

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 meetings at the referenced site on **Wednesday, February 22, 2023**, commencing on-site at approximately 9:00 a.m.

The estimated site times are in bold. The agenda for the meeting is as follows:

1. Consider a request for a hillside development permit for the extension of Flowers Way. The property is currently zoned ASBP (Airport Supporting Business Park) & Open Space. The site is located at the end of the existing Flowers Way. The applicant is Desert Canyons LLC/Curt Gordon. Case No. 2023-HS-004. **Meeting time is approx. 9:00 am**
2. Consider approval of the meeting minutes from the January 24 and the January 25, 2023, meetings.

Mike Hadley, GISP
Senior Planner
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 Location

Item #1 – The end of paved portion of Flowers Way



HILLSIDE REVIEW BOARD AGENDA REPORT: 01/22/2023

Flowers Way Hillside Development Permit (Case No. 2023-HS-004)		
Request:	A Hillside Development Permit to allow disturbance of areas in the 20-30%, 30-40% and 40% and above slope areas. This application is in anticipation of the construction of Rosewood Townhomes.	
Applicant:	Desert Canyons Land LLC/Curt Gordon	
Representative:	Kendall Miller	
Location:	Southern Hills Pkwy	
General Plan:	AVI (Airport Vicinity Industrial), OS (Open Space), & GC (Golf Course), TC (Town Center).	
Existing Zoning:	ASBP (Airport Supporting Business Park) & Open Space	
Surrounding Zoning:	North	ASBP (Airport Supporting Business Park) & Open Space
	South	PD-R (Planned Development Residential), C-2 (Commercial) & Southern Parkway
	East	C-2 (Commercial)
	West	PD-C (Planned Development Commercial), R-1-10(Single Family Residential 10,000 sq ft minimum lot size)
Land Area:	Approximately 14.99 acres	



BACKGROUND

This is a request to obtain a hillside permit for the property located at . The applicants are proposing to extend the existing road Flowers Way on the northern side of Southern Parkway. This property is in the hillside overlay. Section 10-13A-7 of the Zoning Regulations requires that all major development (i.e., cut greater than 4', etc.) on slopes above 20% requires a 'hillside development permit' granted by the City Council upon recommendation from the Hillside Review Board and the Planning Commission.

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 twenty-one percent (21%) to thirty percent (30%), development activity shall not disturb more than 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 a 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 – Site Plan
“Exhibit A” in the packet shows the location of the new road extension.
2. Exhibit B –Grading Plan
“Exhibit B” in the packet shows the proposed preliminary grading plan.
3. Exhibit C – Slope Analysis Map
“Exhibit C” in the packet shows the overall slope analysis for the area to be disturbed.
4. Exhibit D – Geotechnical Report
“Exhibit D” – This is the Geotechnical report for Flowers Way.
5. Exhibit E – Drainage Report
“Exhibit E – This is the Drainage Report for Flowers Way.

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).

General Plan – AVI (Airport Vicinity Industrial), OS (Open Space), & GC (Golf Course), TC (Town Center).



Zoning - ASBP (Airport Supporting Business Park) & Open Space



EXHIBIT A
Site Plan

EXHIBIT B

Grading Plan

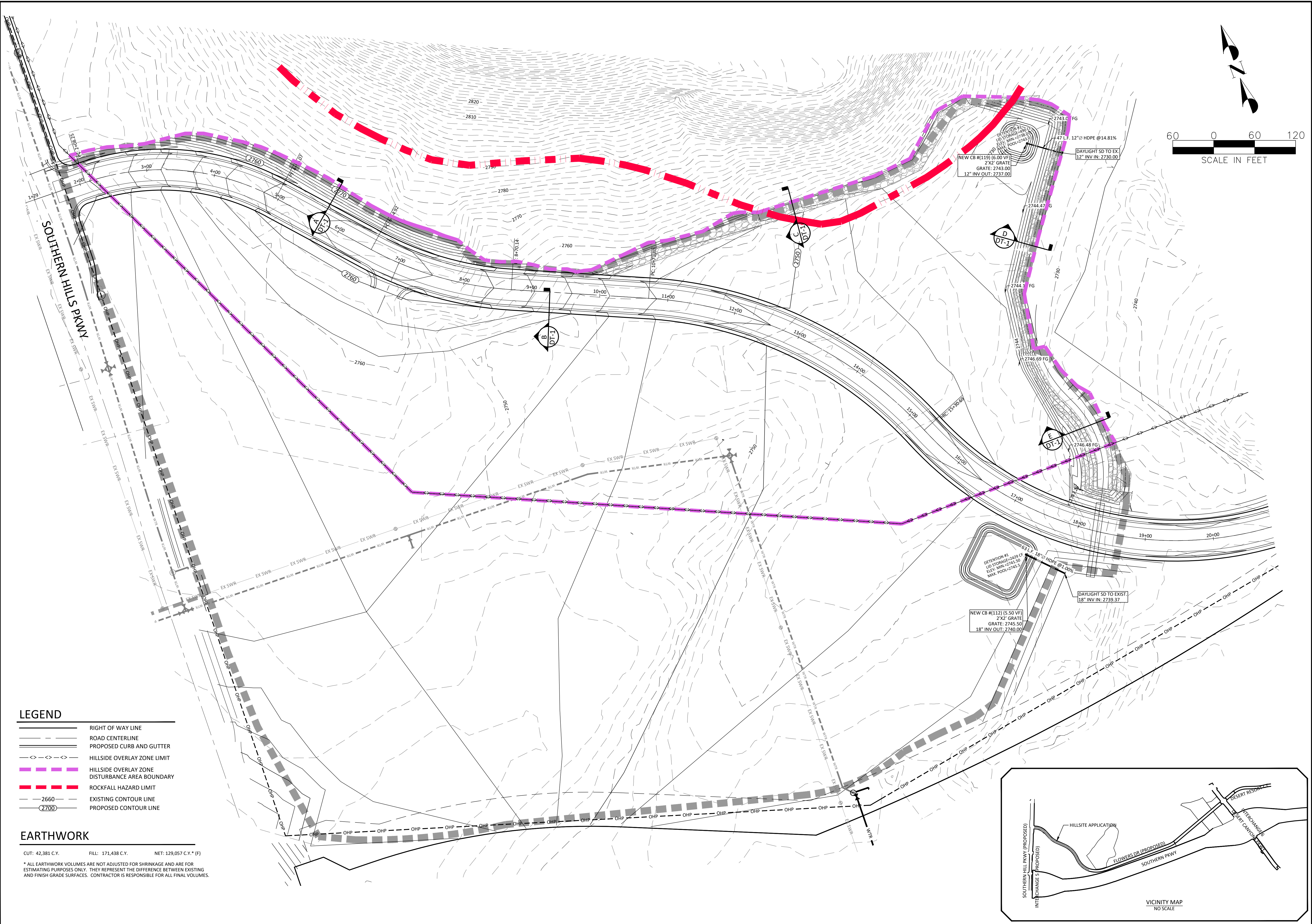
EXHIBIT C
Slope Analysis Map

Exhibit D

Geotechnical Report

Exhibit E

Drainage Report

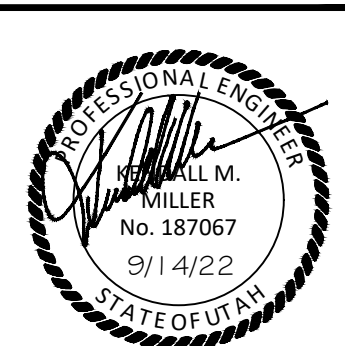
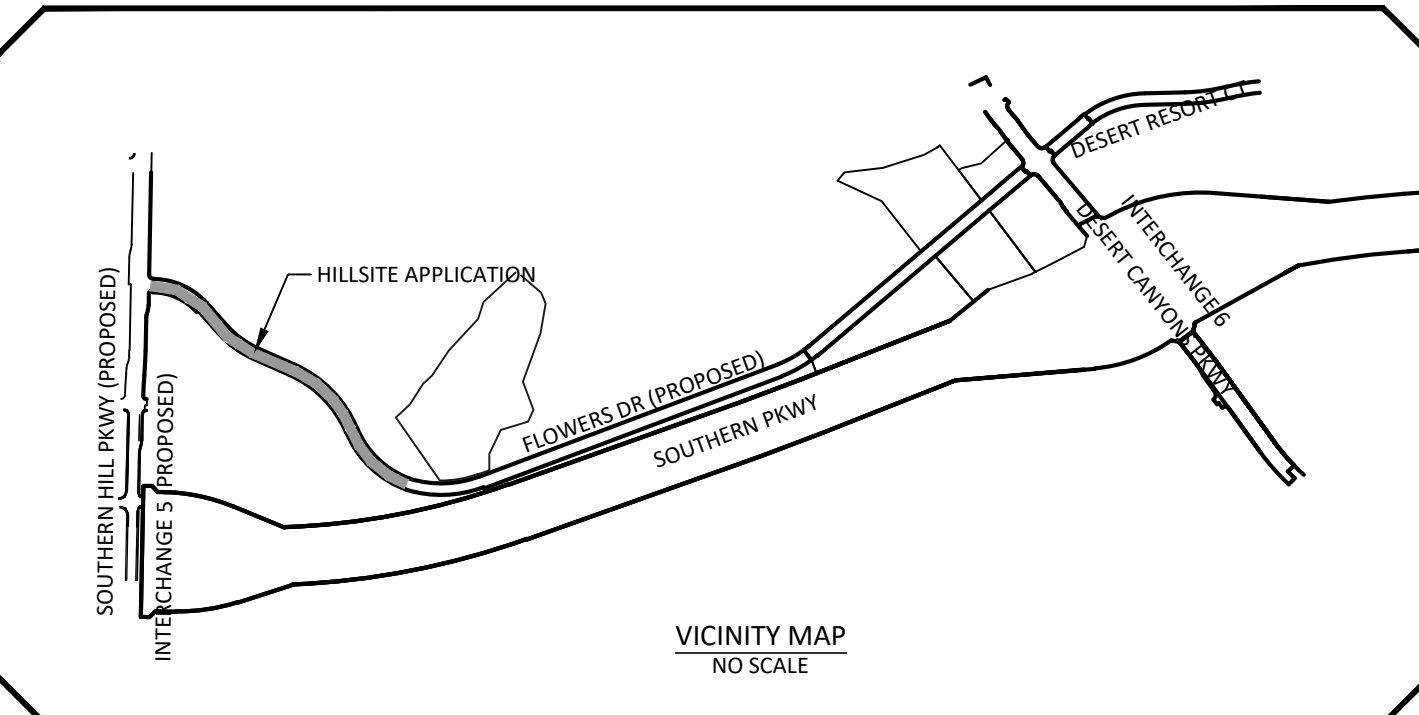
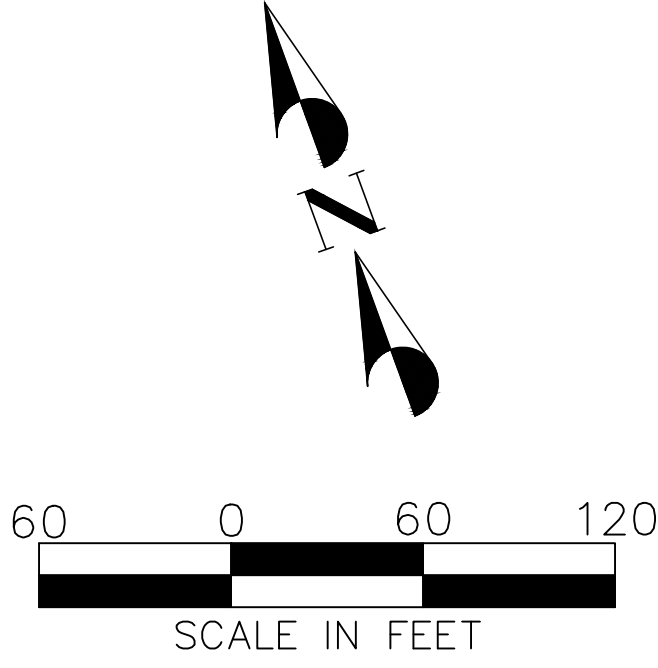


- LEGEND**
- RIGHT OF WAY LINE
 - ROAD CENTERLINE
 - PROPOSED CURB AND GUTTER
 - HILLSIDE OVERLAY ZONE LIMIT
 - HILLSIDE OVERLAY ZONE DISTURBANCE AREA BOUNDARY
 - ROCKFALL HAZARD LIMIT
 - EXISTING CONTOUR LINE
 - PROPOSED CONTOUR LINE

EARTHWORK

CUT: 42,381 C.Y. FILL: 171,438 C.Y. NET: 129,057 C.Y.* (F)

* ALL EARTHWORK VOLUMES ARE NOT ADJUSTED FOR SHRINKAGE AND ARE FOR ESTIMATING PURPOSES ONLY. THEY REPRESENT THE DIFFERENCE BETWEEN EXISTING AND FINISH GRADE SURFACES. CONTRACTOR IS RESPONSIBLE FOR ALL FINAL VOLUMES.



NO.	DESCRIPTION	DATE	APP'D.

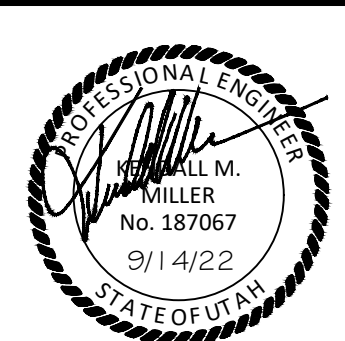
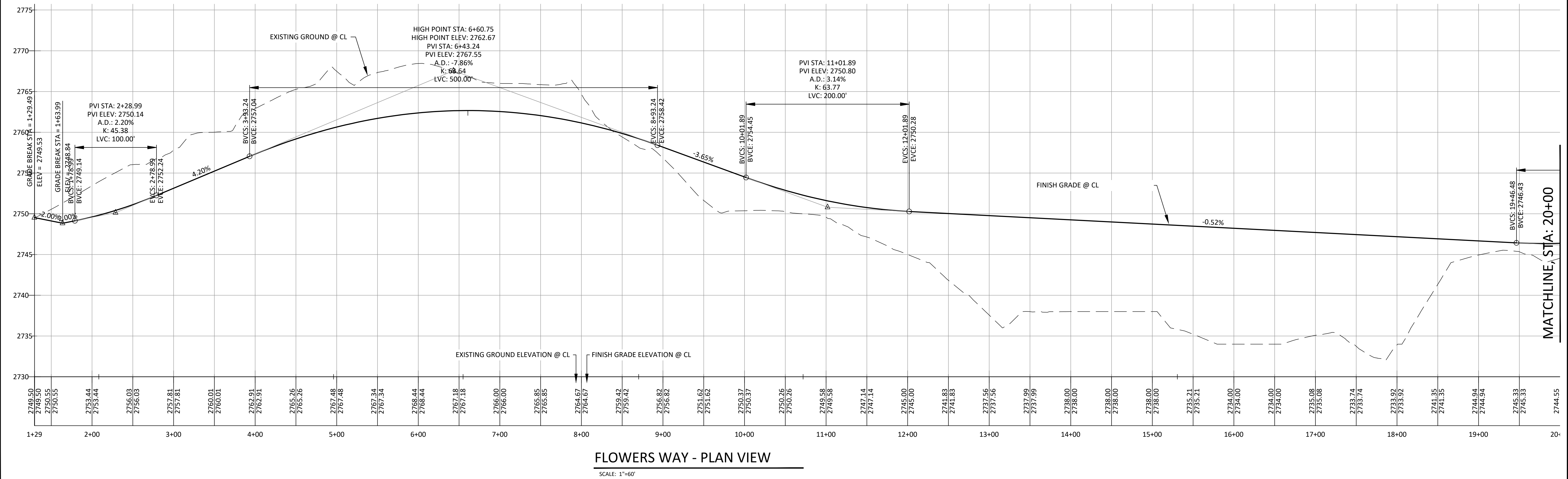
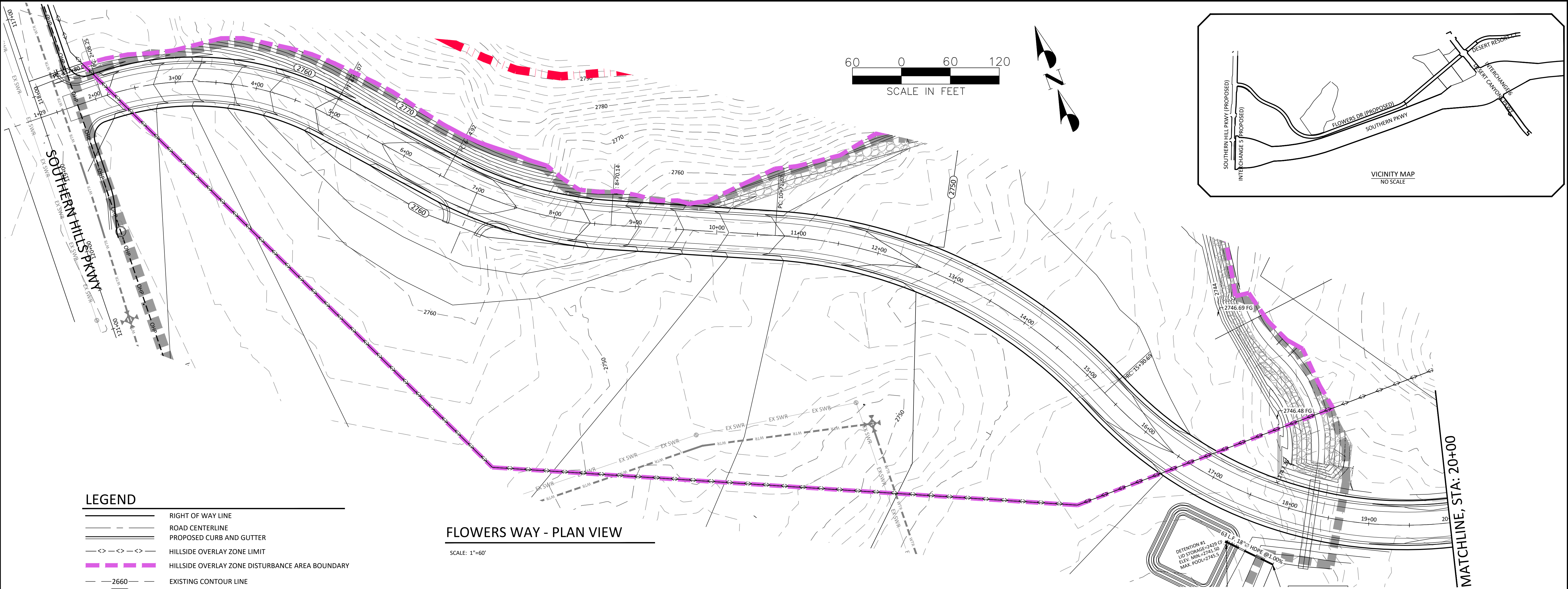
PROJECT NAME: **FLOWERS DRIVE HILLSIDE OVERLAY ZONE**
ST. GEORGE, UTAH

SHEET NAME: **GRADING PLAN**

DEVELOPMENT SOLUTIONS, INC.
CIVIL ENGINEERS, LAND SURVEYORS, LAND PLANNERS,
120 East 200 North Suite #2
St. George, UT 84770
Office (435) 628-2121



DATE:	5-3-22
PM:	KMM
DRAWN BY:	KMM
DESIGNED BY:	KMM
CHECKED BY:	KM
PROJECT NO.:	20-022
SCALE:	1"=60'
SHEET NUMBER:	1



NO.	DESCRIPTION	DATE	APP'D.

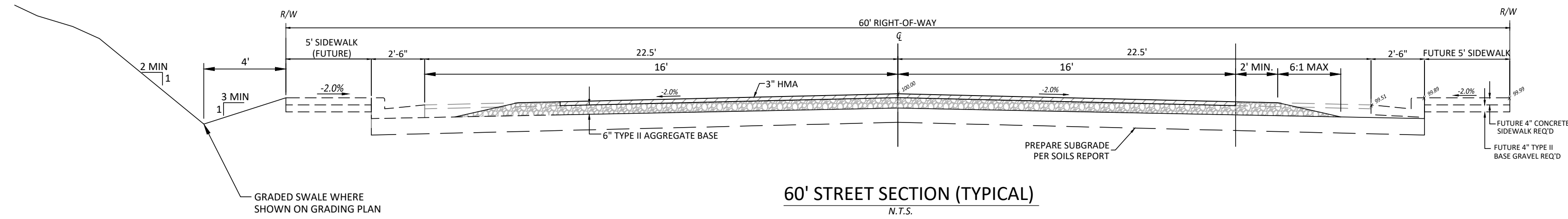
FLOWERS DRIVE
HILLSIDE OVERLAY ZONE
ST. GEORGE, UTAH

PLAN & PROFILE, STA: 1+29 TO 20+00

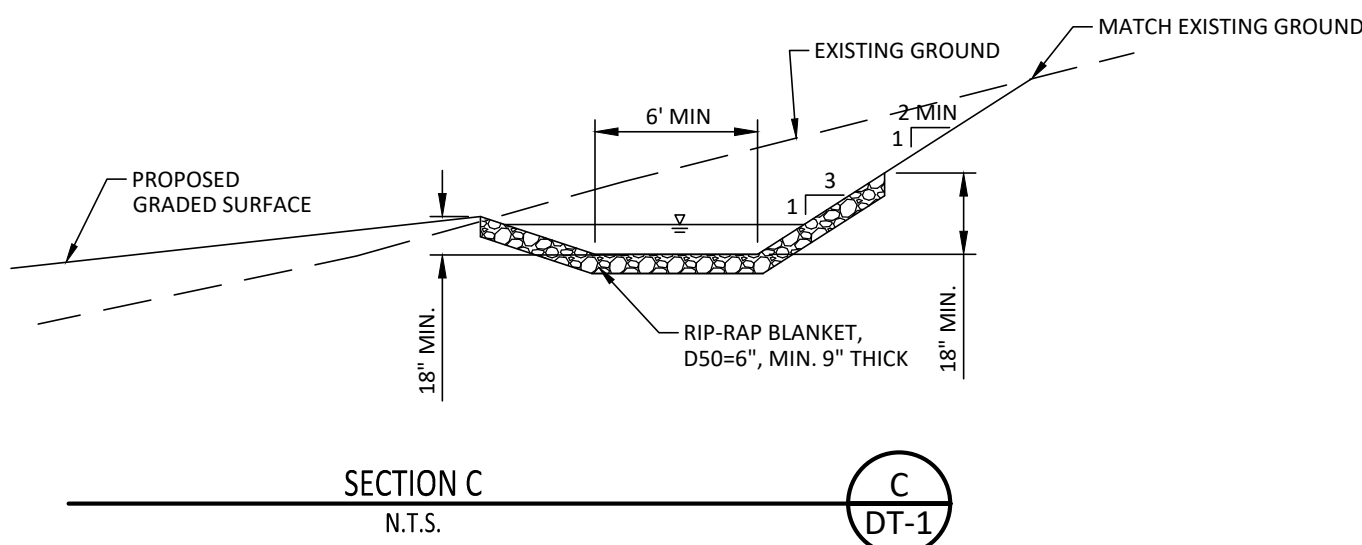
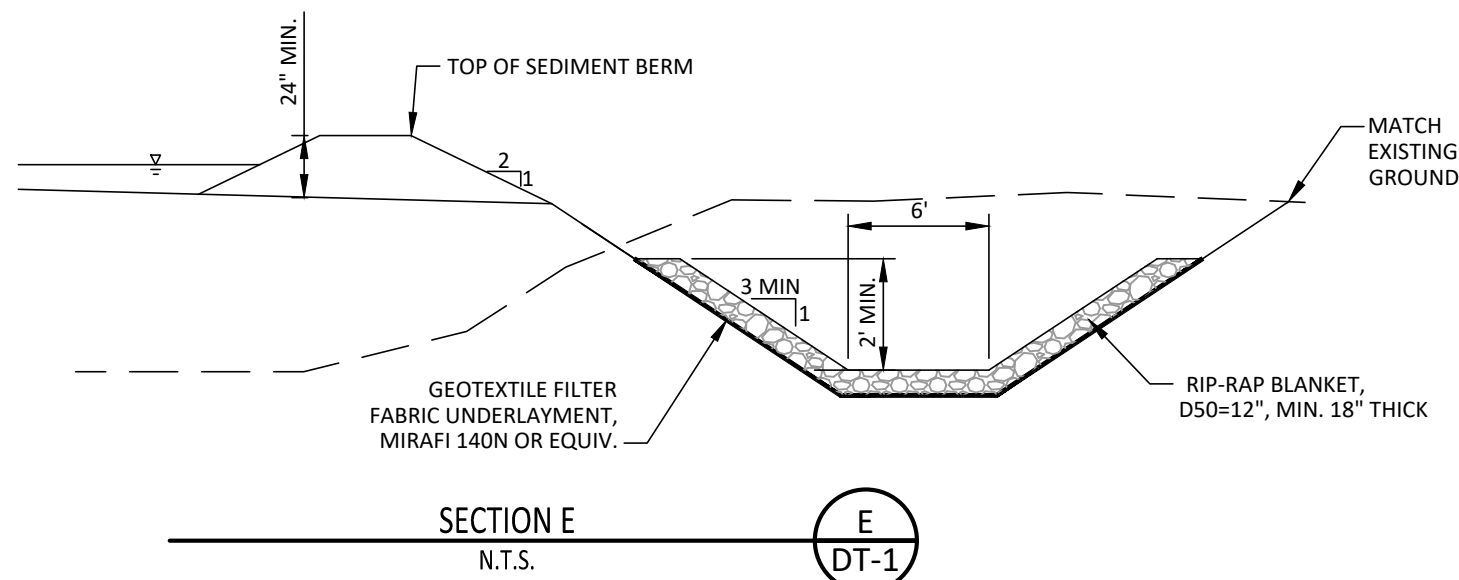
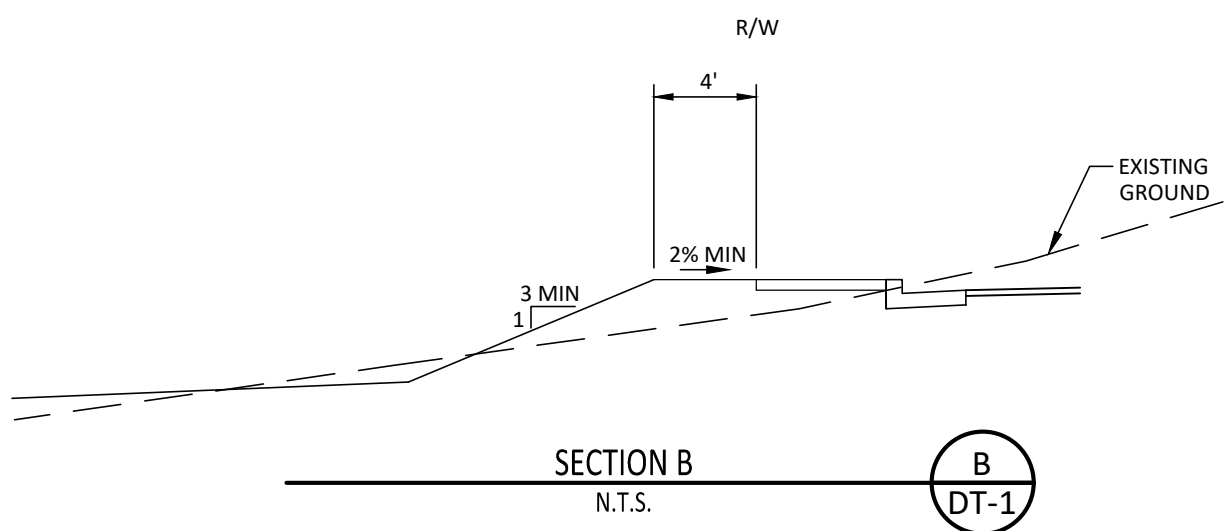
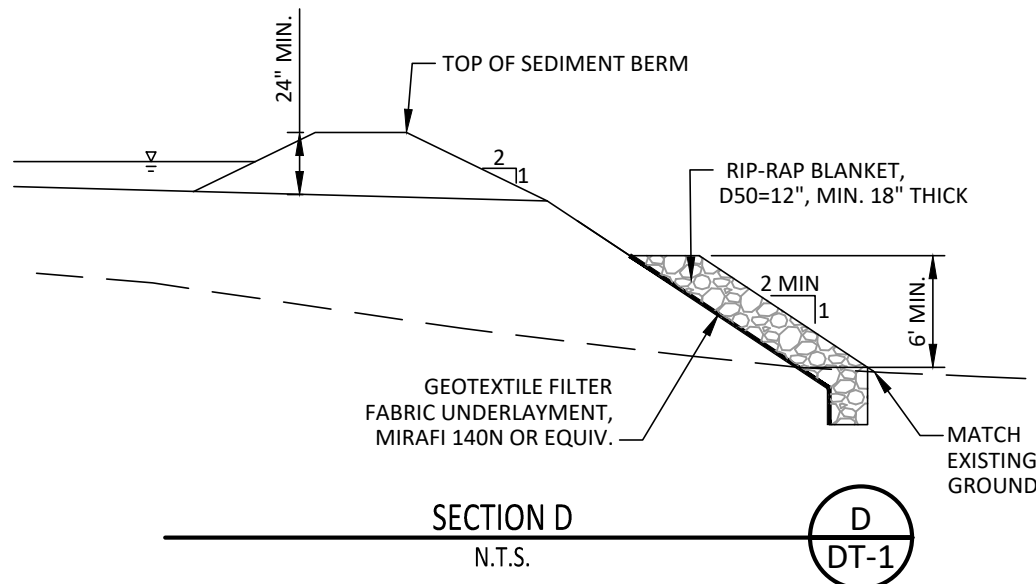
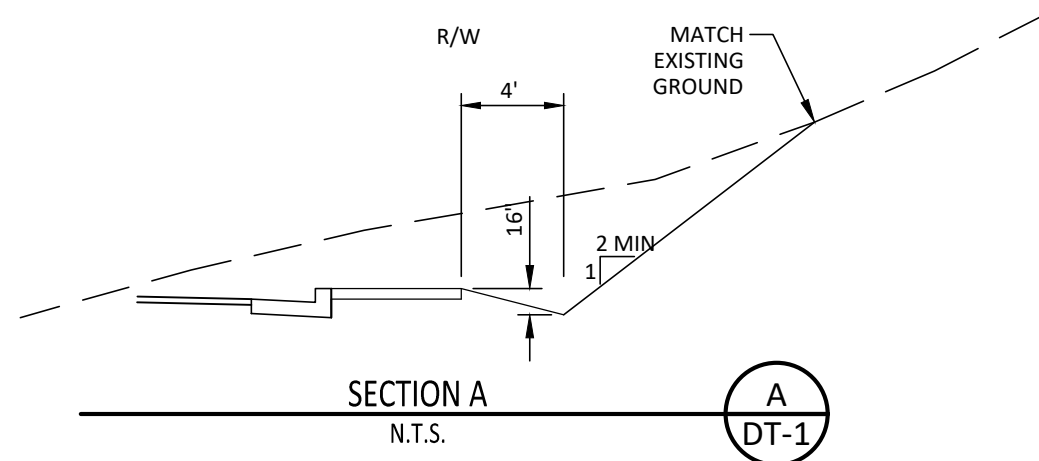
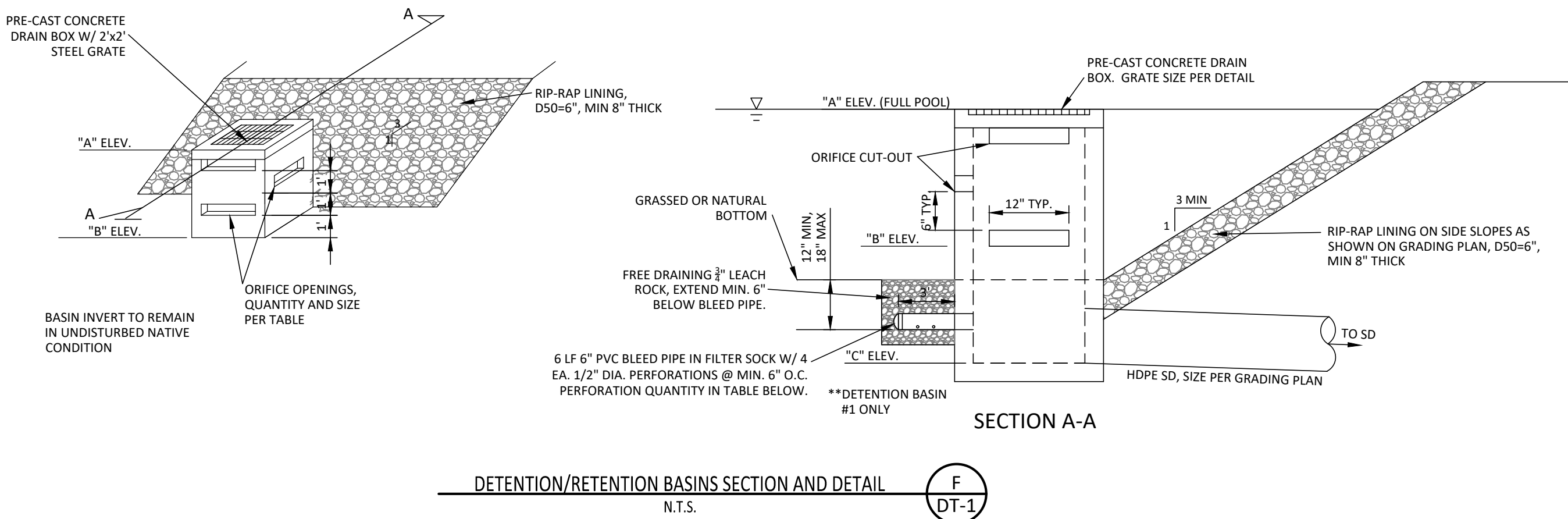
DEVELOPMENT SOLUTIONS, INC.
CIVIL ENGINEERS, LAND SURVEYORS, LAND PLANNERS,
120 East 200 North Suite #2
St. George, UT 84770
Office (435) 628-2121



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PROJECT NO.:	20-022
SCALE:	1"=60'
SHEET NUMBER:	2



DETENTION BASIN OUTLET TABLE									
DETENTION BASIN	ELEVATION TABLE (feet, MSL)			BASIN BOTTOM ELEV	# CUT-OUT LEVELS	CUT-OUTS PER LEVEL	CUT-OUT SIZE	VOLUME AT FULL POOL (CF)	LID VOLUME (CF)
	"A"	"B"	"C"						
1	2745.5	2742.5	2740.0	2741.5	3		6" H x 12" W	9,148	4860
2	2742.0	2739.0	2737.0	2738.0	3	1	4" H x 10" W	9,148	980

[illegible]

PROJECT NAME: DESERT CANYONS/SOUTHERN HILLS EAST
NORTH FRONTAGE ROAD

SHEET NAME: SECTIONS AND DETAILS

EVELOPMENT SOLUTIONS, INC.
CIVIL ENGINEERS, LAND SURVEYORS, LAND PLANNERS,
120 East 200 North Suite #2
St. George, UT 84770
Office (435) 628-2121



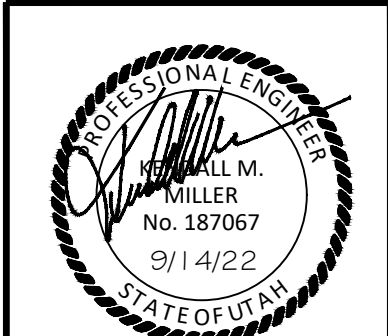
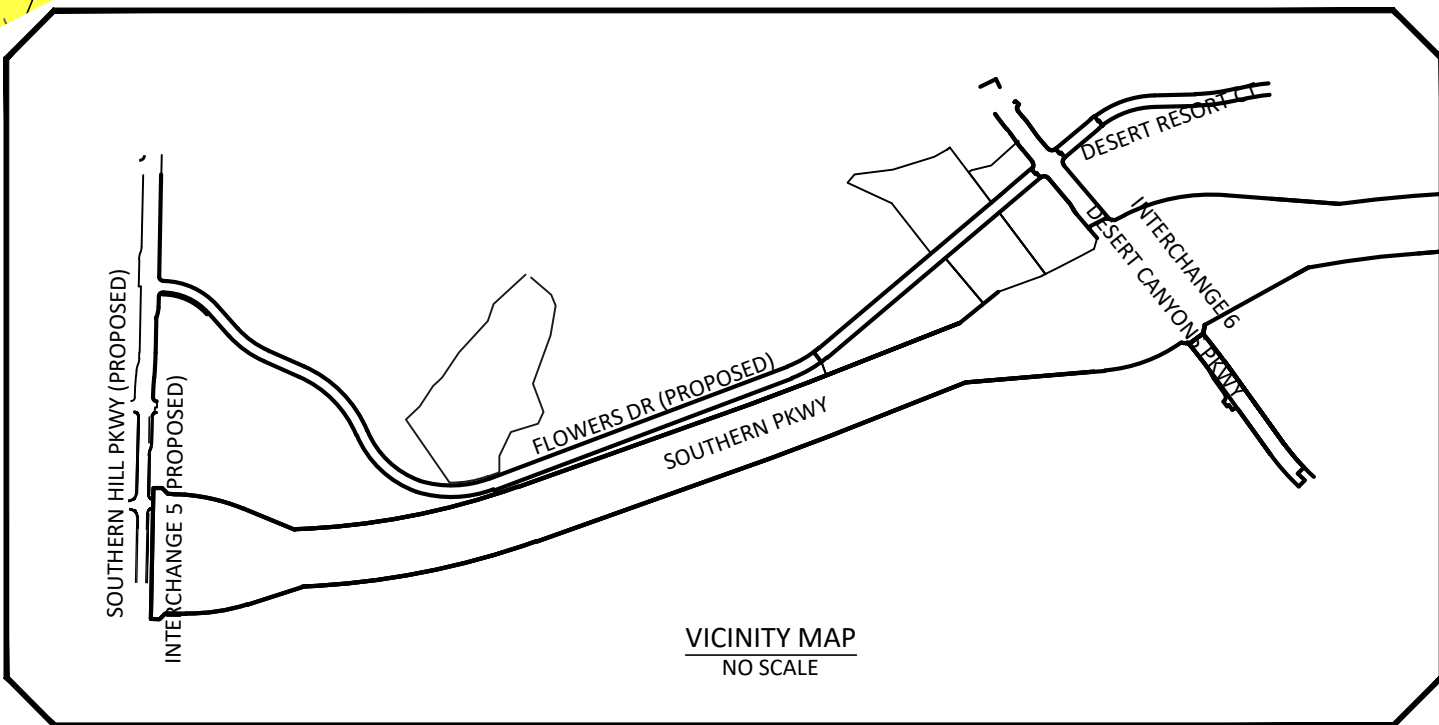
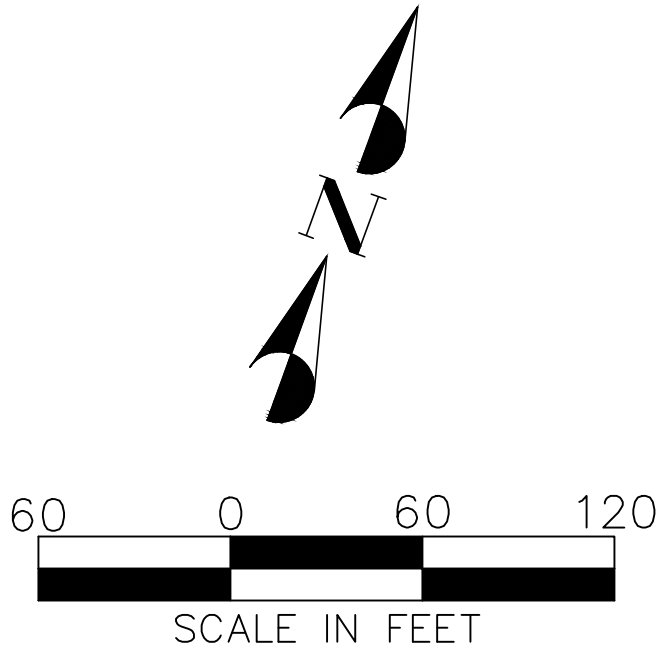
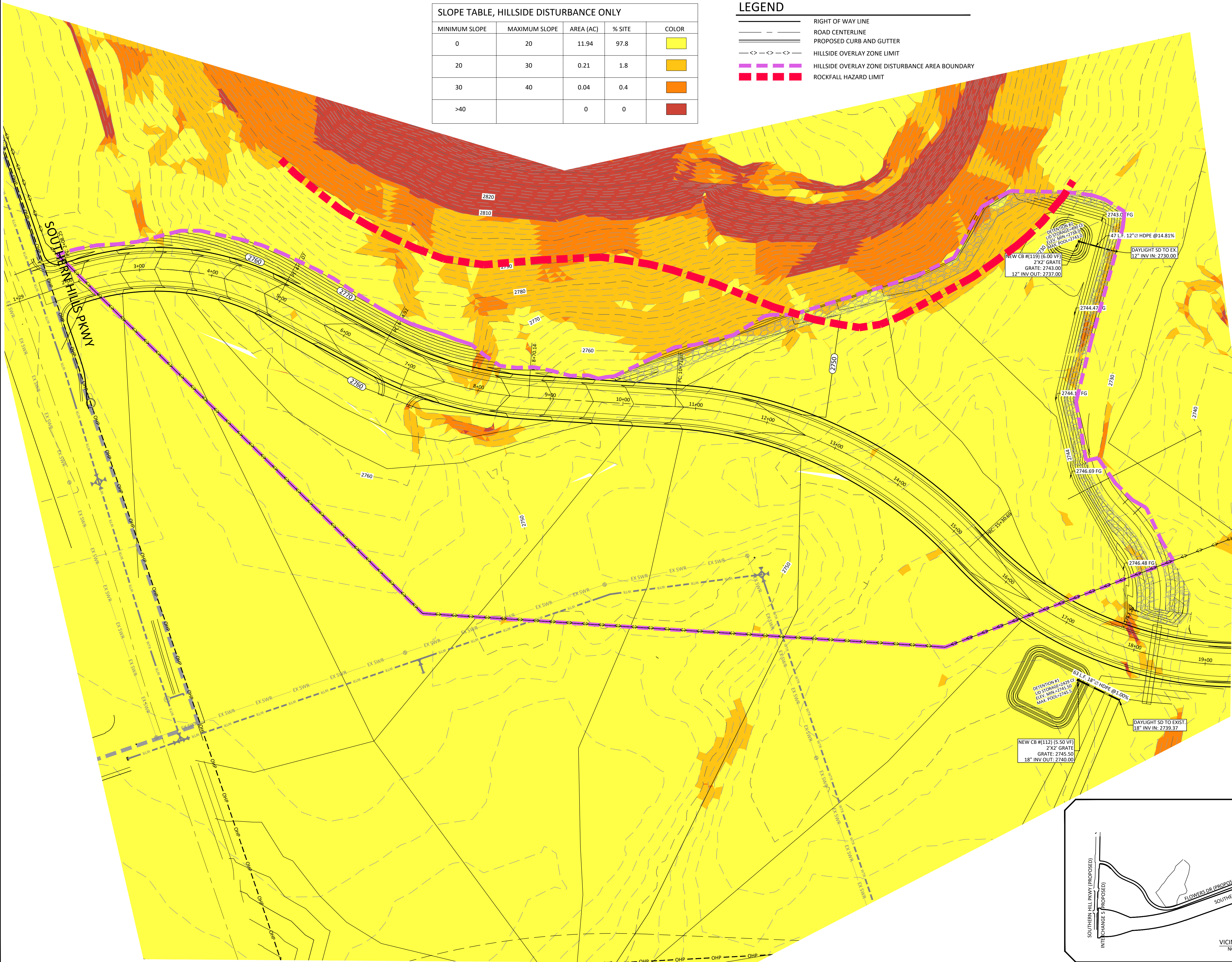
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PROJECT NO. :	22-002
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DT-1

SLOPE TABLE, HILLSIDE DISTURBANCE ONLY				
MINIMUM SLOPE	MAXIMUM SLOPE	AREA (AC)	% SITE	COLOR
0	20	11.94	97.8	
20	30	0.21	1.8	
30	40	0.04	0.4	
>40		0	0	

- LEGEND
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 - PROPOSED CURB AND GUTTER
 - HILLSIDE OVERLAY ZONE LIMIT
 - HILLSIDE OVERLAY ZONE DISTURBANCE AREA BOUNDARY
 - ROCKFALL HAZARD LIMIT



PROJECT NAME	DESCRIPTION	DATE	APP'D
DESERT CANYONS NORTH FRONTAGE RD HILLSIDE OVERLAY ZONE			

PROJECT NAME	SHEET NAME
DESERT CANYONS NORTH FRONTAGE RD HILLSIDE OVERLAY ZONE	SLOPE MAP

DEVELOPMENT SOLUTIONS, INC.
CIVIL ENGINEERS, LAND SURVEYORS, LAND PLANNERS,
120 East 200 North Suite #2
St. George, UT 84770
Office (435) 628-2121



DATE :	5-3-22
PM :	KMM
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DESIGNED BY :	KMM
CHECKED BY :	KM
PROJECT NO. :	20-022
SCALE :	1"=60'
SHEET NUMBER :	



January 3, 2023

DSG Engineering, Inc.
113 East 200 North, Suite 2
Saint George, UT 84770

Attention: Ken Miller
EMAIL: ken@dsgcivil.com

Subject: Reconnaissance-level Geologic-hazards Study
Proposed Flowers Drive
St George, Utah
Project No. 2222009

Mr. Miller:

Applied Geotechnical Engineering Consultants was requested to perform a reconnaissance-level geologic-hazards study for the proposed Flowers Drive to be constructed in St George, Utah.

PURPOSE AND SCOPE OF INVESTIGATION

This letter presents the results of a reconnaissance-level geologic-hazards study for the proposed road. The study was conducted to identify potential geologic hazards that may affect the proposed road development. The hazards evaluated are surface fault rupture, landslide, rockfall, debris flow and liquefaction. The study included a review of geologic literature, aerial photographs, site reconnaissance and geologic analysis. This report has been prepared to summarize the data obtained during the study and to present our conclusions and recommendations.

PROPOSED CONSTRUCTION

We understand that Flowers Drive will be constructed at the approximate location indicated on Figure 2. The road will encroach on the Hillside Overlay Zone. The road has a 60-foot right of way and will be paved with asphalt. It will have curbs, gutters and sidewalks.

SITE DESCRIPTION

At the time of our site visit, there were no permanent structures or pavement on the site. The property consists of undeveloped land. There are cliffs above the site to the north composed of conglomerate.

The ground surface of the area slopes gently to steeply with near vertical cliffs above the site.

Vegetation consists of a sparse coverage of grass and brush.

The surrounding areas are currently undeveloped land similar to the site.

OFFICE METHODS OF INVESTIGATION

Geologic conditions at the site were evaluated by a review of geologic literature and aerial photographs. Aerial photographs used during the investigation were obtained from Bowman and others (2011). The low-sun-angle aerial photographs reviewed are from 1982 to 1983 with numbers of 810941-AM-5-2A and 3A.

A. Geologic Literature Review

The site is located in the area of transition from the east side of the Basin and Range Province and west side of the Colorado Plateau Province (Hayden and Willis, 2011). The site is underlain by the Upper Red Member of the Moenkopi Formation, which consists of siltstone and sandstone with gypsum beds and stringers. The cliffs above the site are part of the Shinarump Conglomerate Member of the Chinle Formation, which consists of well-indurated sandstone and conglomerate.

The bedrock in the area dips down at approximately 5 degrees to the east.

There are no active faults mapped in the area (Utah Geological Survey, 2022). The closest potentially active fault trace to the site is that of the Washington Fault located approximately 3 miles to the east.

B. Aerial Photograph Lidar Review

Based on review of the aerial photographs, there is no evidence of lineations that would be consistent with fault scarps and no evidence of landslide deposits or debris flow deposits on the property. There is evidence of rocks related to rockfall along the slope below the cliffs, though there is no evidence that the rocks representing active rockfall have reached the area planned for Flowers Drive.

C. Seismicity

The property is located in the Intermountain Seismic Zone, which consists of an area of relatively high historical seismic activity. The most intense seismic ground shaking at the site is expected to originate from the Washington or possibly the Hurricane fault zones in this area. The Washington and Hurricane fault zones are considered capable of producing large-magnitude earthquakes and can result in significant seismic ground shaking at the site. The US Geological Survey data indicate that a peak ground acceleration of 0.29g can be expected to have a 2 percent probability of being exceeded in a 50-year time period at this site (ICC, 2017).

D. Liquefaction Potential

Based on our understanding of the geology of the area with shallow depth to bedrock and a water likely more than 50 feet below the ground surface, liquefaction is not considered a hazard at this site.

FIELD METHODS OF INVESTIGATION

A site visit was made by a geologist from AGECE. The site shows no evidence of recent landslide activity, debris flow or scarps associated with fault rupture. There are rocks on the ground surface north of the proposed road alignment that represent rocks that have detached from the cliff faces and rolled down slope to near the rockfall limit line shown on Figure 2. There are rocks south of this line that appear to have a similar origin but are mostly buried and likely represent significantly older rockfall events.

ROCKFALL EVALUATION

A site visit was made on December 8, 2022. Source boulders for rockfall hazard originate from the outcrops of conglomerate north of the site. Potential rockfall rocks are up to approximately 5 feet in size. They are primarily angular rocks weathering from the cliffs above the site.

Reconnaissance of the rockfall source area finds that there are numerous rocks that could potentially dislodge from the cliffs above the site.

We identified the extent of rocks that appear to represent rocks that have dislodged from the cliff face above the site in recent times and located these on the site plan. We also developed two ground profiles of the slope from the top of the cliffs, down the slope to the south of the cliffs. We have assumed a shadow angle of 20 degrees in selecting the rockfall hazard area on Figure 1, which has been found to provide a reasonable estimate for rock runout for the St. George area. The rocks identified in the field are upslope of the shadow angle line, consistent with the shadow angle selected. The approximate area of rockfall hazard is presented on Figure 1. The road is not planned to encroach on the rockfall hazard zone.

CONCLUSIONS AND RECOMMENDATIONS

Surface fault rupture, landslide, rockfall, debris flow and liquefaction are not considered to be significant hazards for the proposed road.

Note that rockfall is not currently a hazard at the site but could be produced if slopes are steeped more than about 1 ½ horizontal to 1 vertical below boulders exposed at the ground surface or may become exposed with excavation. We can review the site conditions at the time of construction to determine if rockfall becomes a concern during grading activities. Rocks that may become a concern could be removed from the slope to mitigate the hazard.

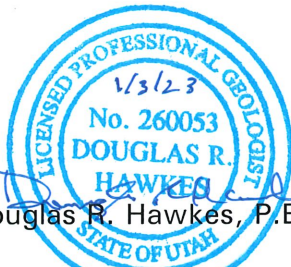
LIMITATIONS

This study was performed in accordance with generally accepted engineering geology practices for the area. The findings of the study are based on published geologic maps, review of aerial photographs and our interpretation of geologic conditions at the site.

If you have questions or we can be of further service, please call.

Sincerely,

APPLIED GEOTECHNICAL ENGINEERING CONSULTANTS, INC.



Douglas R. Hawkes, P.E., P.G.

Reviewed by James E. Nordquist, P.E.
DRH/rs

Enclosures

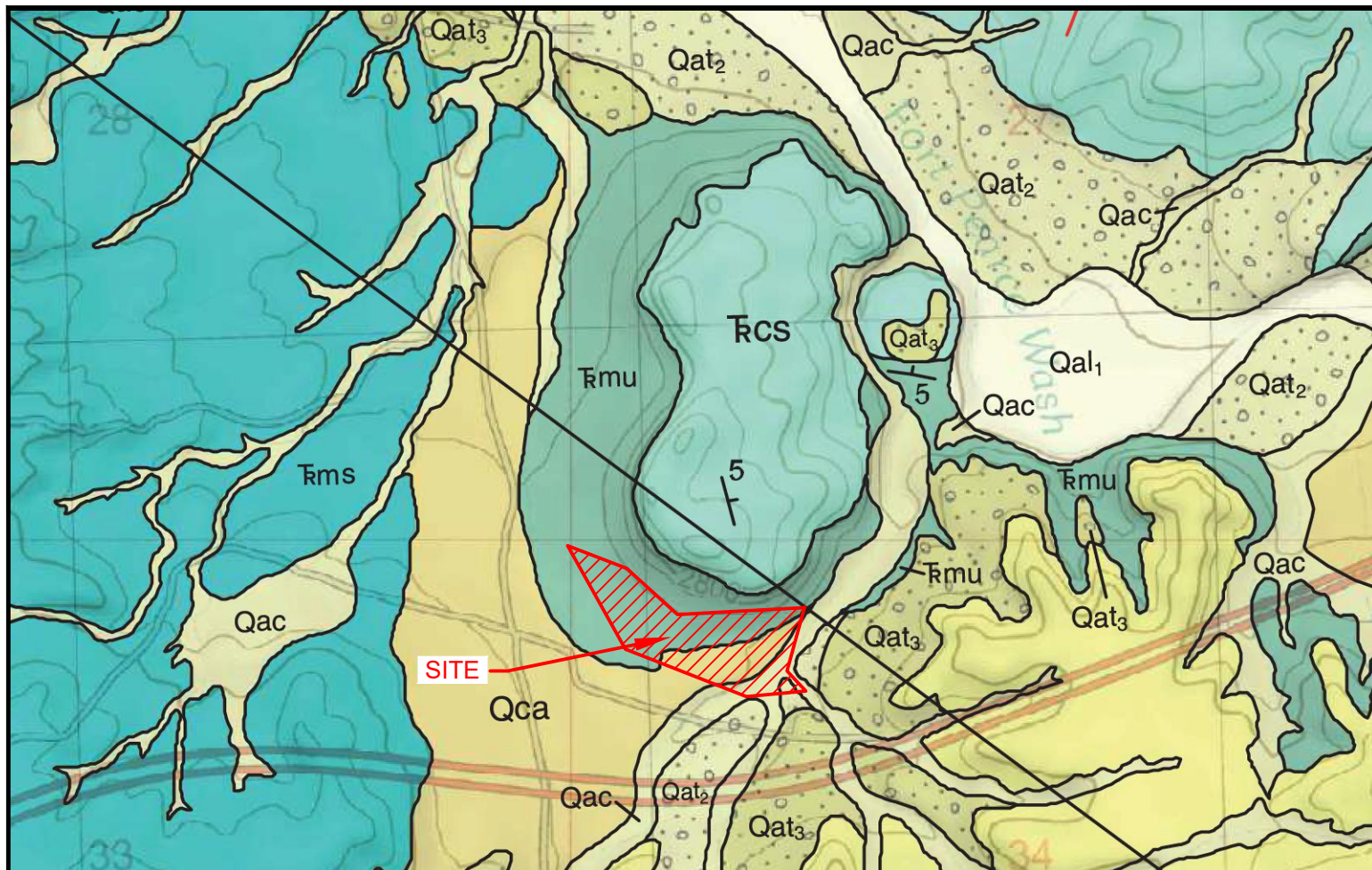
REFERENCES

Bowman, S.D., Young, B.W. and Unger, C.D., 2011; Compilation of 1982-1983 seismic safety investigation reports of eight SCS dams in southwestern Utah (Hurricane and Washington fault zones) and low-sun-angle aerial photography, Washington and Iron Counties, Utah, and Mohave County, Arizona, Utah Geological Survey Open-file Report 583.

Hayden, J.M. and Willis, G.C., 2011; Geologic map of the St George 7.5' quadrangle, Washington County, Utah, Utah Geological Survey Map 251DM.

International Code Council, 2017, 2018; International Building Code, Falls Church, Virginia.

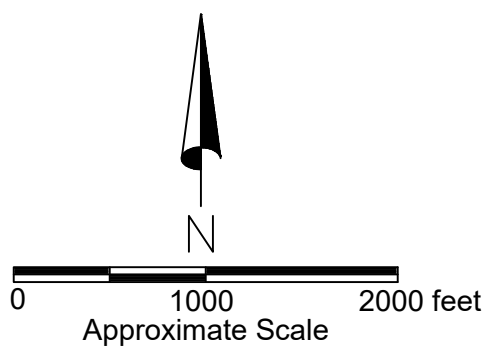
Utah Geological Survey, 2022; Utah Geologic Hazard Portal accessed December 20, 2022 at <https://geology.utah.gov/apps/hazards/>.



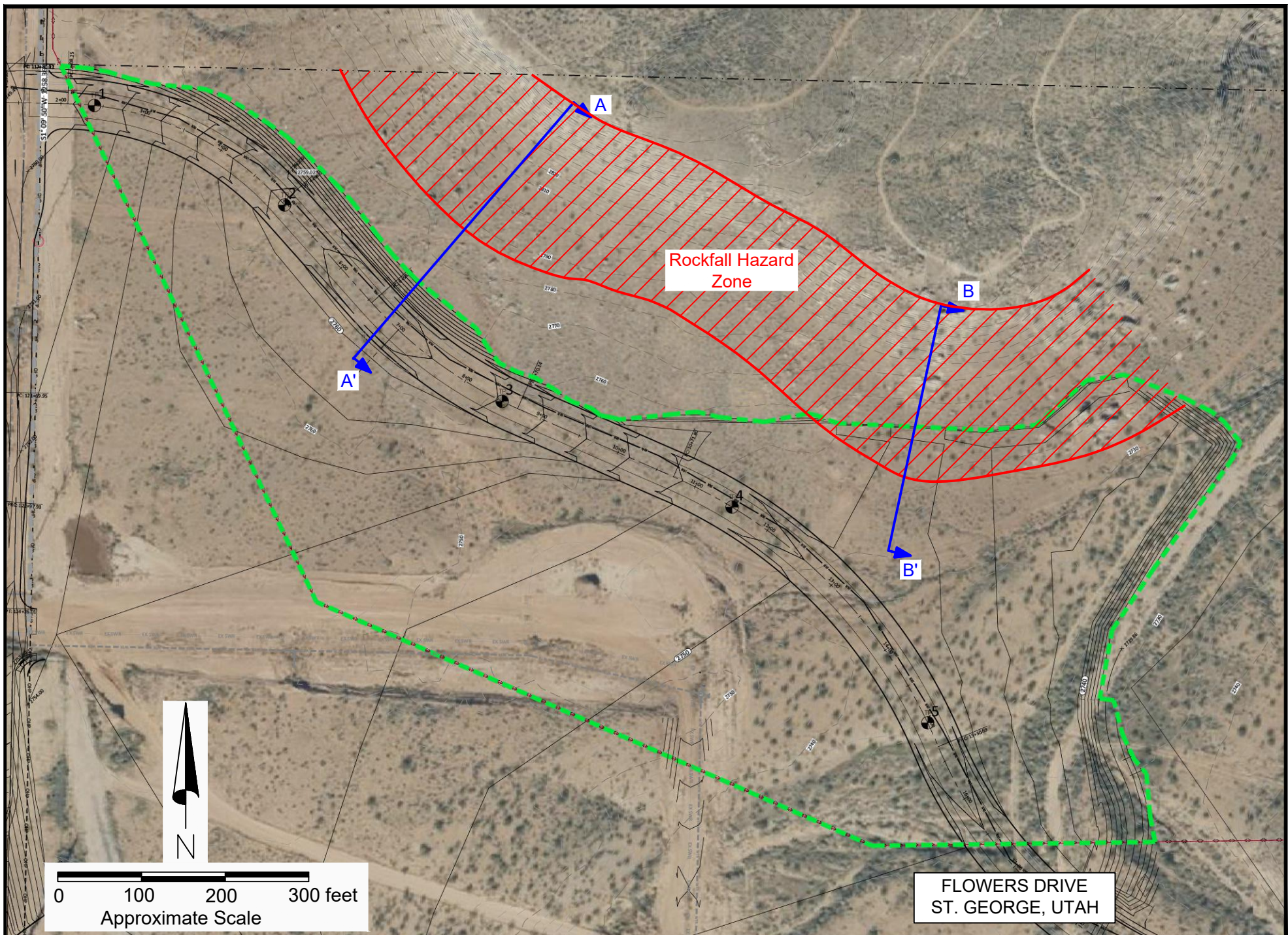
from Hayden and Willis (2011)

EXPLANATION OF SYMBOLS AND GEOLOGIC UNITS IN AREA OF PROPOSED DEVELOPMENT

- Qac - Mixed alluvial and colluvial deposits (Holocene to upper Pleistocene).
- Qca - Mixed colluvial and alluvial deposits (Holocene to middle Pleistocene).
- Qat₂ - Level 2 alluvial-terrace deposits (Holocene to lower Pleistocene).
- Qat₃ - Level 3 alluvial-terrace deposits (lower Pleistocene).
- Tcs - Shinarump Conglomerate Member of the Chinle Formation (upper Triassic).
- Tmu - Upper red member of the Moenkopi Formation (lower Triassic).
- — — Geologic contact between units, dashed where approximate.
- 5
|
— Strike and dip of bedding.



FLOWERS DRIVE
ST. GEORGE, UTAH

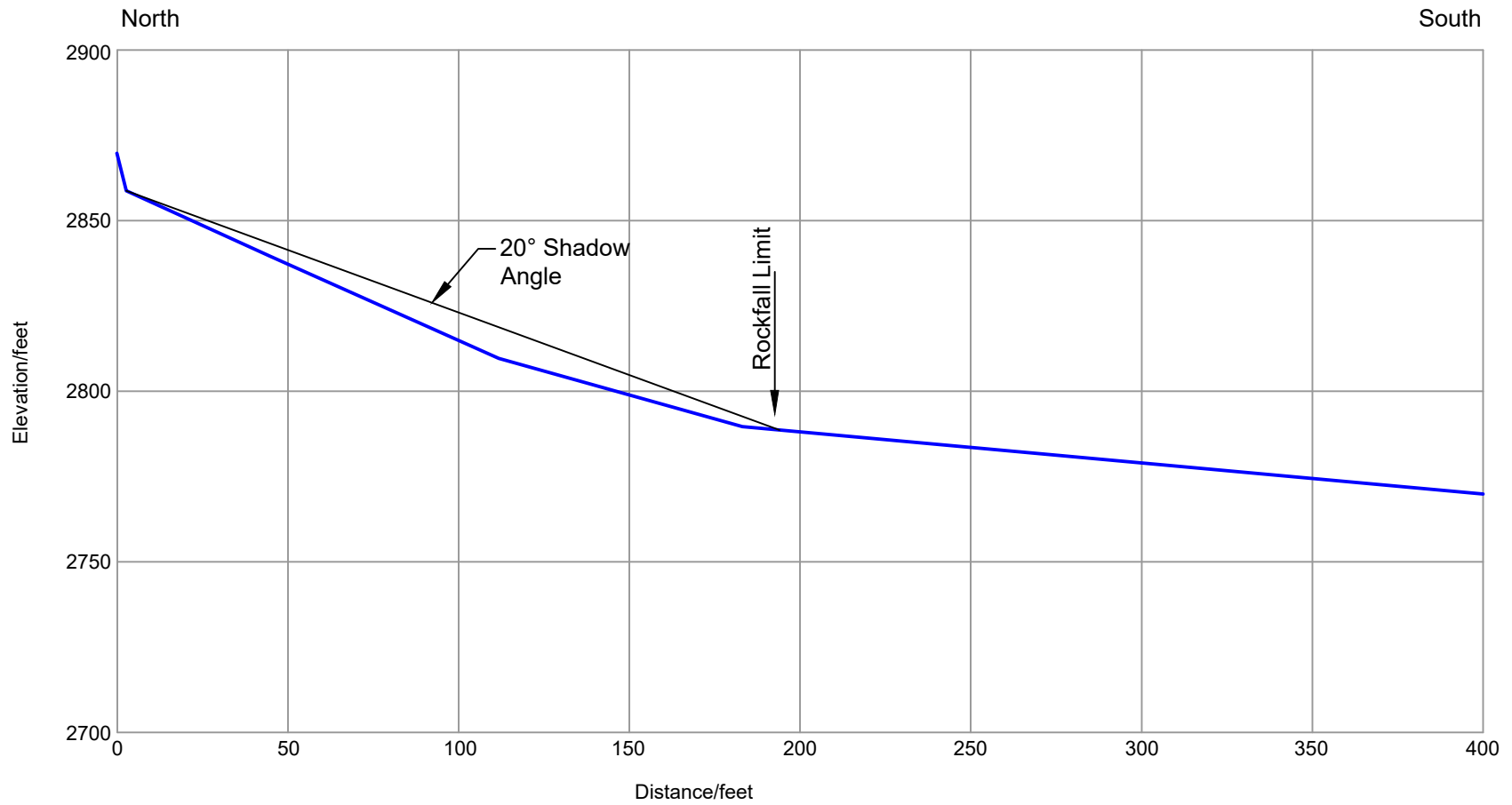


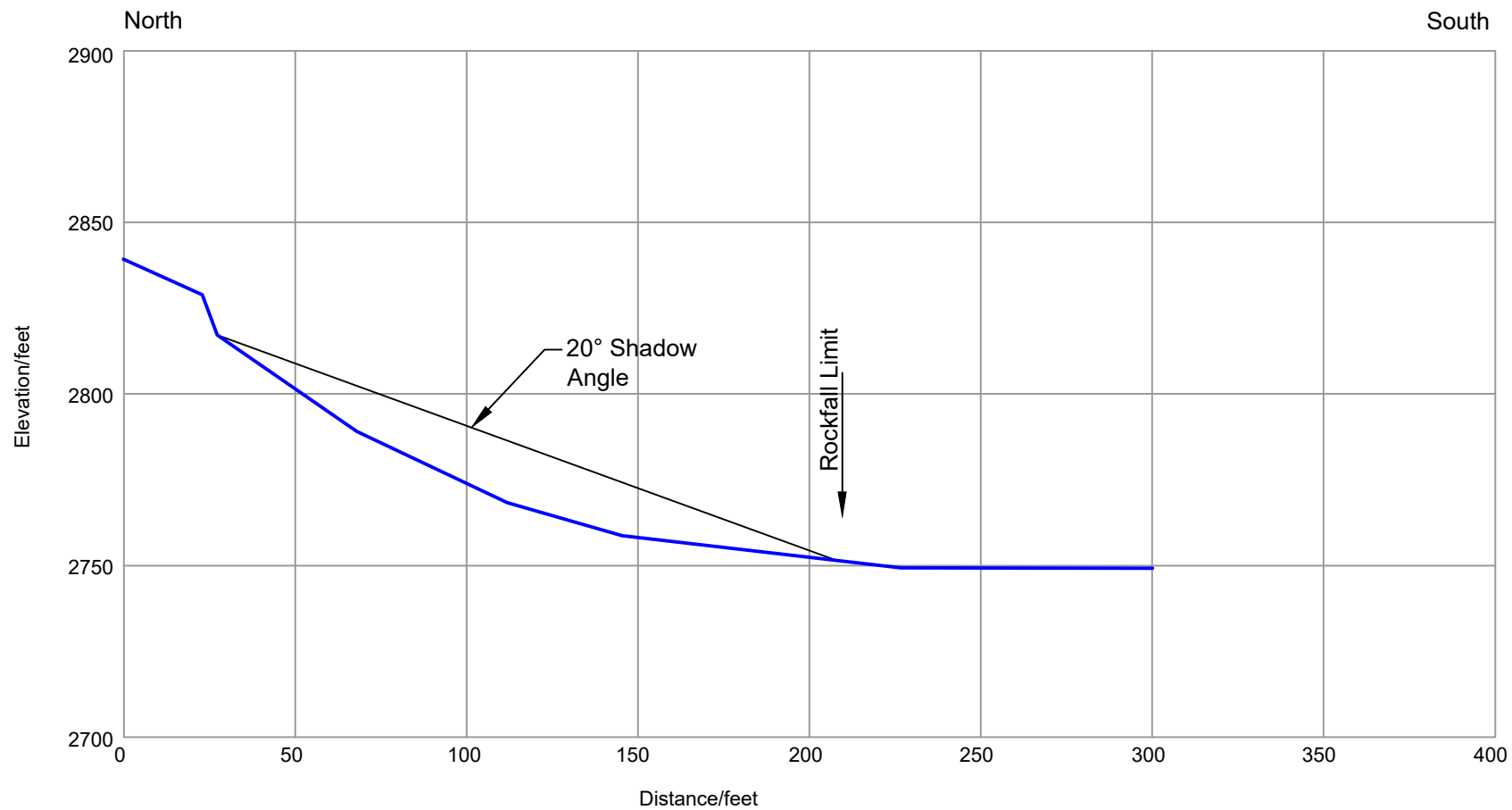
2222009

AGEC

Rockfall Hazard Zone and Profile Locations

Figure 2







December 9, 2022

DSG Engineering, Inc.
113 East 200 North, Suite 2
St. George, Utah 84770

Attention: Ken Miller, P.E.
email: ken@dsgcivil.com

Subject: Geotechnical Recommendations
Flowers Drive
St. George, Utah
AGEC Project No. 2222009

Reference: 1. "Flowers Drive Hillside Overlay Zone, Grading Plan", by DSG Engineering, Inc., dated Mar 3, 2022, Project No. 20-022.

Applied Geotechnical Engineering Consultants, Inc. (AGEC) was requested to conduct a subsurface investigation and provide geotechnical recommendations for the design and construction of the proposed Flowers Drive in St. George, Utah as shown on Figure 1.

SITE CONDITIONS

The alignment is located from the proposed Southern Hills Parkway extending east along the base of an hillside to the east approximately 1,800 feet as shown on Figures 1 and 2. The area is undeveloped and covered in sparse native grass and desert brush. The hillside above the western portion has a rock cap above which may present some rockfall hazard to the road. The area is surrounded by undeveloped property with the Southern Parkway further to the south.

SUBSURFACE SOIL CONDITIONS

The subsurface profile observed within the test pits excavated along the roadway alignment consists of near surface silty sand to sandy silt and silty clay with sand underlain by shale and sandstone bedrock. Silty gravel with sand was observed below the near surface sand in Test Pit TP-7. Practical excavator refusal was encountered on sandstone bedrock in Test Pits TP-2 through TP-4 and TP-6 at depths ranging from 4 to 6 feet below the existing grade. The test pits were excavated with a large track-mounted excavator.

Descriptions of the soil and bedrock type encountered follow:

Silty Clay with Sand - The silty clay with sand is medium stiff to stiff, dry to slightly moist, porous, contains roots and is brown to reddish brown in color.

Laboratory tests conducted samples of the silty clay indicate an in-place moisture content of 2 percent, an in-place dry density of 89 pounds per cubic foot (pcf), gravel contents (percent retained on the No. 4 sieve) ranging from 3 to 8 percent and fines contents (percent passing the No. 200 sieve) ranging from 78 to 83 percent. An Atterberg Limits test completed on the clay indicates a Liquid Limits of 23 percent and a Plasticity Index of 5 percent. A California Bearing Ratio test completed on a sample of the silty clay with sand indicates a CBR value of 6 percent.

A moisture-density relationship (Modified Proctor) test conducted on a sample of the silty clay with sand indicates a maximum dry density of 114.5 pcf and an optimum moisture content of 12.0 percent.

Silty Sand to Sandy Silt - The silty sand to sandy silt contains varied amounts of gravel. It is loose near the surface to dense with depth (in TP-7). It is dry to slightly moist, contains roots on the upper 1 to 3 feet, porous near the surface and reddish brown in color.

Laboratory tests conducted on samples of the silty sand to sandy silt indicate an in-place moisture content of 4 percent, in-place dry densities ranging from 87 to 102 pcf, gravel contents ranging from 0 to 19 percent and fines contents ranging from 43 to 60 percent.

Silty Gravel with Sand - The silty gravel with sand is dense, dry and reddish brown in color.

Shale Bedrock - The shale bedrock is soft to moderately hard, weathered and fractured, dry, low to medium plastic and reddish brown in color. It also contains grey layers.

Laboratory tests conducted on samples of the shale bedrock indicate an in-place moisture contents ranging from 3 to 6, in-place dry densities ranging from 107 to 148 pcf and fines contents ranging from 88 to 98 percent. An Atterberg Limits test indicates a Liquid Limits of 26 percent and a Plasticity Index of 7 percent.

Sandstone Bedrock - The sandstone bedrock is hard, dry and greyish brown in color.

The Logs of Test Pits are shown on Figure 3. The Legend and Notes to Test Pits are shown on Figure 4. Laboratory test results are also shown on Figure 3 and are summarized in the Summary of Laboratory Test Results, Table 1. The Gradation and Moisture-Density Relationship Results (Proctor) are shown graphically on Figure 5. The CBR results are shown on Figure 6.

SUBSURFACE WATER

Subsurface water was not encountered in the test pits excavated to the maximum depth investigated, approximately 11½ feet below the existing grade. Fluctuations in the groundwater level may occur over time. An evaluation of such fluctuations is beyond the scope of this report.

PROPOSED CONSTRUCTION

We understand that the proposed alignment for Flowers Drive will be a 60 foot right of way (ROW). The pavement section will be designed using a Traffic Index of 5.5 in accordance with St. George City Specifications. The roadway will be constructed with asphaltic concrete pavement underlain by approved city spec base course. The roadway will also include concrete sidewalk and curb and gutter.

A preliminary grading plan provided by DSG Engineering, Inc. indicates cuts up to approximately 12 feet along the base of the uphill slope and fills on the order of 2 to 5 feet on the downslope side of the road. A riprap lined drainage swale will also be constructed along the base of the slope to capture and direct surface water. The existing wash near the east end of the project will also be re-shaped with a berm constructed above the wash along the west side. It will also be lined with rock riprap.

RECOMMENDATIONS

Based on our experience in the area, the information from the referenced report and the proposed construction, the following recommendations are given:

A. Site Grading

1. Subgrade Preparation

Prior to placing fill, the site should be grubbed and overexcavated to remove the near surface loose, dry soil as shown in the following table and on Figure 3:

Area	Depth
Grubbing (entire project site)	2 to 3 inches
Pavement and Flatwork	½ to 4 feet

The excavations should extend at least 5 feet beyond the perimeter of the proposed building and flatwork. Subsequent to grubbing and overexcavation and prior to placing fill, concrete or pavement, the exposed subgrade scarified to a depth of 8 inches, properly moisture conditioned and compacted to at least 90 percent of the maximum dry density as determined by ASTM D-1557. The removed soil may be replaced in properly moisture conditioned and compacted lifts.

2. Excavation

Excavation of the on-site soil and the soft shale bedrock at the site may be accomplished with typical excavation equipment. The hard sandstone bedrock will be difficult to excavate and will require a large trackhoe equipped with rock teeth or a single ripper tooth. A rock hammer may also be necessary to excavate the sandstone.

3. Grading Slopes and Trenches

The following table summarizes recommendations for excavation of permanent cut slope excavations, temporary trench excavations (OSHA Guidelines) and permanent fill slope construction. Slopes should include benches in accordance with the 2018 IBC.

Slope Condition	Maximum Slope (Horizontal:Vertical)
Permanent Cut Slopes in Overburden Soils	2:1
Permanent Fill Slopes - Compacted fill	2:1
Utility Trenches in On-site Soils (OSHA Soil Class C)	1 ½ :1 *
Utility Trenches in Bedrock (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.

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.

4. Materials

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

Area	Fill Type	Recommendations
Foundations/slabs	Site grading/ structural fill	-200 < 35%, LL < 30 % Maximum size: 4 inches Solubility < 1 %
Parking	Base course	CBR > 60%, 200 < 12 % Maximum size: 1 inch
Underslab	Base course	-200 < 12 % Maximum size: 1 inch

-200 = Percent Passing the No. 200 Sieve
LL = Liquid Limit

The on-site soils, free of organics, debris, and material larger than 6 inches are suitable for use as site grading fill, wall backfill and utility trench backfill. The on-site bedrock is suitable for use as site grading fill, wall backfill and utility trench backfill provided it is processed such that the maximum particle size is 4 inches and at least 60 percent of the material passes the Number 4 sieve.

5. Compaction

Compaction of materials placed at the site should equal or exceed the following minimum densities when compared to the maximum dry density as determined by ASTM D-1557:

Area	Percent Compaction
Subgrade (on-site)	90
Site grading	95
Utility trenches	95
Pipe zone	90
Base course	95

To facilitate the compaction process, the fill should be moisture conditioned to within 2 percentage points of the optimum moisture content as determined by ASTM D-1557 prior to placement. Fill should be placed in loose lift thicknesses which do not exceed the capacity of the equipment being utilized. Generally, 6 to 8-inch loose lifts are adequate for large rubber tired or sheepfoot equipment. Lift thicknesses should be reduced to 4-inches for hand compaction equipment.

B. Soil Corrosion

Based upon our experience in the area, the on-site soils and many imported sources may contain sulfates 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) 318-14. Tables 19.3.1.1 and 19.3.2.1 of ACI 318-14 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.

C. Pavement

1. Analysis

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

- Base course that meets St. George City specifications which would correspond to a Structural Coefficient (a_2) of at least 0.12. Asphalt that provides a Structural Coefficient (a_1) of at least 0.40.
- Drainage Coefficient = 1.0.
- We anticipate the subgrade materials will be variable and consist of sandy clay. We have measured a CBR value of 6 percent for a properly prepared subgrade. Prior to placing base course or pavement area grading fill, the subgrade should be grubbed and prepared as recommended in the Subgrade Preparation section of this report. A M_R value of 9,000 pounds per square inch (psi) was used for the subgrade based upon the CBR value and the relationship between CBR and Resilient Modulus (M_R).
- Serviceability Index: $P_o = 4.2$, $P_t = 2.5$, therefore, $\Delta PSI = 1.7$.
- Reliability of 90 percent.
- Standard Deviation (S_o) = 0.45.

2. Subgrade Support

Our design assumes a properly prepared subgrade as recommended in the Subgrade Preparation section of this report. The subgrade preparation varies depending on the location on the site. Prior to placing base course or pavement or grading fill, the subgrade should be prepared as recommended in the Subgrade Preparation section of this report.

3. Traffic Loading

The following traffic Indexes were used in design of roadways:

Roadway	ROW (ft)	Traffic Index	Structural Number Required
Flowers Drive	60 foot - Residential Collector	5.5	1.59

4. Pavement Thickness

Based on the assumed traffic loadings and Washington City traffic indexes, a 20-year design life, and AASHTO design methods, the following pavement sections are recommended.

Roadway	Asphalt (in.)	Base Course (in.)	Structural Number Provided
Flowers Drive	3	6	1.8

5. Pavement Materials

The pavement materials should meet City of St. George specifications for gradation and quality. The pavement thicknesses indicated above assume that the base course is a high quality material with a CBR of at least 50 percent and the asphaltic concrete has a minimum Marshall stability of 1,800 pounds. Other materials may be considered for use in the pavement section. The use of other materials may result in other pavement material thicknesses.

6. 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.

D. **Construction Testing and Observations**

We recommend the following testing and observations be done as a minimum as required by the City of St. George.

1. Observe grubbing and removal of soil containing roots and organics.
2. Conduct compaction testing on fill placed below foundations and in building pads. We recommend testing each foot of fill placed.
3. Conduct construction materials testing on city improvements at a frequency which meets or exceeds St. George City requirements.

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 subsurface investigation, information from the reference report, 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.

If you have any questions or if we can be of further service, please call.

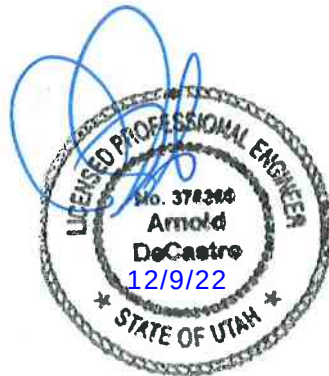
Sincerely,

APPLIED GEOTECHNICAL ENGINEERING CONSULTANTS, INC.

Arnold DeCastro, P.E.

Rev by JRH, P.E..

P:\2022 Project Files\2222000\2222009 - GT Desert Canyon



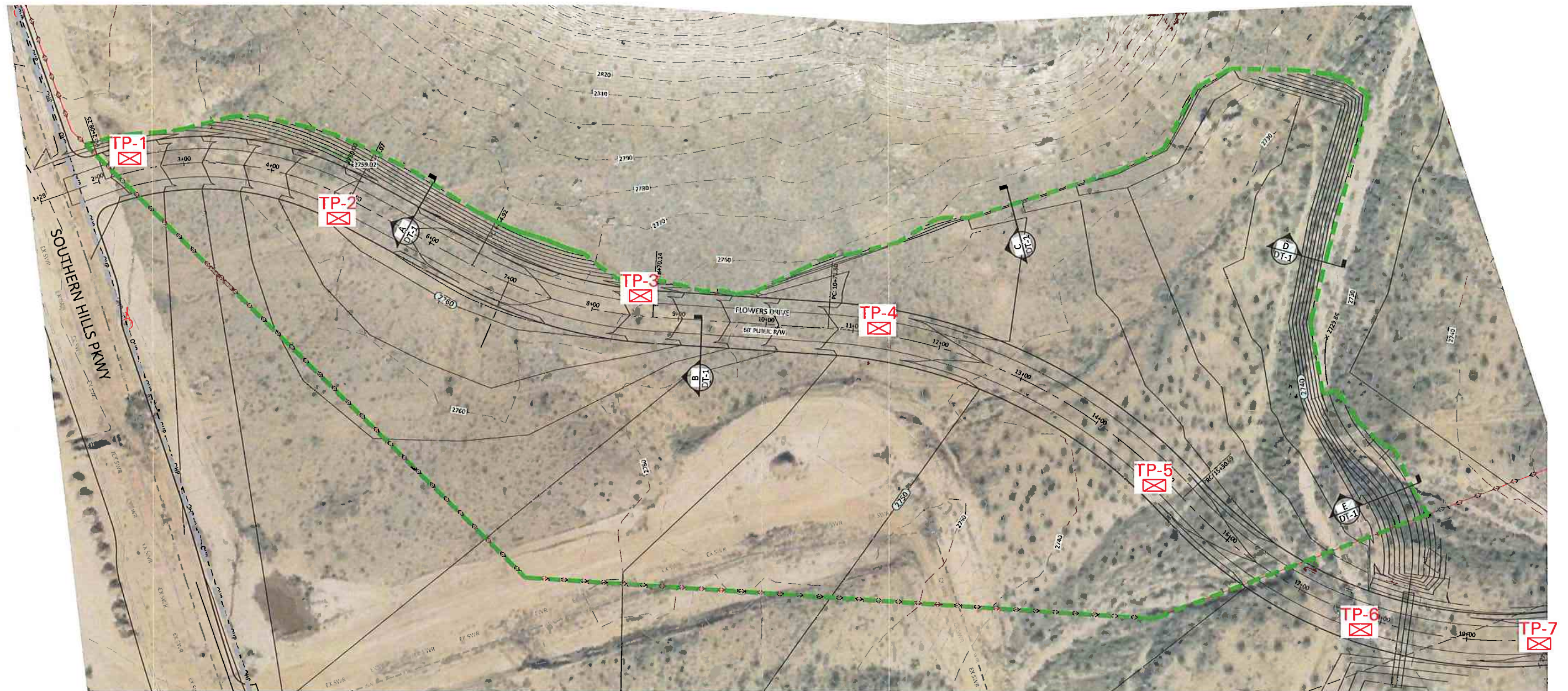
wpd



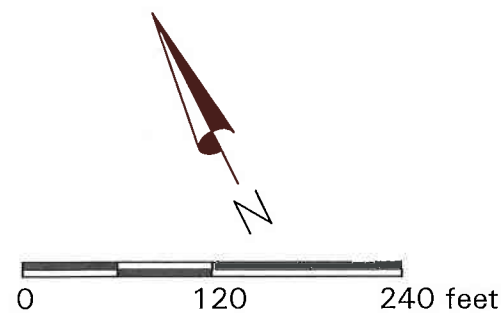
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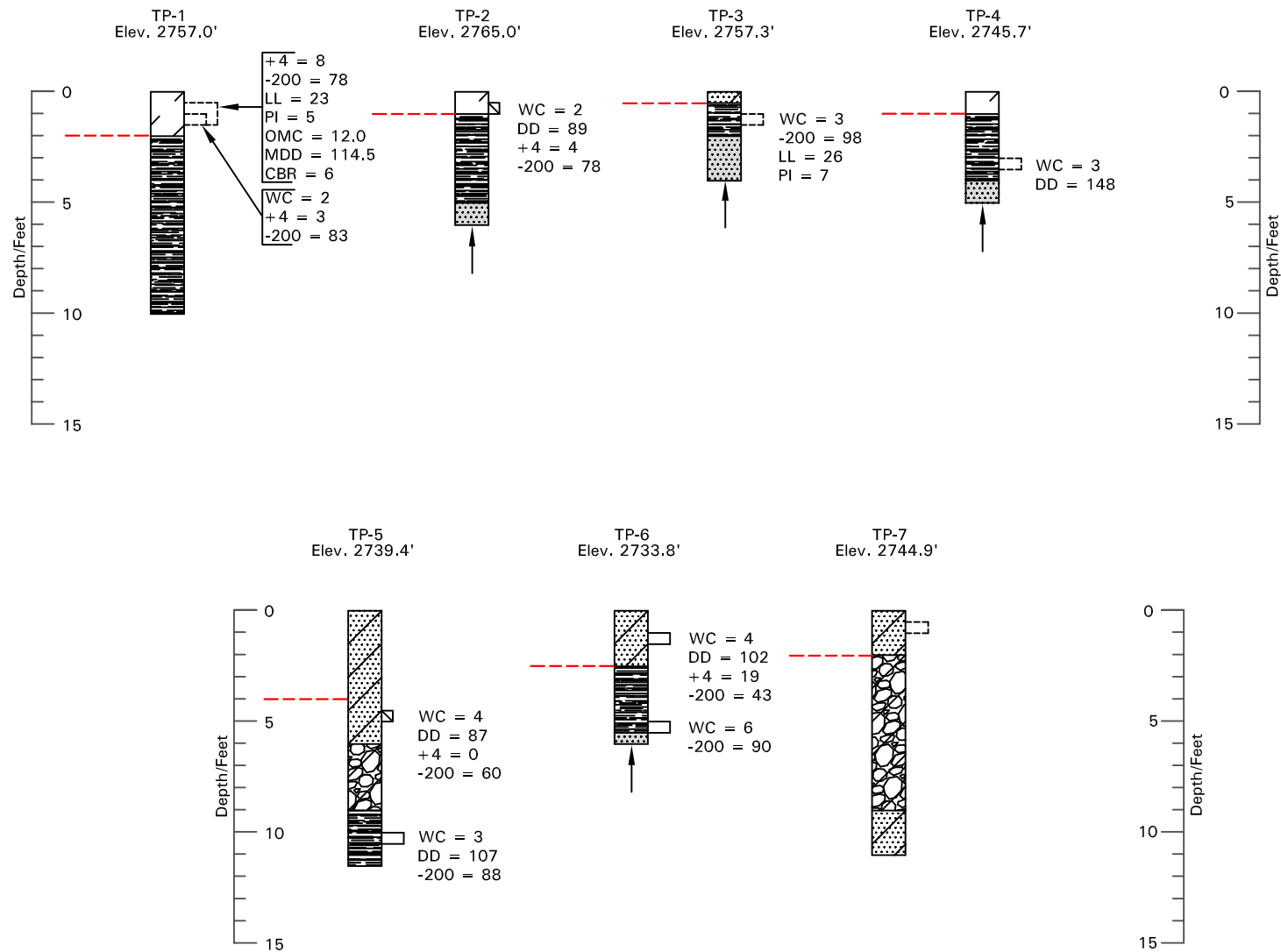
FLOWERS DRIVE
ST. GEORGE, UTAH

FLOWERS DRIVE
ST. GEORGE, UTAH



⊠ Approximate test pit location





----- Bottom of overexcavation to remove unsuitable soils

LEGEND:



Silty Clay with Sand (CL-ML); medium stiff to stiff, dry to slightly moist, porous, contains small roots, brown to reddish brown in color.



Silty Sand (SM) to Sandy Silt (ML); contains varied amounts of gravel. It is loose near surface to dense with depth (TP-7). It is dry to slightly moist, contains roots in the upper 1 to 3 feet, porous near surface and reddish brown in color.



Silty Gravel with Sand (GM); dense, dry, reddish brown in color.



Shale Bedrock; soft to moderately hard, weathered, fractured, low to medium plastic, reddish brown with grey layers.



Sandstone Bedrock; hard, dry, greyish brown in color.



Indicates relatively undisturbed block sample taken.



Indicates disturbed sample taken.



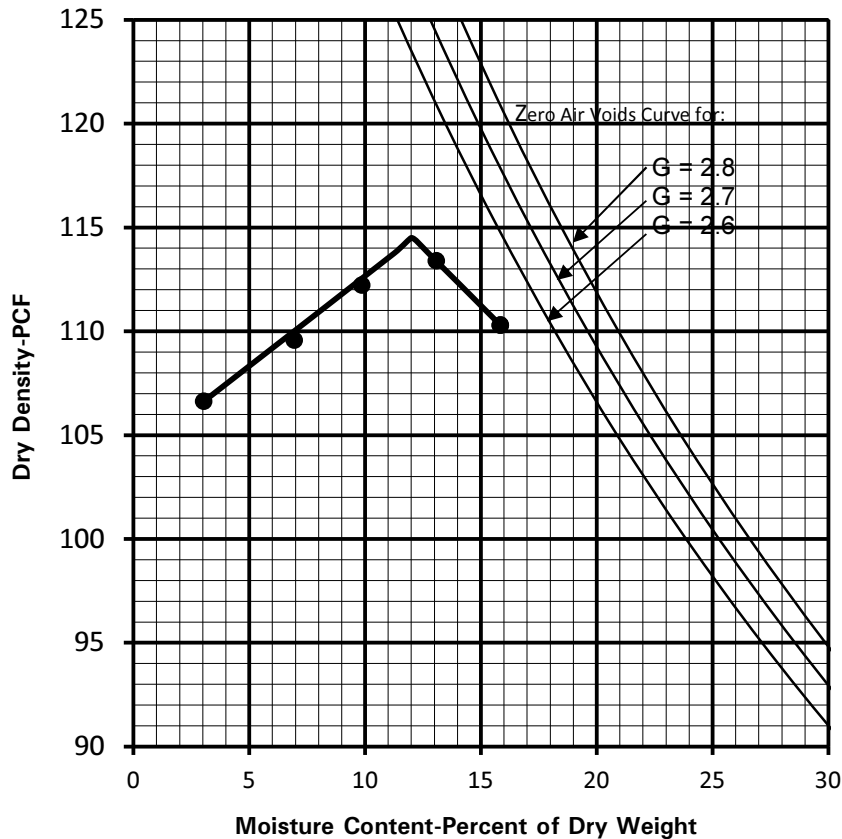
Indicates practical backhoe refusal on boulders, sandstone bedrock, or limestone bedrock.



Bottom of overexcavation to remove unsuitable soils

NOTES:

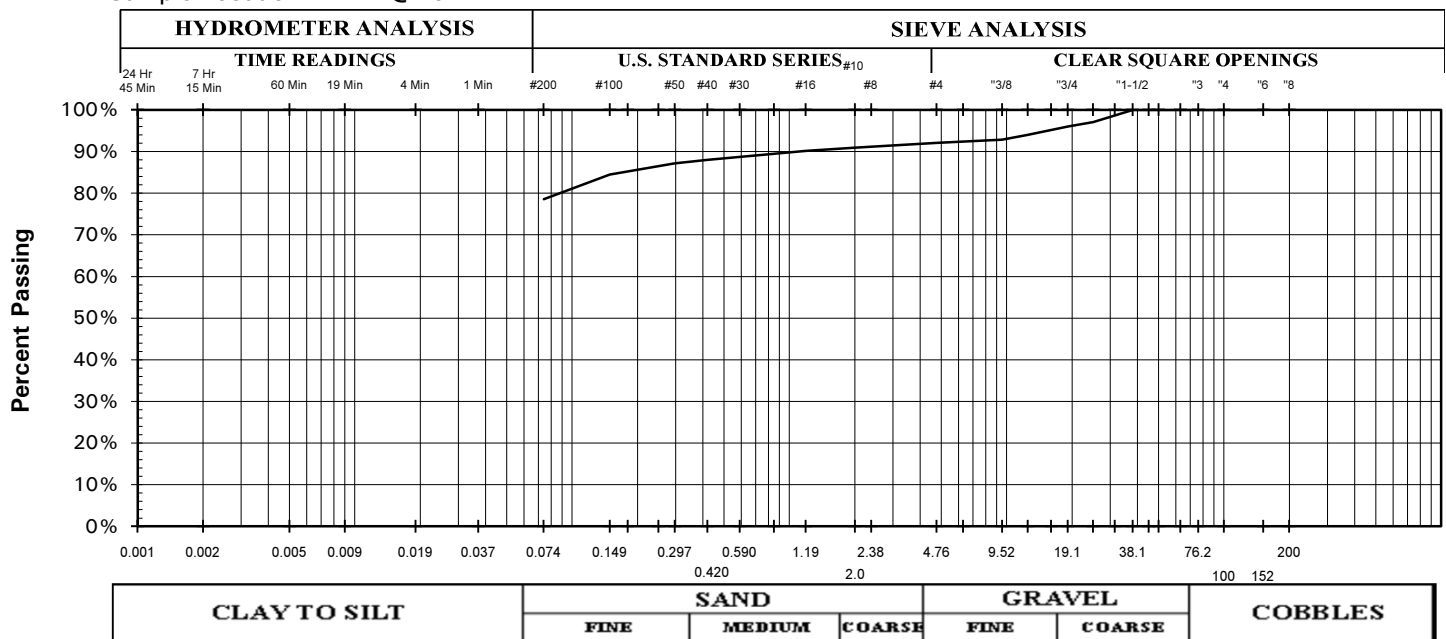
1. The test pits were excavated on November 3, 2022 with a trackhoe.
2. The locations and elevations of the test pits were measured by DSG Engineering, Inc. using GPS methods.
3. The test pit locations and elevations should be considered accurate only to the degree implied by the method used.
4. The lines between the materials shown on the test pit logs represent the approximate boundaries between material types and the transitions may be gradual.
5. Free water was not encountered in the test pits at the time of excavation.
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 (%);
NP = non-plastic;
CBR = california bearing ratio (%);
MDD = maximum dry density (pcf);
OMC = optimum moisture content (%).

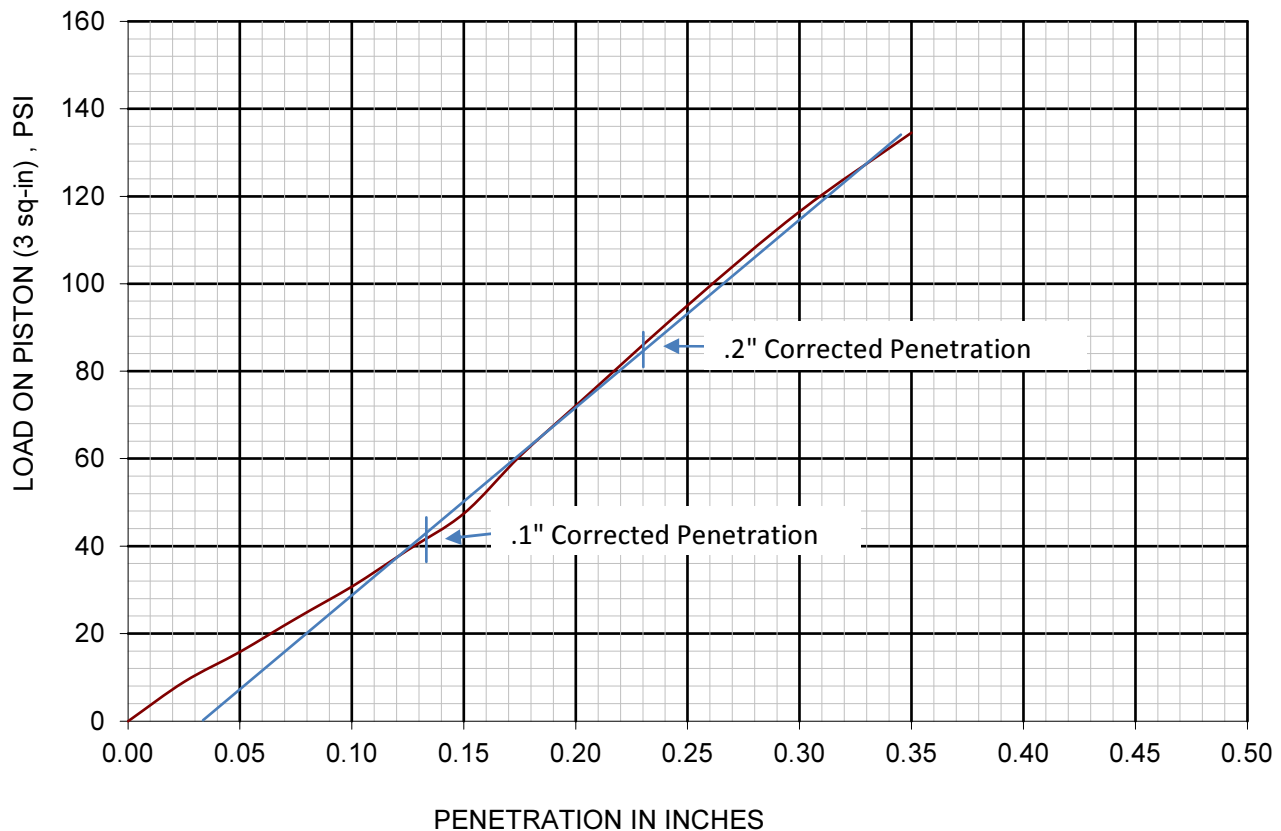


Sample Date: 11/3/22
Sample No. 221104B
Maximum Dry Density: 114.5
Optimum Moisture: 12.0
Atterberg Limits
 Liquid Limit: 23%
 Plasticity Index: 5%
Gradation
 Gravel: 8%
 Sand: 14%
 Silt & Clay: 78%

Moisture - Density Relationship Test Procedure: ASTM D-1557 B
 Sample Description: silty claywith sand (CL-ML)
 AASHTO Classification: A-4
 Sample Location: TP-1 @ .5-1'

Reviewed By: TT





Project	Flowers Drive	Sample Location	-				
Sample Classification	CL-ML Silty Clay with Sand			AGEC Sample ID No.	A-112122		
Method of sample preparation:				Remolded to approximately 95% of the maximum dry density at the optimum moisture content as per ASTM D 1557			
Sample penetration after soaking for				96	hours		
Dry Density:	as molded	112	pcf	Moisture Content:	as molded	12.5	percent
	after soaking	111	pcf		top 1-inch after soaking	14.5	percent
Swell:	after soaking	0.0	percent		average after soaking	15.9	percent
	Comments: CBR value taken at 0.2 inch penetration						
Bearing Ratio of Sample,		CBR =	6	percent	Surcharge	30	lb

APPLIED GEOTECHNICAL ENGINEERING CONSULTANTS, INC.

TABLE I
SUMMARY OF LABORATORY TEST RESULTS

Flowers Drive

Project Number 2222009

Sample Location		Natural Moisture Content (%)	Natural Dry Density (pcf)	Gradation			Atterberg Limits		Moisture Density Relationship		California Bearing Ratio (%)	Sample Classification
Test Pit No.	Depth (feet)			Gravel (%)	Sand (%)	Silt/ clay (%)	Liquid Limit (%)	Plasticity Index (%)	Optimum Moisture Content (%)	Maximum Dry Density (pcf)		
TP-1	½-1			8	14	78	23	5	12.0	114.5	6	Silty Clay with Sand (CL-ML)
TP-1	1	2		3	14	83						Silty Clay (CL-ML)
TP-2	½	2	89	4	18	78						Silty Clay (CL-ML)
TP-3	1	3				98	26	7				Shale Bedrock
TP-4	3	3	148									Shale Bedrock
TP-5	4½	4	87	0	40	60						Sandy Silt (ML)
TP-5	10	3	107			88						Shale Bedrock
TP-6	1	4	102	19	38	43						Silty Sand (SM)
TP-6	5	6				90						Shale Bedrock

FLOWERS WAY HILLSIDE APPLICATION

Drainage Study

St. George, Utah



Prepared By:



113 East 200 North Suite #2
St. George, Utah 84770
(435) 628-2121

November, 2022

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3.2 Master Plan Drainage Facilities.....	2
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APPENDIX



1.0 INTRODUCTION

This Preliminary Drainage Study addresses the hydrologic impacts of proposed public street and rough grading for, and in the vicinity of, the proposed Flowers Way public street improvements located in the Desert Canyons Master Planned Community, St. George, Utah. The objective of this study is to analyze the off-site and on-site hydrology under current conditions, and to analyze the impact of the proposed development on the existing on-site and downstream runoff. Flow patterns, points of discharge, and peak runoff are evaluated and compared to determine compliance with City of St. George drainage requirements. A plan was developed for the conveyance of storm flows through and around the site, establishment of flow rates for use as the basis of design for permanent and temporary flood protection facilities and for the determination of potential impacts to adjacent properties and facilities.

2.0 PROJECT DESCRIPTION

2.1 Location

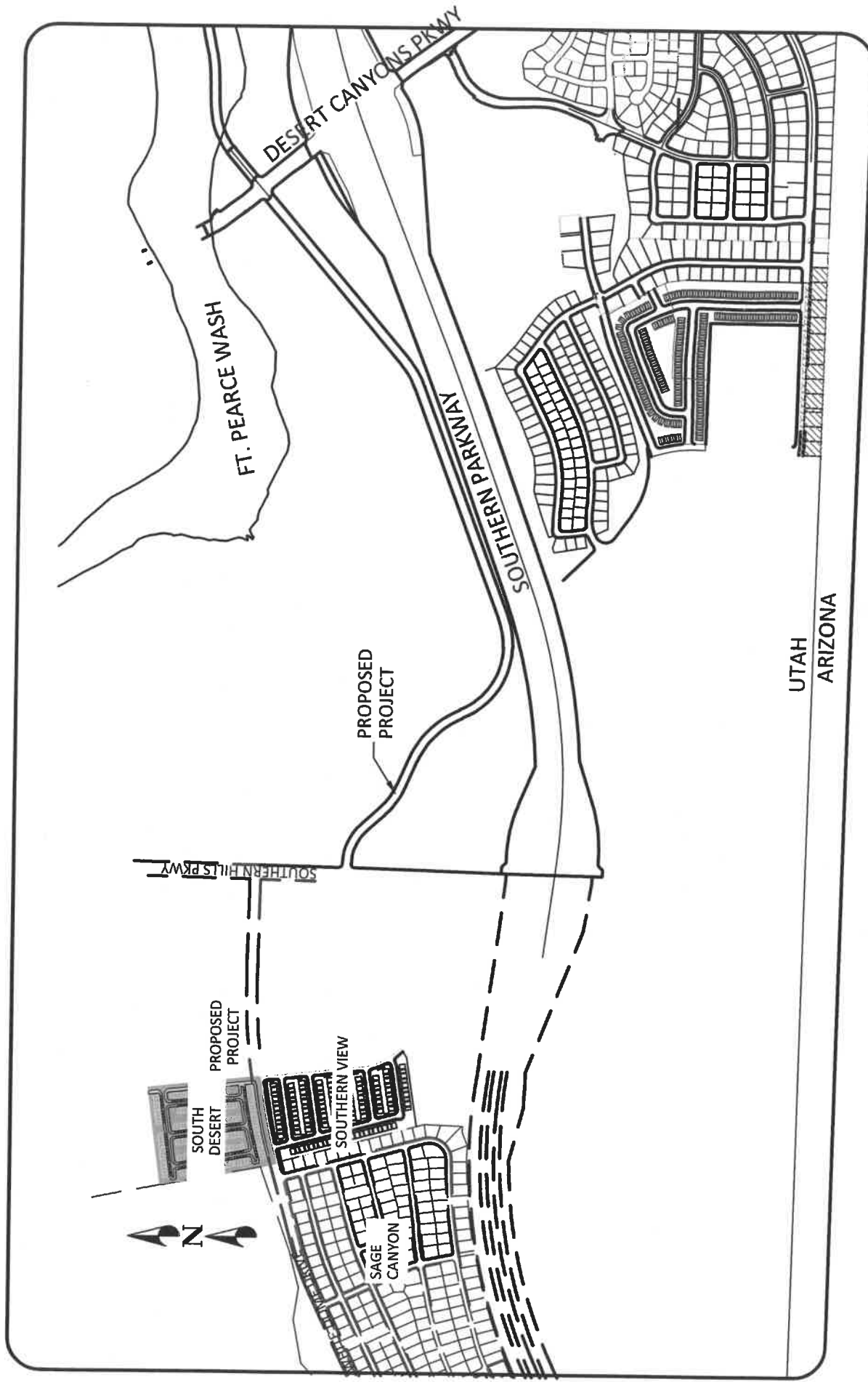
The project site is located generally in the northwest one-quarter Section 34, Township 43 South, Range 15 West, Salt Lake Base and Meridian. A map illustrating the location of the project in relation to St. George and the surrounding area is presented in Figure 1 of Appendix.

2.2 Project Description

The Flowers Way road improvement project located within the St. George City Hillside Overlay zone consists of the construction of approximately 500 linear feet of 60-ft public right-of-way street improvements, and limited rough grading of some adjacent property. The proposed street improvements will consist of curb and gutter, sidewalk, and asphaltic concrete pavement throughout the public right-of-way.

2.3 Soils

Soils information was referenced from the USDA Web Soil Survey. A copy of the soil map is included in the Appendix. Soils found in off-site subbasins consist primarily of the Nikey sandy loam and St. George silt loam soils (hydrologic group "B"), a relative small amount of bedrock (Hobog-Rock, hydrologic group "D"), and Stony colluvial land (assumed hydrologic group "C"). Composite SCS Curve number calculations based upon soil types and land uses are included in the Appendix.



Vicinity Map

NOT TO SCALE

3.0 DRAINAGE BASINS

3.1 FEMA Floodplain

Based upon the Flood Insurance Rate Map (FIRM) all proposed structures lie within an area designated as Zone "X", defined by FEMA as an area outside the 100-year floodplain and is shown on FEMA map ID 49053C1044G (See Figure 2).

3.2 Master Plan Drainage Facilities

No master planned drainage facilities are addressed in the St. George City Master Drainage Study within the project boundaries.

3.3 Existing Drainage Conditions

The project site is located primarily in upland terrace topography. A portion of the proposed roadway is located near the base of a small mesa. The mesa top consists of sandstone caprock (Shinarump Member of the Chinle Formation). The mesa side slopes range from greater than 40% near the cap rock, to less than 20% in the vicinity of the proposed roadway. The existing ground surface is sparsely vegetated with desert vegetation native to the area.

3.4 Developed Drainage Conditions

The proposed overall site development located within the existing Hillside Overlay Zone will consist of approximately 500 linear feet of 60 feet with improved public right-of-way, two rough graded commercial pads, detention/sedimentation basins, and storm drain facilities. Slope armoring is proposed along the west side of an existing ephemeral wash located in the eastern limits of the project site. See Figure 4 for developed conditions. Temporary sedimentation basins will be constructed on each pad at the downstream extent of each lot. Permanent detention/sediment basins will be required on each lot when development occurs on the lot. The temporary detention/sediment basins will accommodate LID storage volume and discharge requirements.

4.0 HYDROLOGICAL DESIGN METHODS

4.1 Rainfall Methodology

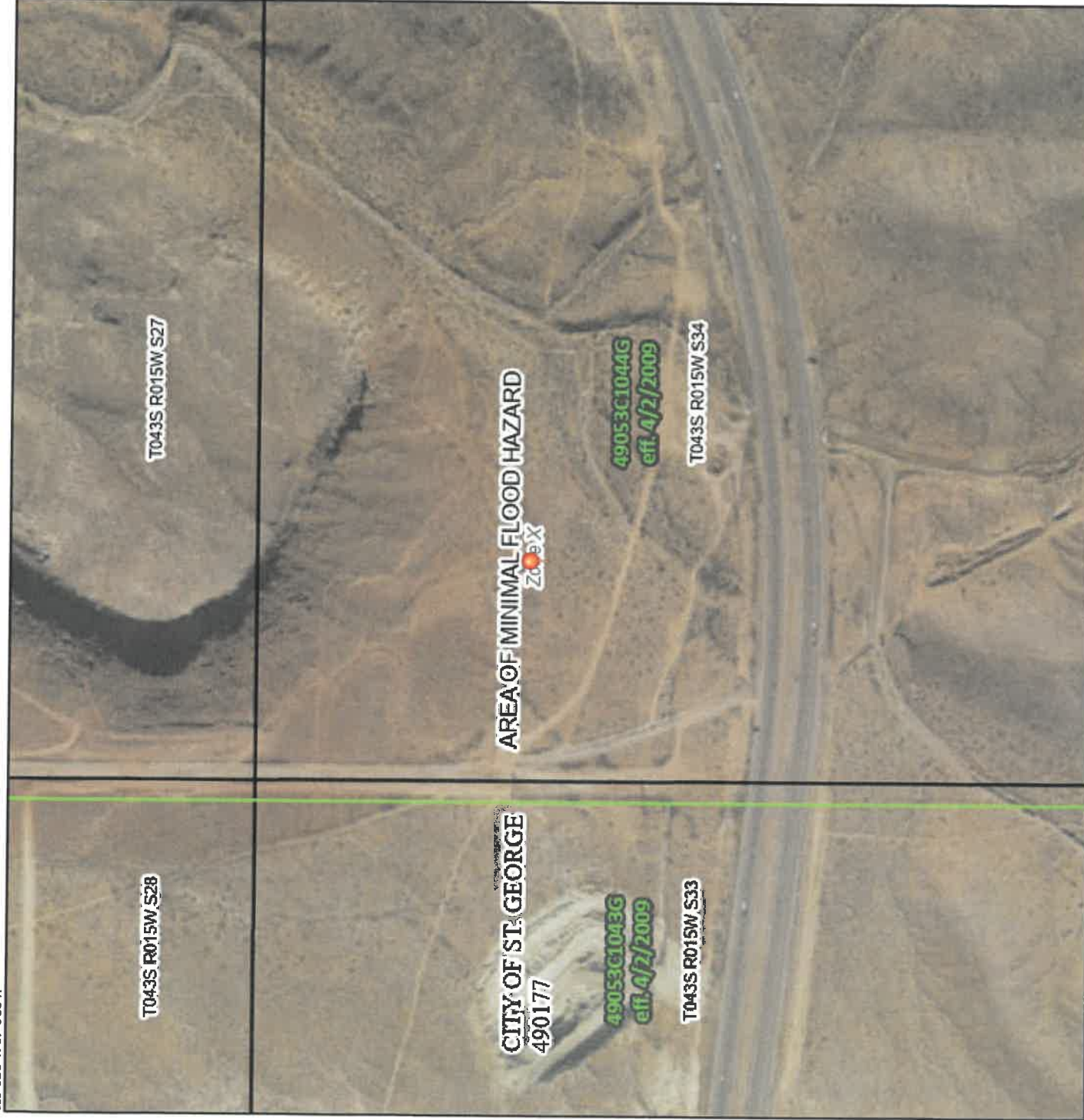
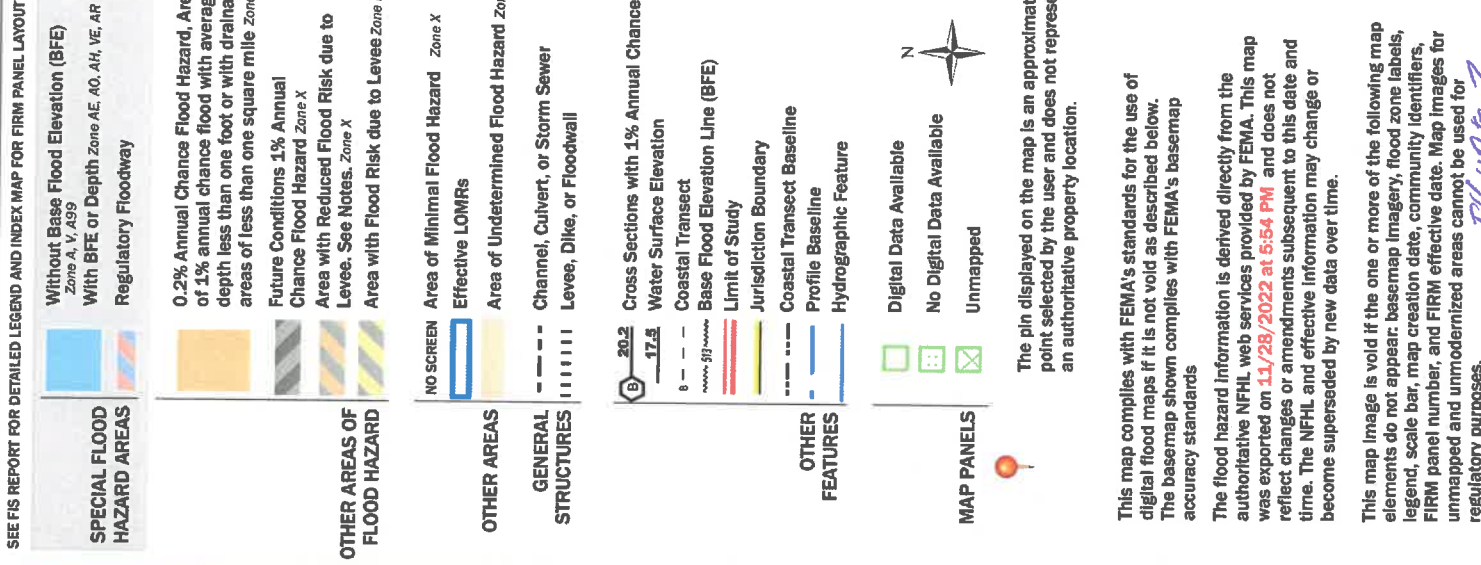
The rainfall and runoff data developed for this hydrologic analysis was prepared for use with the Army Corp of Engineering's program HEC-1 in accordance with the City of St. George Drainage Design Manual. HEC-1 input data was generated using the St. George Drainage Manual. Runoff modeling was performed for the 10-year and 100-year storm frequencies.

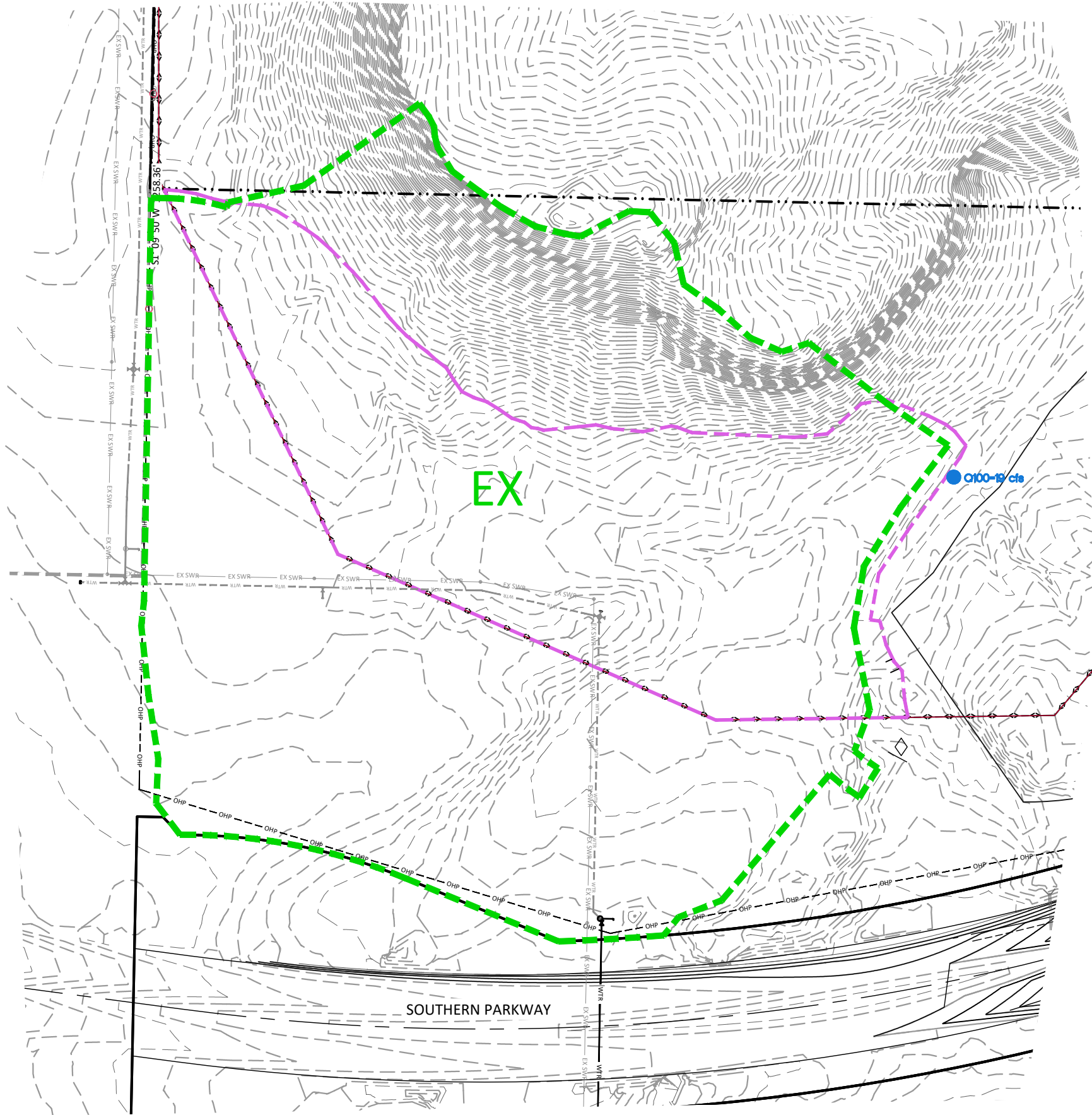
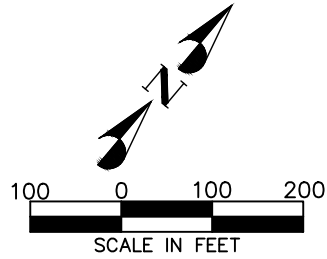
National Flood Hazard Layer FIRMette

113°32'3"W 37°0'38"N



Legend





LEGEND:

- DRAINAGE BASIN BOUNDARY
- EX** DRAINAGE BASIN LABEL
- DISTURBED AREA LOCATED WITHIN HILLSIDE OVERLAY ZONE
- Q100-5 cfs** RUNOFF POINT OF CONCENTRATION W/ Q100 RUNOFF
- 33 cfs** LID STORMWATER STORAGE AREA WITH MINIMUM STORAGE AT 0.5' DEPTH
- STORM DRAIN FLOW

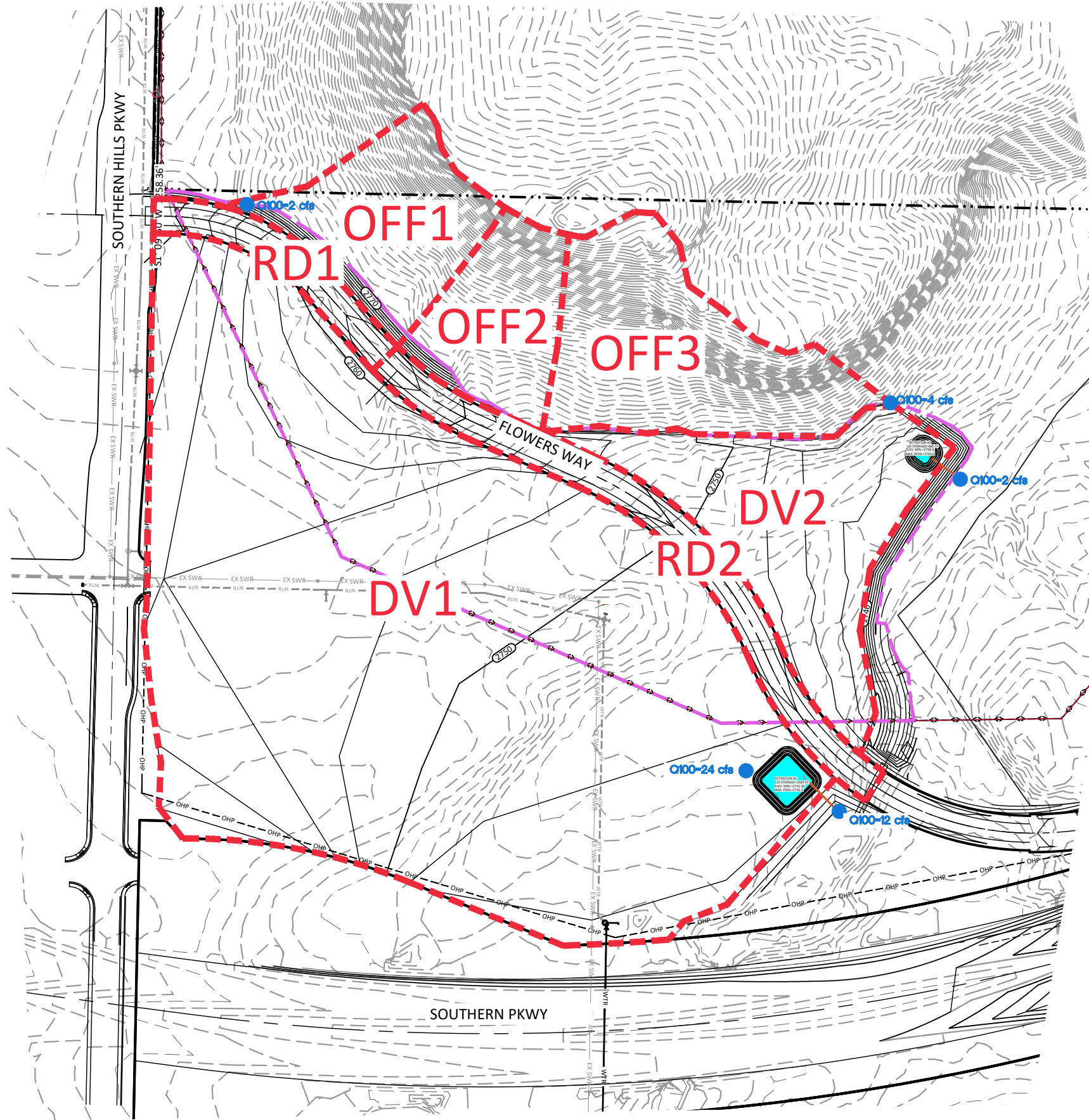
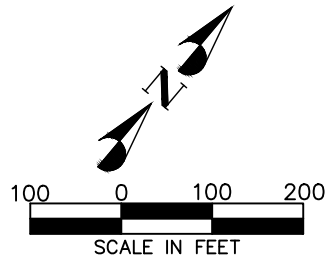
NO.	DESCRIPTION	DATE	APPD.

PROJECT NAME:
**FLOWERS WAY
HILLSIDE APPLICATION**

SHEET NAME:
EXISTING CONDITIONS

DEVELOPMENT SOLUTIONS, INC.
CIVIL ENGINEERS, LAND SURVEYORS, LAND PLANNERS,
120 East 200 North Suite #2
St. George, UT 84770
Office (435) 628-2121

DATE: 11/25/22
PM: KMM
DRAWN BY: KMM
DESIGNED BY: KMM
CHECKED BY: KM
PROJECT NO.: 20-022
SCALE: 1"=100'
SHEET NUMBER:
3
OF TOTAL



LEGEND:	
	DRAINAGE BASIN BOUNDARY
	DRAINAGE BASIN LABEL
	DISTURBED AREA LOCATED WITHIN HILLSIDE OVERLAY ZONE
	RUNOFF POINT OF CONCENTRATION W/ Q100 RUNOFF
	STORM DRAIN FLOW
	LID STORMWATER STORAGE AREA WITH MINIMUM STORAGE AT 0.5' DEPTH

NO.	DESCRIPTION	DATE	APPD.

PROJECT NAME:
**FLOWERS WAY
HILLSIDE APPLICATION**

SHEET NAME:
DEVELOPED CONDITIONS

DEVELOPMENT SOLUTIONS, INC.
CIVIL ENGINEERS, LAND SURVEYORS, LAND PLANNERS,
120 East 200 North Suite #2
St. George, UT 84770
Office (435) 628-2121

DATE: 11/25/22
PM: KMM
DRAWN BY: KMM
DESIGNED BY: KMM
CHECKED BY: KM
PROJECT NO.: 20-022
SCALE: 1"=100'
SHEET NUMBER:
4
OF TOTAL

100-year and 10-year, 3-hour point rainfall depth of 1.64 inches and 1.00 inches were utilized in the HEC-1 portion of this hydrology analysis to size the detention basins and calculate street flows. No area reduction was utilized in the point rainfall determinations.

4.2 Runoff Methodology

The SCS Curve number method was used for the loss calculations in all scenarios. The curve numbers for the water sheds were determined using a weighted average based on soil type, vegetation and land use. The lag time for each basin was calculated using both the travel time component method and the SCS empirical method. The shortest lag time was then used in the transform analysis. The time of concentration was calculated as follows:

$$T_c = T_i + T_t$$

where:

T_c = Time of concentration

T_i = Initial, inlet or sheet flow travel time

T_t = Travel time for shallow concentrated flow

Initial flow time was calculated as follows:

$$T_i = 0.007(nL)^{0.8}/(P_2)^{0.5}s^{0.4}$$

where:

T_i = Initial overland travel time (minutes)

n = manning's number

L = sheet flow length (typically less than 300 feet)

P_2 = 2-yr 24-hr precipitation (inches)

s = slope (ft/ft)

Shallow concentrated flow travel time was calculated as follows:

$$T_t = L/3600V$$

Where:

T_t = travel time for shallow concentrated flow

L = flow length (feet)

V = average velocity (ft/s)

The velocity used in the travel time computations for all offsite and onsite basins was estimated using TR-55's Figure 3-1 and assuming unpaved surfaces.

The lag time was calculated as follows:

$$T_{lag} = 0.6T_c \text{ (hours)}$$

5.0 RESULTS OF ANALYSIS

5.1 Peak Runoff

Historical, existing on-site, and developed on-site calculated peak runoff at critical points of discharge are indicated on Figures 3 and 4, respectively. Final downstream points of discharge have been altered between the developed and existing condition. However, all runoff is conveyed to the same existing downstream conveyance. Peak runoff flow rates and points of discharge for the developed basins are presented in Table 1.

Table 1.
Calculated Runoff

Hydrologic Condition/Basin	Q10 (cfs)	Q100 (cfs)
Existing Conditions		
EX (All Subbasins)		19
OFF1		2
OFF2		1
OFF3		3
Developed Conditions		
DV1		21
DV2		4
RD1		2
RD2		5
Combined Onsite Developed and Offsite Existing after Detention		18

Based on the calculated peak flowrates at downstream points of concentration, peak flowrates generated by the proposed subdivision development will not exceed existing condition peak flows.

Detention/sedimentation basins should be designed with sufficient capacity to accommodate the 10-year and 100-year storm events. Based upon the HEC1 analysis, detention/sedimentation basins should be designed with the following capacities: Basin #1: Top of grate elevation=2745.5,

Table 2
Detention/Sediment Basin Data

Basin	Top of Grate Elevation (ft)	Detention Volume at Grate (cf)	LID Volume at first 12" Depth (cf)
1	2745.5	20473	4860
2	2743.0	9148	980

5.2 LID

Temporary sediment basins are proposed within the DC West Commercial subdivision for the purpose of capturing the 80th percentile storm. The required retention volume was calculated in accordance with the Dixie Storm Water Coalition GI/LID Guidance manual. Based upon the reference guidance manual, the retention volume for each rough graded pad and adjacent improved roadway is listed in Table 2. Retention volume calculations are included in the Appendix.

Table 3
Required LID Volume

Sediment Basin	Req'd LID Volume (cu ft)
1	2429
2	490

5.3 Hydraulic Results

A hydraulic analysis included depth of flow and velocity within the proposed on-site public street, graded swales, and storm drain facilities. Calculated depths of flow and velocities within the project, during the 10-year and 100-year storm events, did not exceed the maximum amount set forth by the City of St. George. All hydraulic calculations and analysis are included the Appendix. The 10-year depths and velocities were not calculated because the 100-year depths did not exceed dry-lane criteria.

Storm drain and detention basin orifice calculations are included in the Appendix.

6.0 CONCLUSIONS

Street and storm drain improvements are designed to convey the calculated 100-yr and 10-yr storm event runoff within the limits established by the City of St. George.

APPENDIX

Hydrologic Criteria

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

TIME OF CONCENTRATION

PROJECT: FLOWERS WAY

Run: Final

FILE : SF4

CALCULATED BY: kmm

DATE : 11/23/2022

Sub-Basin Data				Initial/Overland Time (Ti)				Travel Time (Tt)				Tc	Tc Check (Urbanized Basins)		Final Tc	Flag	Remarks
DESIG	CN	K	AREA (acres)	AREA (mi²)	LENGTH (ft)	SLOPE (%)	Ti (min)	LENGTH (ft)	SLOPE (%)	VELOCITY (fps)	Tt (min)	Tc=Ti+Tt (min)	TOTAL (ft)	Tc (min)	(min)	(hrs)	
(1)		(2)	(3)		(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)		
ONSITE BASINS - DEVELOPED CONDITIONS																	
DV1	87.5	0.765	20.40	0.0319	300	2.00	8.3	860	1.00	1.5	9.6	17.8	1160.0	NA	17.8	0.178	
DV2	87	0.758	3.50	0.0055	100	3.50	4.0	400	1.00	1.5	4.4	8.5	500.0	NA	8.5	0.085	
RD1	98	0.904	0.70	0.0011	30	2.00	1.5	460	3.00	4.0	1.9	3.5	490.0	NA	3.5	0.035	
RD2	98	0.904	1.60	0.0025	30	2.00	1.5	1100	1.50	3.0	6.1	7.6	1130.0	NA	7.6	0.076	
OFFSITE BASINS - EXISTING CONDITIONS																	
EX	81	0.679	32.70	0.0511	300	33.00	4.1	1285	3.20	2.5	8.6	12.7	1585.0	NA	12.7	0.127	
OFF1	85	0.732	2.00	0.0031	300	33.00	3.6	360	3.00	2.4	2.5	6.1	660.0	NA	6.1	0.061	
OFF2	85	0.732	1.50	0.0023	300	33.00	3.6	260	4.00	3.0	1.4	5.0	560.0	NA	5.0	0.050	
OFF3	85	0.732	3.00	0.0047	300	33.00	3.6	580	1.00	1.5	6.4	10.0	880.0	NA	10.0	0.100	

65.40

$$Tt = (1.8(1.1-K)L^{1/2}) / (S^{1/3})$$

$$Tc = Tt + TT$$

$$K = 0.0132(CN)^{-0.39}$$

$$T_{lag} = 6Tc$$

* Soil is Type 'C'.

REFERENCE:

STANDARD FORM 4



Area of Interest (AOI)

Soil Map

Soil Data Explorer

Download Soils Data

Shopping Cart (Free)

View Soil Information By Use: All Uses

[Printable Version](#)[Add to Shopping Cart](#)[Intro to Soils](#)[Suitabilities and Limitations for Use](#)[Soil Properties and Qualities](#)[Ecological Sites](#)[Soil Reports](#)

Search

Properties and Qualities Ratings

[Open All](#) [Close All](#)

Soil Chemical Properties

Soil Erosion Factors

Soil Health Properties

Soil Physical Properties

Soil Qualities and Features

AASHTO Group Classification (Surface)

AASHTO Group Index

Depth to a Selected Soil Restrictive Layer

Depth to Any Soil Restrictive Layer

Depth to Bedrock

Drainage Class

Frost Action

Frost-Free Days

Hydrologic Soil Group

[View Description](#) [View Rating](#)

View Options

Map ☒Table ☒Description of Rating ☒

Rating Options

☐ Detailed Description

Advanced Options

Aggregation Method Dominant Condition

Component Percent Cutoff

Tie-break Rule

☐ Lower
☒ Higher[View Description](#) [View Rating](#)

Map Unit Name

Parent Material Name

Representative Slope

Soil Slippage Potential

Subsidence, Initial

Subsidence, Total

Unified Soil Classification (Surface)

Water Features

Map — Hydrologic Soil Group

Scale (not to scale)



Warning: Soil Ratings Map may not be valid at this scale.

You have zoomed in beyond the scale at which the soil map for this area is intended to be used. Map is done at a particular scale. The soil surveys that comprise your AOI were mapped at 1:24,000. The map units and the level of detail shown in the resulting soil map are dependent on that map scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of map accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could be shown at a more detailed scale.

Tables — Hydrologic Soil Group — Summary By Map Unit

Summary by Map Unit — Washington County Area, Utah (UT641)

Summary by Map Unit — Washington County Area, Utah (UT641)

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
HG	Hobog-Rock land association	D	0.9	2.5%
NLE	Nikey sandy loam, 3 to 15 percent slopes	B	2.3	6.7%
Sa	St. George silt loam	B	14.9	43.3%
SY	Stony colluvial land		16.3	47.5%
Totals for Area of Interest			34.3	100.0%

Description — Hydrologic Soil Group

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

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.

CURVE NUMBER CALCULATION

Project: FLOWERS WAY
 Basin: DV1
 Area: 20.4 Acres

Land Use Cover Type	Area (acres)	Soil Type	Percent age (P)	Curve Number (CN)	Product (PxCN)
rough graded	14.3	B	70%	86	60.2
rough graded	6.1	C	30%	91	27.3
Total:	20.4		100%		87.5

CURVE NUMBER CALCULATION

Project: FLOWERS WAY
 Basin: DV2
 Area: 3.5 Acres

Land Use Cover Type	Area (acres)	Soil Type	Percent age (P)	Curve Number (CN)	Product (PxCN)
rough graded	2.8	B	80%	86	68.8
rough graded	0.7	B	20%	91	18.2
Total:	3.5		100%		87.0

CURVE NUMBER CALCULATION

Project: FLOWERS WAY
 Basin: RD1, RD2
 Area: 2.3 Acres

Land Use Cover Type	Area (acres)	Soil Type	Percent age (P)	Curve Number (CN)	Product (PxCN)
paved	2.3	B	100%	98	98.0
Total:	2.3		100%		98.0

CURVE NUMBER CALCULATION

Project: FLOWERS WAY
 Basin: OFF1, OFF2
 Area: 2.3 Acres

Land Use Cover Type	Area (acres)	Soil Type	Percent age (P)	Curve Number (CN)	Product (PxCN)
Desert shrub, poor	2.3	C	100%	85	85.0
Total:	2.3		100%		85.0

CURVE NUMBER CALCULATION

Project: FLOWERS WAY
 Basin: OFF3
 Area: 3 Acres

Land Use Cover Type	Area (acres)	Soil Type	Percent age (P)	Curve Number (CN)	Product (PxCN)
Desert shrub, poor	2.6	C	85%	85	72.3
Desert shrub, poor	0.5	D	15%	88	13.2
Total:	3.0		100%		85.5

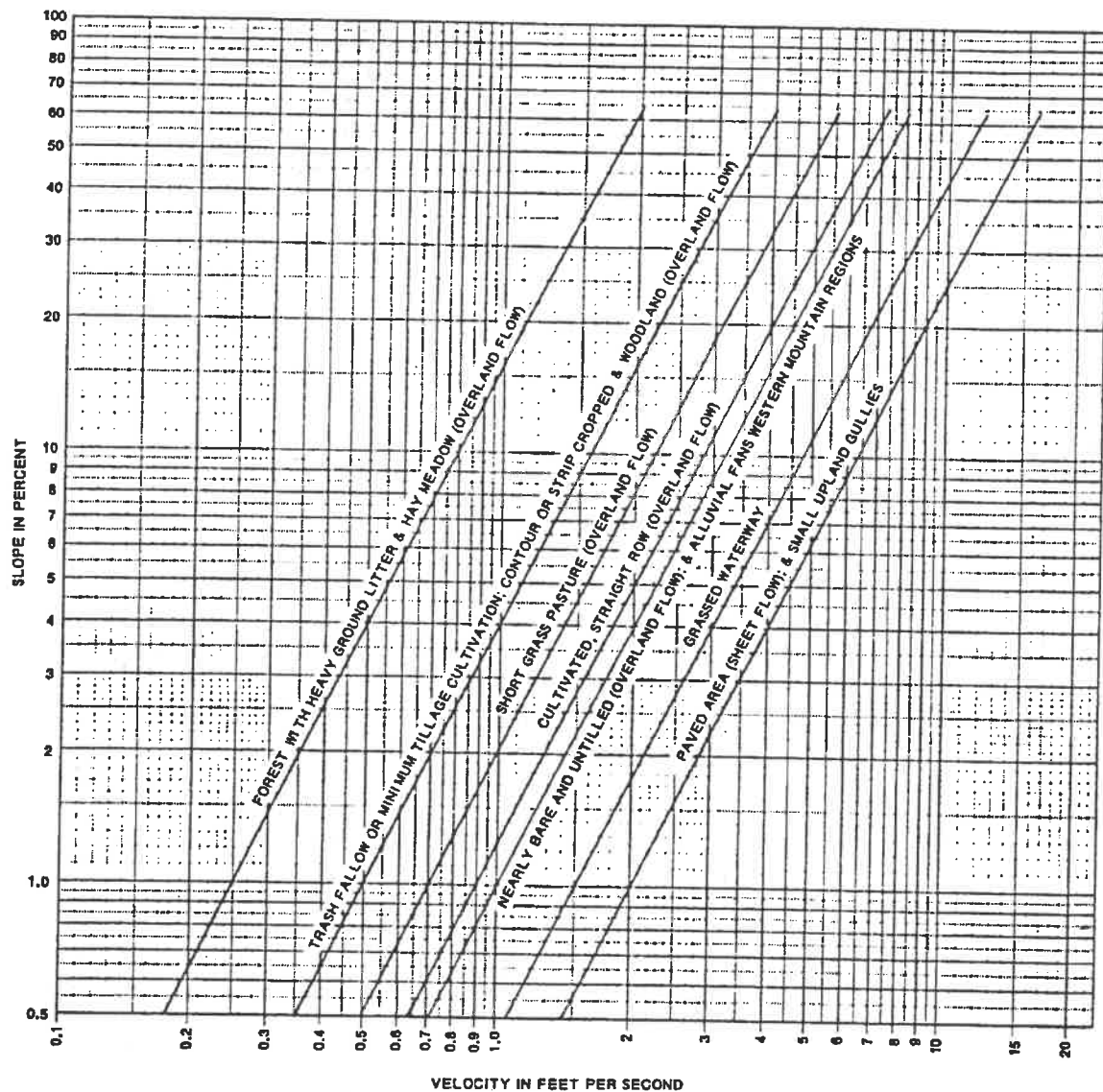
CURVE NUMBER CALCULATION

Project: FLOWERS WAY
 Basin: EX
 Area: 32.7 Acres

Land Use Cover Type	Area (acres)	Soil Type	Percent age (P)	Curve Number (CN)	Product (PxCN)
Desert shrub, poor	18.0	B	55%	77	42.4
Desert shrub, poor	13.1	C	40%	85	34.0
Desert shrub, poor	1.6	D	5%	88	4.4
Total:	14.7		45%		80.8

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

TRAVEL TIME VELOCITY



Revision	Date

**WRC
ENGINEERING**

REFERENCE: SCS National Engineering Handbook
Section 4, Hydrology, March, 1985

FIGURE 602

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

RUNOFF CURVE NUMBERS (URBAN AREAS¹)

Cover description		Curve numbers for hydrologic soil group—			
Cover type and hydrologic condition	Average percent impervious area ²	A	B	C	D
<i>Fully developed urban areas (vegetation established)</i>					
Open space (lawns, parks, golf courses, cemeteries, etc.): ³					
Poor condition (grass cover < 50%)		68	79	86	89
Fair condition (grass cover 50% to 75%)		49	69	79	84
Good condition (grass cover > 75%)		39	61	74	80
Impervious areas:					
Paved parking lots, roofs, driveways, etc. (excluding right-of-way)		98	98	98	98
Streets and roads:					
Paved: curbs and storm sewers (excluding right-of-way)		98	98	98	98
Paved: open ditches (including right-of-way)		83	89	92	93
Gravel (including right-of-way)		76	85	89	91
Dirt (including right-of-way)		72	82	87	89
Western desert urban areas:					
Natural desert landscaping (pervious areas only) ⁴ ...		63	77	85	88
Artificial desert landscaping (impervious weed barrier, desert shrub with 1- to 2-inch sand or gravel mulch and basin borders)		96	96	96	96
Urban districts:					
Commercial and business	85	89	92	94	95
Industrial	72	81	88	91	93
Residential districts by average lot size:					

See Table 602A

Developing urban areas

Newly graded areas (pervious areas only, no vegetation) ⁵	77	86	91	94
--	----	----	----	----

1 Average runoff condition, and $I_p = 0.2S$.

2 The average percent impervious area shown was used to develop the composite CN's. Other assumptions are as follows: impervious areas are directly connected to the drainage system. Impervious areas have a CN of 98, and pervious areas are considered equivalent to open space in good hydrologic condition. CN's for other combinations of conditions may be computed using Figure 603.

3 CN's shown are equivalent to those of pasture. Composite CN's may be computed for other combinations of open space cover type.

4 Composite CN's for natural desert landscaping should be computed using Figure 603 based on the impervious area percentage (CN #98) and the pervious area CN. The pervious area CN's are assumed equivalent to desert shrub in poor hydrologic condition.

5 Composite CN's to use for the design of temporary measures during grading and construction should be computed using Figure 603 based on the degree of development impervious area percentage) and the CN's for the newly graded pervious areas.

Revision	Date

**WRC
ENGINEERING**

REFERENCE:
SCS TR-55, USDA, June 1986.

**TABLE 602
1 of 4**

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

RUNOFF CURVE NUMBERS (SEMIARID RANGELANDS¹)

Cover description		Curve numbers for hydrologic soil group—			
Cover type	Hydrologic condition ²	A ³	B	C	D
Herbaceous—mixture of grass, weeds, and low-growing brush, with brush the minor element.	Poor		80	87	93
	Fair		71	81	89
	Good		62	74	85
Oak-aspen—mountain brush mixture of oak brush, aspen, mountain mahogany, bitter brush, maple, and other brush.	Poor		66	74	79
	Fair		48	57	63
	Good		30	41	48
Pinyon-juniper—pinyon, juniper, or both; grass understory.	Poor		75	85	89
	Fair		58	73	80
	Good		41	61	71
Sagebrush with grass understory.	Poor		67	80	85
	Fair		51	63	70
	Good		35	47	55
Desert shrub—major plants include saltbush, greasewood, creosotebush, blackbrush, bursage, palo verde, mesquite, and cactus.	Poor	63	77	85	88
	Fair	55	72	81	86
	Good	49	68	79	84

¹Average runoff condition, and $I_a = 0.2S$.

²Poor: < 30% ground cover (litter, grass, and brush overstory).

Fair: 30 to 70% ground cover.

Good: > 70% ground cover.

³Curve numbers for group A have been developed only for desert shrub.

Revision	Date

**WRC
ENGINEERING**

REFERENCE:

SCS TR-55, USDA, June 1986.

**TABLE 602
4 of 4**

HEC-1 Calculations

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1*****
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*
* FLOOD HYDROGRAPH PACKAGE (HEC-1)
ENGINEERS *
* SEPTEMBER 1990
CENTER *
* VERSION 4.0
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* RUN DATE 11/28/2022 TIME 13:48:53
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* U.S. ARMY CORPS OF
*
* HYDROLOGIC ENGINEERING
*
* 609 SECOND STREET
*
* DAVIS, CALIFORNIA 95616
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* (916) 756-1104
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X X XXXXXX XXXXX X
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THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

STRUCTURE. THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT

THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
 NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
 DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL LOSS RATE:GREEN AND AMPT INFILTRATION
 KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

1

HEC-1 INPUT

PAGE 1

```

LINE      ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10
1         ID      HEC-1 Analysis using GeoShed
2         ID      FLOWERS WAY
3         ID      10-YR 3-HR FF
          *DIAGRAM
4         IT      5 1JAN22      0      100
5         IO      0
6         KK      OFF2
7         KO      0      0      0      0      22
8         BA      0.0023
9         PB      1
10        IN      5 1JAN22      0
          * FARM3HR
11        PC      0      0      1      1      2      2      3      28      48      62
12        PC      71      77      81      84      86      88      90      91      92      93
13        PC      93      94      94      94      95      95      96      96      97      97
14        PC      97      98      98      99      99      100      100
15        LS      0      85      0
16        UD      0.053
17        KK      9R      CNAME      9C
18        KO      0      0      0      0      22
19        RN      9R
20        KK      OFF3
21        KO      0      0      0      0      22

```

					FLWR1.OUT				
22	BA	0.0047							
23	LS	0	85	0					
24	UD	0.1							
25	KK	8C	CNAME	8R					
26	KO	0	0	0	0	22			
27	HC	2							
28	KK	8R	CNAME	8C					
29	KO	0	0	0	0	22			
30	RD	100	0.01	0.035		TRAP	3	3	
31	KK	DV2							
32	KO	0	0	0	0	22			
33	BA	0.0055							
34	LS	0	87	0					
35	UD	0.085							
36	KK	7C	CNAME	7R					
37	KO	0	0	0	0	22			
38	HC	2							
39	KK	V1							
	* RESERVOIR STORAGE								
40	KO	0	0	0	0	22			
41	RS	1	FLOW	0	0				
	* STORRES2								
42	SV	0	0	0.1	0.1	0.2	0.2		
	* ELEVRES2								

1

HEC-1 INPUT

PAGE 2

LINE	ID.....	1.....	2.....	3.....	4.....	5.....	6.....	7.....	8.....	9.....	10
43	SE	2739.5	2740.5	2741.5	2742	2743					
	* OUTRES2										
44	SQ	0	0.4	1.2	2.3	2.7	28.8				
	* ELEVRES2										
45	SE	2739.5	2740.5	2741.5	2742	2743					
46	KK	DV1									
47	KO	0	0	0	0	22					
48	BA	0.0319									
49	PB	1									
50	IN	5	1JAN22	0							
	* FARM3HR										
51	PC	0	0	1	1	2	2	3	28	48	62
52	PC	71	77	81	84	86	88	90	91	92	93
53	PC	93	94	94	94	95	95	96	96	97	97
54	PC	97	98	98	99	99	100	100			
55	LS	0	88	0							
56	UD	0.178									
57	KK	RD2									
58	KO	0	0	0	0	22					
59	BA	0.0025									
60	LS	0	98	0							
61	UD	0.076									
62	KK	9C	CNAME	9R							
63	KO	0	0	0	0	22					
64	HC	2									
65	KK	V1									
	* RESERVOIR STORAGE										
66	KO	0	0	0	0	22					
67	RS	1	FLOW	0	0						
	* STORRES1										
68	SV	0	0.2	0.3	0.5	0.6	0.6				
	* ELEVRES1										
69	SE	2741.5	2743	2744	2745	2745.5	2746				
	* OUTRES1										
70	SQ	0	1.2	4	9	11.7	28				
	* ELEVRES1										
71	SE	2741.5	2743	2744	2745	2745.5	2746				

FLWR1.OUT

72	KK	9R	CNAME	9C					
73	KO	0	0	0	0	22			
74	RD	450	0.01	0.035		TRAP	10	3	
75	KK	7C	CNAME	7R					
76	KO	0	0	0	0	22			
77	HC	2							

1

HEC-1 INPUT

PAGE 3

LINE ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10

78	KK	7R	CNAME	7C						
79	KO	0	0	0	0	22				
80	RN	7R								
81	KK	EX								
82	KO	0	0	0	0	22				
83	BA	0.0511								
84	PB	1								
85	IN	5	1JAN22	0						
	* FARM3HR									
86	PC	0	0	1	1	2	2	3	28	48
87	PC	71	77	81	84	86	88	90	91	92
88	PC	93	94	94	94	95	95	96	96	97
89	PC	97	98	98	99	99	100	100		
90	LS	0	81	0						
91	UD	0.127								
92	KK	6R	CNAME	6C						
93	KO	0	0	0	0	22				
94	RN	6R								
95	KK	OFF1								
96	KO	0	0	0	0	22				
97	BA	0.0031								
98	LS	0	85	0						
99	UD	0.061								
100	KK	5R	CNAME	5C						
101	KO	0	0	0	0	22				
102	RD	150	0.03	0.015		TRAP				
103	KK	RD1								
104	KO	0	0	0	0	22				
105	BA	0.0011								
106	LS	0	98	0						
107	UD	0.05								
108	KK	4C	CNAME	4R						
109	KO	0	0	0	0	22				
110	HC	2								
111	KK	4R	CNAME	4C						
112	KO	0	0	0	0	22				
113	RN	4R								
114	ZZ									

1

SCHEMATIC DIAGRAM OF STREAM NETWORK

INPUT	(V) ROUTING	(--->) DIVERSION OR PUMP FLOW
LINE		
NO.	(.) CONNECTOR	(<---) RETURN OF DIVERTED OR PUMPED FLOW
6	OFF2	
	V	
	V	
17	9R	
	.	
	.	
20	.	OFF3
	.	.
	.	.

```

25      8C.....
      V
      V
28      8R
      .
      .
31      .      DV2
      .
      .
36      7C.....
      V
      V
39      V1
      .
      .
46      .      DV1
      .
      .
57      .      RD2
      .
      .
62      .      9C.....
      .      V
      .      V
65      .      V1
      .      V
      .      V
72      .      9R
      .
      .
75      7C.....
      V
      V
78      7R
      .
      .
81      .      EX
      .      V
      .      V
92      .      6R
      .
      .
95      .      OFF1
      .      V
      .      V
100     .      5R
      .
      .
103     .      RD1
      .
      .
108     .      4C.....
      .      V
      .      V
111     .      4R

```

1

RUNOFF SUMMARY
FLOW IN CUBIC FEET PER SECOND
TIME IN HOURS, AREA IN SQUARE MILES

+	OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD			BASIN AREA	MAXIMUM STAGE	TIME OF MAX STAGE
					6-HOUR	24-HOUR	72-HOUR			
+	HYDROGRAPH AT	OFF2	0.	.83	0.	0.	0.	.00		
+	ROUTED TO	9R	0.	.83	0.	0.	0.	.00		
+	HYDROGRAPH AT	OFF3	1.	.92	0.	0.	0.	.00		

FLWR1.OUT

+	2 COMBINED AT	8C	1.	.92	0.	0.	0.	.01		
+	ROUTED TO	8R	1.	.92	0.	0.	0.	.01		
+	HYDROGRAPH AT	DV2	1.	.83	0.	0.	0.	.01		
+	2 COMBINED AT	7C	2.	.92	0.	0.	0.	.01		
+	ROUTED TO	V1	1.	1.33	0.	0.	0.	.01	2741.02	1.33
+	HYDROGRAPH AT	DV1	7.	1.00	1.	1.	1.	.03		
+	HYDROGRAPH AT	RD2	3.	.75	0.	0.	0.	.00		
+	2 COMBINED AT	9C	9.	.92	1.	1.	1.	.03		
+	ROUTED TO	V1	3.	1.42	1.	1.	1.	.03	2743.79	1.42
+	ROUTED TO	9R	3.	1.42	1.	1.	1.	.03		
+	2 COMBINED AT	7C	4.	1.42	1.	1.	1.	.05		
+	ROUTED TO	7R	4.	1.42	1.	1.	1.	.05		
+	HYDROGRAPH AT	EX	4.	1.00	1.	0.	0.	.05		
+	ROUTED TO	6R	4.	1.00	1.	0.	0.	.05		
+	HYDROGRAPH AT	OFF1	1.	.83	0.	0.	0.	.00		
+	ROUTED TO	5R	1.	.83	0.	0.	0.	.00		
+	HYDROGRAPH AT	RD1	1.	.67	0.	0.	0.	.00		
+	2 COMBINED AT	4C	2.	.75	0.	0.	0.	.00		
+	ROUTED TO	4R	2.	.75	0.	0.	0.	.00		
1										

SUMMARY OF KINEMATIC WAVE - MUSKINGUM-CUNGE ROUTING

(FLOW IS DIRECT RUNOFF WITHOUT BASE FLOW)

INTERPOLATED TO

COMPUTATION INTERVAL

ISTAQ	ELEMENT	DT	PEAK	TIME TO PEAK	VOLUME	DT	PEAK	TIME TO PEAK	VOLUME
-------	---------	----	------	-----------------	--------	----	------	-----------------	--------

FLWR1.OUT

	(MIN)	(CFS)	(MIN)	(IN)	(MIN)	(CFS)	(MIN)	(IN)
8R MANE	.99	1.16	54.36	.17	5.00	1.16	55.00	.17

CONTINUITY SUMMARY (AC-FT) - INFLOW= .6481E-01 EXCESS= .0000E+00 OUTFLOW= .6481E-01 BASIN STORAGE= .5447E-04 PERCENT ERROR= -.1

9R MANE	2.75	3.40	88.00	.28	5.00	3.39	85.00	.28
---------	------	------	-------	-----	------	------	-------	-----

CONTINUITY SUMMARY (AC-FT) - INFLOW= .5219E+00 EXCESS= .0000E+00 OUTFLOW= .5208E+00 BASIN STORAGE= .1662E-02 PERCENT ERROR= -.1

5R MANE	.51	.56	50.72	.17	5.00	.55	50.00	.17
---------	-----	-----	-------	-----	------	-----	-------	-----

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2870E-01 EXCESS= .0000E+00 OUTFLOW= .2870E-01 BASIN STORAGE= .2338E-04 PERCENT ERROR= -.1

*** NORMAL END OF HEC-1 ***

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1*****
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*
*
* FLOOD HYDROGRAPH PACKAGE (HEC-1)
ENGINEERS *
* SEPTEMBER 1990
CENTER *
* VERSION 4.0
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* RUN DATE 11/28/2022 TIME 13:41:37
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* U.S. ARMY CORPS OF
* HYDROLOGIC ENGINEERING
* 609 SECOND STREET
* DAVIS, CALIFORNIA 95616
* (916) 756-1104
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X   X XXXXXXX XXXXX   X
X   X X   X   X   XX
X   X X   X   X   X
XXXXXXX XXXX   X   XXXXX X
X   X X   X   X   X
X   X X   X   X   X
X   X XXXXXXX XXXXX   XXX

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THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

STRUCTURE. THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT

THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
 NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
 DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL LOSS RATE:GREEN AND AMPT INFILTRATION
 KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

1

HEC-1 INPUT

PAGE 1

LINE	ID	1	2	3	4	5	6	7	8	9	10
1	ID	HEC-1 Analysis using GeoShed									
2	ID	FLOWERS WAY									
3	ID	100-YR 3-HR FF									
	*DIAGRAM										
4	IT	5	1JAN22	0	100						
5	IO	0									
6	KK	OFF2									
7	KO	0	0	0	0	22					
8	BA	0.0023									
9	PB	1.64									
10	IN	5	1JAN22	0							
	* FARM3HR										
11	PC	0	0	1	1	2	2	3	28	48	62
12	PC	71	77	81	84	86	88	90	91	92	93
13	PC	93	94	94	94	95	95	96	96	97	97
14	PC	97	98	98	99	99	100	100			
15	LS	0	85	0							
16	UD	0.053									
17	KK	9R	CNAME	9C							
18	KO	0	0	0	22						
19	RN	9R									
20	KK	OFF3									
21	KO	0	0	0	0	22					

FLWR2.OUT

22	BA	0.0047							
23	LS	0	85	0					
24	UD	0.1							
25	KK	8C	CNAME	8R					
26	KO	0	0	0	0	22			
27	HC	2							
28	KK	8R	CNAME	8C					
29	KO	0	0	0	0	22			
30	RD	100	0.01	0.035		TRAP	3	3	
31	KK	DV2							
32	KO	0	0	0	0	22			
33	BA	0.0055							
34	LS	0	87	0					
35	UD	0.085							
36	KK	7C	CNAME	7R					
37	KO	0	0	0	0	22			
38	HC	2							
39	KK	V1							
	* RESERVOIR STORAGE								
40	KO	0	0	0	0	22			
41	RS	1	FLOW	0	0				
	* STORRES2								
42	SV	0	0	0.1	0.1	0.2	0.2		
	* ELEVRES2								

1

HEC-1 INPUT

PAGE 2

LINE	ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10
43	SE 2739.5 2740.5 2741.5 2742 2743
	* OUTRES2
44	SQ 0 0.4 1.2 2.3 2.7 28.8
	* ELEVRES2
45	SE 2739.5 2740.5 2741.5 2742 2743
46	KK DV1
47	KO 0 0 0 0 22
48	BA 0.0319
49	PB 1.64
50	IN 5 1JAN22 0
	* FARM3HR
51	PC 0 0 1 1 2 2 3 28 48 62
52	PC 71 77 81 84 86 88 90 91 92 93
53	PC 93 94 94 94 95 95 96 96 97 97
54	PC 97 98 98 99 99 100 100
55	LS 0 88 0
56	UD 0.178
57	KK RD2
58	KO 0 0 0 0 22
59	BA 0.0025
60	LS 0 98 0
61	UD 0.076
62	KK 9C CNAME 9R
63	KO 0 0 0 0 22
64	HC 2
65	KK V1
	* RESERVOIR STORAGE
66	KO 0 0 0 0 22
67	RS 1 FLOW 0 0
	* STORRES1
68	SV 0 0.2 0.3 0.5 0.6 0.6
	* ELEVRES1
69	SE 2741.5 2743 2744 2745 2745.5 2746
	* OUTRES1
70	SQ 0 1.2 4 9 11.7 28
	* ELEVRES1
71	SE 2741.5 2743 2744 2745 2745.5 2746

FLWR2.OUT

72	KK	9R	CNAME	9C					
73	KO	0	0	0	0	22			
74	RD	450	0.01	0.035		TRAP	10	3	
75	KK	7C	CNAME	7R					
76	KO	0	0	0	0	22			
77	HC	2							

1

HEC-1 INPUT

PAGE 3

LINE ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10

78	KK	7R	CNAME	7C							
79	KO	0	0	0	0	22					
80	RN	7R									
81	KK	EX									
82	KO	0	0	0	0	22					
83	BA	0.0511									
84	PB	1.64									
85	IN	5	1JAN22	0							
	* FARM3HR										
86	PC	0	0	1	1	2	2	3	28	48	62
87	PC	71	77	81	84	86	88	90	91	92	93
88	PC	93	94	94	94	95	95	96	96	97	97
89	PC	97	98	98	99	99	100	100			
90	LS	0	81	0							
91	UD	0.127									
92	KK	6R	CNAME	6C							
93	KO	0	0	0	0	22					
94	RN	6R									
95	KK	OFF1									
96	KO	0	0	0	0	22					
97	BA	0.0031									
98	LS	0	85	0							
99	UD	0.061									
100	KK	5R	CNAME	5C							
101	KO	0	0	0	0	22					
102	RD	150	0.03	0.015		TRAP					
103	KK	RD1									
104	KO	0	0	0	0	22					
105	BA	0.0011									
106	LS	0	98	0							
107	UD	0.05									
108	KK	4C	CNAME	4R							
109	KO	0	0	0	0	22					
110	HC	2									
111	KK	4R	CNAME	4C							
112	KO	0	0	0	0	22					
113	RN	4R									
114	ZZ										

1

SCHEMATIC DIAGRAM OF STREAM NETWORK

INPUT	(V) ROUTING	(--->) DIVERSION OR PUMP FLOW
LINE		
NO.	(.) CONNECTOR	(<---) RETURN OF DIVERTED OR PUMPED FLOW
6	OFF2	
	V	
	V	
17	9R	
	.	
	.	
20	.	OFF3
	.	.
	.	.

```

25      8C.....
      V
      V
28      8R
      .
      .
31      .      DV2
      .      .
      .      .
36      7C.....
      V
      V
39      V1
      .
      .
46      .      DV1
      .      .
      .      .
57      .      .      RD2
      .      .      .
      .      .      .
62      .      9C.....
      .      V
      .      V
65      .      V1
      .      V
      .      V
72      .      9R
      .      .
      .      .
75      7C.....
      V
      V
78      7R
      .
      .
81      .      EX
      .      V
      .      V
92      .      6R
      .      .
      .      .
95      .      .      OFF1
      .      .      V
      .      .      V
100     .      .      5R
      .      .      .
      .      .      .
103     .      .      .      RD1
      .      .      .      .
      .      .      .      .
108     .      .      4C.....
      .      .      V
      .      .      V
111     .      .      4R

```

1

RUNOFF SUMMARY
FLOW IN CUBIC FEET PER SECOND
TIME IN HOURS, AREA IN SQUARE MILES

+	OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD			BASIN AREA	MAXIMUM STAGE	TIME OF MAX STAGE
					6-HOUR	24-HOUR	72-HOUR			
+	HYDROGRAPH AT									
+		OFF2	1.	.75	0.	0.	0.	.00		
+	ROUTED TO									
+		9R	1.	.75	0.	0.	0.	.00		
+	HYDROGRAPH AT									
+		OFF3	3.	.83	0.	0.	0.	.00		

		FLWR2.OUT								
+	2 COMBINED AT	8C	4.	.83	0.	0.	0.	.01		
+	ROUTED TO	8R	4.	.83	0.	0.	0.	.01		
+	HYDROGRAPH AT	DV2	4.	.83	0.	0.	0.	.01		
+	2 COMBINED AT	7C	8.	.83	1.	1.	1.	.01		
+	ROUTED TO	V1	3.	1.25	1.	1.	1.	.01	2742.79	1.25
+	HYDROGRAPH AT	DV1	21.	.92	2.	2.	2.	.03		
+	HYDROGRAPH AT	RD2	5.	.75	0.	0.	0.	.00		
+	2 COMBINED AT	9C	24.	.92	3.	2.	2.	.03		
+	ROUTED TO	V1	12.	1.25	3.	2.	2.	.03	2745.47	1.25
+	ROUTED TO	9R	12.	1.25	3.	2.	2.	.03		
+	2 COMBINED AT	7C	14.	1.25	3.	3.	3.	.05		
+	ROUTED TO	7R	14.	1.25	3.	3.	3.	.05		
+	HYDROGRAPH AT	EX	19.	.92	2.	2.	2.	.05		
+	ROUTED TO	6R	19.	.92	2.	2.	2.	.05		
+	HYDROGRAPH AT	OFF1	2.	.75	0.	0.	0.	.00		
+	ROUTED TO	5R	2.	.83	0.	0.	0.	.00		
+	HYDROGRAPH AT	RD1	2.	.67	0.	0.	0.	.00		
+	2 COMBINED AT	4C	4.	.75	0.	0.	0.	.00		
+	ROUTED TO	4R	4.	.75	0.	0.	0.	.00		
1										

SUMMARY OF KINEMATIC WAVE - MUSKINGUM-CUNGE ROUTING

(FLOW IS DIRECT RUNOFF WITHOUT BASE FLOW)

		INTERPOLATED TO COMPUTATION INTERVAL								
ISTAQ	ELEMENT	DT	PEAK	TIME TO PEAK	VOLUME	DT	PEAK	TIME TO PEAK	VOLUME	

	(MIN)	(CFS)	FLWR2.OUT (MIN)	(IN)	(MIN)	(CFS)	(MIN)	(IN)
8R MANE	.71	4.14	50.90	.54	5.00	4.12	50.00	.54

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2026E+00 EXCESS= .0000E+00 OUTFLOW= .2026E+00 BASIN STORAGE= .5721E-04 PERCENT ERROR= .0

9R MANE	2.50	11.54	75.00	.73	5.00	11.54	75.00	.73
---------	------	-------	-------	-----	------	-------	-------	-----

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1336E+01 EXCESS= .0000E+00 OUTFLOW= .1335E+01 BASIN STORAGE= .1949E-02 PERCENT ERROR= -.1

5R MANE	.38	1.93	45.55	.54	5.00	1.91	50.00	.54
---------	-----	------	-------	-----	------	------	-------	-----

CONTINUITY SUMMARY (AC-FT) - INFLOW= .8974E-01 EXCESS= .0000E+00 OUTFLOW= .8974E-01 BASIN STORAGE= .2349E-04 PERCENT ERROR= .0

*** NORMAL END OF HEC-1 ***

Sediment Retention

SCS RUNOFF VOLUME

FLOWERS WAY

$$Q = (P - 0.2S)^2 / (P + 0.8S)$$

Storm: 3-hr, 100-yr FF

where:

Q = runoff (inches)

P = precipitation (inches)

S = maximum potential retention (inches)

$$S = (1000/CN) - 10$$

CN = curve number

P = 1.64 inches

Subbasin	Area (ac)	CN	S	Q (inches)	Q (ac-ft)	Q (cubic feet)
----------	-----------	----	---	------------	-----------	----------------

DEVELOPED CONDITION

DV1	20.4	88	1.36	0.50	0.8511	37075
DV2	3.5	87	1.49	0.47	0.1380	6009
RD1	0.7	98	0.20	0.89	0.0517	2253
RD2	1.6	98	0.20	0.89	0.1182	5151
OFF1	2	85	1.76	0.42	0.0703	3062
OFF2	1.5	85	1.76	0.42	0.0527	2296
OFF3	3	85	1.76	0.42	0.1054	4593
Total:	32.7				1.3875	60440

EXISTING CONDITION

EX	32.7	81	2.35	0.33	0.9073	39523
----	------	----	------	------	--------	-------

Volume Difference:

0.4802 20917

Prorate to developed areas DV1, DV2:

Subbasin	Area, ac	Ratio	Det Vol, cf
DV1	20.4	0.85	17854
DV2	3.5	0.15	3063

Hydraulic Calculations

DEBRIS RISER #1

ORIFICE FLOW

$Q = 0.62 \cdot A \cdot \sqrt{(2 \cdot g) \cdot H}$

$g = 32.2 \text{ ft/s}$

Orifice Width: 12 inches

Orifice Height: 6 inches

Area of Orifice: 0.25 ft²

Width Riser Grate: 24 inches

Percent Restricted: 50 %

Base Elevation: 2741.5 ft

Orifice #1 Elevation: 2742.5 ft

Orifice #2 Elevation: 2743.5 ft

Orifice #3 Elevation: 2744.5 ft

Orifices per Level: 2

Top of Riser: 2745.5 ft

Detention Stage above Elevation	Stage Base (ft)	DEPTH TO CENTER OF ORIFICE #1	DEPTH TO CENTER OF ORIFICE #2	DEPTH TO CENTER OF ORIFICE #3	ORIFICE #1 FLOW, Q1 (cfs)	ORIFICE #2 FLOW, Q2 (cfs)	ORIFICE #3 FLOW, Q3 (cfs)	ORIFICE FLOW per Level (cfs)
2743	1.5	0.25	0.00	0.00	1.24	0.00	0.00	1.24
2744	2.5	1.25	0.25	0.00	2.78	1.24	0.00	4.03
2745	3.5	2.25	1.25	0.25	3.73	2.78	2.49	9.00
2745.5	4	2.75	1.75	0.75	4.13	3.29	4.31	11.73

WEIR FLOW:

Length of Weir: 8 ft

$Q = 2/3 \cdot C_1 \cdot b \cdot \sqrt{(2 \cdot g) \cdot H^{(2/3)}}$

$C_1 = 0.61$

Detention Stage above Elevation	Stage above Top of Riser (ft)	Weir Flow (cfs)	Total Weir and Orifice Flow (cfs)
2745.5	0	0.00	11.73
2745.6	0.1	5.62	17.35
2745.7	0.2	8.92	20.65
2745.8	0.3	11.70	23.42
2746	0.5	16.44	28.17

DEBRIS RISER #2

ORIFICE FLOW

$Q = 0.62 \cdot A \cdot \sqrt{2 \cdot g \cdot H}$

$g = 32.2 \text{ ft/s}$

Orifice Width: 10 inches

Orifice Height: 4 inches

Area of Orifice: 0.14 ft²

Width Riser Grate: 24 inches

Percent Restricted: 50 %

Base Elevation: 2738 ft

Orifice #1 Elevation: 2739 ft

Orifice #2 Elevation: 2740 ft

Orifice #3 Elevation: 2741 ft

Orifices per Level: 1
Top of Riser: 2742 ft

Detention Stage Elevation	Stage above Base (ft)	DEPTH TO CENTER OF ORIFICE #1	DEPTH TO CENTER OF ORIFICE #2	DEPTH TO CENTER OF ORIFICE #3	ORIFICE #1 FLOW, Q1 (cfs)	ORIFICE #2 FLOW, Q2 (cfs)	ORIFICE #3 FLOW, Q3 (cfs)	ORIFICE FLOW per Level (cfs)
2739.5	1.5	0.33	0.00	0.00	0.40	0.00	0.00	0.40
2740.5	2.5	1.33	0.33	0.00	0.80	0.40	0.00	1.20
2741.5	3.5	2.33	1.33	0.33	1.06	0.80	0.40	2.25
2742	4	2.83	1.83	0.83	1.16	0.94	0.63	2.73

WEIR FLOW:

Length of Weir: 8 ft

$Q = 2/3 \cdot C_1 \cdot b \cdot \sqrt{2 \cdot g \cdot H} \cdot H^{(2/3)}$

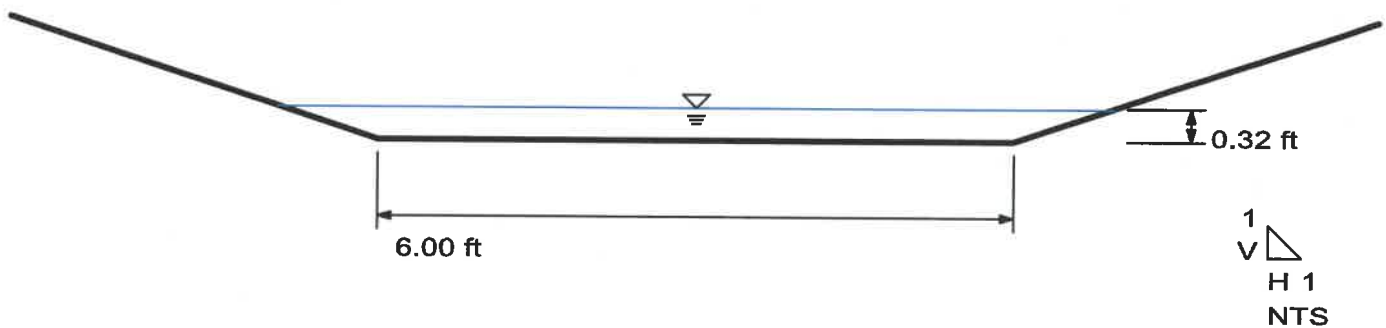
$C_1 = 0.61$

Detention Stage Elevation	Stage above Top of Riser (ft)	Weir Flow (cfs)	Total Weir and Orifice Flow (cfs)
2742.1	0.1	5.62	8.35
2742.2	0.2	8.92	11.65
2742.3	0.3	11.70	14.42
2742.5	0.5	16.44	19.17
2743	1	26.11	28.84

BASIN DV2 SWALE X-SECTION
Cross Section for Trapezoidal Channel

Project Description	
Project File	c:\haestad\fmw\desert c.fm2
Worksheet	FLOWERS WAY DV2 SWALE
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data	
Mannings Coefficient	0.035
Channel Slope	0.010000 ft/ft
Depth	0.32 ft
Left Side Slope	3.000000 H : V
Right Side Slope	3.000000 H : V
Bottom Width	6.00 ft
Discharge	4.00 cfs



BASIN DV2 SWALE
Worksheet for Trapezoidal Channel

Project Description	
Project File	c:\haestad\fmw\desert c.fm2
Worksheet	FLOWERS WAY DV2 SWALE
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data	
Mannings Coefficient	0.035
Channel Slope	0.010000 ft/ft
Left Side Slope	3.000000 H : V
Right Side Slope	3.000000 H : V
Bottom Width	6.00 ft
Discharge	4.00 cfs

Results	
Depth	0.32 ft
Flow Area	2.22 ft ²
Wetted Perimeter	8.02 ft
Top Width	7.91 ft
Critical Depth	0.23 ft
Critical Slope	0.030487 ft/ft
Velocity	1.80 ft/s
Velocity Head	0.05 ft
Specific Energy	0.37 ft
Froude Number	0.60
Flow is subcritical.	

Worksheet
Worksheet for Triangular Channel

Project Description	
Project File	c:\haestad\fmw\desert c.fm2
Worksheet	FLOWERS WAY STATION 5+00
Flow Element	Triangular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data	
Mannings Coefficient	0.035
Channel Slope	0.010000 ft/ft
Left Side Slope	3.000000 H : V
Right Side Slope	2.000000 H : V
Discharge	2.00 cfs

Results		
Depth	0.65	ft
Flow Area	1.05	ft ²
Wetted Perimeter	3.50	ft
Top Width	3.24	ft
Critical Depth	0.52	ft
Critical Slope	0.030883	ft/ft
Velocity	1.90	ft/s
Velocity Head	0.06	ft
Specific Energy	0.70	ft
Froude Number	0.59	
Flow is subcritical.		

Worksheet

Worksheet for Triangular Channel

Project Description	
Project File	c:\haestad\fmw\desert c.fm2
Worksheet	FLOWERS WAY STATION 5+00
Flow Element	Triangular Channel
Method	Manning's Formula
Solve For	Channel Depth

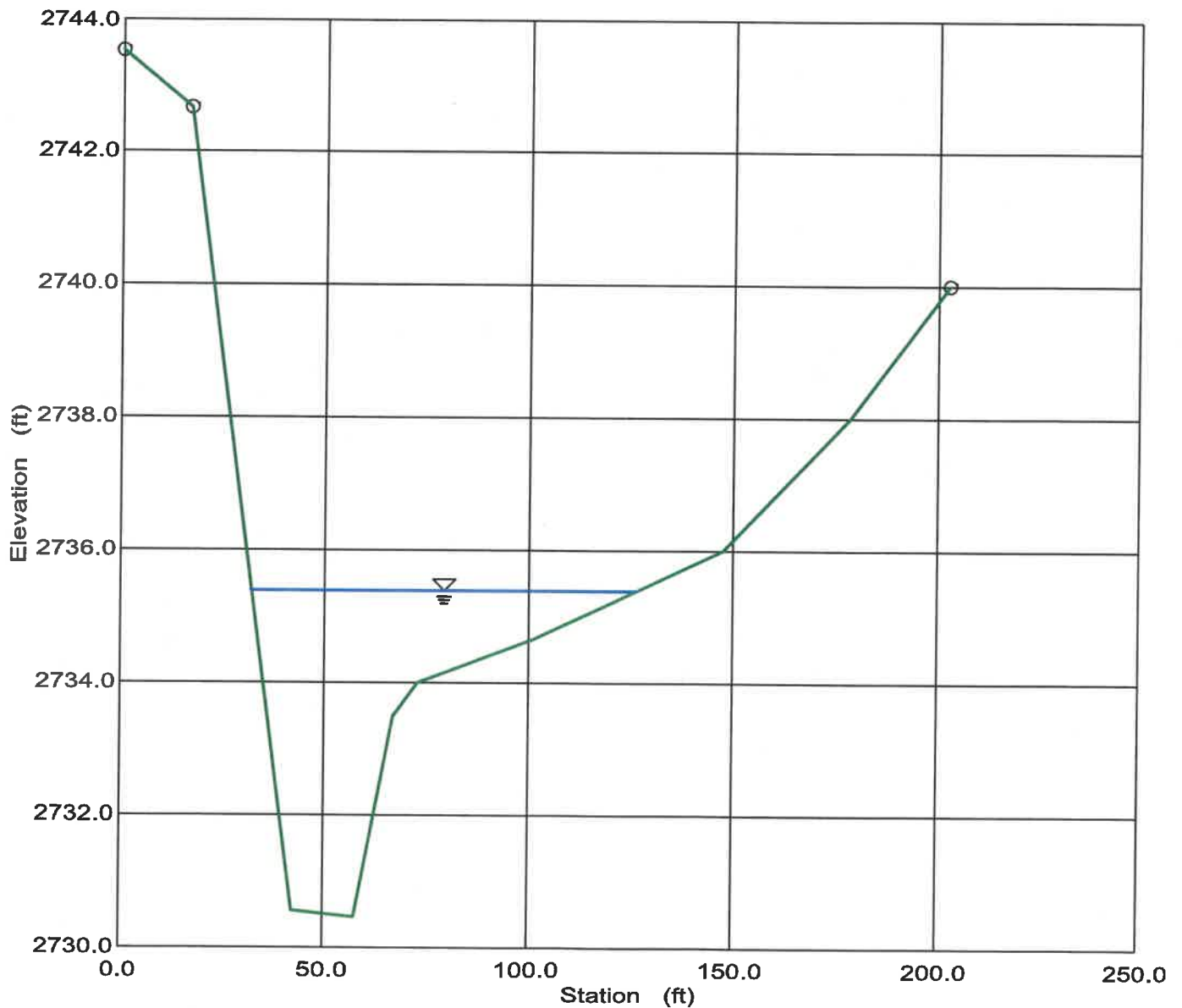
Input Data	
Mannings Coefficient	0.035
Channel Slope	0.010000 ft/ft
Left Side Slope	3.000000 H : V
Right Side Slope	2.000000 H : V
Discharge	2.00 cfs

Results		
Depth	0.65	ft
Flow Area	1.05	ft ²
Wetted Perimeter	3.50	ft
Top Width	3.24	ft
Critical Depth	0.52	ft
Critical Slope	0.030883	ft/ft
Velocity	1.90	ft/s
Velocity Head	0.06	ft
Specific Energy	0.70	ft
Froude Number	0.59	
Flow is subcritical.		

Cross Section
Cross Section for Irregular Channel

Project Description	
Project File	c:\haestad\fmw\desert c.fm2
Worksheet	FLOWERS WAY WASH SECTION 1
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Water Elevation

Section Data		
Wtd. Mannings Coefficient	0.035	
Channel Slope	0.010000 ft/ft	
Water Surface Elevation	2,735.38	ft
Discharge	1,151.00	cfs



MAIN WASH SECTION 1 Worksheet for Irregular Channel

Project Description	
Project File	c:\haestad\fmw\desert c.fm2
Worksheet	FLOWERS WAY WASH SECTION 1
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Water Elevation

Input Data				
Channel Slope	0.010000 ft/ft			
Elevation range: 2,730.45 ft to 2,743.53 ft.				
Station (ft)	Elevation (ft)	Start Station	End Station	Roughness
0.00	2,743.53	0.00	16.90	0.030
16.90	2,742.67	16.90	202.90	0.035
42.60	2,730.56			
57.60	2,730.45			
66.80	2,733.49			
73.00	2,734.00			
101.50	2,734.65			
147.80	2,736.00			
178.70	2,738.00			
202.90	2,740.00			
Discharge	1,151.00	cfs		

Results		
Wtd. Mannings Coefficient	0.035	
Water Surface Elevation	2,735.38	ft
Flow Area	178.94	ft ²
Wetted Perimeter	95.95	ft
Top Width	94.34	ft
Height	4.93	ft
Critical Depth	2,735.06	ft
Critical Slope	0.014980	ft/ft
Velocity	6.43	ft/s
Velocity Head	0.64	ft
Specific Energy	2,736.03	ft
Froude Number	0.82	
Flow is subcritical.		

Worksheet
Worksheet for Circular Channel

Project Description	
Project File	c:\haestad\fmw\hddi.fm2
Worksheet	STORM DRAIN OUTLET
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Full Flow Capacity

Input Data	
Mannings Coefficient	0.011
Channel Slope	0.010000 ft/ft
Diameter	12.00 in

Results		
Depth	1.00	ft
Discharge	4.21	cfs
Flow Area	0.79	ft ²
Wetted Perimeter	3.14	ft
Top Width	0.00	ft
Critical Depth	0.87	ft
Percent Full	100.00	
Critical Slope	0.009188	ft/ft
Velocity	5.36	ft/s
Velocity Head	0.45	ft
Specific Energy	FULL	ft
Froude Number	FULL	
Maximum Discharge	4.53	cfs
Full Flow Capacity	4.21	cfs
Full Flow Slope	0.010000	ft/ft

LID CALCULATIONS

80th Percentile Storage

Ref: Dixie Storm Water Coalition GI/LID Guidance

Project: Flower Way Hillside

Number of Lots: 2

Point Rainfall: 0.44 inches Figure 1

Retention \ $WQRV = P_{80\%} * R_{new} * A / 12$

where:

WQRV = Water Quality Retention Volume (ac-ft)

P80% = 80th percentile precipitation value

Rnew = Storm Water Runoff Coefficient associated with the proposed new development where

Rnew = $1.14 (\text{imp}) - 0.371$ for $\text{imp} > 55\%$

Rnew = $0.225(\text{imp}) + 0.05$ for $\text{imp} < 55\%$

A = Area in Acres

Imp = decimal percentage of impervious surface in the contributing watershed

A = 26.2 acres

Impervious 8.78 %

Rnew = 0.07

WQRV = 0.067 ac-ft

= 2919 cu ft

Lot	Area*, ac	%Impervious	Rnew	WQRV, ac	WQRV, cu ft
101	21.8	8.78	0.07	0.056	2429
102	4.4	8.78	0.07	0.011	490
	26.2				2919

*Note: Adjacent public right-of-way added as impervious area

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

Public Notice

Notice is hereby given that the Planning Commission of the City of St. George, Washington County, Utah, will hold a **Hillside Review Board** meeting in the Administrative Conference Room, 175 East 200 North, St George, Utah, on **Tuesday, January 24, 2023**, commencing at **4:00 p.m.**

PRESENT: Commissioner Emily Andrus
Commissioner Steve Kemp
Commissioner Nathan Fisher
Commissioner Ben Rogers
Commissioner Austin Anderson
Commissioner Lori Chapman
Bob Nicholson, Historic Preservation Commission
Bette Arial, Historic Preservation Commission
Scott Messel, Historic Preservation Commission
James Sullivan, Hillside Review Board
Dave Black, Hillside Review Board
Russ Owens, Hillside Review Board
James Dotson, Hillside Review Board
Jeff Mathis, Hillside Review Board

CITY STAFF: City Manager John Willis
Public Works Assistant Director Wes Jenkins
Deputy City Attorney Jami Bracken
Planner III Carol Davidson
Planner III Mike Hadley
Planner III Dan Boles
Development Office Supervisor Brenda Hatch

EXCUSED: Rick Atkin, Historic Preservation
Alan Carter, Historic Preservation

Chair Steve Kemp called the meeting to order. Commissioner Anderson led us in the Pledge of Allegiance.

1. BOARDS AND COMMISSIONS TRAINING

Jami Brackin presented the Open Meetings training. The training covered Open Meetings, GRAMA and Ethical issues. She presented a Power Point presentation covering the following topics.

Public Meeting v. Public Hearing
Closed Meetings
Conduct & Decorum
Case Law
GRAMA
Ethics Act

Hillside Review Board Minutes

January 24, 2023

Page 2 of 2

Municipal Officers & Employees Act
Utah Public Officers' & Employees Act
Conflict of Interest

Open Meetings, GRAMA & Other Stuff

Training for the St. George Planning
Commission and other Committees

January 24, 2024

Jami R. Brackin

Deputy City Attorney

What We Will Cover

1. Open Meetings
2. GRAMA
3. Ethics



OPEN & PUBLIC MEETINGS



Purpose

52-4-102. Declaration of public policy.

- (1) The Legislature finds and declares that the state, its agencies and political subdivisions, exist to aid in the conduct of the people's business.
- (2) It is the intent of the Legislature that the state, its agencies, and its political subdivisions:
 - (a) take their actions openly; and**
 - (b) conduct their deliberations openly.**

When Is It Applicable

52-4-201. Meetings open to the public -- Exceptions.

- (1) A meeting is open to the public unless closed under Sections 52-4-204, 52-4-205, and 52-4-206.
- (2)
 - (a) A meeting that is open to the public includes a workshop or an executive session of a public body in which a quorum is present, unless closed in accordance with this chapter.

...



NOTICE

24 hours prior to the meeting by posting:

1. On the Utah Public Notice website
2. Providing Notice to newspaper or correspondent.
3. City Hall (Principal offices)



NOTICE

Notice must include:

1. Date, Time, Place and Agenda (with reasonable specificity to notify the public as to the topics)

What about agenda materials?



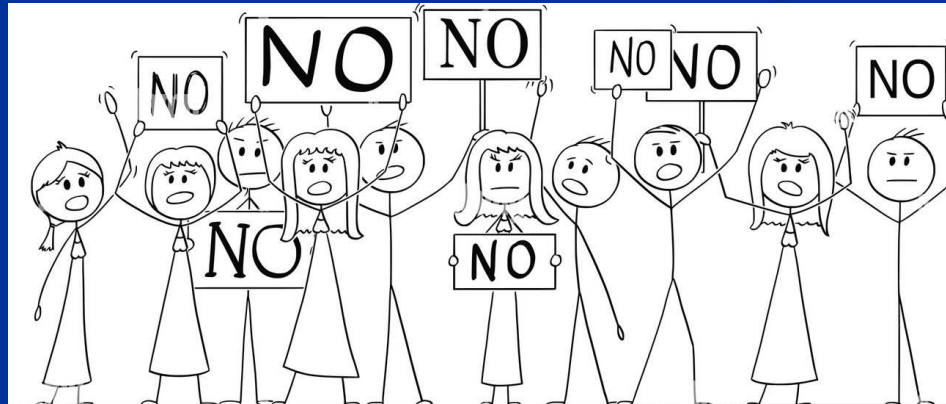
Public Meeting v. Public Hearing

Public Meetings

- Quorum of the public body
- 24-hour notice
- Public input MAY be taken but not required if comments are NOT re items on the agenda

Public Hearing

- Held during Public Meeting
- Must have 10-14 days' notice
- Comments re particular agenda item



What about....

Electronic Meetings

Allowed by Ordinance

Special Meetings

Allowed with Notice

Emergency Meetings

Allowed with Notice to the body

Closed Meeting

Allowed for appropriate reasons



City of St. George
Legal Dept.

CLOSED MEETINGS

Public Meeting may be CLOSED to discuss:

- Character & competence or health of an individual
- Collective Bargaining
- Litigation
- Real Property and water transactions
- Investigations of criminal conduct

Must have quorum present and a 2/3 majority vote to close.

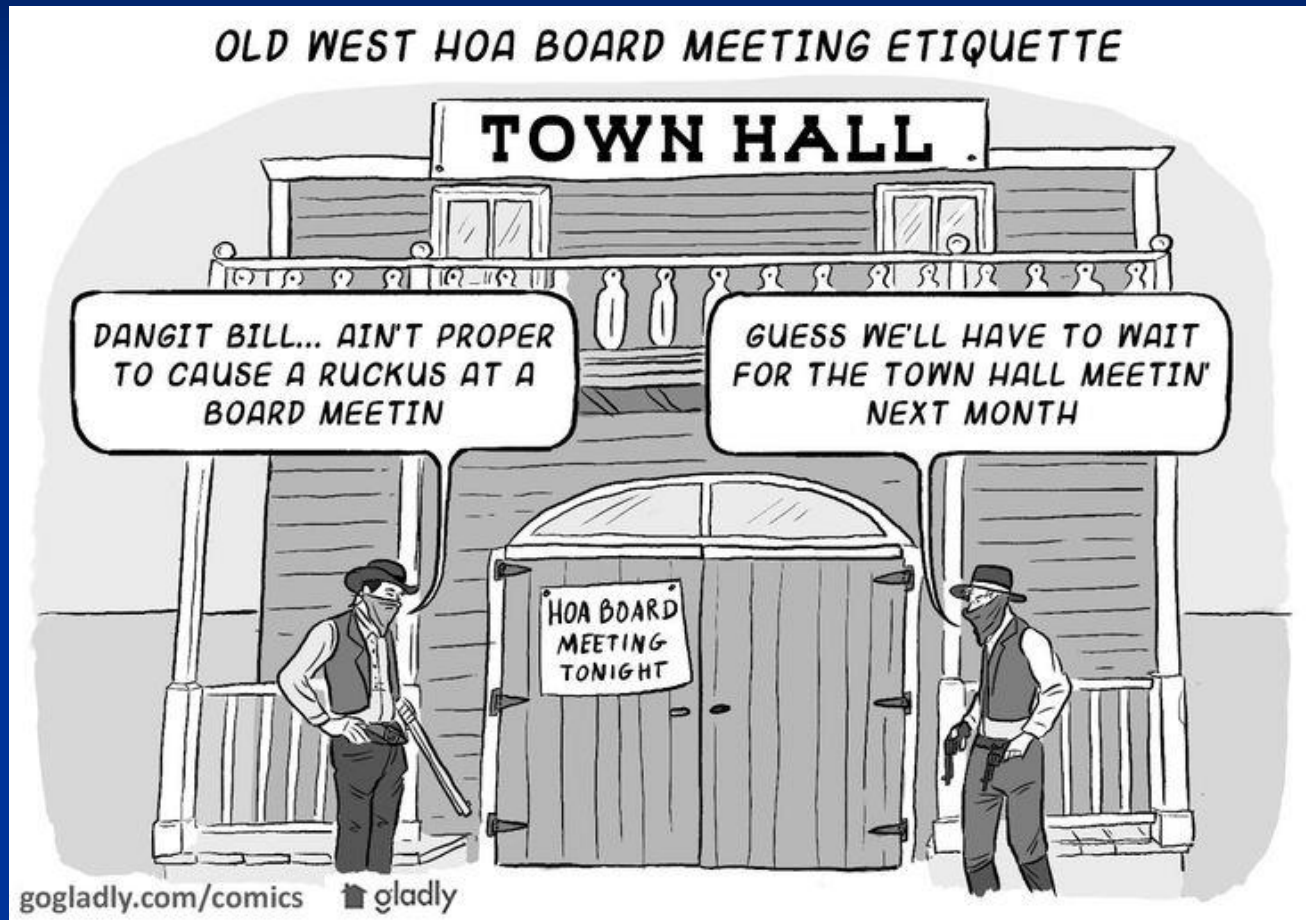
CLOSED MEETINGS (cont)

May not be used to:

- Interview applicant for elected positions or to fill vacant position;
- Approve any ordinance, resolution, rule, contract, or appointment; or
- Vote on any issue (other than to reopen)



Conduct & Decorum



Conduct & Decorum

Member of the body

May be expelled upon
2/3 majority vote

Member of the public

May be expelled upon
2/3 majority vote; OR
Police may arrest for
disorderly conduct.

MINUTES

CS232576



MINUTES

Must Include:

- Date, time, place, & members present & absent;
- The substance of all matters discussed;
- Names of citizens providing comment at public hearing AND the substance of their comments;
- Any matter the body wants to be entered into the record; and
- Record of all votes taken.
- Materials submitted at meeting

RECORDING

May be used for minutes;

Must be kept in full and unedited

Work meetings recorded

Closed meetings recorded UNLESS discussing character & competence of an individual.



CASE LAW

REMEMBER!

It is the intent of the Legislature that the state, its agencies, and its political subdivisions:

- (a) take their actions openly; and
- (b) conduct their deliberations openly.



Wallingford v. Moab City,

2020 UT App 12

“...municipalities may not contract around public hearing requirements found in statute or ordinance.”

“The grants of power to municipalities make clear that cities may not take action that is “repugnant to law,” id. § 10-8-84(1), or that is “expressly prohibited by law,” id. § 10-9a-102(2).”



Wallingford v. Moab (cont)

One type of requirement that appears in statutes and ordinances, as applicable in certain contexts, is **the requirement that municipalities conduct some of their business in public**, so that the citizens of the municipality may know how the public's business is being conducted. See, e.g., Hutchinson, 624 P.2d at 1121 (stating that “[t]he ultimate limitation upon potential abuses by local governments is the people themselves,” whose “vigilance and sound judgment” restricts and directs “all democratic governments”).



Walker v. Tooele County

(Ruling & Order) 3rd District Court, Case No. 18301487

“The Court concludes that, as a matter of law, the Tooele County Commission’s approval and execution of the Southside Agreement was illegal contract zoning.”

“Tooele County (including members of the [County] Commission) and Southside engaged in **private discussions** that produced the Southside Agreement.” – they had been doing so for 2 years.

“due process demands a new trial when the appearance of unfairness is so plain that we are left with the abiding impression that a reasonable person would find the hearing unfair.”



Summit County v. Hideout

(Order on Amended Motion to Show Cause)

4th District Court, Case no. 200500072

“...Summit County demonstrated a likelihood of success on the merits that **Hideout violated the Open and Public Meetings Act** (“OPMA”), Utah Code Ann. §§ 52-4-101, et seq., by conducting its deliberations about the July Pre-Annexation Agreement, modifications of the July Pre-Annexation Agreement, and the decision to adopt the July Pre-Annexation Agreement outside of the public meeting where the July Pre-Annexation Agreement was adopted.”



Summit County v. Hideout (cont)

“The type of harm that the provisions of that act are intended to guard against are the passage of resolutions or other decisions made by a municipal body without notice to those affected by those decisions. See Utah Code Ann. § 52-4-102 (“It is the intent of the Legislature that the state, its agencies, and its political subdivisions (a) take their actions openly; and (b) conduct their deliberations openly.”)”



GRAMA

63G-2-102. Legislative intent.

- (1) In enacting this act, the Legislature recognizes two constitutional rights:
 - (a) the public's right of access to information concerning the conduct of the public's business; and
 - (b) the right of privacy in relation to personal data gathered by governmental entities.



GRAMA

(2) The Legislature also recognizes a public policy interest in allowing a government to restrict access to certain records, as specified in this chapter, for the public good.



GRAMA

What do I need to provide if requested?

Emails: USE CITY EMAIL ADDRESS FOR ALL CITY BUSINESS

Phone logs: Cell phone logs should be retained for 3 months

Text Messages: All text messages should be retained for 3 months if related to City business.

GRAMA

(Whispers, Calls & Texts)

During the Meeting

Avoid the whispers – open deliberation required

No texting!

No emails!

Outside of the Meeting

No Ex parte communications

No deliberations by calls or texts

Questions should be directed to staff



ALL THOSE IN FAVOR
OF WHAT WE DISCUSSED
IN OUR E-MAIL THREAD
AND AT LARRY'S SON'S
BIRTHDAY PARTY SAY 'AYE'

LANDGREN THE LANDMARK
3-16

'Aye'

'Aye'

'Aye'

I

... HAVE
NO IDEA
WHAT'S
GOING ON

WINK
NUDGE

I THOUGHT
THIS MEETING
WAS OPEN?

ETHICS

Municipal Officers' & Employees Act

- | | |
|--|---------------------|
| • Use of office for personal benefit | Prohibited |
| • Compensation for transaction with City | Disclosure required |
| • Interest in business entity | Disclosure required |
| • Investment creating conflict | Disclosure required |

ETHICS

Utah Public Officers' & Employees Act

- Improperly disclosing information Prohibited
- Accepting Gifts Disclosure required + prohibited
- Offering donation for approval Prohibited
- Conflict of Interest Disclosure required



CONFLICT OF INTEREST

Personal investments or pecuniary interest that create conflict between personal interests and public duties

Allowed with proper disclosure

Disclosure of Private or protected information

Prohibited



QUESTIONS?



City of St. George
Legal Dept.

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 meetings at the referenced site on **Wednesday, January 25, 2023**, commencing on-site at approximately 9:00 a.m.

PRESENT:

James Sullivan
Dave Black
Jeff Mathis
Russ Owens

EXCUSED:

James Dotson

CITY STAFF:

Assistant Public Works Director, Wes Jenkins
Planner III, Carol Davidson
Planner III, Michael Hadley
Development Office Supervisor, Brenda Hatch

The agenda for the meeting is as follows:

1. Consider a request for a hillside development permit to build a new townhome development on the property located at 1100 W Curly Hollow Dr. **Meeting time is approx. 9:00 am**

Jared Bates – This is for the proposed Rosewood Townhomes project. We have 134 units. It slopes generally from north to south towards Curly Hollow Drive. Our goal is to stay out of the northeast corner completely that is in the 30 – 40%. It looks like a little bump there that we would be getting into but that is a retaining wall, so if we needed to adjust the retaining wall we could. Jared showed the grading plan and the cross sections.

James Sullivan – Do you have the wall specs?

Jared Bates – No, no wall specs, just grading.

Jeff Mathis – It looks like you have the recreation area in a 4:1.

Jared Bates – Yes, we will flatten that out.

Dave Black – What type of walls?

Jared Bates – I’m guessing they will be rock, that’s usually the cheapest option. There might be some concrete in here where we are close to the buildings.

Russ Owens – So how high is this wall?

Jared Bates – Probably 8.

James Sullivan – Is there no retention?

Jared Bates – No because we are going to send it through.

Wes Jenkins – Is any of this area here part of what you are disturbing?

Jared Bates – No, we will be well below that. There is just this bit here that is yellow.

Dave Black – So in the motion we may want to address that these 3 here are isolated and noncontiguous. The motion probably ought to address the retaining walls as far as the color matching the natural terrain and that the cut slopes be matched with (can’t hear on the tape)

MOTION: Jeff Mathis made a motion to recommend approval of the Rosewood Townhomes as presented with the conditions that the 3 areas in the top north side where the cut slopes go in, they don’t touch steeper than 20% the other areas are noncontiguous slopes so they shouldn’t present a problem, any retaining walls need to be a color that matches the existing landscape and that all the steep cut slopes 4:1, 2:1 slopes have landscaping cover to match the natural landscape.

SECOND: Russ Owens

AYES (4)

James Sullivan

Dave Black

Jeff Mathis

Russ Owens

NAYS (0)

Motion carries

2. Consider a request for a hillside development permit to make modifications to the ridgeline along the southeast slope of the Tech Ridge Development. **Meeting time is approx. 10:00 am**

Mike Bradshaw – What the intent of this ask is to continue, all the way south on the east side and the west side of this mesa is a ridge cap that has held fast, that is there. It creates a ridgetop that is definable, that you can look at, that you can set your buildings off set. Our intent is to put a trail in on the ridge. Our ask is to create that ridge and continue those aesthetics along the east face and define a ridge cap, put a trail against it and ultimately get a pedestrian bridge over the top of this future road that we intend to build for the southeast access. To create this pedestrian loop along the top of the ridge. That is the basis of what this ask is. To create that ridgeline aesthetic and continue that look. We feel like it defines the edge. It mitigates a lot of the buildings right now, the effects

of the buildings that are up here. I think it creates a nice atmosphere to finish this ridge off. So that you don't see the retaining wall or the edge of the building.

Russ Owens – How do you define that?

Mike Bradshaw – There is a spot that kind of maintains that ridge and we will just extend it out. It's somewhat arbitrary. It's more of when we staked it, and when we got there it felt like the most logical place.

Russ Owens – So there are stakes?

Mike Bradshaw – There were, it's been about a year.

Isaac Barlow – It's important to the pedestrian trail experience that we do around the edge. It allows for the pedestrian experience to connect without having to get them across the main access road.

Dave Black – I think we probably ought to table this particular item but we can continue on with further discussion about the things that we like about it. I think we will need a Geotech report that addresses that, the report you submitted doesn't address the walls and the location. Specifically, I think they would want to state, and what we don't want to happen, at least in my mind is that the base of the wall extend on top of the landslide in any location. We want to make sure that the base of the wall is back from what they determine as landslide. We don't want to add more weight or fill to the landslide. I think the Geotech report should look at the location, you will probably have to look at your rocky wall ordinance and look at the heights you have proposed.

Mike Bradshaw – They are 8 ft. tiers. A 16 ft. total.

Dave Black – I like the idea, and they have already proven that they can make things look really nice. We have done something similar on Foremaster Ridge, where some of those last lots we looked at. We had them build rock walls with the basalt and we extended that defined edge. We have done that before. I just think we need to be real careful about the location, that we don't impact the landslide and that we get a Geotech report, which you need anyway for your rock wall construction and your designs.

Wes Jenkins – Do you want them to stake it again so you can walk it?

Dave Black – Yes, it needs to be staked for the Geotechnical engineer as well. It needs address the location so we know that there is no impact to it. I personally don't think I could vote on it right now without having that. I like the idea and don't see anything wrong with it as long as we are matching the colors and it's similar to what they are doing up here.

Jeff Mathis – Obviously you are creating a very visual aspect for our City. I agree that the west side looks beautiful. On this side, this is why we have hillside ordinances. One question I have is there any part of our hillside ordinance that we talk about actually creating ridgelines? That is what were doing, creating a new ridge.

Mike Bradshaw – I think the clarity on that is this is a specific, the hillside doesn't address ridgelines per se. The ridgeline is here by default.

Jeff Mathis – There are certain defined ridgelines in the City, but it doesn't come down this far.

Discussion on what defines the ridgeline.

James Sullivan – The slope map that is the packet, it seems like most of it is in the 0 to 20%.

Jeff Mathis – Those are slope maps on existing slopes, right? If they are building those walls that really flattens this out. Is the overall intent to build commercial property on top of all those walls.

Mike Bradshaw – Yes, between the ridge and the 50 ft offset would be the ridge trail and then the intent would be to start the project outside of that.

Wes Jenkins – As I remember we have had projects where they were going to create a faux ridgeline to tie the two together, it's just that it's never been to this extent.

Jeff Mathis – The ones that we did, the ones that Dave mentioned. You can see them from here. You are starting to see that. The scope of this is so much larger, two tiered walls 16 ft roughly in height when we were talking about 4 or 5 ft over there. We're redefining the skyline.

MOTION: Dave Black made a motion we table this item until we can get a project Geotech report that addresses the walls and any potential impact to the landslide and that when we meet next time that the proposed alignment of the walls have been staked in the field.

SECOND: Russ Owens

AYES (4)

James Sullivan

Dave Black

Jeff Mathis

Russ Owens

NAYS (0)

Motion carries

3. Consider a request for a hillside development permit to construct the southeast access road from 250 West St. to the Tech Ridge Development. **Meeting time is approx. 10:00 am**

Mike Bradshaw – We have the south access road for Tech Ridge coming off of 250 W, ultimately we plan on realigning 250 W so that this is the primary access to the south.

Jeff Mathis – And this is a City project?

Mike Bradshaw – Right, it's in an easement, so we are pretty tight on the location. The easement is imminent domain easement, so we don't have a lot of leeway as far as the location. We have taken the liberty to adjust the grades as tight as possible. I think our max slope is 2:1. Our task was to keep the road within the alignment and those slopes within that slope easement.

Craig Coats – We have some retaining walls that are higher than the ordinance allows, and we will need a variance for that.

Mike Bradshaw – And we were able to achieve that but to Craig's point we have some 9 ft retaining walls.

Craig Coats – It is 9 to 10 ft. down at the bottom.

Mike Bradshaw – In that road we have, the City is also requesting a 12 inch water line. The sewer line as well. The storm drain is primarily, dedicated to collect the water off of the road itself. We are not inducing any water from the top area here, all of that water is going to the west side of the property into the detention basin. This side the drainage pipe is exclusively draining the road itself. We will also have a power line running up that road. We've gone through JUC as far as the first submittal. We've had discussions with the Water Department and the type of line that they want to use. They are anxious to use standard bell and spigot, they don't want to use any welds in it. This side we used ductal but all of the waterline on this side was further south. We did bring a sewer line up which was an HTPE sewer line. We did an HTPE storm drain on that side which we will mimic on this side.

Craig Coats – So that is fused all the way top to bottom, the only penetrations are the inlet boxes and then it's fused all the way.

Mike Bradshaw – But the water line, the City does not want to use any kind of a welded pipe. We have expressed interest in using a welded PVC and they have shut us down, turned us down on that. Their concern with the welded PVC is if it cracks it continues to perpetuate and they don't know where to find the crack. With the bell and spigot the crack is at the end of the pipe.

Craig Coats – So on the sewer it's fused all the way through exactly what we did on Cloud Drive, they have manholes but they are not actually cutting into them unless they need to get into them. It will be a solid pipe until they need to, then they'll just cut out the top little piece. There is no access from the road, it will be from the top here and then it will be one fused pipe all the way down.

Mike Bradshaw – It's the same with the water, we don't anticipate, well in fact the City, the department is looking for a dedicated transmission line from bottom up to the tank on top here, so they are going to mandate no connections to that line as far as service lines or T's or anything of that nature.

Wes Jenkins – And you may recall when we did the hillside over there, we had flexibility with the road. You actually adjusted to get it in areas. On this one we don't have that

flexibility as Mike indicated. The City went in and did imminent domain so we really can't shift that road.

Craig Coats – The thing we can try and do is on the upper end as we get higher, we can try to keep it pretty level in this middle section. There are big cuts on the north end when we tie in. But as we get to the top we try to get the road down as much as possible to limit the wall size that you would potentially see on that edge.

Mike Bradshaw – In fact, what we ended up having to do, to get that down as far as we could, is redo some of the existing Cloud Drive and lower it about a foot. So we will take out a little of Cloud Drive to reduce the elevation of that intersection. We think we've optimized the road as tight as possible. I don't think we have a lot of flexibility. We are constrained to the Right of Way and to the slope easements that we were given.

Discussion on where things would be located from where we were standing.

Mike Bradshaw – Without the use of this road the property is more or less undevelopable. The densities have been approved based on this road and the traffic studies with this road. When we did the traffic study, the top engineer thought that 65% of the traffic of this entire development comes on this road and hits the Bluff Street intersection. This is a critical infrastructure to this development.

Dave Black – The road itself on the alignment and the grades I think you've done an excellent job. They match, there are minimal cuts and fills, minimal disturbance. They've already demonstrated on the other side that they can put that road in with very minimal visual impact, it's going to look great. I have no concerns on the road alignment. The Geotech report that was submitted was prepared in 2018, so it's a little bit old. There is quite a bit of discussion in there that it probably needs to get out to Council. It talks about risk and there is some risk here. There is a little bit of education, and again, I don't think it's enough to not do the road but I think it's an education thing and that information needs to get out somehow. I don't know if AGECE or somebody comes and talks about it to Council. That's just an idea, but I think that needs to get out there. There are some concerns that I have, that we had on the other road. The specific recommendations by AGECE is that no water bearing utilities should be installed within the landslide area. We talked about that on this side. You are in an area that has some water risk. Putting water there, utilities, is not a wise idea. I understand the need of what you want to do, personally, I think you could probably take them through the landslide area but in my opinion it would be better to go perpendicular and get off the slope and down to the bottom as soon as possible and not take it along the road. A significant leak, a slow leak over a long period of time, could have some catastrophic impacts. You would be going against the recommendations of the Geotech report if you do that. According to your code, your ordinance you need to follow the Geotechnical report. I think that's a legitimate concern.

James Sullivan – What are the options available?

Russ Owens – They talked about having the water above ground, then you could see the leak. I don't know if that's possible.

Discussion continued regarding issues with water in the road and solutions that may be feasible.

Dave Black – Another thing is with the road is that you are building on blue clay, not just the landslide. If you're putting the storm drain in the road, the manholes and drop inlets really need to be watertight. Along Blackridge Drive, every one of those drop inlets is where we had problems with the road because the water got in.

Mike Bradshaw – One of the things we could do, and have done in the past on sewer manholes, is grout the seams and things. They come out watertight.

Dave Black – I love the road, but utilities in it are a concern for me.

Jeff Mathis – Is there anything they could do like with the one side of Bluff Street, just have an open channel on the one side where you are not trying to put it in the ground?

Mike Bradshaw – We do have an open channel and what it does, is catches the slope. So we have somewhat of an open channel but we can't get it big enough to convey all of the water and then you still have all the water that is in the street and then it just becomes overwhelming to convey it all to the bottom.

Discussion on how to catch road drainage.

Dave Black – Another option you would have is to get an updated Geotech report where they can spend some time with you looking at these things and maybe the recommendations may change. But right now, the Geotech report you submitted has very specific recommendations on it.

Mike Bradshaw – We could line it, we'll have a discussion maybe we could even grout it on that channel.

James Sullivan – I don't know that there is any other option of getting the road up here.

Discussion continued on the water and utilities in the road versus running it straight up the hillside.

I wonder if we can make two motions, one where we motion on the road alignment and then another to get an updated Geotech report to verify the grading complies with the report and to specifically address, now that there is a design, the water utilities and the stormwater management. To address it specifically in accordance with their recommendations.

MOTION: Dave Black made a motion we recommend approval the alignment and grade of the proposed roadway off of the Black Ridge and any walls for the roads and the cut fill slopes we recommend for approval that portion of the property.

SECOND: Russ Owens

AYES (4)

James Sullivan

Dave Black

Jeff Mathis
Russ Owens
NAYS (0)
Motion carries

MOTION: Dave Black made a motion we recommend that the project Geotechnical investigation report be updated to verify that the proposed cuts and fills are as recommended in the report with minimal impact to the stability of the slope and that they specifically address stormwater management and the potential for water baring utilities in the road, that other options are considered by the City and the design engineers to see if those utilities can be moved out of the roadway.

SECOND: Jeff Mathis

AYES (4)
James Sullivan
Dave Black
Jeff Mathis
Russ Owens
NAYS (0)
Motion carries

4. Approval of the meeting minutes from the November 30, 2022, and the December 14, 2022, meetings.

MOTION: Jeff Mathis made a motion to approve the minutes for the last two meetings.

SECOND: Russ Owens

AYES (4)
James Sullivan
Dave Black
Jeff Mathis
Russ Owens
NAYS (0)
Motion carries

5. Adjourn
Russ Owens made a motion to adjourn.