HURRICANE 2800 WEST ALIGNMENT STUDY

The City of Hurricane

Dixie Metropolitan Planning Organization

April 19, 2019

CivilScience
Engineers | Surveyors | Solutions

HURRICANE 2800 WEST ALIGNMENT STUDY

April 2019

Prepared for:

DIXIE MPO & THE CITY OF HURRICANE

Prepared by:

CivilScience
Engineers | Surveyors | Solutions
1453 S Dixie Drive, Ste 150
St. George, UT 84770
435 986 0100

Staff Member	Role
Cody Howick, PE	Project Manager
Tyler Turner, PE	QC/QA Manager
AJ Yates, PE	Bridge Planning Lead
Brandon Weight, PE	Roadway Planning Lead

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1 EXECUTIVE SUMMARY

1.1 Introduction

The primary goal of this study is to provide a recommended alternative for the alignment of 2800 West or the Babylon Road Corridor in Hurricane from SR-9 and run north across the Virgin River to a point about 1,000 feet north of the Virgin River. The main objectives of the study are to evaluate potential bridge crossings, identify roadway alignments, and provide a cost estimate of the recommended option.

FIGURE 1: WEST AND MIDDLE BRIDGE CROSSING WINDOWS

1.2 Alternatives Analysis

Three bridge crossing windows were created to identify potential bridge crossing locations for potential alignment alternatives. Seven horizontal alignments with vertical profiles were created and analyzed to develop a list of fatal flaws for each alignment. Items such as earthwork, utility conflicts, bridge length, bridge height, existing right-of-way, etc. were considered. After reviewing the results of the analysis with the Dixie MPO and Hurricane City, two alignments, Alternatives 2 and 5, were determined to be feasible and selected to be developed further for concept level design and cost consideration. These have been named Option 1 and Option 2, respectively.

1.3 Corridor Options

Option 1 features a 710-foot steel deck arch bridge to span the Virgin River. This structure type is considered a “complex” bridge and spans the entire channel. By avoiding interior supports, this bridge will not be limited by column heights and can be positioned much higher over the river and avoid large excavation. The total project cost estimate for this option is $85.7M.

Option 2 has an approximately 3,500 foot long cut into the south side of the river to facilitate a traditional steel deck girder bridge. This large amount of excavation will be challenging due

to the shallow bedrock formation. The alignment will require another structure as it passes through another mapped 100-year flood plain north of the river. Another significant obstacle is the regional sewer line conflict near station 63+00. The total cost estimate for this option is $78.4M.

Detailed cost estimates and excavation summaries for both options are provided in the appendix. Table 1 gives a summary of some of the design considerations of the options.

TABLE 1: CORRIDOR OPTIONS SUMMARY

Attributes	Option 1
Cost Estimate 2019	$85,700,000
Bridge Type	Steel Deck Arch Bridge
Bridge Length	710'
Bridge Height	85'-120'
Earthwork	Largest Cut depth 50'-60', length 1,500'. 632,533 cu-yd Cut
Steepest Slope	8% onto the bridge
Utility Conflicts	Minimal
Environmental Concerns	Significant earthwork in Desert Reserve
Drainage	No other special considerations
Intersections	Match existing grade at SR-9 and 600 North
Notes	Significantly higher bridge cost than Option 2

Attributes	Option 2
Cost Estimate 2019	$78,400,000
Bridge Type	Steel Deck Girder Bridge
Bridge Length	735'
Bridge Height	50'
Earthwork	Largest Cut depth 110'-115', length 3,500'. 1,212,504 cu-yd Cut
Steepest Slope	8% onto the bridge
Utility Conflicts	Regional sewer line 20'-30' above proposed road
Environmental Concerns	Significant earthwork in Desert Reserve, additional flood plain crossing, closed mine shafts
Drainage	100 year flood plain area to the north of the river
Intersections	Match existing grade at SR-9 and 600 North
Notes	Significantly higher excavation cost than Option 1

While both options are viable for construction, **Civil Science recommends Option 1** to further study the corridor and bridge design. We recommend Option 1 because it maintains a consistent roadway as an extension of Southern Parkway, allows for more developable land area, minimizes impacts to existing utilities, impacts the mapped flood plain only at the Virgin River, and gives strong consideration to right-of-way acquisition.

2 INTRODUCTION

2.1 Objective

The primary goal of this study is to provide a recommended alternative for the alignment of 2800 West or the Babylon Road Corridor in Hurricane from SR-9 and run north across the Virgin River to a point about 1,000 feet north of the Virgin River. The following outlines the main objectives of the study and highlights several key considerations for the study.

- Prepare base maps with right-of-way and utility background information
- Evaluate potential bridge crossings
    - Height and length of the bridge
    - FEMA 100-year flood plain
    - Protected species habitats
    - Connections to the existing Babylon Road on the north side of the Virgin River
- Identify roadway and corridor alignments
    - Right-of-way
    - Drainage and other utilities
    - Proposed intersections
- Provide a project cost estimate of the recommended option

2.2 Data Collection

On October 30, 2018, a site visit was performed by Dixie MPO, City of Hurricane, and Civil Science that focused on potential bridge crossing locations. After the site visit, potential intersections and bridge connection locations were identified and documented for analysis. Existing utility locations, particularly sewer, water, and power, were collected from the respective providers for design considerations and to show on exhibits. Existing right-of-way area along the proposed corridor was collected and documented for the analysis. There exists partial right-of-way for a future road between SR-9 and 600 North.

FIGURE 2: OBLIQUE PICTURE OF PROJECT SITE VIA GOOGLE EARTH

3 ALTERNATIVES ANALYSIS

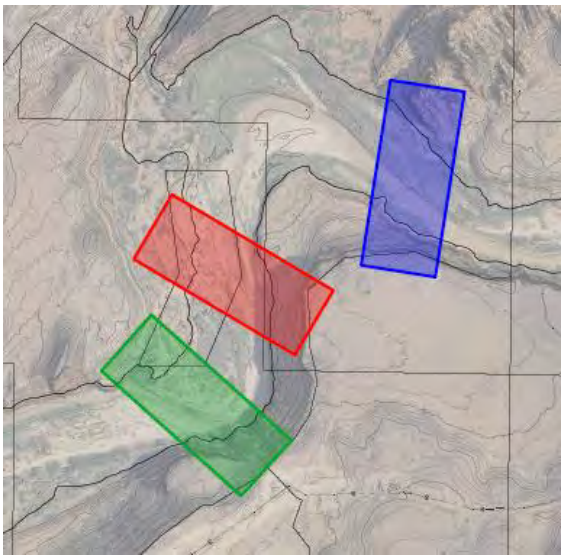

FIGURE 3: CLIP OF BRIDGE CROSSING ANALYSIS EXHIBIT

3.1 Bridge Crossing Analysis

An understanding of the preferred locations for a bridge to cross the Virgin River was needed to develop the proposed alignments. Based on information from the site visit, publically available elevation data, environmental protections, and bridge design constraints, three bridge crossing windows were identified. Figure 3 depicts these windows. A more detailed figure is provided in the appendix.

The west (green) bridge crossing window was considered for proximity to existing development, bridge length, bridge height, and elevated terrain on the north side of the river. The middle (red) bridge crossing window was considered for bridge length, bridge height, and lower terrain on the south side of the river. The east (blue) bridge crossing window was considered based on a previous study performed for Hurricane City and land access on the south side of the river.

3.2 Fatal Flaw Analysis

Seven alignments were created to provide connectivity across the Virgin River from SR-9 to 1,000 feet north the river. These were then analyzed for fatal flaws that would eliminate them from further consideration. Fatal flaws were items that made an alignment non-feasible, such as substandard performance or excessive cost. Each bridge crossing window had two alignments. A seventh alignment considered a hybrid crossing between the middle (red) and east (blue) windows.

Alternatives Matrix

Table 2 summarizes the characteristics of each alternative. The full size table is available in the appendix. The Alignment Alternatives Analysis Exhibit presented in the appendix shows the horizontal alignments and vertical profiles with notes on slope and required earthwork. While general earthwork efforts were considered in the creation of the alternatives, a detailed evaluation was not performed.

Alternative 1 is the alignment from the previous study. This alternative was developed for the shortest bridge; however, it appears that vertical location was not considered. It provides

TABLE 2: FATAL FLAW ANALYSIS SUMMARY

Alignment Name	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5	Alternative 6	Alternative 7
Total Bridge Length	800 feet	800 feet	1,400 feet	1,100 feet	1,000 feet	950 feet	1,000 feet
Max Bridge Height	165 feet	155 feet	140 feet	100 feet	150 feet	110 feet	160 feet
ROW Acquisition (north of 600 N)	Full length	1,400' along property lines. Bisects properties on both sides of the river.	1,850' along property lines. Bisects properties on both sides of the river.	1,800' along property lines. Bisects properties on both sides of the river.	1,800' along property lines. Bisects properties on both sides of the river.	600' along property lines. Bisects properties on both sides of the river.	850' along property lines. Bisects properties on both sides of the river.
Property Notes	Doesn't follow current 2800 W alignment. Bisects multiple properties including newly built Church. Bisects 2 properties in north side.	Follows current 2800 W alignment. Bisects 3 properties on south side. Follows lines of 4 properties on south side. Bisects 2 properties in north side.	Follows current 2800 W alignment. Bisects 3 properties on south side. Follows lines of 4 properties on south side. Bisects 3 properties in north side.	Follows current 2800 W alignment. Bisects 2 properties on south side. Follows lines of 4 properties on south side. Bisects properties in north side.	Follows current 2800 W alignment. Bisects 2 properties on south side. Follows lines of 4 properties on south side. Bisects 5 properties in north side.	Follows current 2800 W alignment. Bisects 2 properties on south side. Follows lines of 4 properties on south side. Bisects 4 properties in north side.	Follows current 2800 W alignment. Bisects 2 properties on south side. Follows lines of 4 properties on south side. Bisects 5 properties in north side.
Grade	6% max grade	8%	8%	8%	8%	8%	8%
Design Speed	50 mph	45 mph	45 mph	45 mph	45 mph	45 mph	45 mph
Flood Plain Impact	Only over the Virgin River	Only over the Virgin River	North section passes through secondary 100-yr flood plain. May be avoided.	North section passes through secondary 100-yr flood plain. 2nd crossing required.	North section passes through secondary 100-yr flood plain. 2nd crossing required.	North section passes through secondary 100-yr flood plain. 2nd crossing required.	North section passes through secondary 100-yr flood plain. 2nd crossing required.
Cuts/Fills	40'-50' cuts and 20'-30' fills on north side. Minimal excavation on south side.	40'-50' cuts and 20'-30' fills on north side. 10'-20' cuts/fills on south side.	80'-100' cuts on north side. 10'-20' cuts/fills on south side.	Minimal excavation on north side. 85' cut on south side; extends 1,100' @ 10% or 2,500' @ 8%.	10'-15' cut/fill on north side. 30' cut on south side; extends 500' @ 8%.	Minimal excavation on north side. 105' cut on south side; extends 2,000' @ 10% or 2,550' @ 8%.	10'-15' cut/fill on north side. 55' cut on south side; extends 1,200' @ 10% or 1,700' @ 8%.
Other Notes	Alignment was designed for higher speed and milder slopes.	Slightly modified alignment will facilitate higher design speed.	Slightly modified alignment will reduce distance in flood plain.	Potential for Curved bridge section.	Long sweeping S-curve on north side of river.	Potential for Curved bridge section.	Long sweeping S-curve on north side of river.

*Issues common to all scenarios:
Connection to SR-9; ROW and alignment (straighter is preferred)
Potential power and sewer conflicts
Widen existing 2800 W ROW from 80' to 90' south of 600 N

a flatter road, a higher design speed, and moderate earthwork on the north side of the river. Right-of-way acquisition required for this option will be significantly higher. Development of the Peregrine Pointe subdivision has also encroached upon this proposed alignment since it has been recommended. **Fatal Flaw: Encroachment over existing development.**

Alternatives 2-7 are identical between SR-9 and 600 North and create an interchange at SR-9, which is part of the future Southern Parkway extension project. These alternatives also create an intersection at 600 North that is west of the existing right-of-way to provide sufficient sight distance.

Alternative 2 is a modified version of Alternative 1 that more closely follows right-of-way between SR-9 and 600 North. It also uses the same bridge crossing window as Alternative 1. This alignment has fewer horizontal curves and minimizes earthwork on the south side of the river. Moderate earthwork is required on the north side of the river.

Alternative 3 minimizes horizontal curves as it continues across the river. It turns west along a steep slope and crosses the river at a relatively wide point. This crossing resulted in the longest bridge. It also passes parallel through a mapped 100-year flood plain that is north of the river. Alternative 3 is not within one of the three crossing windows identified in the bridge

crossing analysis. **Fatal Flaw: Excessive bridge length and impacts to 100-year flood plain.**

Alternatives 4 and 5 utilize the middle (red) bridge crossing window. Alternative 4 has a portion of the bridge located on a horizontal curve and lands at the bottom of a plateau. The connecting road would cross the mapped 100-year flood plain that is north of the river, which would require another bridge. Such a structure would not be captured in the cost estimate of this study. Alternative 4 has a long bridge length, significant earthwork, but has the shortest bridge height in the study. Alternative 5 bridge land on top of the plateau but still must still cross through the mapped 100-year flood plain to the north of the river. Landing on top of the plateau would require a smaller cut on the south side of the river, but would also increase the column height of a proposed bridge. It has a long bridge length, is high above the river, and requires moderate earthwork. **Fatal Flaw (Alternative 4): Horizontal curve on the bridge. Fatal Flaw (Alternative 5): Excessively tall bridge columns.**

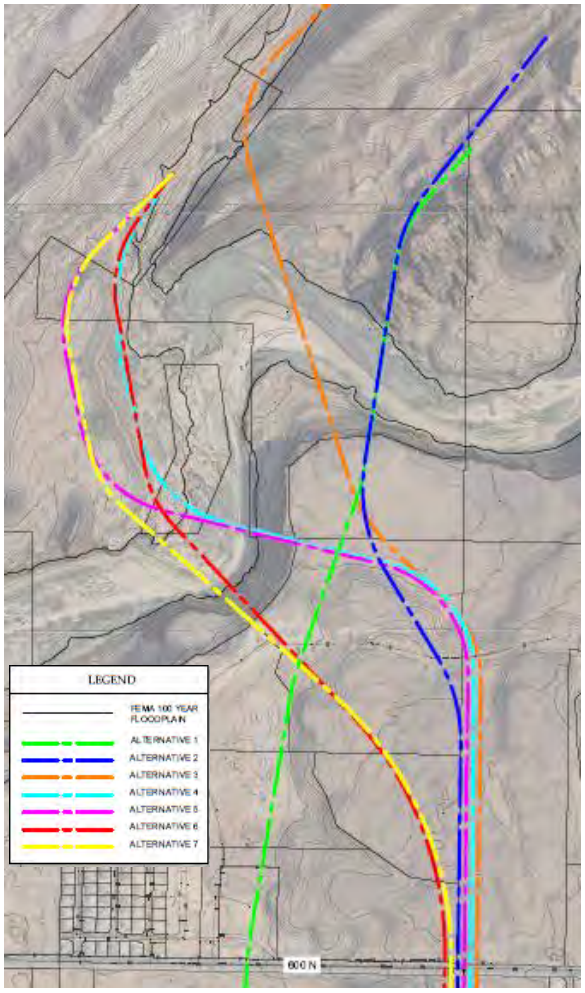

FIGURE 4: ALTERNATIVE ALIGNMENTS

Alternatives 6 and 7 utilize the west (green) bridge crossing window. These alternatives would also have a road that requires another structure to cross the mapped 100-year flood plain north of the river (like Alternatives 3, 4, and 5). Alternative 6 has the second shortest bridge length and height, but has a large amount of earthwork. Alternative 7 minimizes the amount of excavation by landing on top of the plateau, but still has tall bridge column heights. It has a moderate bridge length, is the second highest bridge of the study, and requires extensive earthwork. **Fatal Flaw: Excessively long bridge spans and tall bridge columns.**

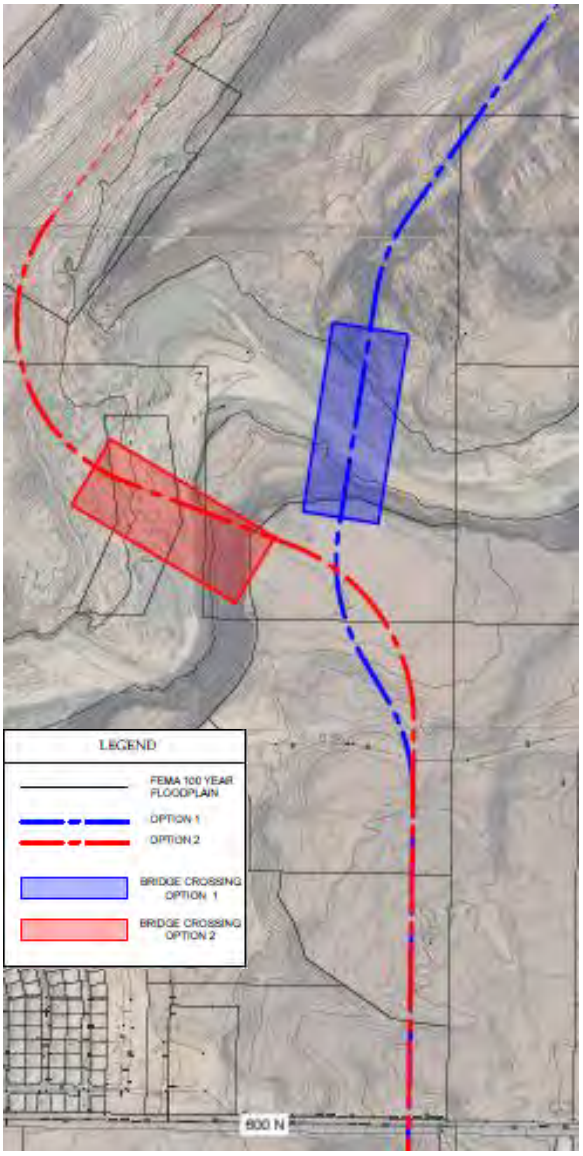

FIGURE 5: RECOMMENDED OPTIONS

Recommended Alternatives

Alternatives 1, 3, 4, 6, and 7 were eliminated during the fatal flaw analysis and subsequent discussions with Dixie MPO and City of Hurricane. Alternatives 2 and 5 were determined to be feasible after design modifications to fit bridge design criteria and selected to be developed further for concept level design and cost consideration. These have been named Option 1 and Option 2, respectively. Some refinements were made in creating Options 1 and 2 from the alternatives resulting in a more detailed road design approach, bridge construction, intersection sight distances, and existing right-of-way considerations.

Exhibits in the appendix show the alignment of both options with cut and fill limits, land ownership, existing parcels, and the mapped 100-year flood plain. The second sheet of each exhibit shows the vertical profile including proposed intersections, bridge features, and the existing ground surface.

3.3 Corridor Options

Option 1

Option 1 features a 710-foot steel deck arch bridge to span the Virgin River. This bridge type is relatively uncommon in Utah and is similar to the 490-foot Hurricane Arch Bridges that carry SR-9 over the Virgin River, approximately 5 miles upstream (UDOT Structure Numbers 0C 158 and 1C 915). The straighter alignment reduces overall road length and costs. This structure type is considered a “complex” bridge and spans the entire channel. By avoiding interior supports, this bridge will not be limited by column heights and can be positioned much higher over the river and avoid large excavation.

The total project cost estimate for this option is $85.7M. A detailed cost estimate and excavation summary for Option 1 is provided in the appendix. Table 3 gives a summary of some of the design considerations of this option.

TABLE 3: OPTION 1 SUMMARY

Attributes	Option 1
Cost Estimate 2019	$85,700,000
Bridge Type	Steel Deck Arch Bridge
Bridge Length	710'
Bridge Height	85'-120'
Earthwork	Largest Cut depth 50'-60', length 1,500'. 632,533 cu-yd Cut
Steepest Slope	8% onto the bridge
Utility Conflicts	Minimal
Environmental Concerns	Significant earthwork in Desert Reserve
Drainage	No other special considerations
Intersections	Match existing grade at SR-9 and 600 North
Notes	Significantly higher bridge cost than Option 2

Option 2

Alternative 5 was modified to have max bridge height of 50 feet and land at the bottom of the plateau resulting in a large cut into the bedrock. It does cut into the edge of the plateau on to facilitate the required road radius. Option 2 has an approximately 3,500 foot long cut into the south side of the river to facilitate a traditional steel deck girder bridge, which is common to Utah. This large amount of excavation will be challenging due to the shallow bedrock formation. The bridge has a slight horizontal curvature on the south end and a tighter horizontal curve on the north end. The alignment will require another structure (beyond the extents of this study) as it passes through another mapped 100-year flood plain north of the river. Another significant obstacle for this option is the regional sewer conflict near station 63+00. Assuming the sewer line currently has 10 feet of cover, the sewer would end up 30 feet above the proposed roadway. A utility bridge could be utilized to carry the utility over the roadway; otherwise, a significant redesign of the line would be necessary.

TABLE 4: OPTION 2 SUMMARY

Attributes	Option 2
Cost Estimate 2019	$78,400,000
Bridge Type	Steel Deck Girder Bridge
Bridge Length	735'
Bridge Height	50'
Earthwork	Largest Cut depth 110'-115', length 3,500'. 1,212,504 cu-yd Cut
Steepest Slope	8% onto the bridge
Utility Conflicts	Regional sewer line 20'-30' above proposed road
Environmental Concerns	Significant earthwork in Desert Reserve, additional flood plain crossing, closed mine shafts
Drainage	100 year flood plain area to the north of the river
Intersections	Match existing grade at SR-9 and 600 North
Notes	Significantly higher excavation cost than Option 1

The total cost estimate for this option is $78.4M. A detailed cost estimate and excavation summary for Option 2 is provided in the appendix. Table 4 gives a summary of some of the design considerations of this option.

Recommended Option

While both options are viable for construction, **Civil Science recommends Option 1** to further study the corridor and bridge design. Option 1 is a modified version of the previously recommended alignment of the Babylon Corridor. We recommend Option 1 because of several factors:

1. Maintaining a consistent roadway as an extension of Southern Parkway
2. Significantly smaller cut depth for the roadway, which allows for more developable area, little impact to the regional sewer line, and better overall project optics
3. Main bridge is the only structure required over the mapped flood plain
4. Safe sight distance requirements are exceeded over the length of the alignment
5. Gives strong consideration to right-of-way acquisition

Option 2 remains a constructible alternate option for the corridor. The loss of access to the roadway because of the large cut, another structure required to cross over the mapped flood plain, and impacts to existing utilities cause Option 2 to be an alternate to the recommended Option 1. Construction cost estimates favor Option 2 as the more cost effective option by approximately $8.3 Million according to the scope of this study. The additional structure over the mapped flood plain and longer road length to meet up with the existing Babylon Road would offset some of the cost difference between the two options.

Appendix

Bridge Crossing Analysis

Alignment Alternative Analysis and Profiles

Alignment Options

Alignment Option 1 and Profile

Alignment Option 2 and Profile

Fatal Flaw Analysis

Engineer's Cost Estimate Option 1

Engineer's Cost Estimate Option 2

Typical Roadway Sections

Cut/Fill Report Option 1

Cut/Fill Report Option 2

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N

0 200
100 400
SCALE: 1" = 400'

BABYLON ROAD

VIRGIN RIVER

600 N

SR-9

LEGEND

FEMA 100 YEAR FLOODPLAIN

BRIDGE CROSSING OPTION 1

BRIDGE CROSSING OPTION 2

BRIDGE CROSSING OPTION 3

SHEET 1 OF 1

BRIDGE CROSSING ANALYSIS

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HURRICANE, UTAH

CivilScience
1453 S. DIXIE DRIVE, SUITE 150
ST. GEORGE, UT 84770
435.986.0100

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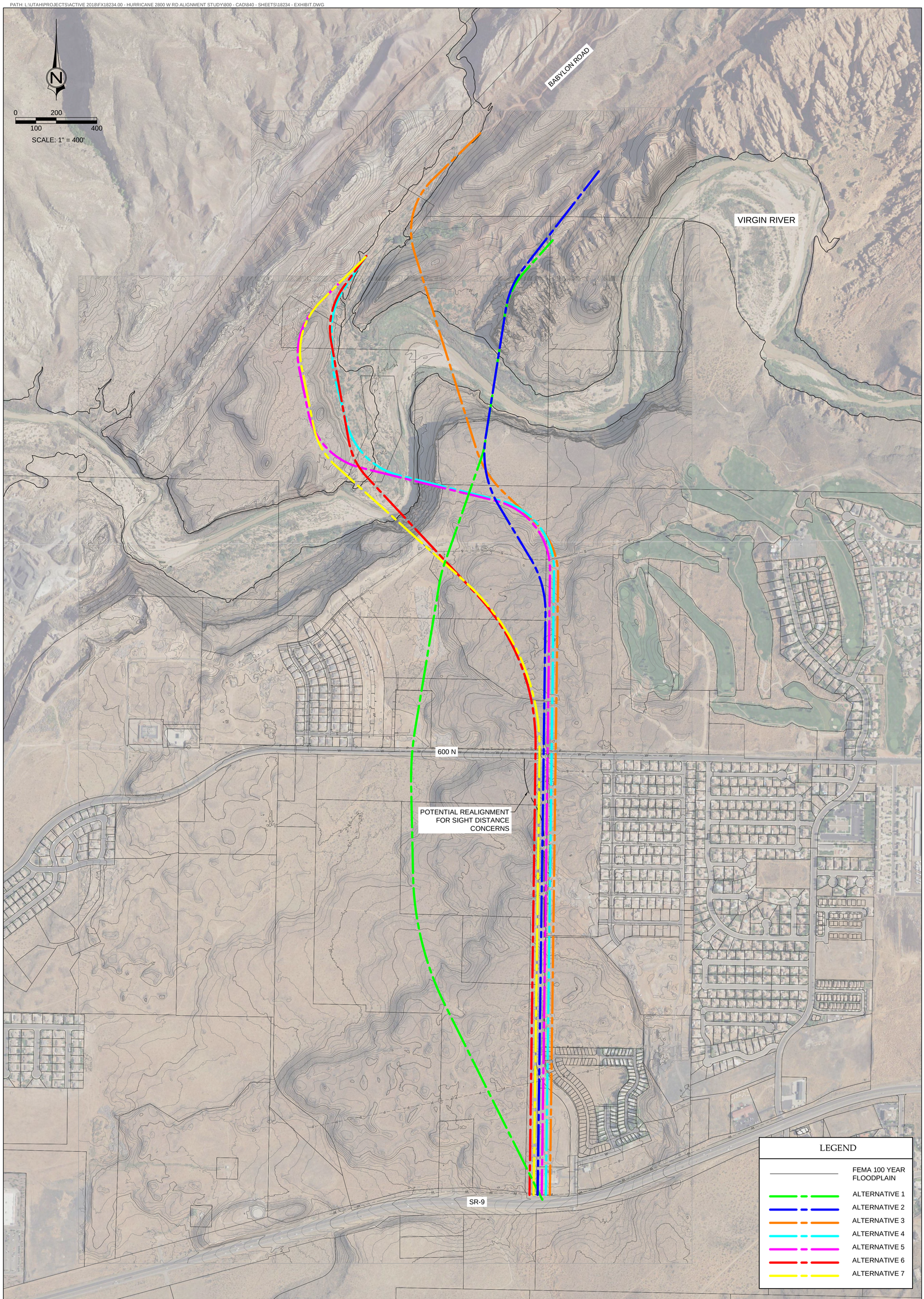

SHEET 1 OF 2

ALIGNMENT ALTERNATIVES ANALYSIS

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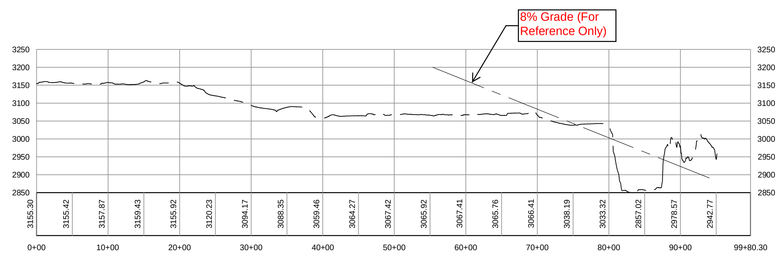
HURRICANE, UTAH

CivilScience
1453 S. DIXIE DRIVE, SUITE 150
ST. GEORGE, UT 84770
435.986.0100



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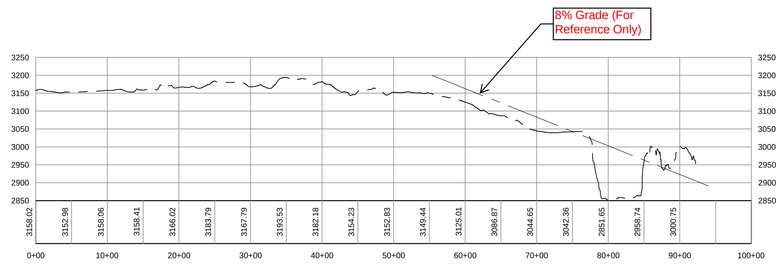

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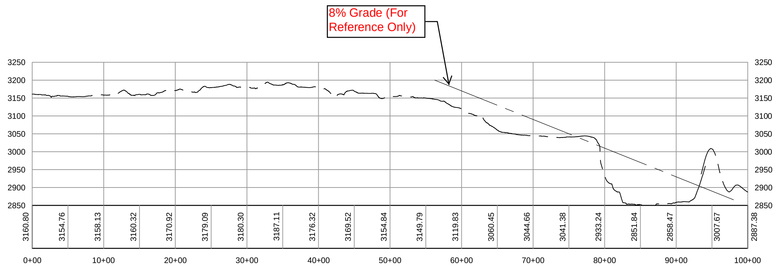

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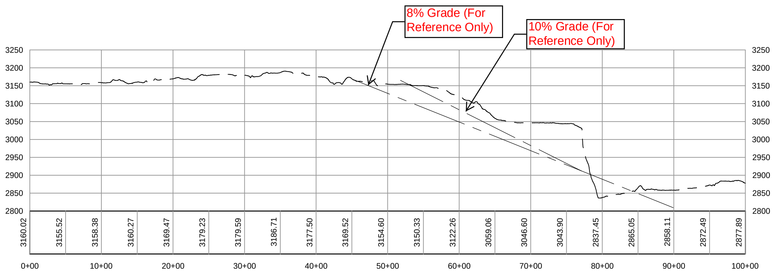

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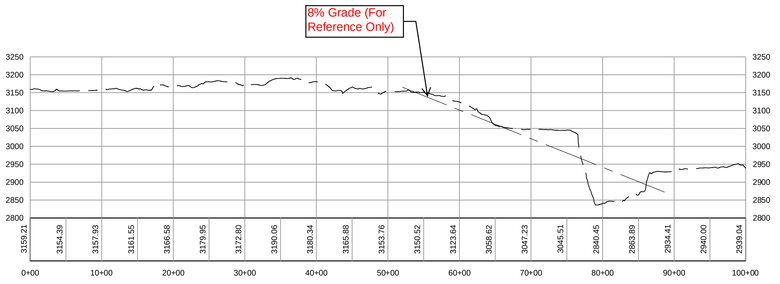

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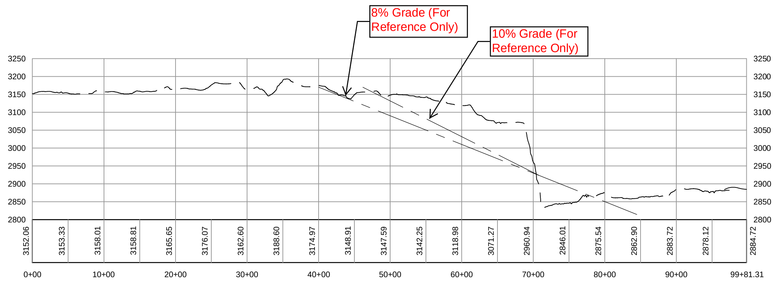

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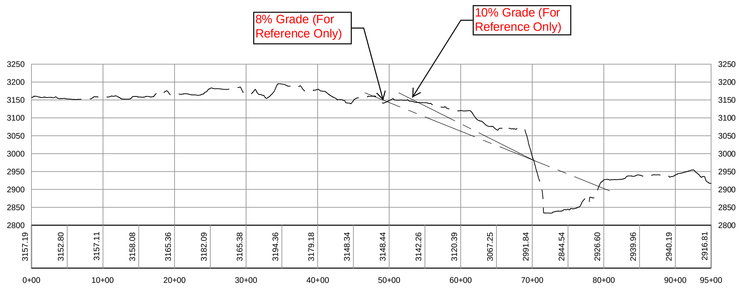

ALTERNATIVE 7

SHEET 2 OF 2

ALIGNMENT ALTERNATIVES ANALYSIS

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HURRICANE, UTAH

CivilScience
1453 S. DIXIE DRIVE, SUITE 150
ST. GEORGE, UT 84770
435.986.0100

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0 225
112.5 450
SCALE: 1" = 450'

BABYLON ROAD

VIRGIN RIVER

600 N

SR-9

LEGEND

- FEMA 100 YEAR FLOODPLAIN
- OPTION 1
- OPTION 2
- BRIDGE CROSSING OPTION 1
- BRIDGE CROSSING OPTION 2

SHEET
1 OF 1

ALIGNMENT OPTIONS

HURRICANE 2800 WEST ROAD ALIGNMENT STUDY
HURRICANE, UTAH

CivilScience
1453 S. DIXIE DRIVE, SUITE 150
ST. GEORGE, UT 84770
435.986.0100

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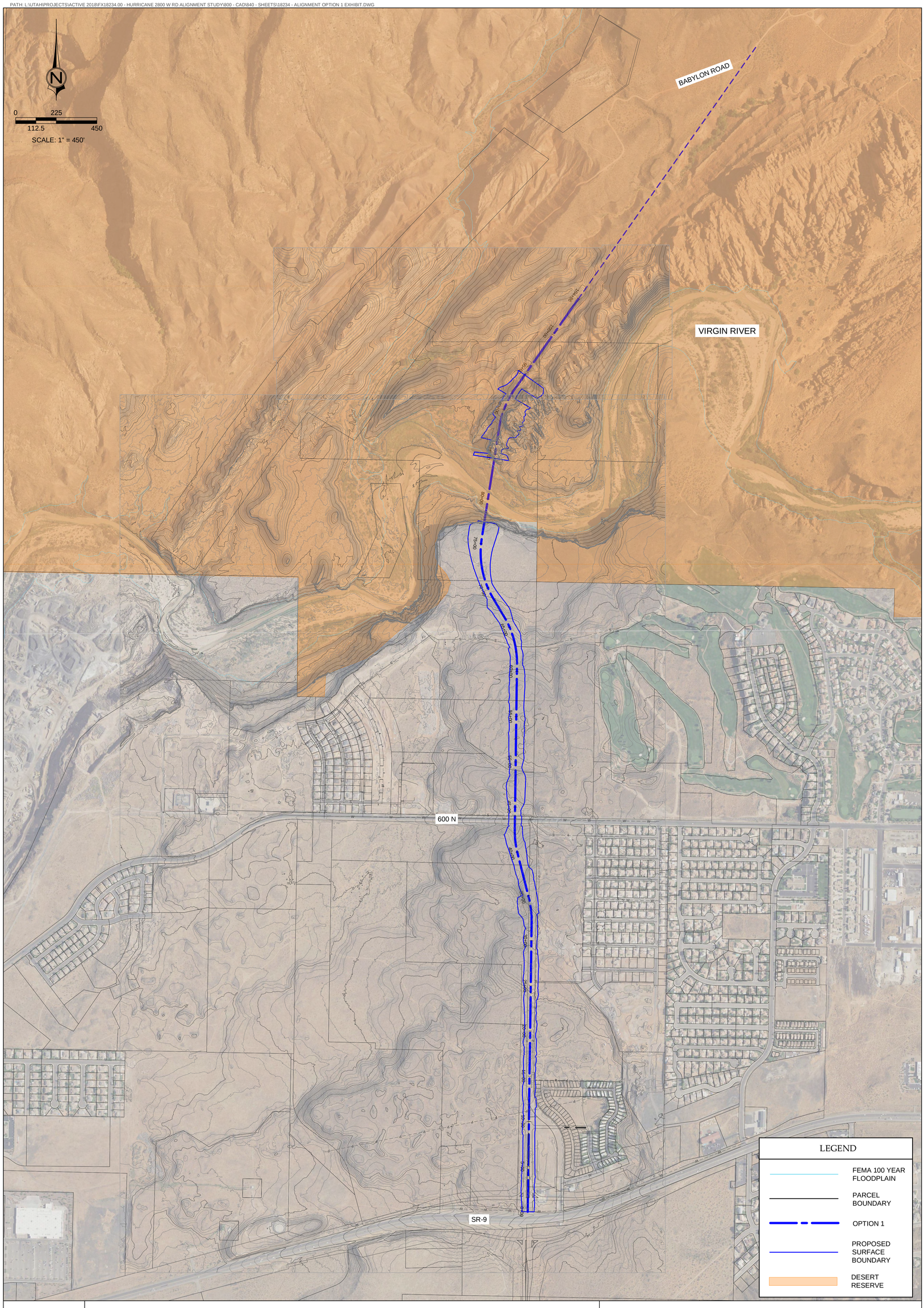

SHEET
1 OF 2

ALIGNMENT OPTION 1

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CivilScience
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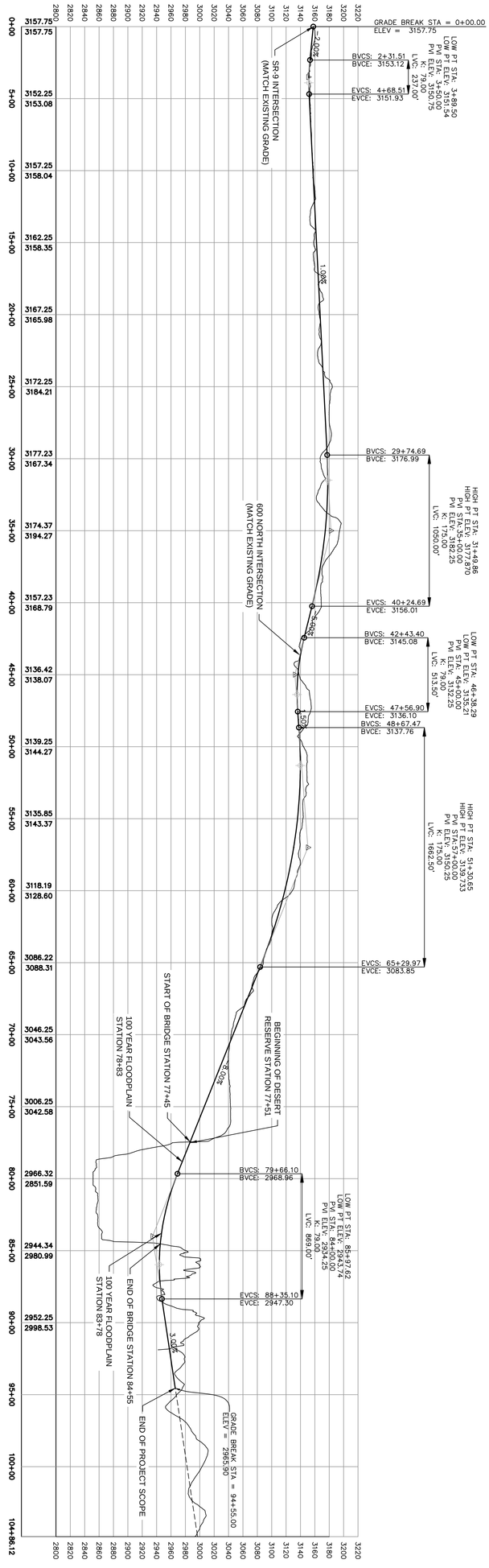
ST. GEORGE, UT 84770
435.986.0100



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2 OF 2

ALIGNMENT OPTION 1

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HURRICANE, UTAH

CivilScience
1453 S. DIXIE DRIVE, SUITE 150
ST. GEORGE, UT 84770
435.986.0100

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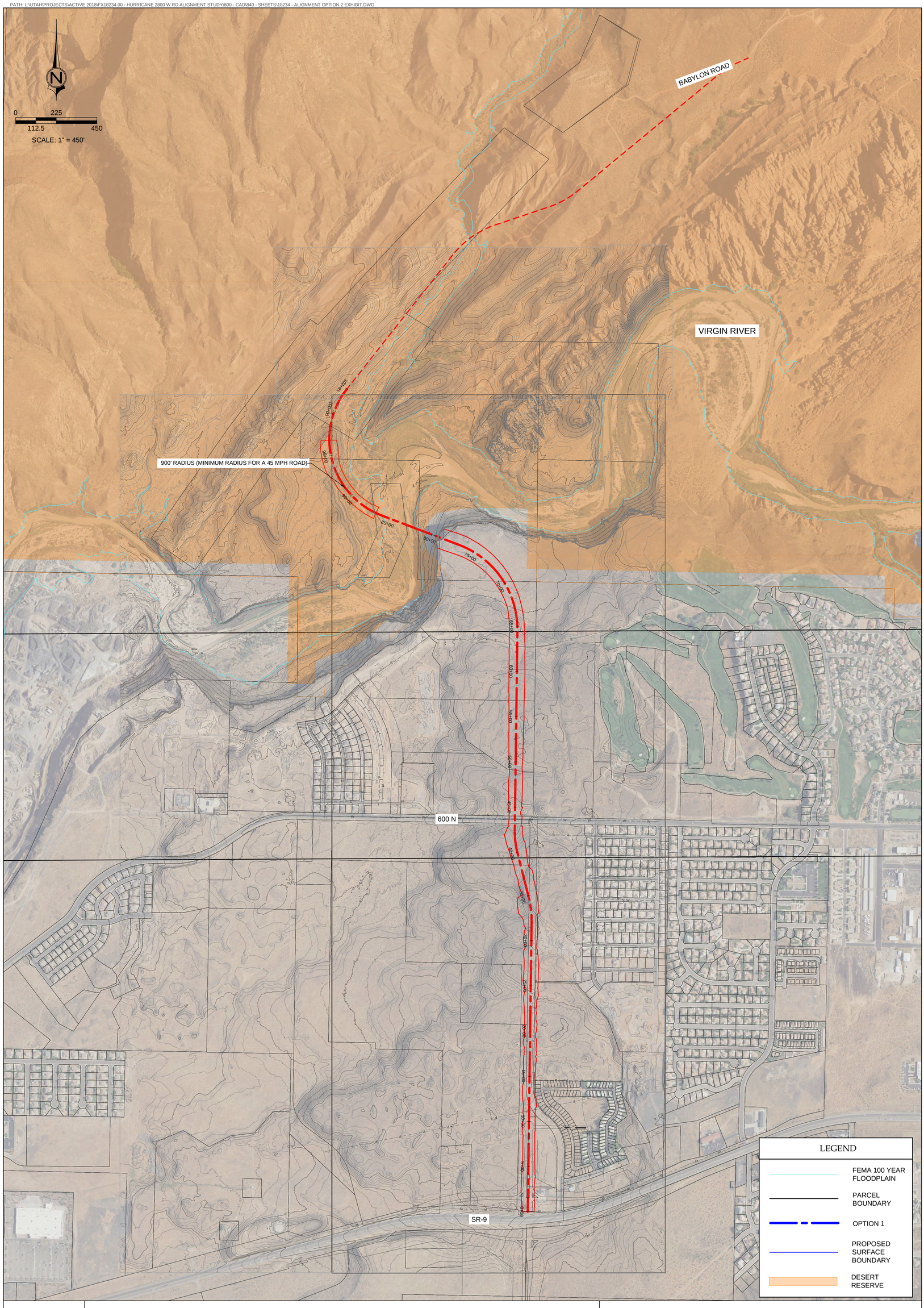

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1 OF 2

ALIGNMENT OPTION 2

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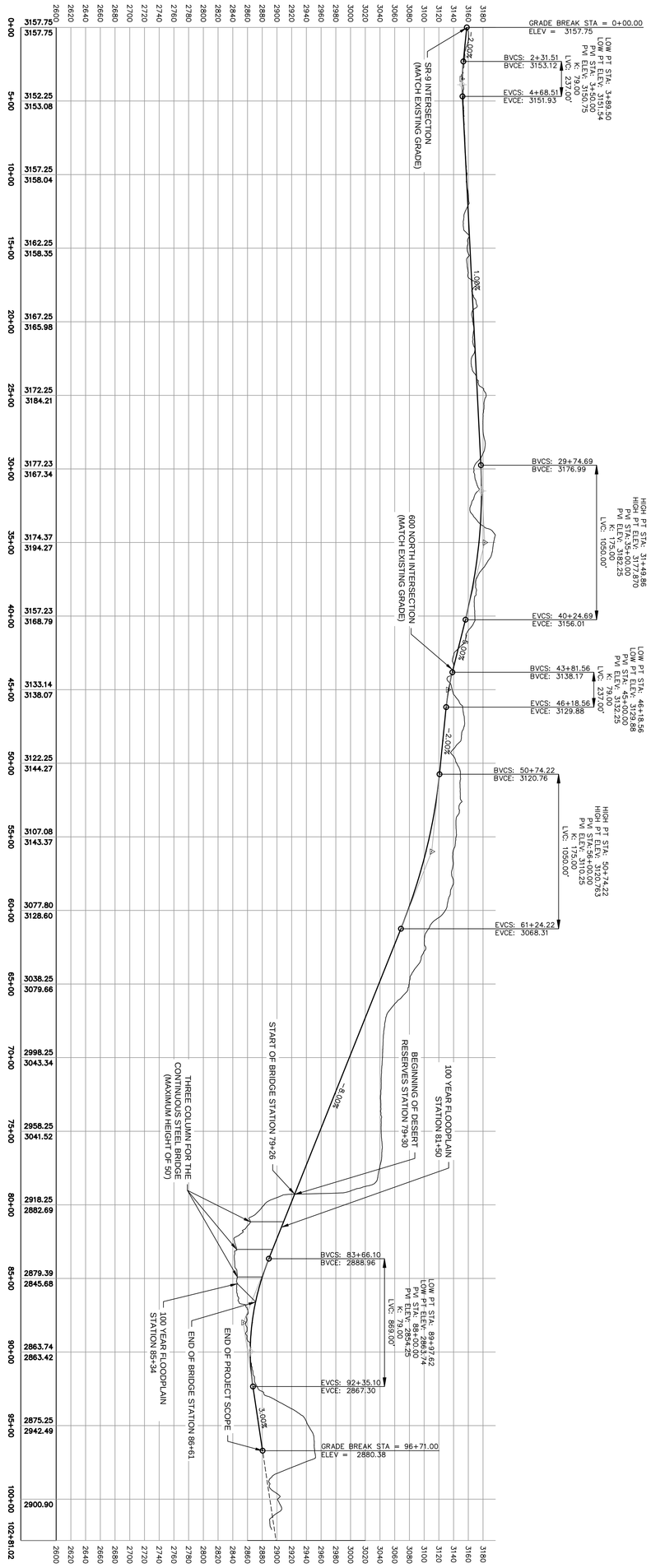

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2 OF 2

ALIGNMENT OPTION 2

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CivilScience
1453 S. DIXIE DRIVE, SUITE 150
ST. GEORGE, UT 84770
435.986.0100

FATAL FLAW ANALYSIS

Alignment Name	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5	Alternative 6	Alternative 7
Total Bridge Length	800 feet	800 feet	1,400 feet	1,100 feet	1,000 feet	950 feet	1,000 feet
Max Bridge Height	165 feet	155 feet	140 feet	100 feet	150 feet	110 feet	160 feet
ROW Acquisition (north of 600 N)	Full length	1,400' along property lines. Bisects properties on both sides of the river.	1,850' along property lines. Bisects properties on both sides of the river.	1,800' along property lines. Bisects properties on both sides of the river.	1,800' along property lines. Bisects properties on both sides of the river.	600' along property lines. Bisects properties on both sides of the river.	850' along property lines. Bisects properties on both sides of the river.
Property Notes	Doesn't follow current 2800 W alignment. Bisects multiple properties including newly built Church. Bisects 2 properties in north side.	Follows current 2800 W alignment. Bisects 3 properties on south side. Follows lines of 4 properties on south side. Bisects 2 properties in north side.	Follows current 2800 W alignment. Bisects 3 properties on south side. Follows lines of 4 properties on south side. Bisects 3 properties in north side.	Follows current 2800 W alignment. Bisects 2 properties on south side. Follows lines of 4 properties on south side. Bisects properties in north side.	Follows current 2800 W alignment. Bisects 2 properties on south side. Follows lines of 4 properties on south side. Bisects 5 properties in north side.	Follows current 2800 W alignment. Bisects 2 properties on south side. Follows lines of 4 properties on south side. Bisects 4 properties in north side.	Follows current 2800 W alignment. Bisects 2 properties on south side. Follows lines of 4 properties on south side. Bisects 5 properties in north side.
Grade	6% max grade	8%	8%	8%	8%	8%	8%
Design Speed	50 mph	45 mph	45 mph	45 mph	45 mph	45 mph	45 mph
Flood Plain Impact	Only over the Virgin River	Only over the Virgin River	North section passes through secondary 100-yr flood plain. May be avoided.	North section passes through secondary 100-yr flood plain. 2nd crossing required.	North section passes through secondary 100-yr flood plain. 2nd crossing required.	North section passes through secondary 100-yr flood plain. 2nd crossing required.	North section passes through secondary 100-yr flood plain. 2nd crossing required.
Cuts/Fills	40'-50' cuts and 20'-30' fills on north side. Minimal excavation on south side.	40'-50' cuts and 20'-30' fills on north side. 10'-20' cuts/fills on south side.	80'-100' cuts on north side. 10'-20' cuts/fills on south side.	Minimal excavation on north side. 85' cut on south side; extends 1,100' @ 10% or 2,500' @ 8%.	10'-15' cut/fill on north side. 30' cut on south side; extends 500' @ 8%.	Minimal excavation on north side. 105' cut on south side; extends 2,000' @ 10% or 2,550' @ 8%.	10'-15' cut/fill on north side. 55' cut on south side; extends 1,200' @ 10% or 1,700' @ 8%.
Other Notes	Alignment was designed for higher speed and milder slopes.	Slightly modified alignment will facilitate higher design speed.	Slightly modified alignment will reduce distance in flood plain.	Potential for Curved bridge section.	Long sweeping S-curve on north side of river.	Potential for Curved bridge section.	Long sweeping S-curve on north side of river.

*Issues common to all scenarios:

Connection to SR-9; ROW and alignment (straighter is preferred)

Potential power and sewer conflicts

Widen existing 2800 W ROW from 80' to 90' south of 600 N

PROJECT NAME: Hurricane City 2800 West Alignment Option 1
Cost Estimate - Concept Level

Prepared By: Civil Science, Inc **Date** 1/25/2019

Proposed Project Scope: **Construct a four lane two-way virgin road that connects SR-6 to Babylon Road. This 1.8-mile road includes curb and gutter, 5.5' park strip, 5' sidewalk. In order to cross over virgin river a 710' arch bridge will be required.**

Approximate Route Reference Mile Post (BEGIN) =	0.000	(END) =	1.791
Project Length =	1.791	miles	9,455 ft
Current FY Year (July-June) =	2019		
Assumed Construction FY Year =	2020		
Construction Items Inflation Factor =	1.10	1	yrs for inflation
Assumed Yearly Inflation for Engineering Services (PE and CE) (%/yr) =	3.0%		
Assumed Yearly Inflation for Right of Way (%/yr) =	3.0%		
Items not Estimated (% of Construction) =	5.0%		
Preliminary Engineering (% of Construction + Incentives) =	7.5%		
Construction Engineering (% of Construction + Incentives) =	8.5%		

Construction Items		Cost	Remarks
Public Information Services		$155,000	
Roadway and Drainage		$24,291,059	
Traffic and Safety		$21,132	
Structures		$35,040,000	
Environmental Mitigation		$66,253	
ITS		$0	
	Subtotal	$59,573,444	
	Items not Estimated	$2,978,672	
	Construction Subtotal	**$62,552,116**	
P.E. Cost	**P.E. Subtotal**	**$4,691,409**	
C.E. Cost	**C.E. Subtotal**	**$5,316,930**	
Right of Way	**Right of Way Subtotal**	$7,473,660	
Utilities	**Utilities Subtotal**	$20,000	
Incentives	**Incentives Subtotal**	$0	
Miscellaneous	**Miscellaneous Subtotal**	**$0**	

Cost Estimate (ePM screen 505)		2019		2020
P.E.		**$4,691,000**		**$4,832,000**
Right of Way		**$7,474,000**		**$7,698,000**
Utilities		**$20,000**		**$22,000**
Construction		**$62,552,000**		**$68,962,000**
C.E.		**$5,317,000**		**$5,477,000**
Incentives		**$0**		**$0**
Aesthetics	**0.00%**	**$0**		**$0**
Change Order Contingency	**9.00%**	**$5,630,000**		**$6,207,000**
UDOT Oversight		**$0**		**$0**
Miscellaneous		**$0**		**$0**
	TOTAL	**$85,684,000**	**TOTAL**	**$93,198,000**

PROPOSED COMMISSION REQUEST	**TOTAL**	**$85,684,000**	**TOTAL**	**$93,198,000**

Project Assumptions/Risks

1 Assume a pavement section of 6" HMA, 6" UTBC, and 12" Granular Borrow.

2 Assume 20% of the cut volume is rock excavation, and 80% of the cut volume is roadway excavation.

3 Assume catch basins every 100' and storm drain manholes every 300' on both sides of the road where there is curb and gutter.

4 Assume 24" storm drain pipe runs along both sides of the roadway.

5 Assume four 36" diameter box culverts are installed.

6 Assume all side slopes will be 2:1 and will need slope restoration from the edge of the landscape buffer to 12' passed the catch point.

7 Assume longitudinal (shoulder) rumble strip start 0.25 miles passed 600 North (Station 49+94).

8 Assume sidewalk and curb and gutter runs along the entire project.

9 Assume longitudinal (shoulder) rumble strip start 0.25 miles passed 600 North (Station 49+94).

10 Assume no street lights are installed on this project.

11 Assume no incentive will be used on this project.

12 Assume Hurricane City already own all of the ROW from between SR-9 to 600 North.

13

14

Roadway and Drainage

PROJECT NAME: Hurricane City 2800 West Alignment Option 1

Item #	Item	Quantity	Units	Price	Cost	Remarks
Roadway						
1	Mobilization	1	lump	$4,400,000.00	$4,400,000.00	
2	Traffic Control	1	lump	$1,885,000.00	$1,885,000.00	
3	Dust Control and Watering	2,170	1000 gallons	$20.00	$43,400.00	
4	Survey	1	lump	$626,000.00	$626,000.00	
5	Granular Borrow (Plan Quantity)	29,300	cubic yard	$25.00	$732,500.00	
6	Rock Excavation (Plan Quantity)	126,510	cubic yard	$22.00	$2,783,220.00	
7	Roadway Excavation (Plan Quantity)	506,030	cubic yard	$15.00	$7,590,450.00	
8	Untreated Base Course (Plan Quantity)	18,410	cubic yard	$38.00	$699,580.00	
9	HMA - 1/2 Inch	24,080	ton	$98.00	$2,359,840.00	
11	Concrete Curb and Gutter Type B1	17,490	foot	$20.00	$349,800.00	
12	Concrete Sidewalk	87,450	square foot	$6.20	$542,190.00	
13	Longitudinal Rumble Strip - Asphalt	8,510	foot	$0.35	$2,978.50	
Roadway Subtotal					**$22,014,959**	
Drainage						
14	Catch Basin	175	each	$3,000.00	$525,000	
15	4 Foot Standard Manhole	59	each	$3,000.00	$177,000	
16	Drainage Pipe - 24", Smooth, Leak Resistant	17,490	foot	$90.00	$1,574,100	
Drainage Subtotal					**$2,276,100**	
PI						
17	Public Information Services	1	lump	$155,000.00	**$155,000**	Usually 0.25% of construction

Traffic, Safety & ITS

PROJECT NAME: Hurricane City 2800 West Alignment Option 1

Item #	Item	Quantity	Units	Price	Cost	Remarks
Traffic						
18	Pavement Markings(Striping)	219	gallons	$28.00	$6,132.00	
Signals						
19	Signs	1	lump	$15,000.00	$15,000.00	
Lighting						
Traffic and Safety Subtotal					**$21,132**	
ITS						
ITS Subtotal					**$0**	

Structures

PROJECT NAME: Hurricane City 2800 West Alignment Option 1

Item #	Item	Quantity	Units	Price	Cost	Remarks
Bridges						
20	Deck Arch Bridge	1	Lump	$35,000,000.00	$35,000,000.00	
Walls						
Sign Structures						
Hydraulics						
21	36" Diameter Box Culvert	4	each	$10,000.00	$40,000.00	
Geotech						
Structures Subtotal					**$35,040,000**	

Environmental and Landscaping

PROJECT NAME: Hurricane City 2800 West Alignment Option 1

Item #	Item	Quantity	Units	Price	Cost	Remarks
Environmental						
Temporary Erosion Control						
22	Erosion Control	1	lump	$19,280.00	$19,280.00	
Landscaping						
23	Strip, Stockpile, and Spread Topsoil (Plan Quantity)	49,830	square yard	$0.75	$37,372.50	
24	Slope Restoration	16.00	acre	$600.00	$9,600.00	
Environmental Mitigation Subtotal					**$66,253**	

Utilities, Right of Way, and Incentives

PROJECT NAME: Hurricane City 2800 West Alignment Option 1

Item #	Item	Quantity	Units	Price	Cost	Remarks
Utilities						
25	Install Utilities	1	Lump	$20,000.00	$20,000.00	
Utilities Subtotal					**$20,000**	
Right-of-way						
26	Right of Way	512,880	square foot	$8.00	$4,103,040.00	
27	Perminate Easement	199,920	square foot	$7.00	$1,399,440.00	
28	Construction Easement	657,060	square foot	$3.00	$1,971,180.00	
Right-of-Way Subtotal					**$7,473,660**	
Incentives						
Incentives Subtotal					**$0**	

PROJECT NAME: Hurricane City 2800 West Alignment Option 2
Cost Estimate - Concept Level

Prepared By: Civil Science, Inc **Date** 1/25/2019

Proposed Project Scope: **Construct a four lane two-way virgin road that connects SR-6 to Babylon Road. The first 0.8 miles includes curb and gutter, 5.5' park strip, and 5' sidewalk. The remaining mile will have a 6 to 1 slope for 22' passed the shoulder and then have a 0.5 to 1 tie-in slope. In order to cross over virgin river a 735' continuous steel girder bridge will be required.**

Approximate Route Reference Mile Post (BEGIN) =	0.000	(END) =	1.832
Project Length =	1.832	miles	9,671 ft
Current FY Year (July-June) =	2019		
Assumed Construction FY Year =	2020		
Construction Items Inflation Factor =	1.10	1	yrs for inflation
Assumed Yearly Inflation for Engineering Services (PE and CE) (%/yr) =	3.0%		
Assumed Yearly Inflation for Right of Way (%/yr) =	3.0%		
Items not Estimated (% of Construction) =	5.0%		
Preliminary Engineering (% of Construction + Incentives) =	7.5%		
Construction Engineering (% of Construction + Incentives) =	8.5%		

Construction Items		Cost	Remarks
Public Information Services		$145,000	
Roadway and Drainage		$34,266,009	
Traffic and Safety		$21,272	
Structures		$20,020,000	
Environmental Mitigation		$50,296	
ITS		$0	
	Subtotal	$54,502,577	
	Items not Estimated	$2,725,129	
	Construction Subtotal	**$57,227,706**	
P.E. Cost	**P.E. Subtotal**	**$4,292,078**	
C.E. Cost	**C.E. Subtotal**	**$4,864,355**	
Right of Way	**Right of Way Subtotal**	$6,818,230	
Utilities	**Utilities Subtotal**	$20,000	
Incentives	**Incentives Subtotal**	$0	
Miscellaneous	**Miscellaneous Subtotal**	**$0**	

Cost Estimate (ePM screen 505)		2019		2020	
	P.E.		**$4,292,000**		**$4,421,000**
	Right of Way		**$6,818,000**		**$7,023,000**
	Utilities		**$20,000**		**$22,000**
	Construction		**$57,228,000**		**$63,092,000**
	C.E.		**$4,864,000**		**$5,010,000**
	Incentives		**$0**		**$0**
	Aesthetics	**0.00%**	**$0**		**$0**
	Change Order Contingency	**9.00%**	**$5,151,000**		**$5,679,000**
	UDOT Oversight		**$0**		**$0**
	Miscellaneous		**$0**		**$0**
		TOTAL	**$78,373,000**	**TOTAL**	**$85,247,000**

PROPOSED COMMISSION REQUEST	**TOTAL**	**$78,373,000**	**TOTAL**	**$85,247,000**

Project Assumptions/Risks

1 Assume a pavement section o 6" HMA, 6" UTBC, and 12" Granular Borrow.

2 Assume 50% of the cut volume is rock excavation, and 50% of the cut volume is roadway excavation.

3 Assume catch basins every 100' and storm drain manholes every 300' on both sides of the road before 600 North (Station 43+62).

4 Assume 24" storm drain pipe runs along both sides of the roadway before 600 North (Station 43+62).

5 Assume four 36" diameter box culverts are installed.

6 Assume all side slopes before 600 North (Station 43+62) will be 2:1 and will need slope restoration from the edge of the landscape buffer to 12' passed the catch point.

7 Assume longitudinal (shoulder) rumble strip start 0.25 miles passed 600 North (Station 49+94).

8 After 600 North (Station 43+62)assume delineator are place every 528 ft along the project area.

9 Assume sidewalk and curb and gutter runs along the entire project until 600 North (Station 43+62).

10 Assume park strip and landscape buffer are incidental to sidewalk.

11 Assume no street lights are installed on this project.

12 Assume no incentive will be used on this project.

13 Assume Hurricane City already own all of the ROW from between SR-9 to 600 North.

14

Roadway and Drainage

PROJECT NAME: Hurricane City 2800 West Alignment Option 2

Item #	Item	Quantity	Units	Price	Cost	Remarks
Roadway						
1	Mobilization	1	lump	$4,025,000.00	$4,025,000.00	
2	Traffic Control	1	lump	$1,725,000.00	$1,725,000.00	
3	Dust Control and Watering	2,220	1000 gallon	$20.00	$44,400.00	
4	Survey	1	lump	$572,000.00	$572,000.00	
5	Granular Borrow (Plan Quantity)	29,970	cubic yard	$25.00	$749,250.00	
6	Rock Excavation (Plan Quantity)	606,260	cubic yard	$22.00	$13,337,720.00	
7	Roadway Excavation (Plan Quantity)	606,260	cubic yard	$15.00	$9,093,900.00	
8	Untreated Base Course (Plan Quantity)	18,830	cubic yard	$38.00	$715,540.00	
9	HMA - 1/2 Inch	24,640	ton	$98.00	$2,414,720.00	
10	Concrete Curb and Gutter Type B1	8,730	foot	$20.00	$174,600.00	
11	Concrete Sidewalk	43,620	square foot	$6.20	$270,444.00	
12	Longitudinal Rumble Strip - Asphalt	8,870	foot	$0.35	$3,104.50	
13	Delineator Post - Type I	18	each	$65.00	$1,170.00	
Roadway Subtotal					**$33,126,849**	
Drainage						
14	Catch Basin	88	each	$3,000.00	$264,000	
15	4 Foot Standard Manhole	30	each	$3,000.00	$90,000	
16	Drainage Pipe - 24", Smooth, Leak Resistant	8,724	foot	$90.00	$785,160	
Drainage Subtotal					**$1,139,160**	
PI						
17	Public Information Services	1	lump	$145,000.00	**$145,000**	Usually 0.25% of construction

Traffic, Safety & ITS

PROJECT NAME: Hurricane City 2800 West Alignment Option 2

Item #	Item	Quantity	Units	Price	Cost	Remarks
Traffic						
18	Pavement Marking (Striping)	224	gallons	$28.00	$6,272.00	
Signals						
19	Signs	1	lump	15,000	$15,000.00	
Lighting						
Traffic and Safety Subtotal					**$21,272**	
ITS						
ITS Subtotal					**$0**	

Structures

PROJECT NAME: Hurricane City 2800 West Alignment Option 2

Item #	Item	Quantity	Units	Price	Cost	Remarks
Bridges						
20	Continuous Steel Girder Bridge	1	lump	$20,000,000.00	$20,000,000.00	
Walls						
Sign Structures						
Hydraulics						
21	36" Diameter Box Culvert	4	each	$10,000.00	$20,000.00	
Geotech						
Structures Subtotal					**$20,020,000**	

Environmental and Landscaping

PROJECT NAME: Hurricane City 2800 West Alignment Option 2

Item #	Item	Quantity	Units	Price	Cost	Remarks
Environmental						
Temporary Erosion Control						
22	Erosion Control	1	lump	$20,371.00	$20,371.00	
Landscaping						
23	Strip, Stockpile, and Spread Topsoil (Plan Quantity)	35,100	square yard	$0.75	$26,325.00	
24	Slope Restoration	6.00	acre	$600.00	$3,600.00	
Environmental Mitigation Subtotal					**$50,296**	

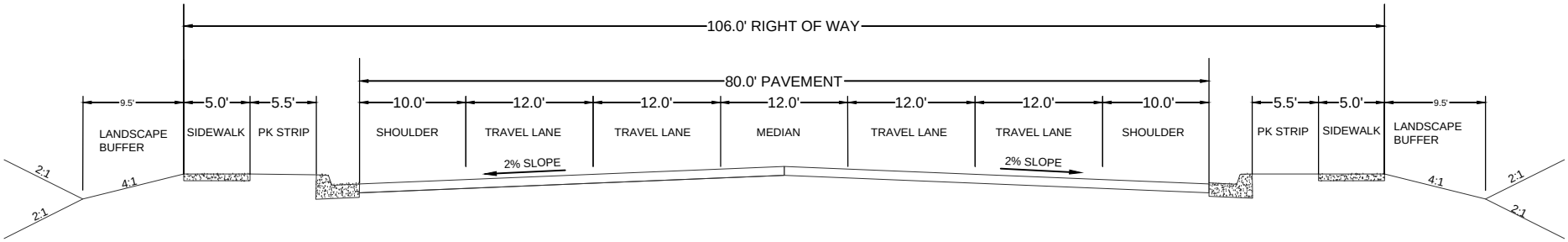
Utilities, Right of Way, and Incentives

PROJECT NAME: Hurricane City 2800 West Alignment Option 2

Item #	Item	Quantity	Units	Price	Cost	Remarks
Utilities						
25	Install Utilities	1	lump	$20,000.00	$20,000.00	
Utilities Subtotal					**$20,000**	
Right-of-way						
26	Right of Way	533,770	square foot	$8.00	$4,270,160.00	
27	Perminate Easement	102,470	square foot	$7.00	$717,290.00	
28	Construction Easement	610,260	square foot	$3.00	$1,830,780.00	
Right-of-Way Subtotal					**$6,818,230**	
Incentives						
Incentives Subtotal					**$0**	

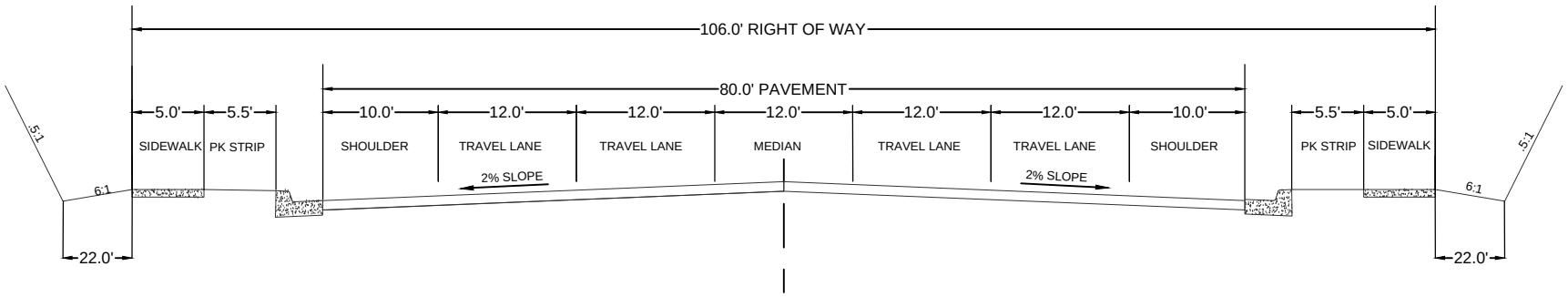
OPTION 1 TYPICAL SECTION
(STA 0+00 TO STA 94+81.61)

OPTION 2 TYPICAL SECTION
(STA 0+00 TO STA 45+00)



CITY OF HURRICANE -MAJOR ARTERIAL

OPTION 2 TYPICAL SECTION
(STA 45+00 TO STA 95+84)



CITY OF HURRICANE -MAJOR ARTERIAL

CivilScience
Engineers / Surveyors / Solutions
1453 S. DIXIE DRIVE, SUITE 150
ST. GEORGE, UT 84770
435.986.0100

Cut/Fill Report

Generated: 2019-01-24 12:57:45

By user: cfurner

Drawing: L:\Utah\Projects\Active 2018\Fx18234.00 - Hurricane 2800 W Rd Alignment Study\800 - CAD\830 - Design\L:\Utah\Projects\Active 2018\Fx18234.00 - Hurricane 2800 W Rd Alignment Study\800 - CAD\830 - Design\Concept_Alignments Option 1.dwg

Volume Summary

Name	Type	Cut Factor	Fill Factor	2d Area (Sq. Ft.)	Cut (Cu. Yd.)	Fill (Cu. Yd.)	Net (Cu. Yd.)
Option 1 Datum Vs Grid fro em firle WashCo	full	1.000	1.000	1471475.27	632533.29	92274.99	540258.30<Cut>
Option 1 Datum VS Small Existing Surface	full	1.000	1.000	126.59	0.00	340.76	340.76<Fill>

Totals

	2d Area (Sq. Ft.)	Cut (Cu. Yd.)	Fill (Cu. Yd.)	Net (Cu. Yd.)
Total	1471601.86	632533.29	92615.75	539917.54<Cut>

* Value adjusted by cut or fill factor other than 1.0

Cut/Fill Report

Generated: 2019-01-24 16:14:50

By user: cfurner

Drawing: L:\Utah\Projects\Active 2018\Fx18234.00 - Hurricane 2800 W Rd Alignment Study\800 - CAD\830 - Design\L:\Utah\Projects\Active 2018\Fx18234.00 - Hurricane 2800 W Rd Alignment Study\800 - CAD\830 - Design\Concept_Alignments Option 2.dwg

Volume Summary

Name	Type	Cut Factor	Fill Factor	2d Area (Sq. Ft.)	Cut (Cu. Yd.)	Fill (Cu. Yd.)	Net (Cu. Yd.)
Proposed Surface (Datum) VS Existing Surface	full	1.000	1.000	1432163.21	1212503.97	43074.17	1169429.80<Cut>

Totals

	2d Area (Sq. Ft.)	Cut (Cu. Yd.)	Fill (Cu. Yd.)	Net (Cu. Yd.)
Total	1432163.21	1212503.97	43074.17	1169429.80<Cut>

* Value adjusted by cut or fill factor other than 1.0