NOTES:
1. EXISTING UTILITIES ARE SHOWN ON PLANS FOR THE CONVENIENCE OF THE CONTRACTOR ONLY. THE CONTRACTOR IS RESPONSIBLE FOR THE LOCATION AND PROTECTION OF ALL UTILITIES. UTILITY OWNERS SHOULD BE RESPONSIBLE FOR UTILITIES NOT SHOWN OR SHOWN INCORRECTLY.

EXHIBIT C

Grading Plan



LEGEND

SITE DATA

PARCEL NUMBER:

CURRENT ZONE:

TOTAL PROJECT AREA:
331,932 SQ. FT.
7.62 ACRES
DISTURBED AREA: 2.92 ACRES

UNIT COUNT:
TOP UNITS: 13
LOWER UNITS: 20
TOTAL UNITS: 33

PARKING:
2 SPACES FOR EVERY UNIT, 1 GUEST SPACE FOR EVERY 3 UNITS

TOTAL SPACES REQUIRED:
 $33 \times 2 = 66$
 $33 / 3 = 11$
 $66 + 11 = 77$ SPACES

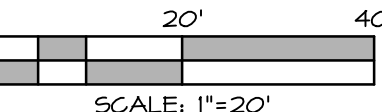
LOWER UNITS TOTAL= 2(SPACES) X 20 (UNITS)
= 40 REQUIRED SPACES
(PARKING FOR LOWER UNITS PROVIDED BY GARAGE & DRIVEWAY.

TOP UNITS: 2(SPACES) X 13 (UNITS)
= 26 REQUIRED SPACES

GUEST PARKING REQUIRED= 33 (UNITS) / 1 (SPACE,
= 11 REQUIRED SPACES

TOTAL SPACES REQUIRED: 77
PROVIDED: 77
ADA ACCESSIBLE: 3 (1 VAN, 2 STANDARD)

SETBACKS:
FRONT: 25'
SIDE ALONG STREET: 20'
SIDE:10'
REAR:20'
BUILDING SEPARATION: 20'



Know what's **below**.
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NOTICE:
EXISTING UTILITIES ARE SHOWN ON PLANS FOR THE CONVENIENCE
OF THE CONTRACTOR ONLY. THE CONTRACTOR IS RESPONSIBLE
FOR THE LOCATION AND PROTECTION OF ALL UTILITIES. THE
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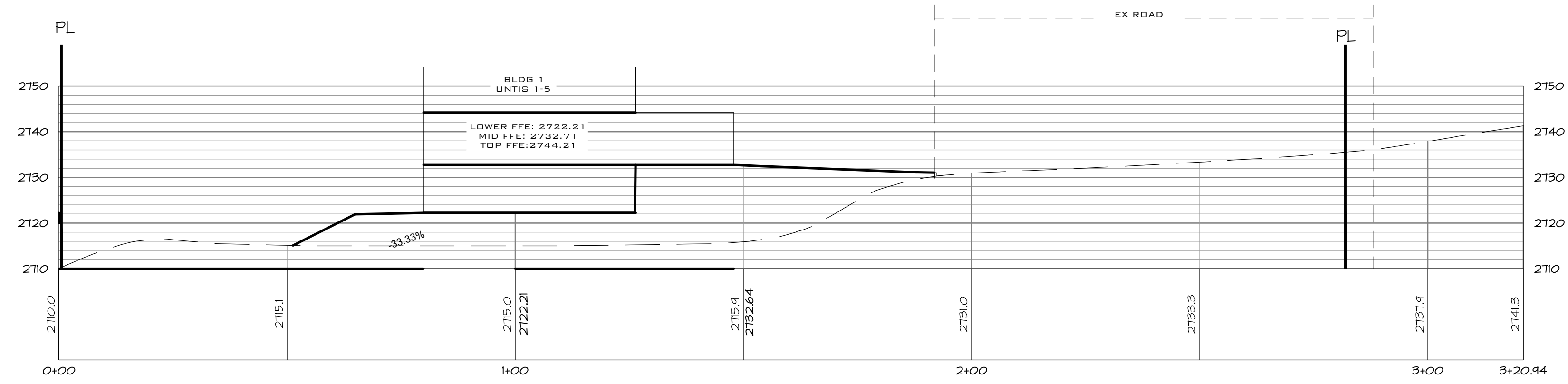


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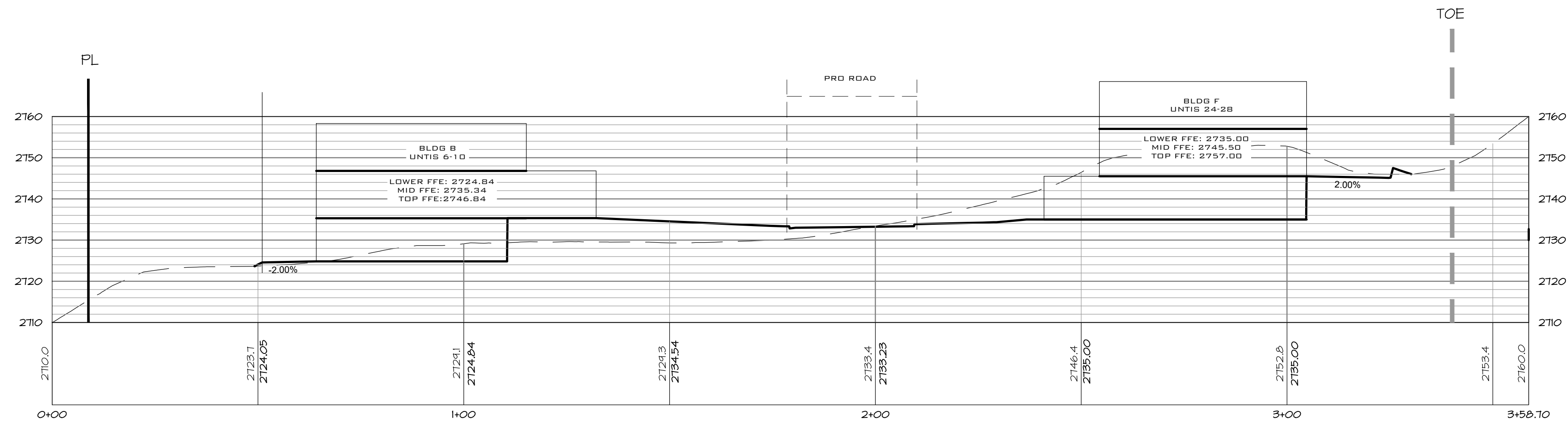
CONCEPT LAYOUT
FOR
MIRABELLA AT SUNBROOK
SAINT GEORGE
UT

SHEET
1.0
OF 3 SHEETS

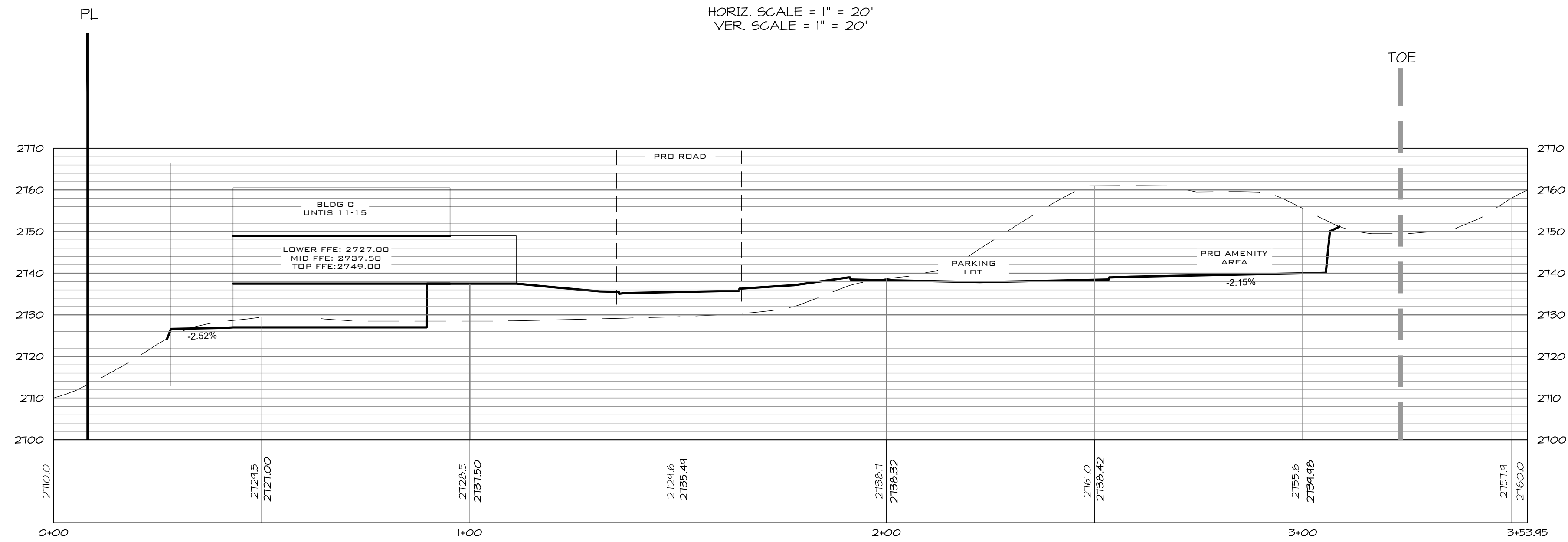
1 OF 3 SHEETS



SECTION A-A STATION 0+00 - 3+20
 HORIZ. SCALE = 1" = 20'
 VER. SCALE = 1" = 20'



SECTION B-B STATION 0+00 - 3+58
 HORIZ. SCALE = 1" = 20'
 VER. SCALE = 1" = 20'



SECTION C-C STATION 0+00 - 3+53
 HORIZ. SCALE = 1" = 20'
 VER. SCALE = 1" = 20'

DATE:	3-21-25
JOB NO.:	#504-24-054
DESIGNED BY:	ETY
CHECKED BY:	JWB
DWG:	HGN LAYOUT
DATE:	
REVISIONS:	

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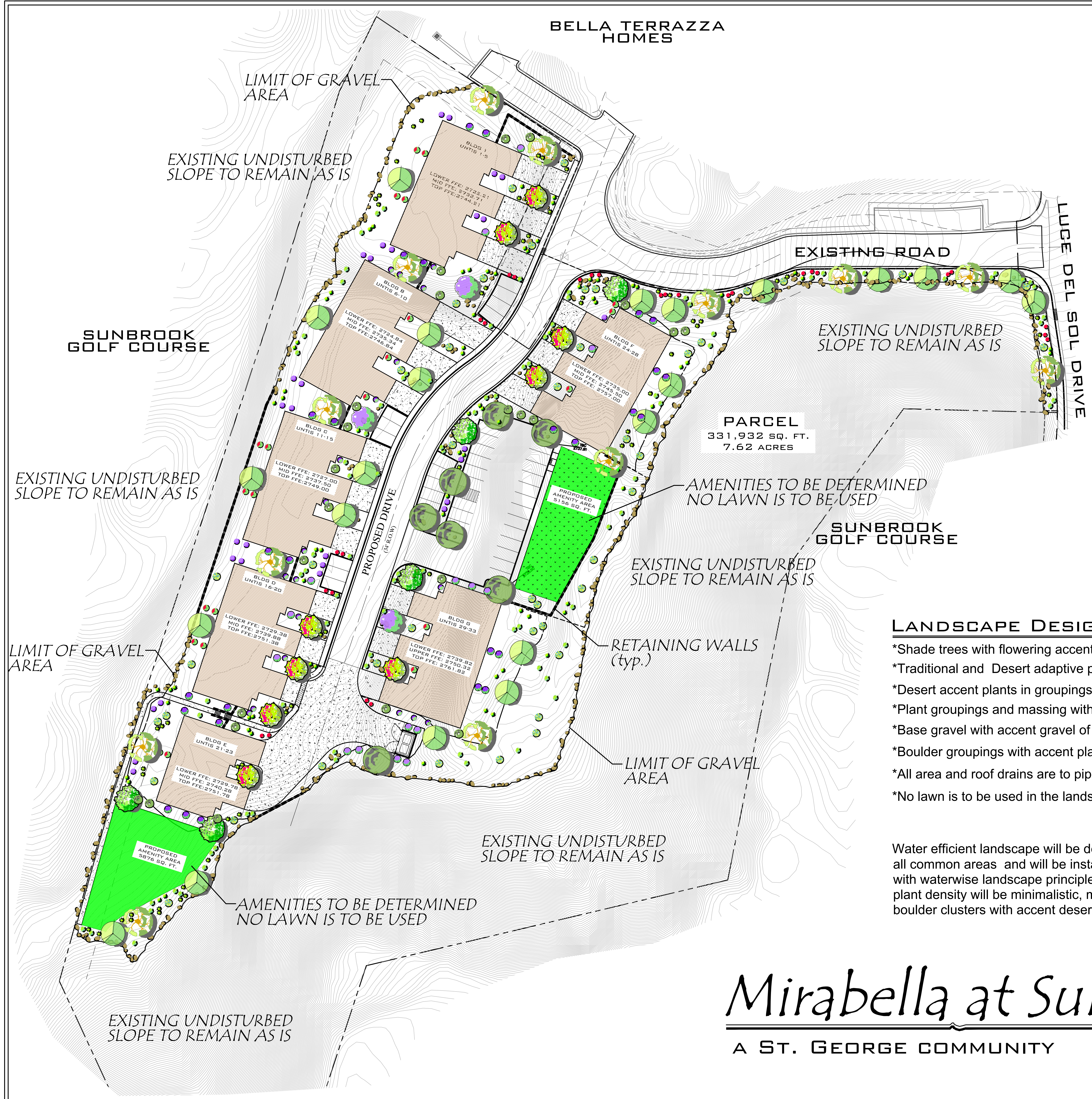
CROSS SECTIONS
 FOR
MIRABELLA AT SUNBROOK
 SAINT GEORGE
 UT



PRO ROAD PROFILE STATION 0+00 - 5+17

EXHIBIT D

Landscape Plan



LANDSCAPE DESIGN INTENT

- *Shade trees with flowering accent trees
- *Traditional and Desert adaptive plants
- *Desert accent plants in groupings
- *Plant groupings and massing with accent plants
- *Base gravel with accent gravel of different colors/sizes
- *Boulder groupings with accent plantings
- *All area and roof drains are to pipe to street
- *No lawn is to be used in the landscape due to soil conditions

Water efficient landscape will be developed in all common areas and will be installed in keeping with waterwise landscape principles. Due to soil conditions plant density will be minimalistic, maintaining plant groupings, boulder clusters with accent desert plants as focal features.

PLANT PALETTE

TREES – MEDIUM SHADE TREES

- NAME
- Chilopsis linearis* 'L. Hamilton'
 - Desert Willow
 - Olea europaea* 'Wilsonii'
 - Wilson Olive
 - Prosopis glandulosa* 'maverick'
 - Maverick Honey Mesquite
 - Quercus virginiana*
 - Live Oak
 - Pistachio chinensis*
 - Chinese Pistache
 - Quercus virginiana*
 - Live Oak

TREES – SMALL, ACCENT FLOWERING

- Vitex agnus-castus*
- Chaste Tree
- Lagerstroemia indica*
- Crepe Myrtle

SHRUBS – TRADITIONAL

- NERIUM oleander* 'Hardy Red'
- Hardy Dwarf Oleander
- EUONYMUS j. Aureo-marginata*
- Gold Spot Euonymus
- ABELIA x grand.* 'Sunrise'
- Sunrise Variegated Abelia
- Rosa x 'Noare'*
- Flowering Carpet Rose
- ROSMARINUS o. 'Prostratus'*
- Prostrate Rosemary

SHRUBS – DESERT ADAPTIVE

- LEUCOPHYLLUM langmaniae*
- Lynn's Legacy Ranger
- PEROVSKIA atriplicifolia*
- Russian Sage
- SALVIA greggii*
- Red Sage
- MUHLENBERGIA capillaris* 'R. Mist'
- Regal Mist Deer Grass
- CHRYSANTHEMUM mexicanum*
- Damianita

DESERT ACCENTS

- DASYLIRION longissimum*
- Toothless Desert Spoon
- DASYLIRION wheeleri*
- Desert Spoon
- HESPERALOE parviflora*
- Red Yucca
- YUCCA filamentosa* 'Color Guard'
- Color Guard Yucca
- AGAVE americana* 'Marginata'
- Variegated Century Plant
- AGAVE parryi*
- Parry's Agave

COSTANZA PS ASSOCIATES
John J. Costanza
P.O. Box 3122
St. George, Utah 84771
Telephone 435-862-8317
costanza@costanza.com

LANDSCAPE ARCHITECT
John J. Costanza
Signature
Date
97-228108-5301
5/16/26 mirabella

MIRABELLA at Sunbrook
CONCEPTUAL LANDSCAPE PLAN

no.	revisions	dated by

Scale: 1" = 60'

Date: MAY 15, 2026

Drawn By: JUC

Approved By: JUC

MIRABELLA at Sunbrook
CONCEPT LANDSCAPE PLAN

North

Job No.

misc.

Sheet No.

L-1

of 1

30" x 42" SHEET FORMAT

0 30 60 120

1" = 30'-0"

Mirabella at Sunbrook

A ST. GEORGE COMMUNITY

EXHIBIT E

Drainage Study

PRELIMINARY DRAINAGE CONTROL REPORT

Meribella at Sunbrook
St. George, Utah

Prepared For:
Sun Hill Development
2240 W Sunbrook Dr. #5
St. George, UT 84790

Rosenberg Associates
Project No: 1504-24-054

June 3, 2026

This report for the drainage design of Meribella at Sunbrook was prepared by me (or under my direct supervision) in accordance with the provisions of Washington County Flood Control Authority (WCFA) Storm Drainage Systems Design and Management Manual and was designed to comply with the provisions thereof. I understand that the City of St. George and WCFA do not and will not assume liability for drainage facilities design.

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APPENDICIES

APPENDIX A – GENERAL

Figure 1 – *Vicinity Map*

Figure 2 – *Existing Conditions*

Figure 3 – *Developed Conditions*

Figure 4 – *FEMA - Flood Insurance Rate Map*

NRCS Soil Report

NOAA Atlas 14 – Point Precipitation Frequency Estimates

Farmer-Fletcher Modified 3-hr Distribution Table

APPENDIX B – EXISTING CONDITIONS DRAINAGE

HEC-HMS Model Diagram

Existing Watershed Hydrology Model Input Spreadsheets

Existing Conditions HEC-HMS Model and Output Tables

APPENDIX C – DEVELOPED CONDCTIONS DRAINAGE

HEC-HMS Model Diagram

Developed Watershed Hydrology Model Input Spreadsheets

Developed Conditions HEC-HMS Model and Output Tables

Detention Calculations

MS4 Retention Volume Calculation

1.0 PROJECT LOCATION

The proposed Meribella at Sunbrook project includes construction of 7 townhome buildings, street improvements, an amenity area, and utility improvement in St. George, Utah. Proposed improvements are located south of 335 South Terrazo, and East of Luce Del Sol Drive within Section 27, Township 32 South, Range 16 West, Salt Lake Base and Meridian.

See Figure 1 in Appendix, *Vicinity Map*

2.0 EXISTING DRAINAGE CONDITIONS

2.1 EXISTING ON-SITE DRAINAGE

The 7.8-acre project area is comprised of moderately sloping hillsides with natural vegetation. Slopes range from 9.0% – 38.0%, with the overall trend sloping to the west. Onsite soils are comprised of *Eroded land-Shalet complex, warm (EB)* – hydrologic soil type “D” – hydrologic soil type “D”. Stormwater generated within the site generally flows to the Northwest.

2.2 EXISTING OFF-SITE DRAINAGE

Runoff generated from areas to the east and south flows north and west entering the site. Runoff generated from areas to the north and west do not enter the site as these area are lower in elevations.

See Figure 2 in Appendix, *Existing Drainage Conditions*

2.3 PREVIOUS DRAINAGE STUDIES/RELATED DRAINAGE STUDIES

No previous or related drainage studied were referenced for this project.

2.4 MASTER PLANNING INFORMATION

As per the St. George City Storm Water Master Plan Update(2019), no additional improvements or upsizing of storm drain lines are recommended at this time.

2.5 FLOODPLAIN AND EROZION HAZARD INFORMATION

According to the FEMA Flood Insurance Rate Map¹ numbered 49053C1007G, the project area is located within Zone X.

See Figure 4 in Appendix, *Excerpt from FEMA Flood Insurance Rate Map*.

¹ National Flood Insurance Program, Flood Insurance Rate Map, Washington County, Utah Map Number 49053C 1007G, Effective Date April 2, 2009.

2.6 REQUIRED PERMITS/PLANS

Proposed earthwork will require a Grading Permit and the proposed Storm Water Pollution Prevention Plan (SWPPP) should comply with the City of Santa Clara established best management practices. The grading plan and SWPPP (including NOI and NOT) will be submitted independent of this study prior to construction.

2.7 HILLSIDE CONCERNS

The proposed project is located within the Hillside Protection Overlay Zone. (Green Valley Hills 9-1992).

3.0 DEVELOPED DRAINAGE CONDITIONS

3.1 DEVELOPED ON-SITE DRAINAGE

Runoff generated within Subarea A generally flows towards the proposed private road to be intercepted by curb and gutter and routed north to an existing storm drain. Runoff generated in Subarea B and D generally sheet flows to the west to be intercepted by storm drain inlets and routed northeast to an existing storm drain network. Runoff generated within Subarea C generally flows east to be intercepted by a existing storm drain inlet. Subarea E generally flows to the east to be intercepted by storm drain inlet. Final design of the on-site drainage improvements to be addressed with the construction plans.

Building finished floor elevations shall be at or above elevations shown on the construction plans to enable runoff to drain from the structures to the roadways.

3.2 DEVELOPED OFF-SITE DRAINAGE

Runoff generated in Off As flows generally west to be intercepted by a proposed drainage swales which will route flows north or south to tie into the stormdrain network along the west property boundary. Final design of the off-site drainage improvements to be addressed with the construction plans.

See Figure 3 in Appendix, *Developed Drainage Conditions*

4.0 HYDROLOGIC ANALYSIS

4.1 HYDROLOGIC CALCULATIONS

HEC-HMS² Version 4.10 was used to perform the hydrologic analysis for this study. Curve numbers for existing and developed conditions were calculated using a custom Natural Resources Conservation Service (NRCS) Soil Report and the TR-55 Table 2-2a, which assumes directly connected impervious areas. Time of concentration (T_c) was calculated as 0.6 times the Travel Time (T_t) as included in TR-55 which is based on the summation of sheet flow, shallow concentrated flow, and channel flow for each subarea (TR-55 eqs. 3-1 through 3-4). A modified Farmer-Fletcher distribution is used for the 3-hour storm events

² U.S. Army Corps of Engineers, Hydraulic Engineering Circular Hydrologic Modeling System (HEC-HMS) software, Version 4.10

(the distribution is modified based on the local 1 hour and 3 hour rainfall depths) and the SCS Type II distribution is used for the 24-hour storm events. Simulated precipitation values were determined using the Point Precipitation Frequency Estimates (Latitude: 37.1024°, Longitude: -113.6299°) from the NOAA Atlas 14³. Utilizing the model input values listed in Tables 1 & 2, the HEC-HMS model yielded the design storm peak flow values summarized in Tables 3 & 4.

TABLE 1 – HYDRAULIC MODEL INPUT – EXISTING CONDITIONS

Subarea		Area		SCS	Flow Length	Average Slope	Lag Time	
Name	Description	(acre)	(sq mi)	CN	(ft.)	S (%)	(hr.)	(min)
Sub A	Central portion of Site	2.18	0.00340	88	173	15.3%	0.04	2.208
Sub B	Western portion of Site	1.01	0.00158	88	108	12.7%	0.03	1.700
Sub C	Northwestern portion of Site	0.28	0.00044	88	99	12.6%	0.03	1.612
Sub D	Southern portion of Site	0.25	0.00039	88	110	9.4%	0.03	1.598
Sub E	Northeastern portion of Site	0.13	0.00020	88	105	9.1%	0.03	1.645
Off A	East of Site	3.91	0.00612	88	188	38.4%	0.01	0.751

TABLE 2 – HYDRAULIC MODEL INPUT – DEVELOPED CONDITIONS

Subarea		Area		SCS	Flow Length	Average Slope	Lag Time	
Name	Description	(acre)	(sq mi)	CN	(ft.)	S (%)	(hr.)	(min)
Sub A	Central portion of Site	2.18	0.00340	88	469	1.9%	0.02	1.435
Sub B	Western portion of Site	1.01	0.00158	88	108	9.7%	0.02	1.393
Sub C	Northwestern portion of Site	0.28	0.00044	88	72	5.3%	0.01	0.474
Sub D	Southern portion of Site	0.25	0.00039	90	110	9.4%	0.03	1.560
Sub E	Northeastern portion of Site	0.13	0.00020	98	20	1.5%	0.02	1.039
Off A	East of Site	3.91	0.00612	88	188	38.4%	0.01	0.751

TABLE 3 – HYDRAULIC MODEL OUTPUT – EXISTING CONDITIONS

Subarea		3-Hour Storm		24-Hour Storm	
		Existing		Existing	
Name	Description	10-Year (cfs)	100-Year (cfs)	10-Year (cfs)	100-Year (cfs)
Sub A	Central portion of Site	0.9	1.1	0.3	0.3
Sub B	western portion of Site	0.4	0.5	0.1	0.1
Sub C	Northwestern portion of Site	0.1	0.1	<0.1	<0.1
Sub D	Southern portion of Site	0.1	0.1	<0.1	<0.1
Sub E	Northeastern portion of Site	0.1	0.1	<0.1	<0.1
Off A	East of Site	1.6	1.9	0.5	0.5
Outfall 1	Existing SD Inlet Northwest of Site	1.6	1.9	0.5	0.5

³ NOAA's National Weather Service. [Precipitation Frequency Data Server](#). Retrieved April 15, 2026

TABLE 4 – HYDRAULIC MODEL OUTPUT – DEVELOPED CONDITIONS

Subarea		3-Hour Storm		24-Hour Storm	
		Developed		Developed	
Name	Description	10-Year (cfs)	100-Year (cfs)	10-Year (cfs)	100-Year (cfs)
Sub A	Central portion of Site	1.9	2.1	0.6	0.6
Sub B	western portion of Site	0.7	0.8	0.2	0.2
Sub C	Northwestern portion of Site	0.2	0.2	0.1	0.1
Sub D	Southern portion of Site	0.1	0.1	0.0	0.0
Sub E	Northeastern portion of Site	0.1	0.1	0.0	0.0
Off A	East of Site	1.6	1.9	0.5	0.5
Outfall 1	Existing SD Inlet Northwest of Site	2.9	3.3	1.0	1.0

4.2 COMPARISON OF PEAK FLOW VALUES

Based on information shown in Tables 3 and 4, the proposed development increases runoff within the site 1.4 CFS [Post (SITE) - Pre (SITE)] during the 100-year 3-hour event.

5.0 PROPOSED DRAINAGE IMPROVEMENTS

5.1 STORMDRAIN DESIGN

The runoff generated within the proposed development is generally routed via curb and gutter to storm drain inlets on grade or in sag as mentioned in the Developed Onsite Drainage section. All flow is routed through poly pipes. Final design of the drainage improvements to be addressed with the construction plans.

The final storm drain design shall be designed to convey the onsite and offsite 100-year 3-hour event. See the Appendix for hydraulic calculations.

5.2 DETENTION

The Washington County Flood Control Authority – Storm Drainage Systems Design and Management Manual requires the peak storm runoff exiting a site not be increased by new development. For this analysis, the 100-year 3-hour peak flow events produced a required detention volume of 870 ft³ at Outfall. Final detention facilities to be addressed with the construction plans.

5.3 RETENTION/LID

The Small Municipal Separate Storm Sewer System (MS4) General Permit requires new development to prevent the off-site discharge of the precipitation from all rainfall events less than or equal to the 80th percentile rainfall event or a predevelopment hydrologic condition, whichever is less. The 80th percentile depth for the Dixie Storm Water Coalition Region is 0.44-inches. Based on the retention volume equation #1, the Water Quality Retention Volume (WQRV) required for this site is 1,840 ft³. Due to the presence of expansive mudstone, onsite retention for this project to be technically infeasible. In lieu of retention, the site will detain the volume of water required for retention.

The proposed Low Impact Development (LID) Best Management Practices (BMPs) proposed with this development are consistent with the findings and recommendations provided with the Geotechnical Investigation – Mirabella at Sunbrook document prepared by AGECE, April 21, 2026.

A copy of the Stormwater Quality Report is included with the Appendix.

6.0 CONCLUSIONS

It is the opinion of Rosenberg Associates that the preliminary recommendations and drainage improvements included in this study and shown in the improvement plans will effectively convey storm water through the site. Final drainage improvement designs shall be compliant with the City of St. George drainage requirements and computations/methods used to create designs were completed using the current standard of care.

APPENDIX A

Figure 1 – *Vicinity Map*

Figure 2 – *Existing Conditions*

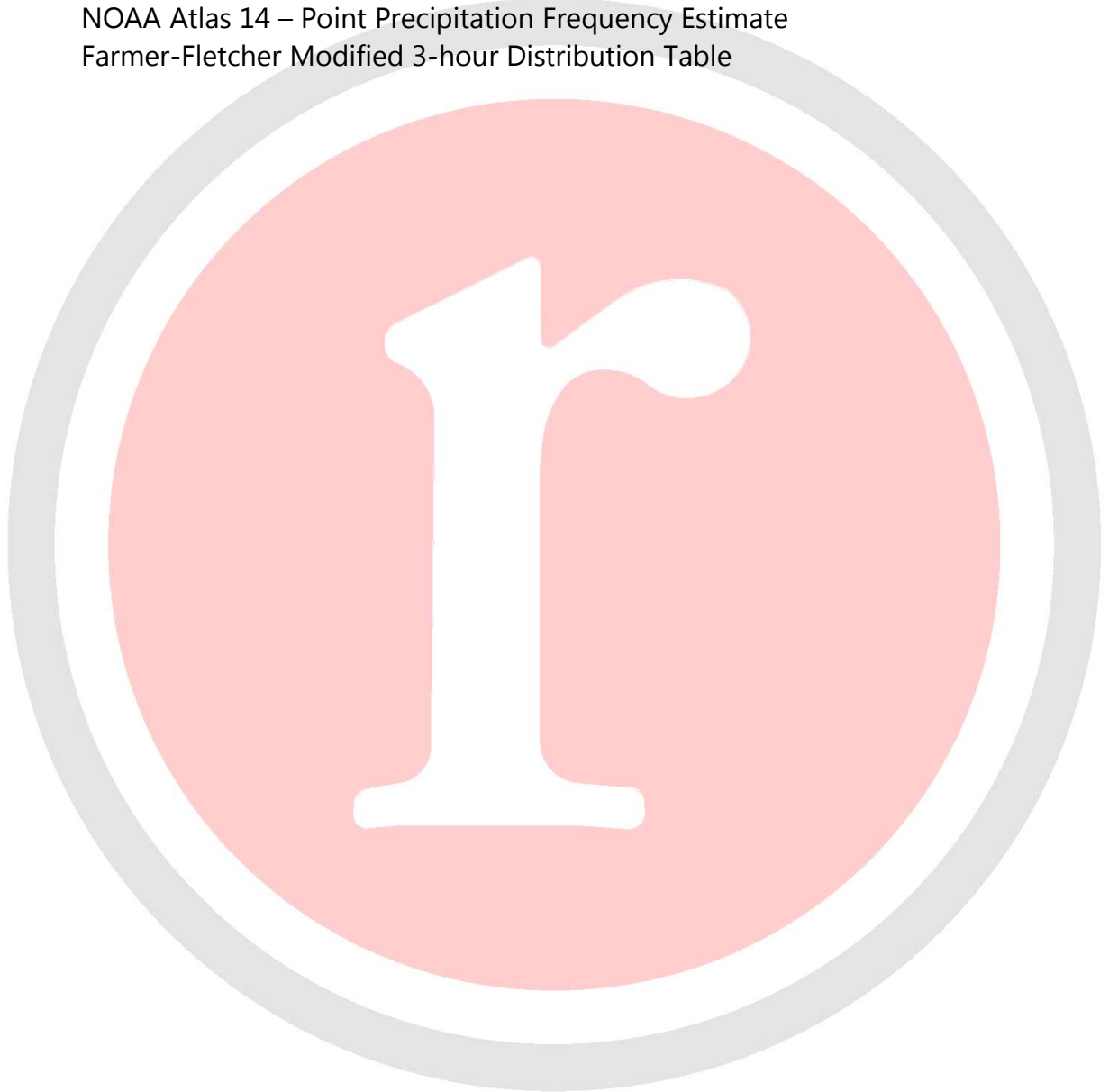
Figure 3 – *Developed Conditions*

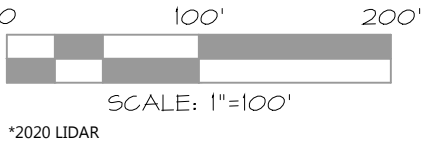
Figure 4 – *FEMA - Flood Insurance Rate Map*

NRCS Custom Soil Resource Report

NOAA Atlas 14 – Point Precipitation Frequency Estimate

Farmer-Fletcher Modified 3-hour Distribution Table





LEGEND

- SUB-AREA BOUNDARY
- FLOW DIRECTION

EXISTING BASIN SUMMARY

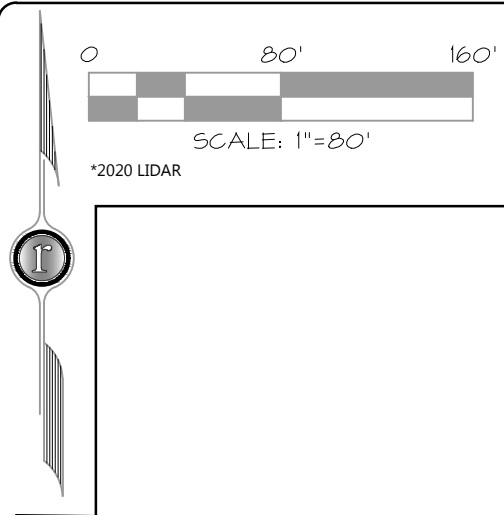
BASIN	AREA (AC.)	3-HOUR STORM	
		Q ₀ (CFS)	Q ₁₀₀ (CFS)
SUB A	2.18	0.9	1.1
SUB B	1.01	0.4	0.5
SUB C	0.28	0.1	0.1
SUB D	0.25	0.1	0.1
SUB E	0.13	0.1	0.1
OFF A	3.91	1.6	1.9

DATE: 6-3-2026
JOB NO.: 1504-24-054
DESIGNED BY: TJB
CHECKED BY: JWB
DWG: EXISTING COND
DATE: _____
REVISIONS: _____

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EXISTING CONDITIONS
FOR
MERIBELLA AT SUNBROOK
ST. GEORGE
UTAH

SHEET
2
4 OF 4 SHEETS



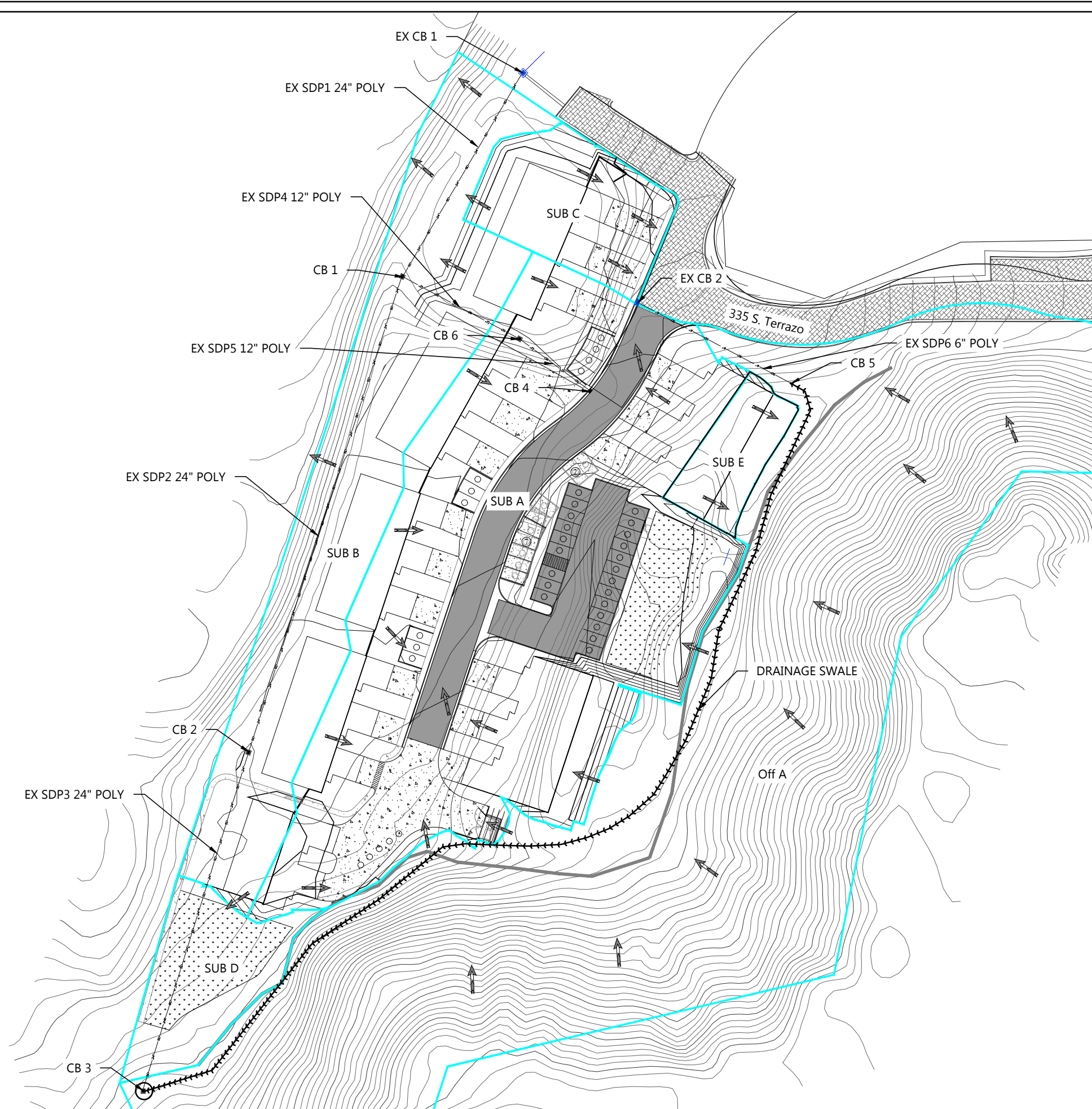
LEGEND

SUB-AREA BOUNDARY

FLOW DIRECTION

EXISTING BASIN SUMMARY

BASIN	AREA (AC.)	3-HOUR STORM	
		Q ₁₀ (CFS)	Q ₁₀₀ (CFS)
SUB A	2.18	1.9	2.1
SUB B	1.01	0.7	0.8
SUB C	0.28	0.2	0.2
SUB D	0.25	0.1	0.1
SUB E	0.13	0.1	0.1
OFF A	3.91	1.6	1.9



DATE: 6-3-2026

JOB NO.: 1504-24-054

DESIGNED BY: TJB

CHECKED BY: JWB

DWG: PROPOSED COND

DATE

REVISIONS

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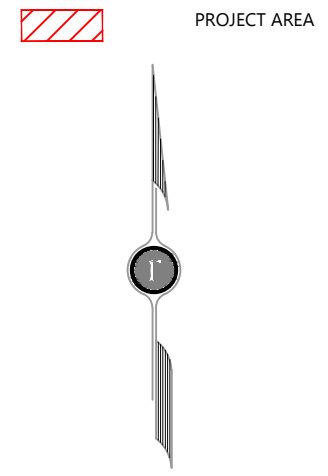
PROPOSED CONDITIONS
FOR
MERIBELLA AT SUNBROOK
ST. GEORGE
UTAH

SHEET
2
4 OF 4 SHEETS

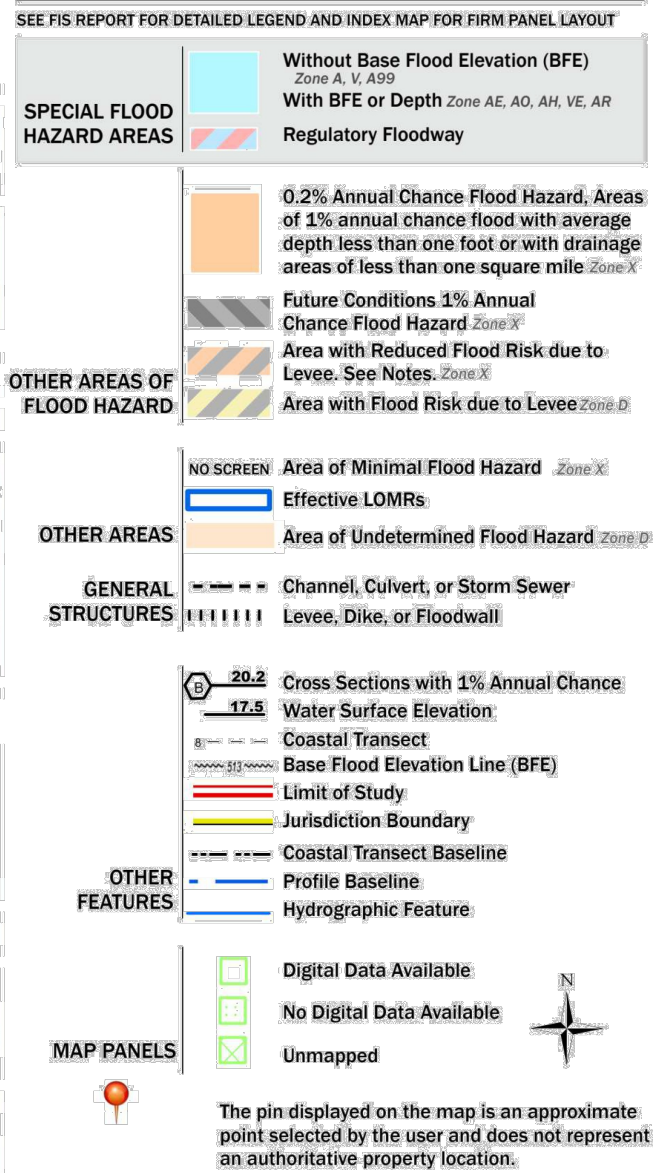
National Flood Hazard Layer FIRMette



LEGEND



Legend



This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards.

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on **5/26/2026 at 10:53 PM** and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.



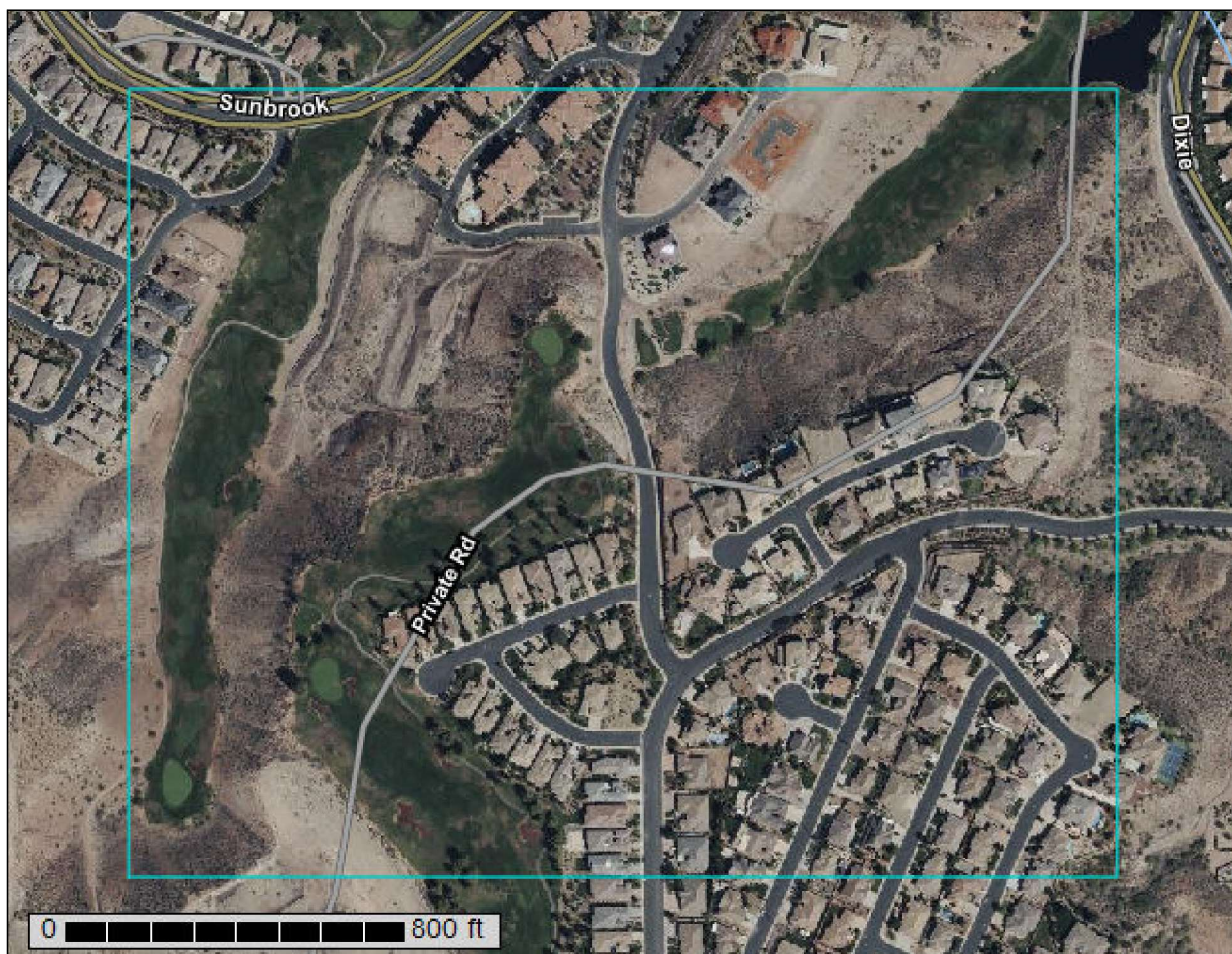
United States
Department of
Agriculture

NRCS

Natural
Resources
Conservation
Service

A product of the National
Cooperative Soil Survey,
a joint effort of the United
States Department of
Agriculture and other
Federal agencies, State
agencies including the
Agricultural Experiment
Stations, and local
participants

Custom Soil Resource Report for Washington County Area, Utah



Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (<http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/>) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (<https://offices.sc.egov.usda.gov/locator/app?agency=nrcs>) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

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How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units).

Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil

scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

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identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report Soil Map



Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
BB	Badland, very steep	29.3	29.5%
EB	Eroded land-Shalet complex, warm	29.1	29.3%
Ha	Hantz silty clay loam	4.0	4.1%
LcC	Laverkin fine sandy loam, 2 to 5 percent slopes	0.1	0.1%
WBD	Winkel gravelly fine sandy loam, 1 to 8 percent slopes	36.7	37.0%
Totals for Area of Interest		99.1	100.0%

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

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The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Washington County Area, Utah

BB—Badland, very steep

Map Unit Composition

Badland: 100 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Badland

Setting

Landform: Escarpments, Hills

Landform position (two-dimensional): Backslope

Landform position (three-dimensional): Free face, side slope

Down-slope shape: Convex

Across-slope shape: Convex

EB—Eroded land-Shalet complex, warm

Map Unit Setting

National map unit symbol: j8ds

Elevation: 3,600 to 5,550 feet

Mean annual precipitation: 10 to 13 inches

Mean annual air temperature: 52 to 56 degrees F

Frost-free period: 165 to 170 days

Farmland classification: Not prime farmland

Map Unit Composition

Eroded land: 78 percent

Shalet and similar soils: 20 percent

Minor components: 2 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Eroded Land

Setting

Landform: Erosion remnants

Parent material: Residuum weathered from shale

Description of Shalet

Setting

Landform: Swales

Down-slope shape: Concave

Across-slope shape: Concave

Parent material: Residuum weathered from shale

Typical profile

H1 - 0 to 4 inches: clay loam

H2 - 4 to 12 inches: clay loam

H3 - 12 to 16 inches: weathered bedrock

Properties and qualities

Slope: 2 to 20 percent
Depth to restrictive feature: 4 to 15 inches to paralithic bedrock
Drainage class: Well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately high (0.00 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 20 percent
Gypsum, maximum content: 10 percent
Maximum salinity: Nonsaline to slightly saline (0.0 to 4.0 mmhos/cm)
Sodium adsorption ratio, maximum: 5.0
Available water supply, 0 to 60 inches: Very low (about 2.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: D
Ecological site: R030XY134UT - Desert Shallow Loam (Creosotebush)
Hydric soil rating: No

Minor Components

Badland

Percent of map unit: 2 percent

Ha—Hantz silty clay loam

Map Unit Setting

National map unit symbol: j8dy
Elevation: 2,700 to 3,300 feet
Mean annual precipitation: 8 to 11 inches
Mean annual air temperature: 57 to 65 degrees F
Frost-free period: 190 to 195 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

Hantz and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Hantz

Setting

Landform: Alluvial fans
Down-slope shape: Concave
Across-slope shape: Convex

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Parent material: Mixed alluvium derived from limestone, sandstone, and shale

Typical profile

H1 - 0 to 9 inches: silty clay loam

H2 - 9 to 19 inches: silty clay

H3 - 19 to 47 inches: silty clay

H4 - 47 to 70 inches: silty clay

Properties and qualities

Slope: 0 to 2 percent

Depth to restrictive feature: More than 80 inches

Drainage class: Well drained

Runoff class: Medium

Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Calcium carbonate, maximum content: 20 percent

Gypsum, maximum content: 5 percent

Maximum salinity: Very slightly saline to slightly saline (2.0 to 4.0 mmhos/cm)

Sodium adsorption ratio, maximum: 5.0

Available water supply, 0 to 60 inches: High (about 10.8 inches)

Interpretive groups

Land capability classification (irrigated): 3s

Land capability classification (nonirrigated): 7s

Hydrologic Soil Group: C

Ecological site: R030XA103AZ - Clayey Bottom 3-6" p.z.

Hydric soil rating: No

Minor Components

Tobler

Percent of map unit: 5 percent

St. george, moderately saline

Percent of map unit: 5 percent

Leeds

Percent of map unit: 5 percent

LcC—Laverkin fine sandy loam, 2 to 5 percent slopes

Map Unit Setting

National map unit symbol: j8fg

Elevation: 2,550 to 3,300 feet

Mean annual precipitation: 8 to 11 inches

Mean annual air temperature: 57 to 67 degrees F

Frost-free period: 190 to 195 days

Farmland classification: Prime farmland if irrigated

Map Unit Composition

Laverkin and similar soils: 90 percent

Minor components: 10 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Laverkin

Setting

Landform: Alluvial fans, Stream terraces

Landform position (three-dimensional): Tread

Down-slope shape: Concave, linear

Across-slope shape: Convex, concave

Parent material: Alluvium derived from limestone, sandstone, and shale

Typical profile

H1 - 0 to 3 inches: fine sandy loam

H2 - 3 to 16 inches: fine sandy loam

H3 - 16 to 30 inches: sandy clay loam

H4 - 30 to 42 inches: sandy clay loam

H5 - 42 to 60 inches: sandy clay loam

Properties and qualities

Slope: 2 to 5 percent

Depth to restrictive feature: More than 80 inches

Drainage class: Well drained

Runoff class: Low

Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Calcium carbonate, maximum content: 30 percent

Gypsum, maximum content: 5 percent

Maximum salinity: Nonsaline to slightly saline (0.0 to 4.0 mmhos/cm)

Available water supply, 0 to 60 inches: High (about 9.4 inches)

Interpretive groups

Land capability classification (irrigated): 3e

Land capability classification (nonirrigated): 7e

Hydrologic Soil Group: B

Ecological site: R030XY110UT - Desert Loam (Creosotebush)

Hydric soil rating: No

Minor Components

Tobler

Percent of map unit: 5 percent

Nikey

Percent of map unit: 5 percent

WBD—Winkel gravelly fine sandy loam, 1 to 8 percent slopes

Map Unit Setting

National map unit symbol: j8h9
Elevation: 2,800 to 4,000 feet
Mean annual precipitation: 8 to 11 inches
Mean annual air temperature: 57 to 61 degrees F
Frost-free period: 190 to 195 days
Farmland classification: Not prime farmland

Map Unit Composition

Winkel and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Winkel

Setting

Landform: Mesas
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Calcareous material weathered from basalt, limestone, and wind-deposited sand.

Typical profile

H1 - 0 to 1 inches: gravelly fine sandy loam
H2 - 1 to 6 inches: gravelly fine sandy loam
H3 - 6 to 12 inches: very gravelly fine sandy loam
H4 - 12 to 16 inches: extremely cobbly fine sandy loam
H5 - 16 to 20 inches: indurated
H6 - 20 to 24 inches: unweathered bedrock

Properties and qualities

Slope: 1 to 8 percent
Depth to restrictive feature: 11 to 19 inches to petrocalcic; 14 to 24 inches to lithic bedrock
Drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately high (0.00 to 0.60 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 30 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum: 5.0
Available water supply, 0 to 60 inches: Very low (about 1.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified

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Land capability classification (nonirrigated): 7s

Hydrologic Soil Group: D

Ecological site: R030XY134UT - Desert Shallow Loam (Creosotebush)

Hydric soil rating: No

Minor Components

Lava flows

Percent of map unit: 5 percent

Harrisburg

Percent of map unit: 5 percent

Bermesa

Percent of map unit: 5 percent

Soil Information for All Uses

Soil Reports

The Soil Reports section includes various formatted tabular and narrative reports (tables) containing data for each selected soil map unit and each component of each unit. No aggregation of data has occurred as is done in reports in the Soil Properties and Qualities and Suitabilities and Limitations sections.

The reports contain soil interpretive information as well as basic soil properties and qualities. A description of each report (table) is included.

Soil Physical Properties

This folder contains a collection of tabular reports that present soil physical properties. The reports (tables) include all selected map units and components for each map unit. Soil physical properties are measured or inferred from direct observations in the field or laboratory. Examples of soil physical properties include percent clay, organic matter, saturated hydraulic conductivity, available water capacity, and bulk density.

Engineering Properties

This table gives the engineering classifications and the range of engineering properties for the layers of each soil in the survey area.

Hydrologic soil group is a group of soils having similar runoff potential under similar storm and cover conditions. The criteria for determining Hydrologic soil group is found in the National Engineering Handbook, Chapter 7 issued May 2007(<http://directives.sc.egov.usda.gov/OpenNonWebContent.aspx?content=17757.wba>). Listing HSGs by soil map unit component and not by soil series is a new concept for the engineers. Past engineering references contained lists of HSGs by soil series. Soil series are continually being defined and redefined, and the list of soil series names changes so frequently as to make the task of maintaining a single national list virtually impossible. Therefore, the criteria is now used to calculate the HSG using the component soil properties and no such national series lists will be maintained. All such references are obsolete and their use should be discontinued. Soil properties that influence runoff potential are those that influence the minimum rate of infiltration for a bare soil after prolonged wetting and when not frozen. These properties are depth to a seasonal high water table, saturated hydraulic conductivity after prolonged wetting, and depth to a layer with a very slow water transmission

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rate. Changes in soil properties caused by land management or climate changes also cause the hydrologic soil group to change. The influence of ground cover is treated independently. There are four hydrologic soil groups, A, B, C, and D, and three dual groups, A/D, B/D, and C/D. In the dual groups, the first letter is for drained areas and the second letter is for undrained areas.

The four hydrologic soil groups are described in the following paragraphs:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

Depth to the upper and lower boundaries of each layer is indicated.

Texture is given in the standard terms used by the U.S. Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in the fraction of the soil that is less than 2 millimeters in diameter. "Loam," for example, is soil that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If the content of particles coarser than sand is 15 percent or more, an appropriate modifier is added, for example, "gravelly."

Classification of the soils is determined according to the Unified soil classification system (ASTM, 2005) and the system adopted by the American Association of State Highway and Transportation Officials (AASHTO, 2004).

The Unified system classifies soils according to properties that affect their use as construction material. Soils are classified according to particle-size distribution of the fraction less than 3 inches in diameter and according to plasticity index, liquid limit, and organic matter content. Sandy and gravelly soils are identified as GW, GP, GM, GC, SW, SP, SM, and SC; silty and clayey soils as ML, CL, OL, MH, CH, and OH; and highly organic soils as PT. Soils exhibiting engineering properties of two groups can have a dual classification, for example, CL-ML.

The AASHTO system classifies soils according to those properties that affect roadway construction and maintenance. In this system, the fraction of a mineral soil that is less than 3 inches in diameter is classified in one of seven groups from A-1 through A-7 on the basis of particle-size distribution, liquid limit, and plasticity index. Soils in group A-1 are coarse grained and low in content of fines (silt and clay). At the other extreme, soils in group A-7 are fine grained. Highly organic soils are classified in group A-8 on the basis of visual inspection.

If laboratory data are available, the A-1, A-2, and A-7 groups are further classified as A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-7-5, or A-7-6. As an additional refinement, the suitability of a soil as subgrade material can be indicated by a group

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index number. Group index numbers range from 0 for the best subgrade material to 20 or higher for the poorest.

Percentage of rock fragments larger than 10 inches in diameter and 3 to 10 inches in diameter are indicated as a percentage of the total soil on a dry-weight basis. The percentages are estimates determined mainly by converting volume percentage in the field to weight percentage. Three values are provided to identify the expected Low (L), Representative Value (R), and High (H).

Percentage (of soil particles) passing designated sieves is the percentage of the soil fraction less than 3 inches in diameter based on an oven-dry weight. The sieves, numbers 4, 10, 40, and 200 (USA Standard Series), have openings of 4.76, 2.00, 0.420, and 0.074 millimeters, respectively. Estimates are based on laboratory tests of soils sampled in the survey area and in nearby areas and on estimates made in the field. Three values are provided to identify the expected Low (L), Representative Value (R), and High (H).

Liquid limit and plasticity index (Atterberg limits) indicate the plasticity characteristics of a soil. The estimates are based on test data from the survey area or from nearby areas and on field examination. Three values are provided to identify the expected Low (L), Representative Value (R), and High (H).

References:

American Association of State Highway and Transportation Officials (AASHTO). 2004. Standard specifications for transportation materials and methods of sampling and testing. 24th edition.

American Society for Testing and Materials (ASTM). 2005. Standard classification of soils for engineering purposes. ASTM Standard D2487-00.

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Absence of an entry indicates that the data were not estimated. The asterisk '*' denotes the representative texture; other possible textures follow the dash. The criteria for determining the hydrologic soil group for individual soil components is found in the National Engineering Handbook, Chapter 7 issued May 2007 (<http://directives.sc.egov.usda.gov/OpenNonWebContent.aspx?content=17757.wba>). Three values are provided to identify the expected Low (L), Representative Value (R), and High (H).

Engineering Properties—Washington County Area, Utah														
Map unit symbol and soil name	Pct. of map unit	Hydrologic group	Depth	USDA texture	Classification		Pct Fragments		Percentage passing sieve number—				Liquid limit	Plasticity index
					Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
EB—Eroded land-Shalet complex, warm			In				L-R-H	L-R-H	L-R-H	L-R-H	L-R-H	L-R-H	L-R-H	L-R-H
	20	D	0-4	Clay loam	CL	A-6	0-0-0	0-0-0	90-95-100	85-93-100	80-90-100	55-63-70	30-35-40	10-15-20
			4-12	Clay loam	CL	A-6	0-0-0	0-0-0	90-95-100	85-93-100	80-90-100	55-63-70	30-35-40	10-15-20
			12-16	Weathered bedrock	—	—	—	—	—	—	—	—	—	—
Ha—Hantz silty clay loam														
Hantz	85	C	0-9	Silty clay loam	CL	A-6, A-7	0-0-0	0-0-0	100-100-100	100-100-100	90-95-100	80-88-95	35-40-45	10-15-20
			9-19	Silty clay	CH, CL	A-7-6	0-0-0	0-0-0	100-100-100	100-100-100	90-95-100	80-88-95	40-48-55	20-28-35
			19-47	Silty clay	CH, CL	A-7-6	0-0-0	0-0-0	100-100-100	100-100-100	90-95-100	80-88-95	40-48-55	20-28-35
			47-70	Silty clay	CH, CL	A-7-6	0-0-0	0-0-0	100-100-100	100-100-100	90-95-100	80-88-95	40-48-55	20-28-35

Custom Soil Resource Report

Engineering Properties—Washington County Area, Utah														
Map unit symbol and soil name	Pct. of map unit	Hydrologic group	Depth	USDA texture	Classification		Pct Fragments		Percentage passing sieve number—				Liquid limit	Plasticity index
					Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
			<i>In</i>				<i>L-R-H</i>	<i>L-R-H</i>	<i>L-R-H</i>	<i>L-R-H</i>	<i>L-R-H</i>	<i>L-R-H</i>	<i>L-R-H</i>	<i>L-R-H</i>
LcC—Laverkin fine sandy loam, 2 to 5 percent slopes														
Laverkin	90 B		0-3	Fine sandy loam	SC-SM, SM	A-4	0-0-0	0-0-0	100-100-100	100-100-100	80-85-90	35-43-50	15-20-25	NP-3-5
			3-16	Fine sandy loam	SC-SM, SM	A-4	0-0-0	0-0-0	100-100-100	100-100-100	80-85-90	35-43-50	15-20-25	NP-3-5
			16-30	Sandy clay loam	CL-ML, SC	A-4	0-0-0	0-0-0	100-100-100	100-100-100	80-85-90	35-45-55	20-25-30	5-8-10
			30-42	Sandy clay loam	CL-ML, SC	A-4	0-0-0	0-0-0	100-100-100	100-100-100	80-85-90	35-45-55	20-25-30	5-8-10
			42-60	Sandy clay loam	CL-ML, SC	A-4	0-0-0	0-0-0	100-100-100	100-100-100	80-85-90	35-45-55	20-25-30	5-8-10
WBD—Winkel gravelly fine sandy loam, 1 to 8 percent slopes														
Winkel	85 D		0-1	Gravelly fine sandy loam	SM	A-2-4, A-4	0-0-0	0-5-10	75-80-85	70-75-80	50-55-60	30-35-40	15-20-25	NP-3-5
			1-6	Gravelly fine sandy loam	SM	A-2-4, A-4	0-0-0	0-5-10	75-80-85	70-75-80	50-55-60	30-35-40	15-20-25	NP-3-5
			6-12	Very gravelly fine sandy loam	GM	A-1-b	0-0-0	10-15-20	40-45-50	35-40-45	25-30-35	15-20-25	15-20-25	NP-3-5
			12-16	Extremely cobbly fine sandy loam	GC-GM, GM	A-1-b, A-2	0-0-0	50-55-60	40-45-50	35-40-45	30-35-40	15-23-30	15-20-25	NP-3-5
			16-20	Indurated	—	—	—	—	—	—	—	—	—	—
			20-24	Unweathered bedrock	—	—	—	—	—	—	—	—	—	—

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Custom Soil Resource Report

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NOAA Atlas 14, Volume 1, Version 5
Location name: Saint George, Utah, USA*
Latitude: 37.1026°, Longitude: -113.63°
Elevation: 2715 ft**
* source: ESRI Maps
** source: USGS



POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Sarah Dietz, Sarah Heim, Lillian Hiner, Kazungu Maitaria, Deborah Martin, Sandra Pavlovic, Ishani Roy, Carl Trypaluk, Dale Unruh, Fenglin Yan, Michael Yekta, Tan Zhao, Geoffrey Bonnin, Daniel Brewer, Li-Chuan Chen, Tye Parzybok, John Yarchoan

NOAA, National Weather Service, Silver Spring, Maryland

[PF_tabular](#) | [PF_graphical](#) | [Maps_&_aerials](#)

PF tabular

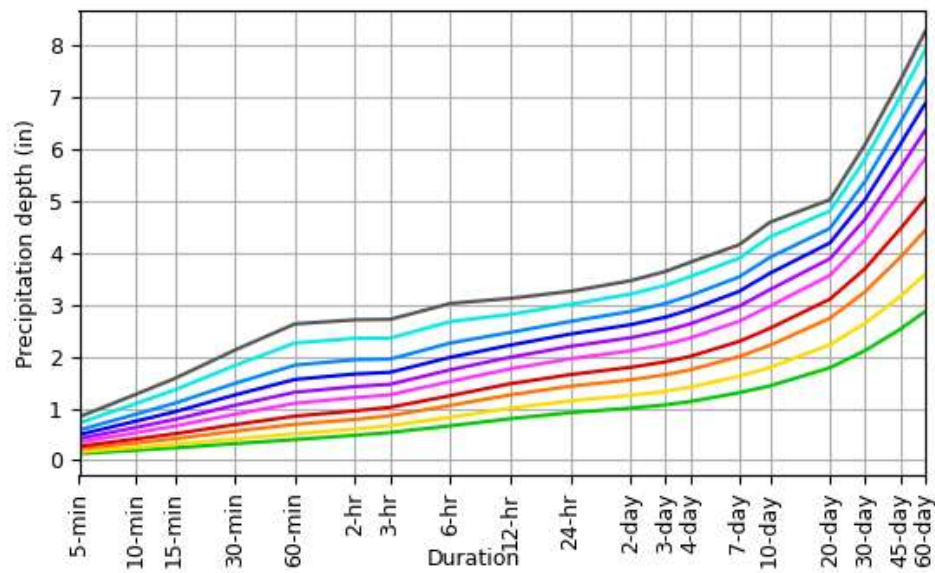
PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches) ¹										
Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	0.127 (0.109-0.149)	0.162 (0.141-0.191)	0.220 (0.189-0.258)	0.270 (0.231-0.318)	0.349 (0.293-0.409)	0.417 (0.345-0.489)	0.495 (0.401-0.584)	0.583 (0.459-0.691)	0.719 (0.543-0.868)	0.836 (0.614-1.02)
10-min	0.193 (0.166-0.226)	0.247 (0.214-0.291)	0.334 (0.288-0.392)	0.411 (0.351-0.484)	0.531 (0.446-0.622)	0.634 (0.525-0.745)	0.754 (0.610-0.889)	0.888 (0.698-1.05)	1.09 (0.827-1.32)	1.27 (0.935-1.55)
15-min	0.239 (0.206-0.280)	0.306 (0.266-0.361)	0.415 (0.356-0.486)	0.510 (0.436-0.600)	0.659 (0.553-0.771)	0.787 (0.651-0.923)	0.934 (0.756-1.10)	1.10 (0.865-1.30)	1.36 (1.03-1.64)	1.58 (1.16-1.92)
30-min	0.321 (0.277-0.377)	0.412 (0.357-0.486)	0.559 (0.480-0.655)	0.687 (0.587-0.809)	0.887 (0.745-1.04)	1.06 (0.876-1.24)	1.26 (1.02-1.48)	1.48 (1.17-1.76)	1.83 (1.38-2.20)	2.12 (1.56-2.59)
60-min	0.398 (0.342-0.467)	0.510 (0.442-0.602)	0.692 (0.594-0.810)	0.850 (0.726-1.00)	1.10 (0.922-1.29)	1.31 (1.08-1.54)	1.56 (1.26-1.84)	1.83 (1.44-2.18)	2.26 (1.71-2.73)	2.63 (1.93-3.20)
2-hr	0.482 (0.424-0.553)	0.600 (0.529-0.694)	0.787 (0.691-0.905)	0.952 (0.830-1.10)	1.21 (1.04-1.38)	1.42 (1.20-1.63)	1.66 (1.37-1.92)	1.94 (1.56-2.26)	2.35 (1.83-2.78)	2.71 (2.05-3.24)
3-hr	0.534 (0.476-0.606)	0.666 (0.596-0.760)	0.858 (0.765-0.976)	1.02 (0.904-1.16)	1.26 (1.11-1.44)	1.46 (1.26-1.67)	1.70 (1.43-1.94)	1.95 (1.61-2.28)	2.36 (1.89-2.81)	2.72 (2.12-3.28)
6-hr	0.664 (0.595-0.748)	0.830 (0.749-0.939)	1.06 (0.948-1.19)	1.24 (1.11-1.41)	1.52 (1.34-1.71)	1.74 (1.51-1.97)	1.98 (1.70-2.27)	2.26 (1.90-2.60)	2.67 (2.18-3.13)	3.02 (2.41-3.58)
12-hr	0.801 (0.723-0.892)	1.00 (0.905-1.12)	1.26 (1.13-1.41)	1.48 (1.32-1.65)	1.76 (1.56-1.97)	1.99 (1.74-2.23)	2.22 (1.92-2.51)	2.46 (2.11-2.81)	2.81 (2.35-3.24)	3.12 (2.56-3.64)
24-hr	0.918 (0.854-0.985)	1.14 (1.07-1.23)	1.43 (1.33-1.53)	1.65 (1.54-1.77)	1.96 (1.82-2.09)	2.19 (2.03-2.34)	2.43 (2.24-2.60)	2.68 (2.45-2.87)	3.00 (2.72-3.27)	3.26 (2.93-3.68)
2-day	1.00 (0.943-1.07)	1.25 (1.17-1.34)	1.55 (1.46-1.66)	1.79 (1.68-1.91)	2.11 (1.98-2.25)	2.36 (2.20-2.52)	2.61 (2.43-2.78)	2.87 (2.65-3.06)	3.20 (2.94-3.44)	3.46 (3.16-3.72)
3-day	1.07 (1.01-1.14)	1.33 (1.25-1.42)	1.65 (1.56-1.75)	1.90 (1.79-2.01)	2.24 (2.10-2.37)	2.50 (2.34-2.65)	2.76 (2.58-2.93)	3.02 (2.81-3.22)	3.37 (3.11-3.61)	3.64 (3.33-3.91)
4-day	1.13 (1.07-1.21)	1.41 (1.33-1.50)	1.75 (1.65-1.85)	2.00 (1.90-2.12)	2.36 (2.23-2.49)	2.63 (2.48-2.78)	2.90 (2.72-3.08)	3.18 (2.96-3.38)	3.54 (3.28-3.78)	3.82 (3.51-4.09)
7-day	1.30 (1.22-1.39)	1.62 (1.52-1.72)	2.00 (1.88-2.12)	2.29 (2.16-2.42)	2.68 (2.52-2.83)	2.97 (2.79-3.13)	3.26 (3.05-3.43)	3.53 (3.29-3.74)	3.89 (3.61-4.13)	4.15 (3.83-4.43)
10-day	1.43 (1.34-1.53)	1.79 (1.68-1.91)	2.22 (2.08-2.36)	2.54 (2.39-2.70)	2.97 (2.79-3.15)	3.29 (3.09-3.49)	3.60 (3.37-3.83)	3.91 (3.64-4.16)	4.31 (3.99-4.60)	4.59 (4.23-4.92)
20-day	1.78 (1.67-1.91)	2.23 (2.09-2.38)	2.74 (2.57-2.92)	3.11 (2.92-3.30)	3.57 (3.34-3.78)	3.89 (3.64-4.13)	4.19 (3.92-4.46)	4.47 (4.17-4.76)	4.81 (4.47-5.12)	5.02 (4.66-5.36)
30-day	2.12 (1.98-2.26)	2.64 (2.47-2.82)	3.25 (3.04-3.47)	3.69 (3.46-3.94)	4.25 (3.98-4.53)	4.65 (4.34-4.95)	5.02 (4.69-5.36)	5.38 (5.00-5.74)	5.80 (5.38-6.21)	6.09 (5.63-6.54)
45-day	2.53 (2.35-2.72)	3.16 (2.94-3.40)	3.91 (3.64-4.20)	4.46 (4.15-4.78)	5.15 (4.79-5.49)	5.63 (5.24-6.01)	6.09 (5.66-6.50)	6.51 (6.04-6.96)	7.00 (6.49-7.50)	7.32 (6.78-7.87)
60-day	2.87 (2.65-3.09)	3.58 (3.32-3.87)	4.43 (4.11-4.76)	5.04 (4.68-5.41)	5.82 (5.39-6.23)	6.36 (5.89-6.82)	6.88 (6.36-7.38)	7.35 (6.78-7.90)	7.91 (7.28-8.52)	8.27 (7.60-8.94)
¹ Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS). Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values. Please refer to NOAA Atlas 14 document for more information.										

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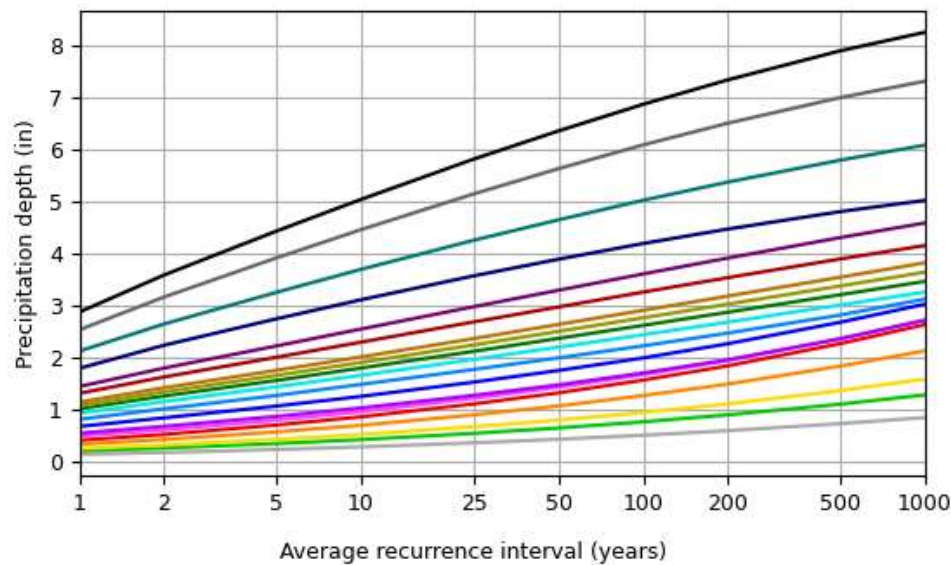
PF graphical

PDS-based depth-duration-frequency (DDF) curves

Latitude: 37.1026°, Longitude: -113.6300°



Average recurrence interval (years)	
1	2
5	10
25	50
100	200
500	1000

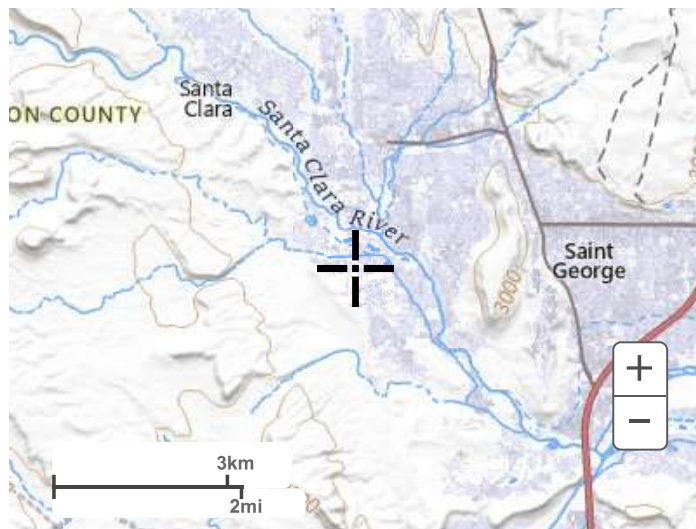


Duration	
5-min	2-day
10-min	3-day
15-min	4-day
30-min	7-day
60-min	10-day
2-hr	20-day
3-hr	30-day
6-hr	45-day
12-hr	60-day
24-hr	

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Maps & aerials

Small scale terrain



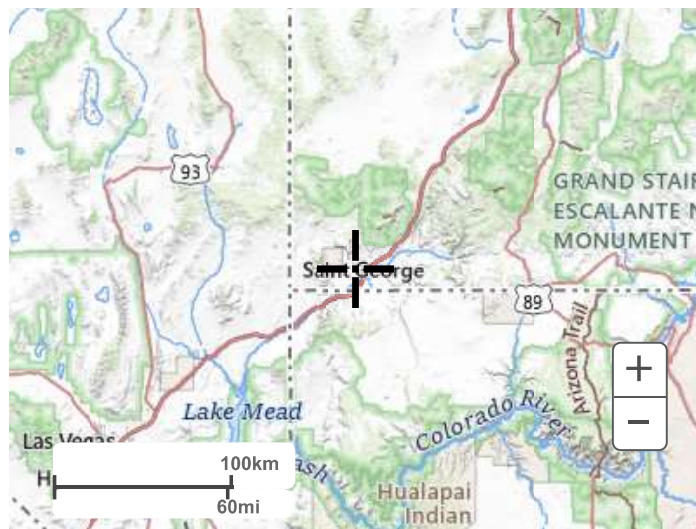
Large scale terrain



Large scale map



Large scale aerial



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PROJECT NO. 1504-24-054

PROJECT: Meribella at Sunbrook Phase 3

BY: TJB

6/3/2026

SUBJECT: 3-hr Distribution Table

CHKD: JWB

DATE: 6/3/2026

Farmer-Fletcher Modified 3-hour Storm Distribution

10 Year Storm

1 hour Depth	0.85 (in)
3 Hour Depth	1.02 (in)

100 Year Storm

1 hour Depth	1.56 (in)
3 Hour Depth	1.7 (in)

Time (min)	Incr.	Cumulative	Incr.	Cumulative
0	0	0	0	0
5	0.007083	0.007083	0.005833	0.005833
10	0.007083	0.014167	0.005833	0.011667
15	0.007083	0.021250	0.005833	0.017500
20	0.007083	0.028333	0.005833	0.023333
25	0.007083	0.035417	0.005833	0.029167
30	0.007083	0.042500	0.005833	0.035000
35	0.285	0.242250	0.444600	0.479600
40	0.225	0.191250	0.351000	0.830600
45	0.157	0.133450	0.244920	1.075520
50	0.100	0.085000	0.156000	1.231520
55	0.060	0.051000	0.093600	1.325120
60	0.046	0.039100	0.071760	1.396880
65	0.034	0.028900	0.053040	1.449920
70	0.026	0.022100	0.040560	1.490480
75	0.020	0.017000	0.031200	1.521680
80	0.018	0.015300	0.028080	1.549760
85	0.016	0.013600	0.024960	1.574720
90	0.013	0.011050	0.020280	1.595000
95		0.007083	0.005833	1.600833
100		0.007083	0.005833	1.606667
105		0.007083	0.005833	1.612500
110		0.007083	0.005833	1.618333
115		0.007083	0.005833	1.624167
120		0.007083	0.005833	1.630000
125		0.007083	0.005833	1.635833
130		0.007083	0.005833	1.641667
135		0.007083	0.005833	1.647500
140		0.007083	0.005833	1.653333
145		0.007083	0.005833	1.659167
150		0.007083	0.005833	1.665000
155		0.007083	0.005833	1.670833
160		0.007083	0.005833	1.676667
165		0.007083	0.005833	1.682500
170		0.007083	0.005833	1.688333
175		0.007083	0.005833	1.694167
180		0.007083	0.005833	1.700000
Total:	1.02		1.7	

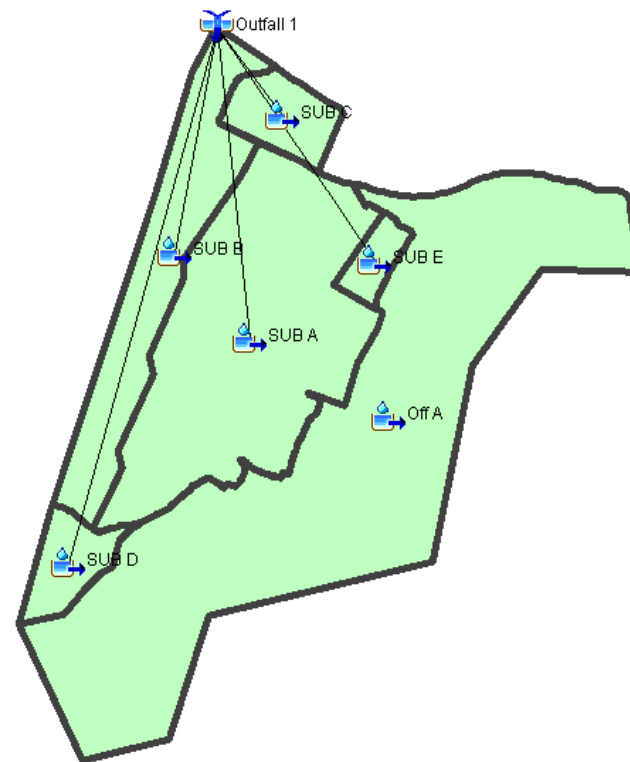
APPENDIX B

Existing HEC-HMS Model Diagram

Existing Watershed Hydrology Model Input Spreadsheets

Existing Conditions HEC-HMS Output Tables







SUBJECT: Existing Site Hydrology Information CHKD: JWB DATE: 6/3/2026

[illegible]

PROJECT NO. 1504-24-054

PROJECT: Meribella at Sunbrook Phase 3 BY: TJB DATE: 6/3/2026

SUBJECT: NRCS Curve Number CHKD: JWB DATE: 6/3/2026

NRCS CURVE NUMBER CHART

Land Use Description	SCS Curve Number (CN) Values			
	Group A	Group B	Group C	Group D
<i>Cultivated Land</i>				
Cultivated Land; Without Conservation Treatment	72	81	88	91
Cultivated Land; With Conservation Treatment	62	71	78	81
<i>Pasture or Range Land</i>				
Pasture or Range Land; Poor Condition	68	79	86	89
Pasture or Range Land; Good Condition	39	61	74	80
<i>Open Spaces (Lawns, Parks, etc.)</i>				
Open Space; Poor Condition; Grass Cover < 50%	68	79	86	89
Open Space; Fair Condition; Grass Cover 50% to 75%	49	69	79	84
Open Space; Good Condition; Grass Cover > 75%	39	61	74	80
<i>Impervious Areas</i>				
Impervious Areas; Paved Parking Lots, Roofs, Driveways	98	98	98	98
Impervious Areas; Streets and Roads; Paved; Curbs and Storm Sewers	98	98	98	98
Impervious Areas; Streets and Roads; Paved; Open Ditches (w/ Right-of-Way)	83	89	92	93
Impervious Areas; Streets and Roads; Gravel (w/ Right-of-Way)	76	85	89	91
Impervious Areas; Streets and Roads; Dirt (w/ Right-of-Way)	72	82	87	89
<i>Urban Commercial and Industrial Districts</i>				
Urban Districts; Commercial and Business; Average 85% Impervious	89	92	94	95
Urban Districts; Industrial; Average 72% Impervious	81	88	91	93
<i>Residential Districts</i>				
Residential Districts; 1/8 Acre (Town Houses); Average 65% Impervious	77	85	90	92
Residential Districts; 1/4 Acre; Average 38% Impervious	61	75	83	87
Residential Districts; 1/3 Acre; Average 30% Impervious	57	72	81	86
Residential Districts; 1/2 Acre; Average 25% Impervious	54	70	80	85
Residential Districts; 1 Acre; Average 20% Impervious	51	68	79	84
Residential Districts; 2 Acre; Average 12% Impervious	46	65	77	82
<i>Western Desert Urban Areas</i>				
Natural Desert Vegetation (Pervious Areas Only)	63	77	85	88
Artificial Desert Landscaping	96	96	96	96
<i>Developing Urban Area (No Vegetation)</i>				
Newly Graded Area (Pervious Only)	77	86	91	94

Sub A 88 Natural Desert Vegetation
 Sub B 88 Natural Desert Vegetation
 Sub C 88 Natural Desert Vegetation
 Sub D 88 Natural Desert Vegetation
 Sub E 88 Natural Desert Vegetation
 Off A 88 Natural Desert Vegetation

PROJECT NO. 1504-24-054

PROJECT: Meribella at Sunbrook Phase 3 BY: TJB DATE: 6/3/2026

SUBJECT: TR 55 Worksheet CHKD: JWB DATE: 6/3/2026

☒ Pre-developed ☐ Post-developed

Subarea: Sub A

Sheet Flow

Surface Description	Mannings 'n'	Flow Length L (ft) ≤100ft	2-yr 24-hr P ₂ (in)	Average slope s (ft/ft)
	0.05	120	1.14	0.1532

$$T_t = \frac{0.007 (nL)^{0.8}}{P_2^{0.5} s^{0.4}}$$

$$T_t = \frac{0.06}{3.493} \text{ hr}$$

Shallow Concentrated Flow

	Ground Type	Flow Length L (ft)	Average Velocity V(ft/s)	Average slope s (ft/ft)
	N	33.200	3.90	0.1532

P - (paved) Pavement and small upland gullies

G - (unpaved) Grassed waterways

N - nearly bare and untilled (overland flow); and alluvial fans western mountain regions

C - Cultivated straight row crops

S - Short-grass pasture

M - Minimum tillage cultivation, contour or strip-cropped, and woodlands

F - Forest with heavy ground litter and hay meadows

$$T_t = \frac{0.0024}{0.142} \text{ hr}$$

$$T_t = \frac{L}{3600 V}$$

Channel Flow

Mannings 'n'	x-sectional flow area, a (ft ²)	Wetted Perimeter P _w	Average slope s (ft/ft)	Flow Length L (ft)
0.05	15.00	30.07	0.1532	20.00

$$V = \frac{1.49 r^{2/3} s^{1/2}}{n}$$

$$r = \frac{a}{P_w}$$

Hydraulic radius r=a/P _w	Average Velocity V(ft/s)
0.50	7.34

$$T_t = \frac{L}{3600 V}$$

$$T_t = \frac{0.00076}{0.045} \text{ hr}$$

Watershed or sub area T_c add up T_t

Lag time = tc*.6

Subarea:	T _c	0.04	hr
Sub A		2.208	min

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SUBJECT: TR 55 Worksheet CHKD: JWB DATE: 6/3/2026

☒ Pre-developed ☐ Post-developed

Subarea: Sub B

Sheet Flow

Surface Description	Mannings 'n'	Flow Length L (ft) ≤100ft	2-yr 24-hr P ₂ (in)	Average slope s (ft/ft)
	0.05	80.00	1.14	0.1268

$$T_t = \frac{0.007 (nL)^{0.8}}{P_2^{0.5} s^{0.4}}$$

$$T_t = \frac{0.05}{2.724} \text{ hr}$$

Shallow Concentrated Flow

	Ground Type	Flow Length L (ft)	Average Velocity V(ft/s)	Average slope s (ft/ft)
	N	17.93	3.55	0.1268

P - (paved) Pavement and small upland gullies

G - (unpaved) Grassed waterways

N - nearly bare and untilled (overland flow); and alluvial fans western mountain regions

C - Cultivated straight row crops

S - Short-grass pasture

M - Minimum tillage cultivation, contour or strip-cropped, and woodlands

F - Forest with heavy ground litter and hay meadows

$$T_t = \frac{0.0014}{0.084} \text{ hr}$$

$$T_t = \frac{L}{3600 V}$$

Channel Flow

Mannings 'n'	x-sectional flow area, a (ft ²)	Wetted Perimeter P _w	Average slope s (ft/ft)	Flow Length L (ft)
0.05	15.00	30.07	0.1268	10.00

$$V = \frac{1.49 r^{2/3} s^{1/2}}{n}$$

$$r = \frac{a}{P_w}$$

$$T_t = \frac{L}{3600 V}$$

Hydraulic radius r=a/P _w	Average Velocity V(ft/s)
0.50	6.67

$$T_t = \frac{0.00042}{0.025} \text{ hr}$$

Watershed or sub area T_c add up T_t

Lag time = tc*.6

Subarea:	T _c	0.03	hr
Sub B		1.700	min



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Subarea: **Sub C**

Sheet Flow

Surface Description	Mannings 'n'	Flow Length L (ft) ≤100ft	2-yr 24-hr rainfall P ₂ (in)	Average slope s (ft/ft)
	0.05	75.00	1.14	0.1259

$$T_t = \frac{0.007 (nL)^{0.83}}{P_2^{0.5} s^{0.4}}$$

$$T_t = \frac{0.04}{2.594} \text{ hr}$$

Shallow Concentrated Flow

	Ground Type	Flow Length L (ft)	Average Velocity V(ft/s)	Average slope s (ft/ft)
	N	14.22	3.54	0.1259

P - (paved) Pavement and small upland gullies

G - (unpaved) Grassed waterways

N - nearly bare and untilled (overland flow); and alluvial fans western mountain regions

C - Cultivated straight row crops

S - Short-grass pasture

M - Minimum tillage cultivation, contour or strip-cropped, and woodlands

F - Forest with heavy ground litter and hay meadows

$$T_t = \frac{0.0011}{0.067} \text{ hr}$$

$$T_t = \frac{L}{3600 V}$$

Channel Flow

Mannings 'n'	x-sectional flow area, a (ft ²)	Wetted Perimeter P _w	Average slope s (ft/ft)	Flow Length L (ft)
0.05	15.00	30.07	0.1259	10.00

$$V = 1.49 r^{2/3} s^{1/22}$$

$$r = \frac{a}{P_w}$$

$$T_t = \frac{n L}{3600 V}$$

Hydraulic radius r=a/P _w	Average Velocity V(ft/s)
0.50	6.65

$$T_t = \frac{0.00042}{0.025} \text{ hr}$$

Watershed or sub area T_c add up T_t

Lag time = tc*.6

Subarea:	T _c	0.03	hr
Sub C		1.612	min

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Subarea: **Sub D**

Sheet Flow

Surface Description	Mannings 'n'	Flow Length L (ft) ≤100ft	2-yr 24-hr rainfall P ₂ (in)	Average slope s (ft/ft)
	0.05	60.00	1.14	0.0938

$$T_t = \frac{0.007 (nL)^{0.8}}{P_2^{0.5} s^{0.4}}$$

$$T_t = \frac{0.04}{2.441} \text{ hr}$$

Shallow Concentrated Flow

Ground Type	Flow Length L (ft)	Average Velocity V(ft/s)	Average slope s (ft/ft)
N	30.09	3.05	0.0938

P - (paved) Pavement and small upland gullies

G - (unpaved) Grassed waterways

N - nearly bare and untilled (overland flow); and alluvial fans western mountain regions

C - Cultivated straight row crops

S - Short-grass pasture

M - Minimum tillage cultivation, contour or strip-cropped, and woodlands

F - Forest with heavy ground litter and hay meadows

$$T_t = \frac{0.0027}{0.164} \text{ hr}$$

$$T_t = \frac{L}{3600 V}$$

Channel Flow

Mannings 'n'	x-sectional flow area, a (ft ²)	Wetted Perimeter P _w	Average slope s (ft/ft)	Flow Length L (ft)
0.05	15.00	30.07	0.0938	20.00

$$V = \frac{1.49 r^{2/3} s^{1/2}}{n}$$

$$r = \frac{a}{P_w}$$

$$T_t = \frac{L}{3600 V}$$

Hydraulic radius r=a/P _w	Average Velocity V(ft/s)
0.50	5.74

$$T_t = \frac{0.00097}{0.058} \text{ hr}$$

Watershed or sub area T_c add up T_t

Lag time = tc*.6

Subarea:	T _c	0.03	hr
Sub D		1.598	min



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SUBJECT: TR 55 Worksheet CHKD: JWB DATE: 6/3/2026

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Subarea: **Sub E**

Sheet Flow

Surface Description	Mannings 'n'	Flow Length L (ft) ≤100ft	2-yr 24-hr rainfall P ₂ (in)	Average slope s (ft/ft)
	0.05	64	1.14	0.0911

$$T_t = \frac{0.007 (nL)^{0.8}}{P_2^{0.5} s^{0.4}}$$

$$T_t = \frac{0.04}{2.601} \text{ hr}$$

Shallow Concentrated Flow

Ground Type	Flow Length L (ft)	Average Velocity V (ft/s)	Average slope s (ft/ft)
N	7.34	3.01	0.091

P - (paved) Pavement and small upland gullies

G - (unpaved) Grassed waterways

N - nearly bare and untilled (overland flow); and alluvial fans western mountain regions

C - Cultivated straight row crops

S - Short-grass pasture

M - Minimum tillage cultivation, contour or strip-cropped, and woodlands

F - Forest with heavy ground litter and hay meadows

$$T_t = \frac{0.0007}{0.041} \text{ hr}$$

$$T_t = \frac{L}{3600 V}$$

Channel Flow

Mannings 'n'	x-sectional flow area, a (ft ²)	Wetted Perimeter P _w	Average slope s (ft/ft)	Flow Length L (ft)
0.05	15.00	30.07	0.0911	34.00

$$V = \frac{1.49 r^{2/3} s^{1/2}}{n}$$

$$r = \frac{a}{P_w}$$

$$T_t = \frac{L}{3600 V}$$

Hydraulic radius r=a/P _w	Average Velocity V (ft/s)
0.50	5.66

$$T_t = \frac{0.00167}{0.100} \text{ hr}$$

Watershed or sub area T_c add up T_t

Lag time = t_c * .6

Subarea:	T _c	0.03	hr
Sub E		1.645	min



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SUBJECT: TR 55 Worksheet CHKD: JWB DATE: 6/3/2026

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Subarea: Off A

Sheet Flow

Surface Description	Mannings 'n'	Flow Length	2-yr 24-hr rainfall	Average slope
	n	L (ft) ≤100ft	P ₂ (in)	s (ft/ft)
	0.05	40	1.14	0.3840

$$T_t = \frac{0.007 (nL)^{0.8}}{P_2^{0.5} s^{0.4}}$$

$$T_t = \frac{0.02}{1.004} \text{ hr min}$$

Shallow Concentrated Flow

	Ground Type	Flow Length	Average Velocity	Average slope
		L (ft)	V(ft/s)	s (ft/ft)
	N	27.70	6.18	0.3840

P - (paved) Pavement and small upland gullies

G - (unpaved) Grassed waterways

N - nearly bare and untilled (overland flow); and alluvial fans western mountain regions

C - Cultivated straight row crops

S - Short-grass pasture

M - Minimum tillage cultivation, contour or strip-cropped, and woodlands

F - Forest with heavy ground litter and hay meadows

$$T_t = \frac{0.0012}{0.075} \text{ hr min}$$

$$T_t = \frac{L}{3600 V}$$

Channel Flow

Mannings 'n'	x-sectional flow area, a (ft ²)	Wetted Perimeter	Average slope	Flow Length
n		P _w	s (ft/ft)	L (ft)
0.05	15.00	30.07	0.38	120.00

$$V = \frac{1.49 r^{2/3} s^{1/2}}{n}$$

$$r = \frac{a}{P_w}$$

$$T_t = \frac{L}{3600 V}$$

Hydraulic radius	Average Velocity
r=a/P _w	V(ft/s)
0.50	11.62

$$T_t = \frac{0.00287}{0.172} \text{ hr min}$$

Watershed or sub area T_c add up T_t

Lag time =tc*.6

Subarea:	T _c	0.01	hr
Off A		0.751	min



Global Summary Results for Run "PRE 10-3"



Project: Meribella at Sunbrook Phase Simulation Run: PRE 10-3

Start of Run: 01Jan2000, 00:00

Basin Model: EXISTING

End of Run: 01Jan2000, 04:00

Meteorologic Model: 10-3

Compute Time: 03Jun2026, 11:05:30

Control Specifications: 10YR-3HR

Show Elements: All Elements ▾

Volume Units: ☒ IN ☐ ACRE-FT

Sorting: Hydrologic ▾

Hydrologic Element	Drainage Area (MI ²)	Peak Discharge (CFS)	Time of Peak	Volume (IN)
SUB A	0.0034	0.9	01Jan2000, 00:45	0.25
Off A	0.0061	1.6	01Jan2000, 00:45	0.25
SUB B	0.0016	0.4	01Jan2000, 00:45	0.25
SUB C	0.0004	0.1	01Jan2000, 00:45	0.25
SUB D	0.0004	0.1	01Jan2000, 00:45	0.25
SUB E	0.0002	0.1	01Jan2000, 00:45	0.25
Outfall 1	0.0060	1.6	01Jan2000, 00:45	0.25

Project: Meribella at Sunbrook Phase Simulation Run: PRE 10-24

Start of Run: 01Jan2000, 00:00

Basin Model: EXISTING

End of Run: 02Jan2000, 05:00

Meteorologic Model: 10-24

Compute Time: 03Jun2026, 11:05:29

Control Specifications: 24HR

Show Elements: All Elements ▾

Volume Units: ☒ IN ☐ ACRE-FT

Sorting: Hydrologic ▾

Hydrologic Element	Drainage Area (MI ²)	Peak Discharge (CFS)	Time of Peak	Volume (IN)
SUB A	0.0034	0.3	01Jan2000, 12:00	0.26
Off A	0.0061	0.5	01Jan2000, 12:00	0.26
SUB B	0.0016	0.1	01Jan2000, 12:00	0.26
SUB C	0.0004	0.0	01Jan2000, 12:00	0.26
SUB D	0.0004	0.0	01Jan2000, 12:00	0.26
SUB E	0.0002	0.0	01Jan2000, 12:00	0.26
Outfall 1	0.0060	0.5	01Jan2000, 12:00	0.26



Project: Meribella at Sunbrook Phase Simulation Run: PRE 100-3

Start of Run: 01Jan2000, 00:00

Basin Model: EXISTING

End of Run: 01Jan2000, 04:00

Meteorologic Model: 100-3

Compute Time: 03Jun2026, 11:05:32

Control Specifications: 100YR-3HR

Show Elements: All Elements ▾

Volume Units: ☒ IN ☐ ACRE-FT

Sorting: Hydrologic ▾

Hydrologic Element	Drainage Area (MI ²)	Peak Discharge (CFS)	Time of Peak	Volume (IN)
SUB A	0.0034	1.1	01Jan2000, 00:45	0.25
Off A	0.0061	1.9	01Jan2000, 00:45	0.25
SUB B	0.0016	0.5	01Jan2000, 00:45	0.25
SUB C	0.0004	0.1	01Jan2000, 00:45	0.25
SUB D	0.0004	0.1	01Jan2000, 00:45	0.25
SUB E	0.0002	0.1	01Jan2000, 00:45	0.25
Outfall 1	0.0060	1.9	01Jan2000, 00:45	0.25

Project: Meribella at Sunbrook Phase Simulation Run: PRE 100-24

Start of Run: 01Jan2000, 00:00

Basin Model: EXISTING

End of Run: 02Jan2000, 05:00

Meteorologic Model: 100-24

Compute Time: 03Jun2026, 11:05:31

Control Specifications: 24HR

Show Elements: All Elements ▾

Volume Units: ☒ IN ☐ ACRE-FT

Sorting: Hydrologic ▾

Hydrologic Element	Drainage Area (MI ²)	Peak Discharge (CFS)	Time of Peak	Volume (IN)
SUB A	0.0034	0.3	01Jan2000, 12:00	0.26
Off A	0.0061	0.5	01Jan2000, 12:00	0.26
SUB B	0.0016	0.1	01Jan2000, 12:00	0.26
SUB C	0.0004	0.0	01Jan2000, 12:00	0.26
SUB D	0.0004	0.0	01Jan2000, 12:00	0.26
SUB E	0.0002	0.0	01Jan2000, 12:00	0.26
Outfall 1	0.0060	0.5	01Jan2000, 12:00	0.26

APPENDIX C

HEC-HMS Model Diagram

Developed Watershed Hydrology Model Input Spreadsheets

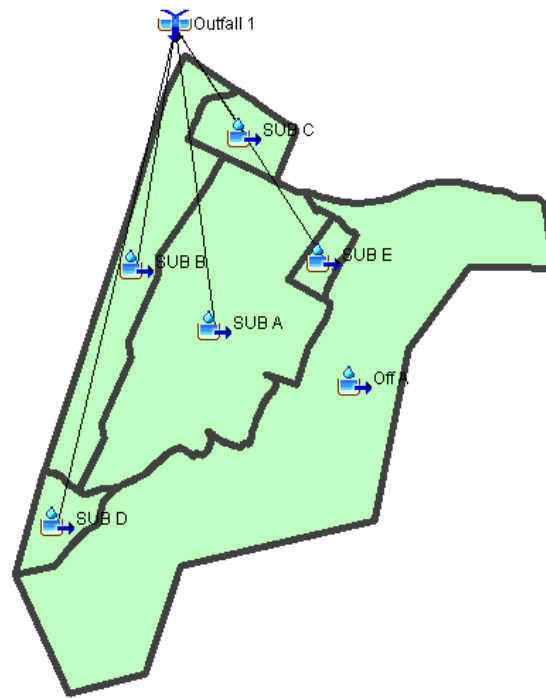
Hand scan – SCS Curve # for Proposed Conditions

Developed Conditions HEC-HMS Model and Output Tables

Detention Calculations

MS4 Retention Volume Calculation







SUBJECT: Proposed Site Hydrology Information CHKD: JWB DATE: 6/3/2026

[illegible]

PROJECT NO. 1504-24-054

PROJECT: Meribella at Sunbrook Phase 3 BY: TJB DATE: 6/3/2026

SUBJECT: NRCS Curve Number CHKD: JWB DATE: 6/3/2026

NRCS CURVE NUMBER CHART

Land Use Description	SCS Curve Number (CN) Values			
	Group A	Group B	Group C	Group D
<i>Cultivated Land</i>				
Cultivated Land; Without Conservation Treatment	72	81	88	91
Cultivated Land; With Conservation Treatment	62	71	78	81
<i>Pasture or Range Land</i>				
Pasture or Range Land; Poor Condition	68	79	86	89
Pasture or Range Land; Good Condition	39	61	74	80
<i>Open Spaces (Lawns, Parks, etc.)</i>				
Open Space; Poor Condition; Grass Cover < 50%	68	79	86	89
Open Space; Fair Condition; Grass Cover 50% to 75%	49	69	79	84
Open Space; Good Condition; Grass Cover > 75%	39	61	74	80
<i>Impervious Areas</i>				
Impervious Areas; Paved Parking Lots, Roofs, Driveways	98	98	98	98
Impervious Areas; Streets and Roads; Paved; Curbs and Storm Sewers	98	98	98	98
Impervious Areas; Streets and Roads; Paved; Open Ditches (w/ Right-of-Way)	83	89	92	93
Impervious Areas; Streets and Roads; Gravel (w/ Right-of-Way)	76	85	89	91
Impervious Areas; Streets and Roads; Dirt (w/ Right-of-Way)	72	82	87	89
<i>Urban Commercial and Industrial Districts</i>				
Urban Districts; Commercial and Business; Average 85% Impervious	89	92	94	95
Urban Districts; Industrial; Average 72% Impervious	81	88	91	93
<i>Residential Districts</i>				
Residential Districts; 1/8 Acre (Town Houses); Average 65% Impervious	77	85	90	92
Residential Districts; 1/4 Acre; Average 38% Impervious	61	75	83	87
Residential Districts; 1/3 Acre; Average 30% Impervious	57	72	81	86
Residential Districts; 1/2 Acre; Average 25% Impervious	54	70	80	85
Residential Districts; 1 Acre; Average 20% Impervious	51	68	79	84
Residential Districts; 2 Acre; Average 12% Impervious	46	65	77	82
<i>Western Desert Urban Areas</i>				
Natural Desert Vegetation (Pervious Areas Only)	63	77	85	88
Artificial Desert Landscaping	96	96	96	96
<i>Developing Urban Area (No Vegetation)</i>				
Newly Graded Area (Pervious Only)	77	86	91	94

Sub A **93 Weighted Average**
 Sub B **91 Weighted Average**
 Sub C **92 Residential Districts**
 Sub D **84 Weighted Average**
 Sub E **92 Residential Districts**
 Off A **88 Natural Desert Vegetation**

PROJECT: Bella Terra DATE: _____ SHEET: _____

SUBJECT: Weighted Average Curve Number BY: _____ JOB #: _____

SUB A TA = 94,783.99
 Town Houses TA = 98820.54 92 CN = ~~50~~⁴% of TA
 Impervious Area TA = 27086.60 98 CN = 29% of TA
 Open Space TA = 51561.0 80 CN = 5% of TA
 Natural Desert Vegetation TA = 13720.75 88 CN = ~~10~~²% of TA
 $(88 \cdot 10\%) + (80 \cdot 5\%) + (98 \cdot 29\%) + (92 \cdot 50\%) = 92.66 \approx 93$
 SUB B TA = 44,139.98
 Town Houses TA = 29443.64 92 CN 67%
 Natural Desert Vegetation TA = 14686.34 88 CN 33%
 $(88 \cdot 33\%) + (92 \cdot 67\%) = 90.68 \approx 91$
 SUB D TA = 10776.5
 Open Space = 5876.85 80 CN = 55%
 Natural Desert Vegetation = 4899.65 88 CN = 45%
 $(80 \cdot 55\%) + (88 \cdot 45\%) = 83.6 \approx 84$

PROJECT NO. 1504-24-054

PROJECT: Meribella at Sunbrook Phase 3 BY: TJB DATE: 6/3/2026

SUBJECT: TR 55 Worksheet CHKD: JWB DATE: 6/3/2026

☐ Pre-developed ☒ Post-developed

Subarea: Sub A

Sheet Flow

Surface Description	Mannings 'n'	Flow Length L (ft) ≤100ft	2-yr 24-hr P ₂ (in)	Average slope s (ft/ft)
	0.01	85	1.14	0.0189

$$T_t = \frac{0.007 (nL)^{0.8}}{P_2^{0.5} s^{0.4}}$$

$$T_t = \frac{0.03}{1.689} \begin{matrix} \text{hr} \\ \text{min} \end{matrix}$$

Shallow Concentrated Flow

	Ground Type	Flow Length L (ft)	Average Velocity V(ft/s)	Average slope s (ft/ft)
	P	44.000	2.79	0.0189

P - (paved) Pavement and small upland gullies

G - (unpaved) Grassed waterways

N - nearly bare and untilled (overland flow); and alluvial fans western mountain regions

C - Cultivated straight row crops

S - Short-grass pasture

M - Minimum tillage cultivation, contour or strip-cropped, and woodlands

F - Forest with heavy ground litter and hay meadows

$$T_t = \frac{0.0044}{0.262} \begin{matrix} \text{hr} \\ \text{min} \end{matrix}$$

$$T_t = \frac{L}{3600 V}$$

Channel Flow

Mannings 'n'	x-sectional flow area, a (ft ²)	Wetted Perimeter P _w	Average slope s (ft/ft)	Flow Length L (ft)
0.01	15.00	30.07	0.0189	340.00

$$V = \frac{1.49 r^{2/3} s^{1/2}}{n}$$

$$r = \frac{a}{P_w}$$

Hydraulic radius r=a/P _w	Average Velocity V(ft/s)
0.50	12.88

$$T_t = \frac{L}{3600 V}$$

$$T_t = \frac{0.00733}{0.440} \begin{matrix} \text{hr} \\ \text{min} \end{matrix}$$

Watershed or sub area T_c add up T_t

Lag time = tc*.6

Subarea:	T _c	0.02	hr
Sub A		1.435	min

PROJECT NO. 1504-24-054

PROJECT: Meribella at Sunbrook Phase 3 BY: TJB DATE: 6/3/2026

SUBJECT: TR 55 Worksheet CHKD: JWB DATE: 6/3/2026

Pre-developed X Post-developed

Subarea: Sub B

Sheet Flow

Surface Description	Mannings 'n'	Flow Length L (ft) ≤100ft	2-yr 24-hr P ₂ (in)	Average slope s (ft/ft)
	0.05	50.00	1.14	0.0966

$$T_t = \frac{0.007 (nL)^{0.8}}{P_2^{0.5} s^{0.4}}$$

$$T_t = \frac{0.03}{2.085} \text{ hr}$$

Shallow Concentrated Flow

	Ground Type	Flow Length L (ft)	Average Velocity V(ft/s)	Average slope s (ft/ft)
	N	36.00	3.10	0.0966

P - (paved) Pavement and small upland gullies

G - (unpaved) Grassed waterways

N - nearly bare and untilled (overland flow); and alluvial fans western mountain regions

C - Cultivated straight row crops

S - Short-grass pasture

M - Minimum tillage cultivation, contour or strip-cropped, and woodlands

F - Forest with heavy ground litter and hay meadows

$$T_t = \frac{0.0032}{0.194} \text{ hr}$$

$$T_t = \frac{L}{3600 V}$$

Channel Flow

Mannings 'n'	x-sectional flow area, a (ft ²)	Wetted Perimeter P _w	Average slope s (ft/ft)	Flow Length L (ft)
0.05	15.00	30.07	0.0966	15.00

$$V = \frac{1.49 r^{2/3} s^{1/2}}{n}$$

$$r = \frac{a}{P_w}$$

Hydraulic radius r=a/P _w	Average Velocity V(ft/s)
0.50	5.83

$$T_t = \frac{L}{3600 V}$$

$$T_t = \frac{0.00072}{0.043} \text{ hr}$$

Watershed or sub area T_c add up T_t

Lag time = t_c*.6

Subarea:	T _c	0.02	hr
Sub B		1.393	min

PROJECT NO. 1504-24-054

PROJECT: Meribella at Sunbrook Phase 3 BY: TJB DATE: 6/3/2026

SUBJECT: TR 55 Worksheet CHKD: JWB DATE: 6/3/2026

 Pre-developed X Post-developed

Subarea: Sub C

Sheet Flow

Surface Description	Mannings 'n'	Flow Length L (ft) ≤100ft	2-yr 24-hr rainfall P ₂ (in)	Average slope s (ft/ft)
	0.01	50.00	1.14	0.0531

$$T_t = \frac{0.007 (nL)^{0.83}}{P_2^{0.5} s^{0.4}}$$

$$T_t = \frac{0.01}{0.731} \text{ hr}$$

Shallow Concentrated Flow

Ground Type	Flow Length L (ft)	Average Velocity V(ft/s)	Average slope s (ft/ft)
P	12.00	4.68	0.0531

P - (paved) Pavement and small upland gullies

G - (unpaved) Grassed waterways

N - nearly bare and untilled (overland flow); and alluvial fans western mountain regions

C - Cultivated straight row crops

S - Short-grass pasture

M - Minimum tillage cultivation, contour or strip-cropped, and woodlands

F - Forest with heavy ground litter and hay meadows

$$T_t = \frac{0.0007}{0.043} \text{ hr}$$

$$T_t = \frac{L}{3600 V}$$

Channel Flow

Mannings 'n'	x-sectional flow area, a (ft ²)	Wetted Perimeter P _w	Average slope s (ft/ft)	Flow Length L (ft)
0.01	2.87	16.89	0.0531	10.00

$$V = \frac{1.49 r^{2/3} s^{1/22}}{n}$$

$$r = \frac{a}{P_w}$$

$$T_t = \frac{L}{3600 V}$$

Hydraulic radius r=a/P _w	Average Velocity V(ft/s)
0.17	10.53

$$T_t = \frac{0.00026}{0.016} \text{ hr}$$

Watershed or sub area T_c add up T_t

Lag time = t_c * .6

Subarea: T _c	0.01	hr
Sub C	0.474	min

PROJECT NO. 1504-24-054

PROJECT: Meribella at Sunbrook Phase 3 BY: TJB DATE: 6/3/2026

SUBJECT: TR 55 Worksheet CHKD: JWB DATE: 6/3/2026

 Pre-developed X Post-developed

Subarea: Sub D

Sheet Flow

Surface Description	Mannings 'n'	Flow Length L (ft) ≤100ft	2-yr 24-hr rainfall P ₂ (in)	Average slope s (ft/ft)
	0.05	60.00	1.14	0.0938

$$T_t = \frac{0.007 (nL)^{0.8}}{P_2^{0.5} s^{0.4}}$$

$$T_t = \frac{0.04}{2.441} \text{ hr}$$

Shallow Concentrated Flow

Ground Type	Flow Length L (ft)	Average Velocity V(ft/s)	Average slope s (ft/ft)
G	30.09	4.94	0.0938

P - (paved) Pavement and small upland gullies

G - (unpaved) Grassed waterways

N - nearly bare and untilled (overland flow); and alluvial fans western mountain regions

C - Cultivated straight row crops

S - Short-grass pasture

M - Minimum tillage cultivation, contour or strip-cropped, and woodlands

F - Forest with heavy ground litter and hay meadows

$$T_t = \frac{0.0017}{0.101} \text{ hr}$$

$$T_t = \frac{L}{3600 V}$$

Channel Flow

Mannings 'n'	x-sectional flow area, a (ft ²)	Wetted Perimeter P _w	Average slope s (ft/ft)	Flow Length L (ft)
0.05	15.00	30.07	0.0938	20.00

$$V = \frac{1.49 r^{2/3} s^{1/2}}{n}$$

$$r = \frac{a}{P_w}$$

$$T_t = \frac{L}{3600 V}$$

Hydraulic radius r=a/P _w	Average Velocity V(ft/s)
0.50	5.74

$$T_t = \frac{0.00097}{0.058} \text{ hr}$$

Watershed or sub area T_c add up T_t

Lag time = t_c * .6

Subarea: T _c	0.03	hr
Sub D	1.560	min



PROJECT NO. 1504-24-054

PROJECT: Meribella at Sunbrook Phase 3 BY: TJB DATE: 6/3/2026

SUBJECT: TR 55 Worksheet CHKD: JWB DATE: 6/3/2026

☐ Pre-developed ☒ Post-developed

Subarea: **Sub E**

Sheet Flow

Surface Description	Mannings 'n'	Flow Length L (ft) ≤100ft	2-yr 24-hr rainfall P ₂ (in)	Average slope s (ft/ft)
	0.05	15	1.14	0.0150

$$T_t = \frac{0.007 (nL)^{0.8}}{P_2^{0.5} s^{0.4}}$$

$$T_t = \frac{0.03}{1.677} \text{ hr}$$

Shallow Concentrated Flow

	Ground Type	Flow Length L (ft)	Average Velocity V (ft/s)	Average slope s (ft/ft)
	N	3.00	1.22	0.015

P - (paved) Pavement and small upland gullies

G - (unpaved) Grassed waterways

N - nearly bare and untilled (overland flow); and alluvial fans western mountain regions

C - Cultivated straight row crops

S - Short-grass pasture

M - Minimum tillage cultivation, contour or strip-cropped, and woodlands

F - Forest with heavy ground litter and hay meadows

$$T_t = \frac{0.0007}{0.041} \text{ hr}$$

$$T_t = \frac{L}{3600 V}$$

Channel Flow

Mannings 'n'	x-sectional flow area, a (ft ²)	Wetted Perimeter P _w	Average slope s (ft/ft)	Flow Length L (ft)
0.05	15.00	30.07	0.0150	2.00

$$V = \frac{1.49 r^{2/3} s^{1/2}}{n}$$

$$r = \frac{a}{P_w}$$

$$T_t = \frac{L}{3600 V}$$

Hydraulic radius r=a/P _w	Average Velocity V (ft/s)
0.50	2.30

$$T_t = \frac{0.00024}{0.015} \text{ hr}$$

Watershed or sub area T_c add up T_t

Lag time = t_c * .6

Subarea:	T _c	0.02	hr
Sub E		1.039	min



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SUBJECT: TR 55 Worksheet CHKD: JWB DATE: 6/3/2026

 Pre-developed X Post-developed

Subarea: Off A

Sheet Flow

Surface Description	Mannings 'n'	Flow Length	2-yr 24-hr rainfall	Average slope
	n	L (ft) ≤100ft	P ₂ (in)	s (ft/ft)
	0.05	40	1.14	0.3840

$$T_t = \frac{0.007 (nL)^{0.8}}{P_2^{0.5} s^{0.4}}$$

$$T_t = \frac{0.02}{1.004} \begin{matrix} \text{hr} \\ \text{min} \end{matrix}$$

Shallow Concentrated Flow

	Ground Type	Flow Length	Average Velocity	Average slope
		L (ft)	V(ft/s)	s (ft/ft)
	N	27.70	6.18	0.3840

P - (paved) Pavement and small upland gullies

G - (unpaved) Grassed waterways

N - nearly bare and untilled (overland flow); and alluvial fans western mountain regions

C - Cultivated straight row crops

S - Short-grass pasture

M - Minimum tillage cultivation, contour or strip-cropped, and woodlands

F - Forest with heavy ground litter and hay meadows

$$T_t = \frac{0.0012}{0.075} \begin{matrix} \text{hr} \\ \text{min} \end{matrix}$$

$$T_t = \frac{L}{3600 V}$$

Channel Flow

Mannings 'n'	x-sectional flow	Wetted Perimeter	Average slope	Flow Length
n	area, a (ft ²)	P _w	s (ft/ft)	L (ft)
0.05	15.00	30.07	0.38	120.00

$$V = \frac{1.49 r^{2/3} s^{1/2}}{n}$$

$$r = \frac{a}{P_w}$$

Hydraulic radius	Average Velocity
r=a/P _w	V(ft/s)
0.50	11.62

$$T_t = \frac{L}{3600 V}$$

$$T_t = \frac{0.00287}{0.172} \begin{matrix} \text{hr} \\ \text{min} \end{matrix}$$

Watershed or sub area T_c add up T_t

Lag time =tc*.6

Subarea:	T _c	0.01	hr
Off A		0.751	min



PROJECT NO. 1504-24-054

PROJECT: Meribella at Sunbrook Phase 3 BY: TJB DATE: 6/3/2026

SUBJECT: TR 55 Worksheet CHKD: JWB DATE: 6/3/2026

☐ Pre-developed ☒ Post-developed

Subarea: 0

Sheet Flow

Surface Description	Mannings 'n'	Flow Length L (ft) ≤100ft	2-yr 24-hr rainfall P ₂ (in)	Average slope s (ft/ft)
	0.05	100	1.14	0.0000

$$T_t = \frac{0.007 (nL)^{0.8}}{P_2^{0.5} s^{0.4}}$$

T_t hr
0.000 min

Shallow Concentrated Flow

	Ground Type	Flow Length L (ft)	Average Velocity V(ft/s)	Average slope s (ft/ft)
	N	-3,100.00		0.0000

P - (paved) Pavement and small upland gullies

G - (unpaved) Grassed waterways

N - nearly bare and untilled (overland flow); and alluvial fans western mountain regions

C - Cultivated straight row crops

S - Short-grass pasture

M - Minimum tillage cultivation, contour or strip-cropped, and woodlands

F - Forest with heavy ground litter and hay meadows

T_t hr
 min

$$T_t = \frac{L}{3600 V}$$

Channel Flow

Mannings 'n'	x-sectional flow area, a (ft ²)	Wetted Perimeter P _w	Average slope s (ft/ft)	Flow Length L (ft)
0.05	15.00	30.07	0.0000	3,000.00

$$V = \frac{1.49 r^{2/3} s^{1/2}}{n}$$

$$r = \frac{a}{P_w}$$

$$T_t = \frac{L}{3600 V}$$

Hydraulic radius r=a/P _w	Average Velocity V(ft/s)
0.50	0.00

T_t hr
#DIV/0! min

Watershed or sub area T_c add up T_t

Lag time = t_c * .6

Subarea:	T _c	#DIV/0! hr
0		#DIV/0! min

PROJECT NO. 1504-24-054

PROJECT: Meribella at Sunbrook Phase 3 BY: TJB DATE: 6/3/2026

SUBJECT: TR 55 Worksheet CHKD: JWB DATE: 6/3/2026

Pre-developed X Post-developed

Subarea: 0

Sheet Flow

Surface Description	Mannings 'n'	Flow Length L (ft) ≤100ft	2-yr 24-hr rainfall P ₂ (in)	Average slope s (ft/ft)
	0.05	100	1.14	0.0000

$$T_t = \frac{0.007 (nL)^{0.8}}{P_2^{0.5} s^{0.4}}$$

T_t 0 hr
0.000 min

Shallow Concentrated Flow

Ground Type	Flow Length L (ft)	Average Velocity V(ft/s)	Average slope s (ft/ft)
N	-434.00		0.000

P - (paved) Pavement and small upland gullies

G - (unpaved) Grassed waterways

N - nearly bare and untilled (overland flow); and alluvial fans western mountain regions

C - Cultivated straight row crops

S - Short-grass pasture

M - Minimum tillage cultivation, contour or strip-cropped, and woodlands

F - Forest with heavy ground litter and hay meadows

T_t 0 hr
0.000 min

$$T_t = \frac{L}{3600 V}$$

Channel Flow

Mannings 'n'	x-sectional flow area, a (ft ²)	Wetted Perimeter P _w	Average slope s (ft/ft)	Flow Length L (ft)
0.05	15.00	30.07	0.00	334.00

$$V = \frac{1.49 r^{2/3} s^{1/2}}{n}$$

$$r = \frac{a}{P_w}$$

$$T_t = \frac{L}{3600 V}$$

Hydraulic radius r=a/P _w	Average Velocity V(ft/s)
0.50	0.00

T_t #DIV/0! hr
#DIV/0! min

Watershed or sub area T_c add up T_t

Lag time =tc*.6

Subarea:	T _c	#DIV/0! hr
0		#DIV/0! min



PROJECT NO. 1504-24-054

PROJECT: Meribella at Sunbrook Phase 3 BY: TJB DATE: 6/3/2026

SUBJECT: TR 55 Worksheet CHKD: JWB DATE: 6/3/2026

 Pre-developed X Post-developed

Subarea: 0

Sheet Flow

Surface Description	Mannings 'n'	Flow Length L (ft) ≤100ft	2-yr 24-hr rainfall P ₂ (in)	Average slope s (ft/ft)
	0.05	50	1.14	0.0000

$$T_t = \frac{0.007 (nL)^{0.8}}{P_2^{0.5} s^{0.4}}$$

T_t 0 hr
0.000 min

Shallow Concentrated Flow

	Ground Type	Flow Length L (ft)	Average Velocity V(ft/s)	Average slope s (ft/ft)
	N	-50.00		0.000

P - (paved) Pavement and small upland gullies

G - (unpaved) Grassed waterways

N - nearly bare and untilled (overland flow); and alluvial fans western mountain regions

C - Cultivated straight row crops

S - Short-grass pasture

M - Minimum tillage cultivation, contour or strip-cropped, and woodlands

F - Forest with heavy ground litter and hay meadows

T_t 0 hr
0.000 min

$$T_t = \frac{L}{3600 V}$$

Channel Flow

Mannings 'n'	x-sectional flow area, a (ft ²)	Wetted Perimeter P _w	Average slope s (ft/ft)	Flow Length L (ft)
0.05	15.00	30.07	0.00	0.00

$$V = \frac{1.49 r^{2/3} s^{1/2}}{n}$$

$$r = \frac{a}{P_w}$$

$$T_t = \frac{L}{3600 V}$$

Hydraulic radius r=a/P _w	Average Velocity V(ft/s)
0.50	0.00

T_t #DIV/0! hr
#DIV/0! min

Watershed or sub area T_c add up T_t

Lag time = t_c * .6

Subarea:	T _c	#DIV/0! hr
0		#DIV/0! min



Project: Meribella at Sunbrook Phase Simulation Run: POST 10-3

Start of Run: 01Jan2000, 00:00

Basin Model: PROPOSED

End of Run: 01Jan2000, 04:00

Meteorologic Model: 10-3

Compute Time: 03Jun2026, 11:05:26

Control Specifications: 10YR-3HR

Show Elements: All Elements ▾

Volume Units: ☒ IN ☐ ACRE-FT

Sorting: Hydrologic ▾

Hydrologic Element	Drainage Area (MI ²)	Peak Discharge (CFS)	Time of Peak	Volume (IN)
Off A	0.0061	1.6	01Jan2000, 00:45	0.25
SUB A	0.0034	1.9	01Jan2000, 00:45	0.45
SUB B	0.0016	0.7	01Jan2000, 00:45	0.36
SUB C	0.0004	0.2	01Jan2000, 00:45	0.40
SUB D	0.0004	0.1	01Jan2000, 00:50	0.15
SUB E	0.0002	0.1	01Jan2000, 00:45	0.40
Outfall 1	0.0060	2.9	01Jan2000, 00:45	0.40



Project: Meribella at Sunbrook Phase Simulation Run: POST 10-24

Start of Run: 01Jan2000, 00:00

Basin Model: PROPOSED

End of Run: 02Jan2000, 05:00

Meteorologic Model: 10-24

Compute Time: 03Jun2026, 11:05:25

Control Specifications: 24HR

Show Elements: All Elements ▾

Volume Units: ☒ IN ☐ ACRE-FT

Sorting: Hydrologic ▾

Hydrologic Element	Drainage Area (MI ²)	Peak Discharge (CFS)	Time of Peak	Volume (IN)
Off A	0.0061	0.5	01Jan2000, 12:00	0.26
SUB A	0.0034	0.6	01Jan2000, 12:00	0.46
SUB B	0.0016	0.2	01Jan2000, 12:00	0.36
SUB C	0.0004	0.1	01Jan2000, 12:00	0.41
SUB D	0.0004	0.0	01Jan2000, 12:00	0.16
SUB E	0.0002	0.0	01Jan2000, 12:00	0.41
Outfall 1	0.0060	1.0	01Jan2000, 12:00	0.41



Global Summary Results for Run "POST 100-3"



Project: Meribella at Sunbrook Phase Simulation Run: POST 100-3

Start of Run: 01Jan2000, 00:00

Basin Model: PROPOSED

End of Run: 01Jan2000, 04:00

Meteorologic Model: 100-3

Compute Time: 03Jun2026, 11:05:28

Control Specifications: 100YR-3HR

Show Elements: All Elements ▾

Volume Units: ☒ IN ☐ ACRE-FT

Sorting: Hydrologic ▾

Hydrologic Element	Drainage Area (MI ²)	Peak Discharge (CFS)	Time of Peak	Volume (IN)
Off A	0.0061	1.9	01Jan2000, 00:45	0.25
SUB A	0.0034	2.1	01Jan2000, 00:45	0.45
SUB B	0.0016	0.8	01Jan2000, 00:45	0.36
SUB C	0.0004	0.2	01Jan2000, 00:45	0.40
SUB D	0.0004	0.1	01Jan2000, 00:50	0.15
SUB E	0.0002	0.1	01Jan2000, 00:45	0.40
Outfall 1	0.0060	3.3	01Jan2000, 00:45	0.40

Global Summary Results for Run "POST 100-24"

Project: Meribella at Sunbrook Phase Simulation Run: POST 100-24

Start of Run: 01Jan2000, 00:00 Basin Model: PROPOSED

End of Run: 02Jan2000, 05:00 Meteorologic Model: 100-24

Compute Time: 03Jun2026, 11:05:27 Control Specifications: 24HR

Show Elements: All Elements Volume Units: ☒ IN ☐ ACRE-FT Sorting: Hydrologic

Hydrologic Element	Drainage Area (MI2)	Peak Discharge (CFS)	Time of Peak	Volume (IN)
Off A	0.0061	0.5	01Jan2000, 12:00	0.26
SUB A	0.0034	0.6	01Jan2000, 12:00	0.46
SUB B	0.0016	0.2	01Jan2000, 12:00	0.36
SUB C	0.0004	0.1	01Jan2000, 12:00	0.41
SUB D	0.0004	0.0	01Jan2000, 12:00	0.16
SUB E	0.0002	0.0	01Jan2000, 12:00	0.41
Outfall 1	0.0060	1.0	01Jan2000, 12:00	0.41



Storm Water Quality Report

Date: 6/3/26

Project Name: Meribella at Sunbrook Phase 3

Project ID: 01504-24-054

Design Engineer: TJB

Is the project within a watershed that is 303(d) listed? YES

If yes:

Name of receiving water(s): SANTA CLARA-1 LOWER COLORADO RIVER

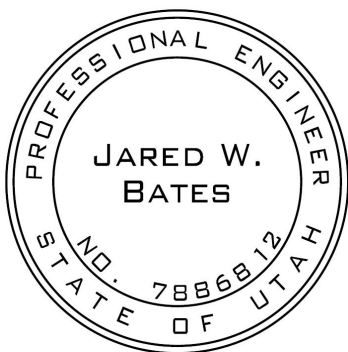
Listed Impairment(s): SELENIUM, TDS, TEMPERATURE

Does the watershed have an approved TMDL? YES

If yes:

Approved TMDL(s): 1,200 MG/L TDS, 4.6µg/L SELENIUM, TEMP TDML NOT SET

I have reviewed the storm water quality design and find this report to be complete, accurate, and current.



JARED BATES P.E. , Project Manager



Dixie Storm Water Coalition

St. George, Washington, Ivins, Santa Clara

Project Information

80th Percentile Storm Depth (in): 0.44

New Development

Area of Land Disturbance (ac): 3.84

Project Impervious Area (ac): 2.25

Project Imperviousness (%): 58.6

Project Volumetric Runoff Coefficient, RV: 0.30

Project 80th Percentile Volume, V_{goal} (cf): 1,840.0

Redevelopment

Area of Land Disturbance (ac): _____

Existing Project Impervious Area (ac): _____

Proposed Project Impervious Area (ac): _____

Change in Impervious Area (%): _____

If change in impervious area > 10%:

Existing Project Conditions

Imperviousness (%): _____

Volumetric Runoff Coefficient, RV: _____

80th Percentile Volume, V_1 (cf): _____

Proposed Project Conditions

Imperviousness (%): _____

Volumetric Runoff Coefficient, RV: _____

80th Percentile Volume, V_2 (cf): _____

$V_{\text{goal}} = V_2 - V_1 =$ _____

Subsurface Information

Groundwater

Depth to Groundwater (ft): Not encountered

Historical High Depth to Groundwater if known (ft): N/A

Source: GEOTECHNICAL INVESTIGATION MIRABELLA AT SUNBROOK - AGEC (4/21/2026)

Groundwater Contamination at Site: NO

Soil Information

Infiltration Rate (in/hr): <0.09

Hydrologic Soil Group: D

Source: NRCS SOIL SURVEY

Soil Contamination at Site: NO

Drinking Water

Within Drinking Water Source Area Protection: NO



Dixie Storm Water Coalition

St. George, Washington, Ivins, Santa Clara

Additional Relevant Site Information

Retention facilities to be addressed with the construction plans.

LID Drainage Areas

Contributing Drainage Area	Area (ac)	Impervious Area (ac)	Imperviousness (%)	Volumetric Runoff Coefficient, R_v	Water Quality Volume, WQV (cf)
CDA 1	3.84	2.25	58.59	0.30	1,839.97
CDA 2					
CDA 3					
CDA 4					
Total WQV (cf)					1,840.0

LID BMP Design

Contributing Drainage Area	LID BMP Type	Water Quality Volume, WQV (cf)	Runoff Retained (cf)	Percent of Runoff Captured (%)
CDA1	TBD	1,839.97		0.0
CDA 2				
CDA 3				
CDA 4				
Total Volume Retained (cf)			0.0	0.0

Percent of V_{goal} captured by LID BMPs: 0.0 %

Describe additional storm water quality measures incorporated into the site:

Due to the presence of expansive mudstone, onsite retention for this project to be technically infeasible. In lieu of retention, the site will detain the volume of water required for retention.



Dixie Storm Water Coalition

St. George, Washington, Ivins, Santa Clara

If 100% of Vgoal is not captured, document and provide narrative of technical in-feasibilities and/or alternate compliance measures below:

Exhibit F

Geotechnical Investigation



GEOTECHNICAL INVESTIGATION

MIRABELLA AT SUNBROOK

ST. GEORGE, UTAH

PREPARED FOR:

**SUN HILL HOLDINGS, LLC
2240 WEST SUNBROOK DRIVE, #5
ST. GEORGE, UTAH 84770**

ATTENTION: SAM FLEMETAKIS

PROJECT NO.2252539

APRIL 21, 2026

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SUMMARY

1. The subsurface soil profile observed in the borings drilled and trenches excavated at the site generally consists of site grading fill overlying clayey sand with gravel to clayey gravel with sand underlain by expansive mudstone bedrock to the maximum depth investigated, approximately 40 feet.
2. Subsurface water was not encountered to the maximum depth investigated, approximately 40 feet below the existing grade. Fluctuations in groundwater level may occur over time. An evaluation of such fluctuations is beyond the scope of this report. Springs or seepages were also not observed on the property.
3. The site is suitable for the proposed construction provided the recommendations within this report are followed.
4. The proposed residences may be supported on conventional spread and spot footings with slab-on-grade floors. Footings and slabs should be supported on a zone of properly compacted, structural fill underlain by a properly prepared subgrade as recommended in the Subgrade preparation section of this report. Residences may also be supported on deep foundation elements. Bearing capacity and design criteria for foundations are included in the Foundation Section of this report.
5. The sandy and gravelly soils free of organics, debris and material greater than 4 inches in size, are suitable for use as site grading fill, structural fill, wall backfill and utility trench backfill. The underlying expansive mudstone should be disposed of off site. The onsite clayey fill may also be used as site grading and low permeable fill beneath the buildings and roadways/pavement provided it is mixed as recommended.
6. Residences may be designed using Seismic Site Class C according the 2021 IBC and ASCE 7-16.
7. There are no mapped active faults extending through the site.
8. The onsite soil and bedrock present a high risk for exhibiting expansive characteristics.
9. The site is mapped as having a high landslide hazard according to Lund and others, 2008 (Figure 4). Based upon observations and analysis, it is our opinion that the risk of landslide is low provided the grading near the toe of the slope results in cuts of 5 feet or less.
10. Detailed recommendations for subgrade preparation, pavements, materials, foundations, and drainage are included in the report.
11. The information provided in this summary should not be used independent of that provided within the body of this report.

SCOPE

This report presents the results of a geotechnical investigation for the proposed Mirabella at Sunbrook residential subdivision in St. George, Utah, as shown in Figure 1. This report presents the subsurface conditions encountered, laboratory test results, and recommendations for geotechnical aspects of the project.

Field exploration was conducted to obtain information on the subsurface conditions and to obtain samples for laboratory testing. Information obtained from the field and laboratory was used to define conditions at the site and to develop recommendations for the proposed construction.

This report has been prepared to summarize the data obtained during the study and to present our conclusions and recommendations based on the proposed construction and the subsurface conditions encountered. Design parameters and a discussion of geotechnical engineering considerations related to construction are included in the report. This report was prepared in general accordance with our proposal for Professional Geotechnical Services under Project No. 2252539, dated December 9, 2025

SITE CONDITIONS

The subject site consists of undeveloped property which has been disturbed by previous site grading operations. A large pile of clay fill is present across the central portion of the site situated in a north-south direction (Photos 1, 3 and 5). Spread fill was placed over the area where pads B - E will be located (Photo 7). The Bella Terazza Townhomes are to the north, undeveloped property is to the south and the golf course is to the east above the undisturbed hillside (Photos 3, 4 and 6). The golf course is also to the west below pads A - E below a relatively steep slope (Photo 8).

The hillside is vegetated with sparse to moderately thick desert brush, weeds and grass (Photos 3, 4 and 6). The remainder of the site has occasional to frequent bushes and vegetation and sparse weeds.

FIELD STUDY

An engineer from AGECE visited the site on February 27, 2023 to observe the drilling of 4 borings as well as the excavation of 5 trenches at the approximate locations shown on Figure 2. The borings were drilled with a truck mounted drill rig equipped with 4-inch solid flight augers. The trenches were excavated with a large trackhoe. The subsurface profile was logged and soil samples were obtained at this time for laboratory testing.

GEOLOGY

The geologic conditions at the site were evaluated based on a review of geologic literature, and a site geologic reconnaissance on April 14, 2026.

A. Geomorphology of the Area

The site is located south of the existing Bella Terrazza subdivision in St. George Utah as shown on Figure 1. The site has been filled in the relatively flat area on the west over alluvial gravel, sand and clay and expansive mudstone (Petrified Forest Member of the Chinle Formation). The hillside to the east is comprised of bedrock of the Chinle formation.

This area is part of the St. George Basin which is bound on the north by the Pine Valley Mountains, on the east by the Hurricane Cliffs, on the west by the Beaver Dam Mountains, and on the south by the Mount Trumbull area.

Bedrock in the St. George basin mainly consists of Upper Permian and Lower Jurassic sandstone, shale, siltstone, limestone, gypsum, and conglomerate. These beds are folded to the southeast into the northeast trending Virgin anticline. Several north-trending faults are present within the St. George Basin, the most prominent of which is the Washington Fault (Christensen and Deen, 1983).

The St. George Basin is characterized by basalt capped buttes and cuestas that were once stream channels along which lava flowed. Erosion of the surrounding softer sedimentary rocks over time has resulted in an inverted topography of old stream channel becoming resistant basalt ridges such as the Middleton Black Ridge and the West Black Ridge (Christenson and Deen, 1983).

The geologic structure within the basin is dominated by the Virgin anticline which trends northeast south and east of the site. The Virgin anticline is a broad, generally symmetrical fold with maximum flank dips of 25 to 30 degrees to the northwest and southeast (Christenson and Deen, 1983).

The geologic conditions at the site were evaluated based on a review of geologic literature, test pit exploration and a reconnaissance of the site. Figure 3 indicates the most recent geologic mapping for the site.

B. Stratigraphy of the Area

The stratigraphy of the area consists of Triassic-aged bedrock of the Chinle Formation. Quaternary-aged alluvial deposits of gravel, sand and clay were also encountered beneath the fill in the borings and test pits although it was not mapped (Figures 3 and 3A).

1. Older River and Stream Deposits (Oat) (Quaternary aged - Holocene to Middle Pleistocene): Stratified, moderately to well-sorted alluvial gravel, sand, silt, and minor clay that forms level to gently sloping terraces above modern drainages; locally divisible into 6 or more distinct terrace levels based on elevation above modern drainages, but undivided here due to map scale; deposited in stream-channel and flood-plain environments and may include colluvial and alluvial-fan deposits too small to map separately; commonly forms a sand-and-gravel veneer 10 to 30 feet (3-9 m) thick over an eroded bedrock surface.
2. Petrified Forest Member of the Chile Formation (T_{rcp}): Swelling, bentonitic mudstone and claystone are common throughout the member and although typically poorly exposed, their bright purple, grayish-red, dark-reddish-brown, light-greenish-gray, brownish-gray, olive-gray, and similar hues locally show through to the surface; they weather to a "popcorn" surface and are responsible for numerous building foundation problems in the region; about 400 to 650 feet (120-200 m) thick.

The geologic conditions of the site and vicinity are shown on Figures 3 and 3A.

GEOLOGIC HAZARDS

Based on review of geologic literature and site reconnaissance, the following information is provided concerning geologic hazards.

A. **Faulting**

Based on previous work by Christenson and Deen (1983), Lund and others (2008), there are no mapped or active faults extending through the property.

B. Rock Fall

Rockfall hazards generally occur with a rockfall source (such as a jointed caprock or cliff forming bedrock) and a slope or grade change to provide adequate energy for the rockfall to occur. There is not caprock at the top of the slope and therefore rockfall hazard is considered low. The site is mapped as having a low rockfall hazard according to the Lund and others (2008).

C. Landslides

The hillside along the east edge of the parcel (Photos 3, 4 and 6) is mapped as having a high landslide hazard according to Lund and others, 2008 (Figures 4 and 4A). During our site investigation, evidence of recent or ancient landslides or debris flow was not observed. The following observations are made:

1. The site is not mapped as an ancient landslide and there is no evidence of landslide activity.
2. The mudstone dips to the northeast at 7 degrees according to geologic mapping which generally parallel to most of the adjacent slope.
3. The golf course above the slope provides a source of water which would weaken the strengths of the mudstone bedrock in slope. Even with the exposure to significant water, the slope is currently stable and signs of lateral movement are not apparent.
4. The slope is relatively gradual at approximately 2.5:1 (Horizontal:Vertical) slope or flatter with occasional steeper locations.

Based upon these observations and analysis, it is our opinion that the risk of landslide is low provided the grading near the toe of the slope results in cuts of 5 feet or less.

D. Flooding

The proposed site is not located in a flood plain, and evidence of flood hazards was not identified at the site. Therefore, flood potential at the site is low (Lund and others, 2008). Heavy precipitation events will likely cause intermittent flow onto and off of the site through drainages and washes. The drainage on and off the site should be properly controlled. A drainage study and drainage plan should be provided by the civil engineer. The drainage of precipitation water off of the slope along the east side of the project should be directed around the site to the storm drain.

E. Liquefaction

Based upon subsurface conditions encountered and geologic mapping (Lund and others, 2008), the subsurface soils and bedrock are non-liquefiable to depths investigated during a severe seismic event.

F. Collapsible Soil

Our subsurface investigation indicates collapsible soils do not exist at the site. The potential presence of collapsible soil is not identified to be a hazard at the site by the geologic mapping hazard by Lund and others, 2008.

G. Expansive Soil/Bedrock

The geologic mapping hazard by Lund and others, 2008 indicates the risk of expansive soils and bedrock at the site is high as shown on Figures 5 and 5A. Our subsurface investigation and laboratory testings confirms this risk is high. It will be addressed by implementing special foundation and grading recommendations to properly support structures.

SUBSURFACE SOIL CONDITION

The subsurface soil profile observed in the borings drilled and trenches excavated at the site generally consists of site grading fill overlying clayey sand with gravel to clayey gravel with sand underlain by expansive mudstone bedrock to the maximum depth investigated, approximately 40 feet. Descriptions of the soil and bedrock types encountered follow.

Fill - The fill is a mix of fat clay, sand and gravel. It is poorly compacted, moist to very moist, and is brown to grey and purple in color.

Laboratory tests conducted on samples of the fill indicate in-place moisture contents ranging from 9 to 14 percent, an in-place dry density of 105 pounds per cubic foot (pcf), gravel contents (percent retained on the No. 4 sieve) ranging from 1 to 22 percent and fines contents (percent passing the No. 200 sieve) ranging from 60 to 88 percent. Atterberg Limits tests indicate liquid limits ranging from 34 to 48 percent and plasticity indexes ranging from 16 to 27 percent.

A one-dimensional consolidation test conducted on a relatively undisturbed sample of the fill indicates it is moderately collapsible when wetted under a constant pressure of approximately 1,000 pounds per square foot (psf) and highly compressible under additional loading.

Clayey Gravel with Sand to Clayey Sand with Gravel - The clayey gravel with sand to clayey sand with gravel is medium to very dense, moist, calcareous, and is light tan to brown in color.

Laboratory tests conducted on samples of the clayey gravel with sand to clayey sand with gravel indicate in-place moisture contents ranging from 2 to 9 percent, gravel contents ranging from 24 to 35 percent, and fines contents ranging from 28 to 34 percent. Atterberg Limits tests indicate liquid limits ranging from 30 to 36 percent and plasticity indexes ranging from 10 to 16 percent.

Moisture-density relationship (Modified Proctor) tests conducted on samples of the clayey gravel with sand to clayey sand with gravel indicate maximum dry densities ranging from 127.5 to 129.5 pounds per cubic foot (pcf) and an optimum moisture content of 9.0 percent.

Mudstone Bedrock - The mudstone bedrock is soft, moist to slightly moist, highly plastic, and is purple to grey in color.

Laboratory tests conducted on samples of the mudstone bedrock indicate in-place moisture contents ranging from 9 to 16 percent, in-place dry densities ranging from 104 to 115 pcf, and fines contents ranging from 59 to 88 percent. Atterberg Limits tests indicate liquid limits ranging from 38 to 54 percent and plasticity indexes ranging from 16 to 32 percent.

One-dimensional consolidation/swell tests conducted on undisturbed of mudstone bedrock indicate it is slightly to highly expansive when wetted under a constant pressure of approximately 1,000 pounds per square foot (psf).

The Logs of Exploratory Borings, Trenches and Legend and Notes of Exploratory Borings and Trenches are shown on Figures 6 - 10. The laboratory test results are also shown on Figures 6 - 10 and are summarized in the Summary of Laboratory Test Results, Table 1. The one-dimensional consolidation/swell test results are shown graphically on Figures 11 - 14. The Gradation and Moisture-Density Relationship Results are shown on Figures 15 and 16.

SUBSURFACE WATER

Subsurface water was not encountered to the maximum depth investigated, approximately 40 feet below the existing grade. Fluctuation in groundwater level may occur over time. An evaluation of such fluctuations is beyond the scope of this report. Springs or seepages were also not observed on the property.

PROPOSED CONSTRUCTION

We understand it is proposed to grade the site for a 7 building, multi-unit town home complex as shown on Figure 2. The buildings will utilize wood framing with a stucco and/or rock veneer and likely use tile roof.

The town homes are proposed to be supported on conventional spread and spot footings with concrete slab on grade floors supported on properly prepared building pads or on deep foundation elements with raised structural floors and crawl spaces. We anticipate wall loads will be less than 5 kips per linear foot (klf) and column loads will be less than 100 kips.

The subdivision will also include construction of one interior local road which will be an asphalt concrete paved 34 foot right of way with curb, gutter and sidewalk. Paved parking will also be constructed. The associated utilities and improvements will also be constructed.

If the proposed construction, building loads or anticipated traffic conditions are significantly different from those listed, we should be notified so that we can reevaluate our recommendations.

RECOMMENDATIONS

Based on our experience in the area, the subsurface conditions encountered, laboratory test results, and the proposed construction, the following recommendations are provided:

A. Site Grading

1. Subgrade Preparation

Based on the preliminary grading plan, buildings B - E will be constructed near up to several feet below the existing grade. Building pad A will required fill to be placed. Building pads F and G will be cut below the existing grade.

General: Prior to placing site grading fill or concrete, the site should be grubbed to remove the near surface vegetation and soil containing roots and organics. We estimate this will require removal of up to 1 to 2 inches of soil.

Building Pad Overexcavation (Conventional Foundations): Prior to placing site grading fill or concrete, the underlying undocumented clayey fill and expansive mudstone should be removed from beneath the proposed structures to provide at least 17 feet of non-expansive cover soil over the underlying expansive bedrock.

The following process should be implemented when placing fill in the overexcavated area which will support the residence:

- *Bottom of excavation to 3 feet below finished pad grade:* The onsite "clayey fill" may be placed as site grading fill on the zone from 17 feet to 3 feet below finished pad grade provided it is mixed with imported, or on site, low-plastic granular soil at a ratio of 1:1 (Granular Soil:Clayey Fill). This mixed soil should be processed with moisture such that the moisture content is 0 to 4 percent above the optimum moisture content as determined by ASTM D-1557 and should also meet AGECE's low permeable fill criteria.
- *3 feet below finished pad grade to finished grade:* Subsequent to placement of the mixed soil, we recommend the building pads be capped with at least 3 feet of imported, properly compacted structural fill. This granular capping soil should be processed to a moisture content of ± 2 percent of the optimum moisture content as determined by ASTM D-1557.

Flatwork, Roads, Walls : A reduced depth of excavation may be considered in areas which will support flatwork roads and block walls. We recommend at least 5 feet of properly compacted, non-expansive, low permeable fill be placed beneath areas which will support roads, flatwork and block walls. The underlying fill should also be removed and replaced with properly compacted, non-expansive fill. Prior to placing approved fill, the exposed subgrade should be moisture conditioned and compacted as recommended in the Compaction section of this report.

Risk: If the mudstone is wetted subsequent to construction, heave of the surface improvements or the residences could occur. Therefore, strict site drainage is critical to the satisfactory performance of flatwork or other surface supported features. The estimated potential surface heave along with the associated overexcavation depths are provided in the following table.

Depth to Expansive Mudstone Bedrock (feet)	Estimated Potential Differential Slab Heave (inches)
0	3 ½ to 4 ¼
2	3 to 3 ¾
4	2 ½ to 3 ¼
6	2 to 2 ¾
8	1 ½ to 2
12	1 to 1 ¾
16	½ to 1
18	< ½ to ¾

We have recommended at least 5 feet of non-expansive, low permeable fill be placed above the mudstone bedrock in areas which will support flatwork, pavement, curbing or walls/fences. The risk of heave potential may also be reduced by increasing the overexcavation depth and by providing strict drainage and implementing desert landscaping. The thickness of non-expansive low permeable fill can be increased if the estimated heave listed above is not acceptable.

Even with the 17 feet of non-expansive cover soil over the underlying mudstone, we estimate that on the order of $\frac{1}{2}$ to $\frac{3}{4}$ inch of surface heave to a residence could still occur after construction if the remaining underlying mudstone is wetted. This could result in foundation/slab movement and subsequent cosmetic damage to the buildings. Therefore, the drainage recommendations provided in this report should be strictly followed.

If this risk of potential movement is not acceptable, additional overexcavation can be completed or the structures should be supported on deep foundation elements. Typically drilled and grouted micropiles are used to support structures underlain by relatively shallow expansive mudstone.

Lateral Extent and Compaction: All overexcavation and subgrade preparation procedures should extend at least 5 feet beyond the perimeter of the proposed construction. Prior to placing approved fill, the exposed subgrade should be moisture conditioned and compacted as recommended in the Compaction section of this report. Fill placed at the site should be placed in properly moisture conditioned and compacted lifts as recommended in the compaction section of this report. Each lift of fill placed should be tested to verify moisture content and compaction are appropriate.

2. Excavation

We anticipate that excavation of the soils and soft bedrock at the site may be accomplished with typical excavation equipment.

3. Grading Slopes and Trenches

The following table summarizes recommendations for excavation of temporary and permanent cut slope excavations, trench excavations and permanent fill slope construction. Slopes should include benches in accordance with the 2021 IBC.

Slope Condition	Maximum Slope (Horizontal:Vertical)
Permanent Cut Slopes in Onsite Soils and Soft Bedrock	2:1
Permanent Cut Slopes in Mudstone Bedrock	2:1
Permanent Fill Slopes - Compacted fill	2½:1
Utility Trenches/Temporary Cuts in On-site Soils (Fill and gravel) and Soft Bedrock (OSHA Soil Class C)	1½:1
Utility Trenches/Temporary Cuts in Stable Mudstone (OSHA Soil Class A)	¾:1

* Steeper trenches will require the use of shoring or a trench box to provide a safe work environment. Safe trench excavation is the responsibility of the contractor.

Steeper trenches will require the use of shoring or a trench box to provide a safe work environment. Safe trench excavation is the responsibility of the contractor.

Fill slopes should be graded by overbuilding and then cutting back to the desired grade to provide a compacted slope face. Fill placed on existing slopes steeper than 3:1 should be placed using a benching procedure to “key” the fill into the existing slope. Benches should be of sufficient width to allow adequate area for the compaction equipment.

The cut and fill slopes will be highly susceptible to erosion. Water should be directed around slopes using drainage swales to reduce potential erosion. A lot specific drainage study should be conducted by the civil engineer to control localized runoff.

4. Compaction

Compaction of fill materials placed at the site should meet the following percentages:

Area	Moisture Content (%)	Compaction (%)
Subgrade	± 2 of w_{opt}	≥ 90
Building Pad - Structural Fill (surface to 3 feet below pad grade)	± 2 of w_{opt}	≥ 95
Building Pad - Low Perm. Fill - 50/50 Mix (17 feet to 3 feet below grade or below roads)	0 - 4 over w_{opt}	93 - 98
Footings/Foundation Subgrade	± 2 of w_{opt}	≥ 95
Site Grading - Non Structural Areas	± 2 of w_{opt}	≥ 90
Site Grading - Structural Areas	± 2 of w_{opt}	≥ 95
Wall Backfill - Non Structural	± 2 of w_{opt}	≥ 90
Wall Backfill - Supporting Structures	± 2 of w_{opt}	≥ 95
Utility Trenches	± 2 of w_{opt}	≥ 95

w_{opt} = Optimum moisture content

Each lift of fill placed at the site should be tested to verify proper compaction. Fill tested should be compared to the maximum dry density as determined by ASTM D-1557. Fill should be placed in lift thicknesses which are appropriate to the type of compaction equipment used. Typically, loose lift thicknesses of 6 to 8 inches are appropriate for heavy equipment. Lift thicknesses should be reduced to 4 inches for hand compaction equipment. Fill should be properly moisture conditioned as listed above and as determined by ASTM D-1557 prior to placement.

5. Materials

Import materials should be non-expansive, non-gypsiferous, granular soil. Listed below are the materials recommended for various imported fill.

Area	Fill Type	Recommendations
Footings/Pad - upper 3 feet where Low Perm Fill is placed	Structural Fill	-#200 < 30%, LL < 25% Maximum size: 4 inches Solubility < 1% USCS: SM, SP, SC, GM, GC, GP or similar dual soil classification
Pad Support - 17 feet to Within 3 Feet of Finished Pad Grade and Roadway, flatwork	Structural Fill/Low Permeable Fill	See Low Permeable Fill Recommendation Below
Roadway - upper 12 inches	Granular borrow	CBR > 20%, -#200 < 30%, LL < 25% Maximum Size: 4 inches
Pavement	Base course	CBR > 60%, 200 < 12% Maximum Size: 1 inch
Under slab (upper 4 inches), Flatwork	Base Course	-200 < 12% Maximum Size: 1 inch Solubility < 1%

#200 = Percent Passing the No. 200 Sieve, + #4 = Percent Retained on the No. 4 Sieve, LL = Liquid Limit

The sandy and gravelly soils free of organics, debris and material greater than 4 inches in size, are suitable for use as site grading fill, structural fill, wall backfill and utility trench backfill. The underlying expansive mudstone and siltstone should be disposed of off site. The onsite fill may also be used as fill beneath the buildings and roadway provided it is mixed and processed as described below.

The potential impact of the expansive characteristics of the underlying expansive mudstone bedrock can be reduced by protecting it from becoming wet. Placement of relatively low permeable fill above the bedrock can help reduce the possibility of water coming in contact with the bedrock.

Low permeable fill used in the overexcavation and above potentially expansive soils should meet one of the following set of criteria.

Liquid Limit (%)	Percent Passing the No. 200 Sieve
45 +	15-20
30-45	20-40
0-30	30-100

The onsite clayey fill may be reused as low permeable fill beneath the building pad provided it is properly moisture conditioned, processed/mixed 1:1 ratio (Granular Soil:Clayey Fill) and compacted as stated above and should meet the low permeable fill requirements provided below if placed in the zone from 17 feet to 3 feet below grade. AGECC should conduct soil classification testing to confirm the low permeable fill criteria are met. The onsite clayey fill may be reused as low permeable fill beneath roadway support areas as well provided it is mixed as described.

6. Drainage

The following drainage recommendations should be implemented to reduce the potential for wetting of the underlying soil supporting the foundation/slab and flatwork.

- Positive site drainage away from foundations should be maintained during the course of construction. After construction has been completed, positive drainage of surface water away from the residence should be maintained throughout the life of the structure. We recommend a minimum slope of 6 inches in the first 10 feet from the perimeter of the structures.
- Desert landscaping, which requires no water, should be implemented due to the expansive characteristics of the underlying mudstone bedrock. Grass should be limited.
- In no case should water be allowed to pond adjacent to foundations.
- Rain gutters should be utilized and roof down spouts should be piped horizontally to discharge away from the residence and preferably off site. This would require flexible, water tight connections.
- Storm water should also be captured and discharged off site with buried pipes which also incorporate flexible, water tight connections. This recommendation is critical for lots affected by mudstone.
- If planters are used, they should be underlined by a impermeable membrane which is sloped to a discharge pipe which discharges water to storm drain. This recommendation is critical for lots affected by mudstone.

- We also recommend that desert landscaping, which requires no water, be used on site to reduce the potential for wetting of the support soils and to reduce salt migration into cement containing elements. CMU walls which are backfilled with soil should be protected with an impermeable membrane. A gravel covered, perforated PVC drain pipe should also be placed at the base of the wall to carry water to a discharge point. This is intended to reduce the potential for salt weathering and sulfate attack on concrete/masonry.

7. Subsurface Drainage Protection

A perimeter subsurface drain should be provided around the basement of the buildings.

The drain system should consist of a 1 foot wide trench excavated around the outside perimeter of the foundation supporting the building. The trench should be excavated to a depth of at least 1 foot below the basement floor. A 4 inch perforated PVC pipe should be placed in the bottom of the trench sloped at a 2% grade (minimum) to drain by gravity or to a sump. The pipe should be covered with clean, free draining gravel to at least 1 foot above the highest anticipated groundwater level. If required, a pump should be placed in the sump and set up to activate with a float system so it will turn on as the sump fills with water. Prior to backfilling, Mirafi 140N filter fabric should be placed over the gravel. The perimeter drain trench should be backfilled with properly compacted fill.

B. Conventional Foundations

Recommendations for design of conventional foundations are provided below.

1. Bearing Material and Foundation Type

The proposed structures may be supported on conventional spread and spot footings bearing on a at least 2 feet of properly compacted structural fill underlain by a properly prepared subgrade as recommended in the Subgrade Preparation section of this report.

2. Bearing Pressures

Spread footings bearing on bedrock or on properly compacted structural fill may be designed for a net allowable bearing pressure of 2,000 psf.

3. Footing Width and Embedment

Footings should have a minimum width of 18 inches and footings should be embedded at least 12 inches below the lowest adjacent grade.

4. Temporary Loading Conditions

The allowable bearing pressure may be increased by one-third for temporary loading conditions such as wind or seismic loads.

5. Settlement

We estimate that the total settlement will be less than 1 inch for footings designed as indicated above due to the load of the structure. Differential settlement is estimated to be approximately ½ inch.

6. Foundation Base

The base of excavations should be cleared of loose or deleterious material prior to placement of fill or concrete.

C. Deep Foundations

The proposed residences may also be supported on deep foundation elements (micropiles) where the expansive bedrock is located at less than 17 feet below the finished pad grade. Grade beams should be utilized to span the distance between piers and support a structural floor with a crawl space below. The following recommendations should be followed for the deep foundation system.

1. The micropiles should extend at least 20 feet into the underlying expansive mudstone with a minimum total length of 30 feet. Our investigation indicates the micropile lengths will vary from approximately 30 to 45 feet in length.
2. End bearing should not be considered for micropile capacity. Micropiles should be of sufficient diameter to allow for placement of grout around reinforcing steel.
3. Micropiles should be designed using the parameters provided in the attached Table 2, Drilled Micropile Design Parameters. Appropriate factors of safety should be considered in the structural design of foundation elements.
4. The piles should be structurally reinforced to resist tensile forces on the pile due to negative skin friction (uplift). The tensile force may be calculated utilizing at least 10 feet of pier length with an ultimate skin friction of 1,100 psf. A greased PVC bond breaker may also be considered to reduce uplift forces on the micropiles. Bond breakers should be verified by load testing.
5. The piles should be designed and spaced so that a minimum dead load of 3,000 pounds can be achieved.

6. Care should be taken to assure the micropiles are not oversized (mushroomed) at the ground surface, which could provide an area where swelling bedrock could exert uplift forces on the piles.
7. The water cement ratio of the grout should be on the order of 0.45 to 0.50. This should be verified during construction using a grout scale to verify the grout has a specific gravity on the order of 1.8 to 1.9. The grout volume should be recorded for each micropile constructed to ensure the appropriate volume is placed.
8. Grout should be placed in the piles the same day they are drilled using a tremmie pipe which extends to the bottom of the drill hole and is raised as the grout is placed to ensure the micropile is free of voids. If water enters the pile holes, it would be necessary to place grout immediately after the pile hole is completed using a tremmie to displace water out of the hole. Failure to place grout the day of drilling may require re-drilling for additional bedrock penetration.
9. Micropile holes should also be inspected to verify caving does not occur below the ground surface which could also result in additional uplift forces. Casing the drill hole may be necessary if the caving occurs to ensure a straight shaft with a consistent diameter. Casing should be removed as the micropile is grouted.
10. Centralizers should be used on the steel reinforcing bar at approximately a 7 to 10 foot spacing to ensure the appropriate grout cover on the reinforcing.

D. Concrete Slabs

1. Slab Support

Slabs should be supported on a properly prepared subgrade as recommended in the Subgrade Preparation section of this report.

2. Underslab Gravel

A 4-inch layer of base course should be placed below the concrete slabs to provide a more firm and stable subgrade and to promote even curing of the concrete.

3. Vapor Barrier

A vapor barrier should be placed below slabs in areas which will receive sensitive floor coverings or coverings which are impermeable.

4. Exterior and Garage Flatwork

Flatwork should be supported on a properly prepared subgrade as recommended in the Subgrade Preparation Section of this report. The owners should be aware that exterior flatwork may move where expansive soil is present and is exposed to water. To reduce concerns for flatwork movement causing distress to the structures, the flatwork should be separated from the main structure and allow for unrestrained vertical movement. This generally is accomplished by providing a construction joint between the concrete flatwork and the wall/slab with a heavy felt board.

E. Floor System and Construction (Implemented With Deep Foundation Elements)**1. Structural Floor/Beams/Crawl Space**

Raised structural floors (including porches and patios), supported on grade beams, should be used in conjunction with deep foundation systems. The grade beams should be designed and reinforced to span the distance between the piers/piles.

We recommend that a minimum, 30 inch crawl space be provided below structural floors. Proper ventilation of the crawl space is critical and the ventilation system should be designed by a licensed professional. This is beyond AGECE's scope of services.

A minimum 12-inch void space should be provided below the grade beams to allow the expansive mudstone to swell without exerting uplift forces on the grade beams. Subsequent to removing concrete forms from grade beams, the void should be inspected by AGECE to ensure the proper void space is provided. The void space should also be protected with a treated plywood barrier prior to backfilling the grade beams to ensure the void space is not compromised.

We also recommend low permeable fill be used as backfill around the beams to reduce the potential for infiltration and migration of water to the crawl space. Proper compaction and moisture conditioning of the backfill is critical.

2. Vapor Barrier

A vapor barrier should be placed in the bottom of the crawl space, attached to the interior of the perimeter grade beams using a water resistant attachment system and covered with pea gravel to reduce moisture in the crawl space.

3. Plumbing and Utility Lines

Plumbing lines and utility lines should be hung from the floor when a pier/pile foundation system is utilized. Plumbing lines should have flexible joints where connections are made. A 12-inch void space should also be provided below plumbing where it crosses below grade beams.

4. Exterior and Garage Flatwork

Flatwork should be supported on a properly prepared subgrade as recommended in the Subgrade Preparation Section of this report. The owners should be aware that exterior flatwork will likely move where expansive soil/bedrock is present and is exposed to water. To reduce concerns for flatwork movement causing distress to the structures, the flatwork should be separated from the main structure and allow for unrestrained vertical movement. This generally is accomplished by providing a construction joint between the concrete flatwork and the wall/slab with a heavy felt board.

A 4-inch layer of properly compacted base course should be placed below slabs to provide a firm and consistent subgrade and to promote even curing of the concrete.

5. Exterior Porches/Garage Walls

Exterior porches, overhangs, and garage walls that are structurally tied to the remainder of the residence should be supported by the same foundation system as the remainder of the residence.

F. Lateral Earth Pressures

1. Lateral Resistance for Footings

Lateral resistance for spread footings is controlled by sliding resistance developed between the footing and the subgrade soil. An ultimate friction value of 0.45 may be used in design for ultimate lateral resistance of footings bearing on on-site properly compacted structural fill.

2. Retaining Structures

The following equivalent fluid weights are given for design of subgrade walls and retaining structures. The active condition is where the wall moves away from the soil. The passive condition is where the wall moves into the soil and the at-rest condition is where the wall does not move. We recommend the basement walls be designed in an at-rest condition.

The values listed below assume a horizontal surface adjacent the top and bottom of the wall.

Description	Active	At-Rest	Passive
Granular backfill - Equivalent Fluid Weight	35 pcf	55 pcf	325 pcf
Granular backfill - Earth Pressure Coefficient	0.28	0.44	-
Clay backfill - Equivalent Fluid Weight	49 pcf	68 pcf	200 pcf
Clay backfill - Earth Pressure Coefficient	0.43	0.59	--

The above values account for the lateral earth pressures due to the soil and level backfill conditions and do not account for hydrostatic pressures or surcharge loads.

Lateral loading should be increased to account for surcharge loading using the appropriate earth pressure coefficient and a rectangular distribution if structures are placed above the wall and are within a horizontal distance equal to the height of the wall. If the ground surface slopes up away from the wall, the equivalent fluid weights should also be increased.

Care should be taken to prevent percolation of surface water into the backfill material adjacent to the retaining walls. The risk of hydrostatic buildup can be reduced by placing a subdrain behind the walls consisting of free-draining gravel wrapped in a filter fabric.

3. Seismic Conditions

Under seismic conditions, the equivalent fluid weights should be modified as follows according to the Mononobe-Okabe method assuming a level backfill condition:

Lateral Earth Pressure Condition	Seismic Modification (2% PE in 50 yrs)	
	Granular Backfill	Clay Backfill
Active	8 pcf increase	9 pcf increase
At-rest	no increase	no increase
Passive	19 pcf decrease	14 pcf decrease

The seismic increases and decrease assume a peak ground acceleration (PGA) of 0.22g and a short period ground acceleration (S_1) of 0.16g using the Mononobe-Okabe pressure distribution. The resultant of the seismic increase should be placed up from the base of the wall one-third the height of the wall.

4. Safety Factors

The values recommended assume mobilization of the soil to achieve the assumed soil strength. Conventional safety factors used for structural analysis for such items as overturning and sliding resistance should be used in design.

G. **Seismicity, Liquefaction and Faults**

1. Seismicity

Listed below is a summary of the site parameters as required by the 2018 International Building Code and ASCE 7-16:

Description	Seismic Event - 2% PE in 50 Yrs
	Value
Site Class	C
S_s (0.2 second period)	0.49g
S_1 (1 second period)	0.16g
PGA	0.22g
F_a	1.30
F_v	1.50
F_{PGA}	1.20

The values provided above were generated using the ASCE 7-16 Seismic Hazard Tool. Based on the subsurface conditions anticipated and the seismic parameters mapped for the site as per ASCE 7-16, a ground motion hazard analysis as per ASCE 7-16 is not required by the 2021 International Building Code.

2. Liquefaction

The soils encountered at the site are non-liquefiable during a severe seismic event.

3. Faults

There are no mapped or active faults extending through the parcel.

H. **Soil Corrosion**

Our experience in the area and lab tests indicate that the on-site soils, bedrock, and many import soil sources contain water soluble sulfate concentrations in sufficient concentration to be corrosive to concrete. Therefore, we recommend concrete elements that will be exposed to the on-site soils be designed in accordance with provisions provided in the American Concrete Institute Manual of Concrete Practice (ACI) 318-19 and Section 1904.1 of the 2021 International Building Code. Tables 4.2.1 and 4.3.1 of ACI 318-19 should be referenced for design of concrete elements utilizing a Sulfate Exposure Class of S2.

Consideration should also be given to cathodic protection of buried metal pipes. We recommend utilizing PVC pipes where local building codes allow.

I. **Pavement**

Based on the subsoil conditions encountered and the laboratory test results, the following recommendations are given:

1. Analysis

Asphaltic Concrete: The flexible pavement analysis is based on UDOT and AASHTO design methods and a 20 year design life. The following parameters were considered for our analysis:

- Base course that meets specifications which would correspond to a Structural Coefficient (a_2) of at least 0.10. Asphalt that provides a Structural Coefficient (a_1) of at least 0.40.

- Drainage Coefficient = 1.0.
- The subgrade support soils consist of properly compacted low perm fill. A M_R value of 7,500 pounds per square inch (psi) was used for the subgrade based upon an estimated California Bearing Ratio (CBR) value of 5 percent and the relationship between CBR and Resilient Modulus (M_R).
- Serviceability Index: $P_o = 4.2$, $P_t = 2.5$.
- Reliability of 90 percent.
- Standard Deviation (S_o) = 0.45.

2. Subgrade Support

We anticipate the subgrade materials will consist of compacted low permeable fill. Our design assumes a properly compacted subgrade. Prior to placing base course or site grading fill, the subgrade should be prepared as recommended in the Subgrade Preparation section of this report.

3. Pavement Thickness

Based on the anticipated traffic, a 20 year design life and AASHTO design methods, the following pavement sections are recommended.

	Flexible Pavement			
	Asphaltic concrete (Inches)	Base Course (Inches)	Granular borrow (Inches)	Low Perm Fill (feet)
Interior Roadway	3	6	12	4

4. Pavement Materials

The pavement materials should meet AASHTO and St. George City specifications for gradation and quality. The pavement thicknesses indicated above assume that the base course is high quality material with a CBR of at least 60 percent. Asphalt material should have a Marshal stability of at least 1,800 pounds.

5. Drainage

The collection and diversion of drainage away from the pavement surface is extremely important to the satisfactory performance of the pavement section. Proper drainage should be provided. We further recommend a yearly maintenance program including crack sealing and a surface treatment such as a "slurry seal" to extend the pavement life and reduce water infiltration into the subsurface soils.

J. Construction Testing and Observations

We recommend testing fill, concrete, and asphalt materials at a frequency which meets or exceeds St. George City minimum testing frequency requirements for city improvements. We also recommend the following testing and observations be done as a minimum.

1. Verify the subgrade is properly prepared/compacted in accordance with the recommendations provided in the Subgrade Preparation section of this report.
2. Conduct compaction testing on fill placed below foundations, in building pads, and paved areas. We recommend testing each foot of fill placed.
3. Conduct full time observation and inspection during micropile construction. Observe void space beneath grade beams.

4. Items requiring special inspection as indicated by the structural engineer of record or required by the 2021 International Building Code.
5. Conduct construction materials testing of soils, concrete and asphalt materials and special inspections as required for the proposed construction by St. George City and the structural engineer.
6. Conduct special inspections on the proposed building as required by the 2021 International Building Code and the structural engineer.

K. Geotechnical Recommendation Review

The client should familiarize themselves with the information contained in this report. If specific questions arise or if the client does not fully understand the conclusions/recommendations provided, AGECH should be contacted to provide clarification.

LIMITATIONS

This report has been prepared in accordance with generally accepted soil and foundation engineering practices in the area for the use of the client for design purposes. The conclusions and recommendations included within the report are based on the trenches excavated, borings drilled, laboratory test results and our experience in the area. Variations in the subsurface conditions may not become evident until excavation is conducted. If the subsurface conditions or groundwater level are found to be significantly different from those described above, we should be notified to reevaluate our recommendations.

Sincerely,

APPLIED GEOTECHNICAL ENGINEERING CONSULTANTS, INC.

Arnold DeCastro, P.E.

Reviewed by: Jake Erickson, P.E.

AD/sd P:\2025 Project Files\2252500\2252539 - GT Mirabella at Sunbroo



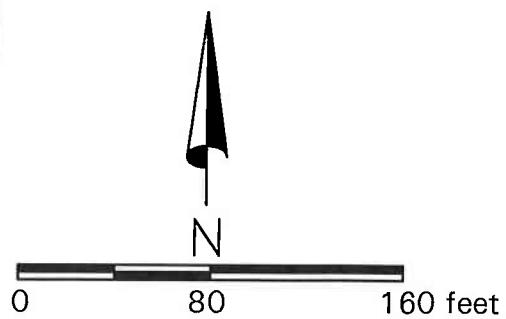


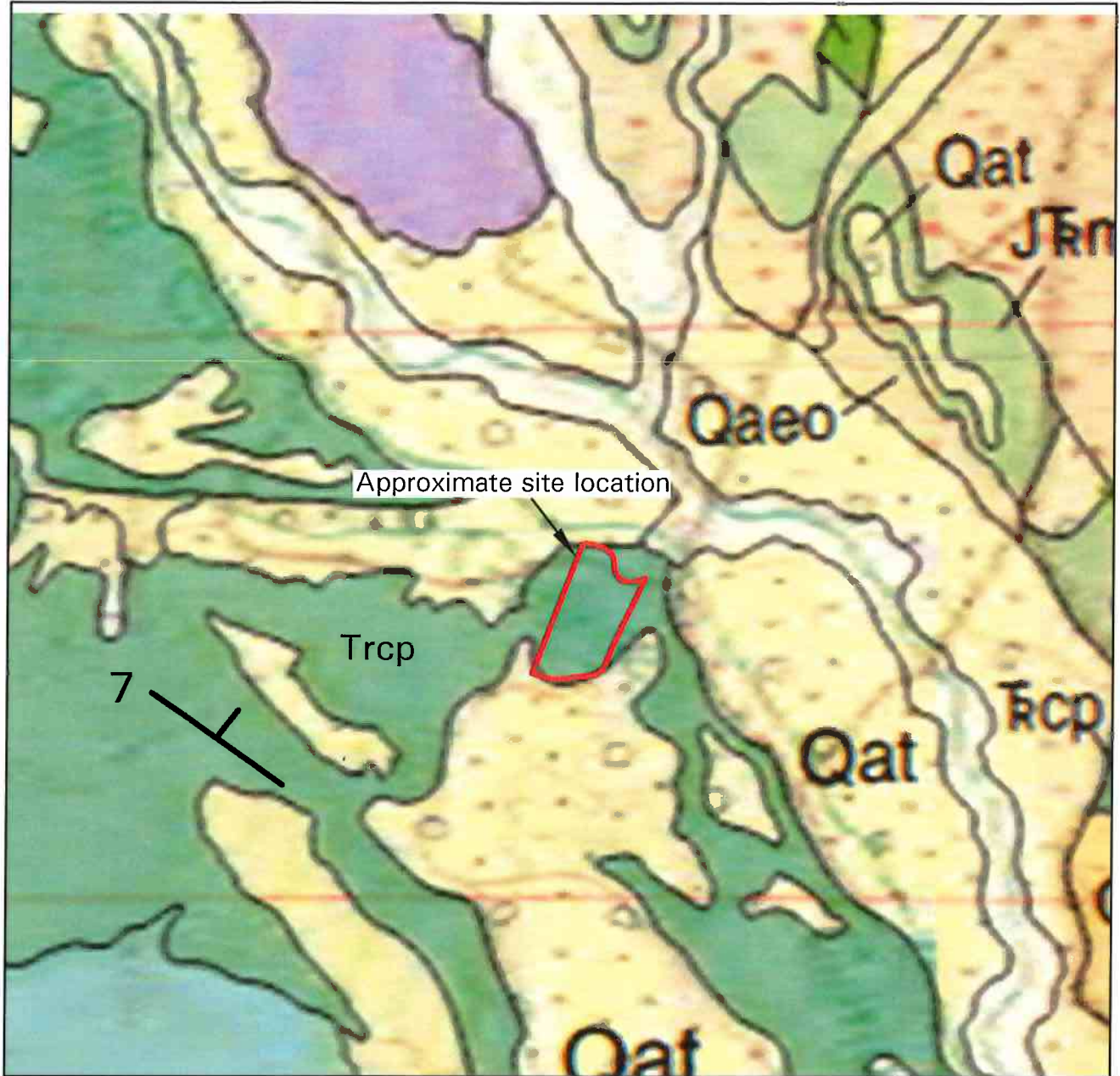
Not to Scale

MIRABELLA AT SUNBROOK
ST. GEORGE, UTAH

MIRABELLA AT SUNBROOK
ST. GEORGE, UTAH

- Approximate boring location
- Trench location
- Ⓢ Photo number, location and direction





Geologic Map of the St. George and East Part of The Clover Mountains, Washington and Iron County, Utah, UGS Map 242DM 2009, R.F. Biek, P.D. Rowley, J.M. Hayden, D.B. Hacker, G.C. Willis, L.F. Hintze, R.E. Anderson and K.D. Brown.

MIRABELLA AT SUNBROOK ST. GEORGE, UTAH



Not to Scale

KEY:

TRcp: Petrified Forest Member of Chinle Formation (Upper Triassic); Swelling, bentonitic mudstone and claystone are common throughout the member and although typically poorly exposed, their bright purple, grayish-red, dark-reddish-brown, light-greenish-gray, brownish-gray, olive-gray, and similar hues locally show through to the surface; they weather to a "popcorn" surface and are responsible for numerous building foundation problems in the region; typically poorly exposed and commonly forms landslides; contains petrified wood, especially in sandstone beds; upper, unconformable contact is at the top of brightly colored swelling mudstones with nodular limestone, above which is a thin chert-pebble conglomerate and overlying reddish-brown, non-bentonitic siltstone and fine-grained sandstone; deposited in a variety of fluvial, flood-plain, palustrine, and lacustrine environments of a back-arc basin formed inland of a magmatic arc associated with a subduction zone along the west coast of North America (Stewart and others, 1972a; Dickinson and others, 1983; Lucas, 1993; Dubiel, 1994; DeCourten, 1998; Lucas and Tanner, 2007); about 400 to 650 feet (120-200 m) thick.

Qat: Old river and stream deposits (Holocene to middle Pleistocene); Stratified, moderately to well-sorted alluvial gravel, sand, silt, and minor clay that forms level to gently sloping terraces above modern drainages; locally divisible into 6 or more distinct terrace levels based on elevation above modern drainages, but undivided here due to map scale; deposited in stream-channel and flood-plain environments and may include colluvial and alluvial-fan deposits too small to map separately; commonly forms a sand-and-gravel veneer 10 to 30 feet (3-9 m) thick over an eroded bedrock surface.

7  Indicates direction of bedrock dip in degrees.

MIRABELLA AT SUNBROOK
ST. GEORGE, UTAH



Landslide-Hazard Map for the St. George-Hurricane Metropolitan Area, Washington County, Utah, UGS Special Study 127 2008, W.R. Lund, T.R. Knudson, G.S. Vice and L.M. Shaw



Not to Scale

MIRABELLA AT SUNBROOK
ST. GEORGE, UTAH

Landslide Susceptibility of Geologic Units

Susceptibility Category	Geologic Units ¹	Comments
A	Existing landslides	Existing slope failures are considered the most likely units in which landsliding may initiate.
B	Petrified Forest Mbr., Chinle Fm	This rock unit consists chiefly of bentonitic clay, which is highly expansive and has low shear strength especially when wet. This unit includes the greatest number of landslides mapped in the study area.
C	Woods Ranch Mbr., Toroweap Fm.; Hamburg Mbr., Kaibab Fm.; Shinarump Mbr. and red members, Moenkopi Fm.; Whitmore Point Mbr., Moenave Fm.; Temple Cap Fm.; Carmel Fm.; Cretaceous bentonitic beds; Iron Springs Fm.	These bedrock units contain varying amounts of gypsum, shale, claystone, mudstone, siltstone, or a combination of the above that imparts weak shear strength characteristics to the units, at least locally, and makes them susceptible to slope failure. These units contain the second greatest number of landslides in the study area.
D	Remaining bedrock and unconsolidated geologic units in the study area	These geologic units either contain a higher percentage of stronger rock types, crop out on slopes too low to generate slope failures, or generate failures that are too small to map at 1:24,000-scale. As a result, they exhibit few or no mapped landslides. Some landslides identified within these units are likely the result of failures in underlying, weaker geologic units.

¹Refer to UGS 1:24,000-scale geologic maps (see SOURCES OF DATA and REFERENCES in accompanying text) for a description of map units.

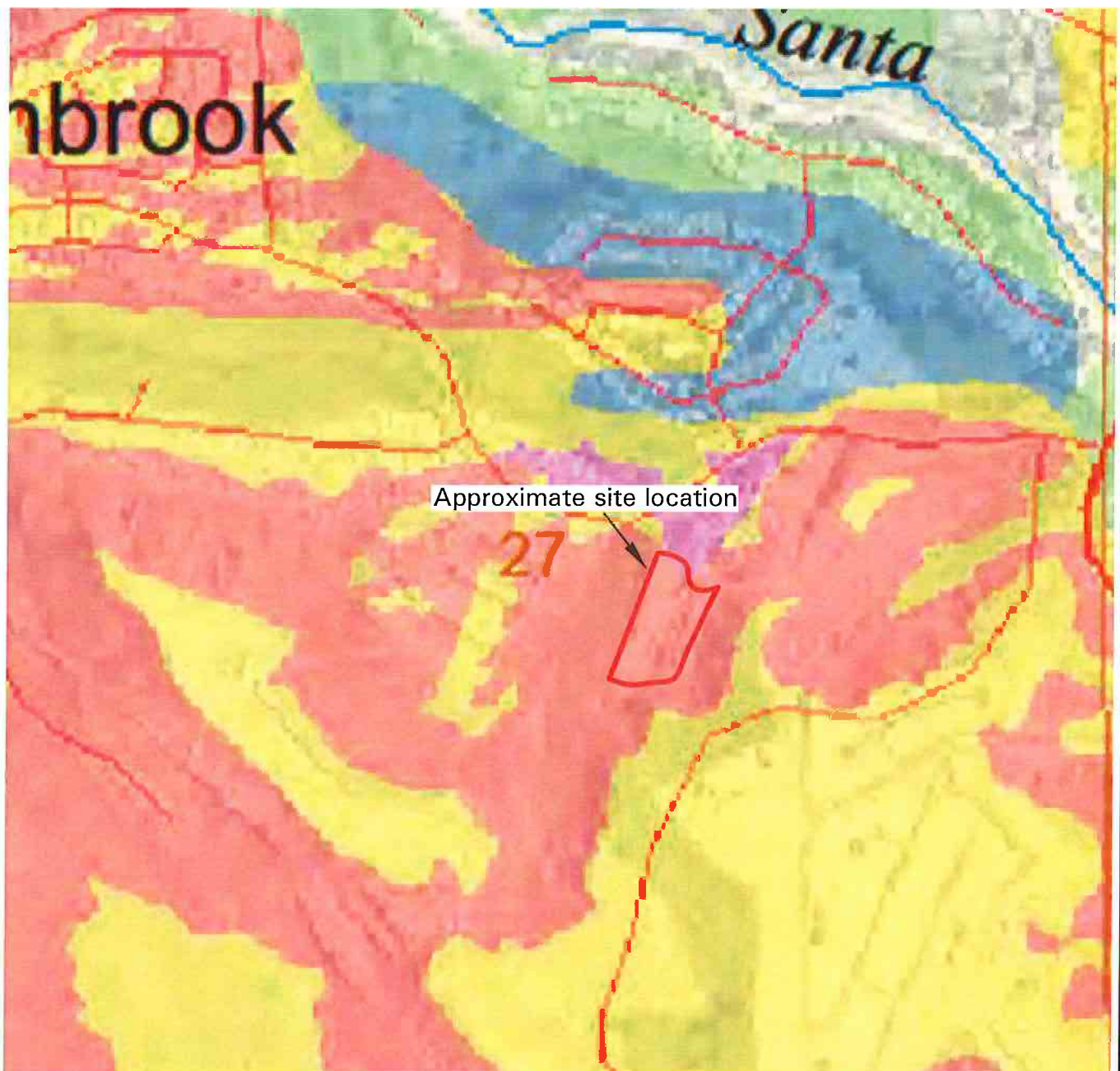
EXPLANATION

VH	Very High: Existing landslides (Category A).
H	High: Areas where Category B geologic units crop out on slopes greater than 15 percent (8.9°).
M_C	Moderate C: Areas where Category C geologic units crop out on slopes greater than 20 percent (11.3°).
M_B	Moderate B: Areas where Category B geologic units crop out on slopes less than 15 percent (8.9°).
L	Low: Areas where Category D geologic units crop out on slopes greater than 30 percent (16.7°).



Not to Scale

MIRABELLA AT SUNBROOK
ST. GEORGE, UTAH



Expansive-Soil-and Rock-Susceptibility Map for the St. George-Hurricane Metropolitan Area, Washington County, Utah, UGS Special Study 127 2008, W.R. Lund, T.R. Knudson, G.S. Vice and L.M. Shaw



Not to Scale

EXPLANATION

SOIL

ESH

Soils with high susceptibility for volumetric change are typically clay rich and have a liquid limit (LL) ≥ 45 , a plasticity index (PI) ≥ 20 , and/or a swell/collapse test (SCT) value of ≥ 3 percent swell. Soils with these characteristics are of limited aerial extent at the surface in the study area, but are frequently found at depth as shown by the geotechnical database (see GEOTECHNICAL DATA EVALUATION section in accompanying text). This phenomenon reflects the fact that most of the geotechnical data available for the study area come from the municipalities of St. George, Santa Clara, Ivins, and Washington, portions of which are underlain at shallow depth (typically <20 feet) by bedrock with high or moderate susceptibility for volumetric change. The influence of this shallow, often clay-rich source rock on overlying soils is apparent in the geotechnical data collected from below a depth of 60 inches.

ESM

Soils classified by the Natural Resources Conservation Service (NRCS) as having moderate susceptibility for volumetric change (LL from 20 to 50, and PI from nonplastic [NP] to 30). These values overlap at their upper ends with soils in the high susceptibility category. Chen (1988) recognized that while PI is an indicator of expansive potential, other factors also exert an influence, and therefore reported a range of PI values when categorizing soil's capacity to shrink or swell.

ESL

Soils classified by the NRCS as having low susceptibility for volumetric change (LL from 0-30, and PI from NP-15). These values overlap at their upper ends with soils in the moderate susceptibility category. However, the low category includes soils with highly variable potential for volumetric change that do not fit easily into the moderate or high categories.

ROCK

ERH

Bedrock units with high shrink/swell susceptibility include claystone horizons in the Virgin Limestone Member of the Moenkopi Formation, the Petrified Forest Member of the Chinle Formation, known locally as the "Blue Clay," the lower red beds of the Dinosaur Canyon Member and the Whitmore Point Member of the Moenave Formation; the Iron Springs Formation, which contains abundant clay-rich strata in its lower part; and a thin interval (maximum thickness 90 feet) of montmorillonitic clay that lies between the Carmel Formation and the overlying Iron Springs Formation. Landslides mapped within these rock units were also included in the high-susceptibility category. These bedrock units contain an abundance of expansive clay minerals and are commonly associated with expansive rock problems in the study area.

ERM

Bedrock units with moderate shrink/swell susceptibility include the Shinarump and lower, middle, and upper red members of the Moenkopi Formation, the Co-op Creek and Crystal Creek Members of the Carmel Formation, and the Temple Cap Formation. These rock units are chiefly fine grained and contain alternating strata of shale, claystone, mudstone, siltstone, sandstone, and limestone. Not all or necessarily the majority of these strata contain expansive clay minerals, but past experience in the study area has shown that a sufficiently high percentage of strata do contain expansive clays that foundation problems are often associated with these rock units. Where mapped as undivided, we assigned a moderate susceptibility to the Moenkopi Formation, Carmel Formation, and grouped Triassic, Triassic/Jurassic, and Jurassic/Cretaceous rocks. Landslides mapped within moderate-susceptibility units are also included in this category.

ERL

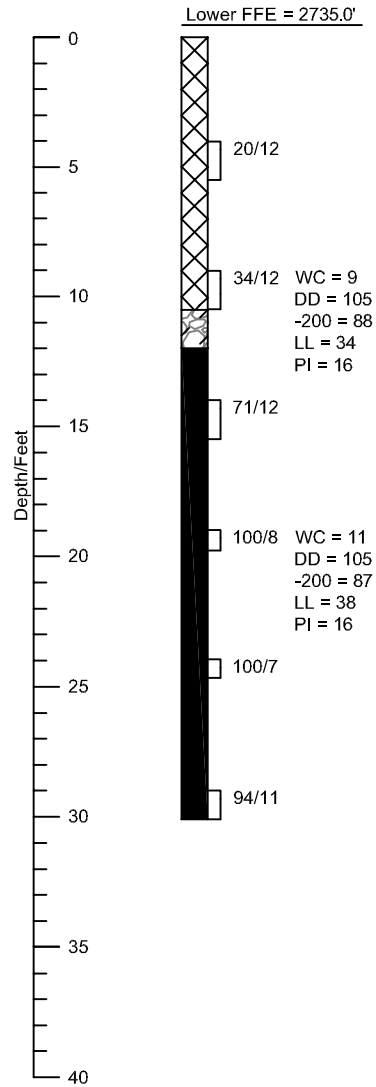
Bedrock units with low shrink/swell susceptibility include the Timpoweap Member of the Moenkopi Formation and the the Kayenta Formation. Although we consider these units to have a low susceptibility relative to the bedrock units identified above, they contain some fine-grained, clay-rich strata that may cause shrink/swell problems locally.

CONCEALED

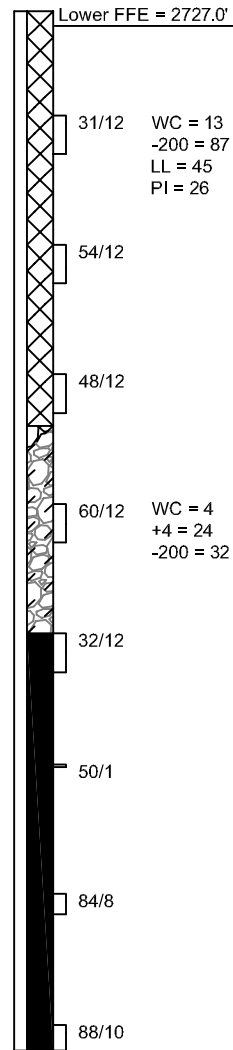
CHESR

Area of highly expansive soil or rock (≥ 5 percent swell) in the shallow subsurface (≤ 20 feet), but with little or no evidence of such material at the ground surface. Based on past engineering experience, such highly expansive soil or rock can cause differential displacements at the ground surface even when overlain by as much as 20 feet of nonexpansive material, and these areas are considered to have a high potential for expansive soil and rock problems.

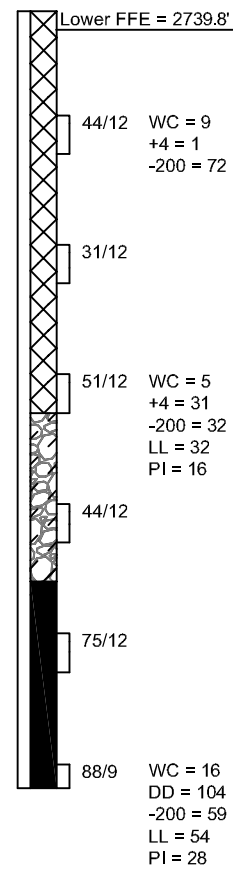
B-1
Elev. 2734.5'



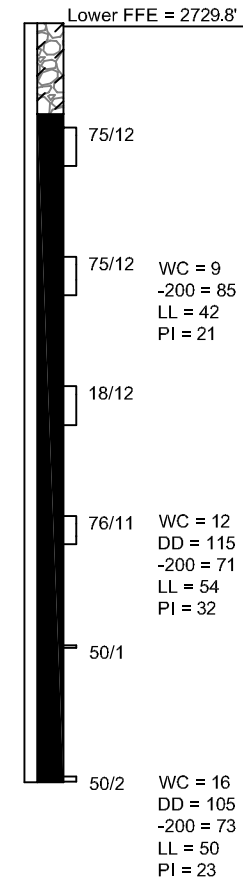
B-2
Elev. 2727.6'

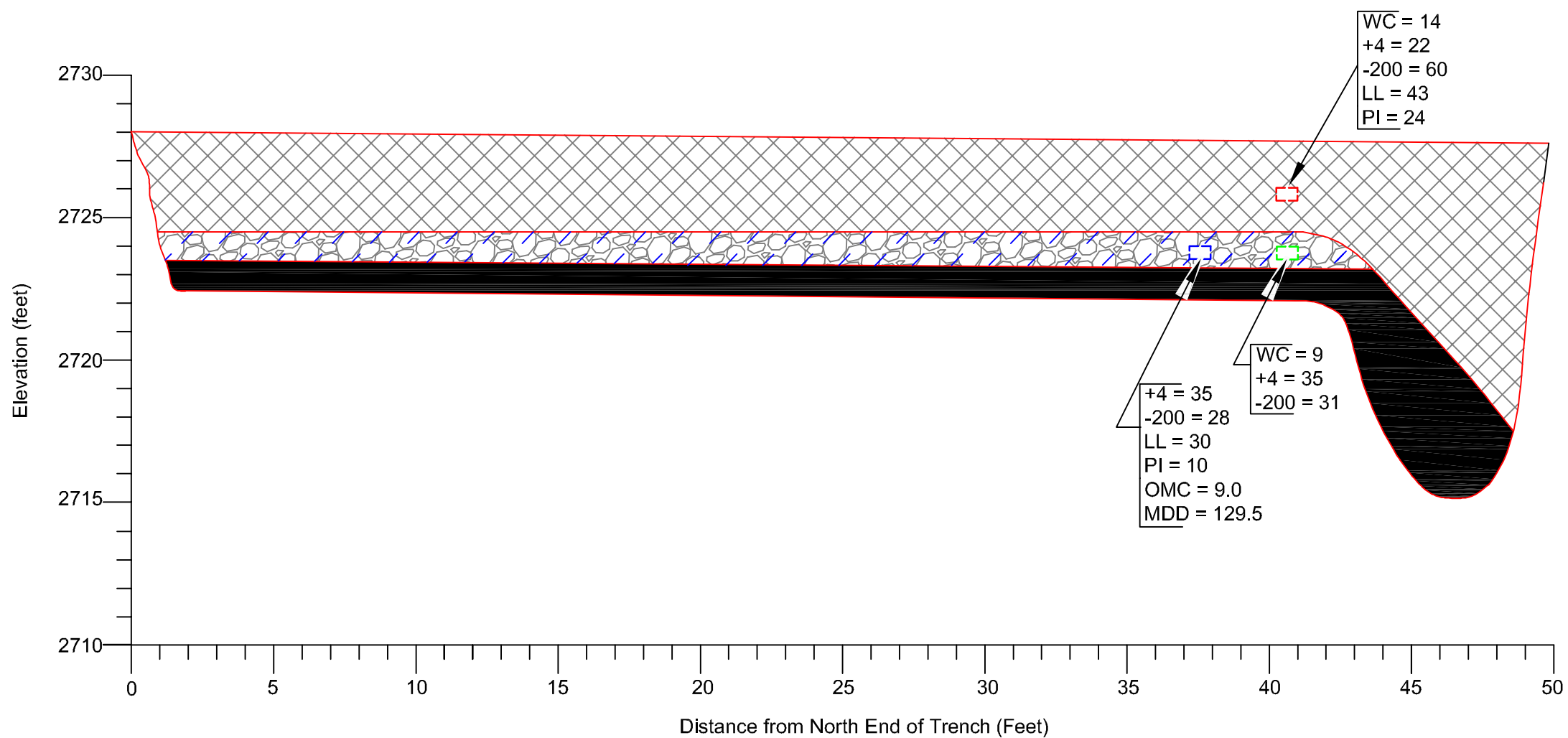
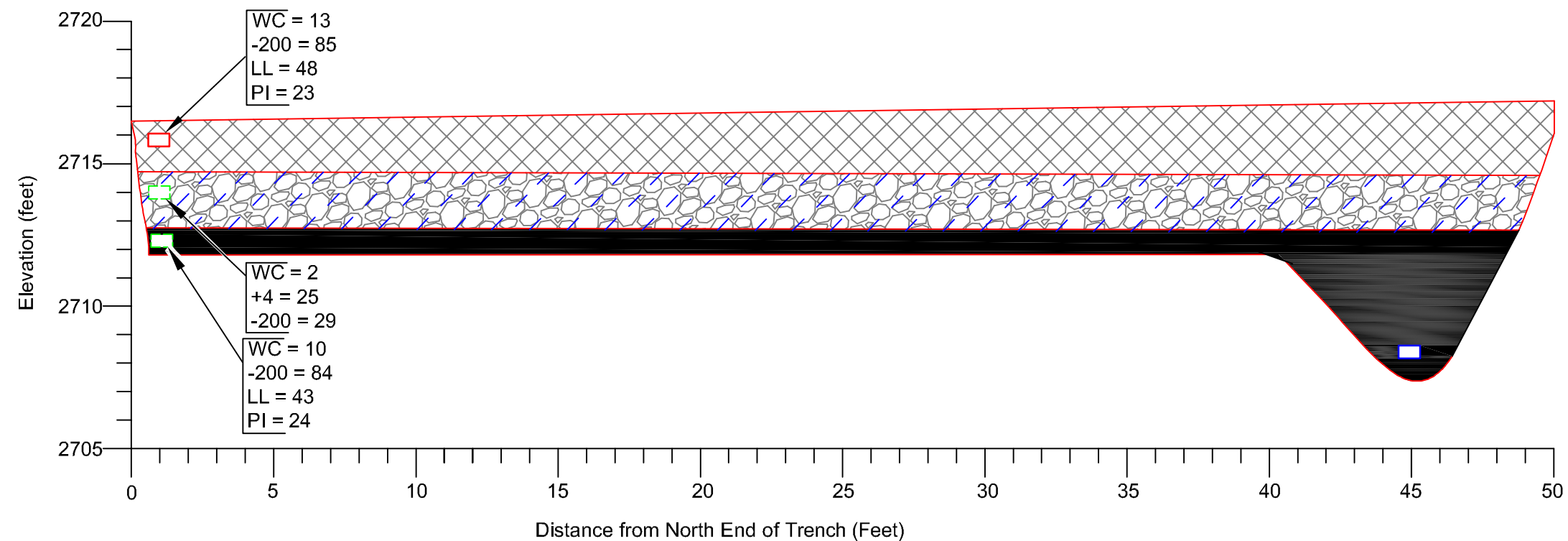


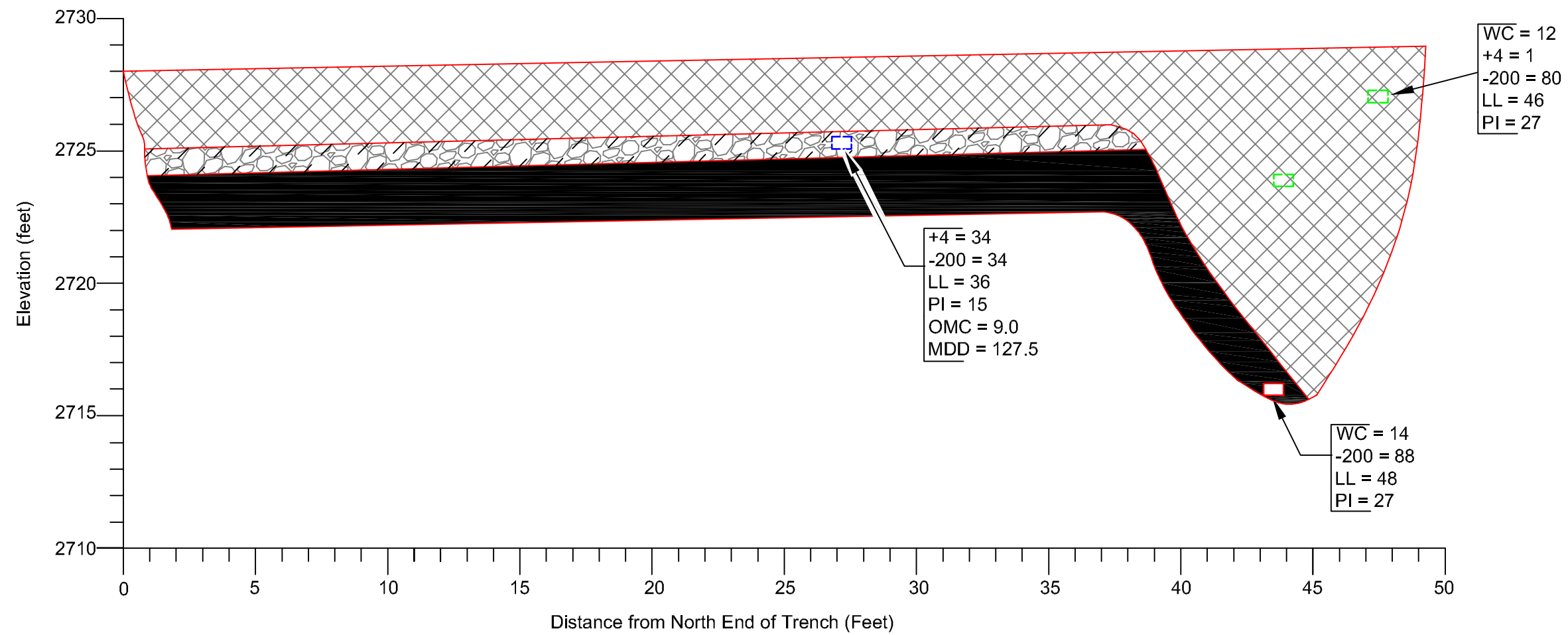
B-3
Elev. 2740.7'

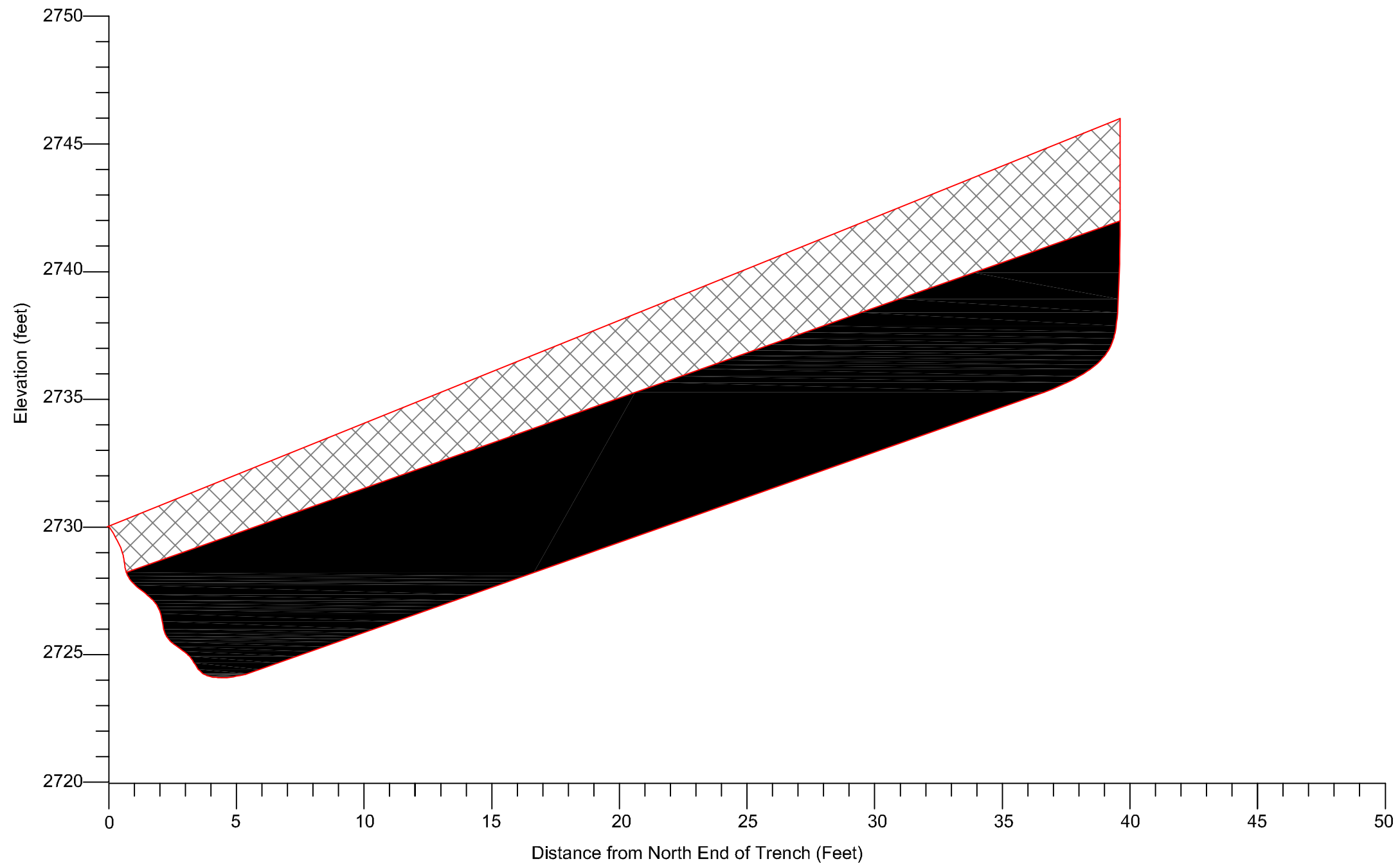


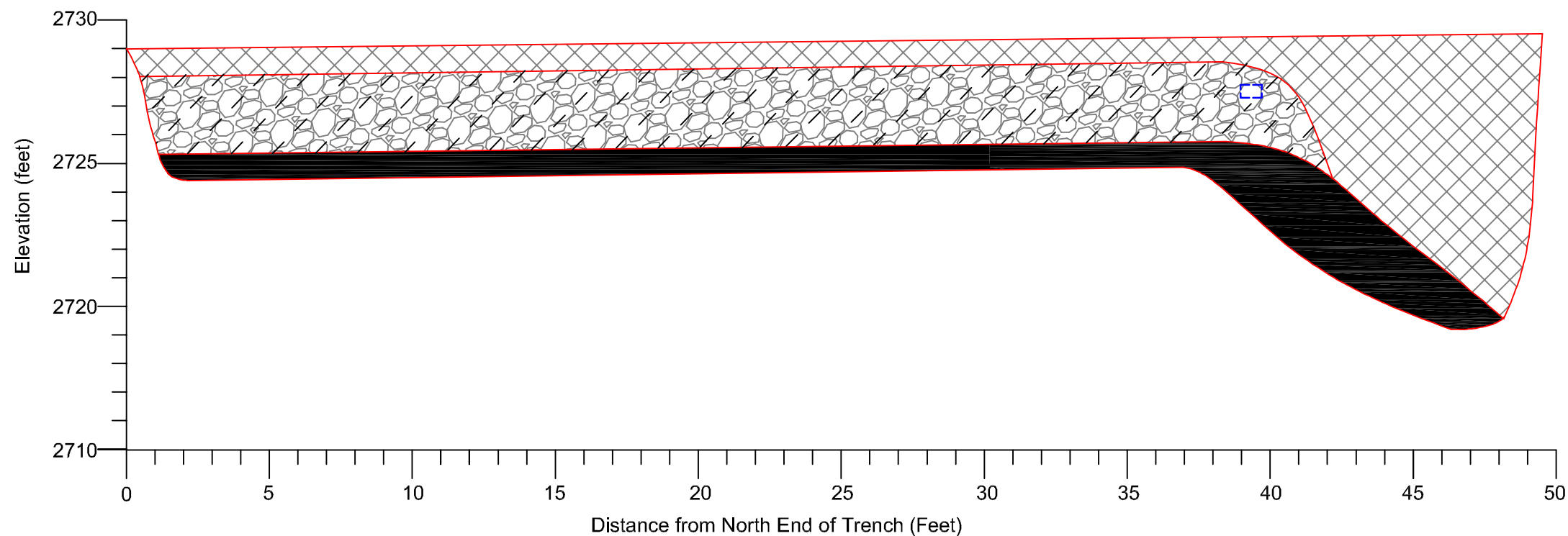
B-4
Elev. 2729.9'











LEGEND:



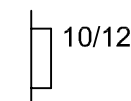
Fill; mix of fat clay, sand and gravel, poorly compacted, moist to very moist, brown to grey and purple.



Clayey Gravel with Sand (GC) to Clayey Sand with Gravel (SC); medium to very dense, moist, calcareous, light tan to brown.



Mudstone Bedrock; soft, moist to slightly moist, highly plastic, purple to grey.



10/12 California drive sample taken. The symbol 10/12 indicates that 10 blows from a 140 pound hammer falling 30 inches were required to drive the sampler 12 inches.



Indicates slotted 1 inch PVC pipe installed in the boring to the depth shown.



Indicates disturbed block sample taken.



Indicates disturbed bucket sample taken.

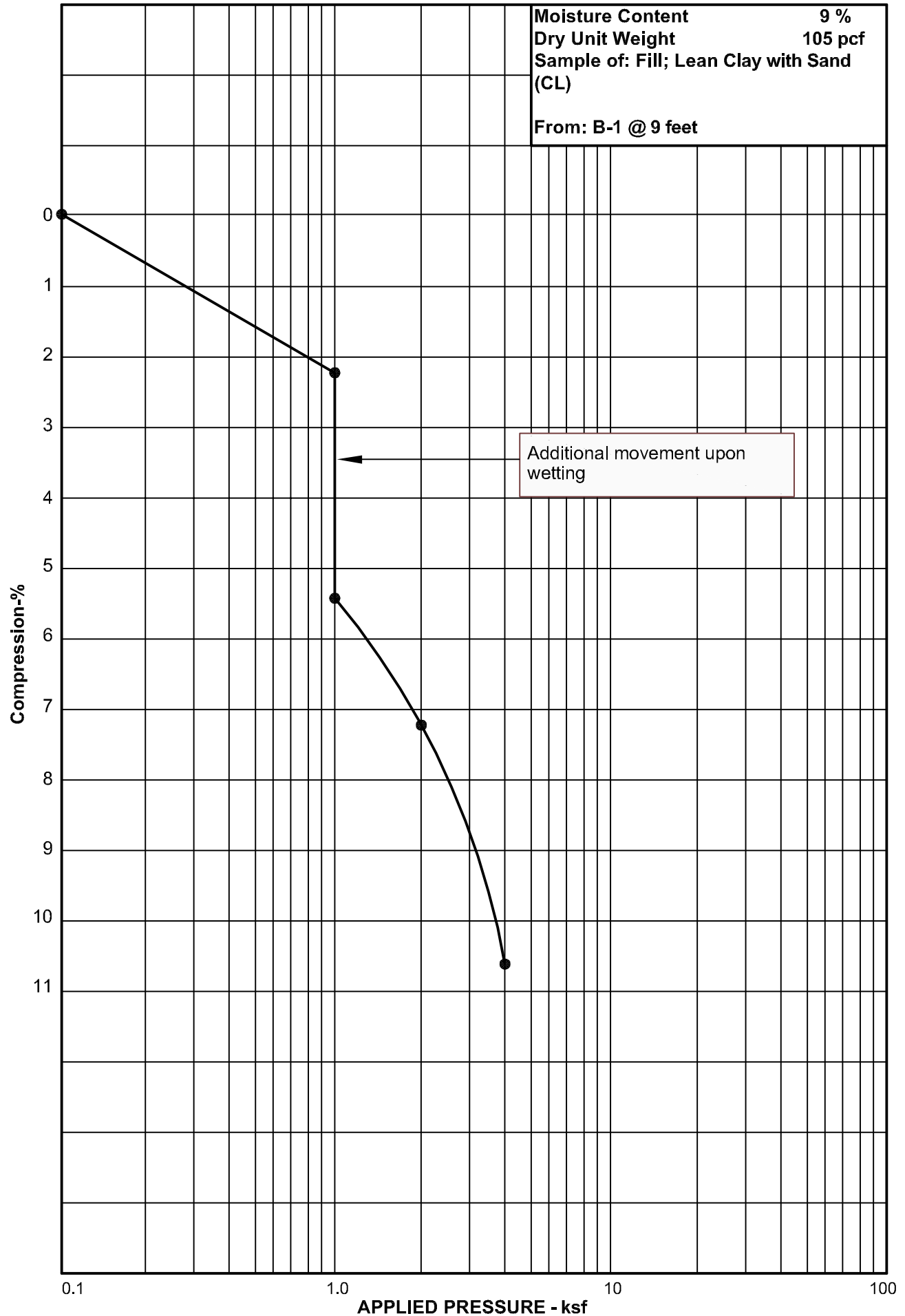


Indicates relatively undisturbed block sample taken.

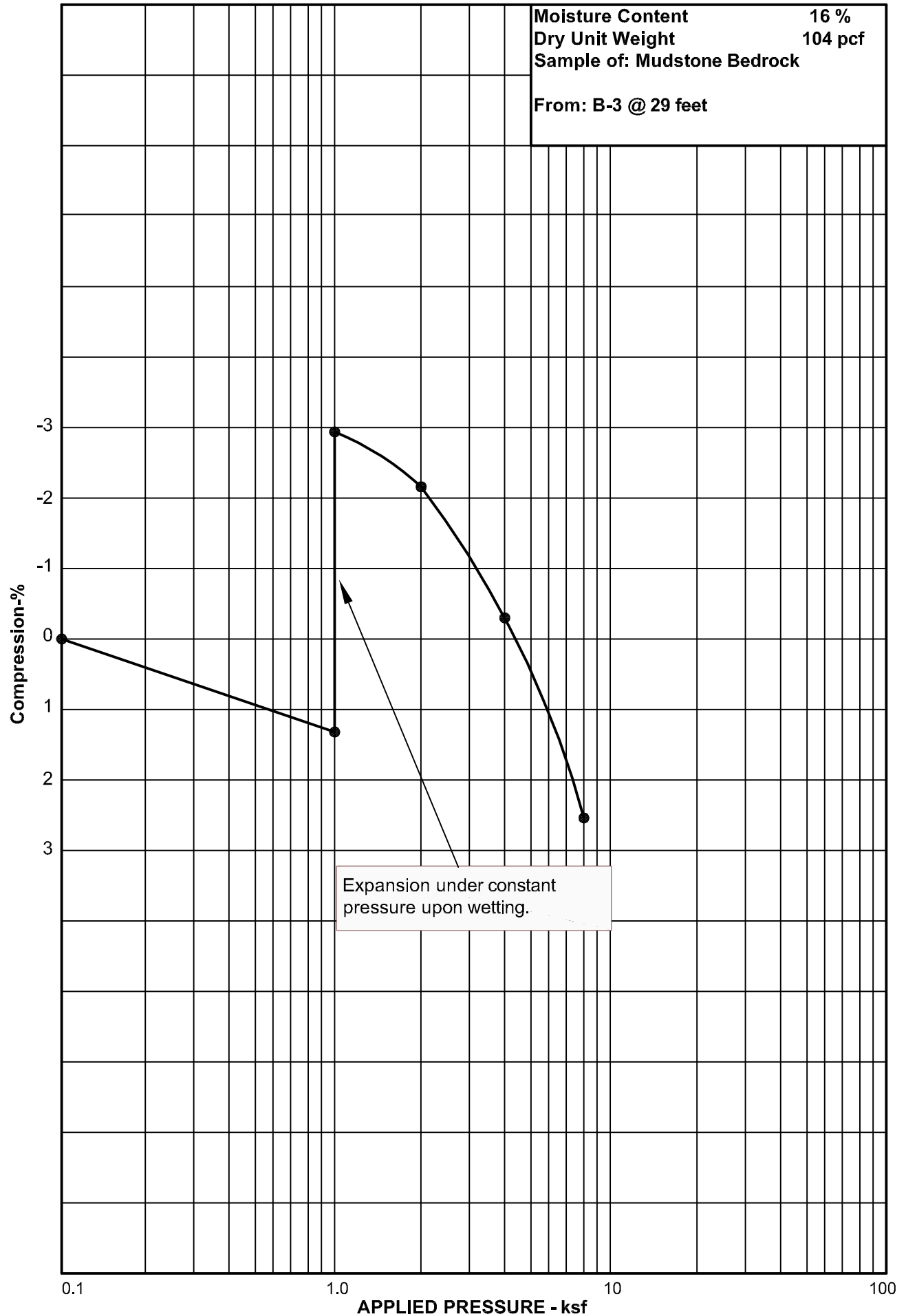
NOTES:

1. The borings were drilled on February 27, 2023 with a truck mounted drill rig equipped with 4-inch solid flight augers. The trenches were excavated with a large track-mounted excavator.
2. The locations and elevations of the borings and trenches were measured by Rosenberg Associates using GPS.
3. The boring locations and elevations should be considered accurate only to the degree implied by the method used.
4. The lines between the materials shown on the boring logs represent the approximate boundaries between material types and the transitions may be gradual.
5. Free water was not encountered in the borings at the time of drilling.
6. WC = water content (%);
DD = dry density (pcf);
+4 = percent retained on the No. 4 sieve;
-200 = percent passing No. 200 sieve;
LL = liquid limit (%);
PI = plasticity index (%);

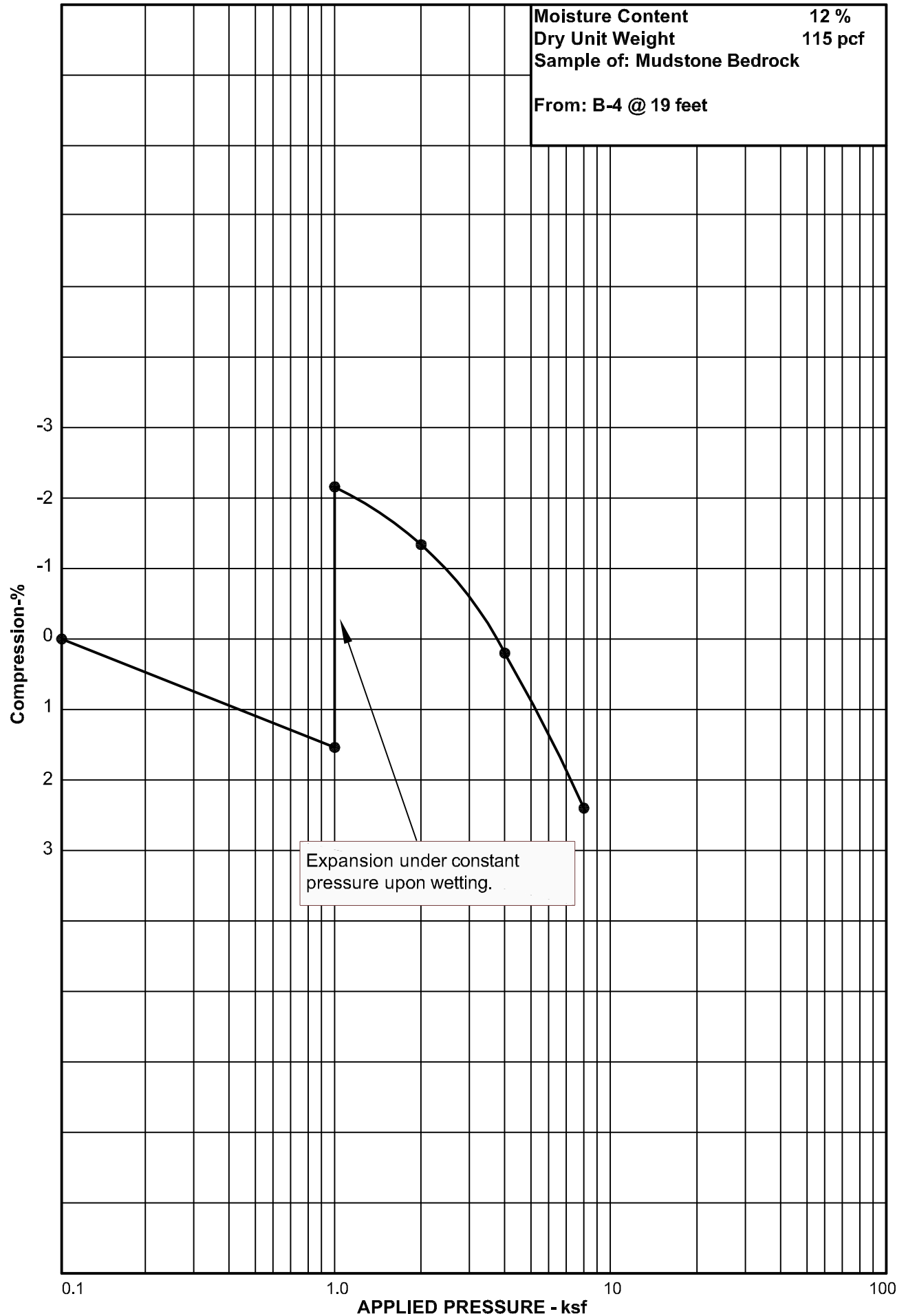
Applied Geotechnical Engineering Consultants, Inc.



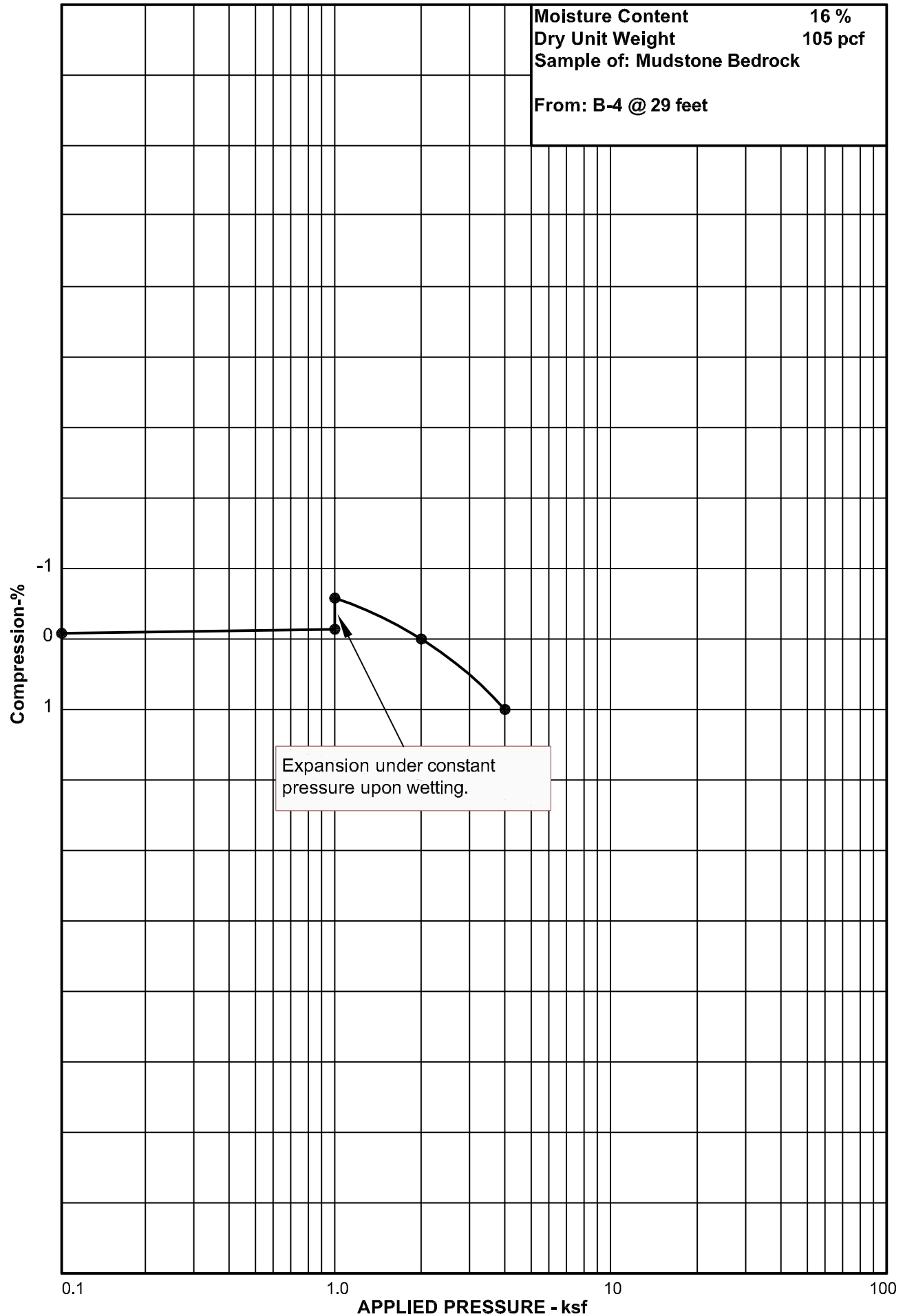
Applied Geotechnical Engineering Consultants, Inc.

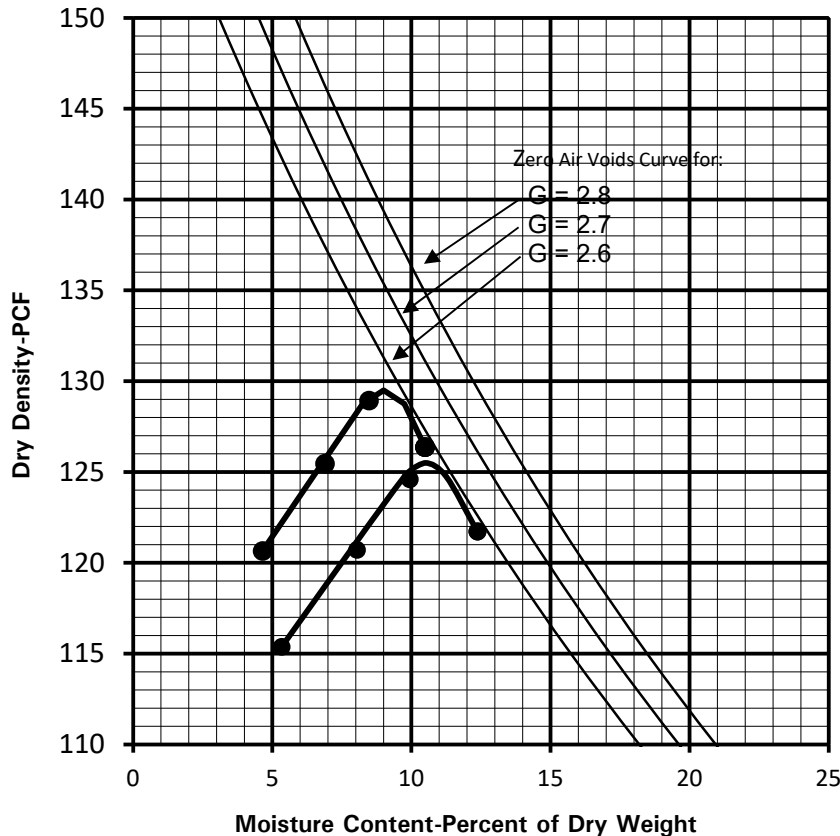


Applied Geotechnical Engineering Consultants, Inc.



Applied Geotechnical Engineering Consultants, Inc.

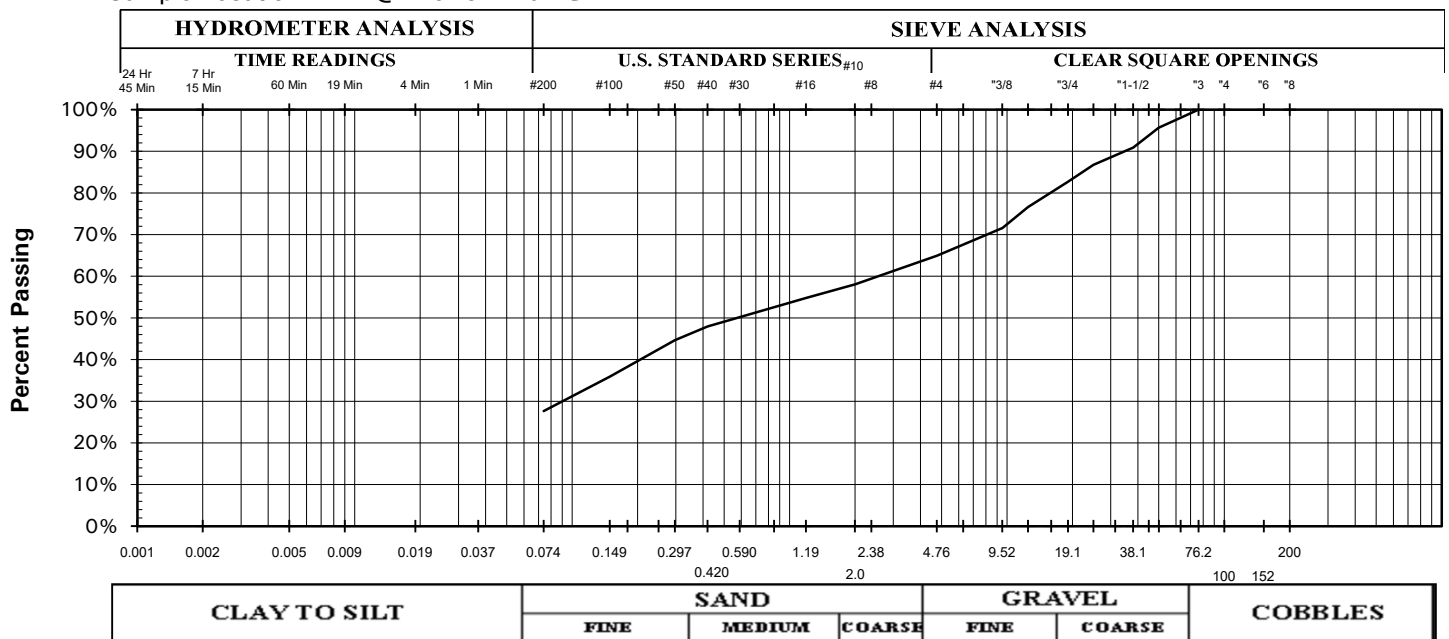




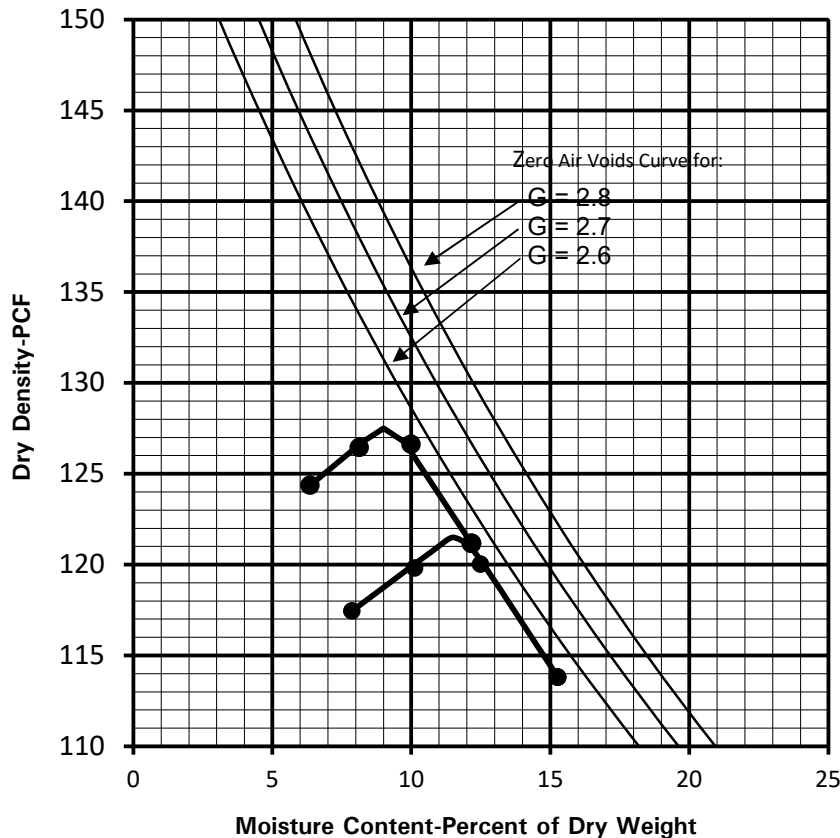
Sample Date: 12/29/25
Sample No. 260126A
Maximum Dry Density: 129.5
Optimum Moisture: 9.0
Atterberg Limits
 Liquid Limit: 30%
 Plasticity Index: 10%
Gradation
 Gravel: 35%
 Sand: 37%
 Silt & Clay: 28%

Moisture - Density Relationship Test Procedure: AASHTO T-180 C
 USCS Classification: clayey sand with gravel (SC) *Rock Corrected*
 AASHTO Classification: A-2-4
 Sample Location: T-2 @ 2.5'-3' Tan-GM

Reviewed By: TT
 Cohesive



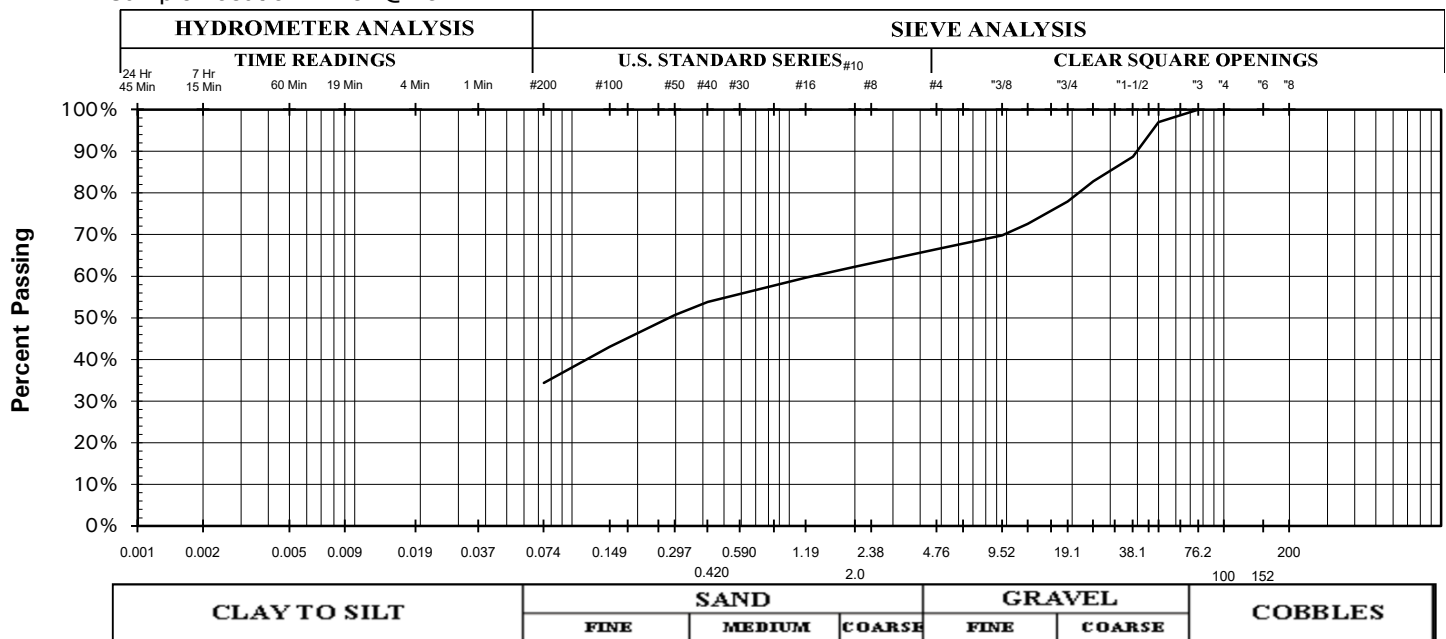
GRADATION AND MOISTURE-DENSITY RELATIONSHIP RESULTS



Sample Date: 12/29/25
Sample No. 260126D
Maximum Dry Density: 127.5
Optimum Moisture: 9.0
Atterberg Limits
Liquid Limit: 36%
Plasticity Index: 15%
Gradation
Gravel: 34%
Sand: 32%
Silt & Clay: 34%

Moisture - Density Relationship Test Procedure: AASHTO T-180 C
 USCS Classification: clayey gravel with sand (GC) *Rock Corrected*
 AASHTO Classification: A-2-6
 Sample Location: T-3 @ 3'-4'

Reviewed By: TT
 Cohesive



GRADATION AND MOISTURE-DENSITY RELATIONSHIP RESULTS

APPLIED GEOTECHNICAL ENGINEERING CONSULTANTS, INC.

TABLE 1 SUMMARY OF LABORATORY TEST RESULTS

Mirabella at Sunbrook

Project Number 2252539

Sample Location		Natural Moisture Content (%)	Natural Dry Density (pcf)	Gradation			Atterberg Limits		Moisture-Density Relationship		Sample Classification
Trench /Boring No.	Depth (feet)			Gravel (%)	Sand (%)	Silt/ clay (%)	Liquid Limit (%)	Plasticity Index (%)	Optimum Moisture Content (%)	Maximum Dry Density (%)	
T-1	½	13				85	48	23			Fill; Lean Clay with Sand (CL)
T-1	2	2		25	46	29					Clayey Sand with Gravel (SC)
T-1	4	10		0	16	84	43	22			Mudstone Bedrock
T-2	2	14		22	18	60	43	24			Fill; Sandy Lean Clay (CL)
T-2	2½-3			35	37	28	30	10	9.0	129.5	Clayey Sand with Gravel (SC)
T-2	4	9		35	34	31					Clayey Sand with Gravel (SC)
T-3	1	12		1	19	80	46	27			Fill; Lean Clay with Sand (CL)
T-3	3-4			34	32	34	36	15	9.0	127.5	Clayey Sand with Gravel (SC)
T-3	12	14				88	48	27			Mudstone Bedrock
B-1	9	9	105			88	34	16			Fill; Lean Clay (CL)
B-1	19	11	105			87	38	16			Mudstone Bedrock
B-2	4	13				87	45	26			Fill; Lean Clay (CL)
B-2	19	4		24	44	32					Clayey Sand with Gravel (SC)
B-3	4	9		1	27	72					Fill; Lean Clay with Sand (CL)

APPLIED GEOTECHNICAL ENGINEERING CONSULTANTS, INC.

TABLE 1
SUMMARY OF LABORATORY TEST RESULTS

Mirabella at Sunbrook

Project Number 2252539

Sample Location		Natural Moisture Content (%)	Natural Dry Density (pcf)	Gradation			Atterberg Limits		Moisture-Density Relationship		Sample Classification
Trench /Boring No.	Depth (feet)			Gravel (%)	Sand (%)	Silt/ clay (%)	Liquid Limit (%)	Plasticity Index (%)	Optimum Moisture Content (%)	Maximum Dry Density (%)	
B-3	14	5		31	37	32	32	16			Clayey Sand with Gravel (SC)
B-3	29	16	104			59	54	28			Mudstone Bedrock
B-4	9	9				85	42	21			Mudstone Bedrock
B-4	19	12	115			71	54	32			Mudstone Bedrock
B-4	29	16	105			73	50	23			Mudstone Bedrock

APPLIED GEOTECHNICAL ENGINEERING CONSULTANTS, INC.

TABLE 2

DRILLED MICROPILE DESIGN PARAMETERS

Mirabella at Sunbrook

Project No. 2252539

Soil Type	Soil Properties				Lateral Design Parameters			Axial Design Parameters	
	Effective Unit Weight (pcf)	Unconfined Compressive Strength (psf)	Cohesion (psf)	Friction Angle (Degrees)	Horizontal Modulus (pci)	Ultimate Passive Resistance (psf)	Strain @ 50% Yield (k_{rm})	Ultimate Skin Friction (psf)	Ultimate Uplift Skin Friction (psf)
Fill	100	1000	500	0	100	4000	.01	275	183
Clayey Gravel (GC)	125	0	0	45	300	21,000	0	950	635
Active Mudstone (Upper 10 feet)	115	6,000	3,000	0	1,500	27,000	0.007	1,650	1,100
Firm Mudstone (> 10 feet)	130	12,000	6,000	0	2,500	54,000	0.004	2,700	1,800

APPENDIX



Photo 1: View of the location of the proposed drive looking south.



Photo 2: View of lot for Building A looking west.

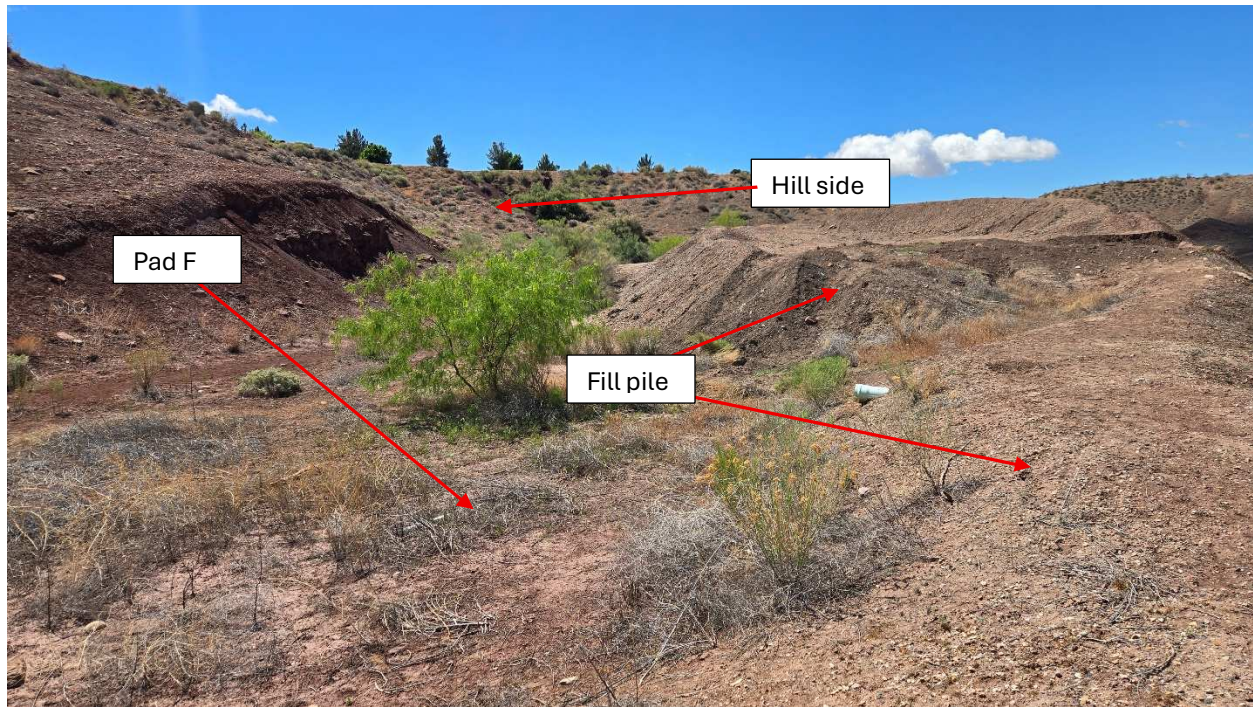


Photo 3: View of the location of the pad for Building F and the hill side to the east.



Photo 4: View of the hillside along the east side of the subdivision. Slopes are approximately $2\frac{1}{2}:1$ (Horizontal:vertical) or flatter.

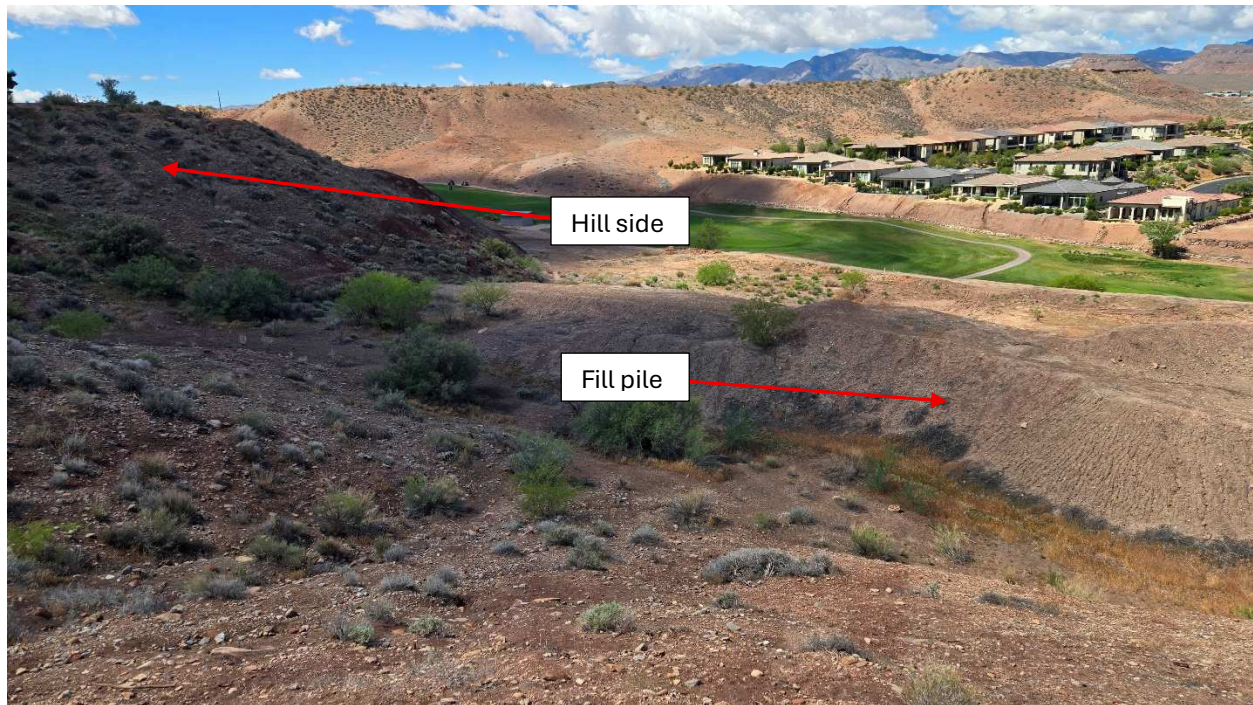


Photo 5: View of the hillside along the east side of the subdivision looking southwest towards the golf course.



Photo 6: View looking down the eastern hillside towards the west.



Photo 7: View of the location of Building pads A – E looking north.



Photo 8: View of the west east and slope on the west of Building pads A – E. Golf course is to the west.

HILLSIDE REVIEW BOARD AGENDA REPORT: 07/22/2026

Crown Point Lots 18, 19, 20 Hillside Disturbance Mitigation Hillside Development Permit (Case No. 2026-HS-005)		
Request:	Consider a Hillside Development Permit to remove excess material from hillside placed during overexcavation of 3 residential lots	
Applicant:	Jace Jackson	
Location:	584 S Valley View Drive	
General Plan:	OS (Open Space)	
Existing Zoning:	PD-R (Planned Development Residential)	
Surrounding Zoning:	North	R-1-10 (Single-Family Residential)
	South	R-1-8 (Single-Family Residential)
	East	R-1-10 (Single-Family Residential) and PD-C (Planned Development Commercial)
	West	R-1-10 (Single-Family Residential)



BACKGROUND

The applicant owns Lots 18, 19, and 20 within the Crown Point Subdivision. The Crown Point Subdivision was originally platted in 1987 with 22 lots and was later amended in 1997 to add Lots 23 through 30.

In July 2025, the owner of Lots 18, 19, and 20 performed grading operations associated with over-excavation of the subgrade for building pad preparation. During those grading activities, a portion of the excavated clay material was pushed onto the existing hillside slope within the homeowner's association common area.

City staff subsequently met with the owner and his contractor to discuss removal of the spoil material and restoration of the hillside. Staff presented the following three options to mitigate the hillside disturbance.

1. Remove all material that was placed on the HOA property. Afterward, place a 12-inch topsoil layer over the disturbed area and hydroseed the area to stabilize the slope.
2. Regrade the material at a 2H:1V slope which would necessitate grading onto the owner's property to achieve the desired slope. Place a 12-inch topsoil layer over the newly graded slope and hydroseed the slope.
3. Construct a retaining wall on the owner's property at the property line. Grade the material below the wall to 2H:1V slope and remove any excess material. Place a 12-inch topsoil layer over the newly graded slope and hydroseed the area.

Staff advised the owner that he would be responsible for maintaining the restoration, providing water as needed to establish the vegetation. In addition, staff informed the owner that an engineered mitigation plan addressing the hillside disturbance would be required, along with concurrence from the HOA.

The owner has submitted two mitigation alternatives for removal of the spoil material and restoration of the hillside.

1. Spoil removal, topsoil placement, and hydroseeding alternative: This alternative was prepared in response to the City's recommended hillside restoration approach and includes removal of the spoil material, placement of topsoil, and hydroseeding of the disturbed area.
2. Geotechnical engineer's recommended restoration alternative: This alternative recommends removing the spoil material without disturbing the original slope soils or existing vegetation, in order to return the slopes to their original condition. However, placement of landscaping rock on the slope was added as requested by the HOA over concern of the revegetation alternative requiring irrigation.

EXHIBITS PROVIDED

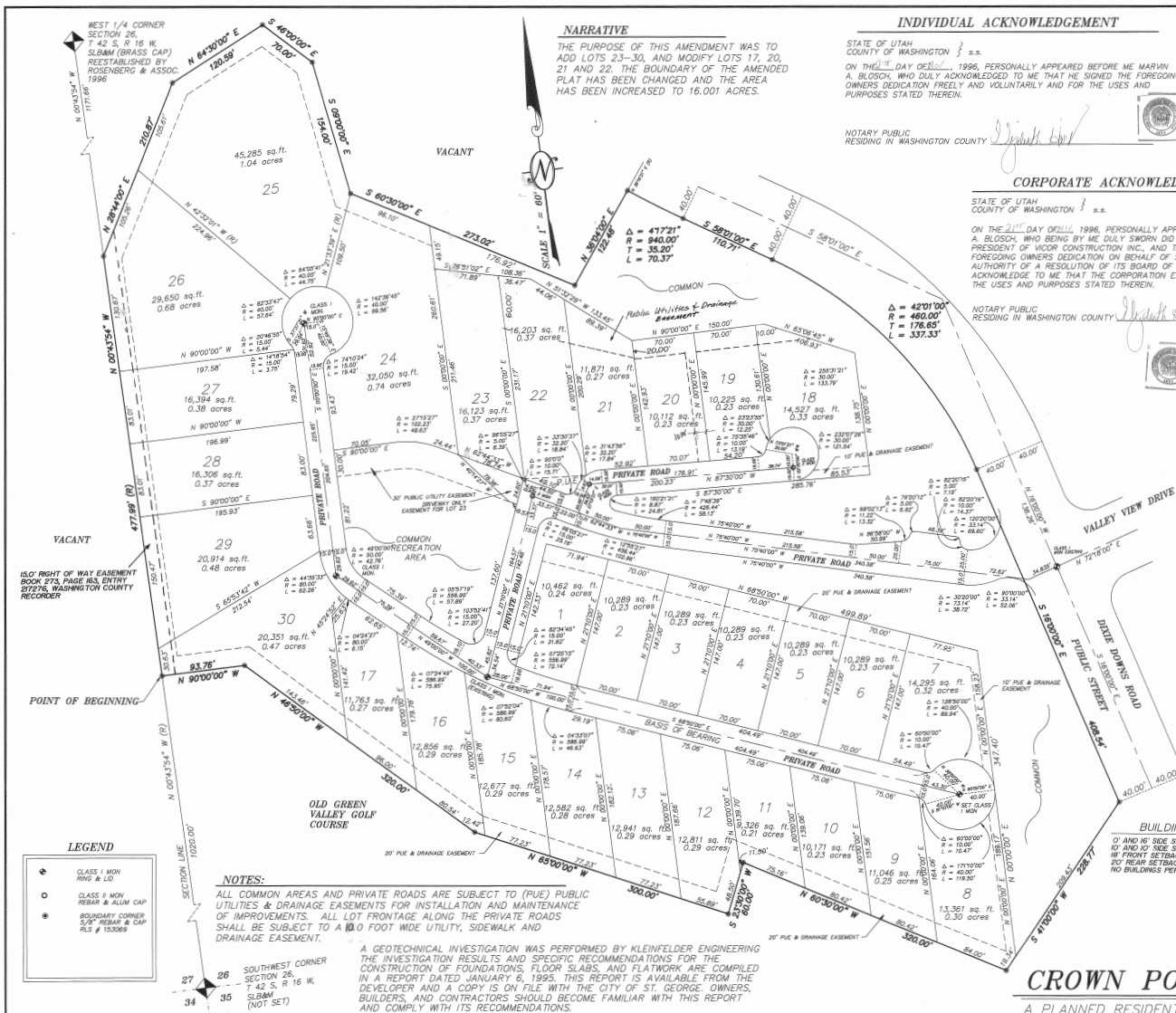
1. Exhibit A – Maps
"Exhibit A" is the Crown Point Amended Subdivision Plat.

2. Exhibit B – Slope Restoration Mitigation Plans
“Exhibit B” in the packet shows proposed mitigation plans.
3. Exhibit C – Crown Point Area Photographs
“Exhibit C” in the packet shows the photos of the hillside of the post graded condition and prior to the grading activities.

RECOMMENDATION

Section 10-13A-8(B)(1) of the “Hillside Review Board Powers and Duties” states that the hillside board can make recommendations to “adopt, modify or reject a proposal” to the Planning Commission (PC).

Exhibit A
SUBDIVISION PLAT



NARRATIVE

THE PURPOSE OF THIS AMENDMENT WAS TO ADD LOTS 23-30, AND MODIFY LOTS 17, 20, 21 AND 22. THE BOUNDARY OF THE AMENDED PLAT HAS BEEN CHANGED AND THE AREA HAS BEEN INCREASED TO 16.001 ACRES.

INDIVIDUAL ACKNOWLEDGEMENT

STATE OF UTAH
COUNTY OF WASHINGTON } s.s.
ON THIS 21ST DAY OF NOV, 1996, PERSONALLY APPEARED BEFORE ME MARVIN A. BLOSH, WHO DULY ACKNOWLEDGED TO ME THAT HE SIGNED THE FOREGOING OWNERS DEDICATION FREELY AND VOLUNTARILY AND FOR THE USES AND PURPOSES STATED THEREIN.

NOTARY PUBLIC
RESIDING IN WASHINGTON COUNTY

CORPORATE ACKNOWLEDGEMENT

STATE OF UTAH
COUNTY OF WASHINGTON } s.s.

ON THE 21ST DAY OF NOV, 1996, PERSONALLY APPEARED BEFORE ME MARVIN A. BLOSH, WHO BEING BY ME DULY SWORN DID SAY THAT HE IS THE PRESIDENT OF VICOR CONSTRUCTION INC., AND THAT HE EXECUTED THE FOREGOING OWNERS DEDICATION ON BEHALF OF SAID CORPORATION BY AUTHORITY OF A RESOLUTION OF ITS BOARD OF DIRECTORS AND HE DID ACKNOWLEDGE TO ME THAT THE CORPORATION EXECUTED THE SAME FOR THE USES AND PURPOSES STATED THEREIN.

NOTARY PUBLIC
RESIDING IN WASHINGTON COUNTY

SURVEYOR'S CERTIFICATE

I, LLOYD RIED POPE, DO HEREBY CERTIFY THAT I AM A PROFESSIONAL ENGINEER AND REGISTERED LAND SURVEYOR AND THAT I HOLD CERTIFICATE OF REGISTRATION NUMBER 153069 AS PRESCRIBED UNDER THE LAWS OF THE STATE OF UTAH. I FURTHER CERTIFY THAT BY AUTHORITY OF THE OWNERS I HAVE MADE A SURVEY OF THE TRACT OF LAND SHOWN ON THIS PLAT AND DESCRIBED BELOW, AND HAVE SUBDIVIDED SAID TRACT OF LAND INTO LOTS AND PRIVATE STREETS TO BE KNOWN AS:

CROWN POINT - AMENDED

AND THAT THE SAME HAS BEEN CORRECTLY STAKED ON THE GROUND AS SHOWN ON THIS PLAT.

BOUNDARY DESCRIPTION

BEGINNING AT A POINT N 00°43'54" W 1020.00 FEET ALONG THE SECTION LINE FROM THE SOUTHWEST CORNER OF SECTION 26, TOWNSHIP 42 SOUTH, RANGE 16 WEST, SALT LAKE BASE AND MERIDIAN AND RUNNING THENCE N 00°43'54" W 477.99 FEET ALONG THE SECTION LINE; THENCE LEAVING SAID SECTION LINE N 28°44'00" E 210.87 FEET; THENCE N 64°30'00" E 120.59 FEET; THENCE S 46°00'00" E 70.00 FEET; THENCE S 09°00'00" E 154.00 FEET; THENCE S 80°30'00" E 273.02 FEET; THENCE N 36°04'00" E 122.48 FEET TO THE SOUTHWEST RIGHT OF WAY LINE OF DIXIE DOWNS ROAD, SAID POINT BEING ON A 940.00 FOOT RADIUS CURVE TO THE LEFT; THENCE ALONG SAID RIGHT OF WAY LINE AND SOUTHEASTERLY ALONG THE ARC OF SAID CURVE 70.37 FEET (Center Bears N 36°16'21" E) TO THE POINT OF TANGENCY; THENCE S 58°01'00" E 110.71 FEET TO A 450.00 FOOT RADIUS CURVE TO THE RIGHT; THENCE SOUTHEASTERLY ALONG THE ARC OF SAID CURVE 337.33 FEET TO THE POINT OF TANGENCY; THENCE S 16°00'00" E 408.54 FEET; THENCE LEAVING SAID RIGHT OF WAY LINE S 41°00'00" W 228.77 FEET; THENCE N 60°30'00" W 320.00 FEET; THENCE S 23°30'00" W 60.00 FEET; THENCE N 65°00'00" W 300.00 FEET; THENCE N 46°50'00" W 320.00 FEET; THENCE N 90°00'00" W 93.76 FEET TO THE POINT OF BEGINNING.

CONTAINING 16.001 ACRES.

LLOYD RIED POPE - PROFESSIONAL ENGINEER & REGISTERED LAND SURVEYOR NO. 153069

DATE: 11-21-96



OWNER'S DEDICATION

KNOW ALL MEN BY THESE PRESENTS THAT THE UNDERSIGNED OWNERS OF ALL THE ABOVE DESCRIBED TRACT OF LAND HAVING CAUSED THE SAME TO BE SUBDIVIDED INTO LOTS, AND COMMON AREAS (INCLUDING PRIVATE ROADS), TO BE HEREAFTER KNOWN AS:

CROWN POINT - AMENDED

DO HEREBY DEDICATE TO THE COMMON USE OF THE PROPERTY OWNERS, BUT NOT TO THE USE OF THE GENERAL PUBLIC, ALL COMMON AREAS (INCLUDING PRIVATE ROADS) SHOWN ON THIS PLAT, IN ACCORDANCE WITH THE TERMS AND CONDITIONS OF DEDICATION OF SAID COMMON AND LIMITED COMMON AREAS AS MORE FULLY PROVIDED IN THE "DECLARATION OF COVENANTS, CONDITIONS AND RESTRICTIONS" APPLICABLE TO THE Crown Point Amended DATED January 6, 1997, AND RECORDED CONCURRENTLY WITH THE PLAT OF Crown Point Amended. SAID DECLARATION OF COVENANTS, CONDITIONS AND RESTRICTIONS IS HEREBY INCORPORATED AND MADE PART OF THIS PLAT. REFERENCE IS MADE TO SAID DECLARATION FOR DETAILS CONCERNING THE RIGHTS AND OBLIGATIONS OF PARTIES HAVING OR ACQUIRING AN INTEREST IN THIS DEVELOPMENT. FOR GOOD AND VALUABLE CONSIDERATION RECEIVED, THE UNDERSIGNED OWNERS HEREBY DEDICATE AND CONVEY TO THE CITY OF ST. GEORGE, EASEMENTS OVER, ON, UNDER AND ACROSS ALL COMMON AREAS AND PRIVATE ROADWAYS FOR THE INSTALLATION AND MAINTENANCE OF PUBLIC UTILITIES AND DRAINAGE. THE UNDERSIGNED OWNERS DO HERBY WARRANT TO THE CITY OF ST. GEORGE AND ITS SUCCESSORS AND ASSIGNS, THE RIGHT TO USE ALL EASEMENTS GRANTED HEREIN AGAINST THE CLAIMS OF ALL PERSONS.

IN WITNESS WHEREOF WE HAVE HEREUNTO SET OUR HANDS.

MARVIN A. BLOSH - INDIVIDUAL

MARVIN A. BLOSH - PRESIDENT
CROWN POINT HOME OWNERS ASSOCIATION

MARVIN A. BLOSH, PRESIDENT
VICOR CONSTRUCTION INC.

INDIVIDUAL ACKNOWLEDGEMENT

STATE OF UTAH
COUNTY OF WASHINGTON } s.s.

ON THIS 21ST DAY OF NOV, 1996, PERSONALLY APPEARED BEFORE ME, THE UNDERSIGNED NOTARY PUBLIC IN AND FOR SAID STATE OF UTAH, SAID COUNTY OF WASHINGTON, MARVIN A. BLOSH, WHO BEING DULY SWORN DID ACKNOWLEDGE TO ME THAT HE IS THE PRESIDENT OF CROWN POINT HOME OWNERS ASSOCIATION AND THAT HE EXECUTED THE OWNER'S DEDICATION FOR AND IN BEHALF OF SAID HOME OWNER'S ASSOCIATION.

NOTARY PUBLIC
RESIDING IN WASHINGTON COUNTY



CROWN POINT - AMENDED

A PLANNED RESIDENTIAL DEVELOPMENT SUBDIVISION

APPROVAL AS TO FORM	ENGINEER'S APPROVAL	APPROVAL OF CITY PLANNER	APPROVAL AND ACCEPTANCE	APPROVAL OF PLANNING COMMISSION	RECORDED NO. 05717
APPROVED AS TO FORM THIS <u>7</u> DAY OF <u>FEBRUARY</u> 1997.	THE ABOVE SUBDIVISION HAS BEEN REVIEWED AND IS APPROVED IN ACCORDANCE WITH INFORMATION ON FILE IN THIS OFFICE THIS <u>7TH</u> DAY OF <u>FEB</u> , A.D. 1997.	ON THIS <u>21ST</u> DAY OF <u>NOV</u> , 1996, THE CITY PLANNER OF THE CITY OF ST. GEORGE, UTAH REVIEWED THE ABOVE SUBDIVISION AND RECOMMEND SAME FOR ACCEPTANCE BY THE CITY OF ST. GEORGE.	WE, THE MAYOR AND CITY COUNCIL OF THE CITY OF ST. GEORGE, HAVE REVIEWED THE ABOVE SUBDIVISION AND BY AUTHORIZATION OF SAID CITY COUNCIL, RECORDED IN THE MINUTES OF ITS MEETING THE <u>21</u> DAY OF <u>NOV</u> , 1996, HEREBY ACCEPTS THE SAID SUBDIVISION WITH ALL COMMITMENTS AND OBLIGATIONS ESTABLISHED THEREON.	ON THIS <u>12</u> DAY OF <u>NOV</u> , 1996, THE PLANNING COMMISSION OF THE CITY OF ST. GEORGE, UTAH REVIEWED THE ABOVE SUBDIVISION AND FIND IT COMPLIES WITH REQUIREMENTS OF ST. GEORGE CITY'S PLANNING ORDINANCES AND BY AUTHORIZATION OF SAID COMMISSION HEREBY APPROVE SAID SUBDIVISION FOR ACCEPTANCE BY THE CITY OF ST. GEORGE.	STATE OF UTAH, COUNTY OF WASHINGTON, RECORDED AND FILED AT THE REQUEST OF SOUTHERN UTAH TITLE DATE: 11-21-97 10:19 A.M. 1075 69 TIME BOOK PAGE FEE: 61.00 WASHINGTON COUNTY RECORDER
<i>[Signature]</i> CITY ATTORNEY-ST. GEORGE	<i>[Signature]</i> DATE ENGINEER-ST. GEORGE, UTAH	<i>[Signature]</i> CITY PLANNER-ST. GEORGE, UTAH	<i>[Signature]</i> CITY RECORDERS CITY OF ST. GEORGE	<i>[Signature]</i> CHAIRMAN-ST. GEORGE, UTAH	<i>[Signature]</i>

Exhibit B

SLOPE RESTORATION MITIGATION PLANS

HILLSIDE MITIGATION WORK PLAN

Project:	Slope Restoration
Location:	Crown Point Subdivision – Lots 18, 19, and 20
Prepared by:	Jackson Realty LLC
Date:	April 01, 2026

1. PROJECT DESCRIPTION

This work plan addresses the removal of previously placed soil material from an HOA-owned slope and restoration of the disturbed area to approximate its prior condition.

2. EXISTING CONDITIONS

A limited area of soil was placed on the slope during prior site activity. The affected area is approximately 60 feet by 30 feet (1,800 sq ft).

Based on stamped geotechnical engineer recommendations, removal of the placed material is expected to return the slope to its prior condition without adversely impacting slope performance.

3. PROPOSED SCOPE OF WORK

A. Spoils Removal

- Remove previously placed soil material from the slope
- Haul material offsite or relocate to an approved area

B. Minor Regrading

- Perform light grading as necessary to match existing slope contours
- No modification to underlying slope geometry is proposed

C. Surface Restoration

- Place topsoil as needed to restore surface conditions
- Apply hydroseed or native seed mix to promote vegetation

D. Temporary Erosion Control

- Apply hydro mulch, tackifier, or straw covering as needed
- Measures are temporary and intended to support vegetation establishment

4. ENGINEERING BASIS

Based on stamped geotechnical engineer recommendations, removal of the placed material is expected to return the slope to its prior condition without adversely impacting slope performance.

No structural stabilization measures, retaining systems, or slope redesign are indicated as part of this scope.

5. PERMIT AND COMPLIANCE

- A grading permit will be obtained if required by the City
- Work will be performed in accordance with City of St. George requirements
- Erosion control measures will be maintained until vegetation is established

6. SUMMARY

This plan is limited to removal of previously placed material and restoration of the slope surface to its prior condition. No additional structural improvements are proposed.



December 4, 2025
Project No. G20257531E2

Jace Jackson
Jackson Realty, LLC
356 S 100 E
Hurricane, Utah 84737

RE: *Slope Observations*
Crown Points Lots 18, 19, and 20
584 South Dixie Drive
St. George, Utah 84770

Dear Mr. Jackson,

Geotechnical and Environmental Services, Inc. (GES) was requested to provide our opinion on the slopes adjacent to Lots 18, 19, and 20. We understand that during the grading operations on the three lots, spoils ended up on the adjacent slopes. We also understand that the homeowner's association has requested that the spoils be removed from the slopes and 3- to 8-inch landscaping rock be placed on the slopes.

Background

GES previously performed geotechnical explorations, site reconnaissance, laboratory testing, and geotechnical analysis for the three lots mentioned above. A summary of our findings and recommendations was presented in the following document.

- Geotechnical Evaluation Report, Crown Points Lots 18, 19, & 20, St. George, Utah prepared by GES, Project No. G20257531E1, dated June 26, 2025.

We understood at the time of our evaluation that the slopes adjacent to each lot belonged to the homeowner's association and that the slopes were not part of our scope. Therefore, a slope stability analysis was not performed. An experienced Geologist and I observed the slopes during our initial site reconnaissance.

The above-mentioned Geotechnical Evaluation Report recommended that any uncontrolled fill, deleterious material, loose or unstable soils should be removed from the building pads or processed to be used as structural fill provided the soils comply with the recommendations outlined in the report. Over-excavation depth was recommended based on foundation option selection, with a minimum of 15-feet of material being removed below the bottom of footings if spread footings were utilized.

GES observed the overexcavation to a depth approximately 17 feet from finished grade across each lot. The adjacent slopes were not excavated or disturbed during the process. GES performed periodic observation and testing of the earthwork within each building pad. GES also observed and tested the structural fill in approximate 1-foot-thick lifts as suitable material was moisture conditioned to near optimum moisture content and compacted to 95 percent of the maximum dry density, or more, as determined by ASTM D1557.

Summary of Geotechnical Recommendations

Based on our observations and experience in the area, we recommend the following:

1. Remove only the spoils without removing the original slope soils or vegetation, or changing the slope inclination
2. Place landscaping rock on slopes as requested by the homeowner's association
3. Grade the three lots such that all drainage flows to the street and that no drainage flows to or over the slopes

• **Geotechnical Engineering**

• **Construction Materials Testing & Inspections**

• **Environmental Services**

• **AASHTO Accredited Testing Laboratories**

• **IAS Accredited**

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7150 Placid Street
Las Vegas, NV 89119 •
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Mesquite
530 Commerce Circle
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5301 Longley Lane, Bldg. H,
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St. George
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Conclusions

It is our opinion that by following the recommendations provided above, the slopes will essentially be returned to their original state.

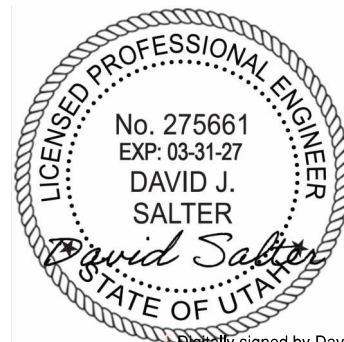
Closure

Our services were performed using that degree of care and skill ordinarily exercised under similar circumstances by reputable engineering firms in this or similar localities. No other warranty, either express or implied, is included or intended in this report.

We appreciate this opportunity to provide continued professional services. If you have any questions or comments regarding this information, please feel free to contact our office.

Sincerely,

Geotechnical & Environmental Services, Inc.



Ben Mayhew

Digitally signed by Ben
Mayhew
Date: 2025.12.04
13:15:04 -07'00'

Ben Mayhew
Tri-State Builder

DJS:BM:vs

Dist: PDF emailed to addressee at jace.jackson@hotmail.com and corey.edwards03@gmail.com
Copy to project folder

David Salter

Digitally signed by David
Salter
Date: 2025.12.04
11:42:12 -08'00'

David J. Salter, P.E.
Geotechnical Practice Leader



Previously Placed Fill Material To Be Removed

Existing Native Slope To Remain Undisturbed

Lot Drainage Directed Toward Crown Point Drive

Removal of previously placed fill material
geotechnical recommendations.

Exhibit C

CROWN POINT AREA PHOTOGRAPHS

Image 1

Aerial View of Site Following Grading Activities



This aerial photograph illustrates the graded building pads and surrounding hillside area. The photograph provides context regarding the overall size of the site and the limited area affected by fill placement on the slope.

Image 2

Aerial View of Site and Adjacent Hillside



This aerial photograph shows the relationship between the lots, the adjacent roadway, and the existing hillside. The image demonstrates the overall slope configuration and surrounding conditions.

Image 3

Regional Context Aerial



This aerial photograph provides a broader view of the surrounding area and illustrates the natural desert character of the hillside environment surrounding the project site.

Image 4

Pre Grading Aerial Image (Google Earth Historical Imagery)



This aerial image depicts site conditions prior to grading activities associated with Lots 18, 19, and 20. The image appears to show previously placed blue clay or similar fill material located on portions of the hillside slope before development of the lots occurred. The image also illustrates the sparse and scattered vegetation characteristic of the site prior to grading activities. This historical imagery is provided to document pre existing hillside conditions and to assist in evaluating the proposed restoration plan.

Image 5

Street Level View of Pre-Existing Hillside



This photograph depicts existing hillside conditions and vegetation. The image illustrates the native desert character of the slope and the presence of naturally occurring sparse vegetation typical of the surrounding area.

ST. GEORGE HILLSIDE REVIEW BOARD MINUTES
MA7 27, 2026, 8:30 A.M.
ON SITE APPROXIMATELY 1540 East Howard Ln

PRESENT:

Hillside Review Board Chair James Sullivan
Hillside Review Board Member, Kevin Holyoak
Hillside Review Board Member, Dave Black

EXCUSED:

Hillside Review Board Member, Hugo Angeles
Hillside Review Board Member, Jeff Mathis

STAFF MEMBERS PRESENT:

Assistant Public Works Director, Wes Jenkins
Planner, Dan Boles
Assistant City Attorney, Kristopher Pearson
Development Office Supervisor, Angie Jessop

OTHERS IN ATTENDANCE:

Applicant Bryce Kelsey

Link to Call to Order by Board Chair Sullivan [00:00:08](#)

Link to Roll Call [00:0:42](#)

ITEM 1

South Rim at Foremaster Lot 59 - This is a request to obtain a hillside permit for the property located at approximately 1540 East Howard Lane in anticipation of construction of a residential home. The purpose of the meeting is to make a recommendation to the Planning Commission on the location of the ridgeline. This property is in the hillside overlay. The applicant is Kelsey Enterprises, represented by Bryce Kelsey. Case No. 2026-HS-003

Agenda Packet [\[Page 3\]](#)

Link to presentation by Bryce Kelsey [00:01:12](#)

Discussion with Hillside Review Board members [00:01:44](#)

Link to motion [00:16:37](#)

MOTION:

A motion was made by Board Member Black that at this location, the ridgeline is not clearly defined, and we have proposed a red line on a map that extends beyond the property line, using the map at Exhibit A. We recommend that the red line be used as the ridgeline for this property.

SECOND:

The motion was seconded by Board Member Holyoak.

VOTE:

Board Chair Sullivan called for a vote, as follows:

Chair Sullivan – aye
Board Member Mathis – absent
Board Member Angeles –absent
Board Member Black –aye
Board Member Holyoak – aye

The vote is unanimous. Motion carries.

APPROVAL OF MINUTES:

Consider a request to approve the minutes from the March 31, 2026 meeting

Agenda Packet [\[Page 10\]](#)

Link to motion [00:18:14](#)

MOTION:

A motion was made by Board Member Black to approve the minutes from the March 31, 2026 meeting.

SECOND:

The motion was seconded by Board Member Holyoak.

VOTE:

Board Vice Chair Angeles called for a vote, as follows:

Chair Sullivan – aye
Board Member Mathis – absent
Board Member Angeles –absent
Board Member Black – aye
Board Member Holyoak – aye

The vote is unanimous and the motion carries

MOTION:

A motion was made by Board Member Black to adjourn.

/s/

Angie Jessop, Development Office Supervisor



Exhibit A