Appendix G.
I-15/US-20 Connector Cost Risk Assessment and Value Engineering Report

Cost Risk Assessment and Value Engineering Report

I-15/US-20 Connector
Idaho Transportation Department

Idaho Falls, Idaho

December 9-12, 2019

Prepared by:

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Disclaimer:

The information contained in this report is the professional opinions of the team members during the Cost Risk Assessment and Value Engineering (CRAVE) study. These opinions were based on the information provided to the team at the time of the study. As the project continues to develop, new information will become available, and this information will need to be evaluated on how it may affect the recommendations and findings in this report. All costs displayed in the report are based on best available information at the time of the study and are in 2019 dollars unless otherwise noted. The resolution or disposition of recommendations is based on the information in this report and is independent of the proceeding of the VE study.

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Introduction

This cost risk assessment and value engineering (CRAVE) report summarizes the events of the study conducted for the Idaho Transportation Department (ITD) and facilitated by HDR Engineering, Inc. (HDR). The subject of the CRAVE study was the I-15/US-20 Connector Project.

The study was conducted December 9-12, 2019. The primary objectives of the CRAVE study were to:

- Verify or improve upon the various concepts for the project.
- Identify high risk areas in delivering the project.
- Improve the value of the project alternatives through innovative measures aimed at improving the performance while reducing costs of the project.
- Perform a cost risk assessment on both the baseline design and the Value Engineering (VE) recommendations.

Project Overview

The Idaho Transportation Department (ITD) is working with the City of Idaho Falls and Bonneville County to study ways to improve I-15 and US-20 to better serve Idaho Falls and the growing region.

ITD is conducting a PEL (Planning and Environmental Linkages) study of six interchanges within a two-mile area that have outlived their usefulness and service capacity. Traffic volumes and congestion and aging infrastructure are impacting safety and travel for all users. The purpose of the PEL study is to identify and analyze corridor improvements that address safety, congestion, mobility and travel time reliability for all users on I-15 and US-20 in Bonneville County near Idaho Falls. This study is a necessary and important preliminary step in redesigning the corridor to provide a safe and reliable commute for the next 20 years and beyond.

The CRAVE team was presented three alternatives:

- **Alternative C ‘As-Presented’**
    - Adds lanes and ramps to separate the through-traffic from the local exiting traffic between the I-15 Exit 118 (Broadway Street) and US-20 Exit 308 (Riverside Drive/City Center)
    - Requires new retaining walls, bridges, and replaces US-20 Exit 308, I-15 Exits 118 and 119
    - Maintains alignment near or in the same location as the existing I-15/US-20 roadways

- **Alternative E 'As-Presented'**
  - Moves the I-15/US-20 interchange (Exit 119) about a half mile north
  - Adds separated through-lanes and frontage roads and converts the existing US-20 from Grandview Drive to Fremont Avenue to a local street
  - *Alternative E – Option 1 'As-Presented'*
    - Removes Exits 307 and 308 and Exit 309
  - *Alternative E – Option 2 'As-Presented'*
    - Removes Exit 307 and replaces the interchange at Exit 308 and Exit 309 into one interchange with ramp modifications
- **Alternative H 'As-Presented'**
  - Moves the I-15/US-20 interchange (Exit 119) about a mile north and adds a new roadway to connect to US-20 at E 49th N (Telford Road)
  - Converts existing US-20 between Johns Hole and E 49th N to a local street
  - Includes new interchanges at I-15 and US-20 to tie new roadway back to existing roadway
  - Adds safety and capacity improvements on I-15 at Exits 118 and 119

Value Engineering Recommendations

In total, the CRAVE team generated 81 ideas for the project. These ideas were compared against the baseline concepts of each alternative and presented by the project team. The ideas evaluated were developed and then added to create new improved alternatives (options):

- Alternative C – Option 3
- Alternative E – Option 3
- Alternative H – Option 1

The performance of the improved alternatives above are shown in **Table 1** and are detailed in Section 6, Development Phase

Table 1: Summary of Recommendations

Description	Performance (P)	Cost (C) $ millions	Value Index
Alternative C – Option 3	634	$ 297.1	2.13
Alternative E – Option 3	634	$ 253.5	2.50
Alternative H – Option 1	620	$ 411.3	1.51

To facilitate implementation, a Value Engineering Recommendation Approval Form is included in **Appendix A**. If the Project Manager elects to reject or modify a recommendation, a brief explanation of why is located on the bottom of the form. Should these VE recommendations be implemented, a separate scenario risk analysis was performed to provide the project team with the additional information associated with

both base cost reduction and risk mitigation. This information is provided in the Analysis of Results section of this report.

Cost and Schedule Risk Analysis

In performing the cost risk analysis, a risk-based modeling tool was incorporated to model the cost and schedule uncertainty and the identified project risks. **Table 2** shows the projects base costs in YOE (Year of Expenditure) dollars. An escalation rate of 3% was used in this analysis. The modeled results at the 70th percentile for Alternative C 'As-Presented' were **$385.0 million**, Alternative E – Option 2 'As-Presented' **$360.6 million**, and Alternative H 'As-Presented' **$510.6 million** prior to implementation of risk management strategies and VE recommendations.

The CRAVE team identified 41 risks that carry both potential schedule and cost impacts to these alternatives. In the workshop, a likely range of schedule and costs impacts and the probability of occurrence were identified for each risk. The next step was to develop response strategies and VE recommendations for the active risks. These were added into the risk-based modeling tool as results to measure the overall impact the risk mitigation strategies would have on the project. Additional opportunities were developed to capture the magnitude of the VE recommendations developed by the team.

This secondary analysis result was presented to the audience during the Presentation Phase of the CRAVE based on the risk mitigation strategies and value engineering recommendations for each alternative as developed by the team.

Please refer to **Table 2** for additional information on additional recommendations introduced as a result of risk mitigation strategies. Additional detail is provided in Section 7, Analysis of Results.

Table 2: 'As-Presented' and Improved CRAVE Analysis – Risk Mitigation

Alternative	Base Total Project Cost (YOE $M)	Value (YOE $M)		
		10%	70%	90%
Alternative C 'As-Presented'	$306.6	$337.9	**$385.0**	$404.6
Alternative C – Option 3	*$217.0*	*$238.5*	***$271.7***	*$286.0*
Net Reduction in Projected Cost of $113.3 million				
Alternative E – Option 2 'As-Presented'	$291.0	$310.1	**$360.6**	$376.3
Alternative E – Option 3	*$203.9*	*$212.7*	***$237.1***	*$248.7*
Net Reduction in Projected Cost of $123.5 million				
Alternative H 'As-Presented'	$402.0	$453.2	**$510.6**	$535.9
Alternative H – Option 1	*$320.6*	*$360.2*	***$411.3***	*$435.8*
Net Reduction in Projected Cost of $99.3 million				

The results in **Table 2** illustrate the power of proactive management and implementation of risk mitigation strategies. In summary, implementing the risk mitigation strategies and

VE recommendations can offer an additional cost reduction beyond the direct cost of the risks themselves due to time related costs, including escalation and extended overheads.

The CRAVE team wishes to express its appreciation to the project design team and management for the excellent support they provided during the study. These recommendations and other design considerations provided will assist in the management decisions necessary to move the project forward.

Sincerely,

Blane H. Long, CVS®
HDR

1 Introduction

This report summarizes the events of the CRAVE study conducted for the Idaho Transportation Department (ITD), facilitated by HDR Engineering, Inc. The subject of the study was the I-15/US-20 Connector Project in Bonneville County near Idaho Falls.

1.1 Project Purpose

1.1.1 I-15/US-20 Connector

The Idaho Transportation Department, City of Idaho Falls, and Bonneville County are working together to plan for the future by studying potential improvements to the I-15 and US-20 interchanges.

ITD is conducting a Planning and Environmental Linkages (PEL) study that is considering short-, mid-, and long-term solutions as funding becomes available. Improvements could include upgrades and changes to current interchanges and roadways, as well as potential new routes.

The purpose of the PEL study is to identify and analyze improvements to address safety, congestion, and mobility and travel time reliability for efficient movement of people, goods and services on I-15 and US-20 in or near Bonneville County and Idaho Falls.

1.1.2 Needs and Objectives

Constructed in the 1950s and 60s, the I-15 and US-20 interchanges in Idaho Falls are not expected to be able to provide adequate safety, mobility and economic opportunity in the city, county, and region given the anticipated future growth in the region. The PEL study will review options for multi-modal connections and capacity improvements to I-15 and US-20 as well as potential new roadway linkages in order to:

1. Address unsafe travel conditions on I-15 and US-20
    a. Traffic backups at exit ramps
    b. Substandard land change / merge space between exits
    c. Interchanges are spaced too closely together
2. Reduce congestion at the I-15/US-20 interchange, particularly for traffic exiting US-20 towards southbound I-15 at the onramp, and for northbound traffic on I-15 exiting at US-20 eastbound exchange, which both operate at a current LOS D
    a. High volumes of freight traffic
    b. High volumes of peak hour local commuter traffic
    c. Limited crossings of railroad and river funnel traffic to the I-15/US-20 corridors

3. Provide pedestrian and bicycle mobility within the I-15 and US-20 corridors
    a. Built and natural barriers limit safe connectivity to adjacent facilities, the river and adjacent multiuse trails
    b. According to the 2008 BMPO Bicycle and Pedestrian plan, the corridor's "existing facilities are either inadequate, deficient, or associated with various problems"
4. Address future travel demand forecasts
    a. Current infrastructure will not accommodate travel demands of increasing local growth and regional tourism
    b. Current infrastructure is projected to operate at Level of Service E or F at the interchange of I-15/US-20 by the year 2045, which will not appropriately provide for future growth as identified in adopted local (City, County, and MPO) land use and comprehensive plans

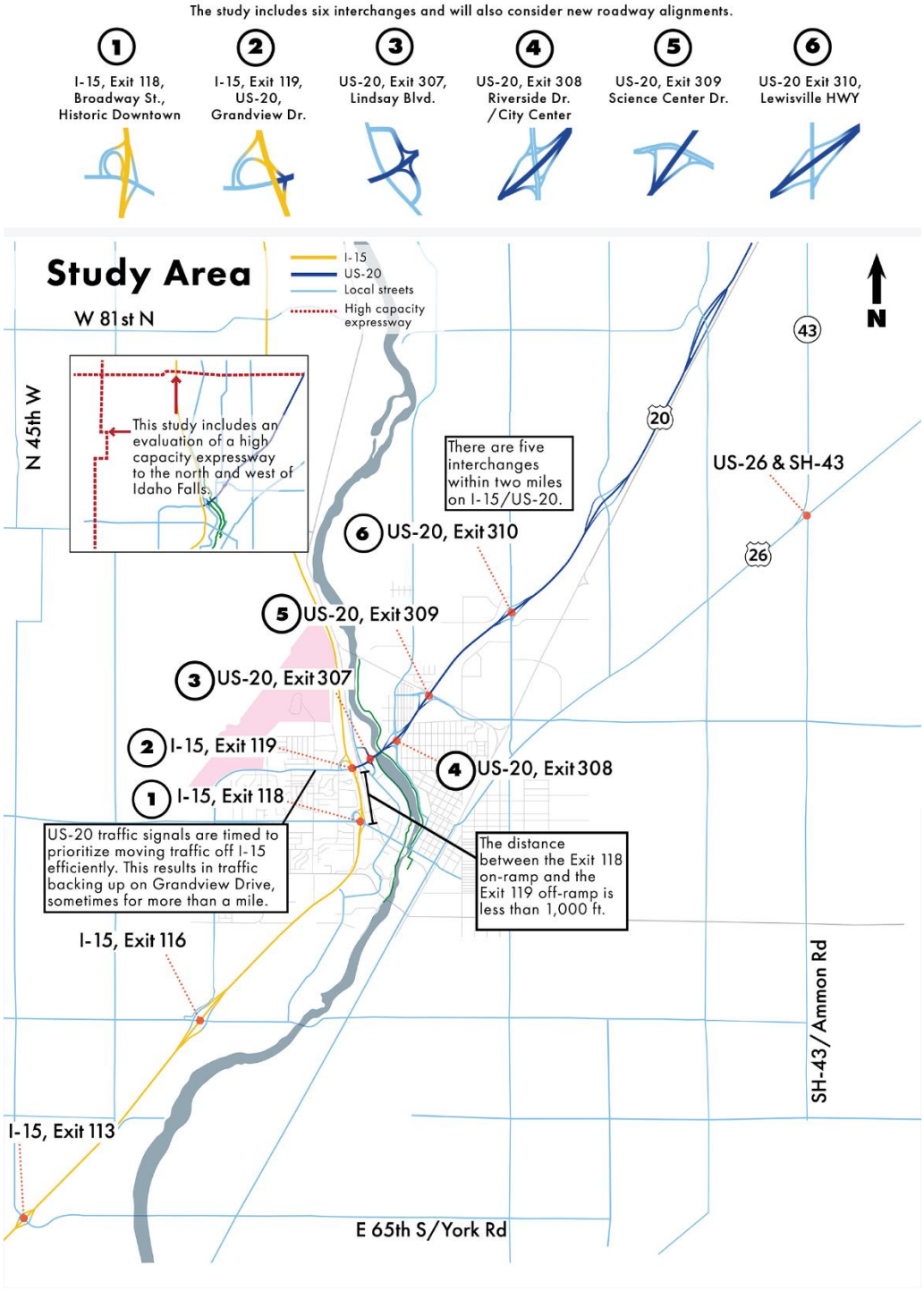
Additional Goals

1. Provide transportation facilities that improve access to local schools, recreation facilities and commercial areas that support local land use plans while also reducing the negative impacts of the existing infrastructure on those community resources.
2. In addition to improvements to pedestrian and bicycle facilities in the corridor, seek to provide additional connections to the surrounding multi-modal network.
3. Provide improvements that serve all types of travelers including local commuters, freight, and regional tourism.
4. Consider new infrastructures impacts to local roads through coordination with Idaho Falls and Bonneville County.
5. In addition to identification and mitigation of any direct environmental impacts of the proposed improvements, seek to provide additional opportunities for the project to enhance local environmental resources.

1.1.3 Project Location and Limits

The PEL study includes six interchanges and will also include new roadway. **Figure 1** depicts project limits.

Figure 1: Project Limits



1.2 Scope of the CRAVE Study

The scope of the CRAVE study was to verify or improve upon the alternatives being proposed for this project. To accomplish this, the CRAVE team applied the principles and practices of the Value Methodology Job Plan (see **Appendix I**) as well as the following:

- Conducted a thorough review and analysis of the key project issues using a multidiscipline, cross-functional team (i.e. review the baseline design).
- Verified or improved upon the various concepts for the I-15/US-20 Connector.
- Identified high risk areas in delivering this project.
- Evaluated the staging options and constructability.
- Improved the value of the project through innovative measures aimed at improving the performance while reducing costs of the project.
- Performed a cost risk assessment on both the baseline design and the VE-recommended design of the alternatives presented during the workshop.

1.3 CRAVE Approach

CRAVE is an advanced project management process that has combined the proven tools and process from cost risk assessment and value engineering process into a single process. The process uses various tools to solicit inputs from the project team and key stakeholders, quantify risks, and track the risks together with the corresponding mitigation strategies. In particular, and as **Figure 2** shows, CRAVE consists of four main steps as follows:

Figure 2: CRAVE Process

1.3.1 Step 1: Baseline Risk Assessment

- Review baseline cost
- Review baseline schedule
- Identify risks related to baseline project
- Assess and quantify risks in terms of project's cost and schedule

1.3.2 Step 2: Value Engineering and Risk Response Development

- Develop value engineering recommendations that further mitigate or avoid high risk elements
- Develop recommendations that add value by modifying project scope and/or schedule

1.3.3 Step 3: Risk Analysis on Response Strategies

- Identify risks related to response strategies
- Assess and quantify threats and opportunities in terms of project's cost and schedule

1.3.4 Step 4: Tracking, Monitoring, and Control

- Identify risk owners, monitoring frequency
- Continuously update risk management plan
- Document and report progress
- At key milestones, update cost and schedule

1.4 CRAVE Study Timing

The study was conducted December 9-12 at the ITD District 6 office, located in Rigby Idaho with the presentation of findings held December 12, 2019.

1.5 CRAVE Team Members

The list of team members for the CRAVE study is provided below. Other attendees are identified on a sign-in sheet, which is provided in **Appendix G**.

Lisa Applebee, FHWA

Lance Bates, Bonneville County

Rachel Bernhard, HDR

Paul Blackham, HDR

Ben Burke, Horrocks

Chris Canfield, City of Idaho Falls

Curtis Calderwood, ITD

Tim Cramer, ITD

Ryan Day, ITD

Tracy Ellwein, HDR

Karen Hiatt, ITD

Will Hume, HDR

Kelly Hoopes, Horrocks

Rick Jensen, ITD

Ryan Lancaster, ITD

Mark Layton, ITD

Blane Long, HDR (Facilitator)

Mike McKee, Horrocks

Drew Meppen, ITD

Scot Stacey, ITD

Eric Staats, ITD

John Stone, Horrocks

Darrell West, BMPO

Figure 3: CRAVE Team

2 Information Phase

2.1 Information Provided to the CRAVE Team

The following project documents were provided to the team for their use during the study.

Table 3: Information Provided to CRAVE Team

Document	Date
Draft Purpose and Need	5/8/2018
Fall 2019 Update Flier	11/26/2019
Level 3 Alternative Exhibits	12/9/2019
Ped/bike Exhibits	11/15/2019
Estimated Construction Cost	11/30/2019
Estimated Construction Schedule and Phasing	12/9/2019
Draft Operational Analysis Technical Memo	11/20/2019
Traffic Counts for Existing and 2045 No-build	12/9/2019
Risks Summary by Alternative	12/9/2019
Level 3 Risk Register	12/9/2019
Interchange Spacing Concerns Summary	12/9/2019

2.2 Constraints and Controlling Decisions

As part of the project briefing, the following constraints or areas of concern were presented as controlling factors in developing the alternatives.

- Common to all alternatives:
  - The origin destination study revealed that approximately 60 percent of the traffic in the project area either had an origin or destination in Idaho Falls or the surrounding county area. Approximately 40 percent of the traffic is “pass-through” in route to areas outside of the project area.
- Alternative C
  - Eastern Idaho Railroad (EIRR) tracks parallel to I-15 and passing under US-20.
    - Grade separation concerns at Broadway (at-grade crossing at Broadway).
    - Grade separation at US-20 is close to Exit 119. Consequently, US-20 is constrained as an overpass over the railroad.
  - Maintaining access for the Lindsay traffic is a priority.

- Exit 119 (I-15/US-20), Exit 307 (Lindsay), Exit 308 (City Center/Riverside/Fremont) and Science Center are all interchanges that are close together. The Johns Hole Bridge falls in the middle of the interchanges. Weaving and merges are a concern that should be improved.
- Railroad at the Science Center half interchange is a limiting factor which prohibited the conversion of the Science Center Interchange to a full interchange (an interchange can be built here but all ramps would be on the south side of Science Center).
- Sensitive cultural resources that are potentially impacted:
  - Temple View Elementary – Antares Park area
  - Grain silos
  - Porter Canal and Snake River aquatic resources
  - Potential environmental justice resource concerns between Freeman Park and US-20
  - Various churches or church owned properties.

- Alternative E – Option 1 and Option 2
  - Grain silos between Lindsay Blvd and I-15 (particularly the norther silos) are potentially eligible for historic.
  - RV/Trailer Park may be a sensitive environmental resource.
  - There are potential wetland areas around the Porter Canal and Snake River in the vicinity of the current crossing.
  - Grade separation of the railroad, the Porter Canal, the Snake River and the new Olympia Drive Interchange created a challenge for connectivity and accessibility.
  - Maintaining access for the Lindsay traffic very difficult due to the proximity grade separation of US-20, Porter Canal and Snake River.
  - Access to the Fremont Avenue and Science Center Drive provides for connectivity to Idaho National Laboratory (INL), City Center and neighborhood areas.
- Alternative H
  - Alternative passes over the existing hatch pit. A landfill that includes construction waste and possibly other waste and is operated by Bonneville County.
  - Alternative creates corridor through areas where no high-speed/high-volume roadways currently exist. Residents have expressed concerns about the potential noise and connectivity.
  - The US-20 eastbound legs as shown for Alternative C and Alternative E, a system-to-system type interchange is a consideration to connect the new corridor to the existing I-15 corridor. Concerns near the proposed system-to-system interchange include:

- Lindsay Blvd (River Road) and 49th North connectivity
- Railroad crossing
- Snake River (much wider than at Johns Hole) at this location

- Connectivity of the local roadways include:
  - 5th West (East River Road)
  - 5th East (Lewisville Highway)
  - 49th North
  - 15th East (St. Leon)

2.3 Base Cost Review

One of the objectives of a cost risk assessment is to review the base cost estimate in a collaborative setting with independent expert opinion and project team members. The base cost estimate represents the project cost that can reasonably be expected if the project materializes as planned, and there is no occurrence of significant risk. Initially the team was provided a high-level cost estimate for each alternative developed on a rough order of magnitude for Level 3 screening purposes dated 11/30/2019 (**Appendix B**).

2.4 Uncertainty

Estimating is not an exact science; a cost estimate is an approximation of the costs composed of many elements that may not be completely defined at the time the estimate is prepared. As a result, there is variability or uncertainty associated with any estimate. When applied to the project estimate, this uncertainty establishes the range that the base cost could fall within. A numerical value of uncertainty is, in essence, an estimate of the error or tolerance within the quantity or unit price of each item within the estimate.

For any given project, the level of uncertainty is directly related to its position in the project life cycle (i.e., the earlier in the project development process, the greater the uncertainty; conversely, the closer to completion, the less uncertainty). Uncertainty was established for the base costs based on all available information at the time of the workshop and resulted in an overall uncertainty in the total project base costs.

In establishing the uncertainty ranges for each item, consideration was given to factors that might affect quantities or bid prices, such as project location (rural vs. urban), quantities (large or small), items that are difficult to construct or site constraints, methods of payments, timing of advertisement, specialty work, geotechnical and project delivery methods.

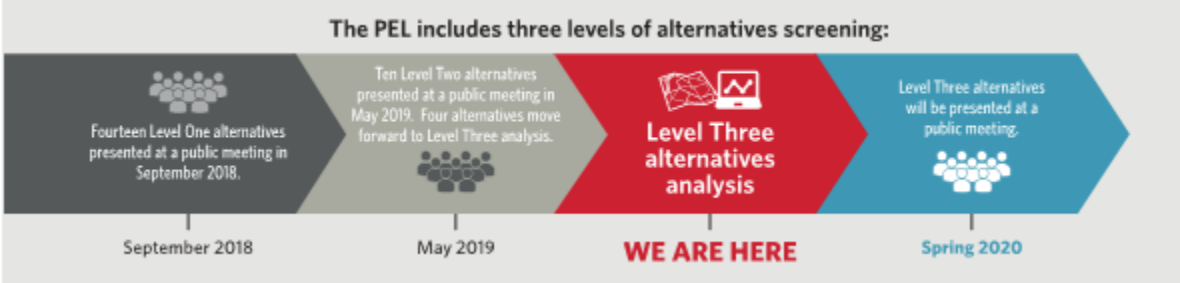
2.5 Project Schedule Review

Figure 4 below represents the PEL study process that began in Fall 2017 and includes several formal public input opportunities to verify broad community participation in this important process. The PEL includes three levels of alternatives screening:

- Fourteen Level One alternatives presented at a public meeting in September 2018.
- Ten Level Two alternatives presented at a public meeting in May 2019. Four recommended to move forward to Level Three analysis.
- Level Three alternatives analysis (the project is currently in this stage)

Level Three alternatives will be presented at a public meeting in the spring 2020 and the final PEL report is expected in summer 2020.

Figure 4: PEL Schedule



The project delivery is assumed Design-Bid-Build. The environmental process is anticipated to begin in July 2020 with completion in December 2022. Final design and ROW acquisition are scheduled to begin in January 2023 with completion in October 2026. Construction will start in April 2027. For the purposes of the study, the CRAVE team assumed the project construction duration will be six construction seasons for each alternative.

2.6 Project Escalation Assumptions

The CRAVE team used 3.00% escalation rate and results are expressed in current year dollars.

2.7 Performance Attributes

Performance attributes are an integral part of the value analysis process. The performance of each alternative must be properly defined and agreed upon by the project team, CRAVE team, and stakeholders at the beginning of each study. These attributes represent those aspects of a project's scope and schedule that possess a range of potential values.

Performance attributes can generally be divided between project scope components (mainline operations, environmental impacts, maintainability, etc.) and project delivery components. It is important to make a distinction between performance attributes and performance requirements. Performance requirements are mandatory and binary in nature. All performance requirements MUST be met by any VE recommendation being considered.

Performance attributes possess a range of acceptable levels of performance. For example, if the project was the design and construction of a new bridge, a performance requirement might be that the bridge must meet all current seismic design criteria. In contrast, a performance attribute might be project schedule, which means that a wide range of alternatives could be acceptable that had different durations.

The CRAVE team, along with the project team, identified and defined the performance attributes for this project and then defined the baseline concept as it pertains to these attributes. The following performance attributes were used throughout the study to identify, evaluate, and document ideas and recommendations. The baseline evaluation criteria can be found in **Appendix E**, and the performance measures for each recommendation can be found in Section 6.4, Recommendations.

2.7.1 Mainline Operations

This Performance Attribute is an assessment of traffic operations and safety through the corridor. Operational considerations include level of service relative to the 20-year traffic projections, as well as geometric considerations such as design speed, sight distance, and lane and shoulder widths.

2.7.2 Local Operations

This Performance Attribute is an assessment of traffic operations and safety on the local roadway infrastructure (cross streets). Operational considerations include level of service relative to the planning year (2045) traffic projections; geometric considerations such as design speed, sight distance, lane and shoulder widths; bicycle and pedestrian operations and access.

2.7.3 Maintainability

This Performance Attribute is an assessment of the long-term maintainability of the facility. Maintenance considerations include the overall durability, longevity, and maintainability of structures and systems; ease of maintenance; accessibility and safety considerations for maintenance personnel, including sediment and debris removal.

2.7.4 Construction Impacts

This Performance Attribute is an assessment of the temporary impacts to the public during construction related to traffic disruptions, detours and delays; impacts to existing utilities; impacts to businesses and residents relative to access, visual effects, noise, vibration, dust, and construction traffic; environmental impacts.

2.7.5 Environmental Impacts

This Performance Attribute is an assessment of the permanent impacts to the environment including ecological (i.e., flora, fauna, air quality, water quality, visual, noise); socioeconomic impacts; impacts to river banks; impacts to cultural, recreational and historic resources.

2.8 Performance Attribute Matrix

A matrix was used to determine the relative importance of the individual performance attributes for the project. The project and VE teams evaluated the relative importance of the performance attributes that would be used to evaluate the creative ideas.

These attributes were compared in pairs, asking the question: “Which one is more important to the purpose and need of the project?” The letter code (e.g., “A”) was entered into the matrix for each pair.

Table 4: Performance Attribute Matrix

Performance Attributes Criteria Matrix							
Paired Comparison							
						Total Points	% of Total
Mainline Operations	A	A	A	A	A	5.0	33.5%
Local Operations		B	B	B	B	4.0	26.6%
Maintainability			C	C	C	3.0	20.0%
Construction Impacts				D	E	1.0	6.6%
Environmental Impacts					E	2.0	13.3%
					Total	15.0	100.0%

After all pairs were discussed, they were tallied (after normalizing the scores by adding a point to each attribute) and the percentages calculated. These scores were then used to calculate the value of each recommendation during the performance evaluation scoring team review for each recommendation.

2.9 Function Analysis

Function analysis results in a unique view of the project. It transforms project elements into functions, which moves the CRAVE team mentally away from the original design and takes it toward a functional concept of the project.

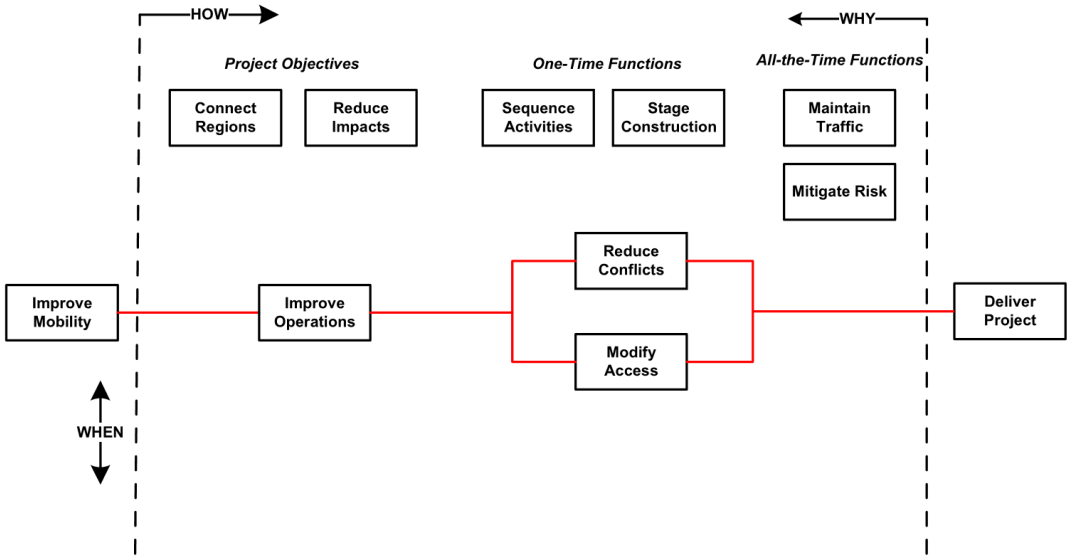
Functions are defined in verb-noun statements to reduce the needs of the project to their most elemental level. Identifying the functions of the major design elements of the project allows a broader consideration of alternative ways to accomplish the functions.

2.10 FAST Diagram

The Function Analysis System Technique or FAST diagram arranges the functions in logical order so that when read from left to right; the functions answer the question "How?" If the diagram is read from right to left, the functions answer the question "Why?" Functions connected with a vertical line are those that happen at the same time as, or are caused by, the function at the top of the column.

The FAST Diagram for this project shows Improve Operations as the basic function of this project. A key secondary function was Increase Capacity and Control Traffic. This provided the CRAVE team with an understanding of the project design rationale and which functions offer the best opportunity for cost or performance improvement.

Figure 5: FAST Diagram



3 Baseline Risk Analysis

In evaluating the risk for the project, a CRAVE process was utilized. The cost risk assessment portion of the evaluation was used to identify the range of unexpected project costs as it relates to total project cost for each alternative as presented, as well as potential delays in schedule that might arise.

The team discussed the potential risk events and elements facing the alternatives. During the discussion of each alternative, the team identified high risk elements or potential events that may occur that would impact that alternative. For each significant risk event that was identified, the probability of the risk and its impact to cost, schedule, or both was estimated.

The risk assessment process includes identifying high risk areas and risk elements as threats (or opportunities where appropriate) to a project, quantifying the identified risk elements, developing appropriate risk response strategies, and quantifying the effects of the risk response strategies to be employed.

The risk assessment process quantified risk events by establishing the expected probability of occurrence and range of impacts through elicitation of information from the CRAVE team. The range of impacts defines the representative distribution to be used when modeling the risk. The probability determines the relative frequency (or likelihood) of an event transpiring.

The CRAVE team identified 48 risks, of which 32 are active quantified risks that pose potential schedule and/or cost threats and opportunities to the alternatives presented for the I-15/US-20 Connector Project. The full list of risks and impacts for each Alternative can be found in the Risk Analysis Sheets in **Appendix D**.

Table 5: Risks Identified

Risk Number		Risk Name
Alternative C		
CNS	10.01	Construction duration
CNS	10.02	Additional traffic control
DES	50.01	Illumination
DES	900.01	Ped/Bike
DES	900.02	Additional river crossings
ENV	10.01	Section 4(f) impacts (public parks, recreation areas, and historical properties)
ENV	50.01	Hazardous material issues
ENV	50.02	Hazardous materials - LUST
ENV	50.03	Hazardous materials - Industrial
ENV	60.01	Wetland mitigation

Risk Number		Risk Name
ROW	10.01	Displacements
ROW	900.01	City park
ROW	900.02	Additional ROW impacts
ROW	900.03	Environmental justice
ROW	900.04	Condemnation/appraisals
Alternative E.1		
CNS	10.01	Construction duration
DES	50.01	Illumination
DES	900.01	Foote Drive connection to US-20
DES	900.02	US-20 flyover
DES	900.03	Science Center Drive access to US-20
ENV	10.01	Section 4(f) impacts (public parks, recreation area, and historical properties)
ENV	50.01	Hazardous material issues
ENV	50.02	Hazardous materials - LUST
ENV	50.03	Hazardous materials - Industrial
ROW	900.01	Commercial property impact
ROW	900.02	City park
ROW	900.03	Displacements
ROW	900.04	Environmental justice
ROW	900.05	Historic structures
ROW	900.06	Condemnation/appraisals
ROW	900.07	Additional ROW impacts
RR	10.01	New UPRR crossing
Alternative E.2		
CNS	10.01	Construction duration
DES	50.01	Illumination
DES	900.01	Foote Drive connection to US-20
DES	900.02	US-20 flyover
DES	900.03	Science Center Drive access to US-20
ENV	10.01	Section 4(f) impacts (public parks, recreation area, and historical properties)
ENV	50.01	Hazardous material issues
ENV	50.02	Hazardous materials - LUST
ENV	50.03	Hazardous materials - Industrial

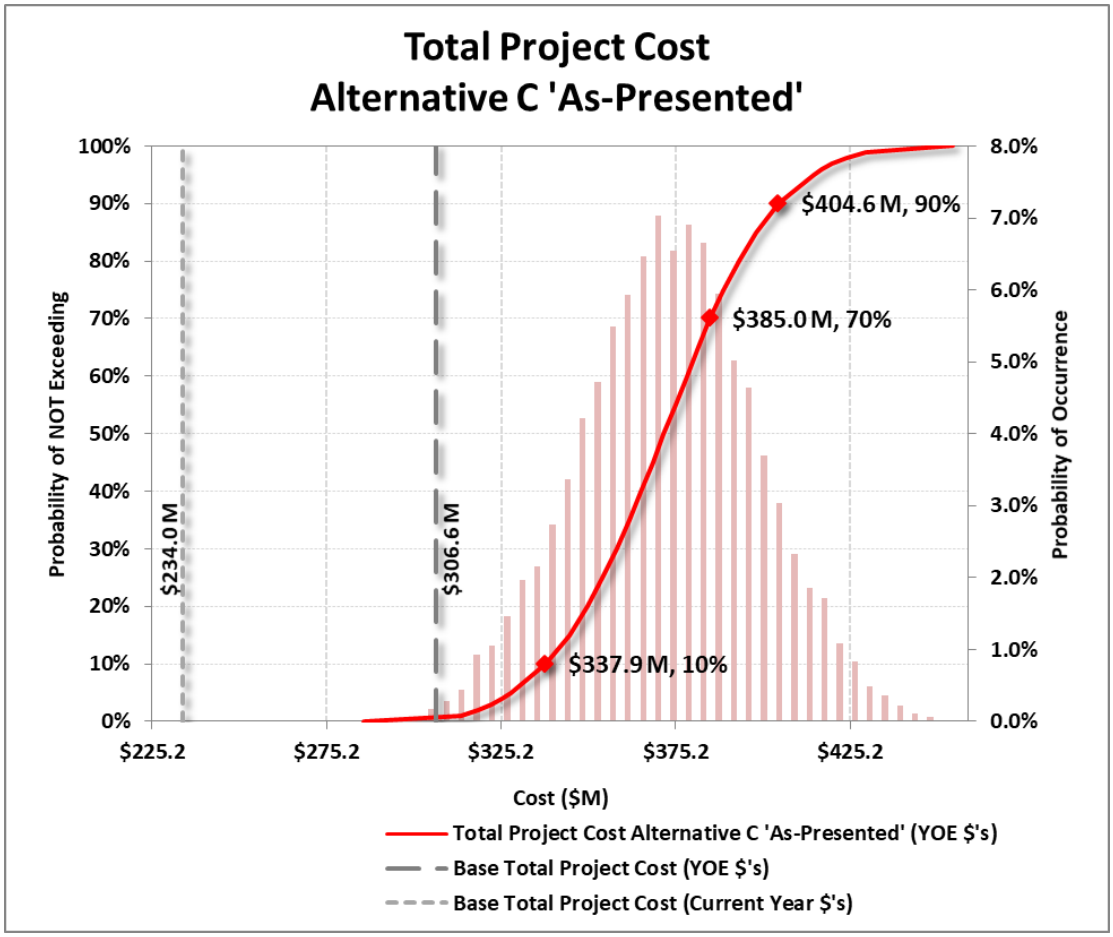
Risk Number		Risk Name
ROW	900.01	Commercial property impact
ROW	900.02	City park
ROW	900.03	Displacements
ROW	900.04	Environmental justice
ROW	900.05	Historic structures
ROW	900.06	Condemnation/appraisals
ROW	900.07	Additional ROW impacts
Alternative H		
CNS	80.01	C&D pit
DES	50.01	Illumination
DES	900.01	Access to agriculture west of I-15
DES	900.02	Airport
ENV	90.01	Sound barrier
PSP	900.01	Public opposition
ROW	900.01	Condemnation/appraisals (cost)
ROW	900.02	Displacements
ROW	900.03	Additional ROW impacts
ROW	900.04	Condemnation/appraisals (schedule)

3.1 'As-Presented' Results

An initial risk workshop and analysis was performed prior to the VE phase to establish a profile of the alternatives as known at the time. The risk analysis results are given in the form of graphs showing the relationship between cost and the probability of not exceeding that cost. Risk-based analysis provides a distribution of probabilities that a project will not exceed an estimated dollar figure. Typically, agencies report the project risk-based estimation using the 70 percent confidence interval.

Each graph indicates the best opinion of the cost ranges by the workshop participants at the time of the analysis.

Figure 6: Alternative C 'As-Presented' Overall Project Cost Risk Analysis Results

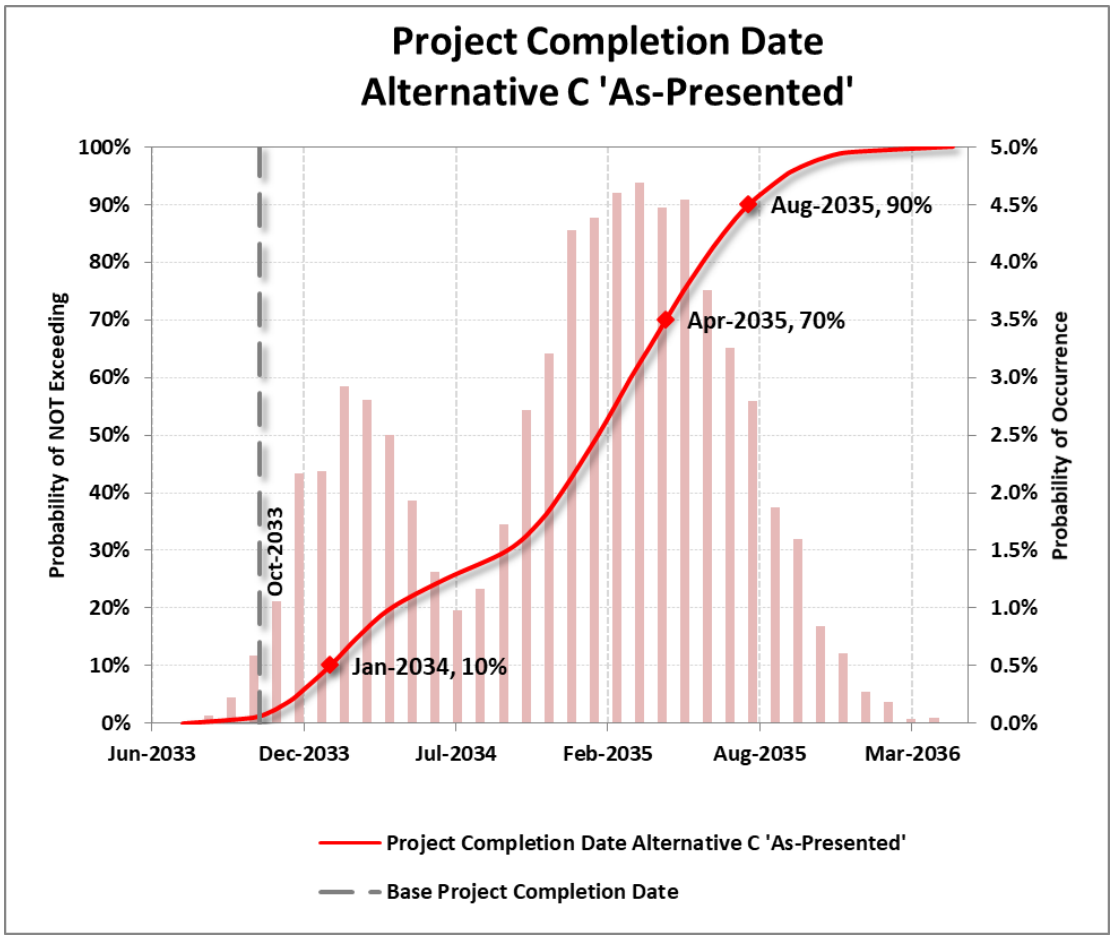


The gray vertical line in **Figure 6** (short dashes) represents the base cost in 2019 dollars. The base cost is the project cost without contingency, or $234.0 million not including costs spent to date. The grey vertical line (long dashes) represents the base cost in YOE dollars, or $306.6 million.

The **red** S-curve represents the cumulative probability distribution after adding in the risks (threats and opportunities) to the base costs and their uncertainties. This S-curve represents all possible values the costs could take, again expressed in YOE dollars.

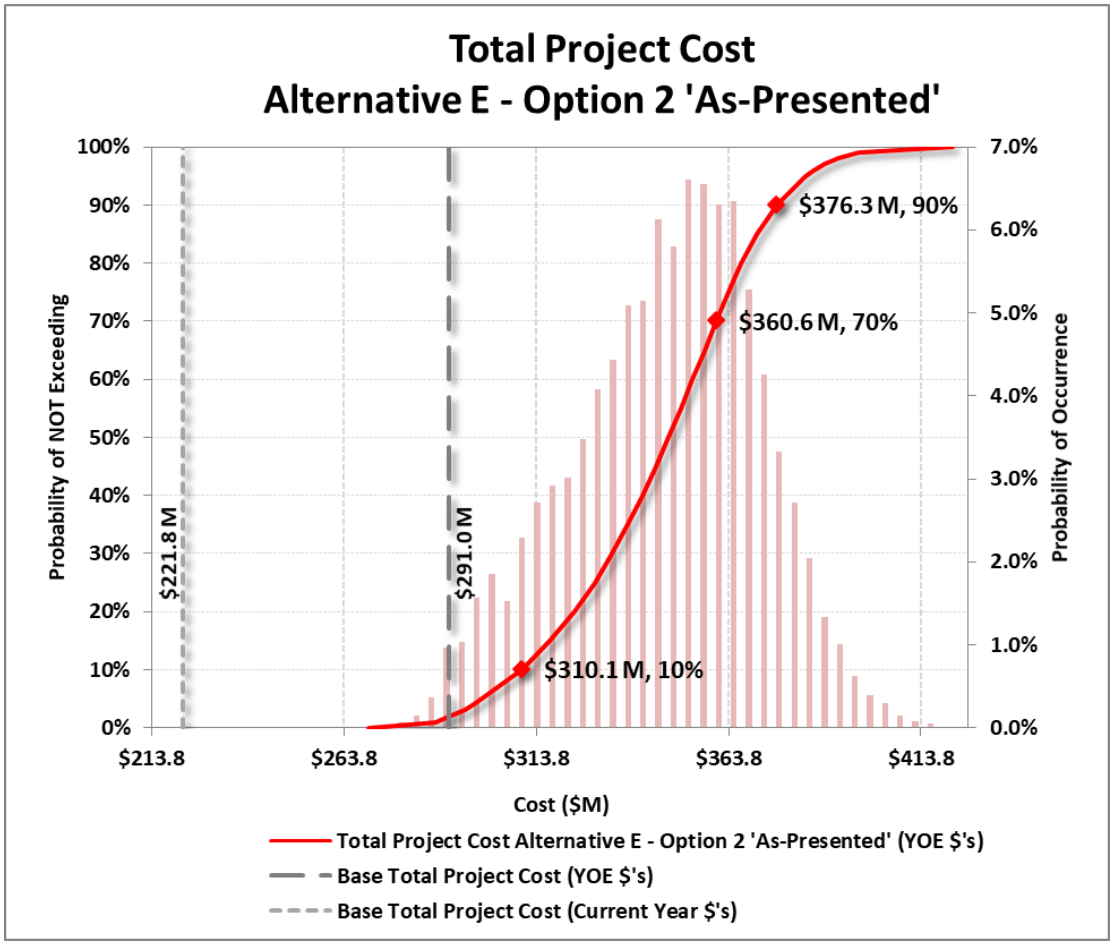
The 80 percent confidence interval, described by the cost range between the 10th percentile and 90th percentile figures, reveals that the total project cost will fall between $337.9 million and $404.6 million. *There is a 70 percent probability the total project cost for Alternative C 'As-Presented' will be less than $385.0 million based on the current scope and risk profile.*

Figure 7: Alternative C 'As-Presented' Overall Project Completion Date Risk Analysis Results



As shown in **Figure 7,** the baseline schedule had project completed on October 2033. The 80 percent confidence interval, described by the schedule range between the 10th percentile and 90th percentile figures, reveals that the completion of construction will fall between January 2034 and August 2035. *There is 70 percent probability that Alternative C 'As-Presented' would be completed by April 2035.*

Figure 8: Alternative E – Option 2 'As-Presented' Overall Project Cost Risk Analysis Results

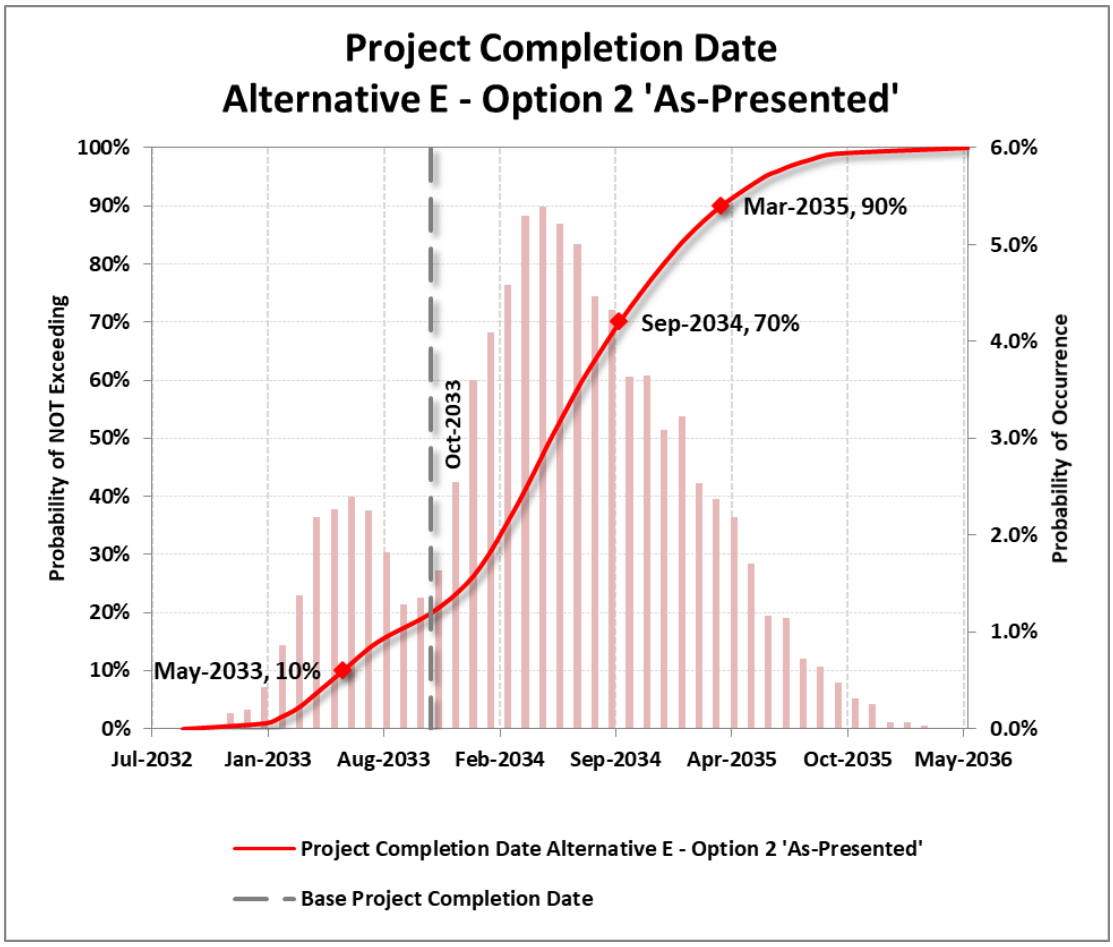


The gray vertical line in **Figure 8** (short dashes) represents the base cost in 2019 dollars. The base cost is the project cost without contingency, or $221.8 million not including costs spent to date. The grey vertical line (long dashes) represents the base cost in YOE dollars, or $291.0 million.

The **red** S-curve represents the cumulative probability distribution after adding in the risks (threats and opportunities) to the base costs and their uncertainties. This S-curve represents all possible values the costs could take, again expressed in YOE dollars.

The 80 percent confidence interval, described by the cost range between the 10th percentile and 90th percentile figures, reveals that the total project cost will fall between $310.1 million and $376.3 million. *There is a 70 percent probability the total project cost for Alternative E – Option 2 'As-Presented' will be less than $360.6 million based on the current scope and risk profile.*

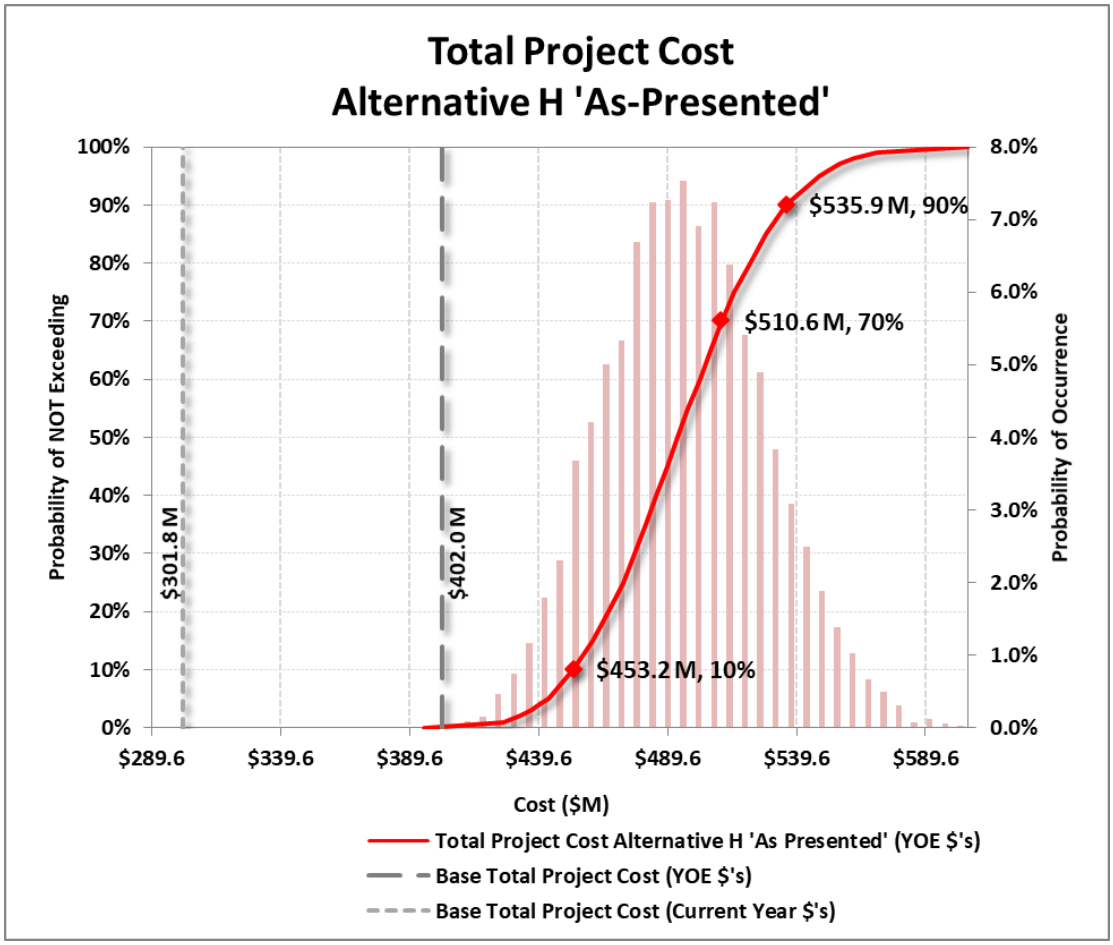
Figure 9: Alternative E – Option 2 'As-Presented' Overall Project Completion Date Risk Analysis Results



As shown in **Figure 9,** the baseline schedule had the project completed on October 2033. The 80 percent confidence interval, described by the schedule range between the 10th percentile and 90th percentile figures, reveals that the completion of construction will fall between May 2033 and March 2035. *There is 70 percent probability that Alternative E – Option 2 'As-Presented' would completed by* September 2034.

Alternative H 'As-Presented'

Figure 10: Alternative H 'As-Presented' Overall Project Cost Risk Analysis Results

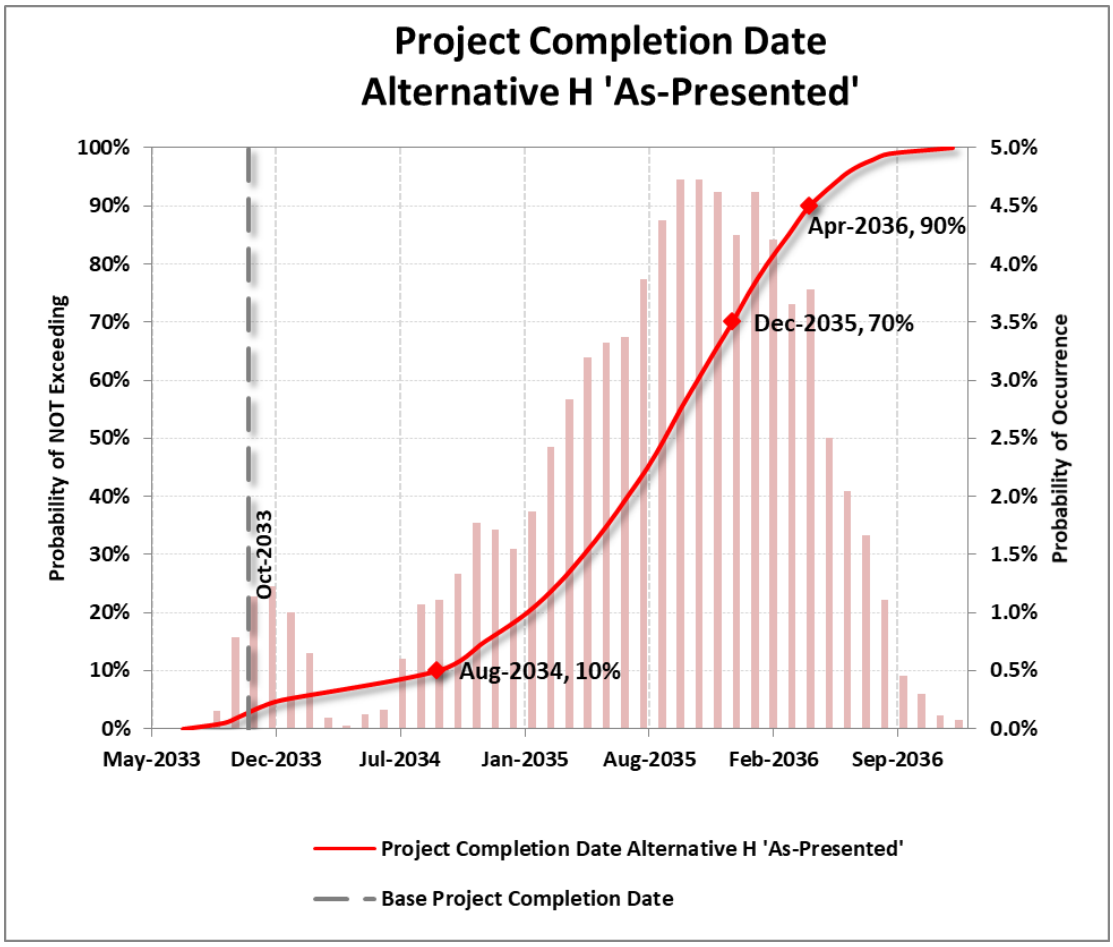


The gray vertical line in **Figure 10** (short dashes) represents the base cost in 2019 dollars. The base cost is the project cost without contingency, or $301.8 million not including costs spent to date. The grey vertical line (long dashes) represents the base cost in YOE dollars, or $402.0 million.

The **red** S-curve represents the cumulative probability distribution after adding in the risks (threats and opportunities) to the base costs and their uncertainties. This S-curve represents all possible values the costs could take, again expressed in 2019 dollars.

The 80 percent confidence interval, described by the cost range between the 10th percentile and 90th percentile figures, reveals that the total project cost will fall between $453.2 million and $535.9 million. *There is a 70 percent probability the total project cost for Alternative H 'As-Presented' will be less than $510.6 million based on the current scope and risk profile.*

Figure 11: Alternative H 'As-Presented' Overall Project Completion Date Risk Analysis Results



As shown in **Figure 11,** the baseline schedule had the project completed on October 2033. The 80 percent confidence interval, described by the schedule range between the 10th percentile and 90th percentile figures, reveals that the completion of construction will fall between August 2034 and April 2036. *There is 70 percent probability that Alternative H 'As-Presented' would be completed by December 2035.*

3.2 Top Risk Factors

After the risks were identified, the CRAVE team focused on responding to risks most likely to happen or those with a significant impact if the event occurs. Using the information portrayed in the tornado diagrams, the highest risk elements received the most focus.

The tornado diagrams for the top risks impacting cost and schedule for each alternative are shown in the following figures.

Alternative C 'As-Presented'

Figure 12: Alternative C 'As-Presented' Top Cost Risks

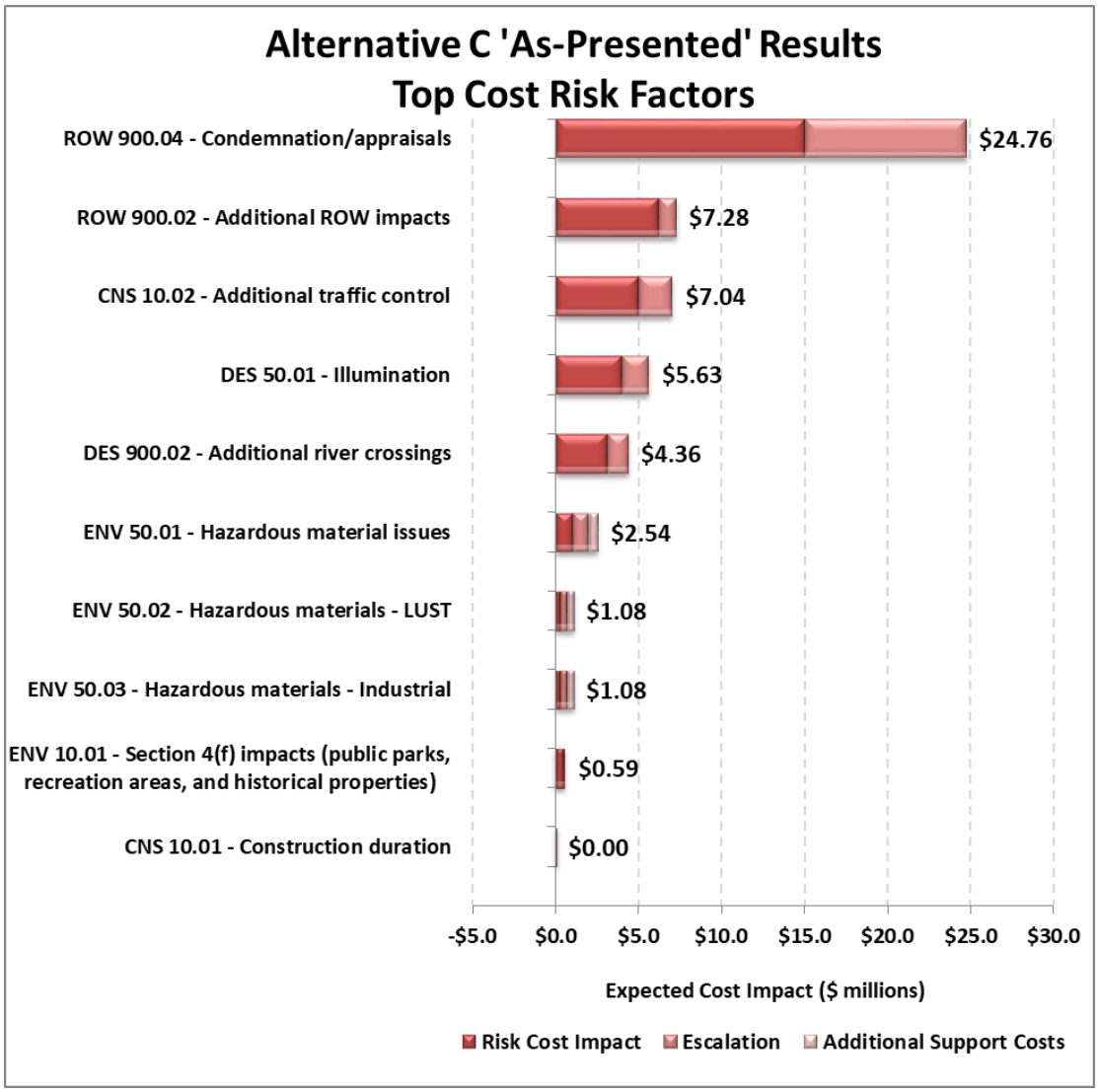
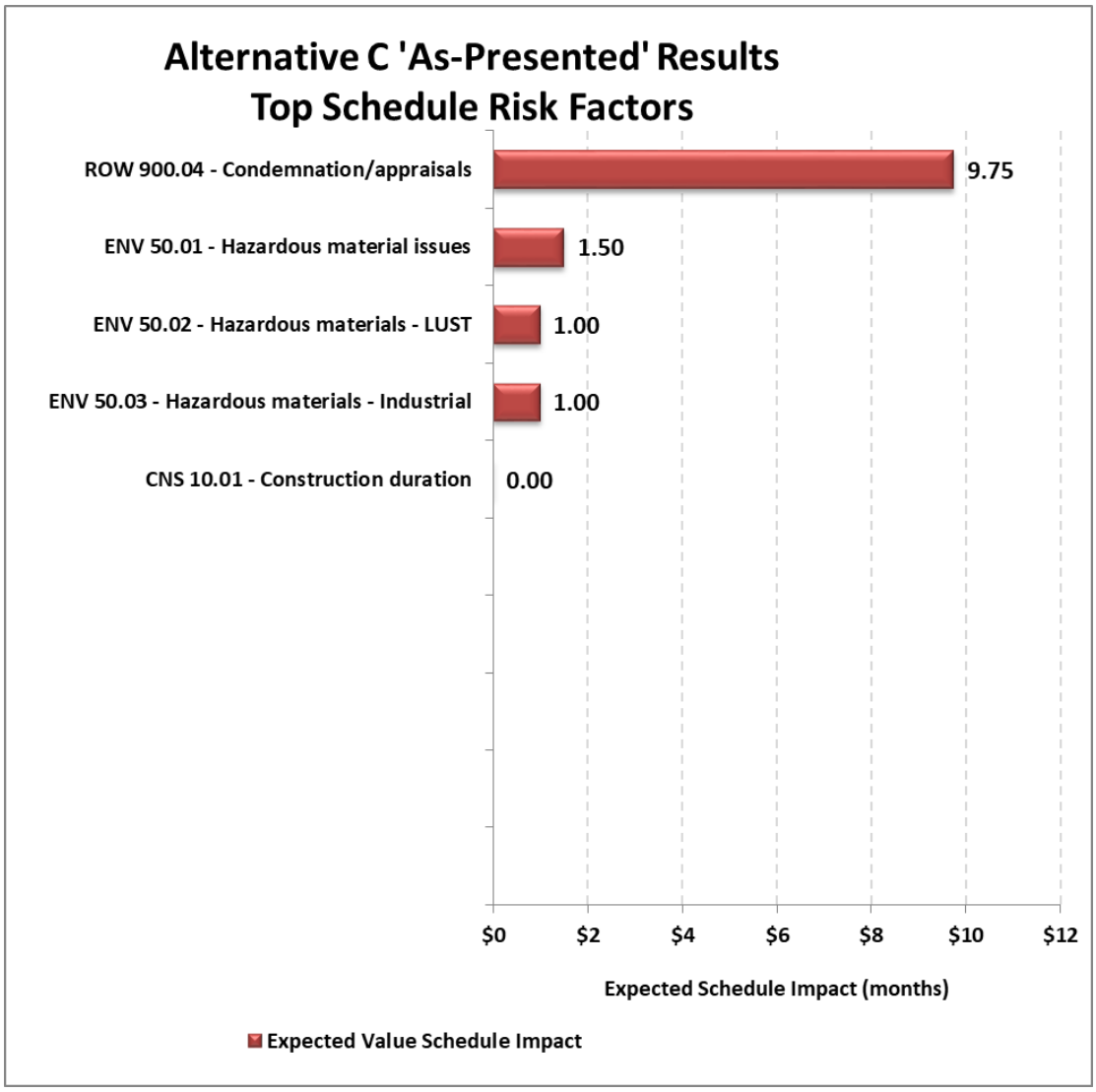


Figure 12 shows the top risk identified for Alternative C 'As-Presented' with the most significant risk attributed to condemnation/appraisals. The dark red bar shows the direct cost impact caused by the risk. The total impact for condemnation/appraisals is $24.8 million, followed by the risk of additional ROW impacts and additional traffic control risks.

Figure 13: Alternative C 'As-Presented' Top Schedule Risks



Currently, the top schedule impact is related to the condemnation/appraisals, followed by a risk of hazardous material issues.

Alternative E – Option 2 'As-Presented'

Because E.1 and E.2 are very similar, E.2 was used in the evaluation.

Figure 14: Alternative E – Option 2 'As-Presented' Top Cost Risks

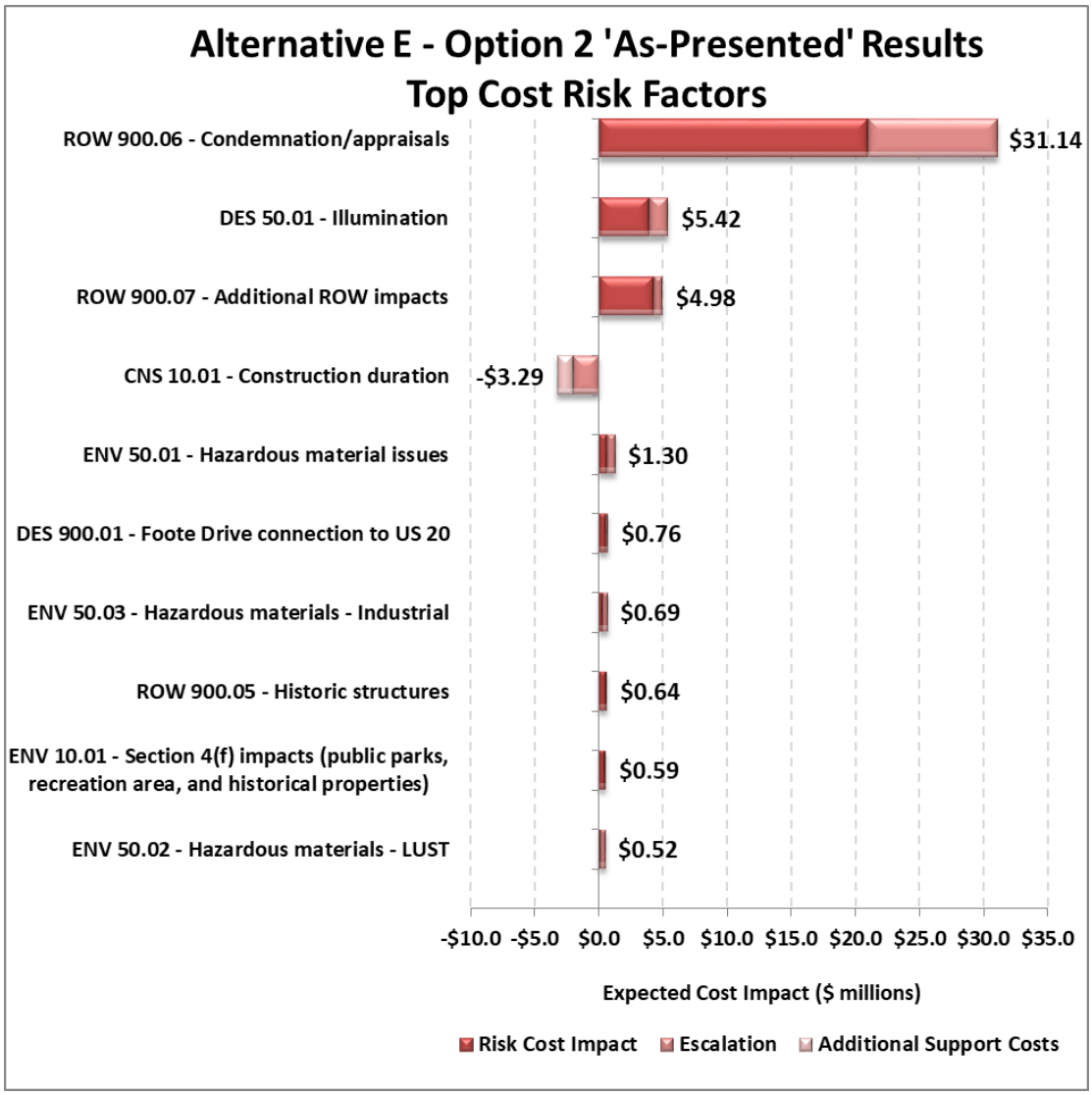
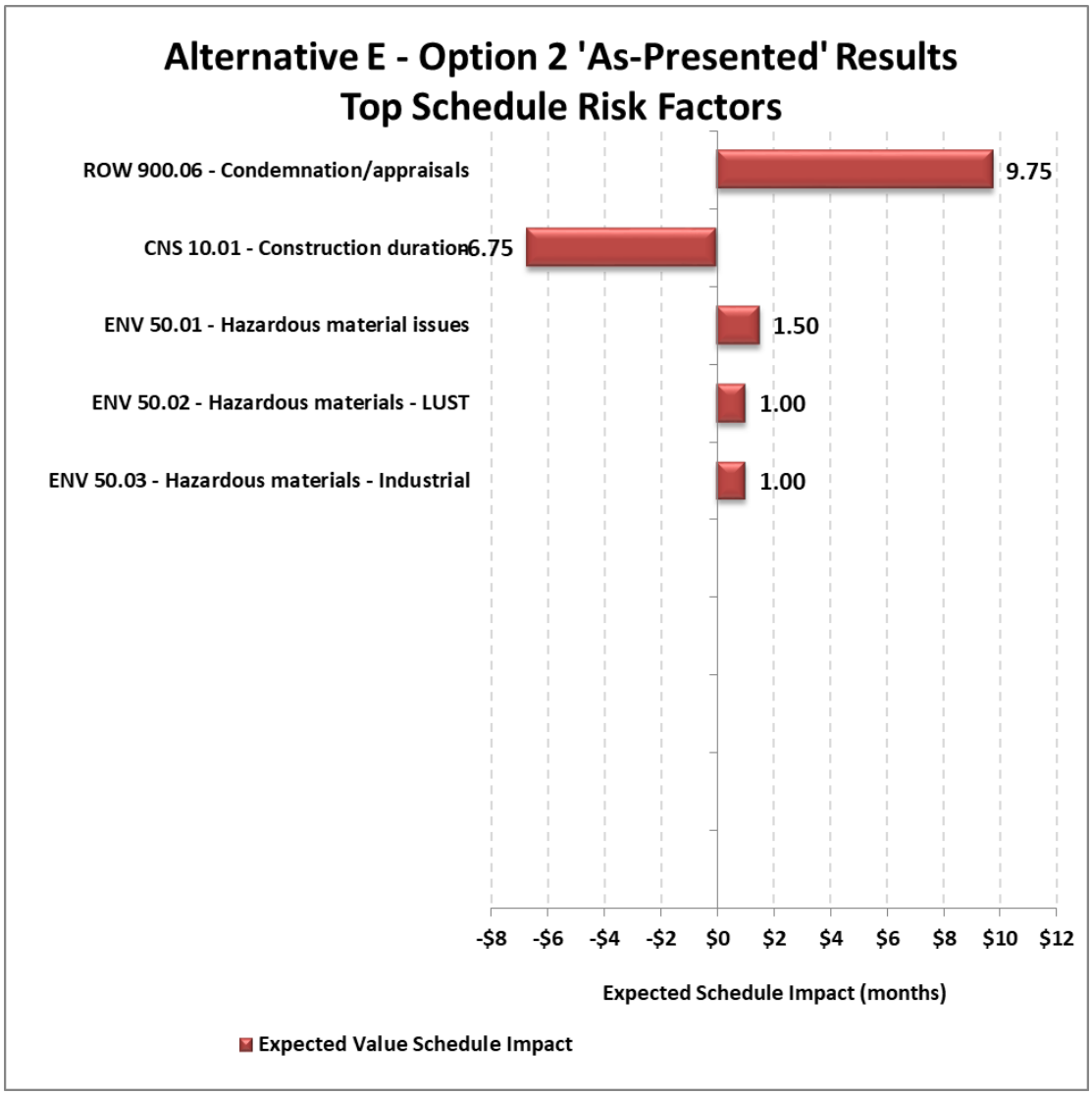


Figure 14 shows the top risk identified for Alternative E - Option 2 'As-Presented' with the most significant risk attributed to condemnation/appraisals. The dark red bar shows the direct cost impact caused by the risk. The total impact for condemnation/appraisals is $31.1 million, followed by the risk of illumination and additional ROW impacts risks.

Figure 15: Alternative E – Option 2 'As-Presented' Top Schedule Risks



Currently, the top schedule impact is related to the condemnation/appraisals, followed by construction duration and a risk of various hazardous material issues.

Figure 16: Alternative H 'As-Presented' Top Cost Risks

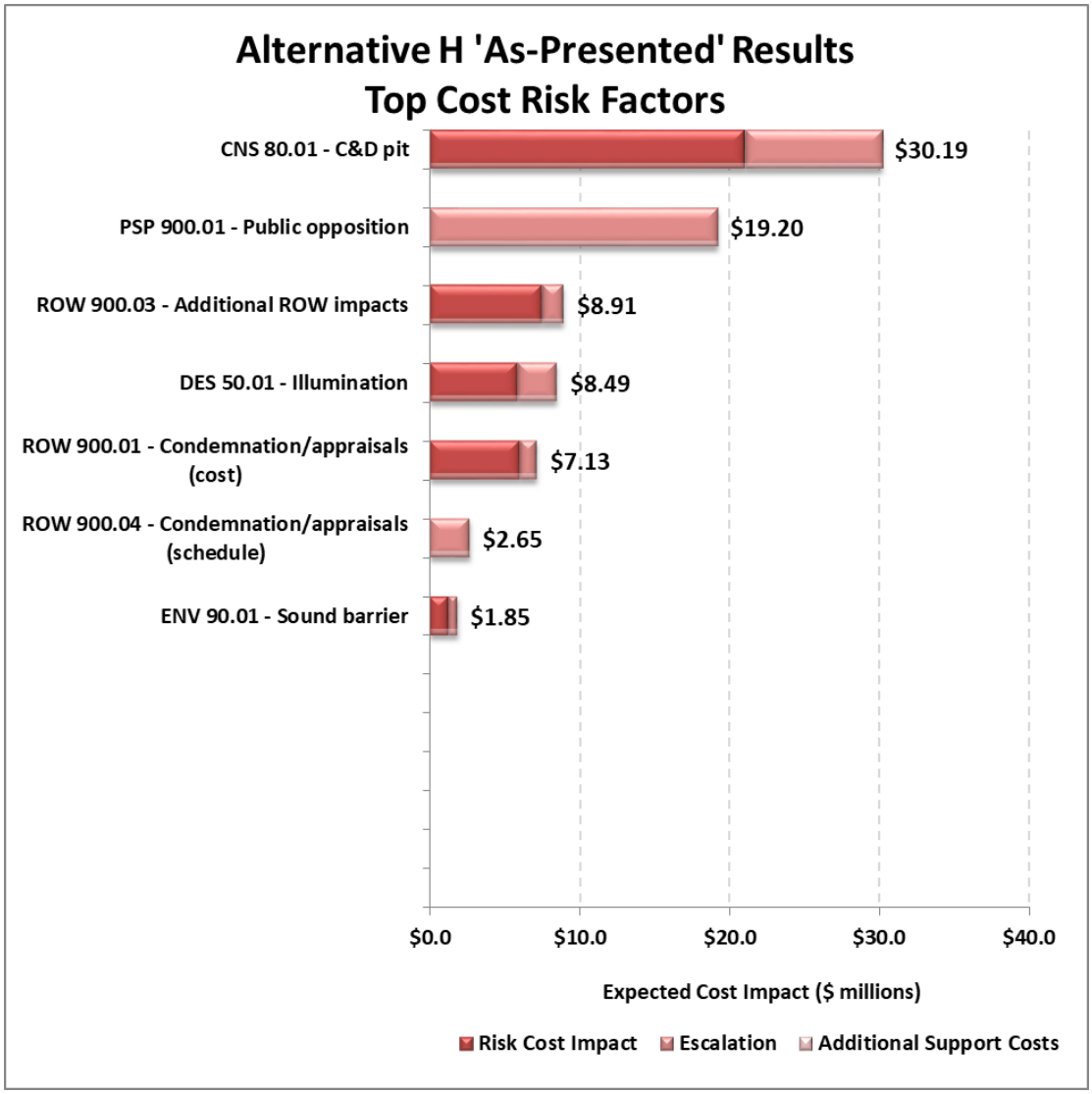
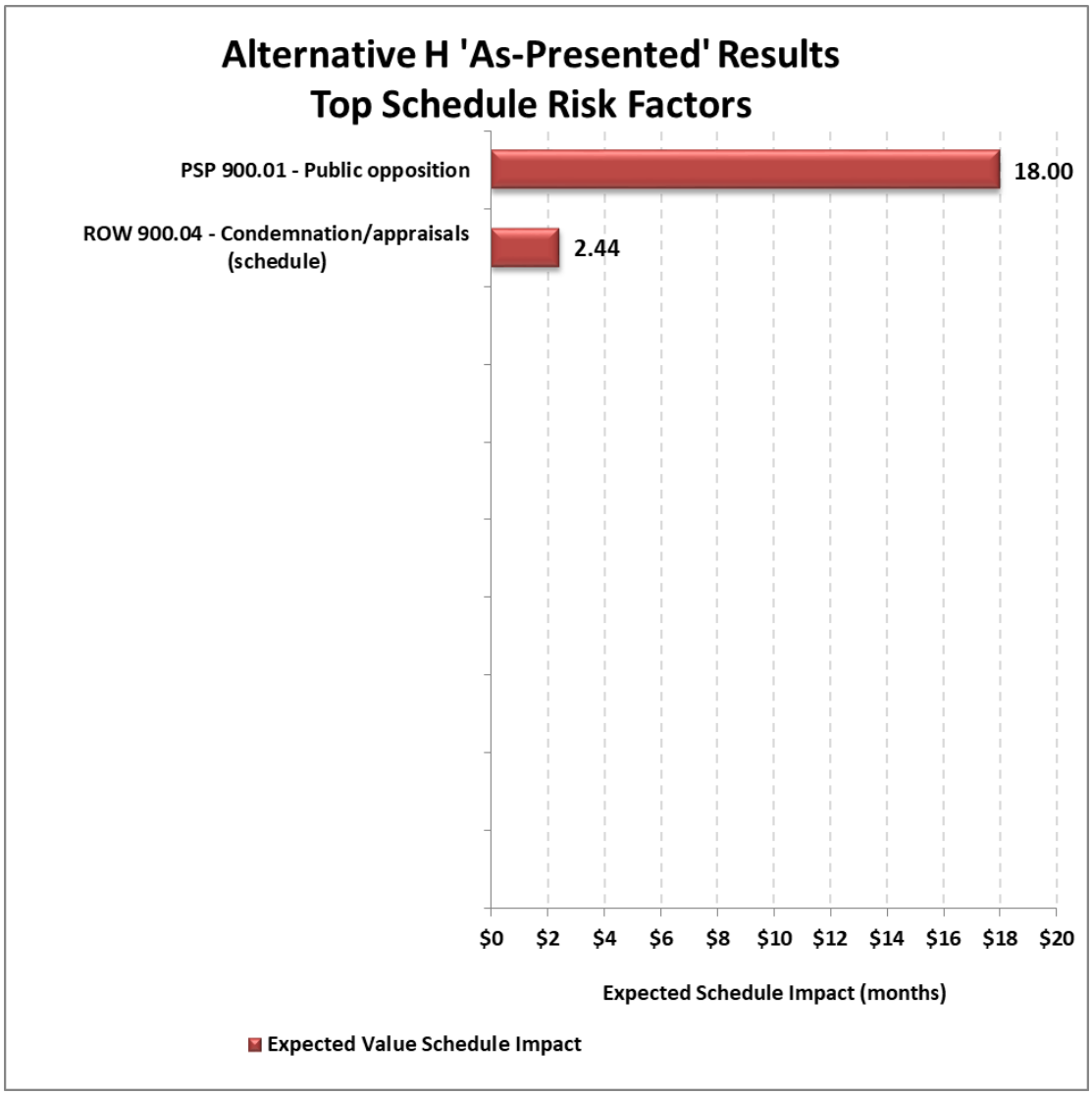


Figure 16 shows the top risk identified for Alternative H 'As-Presented' with the most significant risk attributed to the C&D pit. The dark red bar shows the direct cost impact caused by the risk. The total impact for the C&D pit is $30.2 million, followed by the risk of public opposition and additional ROW impacts.

Figure 17: Alternative H 'As-Presented' Top Schedule Risks



Currently, the top schedule impact is related to public opposition, followed by a risk of condemnation/appraisals.

Additional risk documentation and response strategies were documented for each of the risks above and may be found in **Appendix D**.

The next step was to determine the appropriate risk response strategies for the identified high risk areas. Four risk response strategies, are considered when addressing threat risks. Those strategies are to avoid, accept, transfer, or mitigate the risk.

- **Avoiding** a risk may cost more money up front, but may prevent or reduce a more significant impact.
- **Accepting** a risk means that there is not much that can be done or relatively little benefit in addressing the risk.

- **Transferring** a risk allows for the risk owner to move the liability of the risk to another party that is better able to respond to the risk.
- **Mitigation** of a risk addresses risk by reducing the likelihood of the risk occurring or lessen the impact through proactive efforts.

Each of the risks that were identified had a unique response strategy developed to address it, as well as the identification of the risk owner. Identifying a risk response and risk owner, along with review intervals for the risk, a framework for a risk management plan is established. This allows proactive management of risk throughout the life of the project.

4 Creative Phase

During the Creative Phase of the Value Methodology Job Plan, the CRAVE team brainstormed ideas on how to achieve the various functions. These ideas were based on the available information given to them at the time of the study, taking into consideration the constraints and controlling decisions that were also defined for them. The ideas listed below coincide with each function being considered:

Table 6: Creative Idea List

Idea No.	Description
Alternative C	
1	Reduce design speed on direct ramps
2	Buy out customers utilizing rail, remove rail line
3	Realign NB to EB direct ramps to the middle, move local NB connections to the outside, build offline
4	Create Collector-Distributer road from S of Exit 118 to Exit 309 (Science Center Drive)
5	Consolidate interchanges (Exit 307, 308, 309) on US-20 from three to one
6	Enclose canal
7	Tighten Broadway Street interchange, eliminate two outside structures
8	Buy railroad, invert alternative C (take direct from I-15 at grade, take grade separated for I-15 going NB)
9	Pedestrian tunnels or overpasses under US-20 and I-15
10	EB US-20 traffic exit before Pancheri Drive
11	Eliminate flyover ramps between I-15 and US-20
12	Change interchange type at Exit 118 and Exit 119
13	Utilize folded diamond to create a full interchange at Science Center Drive
14	Mitigate risk of ROW condemnation and cultural resources through construction timing
15	CMGC
16	Design-Build
17	Advanced construction
18	Utilize split diamond between Exit 118 and Exit 119

Idea No.	Description
19	Provide grade separated median U-turn between Science Center Drive and Fremont Avenue, eliminate rail crossing (CD)
20	Inverse interchange between Science Center Drive and Fremont Avenue
21	Braid ramps between Broadway Street and Grandview Drive
22	Eliminate interchange improvements at Exit 118
23	Eliminate Grandview Drive interchange, make improvements to Broadway Street corridor towards airport
24	Construct the direct ramps only
25	One way CD roads between Exit 118 and Exit 119
26	Eliminate US-20 access at Grandview Drive interchange to force traffic to Broadway
Alternative E – Option 1	
27	Construct US-20 north to east ramp at Grandview Drive
28	Eliminate new railroad crossing at Science Center Drive, improve existing railroad crossing at N Boulevard
29	Eliminate new railroad crossing at Science Center Drive, improve existing railroad crossing at Fremont Avenue
30	Eliminate existing railroad crossing at Boulevard to mitigate UPRR risk
31	Increase interchange spacing by moving Exit 118 ramps from Broadway Street to Pancheri
32	Reduce design speed on direct ramps
33	CMGC
34	Design-Build
35	Buy out customers utilizing rail, remove rail line
36	Change interchange type at Exit 118 and Exit 119
37	Eliminate Olympia Street interchange
38	Eliminate Olympia Street interchange, provide new ingress south of Anderson Street
39	Folded diamond to create full interchange at Science Center Drive
40	Eliminate Olympia Street interchange, provide US-20 to I-15 NB ramp
41	Provide ramp for Grandview Drive EB US-20 before Holmes
42	Adjust alignment to avoid north grain silos
43	Buy out customers utilizing rail, remove rail line

Idea No.	Description
44	Braided ramp north of Science Center Drive to connect US-20 and frontage road (EB)
45	Use proposed Olympia Street to serve local WB traffic only, use existing Grandview Drive to serve EB traffic
46	Eliminate ramps at Olympia Street interchange, provide access at Grandview Drive
Alternative E – Option 2	
47	Construct US-20 north to east ramp over Grandview Drive
48	Increase interchange spacing by moving Exit 118 ramps from Broadway Street to Pancheri
49	Reduce design speed on direct ramps
50	CMGC
51	Design-Build
52	Buy out customers utilizing rail, remove rail line
53	Change interchange type at Exit 118 and Exit 119
54	Eliminate Olympia Street interchange
55	Eliminate Olympia Street interchange, provide new ingress south of Anderson Street
56	Full interchange at Science Center Drive
57	Eliminate Olympia Street interchange, provide US-20 to I-15 NB ramp
58	Adjust alignment to avoid north grain silos
59	Buy out customers utilizing rail, remove rail line
60	Eliminate access at Science Center Drive
61	Relocate UPRR from Anderson Street to near 33rd
Alternative H	
62	Realign US-20 to avoid hatch pit (south)
63	Change system-to-system interchange to a service interchange
64	Use cut and cover or tunnel to keep system interchange only one level high
65	Compact hatch it to stabilize
66	Depress roadway through hatch pit to provide natural barrier between subdivision and I-15
67	Reduce system-to-system design speed

Idea No.	Description
68	Provide access potential west of I-15, plan for development to the west
69	Eliminate direct ramps from US-20 to I-15 NB
70	Diamond interchange with direct ramps (move E.1 to H)
71	CMGC
72	Design-Build
73	Preserve ROW of 49th north to west to Hwy 26
74	Eliminate new Saint Leon interchange, utilize existing interchange and realign proposed US-20
75	Move 49th Avenue interchange down to Holmes Avenue, move I-15 to east side of river
76	Braided ramp for NB Holmes traffic to US-20
77	Eliminate all system interchange ramps except NB I-15 to EB US-20, retain direct ramp from existing WB US-20 to SB I-15; new exit ramp from US-20 WB at Woodruff Avenue, tie into existing US-20
78	Bypass Idaho Falls completely with US-20
79	Change interchange type at Exit 118 and Exit 119
80	Increase interchange spacing by moving Exit 118 ramps from Broadway Street to Pancheri Drive
81	One-way CD roads between Exits 118 and 119, move weave from I-15 to CD road

5 Evaluation Phase

Although each project is different, the evaluation process for each CRAVE effort can be thought of in its simplest form as a way of combining, evaluating, and narrowing ideas until the CRAVE team agrees on the proposals to be forwarded.

Taking into consideration the constraints and controlling decisions, the team discussed each idea and documented the advantages and disadvantages. Each idea was then carefully evaluated with the CRAVE team reaching consensus on the overall rating of the idea (zero through three). Ideas scoring 3 were developed further; those that were considered to be equivalent to the baseline (rated two) were documented as design considerations; and low-rated ones (one or lower) were dropped from further consideration; however, the team provided a short description and justification to support the low rating. The rating values are shown below:

3 = Good Opportunity

2 = Design Consideration (comparable to project team's approach)

1 = Major Value Degradation

0 = Fatal Flaw (unacceptable impact or doesn't meet the project purpose and need)

= Advanced as recommendation

= Forwarded as design consideration

= Dropped from further consideration

Function: Improve Mobility

Alternative C

Idea No.	Description	
1	Reduce design speed on direct ramps	
	Advantages	**Disadvantages**
	• Horizontal and vertical design flexibility • Reduces ROW impacts • Reduces environmental impacts • Reduces construction cost • Reduces required length of merge	• Slows traffic flow • Driver expectation • Below design guidelines
	Rating:	***Justification/Comments/Disposition:***
	3	*Moved to further development*

Idea No.	Description	
2	Buy out customers utilizing rail, remove rail line	
	Advantages	**Disadvantages**
	• Reduces conflict between railroad and highway • Eliminates number of levels • Reduces conflicts risk	• Increases cost (two businesses) • Increases schedule risk
	Rating:	***Justification/Comments/Disposition:***
	3	*Moved to further development*

Idea No.	Description	
3	Realign NB to EB direct ramp to the middle, move local NB connections to the outside, build offline	
	Advantages	**Disadvantages**
	• May reduce structures • Easier construction staging	• Constructability
	Rating:	***Justification/Comments/Disposition:***
	3	*Combine with Idea 4*

Idea No.	Description	
4	Create Collector-Distributer road from S of Exit 118 to Exit 309 (Science Center Drive)	
	Advantages	**Disadvantages**
	•	•
	Rating:	***Justification/Comments/Disposition:***
	3	*Combine with Idea 3*

Idea No.	Description	
5	Consolidate interchanges on US-20 from three to one	
	Advantages	**Disadvantages**
	• Increases interchange spacing • Eliminates weaving • Reduces infrastructure	• Additional ROW impacts • Environmental justice issues • Combines commercial traffic into residential corridors
	Rating:	***Justification/Comments/Disposition:***
	3	*Eliminates Lindsay Boulevard, Science Center Drive, and Riverside Drive*

Idea No.	Description	
6	Enclose canal	
	Advantages	**Disadvantages**
	• Reduces structure cost • Provides flexibility	• Coordination with canal company • Additional 404 permitting issues • Additional maintenance • Work windows
	Rating:	***Justification/Comments/Disposition:***
	2	*Forwarded as design consideration*

Idea No.	Description	
7	Tighten Broadway Street interchange, eliminate two outside structures	
	Advantages	**Disadvantages**
	•	•
	Rating:	***Justification/Comments/Disposition:***
	3	*Combine with Ideas 3 and 4*

Idea No.	Description	
8	Buy railroad, invert alternative C (take direct from I-15 at grade, take grade separated for I-15 going NB)	
	Advantages	**Disadvantages**
	• Simplifies major through movement (I-15 to US-20)	• I-15 discontinuity • Driver expectancy
	Rating:	***Justification/Comments/Disposition:***
	3	*Moved to further development*

Idea No.	Description	
9	Pedestrian tunnels or overpasses under US-20 and I-15	
	Advantages	**Disadvantages**
	•	•
	Rating:	***Justification/Comments/Disposition:***
	2	*Forwarded as design consideration, inclusive of all alternatives*

Idea No.	Description	
10	EB US-20 traffic exit before Pancheri Drive	
	Advantages	**Disadvantages**
	• Improves way finding	• Replacement of Pancheri Drive bridge
	Rating:	***Justification/Comments/Disposition:***
	2	*Forwarded as design consideration*

Idea No.	Description	
11	Eliminate flyover ramps between I-15 and US-20 and construct DDI instead	
	Advantages	**Disadvantages**
	• Eliminates multiple structures • Reduces construction duration • Smaller footprint	• Does not remove signals on US-20 • Delays on Grandview Drive
	Rating:	***Justification/Comments/Disposition:***
	3	*Moved to further development*

Idea No.	Description	
12	Change interchange type at exit 118 and exit 119	
	Advantages	**Disadvantages**
	•	•
	Rating:	***Justification/Comments/Disposition:***
	2	*Evaluate interchange type based on traffic demands if Alternative C moves forward*

Idea No.	Description	
13	Utilize folded diamond to create a full interchange at Science Center Drive	
	Advantages	**Disadvantages**
	• Provides all movements • May provide benefits to the west with reducing other movements	• Loop ramps undesirable for truck traffic • Proximity to Riverside interchange • Increases ROW impacts • Requires bridge replacement over railroad
	Rating:	***Justification/Comments/Disposition:***
	3	*Eliminates Fremont Avenue Interchange*

Idea No.	Description	
14	Mitigate risk of ROW condemnation and cultural resources through construction timing	
	Advantages	**Disadvantages**
	•	•
	Rating:	***Justification/Comments/Disposition:***
	2	*Design consideration as project progresses*

Idea No.	Description	
15	CMGC	
	Advantages	**Disadvantages**
	•	•
	Rating:	***Justification/Comments/Disposition:***
	2	*Design consideration as project progresses*

Idea No.	Description	
16	Design-Build	
	Advantages	**Disadvantages**
	•	•
	Rating:	***Justification/Comments/Disposition:***
	2	*Design consideration as project progresses*

Idea No.	Description	
17	Advanced construction	
	Advantages	**Disadvantages**
	•	•
	Rating:	***Justification/Comments/Disposition:***
	2	*Design consideration as project progresses*

Idea No.	Description	
18	Utilize split diamond between Exit 118 and Exit 119	
	Advantages	**Disadvantages**
	• Eliminates weaving • Constructability • May reduce construction duration	• Some traffic will pass through two signals instead of one weave
	Rating:	***Justification/Comments/Disposition:***
	2	*Design consideration for all alternatives*

Idea No.	Description	
19	Provide grade separated median U-turn between Science Center Drive and Fremont Avenue, eliminate rail crossing (CD)	
	Advantages	**Disadvantages**
	•	•
	Rating:	***Justification/Comments/Disposition:***
	3	*Combine with Ideas 3 and 4*

Idea No.	Description	
20	Inverse interchange between Science Center Drive and Fremont Avenue	
	Advantages	**Disadvantages**
	•	•
	Rating:	***Justification/Comments/Disposition:***
	-	*Dropped from further consideration*

Idea No.	Description	
21	Braid ramps between Broadway Street and Grandview Drive	
	Advantages	**Disadvantages**
	•	• Physical constraints
	Rating:	***Justification/Comments/Disposition:***
	1	*Dropped from further consideration*

Idea No.	Description	
22	Eliminate interchange improvements at Exit 118	
	Advantages	**Disadvantages**
	• Reduces impacts	• Does not improve future traffic control
	Rating:	***Justification/Comments/Disposition:***
	1	*Dropped from further consideration*

Idea No.	Description	
23	Eliminate Grandview Drive interchange, make improvements to Broadway Street corridor towards airport	
	Advantages	**Disadvantages**
	• Improves interchange spacing • Eliminates ramp work and structure	• Increases local traffic • Pushes commuter traffic to neighborhoods
	Rating:	***Justification/Comments/Disposition:***
	1	*Dropped from further consideration*

Idea No.	Description	
24	Construct the direct ramps only	
	Advantages	**Disadvantages**
	• Minimizes new infrastructure • Reduces congestion for local traffic, short-term • Simplifies project	• Short-term solution
	Rating:	***Justification/Comments/Disposition:***
	3	*Could provide a good short-term solution, phased approach*

Idea No.	Description	
25	One way CD roads between Exit 118 and Exit 119	
	Advantages	**Disadvantages**
	• Moves weave from I-15 to CD road • Increases weaving distance	• Access control • Additional ROW impacts
	Rating:	***Justification/Comments/Disposition:***
	2	*Forwarded as design consideration*

Idea No.	Description	
26	Eliminate US-20 access at Grandview Drive interchange to force traffic to Broadway Street	
	Advantages	**Disadvantages**
	•	•
	Rating:	***Justification/Comments/Disposition:***
	-	*Dropped from further consideration*

Alternative E – Option 1

Idea No.	Description	
27	Construct US-20 north to east ramp at Grandview Drive	
	Advantages	**Disadvantages**
	•	• SB traffic loses access to Idaho Falls
	Rating:	***Justification/Comments/Disposition:***
	1	*Creates couplet, previous Alternative F dropped during Level 2*

Idea No.	Description	
28	Eliminate new railroad crossing at Science Center Drive, improve existing railroad crossing at N Boulevard	
	Advantages	**Disadvantages**
	• Reduces UPRR risk	• Eliminates direct route
	Rating:	***Justification/Comments/Disposition:***
	1	*Dropped from further consideration*

Idea No.	Description	
29	Eliminate new railroad crossing at Science Center Drive, improve existing railroad crossing at Fremont Avenue	
	Advantages	**Disadvantages**
	• Reduces UPRR risk	• Eliminates direct route
	Rating:	***Justification/Comments/Disposition:***
	2	*Ties into proposed improvements on 33rd*

Idea No.	Description	
30	Eliminate existing railroad crossing at Boulevard to mitigate UPRR risk	
	Advantages	**Disadvantages**
	•	•
	Rating:	***Justification/Comments/Disposition:***
	2	*Forwarded as design consideration*

Idea No.	Description	
31	Increase interchange spacing by moving Exit 118 ramps from Broadway Street to Pancheri	
	Advantages	**Disadvantages**
	• Increases interchange spacing • Improves weaving	• Loss of direct connect at US-20
	Rating:	***Justification/Comments/Disposition:***
	1	*Dropped from further consideration*

Idea No.	Description	
32	Reduce design speed on direct ramps	
	Advantages	**Disadvantages**
	• Horizontal and vertical design flexibility • Reduces ROW impacts • Reduces environmental impacts • Reduces construction cost • Reduces required length of merge	• Slows traffic flow • Driver expectation • Below design guidelines
	Rating:	***Justification/Comments/Disposition:***
	3	*Moved to further development*

Idea No.	Description	
33	CMGC	
	Advantages	**Disadvantages**
	•	•
	Rating:	***Justification/Comments/Disposition:***
	2	*Design consideration as project progresses*

Idea No.	Description	
34	Design-Build	
	Advantages	**Disadvantages**
	•	•
	Rating:	***Justification/Comments/Disposition:***
	2	*Design consideration as project progresses*

Idea No.	Description	
35	Buy out customers utilizing rail, remove rail line	
	Advantages	**Disadvantages**
	• Reduces conflict between railroad and highway • Eliminates number of levels • Reduces conflicts risk	• Increases cost (two businesses) • Increases schedule risk
	Rating:	***Justification/Comments/Disposition:***
	3	*Moved to further development*

Idea No.	Description	
36	Change interchange type at Exit 118 and Exit 119	
	Advantages	**Disadvantages**
	•	•
	Rating:	***Justification/Comments/Disposition:***
	2	*Evaluate interchange type based on traffic demands if Alternative E.1 moves forward*

Idea No.	Description	
37	Eliminate Olympia Street interchange, provide access at Grandview Drive	
	Advantages	**Disadvantages**
	• Reduces construction duration • Reduces ROW and environmental impacts • Reduces cost	• Lose continuity from SB I-15 to US-20 • Lose continuity between local traffic west of I-15 and US-20
	Rating:	***Justification/Comments/Disposition:***
	1	*Dropped from further consideration*

Idea No.	Description	
38	Eliminate Olympia Street interchange, provide new ingress south of Anderson Street	
	Advantages	**Disadvantages**
	• Reduces construction duration • Reduces ROW and environmental impacts	• Lose continuity from SB I-15 to US-20 • Lose continuity between local traffic west of I-15 and US-20
	Rating:	***Justification/Comments/Disposition:***
	1	*Dropped from further consideration*

Idea No.	Description	
39	Folded diamond to create full interchange at Science Center Drive	
	Advantages	**Disadvantages**
	• Provides all movements • May provide benefits to the west with reducing other movements	• Loop ramps undesirable for truck traffic • Significant ROW impacts • Requires new bridge over railroad • Environmental justice concerns • Impacts churches, commercial businesses • Introduces weaving/conflict points • Spacing concerns
	Rating:	***Justification/Comments/Disposition:***
	2	*Forwarded as design consideration*

Idea No.	Description	
40	Eliminate Olympia Street interchange, provide US-20 to I-15 NB ramp	
	Advantages	**Disadvantages**
	•	•
	Rating:	***Justification/Comments/Disposition:***
	1	*Creates minor movement that is not needed*

Idea No.	Description	
41	Provide ramp for Grandview Drive EB US-20 before Holmes	
	Advantages	**Disadvantages**
	• Reduces traffic congestion at Holmes	•
	Rating:	***Justification/Comments/Disposition:***
	1	*Dropped from further consideration*

Idea No.	Description	
42	Adjust alignment to avoid north grain silos	
	Advantages	**Disadvantages**
	• May reduce or eliminate impacts to north grain silos	• Would require reducing design speed
	Rating:	***Justification/Comments/Disposition:***
	3	*Combine with other ideas, may be able to relocate historic items*

Idea No.	Description	
43	Buy out customers utilizing rail, remove rail line	
	Advantages	**Disadvantages**
	• Reduces conflict between railroad and highway • Eliminates number of levels • Reduces conflicts risk	• Increases cost (two businesses) • Increases schedule risk
	Rating:	***Justification/Comments/Disposition:***
	3	*Moved to further development*

Idea No.	Description	
44	Braided ramp north of Science Center Drive to connect US-20 and frontage road (EB)	
	Advantages	**Disadvantages**
	• Reduces traffic congestion at Holmes • Reduces weaving by providing space between connections	• Increases bridge structures • Increases ROW impacts
	Rating:	***Justification/Comments/Disposition:***
	1	*Dropped from further consideration*

Idea No.	Description	
45	Use proposed Olympia Street to serve local WB traffic only, use existing Grandview Drive to serve EB traffic	
	Advantages	**Disadvantages**
	•	•
	Rating:	***Justification/Comments/Disposition:***
	1	*Couplet, Alternative F dropped during Level 2*

Idea No.	Description	
46	Eliminate ramps at Olympia Street interchange, provide access at Grandview Drive	
	Advantages	**Disadvantages**
	•	• Lose continuity from SB I-15 to US-20
	Rating:	***Justification/Comments/Disposition:***
	1	*Dropped from further consideration*

Alternative E – Option 2

Idea No.	Description	
47	Construct US-20 north to east ramp over Grandview Drive	
	Advantages	**Disadvantages**
	•	• SB traffic loses access to Idaho Falls
	Rating:	***Justification/Comments/Disposition:***
	1	*Creates couplet, previous Alternative F dropped during Level 2*

Idea No.	Description	
48	Increase interchange spacing by moving Exit 118 ramps from Broadway Street to Pancheri	
	Advantages	**Disadvantages**
	• Increases interchange spacing • Improves weaving	• Loss of direct connect at US-20
	Rating:	***Justification/Comments/Disposition:***
	1	*Dropped from further consideration*

Idea No.	Description	
49	Reduce design speed on direct ramps	
	Advantages	**Disadvantages**
	• Horizontal and vertical design flexibility • Reduces ROW impacts • Reduces environmental impacts • Reduces construction cost • Reduces required length of merge	• Slows traffic flow • Driver expectation • Below design guidelines
	Rating:	***Justification/Comments/Disposition:***
	3	*Moved to further development*

Idea No.	Description	
50	CMGC	
	Advantages	**Disadvantages**
	•	•
	Rating:	***Justification/Comments/Disposition:***
	2	*Design consideration as project progresses*

Idea No.	Description	
51	Design-Build	
	Advantages	**Disadvantages**
	•	•
	Rating:	***Justification/Comments/Disposition:***
	2	*Design consideration as project progresses*

Idea No.	Description	
52	Buy out customers utilizing rail, remove rail line	
	Advantages	**Disadvantages**
	• Reduces conflict between railroad and highway • Eliminates number of levels • Reduces conflicts risk	• Increases cost (two businesses) • Increases schedule risk
	Rating:	***Justification/Comments/Disposition:***
	3	*Moved to further development*

Idea No.	Description	
53	Change interchange type at Exit 118 and Exit 119	
	Advantages	**Disadvantages**
	•	•
	Rating:	***Justification/Comments/Disposition:***
	2	*Evaluate interchange type based on traffic demands if Alternative E.2 moves forward*

Idea No.	Description	
54	Eliminate Olympia Street interchange, provide access at Grandview Drive	
	Advantages	**Disadvantages**
	• Reduces construction duration • Reduces ROW and environmental impacts • Reduces cost	• Lose continuity from SB I-15 to US-20 • Lose continuity between local traffic west of I-15 and US-20
	Rating:	***Justification/Comments/Disposition:***
	1	*Dropped from further consideration*

Idea No.	Description	
55	Eliminate Olympia Street interchange, provide new ingress south of Anderson Street	
	Advantages	**Disadvantages**
	• Reduces construction duration • Reduces ROW and environmental impacts	• Lose continuity from SB I-15 to US-20 • Lose continuity between local traffic west of I-15 and US-20
	Rating:	***Justification/Comments/Disposition:***
	1	*Dropped from further consideration*

Idea No.	Description	
56	Full interchange at Science Center Drive	
	Advantages	**Disadvantages**
	• Provides all movements • May provide benefits to the west with reducing other movements	• Loop ramps undesirable for truck traffic • Significant ROW impacts • Requires new bridge over railroad • Environmental justice concerns • Impacts churches, commercial businesses • Introduces weaving/conflict points • Spacing concerns
	Rating:	***Justification/Comments/Disposition:***
	2	*All movements provided*

Idea No.	Description	
57*	Eliminate Olympia Street interchange, provide US-20 to I-15 NB ramp	
	Advantages	**Disadvantages**
	•	•
	Rating:	***Justification/Comments/Disposition:***
	1	*Creates minor movement that is not needed*

Idea No.	Description	
58	Adjust alignment to avoid north grain silos	
	Advantages	**Disadvantages**
	• May reduce or eliminate impacts to north grain silos	• Would require reducing design speed
	Rating:	***Justification/Comments/Disposition:***
	3	*Combine with other ideas, may be able to relocate historic items*

Idea No.	Description	
59	Buy out customers utilizing rail, remove rail line	
	Advantages	**Disadvantages**
	• Reduces conflict between railroad and highway • Eliminates number of levels • Reduces conflicts risk	• Increases cost (two businesses) • Increases schedule risk
	Rating:	***Justification/Comments/Disposition:***
	3	*Moved to further development*

Idea No.	Description	
60	Eliminate access at Science Center Drive	
	Advantages	**Disadvantages**
	• Improves US-20 movements • Reduces structure	• Eliminates access • Public opposition
	Rating:	***Justification/Comments/Disposition:***
	1	*Dropped from further consideration*

Idea No.	Description	
61	Relocate UPRR from Anderson Street to near 33rd	
	Advantages	**Disadvantages**
	• Simplifies movements from Science Center Drive to and from US-20 (provides full interchange at Science Center Drive)	• UPRR opposition
	Rating:	***Justification/Comments/Disposition:***
	2	*Approach UPRR early to inquire/coordinate*

Alternative H

Idea No.	Description	
62	Realign US-20 to avoid hatch pit (south)	
	Advantages	**Disadvantages**
	• Avoids hazardous materials at hatch pit • Avoids noise barriers • Avoids neighborhood impacts • Mitigates impacts to possible future park	• ROW impacts • Slightly increases travel time
	Rating:	***Justification/Comments/Disposition:***
	3	*Moved to further development*

Idea No.	Description	
63	Change system-to-system interchange to a service interchange	
	Advantages	**Disadvantages**
	• Allows for connection to the west • Reduces footprint • Reduces structures	• Slows traffic • Public opposition
	Rating:	***Justification/Comments/Disposition:***
	3	*Currently minor growth projected to west.*

Idea No.	Description	
64	Use cut and cover or tunnel to keep system interchange only one level high	
	Advantages	**Disadvantages**
	• May reduce structure	• Environmental impacts, proximity to river
	Rating:	***Justification/Comments/Disposition:***
	0	*Fatal flaw, railroad requires two levels to span*

Idea No.	Description	
65	Compact hatch pit to stabilize	
	Advantages	**Disadvantages**
	•	•
	Rating:	***Justification/Comments/Disposition:***
	2	*Requires further investigation outside scope of VE study*

Idea No.	Description	
66	Depress roadway through hatch pit to provide natural barrier between subdivision and I-15	
	Advantages	**Disadvantages**
	• May reduce public opposition • Reduces sound barrier	• Increases ROW impacts • Increases environmental impacts (possible long-term plan to reclaim land as park) • Additional cleanup/disposal of material • Increases maintenance (snow drifting/storage issues) • Drainage issues • Animal crossing concerns
	Rating:	***Justification/Comments/Disposition:***
	2	*Requires additional investigations*

Idea No.	Description	
67	Reduce system-to-system design speed	
	Advantages	**Disadvantages**
	• Horizontal and vertical design flexibility • Reduces ROW impacts • Reduces environmental impacts • Reduces construction cost • Reduces required length of merge	• Slows traffic flow • Driver expectation • Below design guidelines
	Rating:	***Justification/Comments/Disposition:***
	3	*Moved to further development*

Idea No.	Description	
68	Provide access potential west of I-15, plan for development to the west	
	Advantages	**Disadvantages**
	•	•
	Rating:	***Justification/Comments/Disposition:***
	2	*Forwarded as design consideration*

Idea No.	Description	
69	Eliminate direct ramps from US-20 to I-15 NB	
	Advantages	**Disadvantages**
	• Reduces structure • Reduces maintenance	• Partial interchange requires more difficult IJR approval • Requires out of direction travel
	Rating:	***Justification/Comments/Disposition:***
	3	*May be phased approach, add ramps when traffic dictates*

Idea No.	Description	
70	Diamond interchange with direct ramps (move E.1 to H)	
	Advantages	**Disadvantages**
	• Reduces footprint • Reduces bridge square footage	• Increases number of access points to I-15 • Partial interchange requires more difficult IJR approval
	Rating:	***Justification/Comments/Disposition:***
	3	*Moved to further development*

Idea No.	Description	
71	CMGC	
	Advantages	**Disadvantages**
	•	•
	Rating:	***Justification/Comments/Disposition:***
	2	*Design consideration as project progresses*

Idea No.	Description	
72	Design-Build	
	Advantages	**Disadvantages**
	•	•
	Rating:	***Justification/Comments/Disposition:***
	2	*Design consideration as project progresses*

Idea No.	Description	
73	Preserve ROW of 49th north to west to Hwy 26	
	Advantages	**Disadvantages**
	•	•
	Rating:	***Justification/Comments/Disposition:***
	0	*Outside scope of VE study, however, should be investigated further*

Idea No.	Description	
74	Eliminate new Saint Leon interchange, utilize existing interchange and realign proposed US-20	
	Advantages	**Disadvantages**
	• Reduces footprint • Utilizes existing infrastructure • Reduces cost significantly	• Complicates business development access
	Rating:	***Justification/Comments/Disposition:***
	3	*Moved to further development*

Idea No.	Description	
75	Move 49th Avenue interchange down to Holmes Avenue, move I-15 to east side of river	
	Advantages	**Disadvantages**
	•	•
	Rating:	***Justification/Comments/Disposition:***
	1	*Alternative J dropped during Level 2 review*

Idea No.	Description	
76	Braided ramp for NB Holmes Avenue traffic to US-20	
	Advantages	**Disadvantages**
	• Simplifies access between Holmes Avenue and US-20 NB	• Creates additional access points on limited access facility • Increases cost • Increases structure • Increases maintenance
	Rating:	***Justification/Comments/Disposition:***
	1	*Dropped from further consideration*

Idea No.	Description	
77	Eliminate all system interchange ramps except NB I-15 to EB US-20, retain direct ramp from existing WB US-20 to SB I-15; new exit ramp from US-20 WB at Woodruff Avenue, tie into existing US-20	
	Advantages	**Disadvantages**
	• Reduces infrastructure	• Partial interchange requires more difficult IJR approval
	Rating:	***Justification/Comments/Disposition:***
	1	*Provides no benefit*

Idea No.	Description	
78	Bypass Idaho Falls completely with US-20	
	Advantages	**Disadvantages**
	•	•
	Rating:	***Justification/Comments/Disposition:***
	0	*Eliminated Alternative K in Level 1*

Idea No.	Description	
79	Change interchange type at Exit 118 and Exit 119	
	Advantages	**Disadvantages**
	•	•
	Rating:	***Justification/Comments/Disposition:***
	2	*Evaluate interchange type based on traffic demands if Alternative H moves forward*

Idea No.	Description	
80	Increase interchange spacing by moving Exit 118 ramps from Broadway Street to Pancheri	
	Advantages	**Disadvantages**
	• Increases interchange spacing • Improves weaving	• Loss of direct connect at US-20
	Rating:	***Justification/Comments/Disposition:***
	1	*Dropped from further consideration*

Idea No.	Description	
81	On-way CD roads between Exits 118 and 119, move weave from I-15 to CD road	
	Advantages	**Disadvantages**
	• Moves weave from I-15 to CD road • Increases weaving distance	• Access control • Additional ROW impacts
	Rating:	***Justification/Comments/Disposition:***
	2	*Forwarded as design consideration*

6 Development Phase

The VE Recommendations are presented as written by the team during the CRAVE study. While they have been edited from the CRAVE report to correct errors or better clarify the recommendation, they represent the CRAVE team's findings during the study. The following table is a summary of all recommendations generated and their impact to the project.

Table 7: Recommendation Summary

Recommendation	Performance (P)	Cost (C) $ millions	Value Index
Alternative C – Option 3	634	$297.1	2.13
Alternative E – Option 3	634	$253.5	2.50
Alternative H – Option 1	620	$411.3	1.51

6.1 Design Considerations

In addition to the recommendations above, the CRAVE team generated a number of considerations that they felt were important enough to be documented and should be further considered by the project team.

Table 8: Design Considerations

Alternative-Option	Idea #	Idea Description
C	6	Enclose canal
	9	Pedestrian tunnels or overpasses under US-20 and I-15
	10	EB US-20 traffic exit before Pancheri Drive
	12	Change interchange type at Exit 118 and Exit 119
	14	Mitigate risk of ROW condemnation and cultural resources through construction timing
	15	CMGC
	16	Design-Build
	17	Advanced construction
	18	Utilize split diamond between Exit 118 and Exit 119
	25	One-way CD roads between Exit 118 and Exit 119
E-1	29	Eliminate new railroad crossing at Science Center Drive, improve existing railroad crossing at Fremont Avenue
	30	Eliminate existing railroad crossing at Boulevard to mitigate UPRR risk
	33	CMGC
	34	Design-Build
	36	Change interchange type at Exit 118 and Exit 119
	39	Folded diamond to create full interchange at Science Center Drive
E-2	50	CMGC
	51	Design-Build
	53	Change interchange type at Exit 118 and Exit 119
	56	Full interchange at Science Center Drive

Alternative-Option	Idea #	Idea Description
	61	Relocate UPRR from Anderson Street to near 33rd
H	65	Compact hatch pit to stabilize
	66	Depress roadway through hatch pit to provide natural barrier between subdivision and I-15
	68	Provide access potential west of I-15, plan for development to the west
	71	CMGC
	72	Design-Build
	79	Change interchange type at Exit 118 and Exit 119
	81	One-way CD roads between Exits 118 and 119, move weave from I-15 to CD road

6.2 FHWA Functional Benefit Criteria

Each year, State DOTs are required to report on CRAVE Recommendations to FHWA. In addition to cost implications, FHWA requires the DOTs to evaluate each approved recommendation in terms of the project feature or features that recommendation benefits. If a specific recommendation can be shown to provide benefit to more than one feature described below, count the recommendation in *each category that is applicable*. These same criteria can be found on each of the individual recommendations that follow.

- **Safety:** Recommendations that mitigate or reduce hazards on the facility.
- **Operations:** Recommendations that improve real-time service and/or local, corridor, or regional levels of service of the facility.
- **Environment:** Recommendations that successfully avoid or mitigate impacts to natural and or cultural resources.
- **Construction:** Recommendations that improve work zone conditions, or expedite the project delivery.
- **Right-of-Way:** Recommendations that lower the impacts or costs of Right-of-Way.

6.3 Value Engineering Recommendation Approval

The Value Engineering Recommendation form is to aid in annual reporting of VE activities to FHWA. It is the intent that the project manager review and evaluate the CRAVE team's alternatives included in this report. The Project Manager would then complete the Recommendation Approval Form provided in **Appendix A**.

Each alternative that is not approved or is modified by the Project Manager should include a justification (a summary statement containing the Project Manager's decision not to use the recommendation in the project).

The completed Value Engineering Recommendation Approval form, including justification for any recommendations not approved or modified, shall be sent to the ITD State Value Engineering Coordinator so the results can be included in the annual VE Report to the Federal Highway Administration (FHWA).

6.4 Recommendations

Based on the evaluation process, individual recommendations were developed. Each recommendation consists of a summary of the original concept, a description of the suggested change, a listing of its advantages and disadvantages, and a brief narrative that includes justification, sketches, photos, assumptions and calculations (where applicable) as developed by the CRAVE team. Additional alternatives and recommendations can be found in **Appendix B**.

VE ALTERNATIVE C – OPTION 3: PROVIDE CD	Idea Nos. 4, 7

Baseline Concept

- Adds lanes and ramps to separate the through-traffic from the local existing traffic between the I-15 Exit 118 (Broadway St) and US-20 Exit 308 (Riverside Drive/City Center)
- Requires new retaining walls, bridges, and replaces US-20 Exit 308, I-15 Exits 118 and 119
- Maintains alignment near or in the same location as the existing I-15/US-20 roadways

Recommendation Concept

- Provide a Collector-Distributor (CD) road from Exit 118 through Exit 119 adjacent to I-15 and a CD road adjacent from Exit 308 and Exit 309 adjacent to US-20. CD roads will be located on the outside of the US-20 direct ramps.
- Provide NB slip ramp to I-15 located between Exit 118 and Exit 119
- Provide an EB US-20 braided entrance/exit ramp is east of the existing Exit 308 ramp terminal
- Elevate I-15 over Grandview Drive
- Realign EB Grandview over the river to the south of the existing US-20 bridge
- Realign WB Grandview over the river to the north of the existing US-20 bridge
- Maintain the existing US-20 alignment over the river to serve the direct ramps while still reconstructing the existing bridge

Advantages	Disadvantages
• Eliminates 8 structures • Eliminates all weaves along I-15 and US-20; improving mainline operations • Full separation between local and regional traffic • Improves maintainability and snow plow operations • Avoids Antares Park, School, and community west of I-15 • Reduces impacts to residential neighborhoods to the north and south of US-20 • Reduces earthwork • Reduces ROW acquisitions • Improves signage/wayfinding, easier to sign • Improved local connectivity	• Local roadway improvements constructed before direct ramps • Increased traffic impacts during construction of direct ramps

Cost Summary	Total Cost
Baseline	$211.4M
Recommendation	$152.5M
Cost Savings	$59.0M

FHWA Function Benefit

Safety	*Operations*	*Environment*	*Construction*	*Right-of-Way*
✓	✓	✓		✓

VE ALTERNATIVE C – OPTION 3: PROVIDE CD	Idea Nos. 4, 7

Discussion/Sketches/Photos/Calculations

Discussion of Recommendation Concept

This option is dependent on VE Consideration Alternative C-1 to allow for I-15 to be realigned to the east. The Baseline concept has a NB and SB weave located along I-15 between Exit 118 and Exit 119. The weave length provided is substandard. Although the operational analysis shows acceptable density at the merge/diverge, with a LOS C, the interchange spacing distance does not meet standard and will require a design exception. Additionally, the Baseline concept has an EB and WB weave located along US-20 between Exit 308 and Exit 309. The operational analysis shows the merge/diverges operating at LOS F.

This recommendation eliminates the weaves along NB and SB I-15. Additionally, the CD road reduces the ingress/egress to/from I-15 by having NB I-15 and SB I-15 volume bound for Broadway Street and Grandview Drive exit at Exit 118 (NB) and Exit 119 (SB). A NB slip ramp accessing NB-15 is proposed between Broadway Street and Grandview Drive to improve operations along the CD road and reduce out-of-direction travel for local volume to access NB I-15.

This recommendation also eliminates the weaves along EB and WB US-20. The WB CD road along US-20 is used to collect both local traffic bound for Grandview Drive and Fremont Avenue and intersects with Fremont Avenue. Grandview Drive and SB US-20 traffic continues WB through the signal where traffic will diverge with one lane going to the US-20 direct ramp and the other lane continuing the new WB Grandview Drive bridge over the river.

The EB weave along US-20 is mitigated by providing an EB braided ramp located to the east of intersection of the CD road and Fremont Avenue. The braided ramp will create a weave along the CD road, however, this is a lower speed/lower volume weave and sufficient length between the merge gore and the Anderson Street intersection.

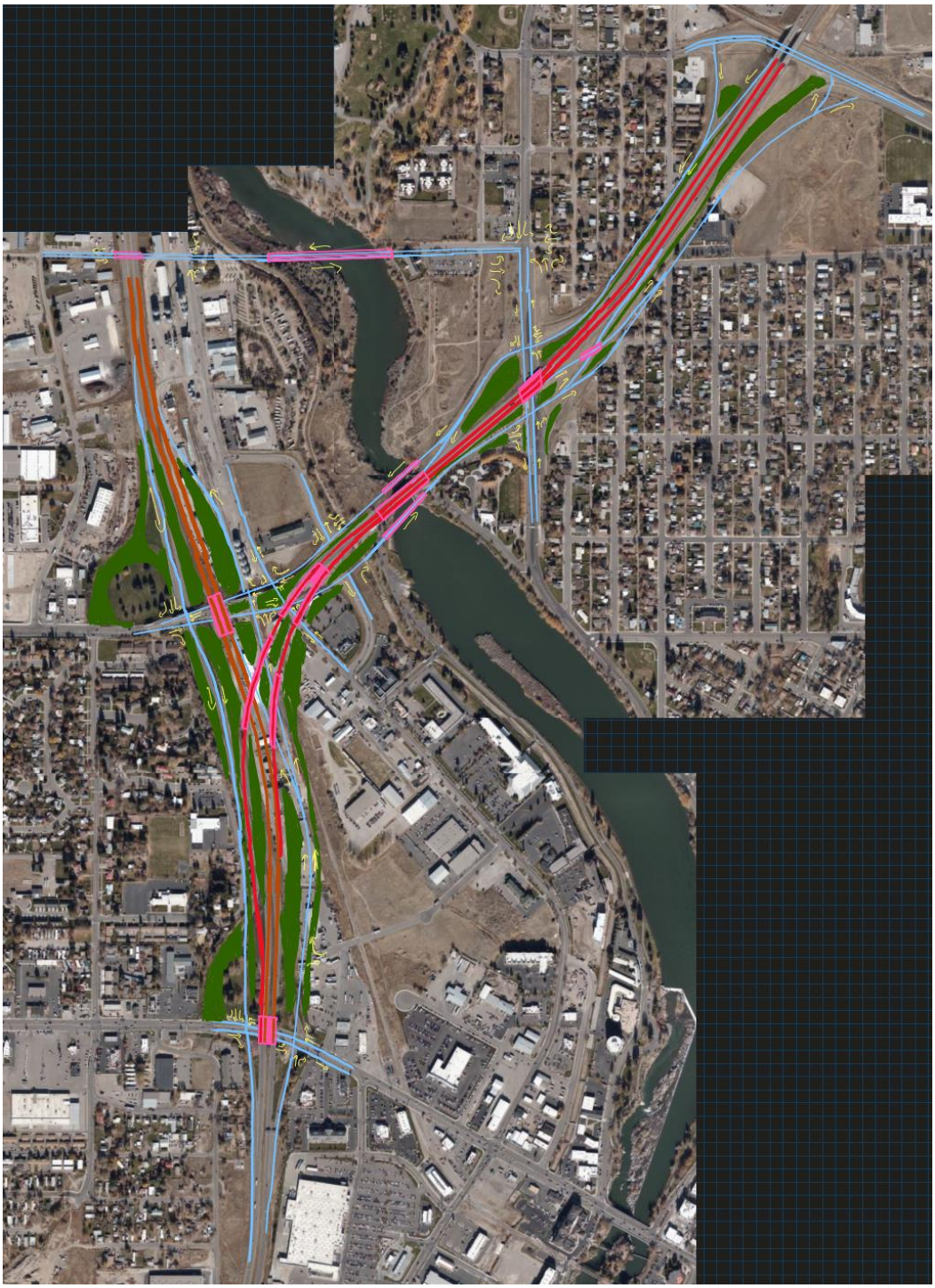
The Baseline concept have the direct ramps located on the outside of I-15 and US-20 entrance/exit ramps. With the direct ramps located on the outside of the ramps, the ramps are essentially located in a valley, between elevated I-15 and elevated direct ramps. This creates maintenance issues and concerns regarding snow plowing operations. The recommendation also allows the US-20 direct ramps to be located on the inside of the local roadway.

The VE Recommendation in **Appendix B** proposes to purchase the railroad and industrial business located east of I-15. Refer to VE Recommendation in **Appendix B** for details for realigning I-15. Purchasing the railroad allows for Grandview Drive to be depressed and allow for I-15 to go over Grandview Drive. This mitigates the impacts to the west of I-15 which include a park, a school, and a residential neighborhood.

The CD roads adjacent to I-15 and US-20 will improve local connectivity by providing directional access and minimizing weaving.

VE ALTERNATIVE C – OPTION 3: PROVIDE CD	Idea Nos. 4, 7

VE Recommendation Concept Sketches



VE ALTERNATIVE C – OPTION 3: PROVIDE CD	Idea Nos. 4, 7

US-20 and Science Center Drive

VE ALTERNATIVE C – OPTION 3: PROVIDE CD	Idea Nos. 4, 7

US-20 and Fremont Avenue

VE ALTERNATIVE C – OPTION 3: PROVIDE CD	Idea Nos. 4, 7

I-15 and US-20 / Grandview Drive and Lindsey

VE ALTERNATIVE C – OPTION 3: PROVIDE CD	Idea Nos. 4, 7

I-15 and Broadway St

VE ALTERNATIVE C – OPTION 3: PROVIDE CD	Idea Nos. 4, 7

Discussion of Schedule Impacts

The construction phasing of this recommendation would include four main stages:

- Stage 1: Construct Higham Street overcrossing (bridges over Snake River and I-15)
- Stage 2: Realign I-15 to the east
- Stage 3: Construct CD roads, construct EB and WB Grandview bridges over river
- Stage 4: Construct US-20 direct ramps

By constructing the Higham Street bridges over I-15 and the Snake River, maintenance of traffic will be easier for Stage 2 through Stage 4

The total number of structures are reduced from 18 to 12.

Discussion of Risk Impacts

This recommendation improves the constructability of Alternative C by acquiring the railroad and properties located to the east of I-15. Additionally, shifting I-15 to the east and realigning the US-20 direct ramps to the inside of the CD roads, several environmental impacts are reduced. This includes the following:

- Eliminates impacts to the park, school, and residential neighborhood located to the west of I-15
- Reduced ROW to the north and south of US-20
- Reduces elevated structures, reducing noise impacts

The construction sequencing will require full closure of Grandview Drive while I-15 is realigned over Grandview Drive. By constructing the Higham Street bridges prior to closing Grandview, constructability and maintenance of traffic is improved.

Assumptions and Calculations

Assumptions:

- Since the US-20 direct ramps tie into the existing alignment, the direct ramps no longer extend east of Anderson Street. A majority of the fill for the I-15 realignment will be cut from depressing Grandview Drive. All CD roads are constructed at-grade. Therefore, the reduction of fill is assumed to be 50%.
- It is assumed HMA is reduced by 20% ending the direct ramps east of Fremont Avenue.

Cost savings:

- Removal of direct ramp structure at Broadway = $10,300,000
- Removal of structure at Railroad = $11,600,000
- Removal of tunnel structure add two struct.at Lindsay = $5,800,000
- Add structure for EB on ramp at riverside (braided ramp) = $1,100,000
- Removal of direct ramp structure at Riverside = $4,800,000
- Removal of direct ramp structure at Science Center Drive = $0 (cost was not included in the base)

VE ALTERNATIVE C – OPTION 3: PROVIDE CD	Idea Nos. 4, 7

- Shifting I-15 to the east (ROW, const. phasing, traffic control = $5,000,000 (see C-2)
- Removal of direct ramps (roadway)= 12,000,000

Cost Estimate

UNIT COSTS & ASSUMPTIONS:

Roadway Preliminary Costs (based on 2019 area average unit prices)

HMA=	$95	Ton	(Assume 148 pcf, computed as $190/CY)	Curb and Gutter =	$60	LF	
Conc Pav =	$100	/SY	(Assume 9" thickness, computes to $400/CY)	Sidewalk =	$55	SY	
3/4" Aggr =	$30	/Ton	(Assume 140 pcf, computes to $56.7/CY	Drainage =	10%	(Assumed % of Roadway	
Subbase =	$30	/CY		Traffic Control =	15%	(Assumed % of Roadway	
Granular Borrow =	$20	/CY		Incidental Items =	5%	(Assumed % of Roadway	
Excavation =	$20	/CY		Environmental =	7.5%	(Assumed % of Roadway	
Retaining Wall =	$60	/SF		Signing and Pav Mark =	5%	(Assumed % of Roadway	
Concrete Barrier =	$125	LF					

Preliminary costs are based on ITD's Bridge Manual, Section 16.1 for estimating prestressed girders

TUNNEL =	$30	/LF/SF	this cost is based off of ITDs stiffleg culvert cost, seems very high
PS =	$200	/SF	
ST =	$245	/SF	
PS RR =	$260	/SF	

Note: All lengths and widths measured in microstation models. Approximately 5' added to most lengths measured to account length to end of slab

CONSTRUCTION COST ALTERNATIVE C-3

ALTERNATIVE - ROADWAY ITEMS			QUANTITY	UNIT	
Roadway Excavation (Cut)			50000	CY	$1,000,000
Roadway Excavation (Fill/Borrow)			250000	CY	$5,000,000
Subbase			56916.17	CY	$1,707,000
3/4" Aggregate	43319.65	CY	81874.1385	Ton	$2,456,000
HMA	100000	CY	199800	Ton	$18,981,000
Concrete Barrier			11612.11	LF	$1,452,000
Curb and Gutter			11861.39	LF	$712,000
Sidwalk			13864.42	SY	$763,000
Retaining Wall			45.09	SF	$3,000
Drainage			%		$3,207,000
Incidental Items			%		$1,604,000
Traffic Control			%		$4,811,000
Environmental Items			%		$2,406,000
Signing and Pavement Marking			%		$1,604,000
			Total Roadway Items		$45,706,000

ALTERNATIVE C STRUCTURE ITEMS	Length	Width	Type	Area	
I-15 NB/SB over Broadway	285	82	PS	23,370 SF	$4,674,000
NB I-15 Ramp near Broadway	450	36	PS	16,200 SF	
SB I-15 Ramp near Broadway	810	36	ST	29,160 SF	
I-15 over Grandview	160	94	ST	15,040 SF	$3,684,800
RR Tunnel	386	1000	TUNNEL	386,000 SF	
Lindsay St Tunnel	152	1292	TUNNEL	196,384 SF	$3,400,000
I-15 to US-20 EB Ramp over RR	115	36	PS RR	4,140 SF	$1,076,400
I-15 to US-20 EB Ramp over Linday	130	36	PS	4,680 SF	$936,000
US-20 to I-15 SB Ramp	1290	36	ST	46,440 SF	$11,377,800
I-15 to US-20 EB Ramp over Canal	110	36	PS	3,960 SF	$792,000
I-15 to US-20 EB Ramp over Snake	326	36	PS	11,736 SF	$2,347,200
John's Hole over Snake (14' Bike Included)	185	95	PS	17,575 SF	$3,515,000
US-20 to I-15 SB Ramp over Snake	215	36	ST	7,740 SF	$1,896,300
US-20 to I-15 SB Ramp over Canal	110	36	PS	3,960 SF	$792,000
I-15 to US-20 EB Ramp over Riverside	435	36	PS	15,660 SF	
US20 over Riverside Interchange (length assumed)	200	82	PS	16,400 SF	$3,280,000
US 20 EB Braided Ramp Structure	242	36	PS	8,712 SF	$1,100,000
New Crossing over Snake and I-15(14' Included)	510	52	PS	26,520 SF	$5,304,000
			Total Structure Items		$44,176,000

Construction Subtotal			***$89,882,000***
Mobilization (Assume percentage of Roadway and Structures Cost)	15%		$13,482,000
Construction Engineering and Inspection	10%		$8,988,000
Total Alternative Construction Cost			**$112,352,000**

Right of Way	
Total Number of Parcels Impacted (including condominium parcels)	207
Total Number of properties (condominium parcels as one property)	171
Total Number of Parcels Assessed over $1 million	10
Total Assessed Value of all impacted properties	$49,405,000
Impacted Value of Parcel (partial impact not including relocation of property)	$18,114,000
Impacted Value of Parcel (partial impact and includes relocation for impact to building with 15' of structure)	**$40,118,000**

VE ALTERNATIVE C – OPTION 3: PROVIDE CD	Idea Nos. 4, 7

Performance Assessment

Performance Attribute	Rationale for Change in Performance
Mainline Operations	**Rated a 9**: The mainline operations along I-15 and US-20 will improve by reducing the number of entrance/exit ramps and eliminating all the weaves along the mainlines. Simplifies wayfinding and signing. Maintains 60-65 mph.
Local Operations	**Rated a 7**: Local operations may slightly degrade due to the combination of local traffic volumes at intersections. Increase delays may be realized due to traffic having to travel through multiple intersections. It is assumed the intersections will along the CD roads will be designed to meet designed criteria.
Maintainability	**Rated a 4**: Maintenance is increased compared to the existing facility due to increase number of structures and increased lane miles.
Construction Impacts	**Rated a 2**: Significant impacts with road closures ranging from 60-90 days. Long duration of construction zones and reduced speeds.
Environmental	**Rated a 4**: Minor degradation, requires some mitigation.

VE ALTERNATIVE E – OPTION 3: REDUCE DESIGN SPEED AND MOVE OLYMPIA IC TO THE SOUTH	Idea Nos. 32/49 & 42/58

Alternative

Alternatives E1 and E2 show a split diamond interchange with the addition of frontage roads between Broadway Street and Olympia Street. Both alternatives replace Exit 118 (Broadway) IC and move the I-15/US-20 interchange (Exit 119) about half mile north. Both alternatives add directional ramps for the I-15 to US-20 connections, remove Exit 307 (Lindsay) and add frontage roads to connect Exit 118 to the new I-15/US-20 (Olympia interchange).

Each alternative differs with the access changes at Exit 308 and Exit 309. E1 removes Exit 308 and improves in town connectivity with a frontage road to Lewisville IC. E2 replaces the interchange at Exit 308 and Exit 309 with braided ramps.

Recommendation

A new alternative, E3, was created that shifts the new Olympia interchange about 500-ft south on I-15. E3 maintains access to US-20 to the Idaho Falls downtown area including ramps to Fremont and Science Center Drive.

Advantages	Disadvantages
• Reduces overall project footprint by 30% • Reduces the bridge span of the direct ramps by150-ft, and the overall bridge footprint by 25% • Eliminated changes to the Broadway bridge and the Lewisville interchange • Avoids the potential 4(f) impacts to the silos, but maybe not the property • 4(f) mitigation opportunity with a kiosk on a future bike path along Lindsay • Avoids an Environmental Justice (EJ) impact in the northeast area of Fremont • Increases separation from Freeman Park to mitigate impacts • Provides access to a designated city/county truck route at Science Center Drive to US-20 EB • Avoids displacement of a large commercial building (Northwind and Bish's RV) • Improves Lindsay access to old US-20 for local connectivity by realigning Lindsay on the existing US-20 ramps at an at-grade intersection • Combine the directional ramp structures with the new US-20/Snake River Bridge • Removes the frontage road on the west side of I-15, may avoid impacts to Temple View and Antares Park • Provides full I-15 access from Broadway and Olympia interchanges • Removes an at-grade RR crossing • Tangent connection to Olympia from the IC • Increases separation from Freeman Park • Avoids impacts a church property near Anderson Street	• Reduces the speed from 65 mph to 55/50 mph, may increase travel time • Shifting some of the responsibilities from State system to local system • WB US-20 to SB I-15 direct access ramp merges on the median side of SB I-15 • I-15 access from Grandview Drive is eliminate

Cost Summary	Total Cost
Baseline	$188.4M
Recommendation	$139.7M
Cost Savings	$48.7M

VE ALTERNATIVE E – OPTION 3: REDUCE DESIGN SPEED AND MOVE OLYMPIA IC TO THE SOUTH	Idea Nos. 32/49 & 42/58

FHWA Function Benefit				
Safety	***Operations***	***Environment***	***Construction***	***Right-of-Way***
✓		✓	✓	✓

Discussion/Sketches/Photos/Calculations

Discussion of Baseline Alternatives

Alternative E1

Alternative E2

Discussion of Recommendation Concept

The VE study teams for Alternative E1 and E2 had the same options to analyze and combined forces to develop a new Alternative E3.

E3 maintains access to US-20 to Idaho Falls downtown area including ramps to Fremont and Science Center Drive. In the Origin and Destination Study (2018), the design team determined 60% of the traffic that used the existing connections was internal traffic to the Idaho Falls downtown area. Maintaining this access will help the majority of the users of these facilities and meets major project goals by improving access to local schools, recreation facilities and commercial areas.

The VE Team came up with the following recommendations to the baseline concept described above to reduce impacts, improve mobility, and reduce cost and schedule. The recommended changes include the following benefits:

Impacts

VE ALTERNATIVE E – OPTION 3: REDUCE DESIGN SPEED AND MOVE OLYMPIA IC TO THE SOUTH	Idea Nos. 32/49 & 42/58

- Move the new IC (Olympia) approximately 500-ft south on I-15 by reducing the design speed on the I-15/US-20 directional ramps from 65 mph to 50 mph. This reduces the required horizontal curve radius from 1660-ft to 900-ft (I-15 NB/US-20 EB) and 1000-ft (US-20 WB/I-15 SB). To connect to the US-20 mainline, the design speed was reduced to 55 mph, reducing the horizontal curve on US-20 from 1660-ft to 1000-ft.
- The ramps can be shortened significantly with the lower design speed. The shorter ramps can connect with I-15 in the vicinity of the Grandview Drive bridge eliminating some of the need for the split diamond interchanges with frontage roads. I-15 access from Grandview Drive is eliminated.
- Reduces the overall footprint and lane miles by approximately 30%.
- Reduces the US-20 Snake River bridge span by approximately 150-ft
- Reduces the overall bridges deck area by 35%.
- Reduces the wetland impacts due to shorter bridge spans.
- Reduces impacts to environmental justice areas located to the northeast of Fremont Avenue.
- Avoids the physical historical structures (silos), though alternative may adversely impact the property.
- Shifts the alignment south which mitigates impacts to Freeman Park.
- Removes the west side frontage road between Broadway and Olympia, which may avoid impacting Temple View and the City Park and reduces ROW impacts and costs.
- Adds a new on ramp from Science Center Drive to NB US-20. This connection does not currently exist and was not included in the baseline.
- Removes modifications at Lewisville interchange.
- No need to replace the Broadway Street interchange.

Mobility

- Utilize the existing Lindsay access to US-20 to be at-grade intersection with Grandview Drive (old US-20).
- The I-15 northbound frontage road is retained and will allow indirect access to I-15 from Grandview Drive.
- The I-15 NB frontage road is modified to be a collector-distributor road to eliminate the merging and diverging conflict with the NB I-15 to EB US-20 direct access ramp while retaining full access at the Broadway Street and Olympia Street interchanges.
- The WB US-20 to SB I-15 direct access ramp will connect on the median side of SB I-15. These recommendations were made to the baseline concept because they offer the following advantages to the new combined Alternative E.3.
- Maintains the ped/bike connections from baseline

Collector-distributor changes

VE ALTERNATIVE E – OPTION 3: REDUCE DESIGN SPEED AND MOVE OLYMPIA IC TO THE SOUTH	Idea Nos. 32/49 & 42/58

Northbound I-15

Shortening the direct access ramps and eliminating the frontage roads reintroduces merging and diverging conflicts between Broadway and the NB I-15 to EB US-20 direct ramp. The merge and diverge area is approximately 0.5 miles long.

The merge and diverge area is eliminated with a collector-distributor road on the east side of I-15. The collector-distributor road is similar to the frontage road idea, but retains full access at the Broadway and Olympia interchanges.

NB I-15 to Olympia Street will exit just north of Broadway Street, merge with the collector-distributor road and then terminate at Olympia Street. Northbound turning vehicles from Broadway Street will enter a NB I-15 ramp from Broadway, merge with the collector-distributor road, and then merge with I-15 just south of the Olympia interchange.

Southbound I-15

A similar merge-diverge conflict between the WB US-20 to SB I-15 direct ramp and the SB Broadway off ramp will be avoided by connecting the direct access ramp to the median side of SB I-15 rather than the shoulder side.

Do not anticipate changes in the traffic operations from the baseline to the new Alternative E.3.

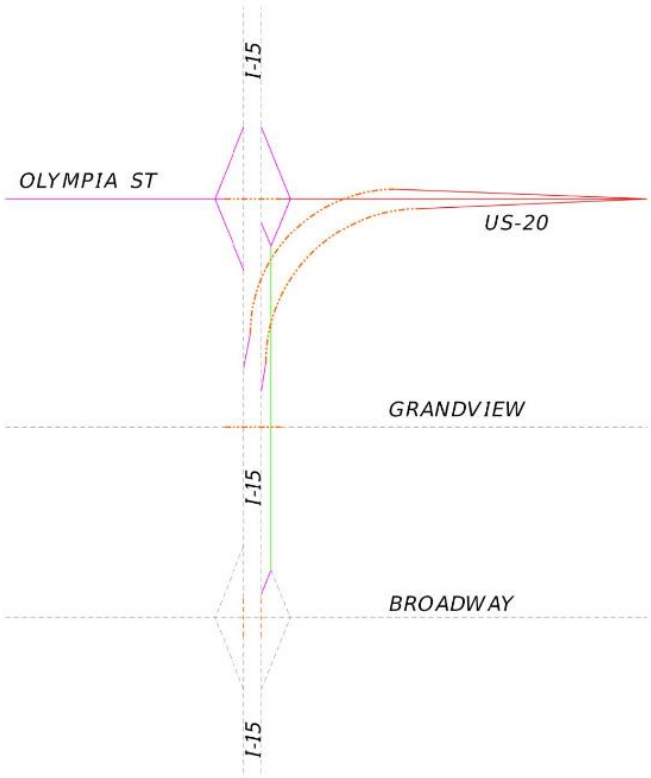
VE ALTERNATIVE E – OPTION 3: REDUCE DESIGN SPEED AND MOVE OLYMPIA IC TO THE SOUTH	Idea Nos. 32/49 & 42/58

VE Recommendation Concept Sketch

New Alternative E – Option 3

VE ALTERNATIVE E – OPTION 3: REDUCE DESIGN SPEED AND MOVE OLYMPIA IC TO THE SOUTH	Idea Nos. 32/49 & 42/58

New Alternative E – Option 3. I-15 northbound collector-distributor road



Discussion of Schedule Impacts

By not having the improvements at Lewisville IC, we can use it as a detour route while constructing other sections of the new alignment. Reducing the miles and # of structures reduces construction time by 1-2 seasons (see assumptions below).

Years 1 & 2: Build river crossing, Olympia IC, braid bridges, and direct ramps

VE ALTERNATIVE E – OPTION 3: REDUCE DESIGN SPEED AND MOVE OLYMPIA IC TO THE SOUTH	Idea Nos. 32/49 & 42/58

Year 3: Build Science Center Drive and other improvements east of the river and Lindsay realignment

Year 4: Complete I-15 improvements and finalize the connection to Fremont

Discussion of Risk Impacts

Reduced risks with Alternative E.3.

- Environmental approvals with combined structure over Snake River
- Number of displacements
- Opportunity for historical mitigation due to a 4(f) impact of the silo with an information kiosk on a bike path along Lindsay
- Avoids the new commercial building impact on the east side of the Snake River
- Improves the Lindsay access to give travelers access from airport to Lindsay
- Eliminates an at-grade railroad crossing as was proposed on E.1
- Reduces the schedule by 1-2 years

Assumptions and Calculations

Additional savings are realized by the improvements to E3 concept.

- Reduction in bridge deck area ($30M savings)
- Reduced the lane miles from 24.7 miles to 16.2 miles ($18M savings)
- Reduced right-of-way needs by 31 Acres ($14M)
- Eliminated two miles of frontage road on the east side of US-20 from Lewisville interchange to Science Center Drive
- Eliminates improvements needed to 33rd N from Lewisville IC to Fremont Avenue
- Avoids impacts to a church property near Anderson Street

Cost Estimate (See Appendix C)

Construction $117.5 M

Right of Way $ 22.2 M

Construction Subtotal			***$94,010,200***
Mobilization (Assume percentage of Roadway and Structures Cost)	15%		$14,102,000
Construction Engineering and Inspection	10%		$9,401,000
Total Alternative Construction Cost			**$117,513,200**

Right of Way	
Total Number of Parcels Impacted (including condominium parcels)	
Total Number of properties (condominium parcels as one property)	
Total Number of Parcels Assessed over $1 million	6
Total Assessed Value of all impacted properties	$28,549,000
Impacted Value of Parcel (partial impact not including relocation of property)	$9,800,000
Impacted Value of Parcel (partial impact and includes relocation for impact to building with 15' of structure)	**$22,220,000**

VE ALTERNATIVE E – OPTION 3: REDUCE DESIGN SPEED AND MOVE OLYMPIA IC TO THE SOUTH	Idea Nos. 32/49 & 42/58

Performance Assessment

Performance Attribute	Rationale for Change in Performance
Mainline Operations	**Rated an 8:** Stable flow, very good operations, reduced speed on directional ramps; added C-D road to mitigate weaving on mainline.
Local Operations	**Rated an 8:** Converts US-20 to local road, adds at-grade intersection at Lindsay, C-D road adds connectivity between interchanges.
Maintainability	**Rated a 4:** Added new structures and lane miles.
Construction Impacts	**Rated a 3:** Some impacts on alignment work and delays. New bridge is off line.
Environmental Impacts	**Rated a 4:** Some mitigation

VE ALTERNATIVE H – OPTION 1: SYSTEM TO SYSTEM INTERCHANGE	Idea Nos. 62, 67, 69, 74

Baseline Concept

The current Option H moves the I-15/US-20 IC about a mile north and adds a new roadway to connect to US-20 at E 49th N (Telford Rd). This also converts the existing US-20 between Johns Hole and E 49th N to a local street. Includes a system-to-system IC at a design speed of 65 mph on the ramps. Interchanges at I-15 MP 118 and 119 become a split diamond IC.

Recommendation Concept

The VE team proposes to reduce the design speed on the ramps of the System to system IC from 65 mph to 50 mph for the N-E and W-S ramps and 45 mph for the S-E, and W-N ramps. This recommendation assumes two lane ramps for the higher volume N-E and W-S movements and single lane ramps for the lower volume S-E and W-N movements. This recommendation minimizes the realignment of I-15 and allows flexibility to move the system to system IC further to the south.

The realignment of US-20 to entirely avoid the hatch pit does not appear feasible. This recommendation bisects hatch pit to reduce environmental impacts to Fairway Estates and Heritage Hills subdivisions.

Maintain the proposed St. Leon IC. Optimize the location and alignment for connectivity and mobility with higher priority given to proposed US-20.

Advantages	Disadvantages
• Reduce the footprint and ROW acquisition for the System to System • Keep federal approval of the IJR at the Division level • Reduce re-alignment of I-15 • Accommodate the variance of travel patterns on the ramps • Moves the proposed alignment farther away from existing neighborhoods • Reduce noise and visual impacts by depressing US-20 through the hatch pit • Pit mitigation could help fund development of planned park • Projected future closure of the hatch pit	• Possible snow and drainage issues on the depressed roadway section • Slight increased travel time • Increased excavation in hatch pit • Loss of hatch pit to the County • Bisecting the proposed park

Cost Summary	Total Cost
Baseline	$268.6M
Recommendation	$215.0M
Cost Savings	$53.6M

FHWA Function Benefit

Safety	*Operations*	*Environment*	*Construction*	*Right-of-Way*
		✓		✓

VE ALTERNATIVE H – OPTION 1: SYSTEM TO SYSTEM INTERCHANGE	Idea Nos. 62, 67, 69, 74

Discussion/Sketches/Photos/Calculations

Discussion of Recommendation Concept

Recommendation H provides a 65 mph design speed for all ramps. This recommendation reduces the design speed on the ramps of the system-to-system IC to 50 mph for the N-E and W-S ramps and 45 mph for the S-E and W-N ramps. The lower speeds reduce structure length and structure complexity. Much of the ramp length is made up of embankment.

Recommendation H provides two lane structures for all ramps. H-1 proposes single lane ramps for the S-E and W-N movements to effectively convey projected traffic volumes and further reduce structure cost and embankment.

Ramp speed reduction also minimizes the realignment of I-15 and allows flexibility to move the system to system IC further south.

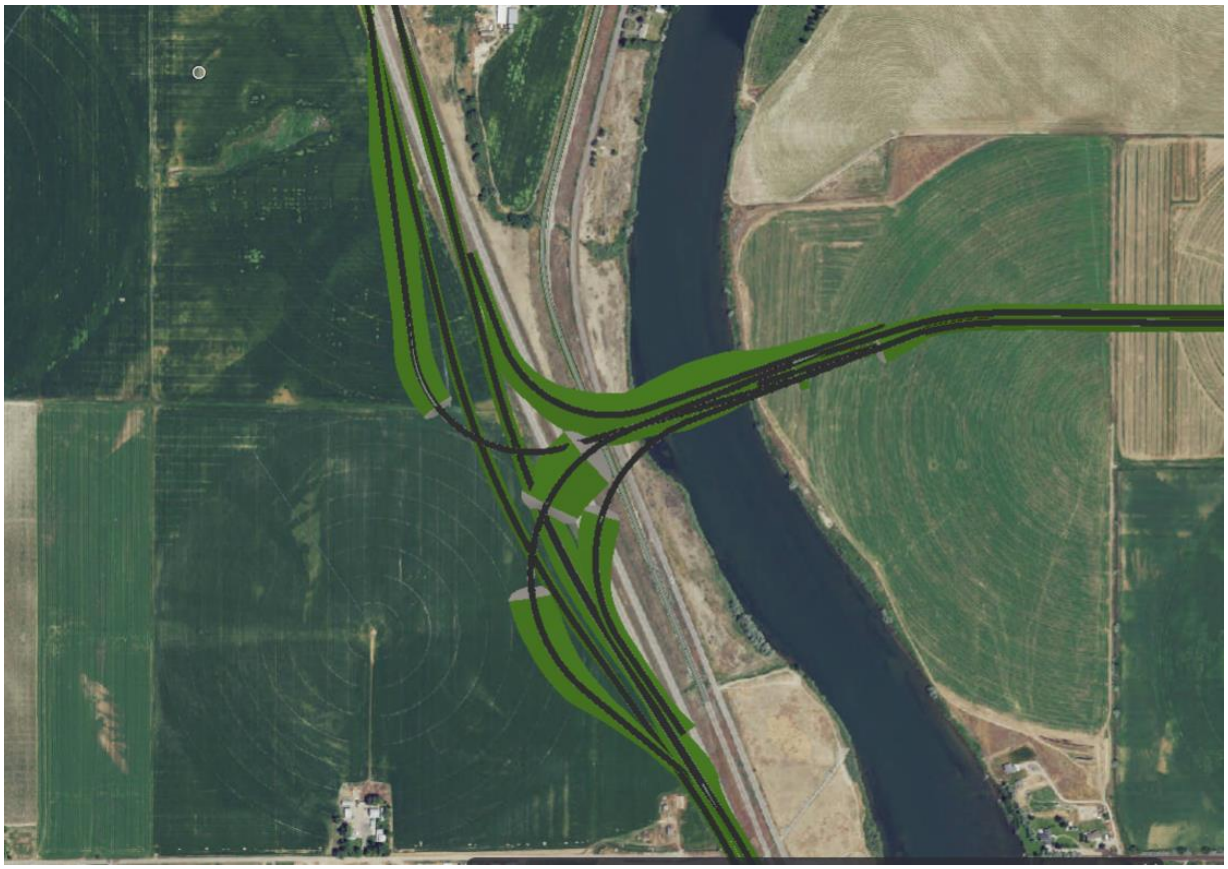
The realignment of US-20 to entirely avoid the hatch pit does not appear feasible. Moving the proposed alignment and bisecting hatch pit reduces environmental impacts to Fairway Estates and Heritage Hills subdivisions. Depressing US-20 through hatch pit reduces noise and visual

Impacts.

The hatch pit is projected to close in the near future and may be converted to a park. Pit mitigation could help fund development of the planned park in the future.

VE Recommendation Concept Sketches

VE ALTERNATIVE H – OPTION 1: SYSTEM TO SYSTEM INTERCHANGE	Idea Nos. 62, 67, 69, 74



VE ALTERNATIVE H – OPTION 1: SYSTEM TO SYSTEM INTERCHANGE	Idea Nos. 62, 67, 69, 74

Discussion of Schedule Impacts

No significant schedule impacts

Discussion of Risk Impacts

Introducing new environmental impacts to the baseline of option H. This would reduce known impacts from the Option H baseline.

Assumptions and Calculations

Reduced bridge lengths for the system-to-system IC. Bridge widths were reduced by 12 feet for two of the ramps.

Increased excavation through the hatch pit due to the depressed roadway through the hatch pit.

Roadway cost offsets due to I-15 being closer to the existing alignment and US-20 increased roadway length to bisect hatch pit.

VE ALTERNATIVE H – OPTION 1: SYSTEM TO SYSTEM INTERCHANGE	Idea Nos. 62, 67, 69, 74

Cost Estimate (See Appendix C)

Construction Subtotal			***$159,165,000***
Mobilization (Assume percentage of Roadway and Structures Cost)	15%		$23,875,000
Construction Engineering and Inspection	10%		$15,917,000
Total Alternative Construction Cost			**$198,957,000**
Right of Way			
Total Number of Parcels Impacted (including condominium parcels)			165
Total Number of properties (condominium parcels as one property)			138
Total Number of Parcels Assessed over $1 million			9
Total Assessed Value of all impacted properties			$35,730,000
Impacted Value of Parcel (partial impact not including relocation of property)			$9,289,000
Impacted Value of Parcel (partial impact and includes relocation for impact to building with 15' of structure)			**$16,039,000**

Performance Assessment

Performance Attribute	Rationale for Change in Performance
Mainline Operations	**Rated an 8**: Reduce speed, Increase travel time, Reduced speed at ramp contrary to driver expectation
Local Operations	**Rated a 7**: No change to local operation with the exception of a new IC at 5th W.
Maintainability	**Rated a 3**: Increase inventory to State and local roads
Construction Impacts	**Rated an 8**: Most of the construction is off alignment
Environmental Impacts	**Rated a 4**: Environmental impact are minor

7 Analysis of Results

7.1 Risk Analysis with Risk Response Strategies

Based on the outcome of the mitigation strategies established for the identified risks, an additional analysis was performed to capture the reduction in exposure to cost and schedule risks should they occur. Further analyses may be performed should the project team require additional cost and schedule results based on the accepted alternative and evaluated costs.

At this point, new cumulative cost curves were generated that represented both the impacts of responding to the risk (mitigation strategies), in addition to the implementation of the VE recommended alternatives.

7.2 Improved Alternative Results

Figure 18: Alternative C Total Cost Risk Analysis Results

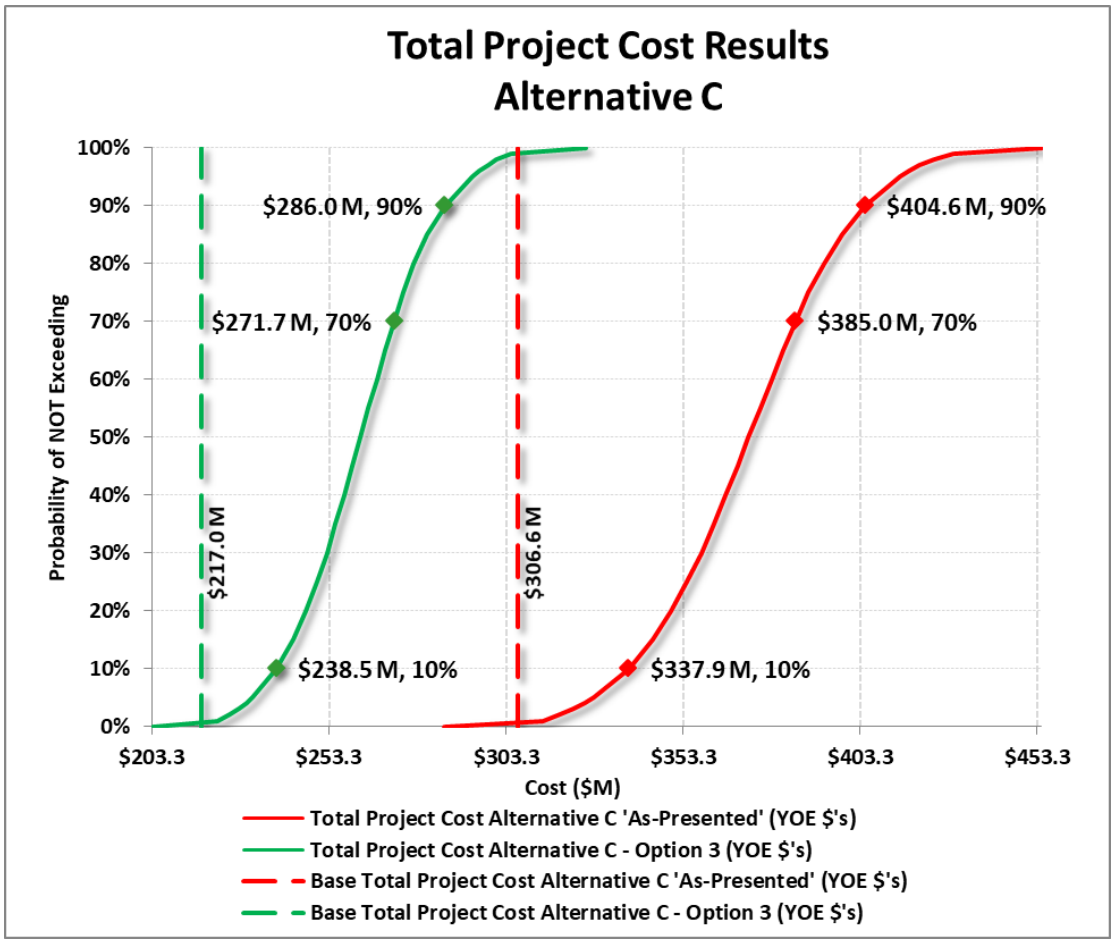


Figure 18 shows the modeled cost results for the project, both Alternative C 'As-Presented' and Alternative C – Option 3. The **red** S-curve shows the modeled results prior to risk mitigation (Alternative C 'As-Presented). The **green** S-curve represents the cumulative probability distribution after responding to the identified risk through risk mitigation and VE

(Alternative C – Option 3). This S-curve represents a range of results, expressed in YOE dollars.

Prior to VE and risk response, the total costs for the project Alternative C 'As-Presented' had a 70 percent chance of being less than $385.0 million. With the VE recommendations and risk response strategies considered in the analysis, the project Alternative C – Option 3 has a 70 percent probability of being less than $271.7 million.

Figure 19: Alternative E Total Cost Risk Analysis Results

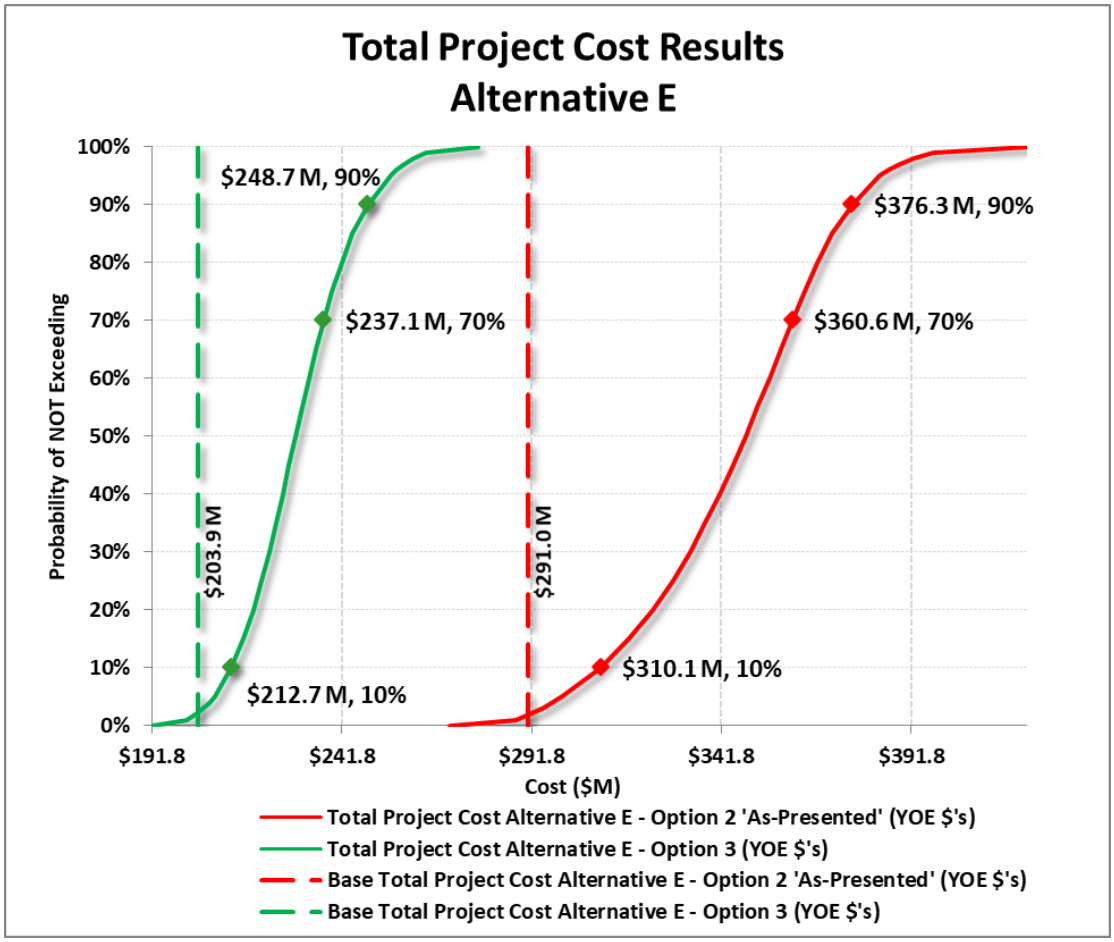


Figure 19 shows the modeled cost results for the project, both Alternative E – Option 2 'As-Presented' and Alternative E – Option 3. The **red** S-curve shows the modeled results prior to risk mitigation (Alternative E – Option 2 'As-Presented'). The **green** S-curve represents the cumulative probability distribution after responding to the identified risk through risk mitigation and VE (Alternative E – Option 3). This S-curve represents a range of results, expressed in YOE dollars.

Prior to VE and risk response, the total costs for the project Alternative E – Option 2 'As-Presented' had a 70 percent chance of being less than $360.6 million. With the VE recommendations and risk response strategies considered in the analysis, the project Alternative E – Option 3 has a 70 percent probability of being less than $237.1 million.

Figure 20: Alternative H Total Cost Risk Analysis Results

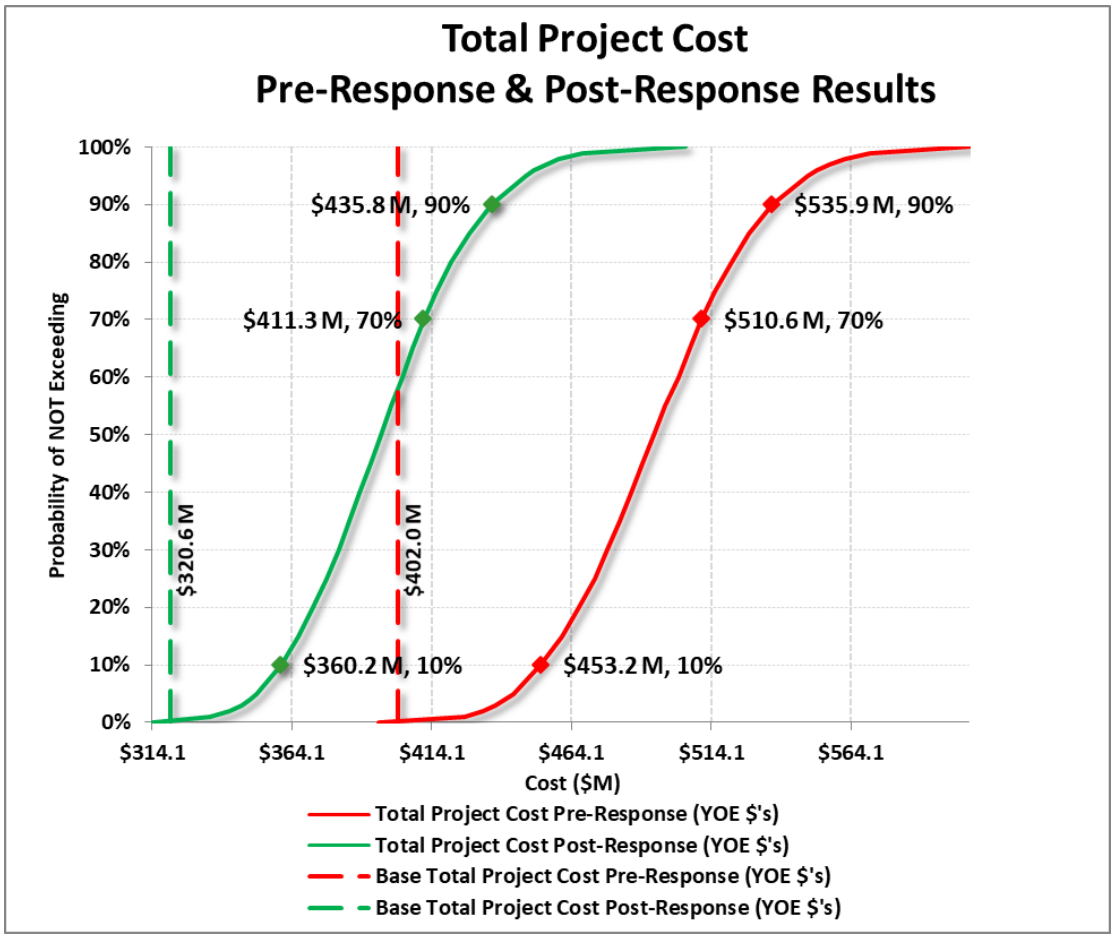


Figure 20 shows the modeled cost results for the project, both Alternative H 'As-Presented' and Alternative H – Option 1. The **red** S-curve shows the modeled results prior to risk mitigation (Alternative H 'As-Presented'). The **green** S-curve represents the cumulative probability distribution after responding to the identified risk through risk mitigation and VE (Alternative H – Option 1). This S-curve represents a range of results, expressed in YOE dollars.

Prior to VE and risk response, the total costs for the project Alternative H 'As-Presented' had a 70 percent chance of being less than $510.6 million. With the VE recommendations and risk response strategies considered in the analysis, the project Alternative H – Option 1 has a 70 percent probability of being less than $411.3 million.

Please see the Risk Analysis Sheets provided in **Appendix D** for additional details.

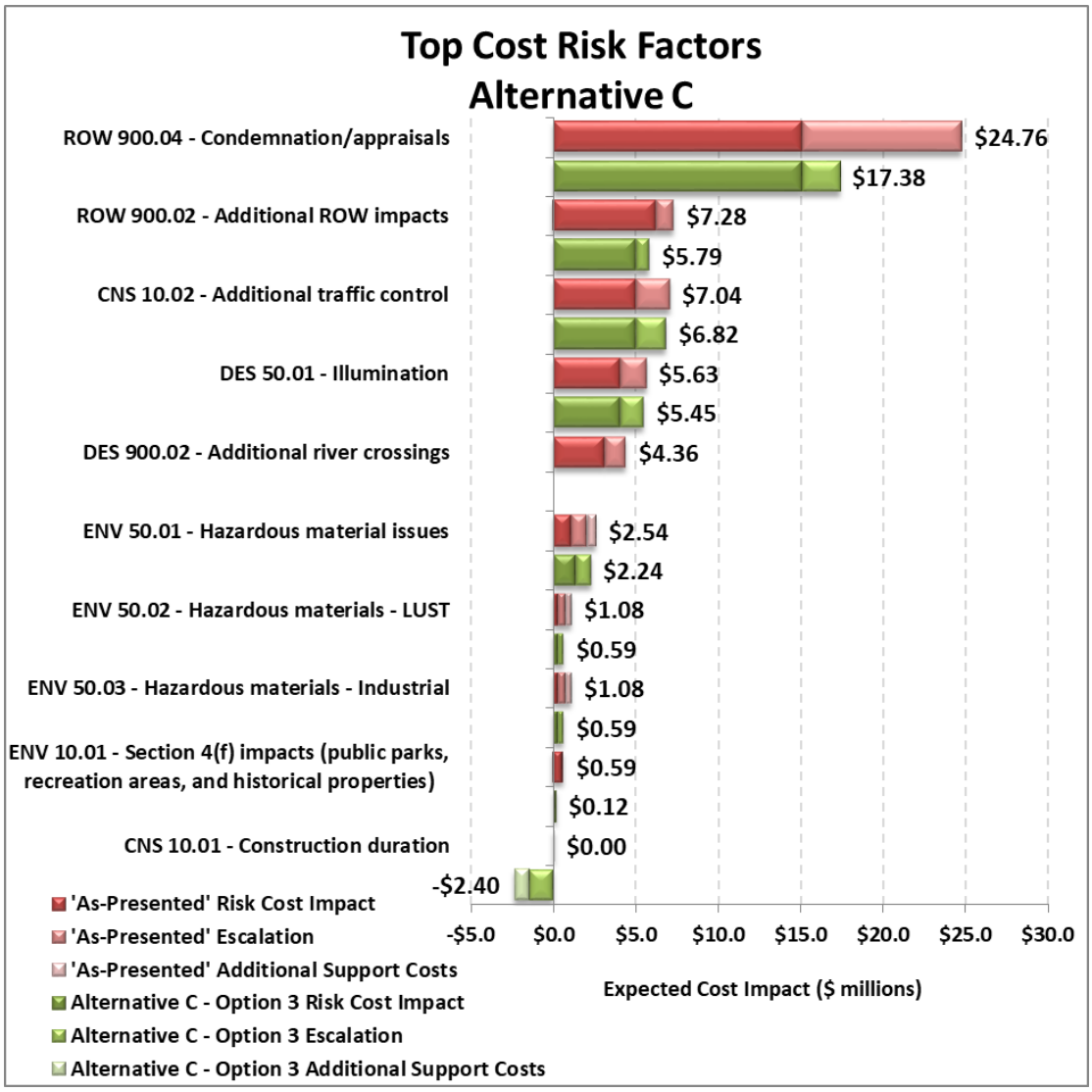
7.3 Tracking, Monitoring, and Control

The expected value (likelihood multiplied by expected risk outcome) tornado diagrams below depict the actual expected values of the identified risks and help summarize the evolution the project has gone through by engaging in the CRAVE process. Not all risks identified require immediate management. Often, a project team needs to prioritize the risks for which it plans to develop strategies in the future in an effort to make the best use of the time available. An example would be to begin with the risks with the highest cost and schedule impacts.

Within the diagrams, the risks have the expected values plotted prior to responding to the risks and implementing the VE recommendations (red bars) and after responding to the risks and implementing VE recommendations at their expected likelihood (green bars).

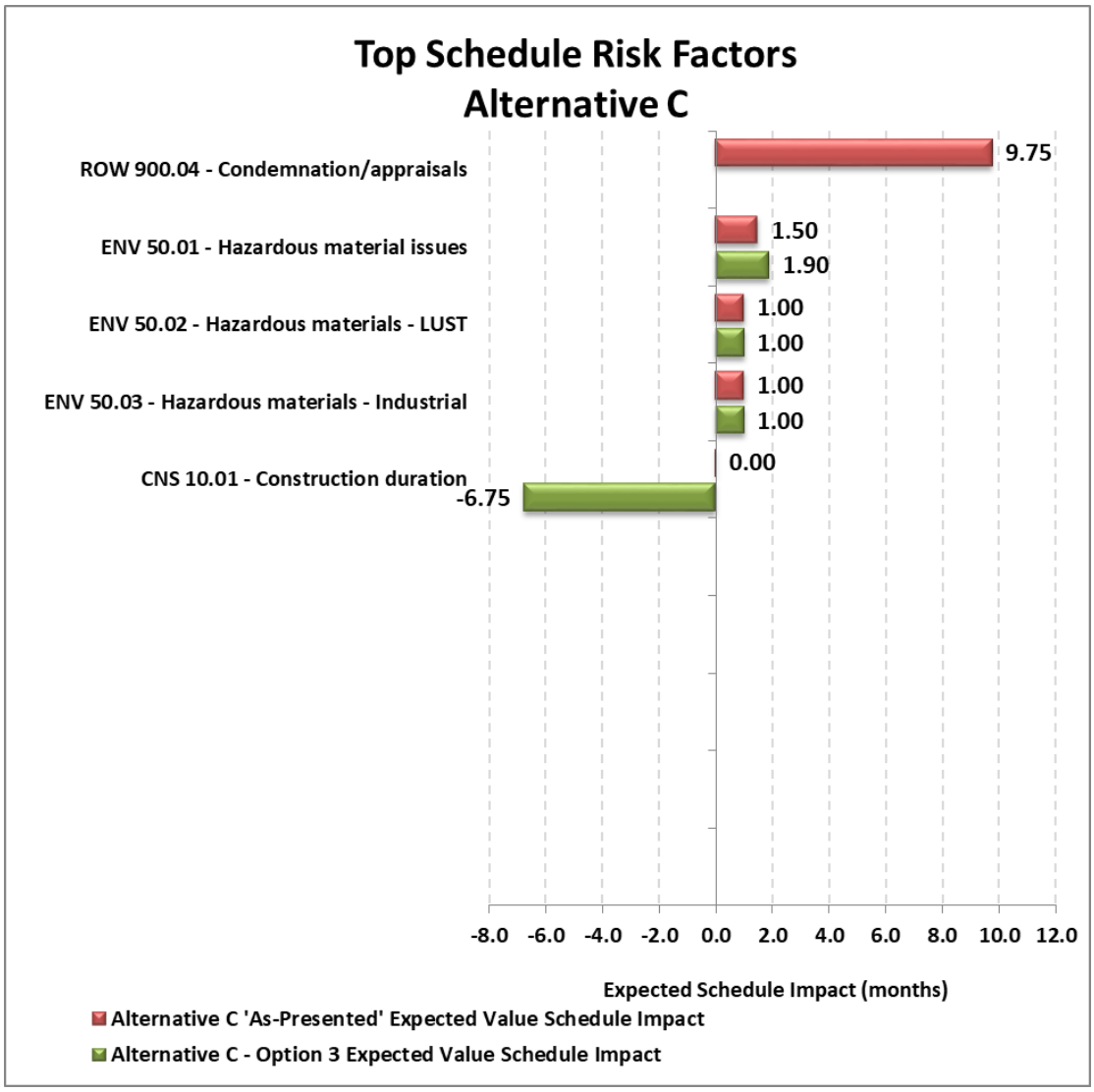
Alternative C 'As-Presented' and Alternative C – Option 3

Figure 21: Alternative C Top Cost Risks



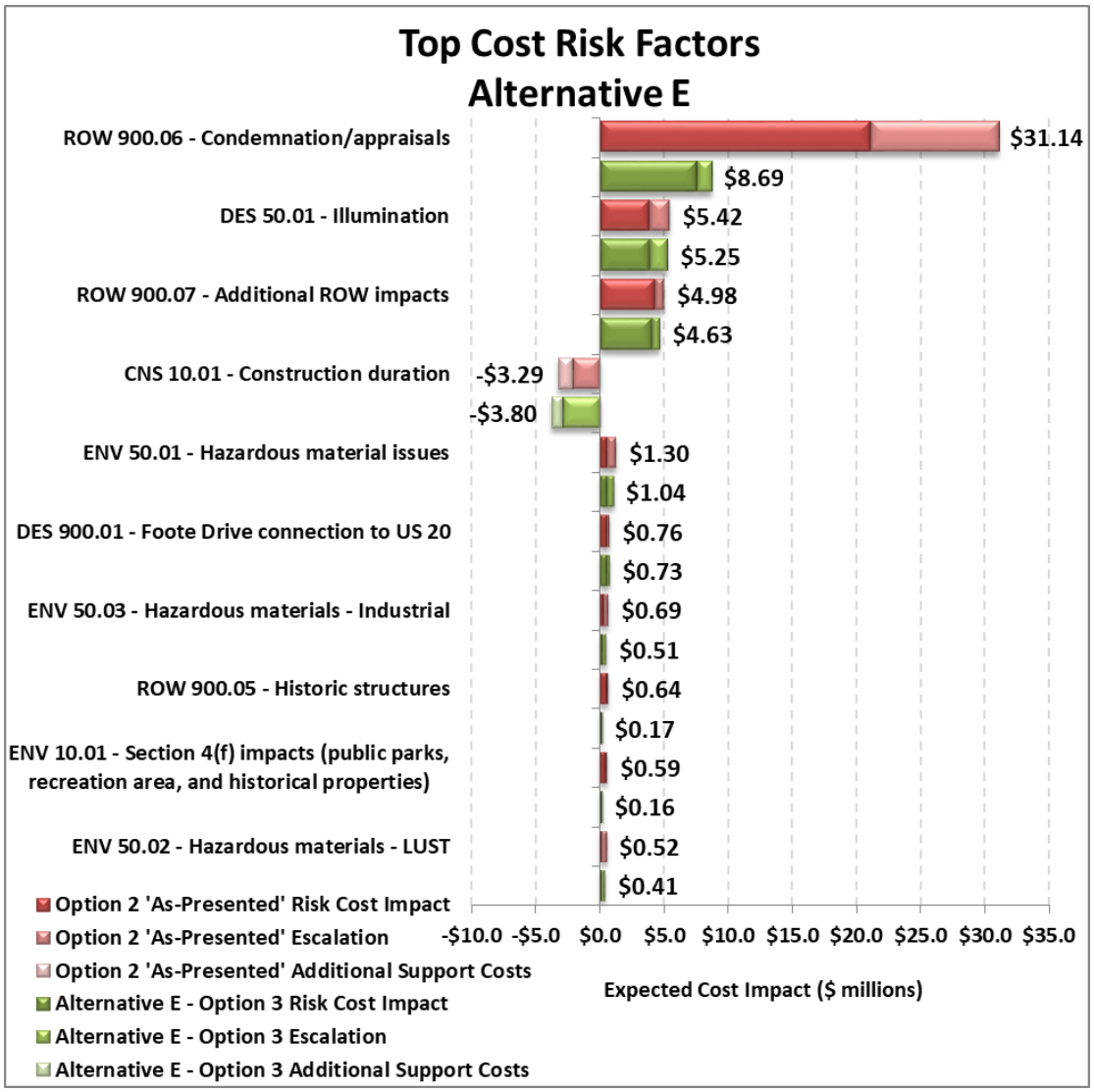
As seen in the figure, the mitigation results (Alternative C – Option 3) are depicted by the green bars. Through risk mitigation and recommendations from the VE alternative, it was discovered that Risk DES 900.02 Additional river crossings was no longer needed and therefore no longer a cost impact.

Figure 22: Alternative C Top Schedule Risks



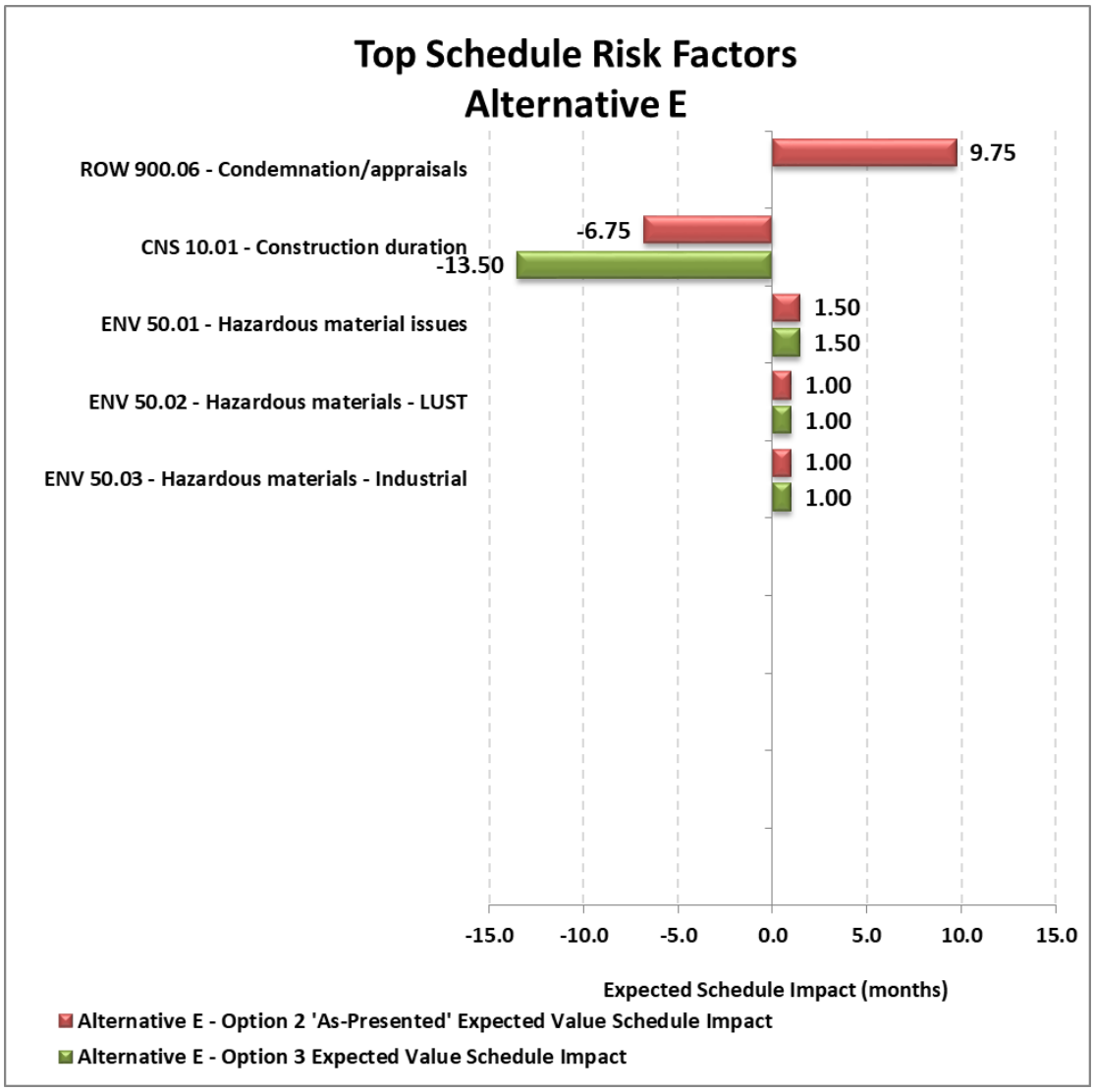
Through risk mitigation and recommendations from the VE alternative, Risk CNS 10.01 Construction duration could be changed from a risk to an opportunity for schedule (and therefore cost) savings to the project alternative.

Figure 23: Alternative E Top Cost Risks



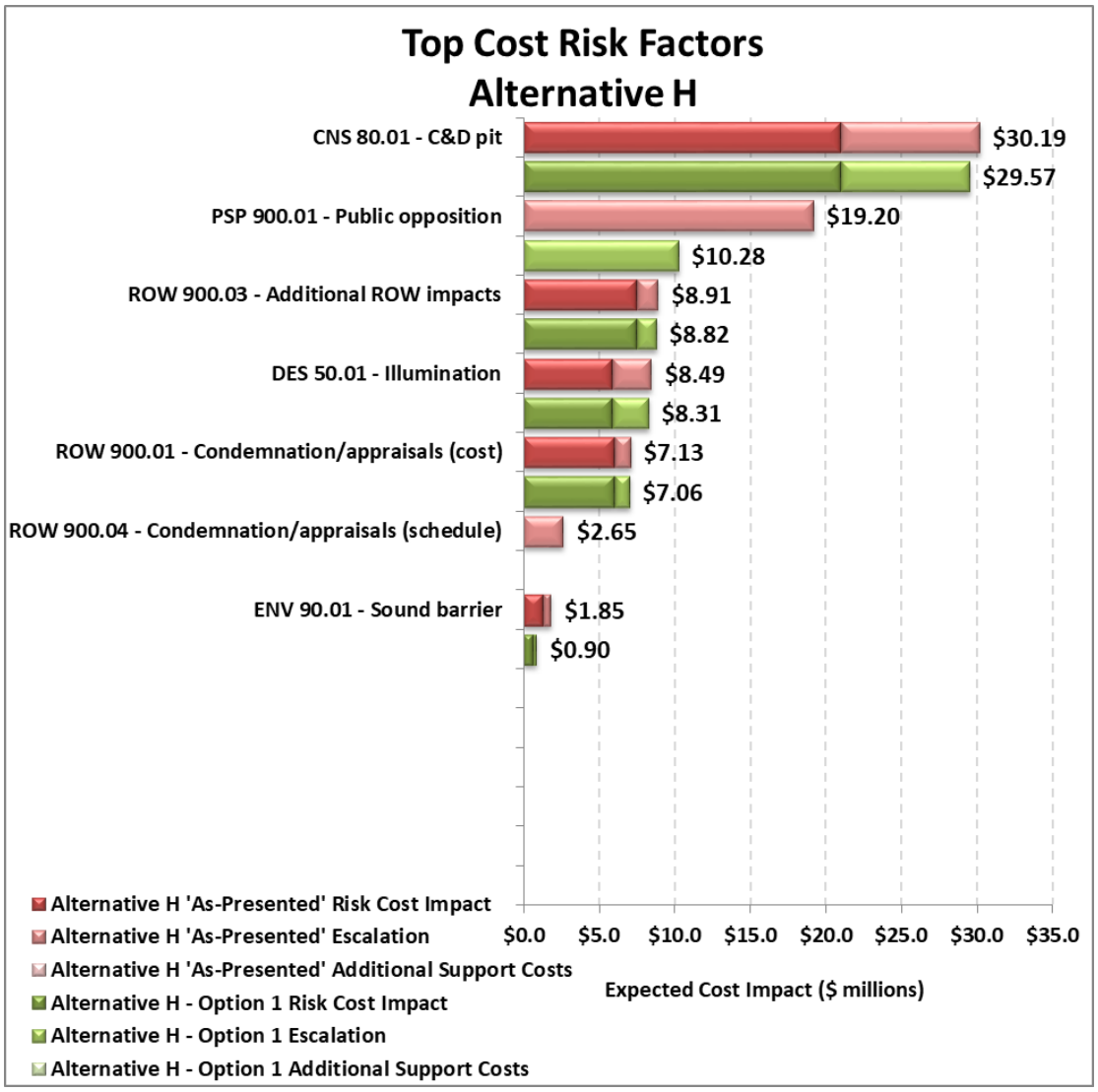
Through the development of VE Alternative E – Option 3, the risk impact of condemnation/appraisals was mitigated significantly (ROW 900.06) from Alternative E – Option 2 'As-Presented'.

Figure 24: Alternative E Top Schedule Risks



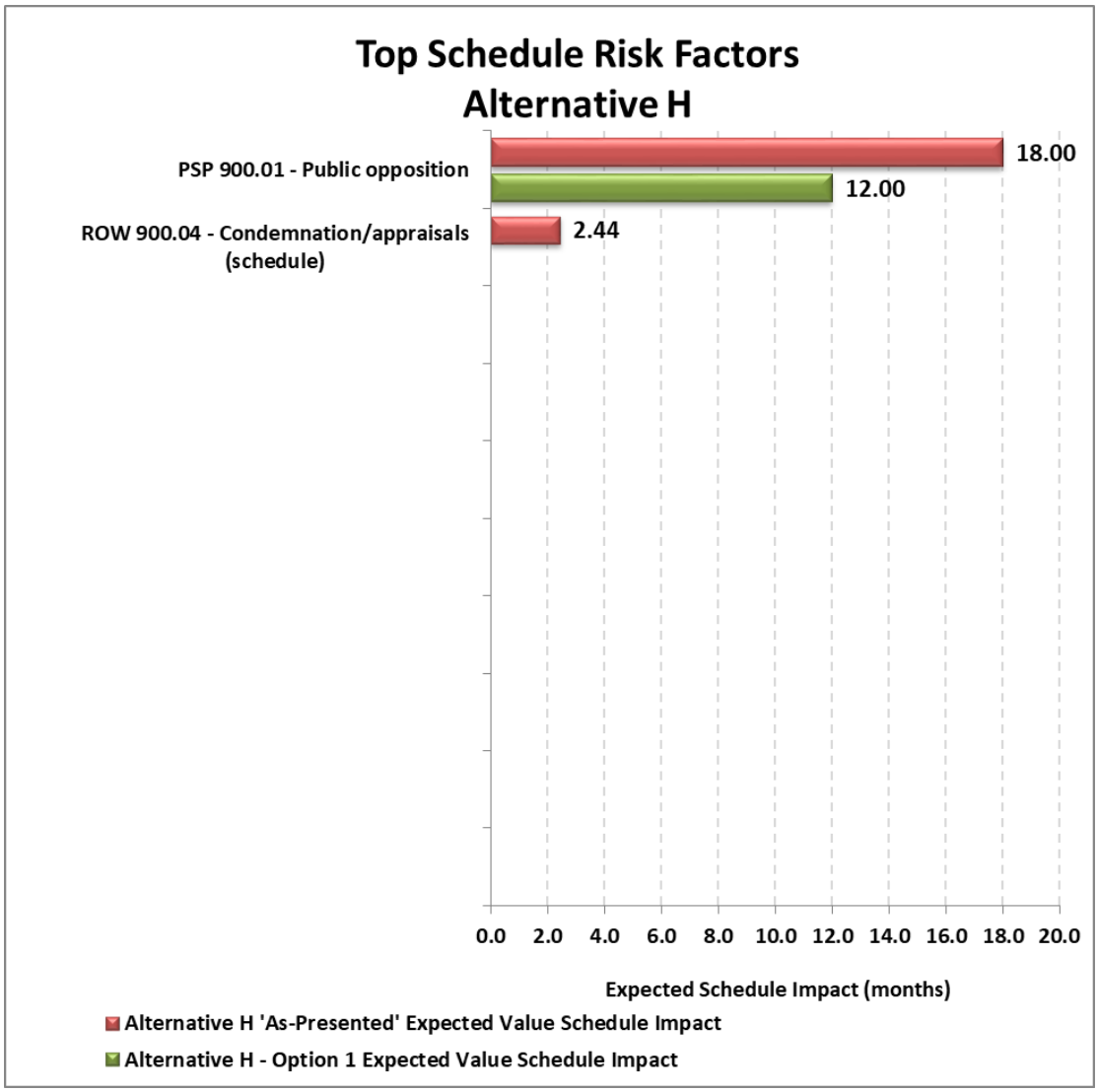
As seen in **Figure 24**, the Alternative E – Option 2 'As-Presented' risk quantification assumed an opportunity to save 6.75 months of construction duration (CNS 10.01) from the baseline assumption of a six year construction schedule. Based on discussions amongst the CRAVE team and through development of Alternative E – Option 3, that opportunity was further exploited to reduce the construction duration by an additional 6.75 months.

Figure 25: Alternative H Top Cost Risks



As seen in the figure, the mitigation of Risk PSP 900.01 Public opposition through the development of Alternative H – Option 1 helps to reduce the risk probability from 75% chance to a 50% chance of occurrence. This reduces both cost (**Figure 25**) and schedule (**Figure 26)** impacts to Alternative H – Option 1 from Alternative H 'As-Presented'.

Figure 26: Alternative H Top Schedule Risks



By engaging in this cost risk analysis process to evaluate the project, the overall expectations of cost and schedule were quantified in relation to identified risks, the associated impacts of those risk elements, the use of a Risk Management Plan to respond to those risk elements, and impacts to the project bottom line of creating value for the project.

Through this process, value can simultaneously be created for the project through the VE portion of the workshop, while risks can be proactively monitored and controlled to reduce potential impacts to the project cost and schedule.

The risk register or risk analysis sheets provided in **Appendix D**, can serve as a risk tracking tool and contains areas for risk response and planning. The project team should assign a “risk owner” to track and record the effectiveness of the strategies and any changes to the project risk profile, as follows:

- Document the response by describing the action, the work activities it will affect, and the cost of the response action.

- Identify the person(s) responsible for successful implementation of the response action.
- Document whether response actions have a positive or negative effect on achieving project objectives in the Risk Management Plan.
- Consider the time impacts of the response action and how the risk response may affect the overall project and/or other risks.
- Monitor progress of implementation of risk response strategies and Value Engineering recommendations.
- Update the Risk Model periodically as necessary to update risk-based estimates.

7.4 CRAVE Process Summary

The cost risk analysis provided an evaluation of the estimated project total cost and schedule and included four major steps.

The first step was to establish a base cost and schedule, then identify and quantify the major risk elements and how they impact cost and schedule. The second step was to identify how to respond to the highest likelihood and impact risk elements. The third step was to quantify the effects of implementation of the risk response strategies. The final step was to quantify the effects on project cost and schedule by implementing the VE recommendations.

The information provided by a CRAVE study gives valuable tools to project managers to help them deliver a successful project on time and within budget. When a multi-discipline team of experts is assembled in a workshop environment, maximum benefit can be achieved by using this combined cost risk assessment/value engineering process.

Appendix A. VE Recommendation Approval Form

Project: I-15/US-20 Connector **VE Study Date: December 9-12, 2019**

			FHWA Functional Benefit						
	Recommendation	Approved Y/N	Safety	Operations	Environment	Construction	ROW	VE Team Estimated Cost ($ millions)	Actual Estimated Cost
1	Alternative C – Option 3		✓	✓	✓		✓	$297.1	
2	Alternative E – Option 3		✓		✓	✓	✓	$253.5	
3	Alternative H – Option 1				✓		✓	$411.3	

Please provide justification if the value engineering workshop recommendations are **not** approved or are implemented in a modified form.

The Project Manager will review and evaluate the VE Team's recommendation(s) that are included in the Final Report. The Project Manager shall complete the VE Recommendation Approval form that is included in this report.

For each recommendation that is not approved or is modified by the Project Manager, justification needs to be provided. This justification shall include a summary statement containing the Project Manager's decision not to use the recommendation in the project.

The completed VE Recommendation Approval form including justification for any recommendations not approved or modified shall be sent to the ITD State Value Engineer by October 1 of each year so the results can be included in the annual Value Engineering Report to FHWA.

_____ _____

Signature Project Manager Date

_____

Name (please print)

FHWA Functional Benefit Criteria

Each year, State DOTs are required to report on VE recommendations to FHWA. In addition to cost implications, FHWA requires the DOTs to evaluate each approved recommendation in terms of the project feature or features that recommendation benefits. If a specific recommendation can be shown to provide benefit to more than one feature described below, count the recommendation in *each category that is applicable*.

Safety: Recommendations that mitigate or reduce hazards on the facility.

Operations: Recommendations that improve real-time service and/or local, corridor, or regional levels of service of the facility.

Environment: Recommendations that successfully avoid or mitigate impacts to natural and/or cultural resources.

Construction: Recommendations that improve work zone conditions or expedite the project delivery.

Right-of-Way: Recommendations that lower the impacts or costs of Right-of-Way.

Appendix B. Additional Alternatives and Recommendations

ALTERNATIVE C – OPTION 1	Idea Nos. 5, 8

Alternative Concept

Adds lanes and ramps to separate the through-traffic from the local existing traffic between the I-15 Exit 118 (Broadway St) and US-20 Exit 308 (Riverside Dr./City Center).

Requires new retaining walls, bridges, and replaces US-20 Exit 308, I-15 Exit 118 and 119.

Maintains alignment near or in the same location as the existing I-15/US-20 roadways.

Recommendation

Removes four interchanges on US-20 and added one interchange between Riverside and Science Center Dr. (Idea 5) (Exit 119, Exit 307, Exit 308, Exit 309)

With the addition of the Railroad ROW (Idea 2) change the traffic flow from I-15 directly onto US-20. This effectively makes I-15 (Y or split) and continues two lanes north on I-15 and two lanes east onto US-20 (Idea 8). Elevate I-15 over Grandview Dr. and depress Grandview Dr. to maintain Grandview connectivity to Lindsay.

Advantages	Disadvantages
• Avoids Antares park, School, and residential properties west of I-15 • Decreases construction phasing and costs • Improves ramp spacing and eliminates all weaving issues • Easier to provide pedestrian access • Direct connection to the major movement • Removes costly direct ramps • Reduces bridges (and future replacements) • Reduces earthwork • Less River crossings • Less ROW take	• To continue onto US-20 driver must keep left and I-15 driver must keep right • I-15 SB merges to the right of US-20 • Grandview is no longer a direct access onto US-20 • EJ issues • Possible cultural issues • Out of direction travel for I-15 onto US-20

Cost Summary	Total Cost
Baseline	$171,316,000
Recommendation	$128,516,000 to $126,316,000
Cost Savings	$42,800,000 to $45,000,000

FHWA Function Benefit

Safety	*Operations*	*Environment*	*Construction*	*Right-of-Way*

ALTERNATIVE C – OPTION 1	Idea Nos. 5, 8

Discussion/Sketches/Photos/Calculations

Discussion of Recommendation

This concept purchases the railroad and business east of I-15 (see Idea 2) and realigns I-15 to the east into the businesses and adjacent railroad ROW. This allows I-15 and US-20 to split with I-15 continuing as two lanes north and US 20 as two lanes east (Idea 8). This concept will also eliminate the Lindsay IC, Riverside IC, and Science Center IC, and place a new full interchange between Riverside and Science Center IC. This concept removes the following eight structures from the base condition, equating to 30.8 million in savings:

- NB and SB direct ramp structures at Broadway
- US structure over Railroad
- EB and WB direct ramp structure at Johns Hole
- EB and WB direct ramp structure at Riverside
- EB direct ramp structure at Science Center

This concept is consistent with the current traffic flows documented in the PEL studies.

Constructing the new roadways in vacated properties along I-15 will save $5 million in ROW (see Idea 2), improve construction phasing, and reduces temporary construction cost. All local connectivity is maintained with this concept. Additional savings $7 million in construction phasing and reduced roadway by consolidating interchanges on US-20.

ALTERNATIVE C – OPTION 1	Idea Nos. 5, 8

VE Recommendation Concept Sketch

Discussion of Schedule Impacts

The time to construct this option and construction phasing will be approximately the same as presented in Idea 2. A reduction is estimated to be a 12 months savings based on reduce stage construction.

Discussion of Risk Impacts

This concept removes some 4f, cultural and substantial ROW on the west side of I-15. However, there are still EJ, cultural, and ROW on the east of I-15 and along the US-20 corridor. Additional risks may be introduced with contaminated soils with the additional property acquired from the railroad. Additional risk exists with FHWA approval of the left exit configuration of US-20 off NB I-

ALTERNATIVE C – OPTION 1	Idea Nos. 5, 8

15 as well as the left entrance of US 20 onto SB I-15. The relocation of US-20 may bisect an EJ neighborhood.

This concept adds the following improvements:

- Avoids Antares park, School, and residential properties west of I-15
- Decreases construction phasing and costs
- Improves ramp spacing and weaving
- Easier to provide pedestrian access
- Direct connection to the major movement
- Removes costly direct ramps
- Reduces bridges (and future replacements)
- Reduces earthwork
- Less River crossings
- Less ROW take

Assumptions and Calculations

Assumptions:

- If this option were to continue forward it must be allowed to bisect an EJ neighborhood
- Historic grain silo is not impacted.
- FHWA approval I-15 to US-20 connections and configuration.

Cost savings:

- Removal of direct ramp structure at Broadway = $10,300,000
- Removal of structure at Railroad = $11,600,000
- Removal of direct ramp structure at Johns Hole = $4,100,000
- Removal of direct ramp structure at Riverside = $4,800,000
- Removal of direct ramp structure at Science Center = $0 (cost was not included in the base)
- Shifting I-15 to the east (ROW, const. phasing, traffic control = $4,000,000 (see C-2)
- Removal of direct ramps (roadway)= 6,000,000
- Traffic control and phasing on US-20 = $1,000,000

Cost Estimate

ALTERNATIVE C – OPTION 1	Idea Nos. 5, 8

CONSTRUCTION COST ALTERNATIVE C					
ALTERNATIVE C ROADWAY ITEMS			QUANTITY	UNIT	
Roadway Excavation (Cut)			50000	CY	$1,000,000
Roadway Excavation (Fill/Borrow)			450000	CY	$9,000,000
Subbase			56916.17	CY	$1,707,000
3/4" Aggregate	43319.65	CY	81874.1385	Ton	$2,456,000
HMA	105000	CY	209790	Ton	$19,930,000
Concrete Barrier			11612.11	LF	$1,452,000
Curb and Gutter			11861.39	LF	$712,000
Sidwalk			13864.42	SY	$763,000
Retaining Wall			45.09	SF	$3,000
Drainage			%		$3,702,000
Incidental Items			%		$1,851,000
Traffic Control			%		$4,628,000
Environmental Items			%		$2,777,000
Signing and Pavement Marking			%		$1,851,000
			Total Roadway Items		$51,832,000

ALTERNATIVE C STRUCTURE ITEMS	Length	Width	Type	Area	
I-15 NB/SB over Broadway	285	82	PS	23,370 SF	$4,674,000
NB I-15 Ramp near Broadway	450	36	PS	16,200 SF	
SB I-15 Ramp near Broadway	810	36	ST	29,160 SF	
I-15 over Grandview	160	94	ST	15,040 SF	$3,684,800
RR Tunnel	386	1000	TUNNEL	386,000 SF	
Lindsay St Tunnel	300	1292	TUNNEL	387,600 SF	$11,628,000
I-15 to US-20 EB Ramp over RR	115	36	PS RR	4,140 SF	$1,076,400
I-15 to US-20 EB Ramp over Linday	130	36	PS	4,680 SF	$936,000
US-20 to I-15 SB Ramp	1290	36	ST	46,440 SF	$11,377,800
I-15 to US-20 EB Ramp over Canal	110	36	PS	3,960 SF	$792,000
I-15 to US-20 EB Ramp over Snake	326	36	PS	11,736 SF	
John's Hole over Snake (14' Bike Included)	185	95	PS	17,575 SF	$3,515,000
US-20 to I-15 SB Ramp over Snake	215	36	ST	7,740 SF	
US-20 to I-15 SB Ramp over Canal	110	36	PS	3,960 SF	$792,000
I-15 to US-20 EB Ramp over Riverside	435	36	PS	15,660 SF	
US20 over Riverside Interchange (length assumed)	200	82	PS	16,400 SF	$3,280,000
US-20 to I-15 SB Ramp over Riverside	242	36	PS	8,712 SF	
New Crossing over Snake (14' Included)	510	62	PS	31,620 SF	$6,324,000
			Total Structure Items		$48,080,000

Construction Subtotal			***$99,912,000***
Mobilization (Assume percentage of Roadway and Structures Cost)	15%		$14,987,000
Construction Engineering and Inspection	10%		$9,991,000
Total Alternative Construction Cost			**$124,890,000**

Right of Way	
Total Number of Parcels Impacted (including condominium parcels)	207
Total Number of properties (condominium parcels as one property)	171
Total Number of Parcels Assessed over $1 million	10
Total Assessed Value of all impacted properties	$53,905,000
Impacted Value of Parcel (partial impact not including relocation of property)	$18,114,000
Impacted Value of Parcel (partial impact and includes relocation for impact to building with 15' of structu	**$40,118,000**

VE RECOMMENDATION: PURCHASE RAILROAD ROW	Idea Nos. 2

Baseline Concept

The original baseline impacted properties east and west of I-15, through a narrow corridor. With narrow corridor, improvements are essentially on top of the existing travel lanes forcing a complex and difficult construction staging.

Recommendation Concept

Buy out businesses and railroad east of the I-15, between Broadway and Grandview, and shift I-15 east. This allows for better construction staging and eliminates ROW needed west of I-15 along with preserving the park and school relocation which are 4f issues.

Advantages	Disadvantages
• Alternative reduces conflict between railroad and highway • Construction staging while maintaining traffic risk is reduced • Provides contractor staging area • Eliminates 4f impacts west of I-15 • Reduces temporary elements for construction • Reduces number construction stages and construction duration • Reduces residential relocations • Eliminates school relocation • Changes land use between I-15 and Lindsey to a more attractive land use type	• Increases cost (ten businesses) • Increases design schedule risk • Potential hazardous waste

Cost Summary	Total Cost
Baseline	$211.4M
Recommendation	Recommend Regardless of Alternative Improvements
Cost Savings/(Cost Added)	$4M Savings (Total Project $205.9M)

FHWA Function Benefit

Safety	*Operations*	*Environment*	*Construction*	*Right-of-Way*

VE RECOMMENDATION: PURCHASE RAILROAD ROW	Idea Nos. 2

Discussion/Sketches/Photos/Calculations

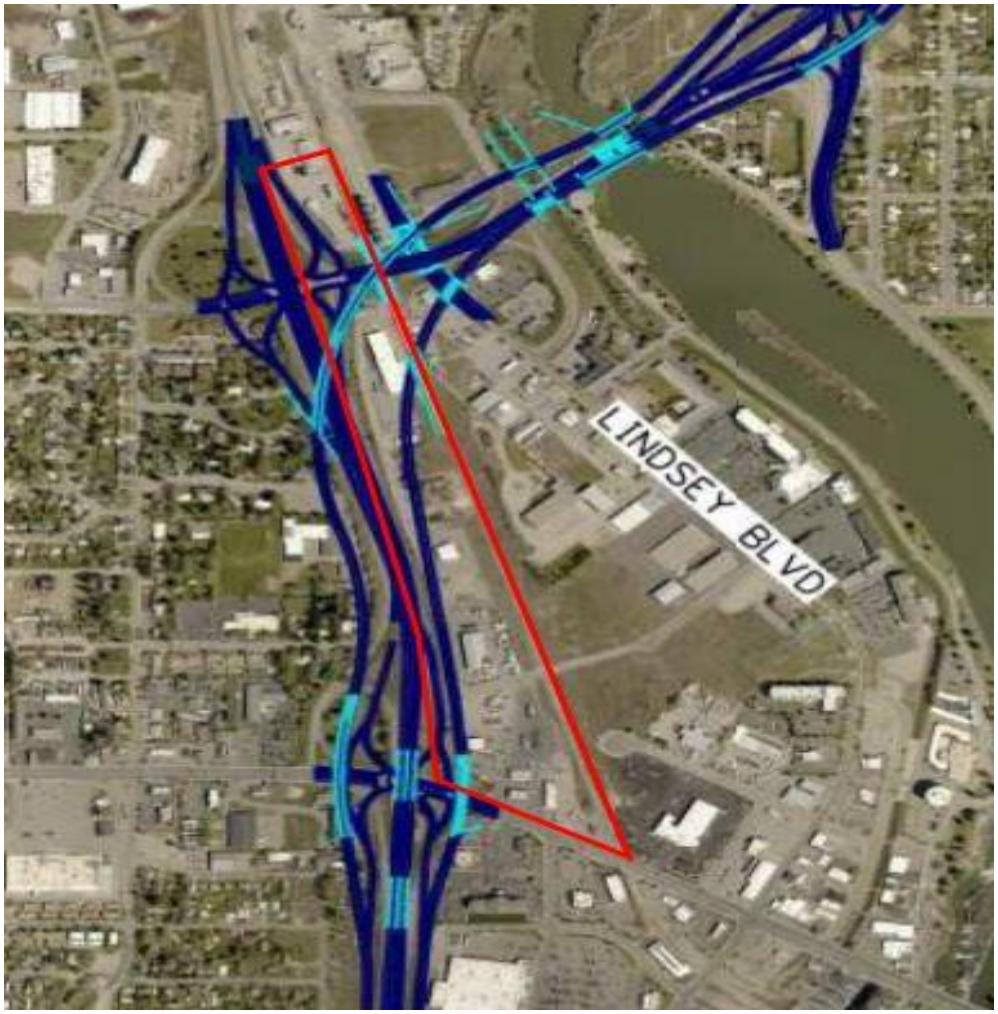
Discussion of Recommendation Concept

This concept realigns I-15 to the east of the current alternative between Broadway Street (Exit 118) and Grandview Drive (Exit 119). In order to accomplish this, the businesses and rail line on the east side of I-15 would have to be acquired. Several advantages were identified and shown below.

Acquiring the property to the east eliminates the conflict between railroad and highway. By eliminating this conflict the project's ability to maintain traffic during construction is greatly improved without additional temporary elements needed to maintain traffic during construction as well as reducing the number of construction stages. Reducing these temporary elements projects an estimated savings of $2.5M. Reducing the number of stages to construct the project reduces the construction duration.

Shifting the main I-15 alignment to the east eliminates 4f impacts of the park and school on the west side of the current I-15 alignment. In addition to eliminating the 4f impact, the number of residential property impacts is reduced by eight. The potential of historic houses and 4f issues are avoided.

VE Recommendation Concept Sketch



Discussion of Schedule Impacts

Reducing the number of stages to construct the project reduces the construction duration.
Contingent on railroad agreeing to the acquisition.
Reduced design schedule by eliminating the 4f process.

Discussion of Risk Impacts

Increase risk on hazardous waste disposal.
Business are valued higher than $500,000.

Assumptions and Calculations

- Reduces number construction stages and construction duration.
- Savings of $2.3M (Seven houses @ $250,000 Each, One apartment building @ $500,000)
- Savings of $5M for relocating school
- Cost of $5M for relocating businesses (10 @ $500,000 Each)
- Cost of $500,000 removal of railroad tracks
- Reduced traffic control from 15% to 9% by eliminating the temporary control ($2.5M)

VE RECOMMENDATION: PURCHASE RAILROAD ROW	Idea Nos. 2

Cost Estimate

Project:	I-15/US20 Corridor Study		Computed:		Date:	11/30/19	
Subject:	Level 3 Cost Analysis		Checked:		Date:		
Task:	Alternatve C Construction Cost		Page:	1	of:	COST EST.	

Note: The following is a high level cost estimate developed on a rough order of magnitude for screening purposes only.

UNIT COSTS & ASSUMPTIONS:

Roadway Preliminary Costs (based on 2019 area average unit prices)

HMA=	$95	Ton	(Assume 148 pcf, computed as $190/CY)	Curb and Gutter =	$60	LF
Conc Pav =	$100	/SY	(Assume 9" thickness, computes to $400/CY)	Sidewalk =	$55	SY
3/4" Aggr =	$30	/Ton	(Assume 140 pcf, computes to $56.7/CY	Drainage =	10%	(Assumed % of Roadway)
Subbase =	$30	/CY		Traffic Control =	15%	(Assumed % of Roadway)
Granular Borrow =	$20	/CY		Incidental Items =	5%	(Assumed % of Roadway)
Excavation =	$20	/CY		Environmental =	7.5%	(Assumed % of Roadway)
Retaining Wall =	$60	/SF		Signing and Pav Mark =	5%	(Assumed % of Roadway)
Concrete Barrier =	$125	LF				

Preliminary costs are based on ITD's Bridge Manual, Section 16.1 for estimating prestressed girders

TUNNEL =	$30	/LF/SF	this cost is based off of ITDs stiffleg culvert cost, seems very high
PS =	$200	/SF	
ST =	$245	/SF	
PS RR =	$260	/SF	

Note: All lengths and widths measured in microstation models. Approximately 5' added to most lengths measured to account length to end of slab.

VE RECOMMENDATION: PURCHASE RAILROAD ROW	Idea Nos. 2

CONSTRUCTION COST ALTERNATIVE C						
ALTERNATIVE C ROADWAY ITEMS				QUANTITY	UNIT	
Roadway Excavation (Cut)				50000	CY	$1,000,000
Roadway Excavation (Fill/Borrow)				500000	CY	$10,000,000
Subbase				56916.17	CY	$1,707,000
3/4" Aggregate	43319.65	CY		81874.1385	Ton	$2,456,000
HMA	118709.94	CY		237182.4601	Ton	$22,532,000
Concrete Barrier				11612.11	LF	$1,452,000
Curb and Gutter				11861.39	LF	$712,000
Sidwalk				13864.42	SY	$763,000
Retaining Wall				45.09	SF	$3,000
Drainage				%		$4,063,000
Incidental Items				%		$2,031,000
Traffic Control				%		$3,656,000
Environmental Items				%		$3,047,000
Signing and Pavement Marking				%		$2,031,000
				Total Roadway Items		$55,453,000
ALTERNATIVE C STRUCTURE ITEMS	Length	Width	Type	Area		
I-15 NB/SB over Broadway	285	82	PS	23,370 SF		$4,674,000
NB I-15 Ramp near Broadway	450	36	PS	16,200 SF		$3,240,000
SB I-15 Ramp near Broadway	810	36	ST	29,160 SF		$7,144,200
I-15 over Grandview	160	94	ST	15,040 SF		$3,684,800
RR Tunnel	386	1000	TUNNEL	386,000 SF		$11,580,000
Lindsay St Tunnel	300	1292	TUNNEL	387,600 SF		$11,628,000
I-15 to US-20 EB Ramp over RR	115	36	PS RR	4,140 SF		$1,076,400
I-15 to US-20 EB Ramp over Linday	130	36	PS	4,680 SF		$936,000
US-20 to I-15 SB Ramp	1290	36	ST	46,440 SF		$11,377,800
I-15 to US-20 EB Ramp over Canal	110	36	PS	3,960 SF		$792,000
I-15 to US-20 EB Ramp over Snake	326	36	PS	11,736 SF		$2,347,200
John's Hole over Snake (14' Bike Included)	185	95	PS	17,575 SF		$3,515,000
US-20 to I-15 SB Ramp over Snake	215	36	ST	7,740 SF		$1,896,300
US-20 to I-15 SB Ramp over Canal	110	36	PS	3,960 SF		$792,000
I-15 to US-20 EB Ramp over Riverside	435	36	PS	15,660 SF		$3,132,000
US20 over Riverside Interchange (length assumed)	200	82	PS	16,400 SF		$3,280,000
US-20 to I-15 SB Ramp over Riverside	242	36	PS	8,712 SF		$1,742,400
New Crossing over Snake (14' Included)	510	62	PS	31,620 SF		$6,324,000
				Total Structure Items		$79,162,000
Construction Subtotal						***$134,615,000***
Mobilization (Assume percentage of Roadway and Structures Cost)				15%		$20,192,000
Construction Engineering and Inspection				10%		$13,462,000
Total Alternative Construction Cost						**$168,269,000**
Right of Way						
Total Number of Parcels Impacted (including condominium parcels)						207
Total Number of properties (condominium parcels as one property)						171
Total Number of Parcels Assessed over $1 million						10
Total Assessed Value of all impacted properties						$53,905,000
Impacted Value of Parcel (partial impact not including relocation of property)						$18,114,000
Impacted Value of Parcel (partial impact and includes relocation for impact to building with 15' of structure)						**$37,618,000**

Appendix C. Project Estimates

Project:	I-15/US20 Corridor Study	Computed:		Date:	11/30/19
Subject:	Level 3 Cost Analysis	Checked:		Date:	
Task:	Alternatve C Construction Cost	Page:	1	of:	COST EST.

Note: The following is a high level cost estimate developed on a rough order of magnitude for screening purposes only.

UNIT COSTS & ASSUMPTIONS:

Roadway Preliminary Costs (based on 2019 area average unit prices)

HMA=	$95	Ton	(Assume 148 pcf, computed as $190/CY)	Curb and Gutter =	$60	LF
Conc Pav =	$100	/SY	(Assume 9" thickness, computes to $400/CY)	Sidewalk =	$55	SY
3/4" Aggr =	$30	/Ton	(Assume 140 pcf, computes to $56.7/CY	Drainage =	10%	(Assumed % of Roadway)
Subbase =	$30	/CY		Traffic Control =	15%	(Assumed % of Roadway)
Granular Borrow =	$20	/CY		Incidental Items =	5%	(Assumed % of Roadway)
Excavation =	$20	/CY		Environmental =	7.5%	(Assumed % of Roadway)
Retaining Wall =	$60	/SF		Signing and Pav Mark =	5%	(Assumed % of Roadway)
Concrete Barrier =	$125	LF				

Preliminary costs are based on ITD's Bridge Manual, Section 16.1 for estimating prestressed girders

TUNNEL =	$30	/LF/SF	this cost is based off of ITDs stiffleg culvert cost, seems very high
PS =	$200	/SF	
ST =	$245	/SF	
PS RR =	$260	/SF	

Note: All lengths and widths measured in microstation models. Approximately 5' added to most lengths measured to account length to end of slab.

CONSTRUCTION COST ALTERNATIVE C

ALTERNATIVE C ROADWAY ITEMS			QUANTITY	UNIT	
Roadway Excavation (Cut)			50000	CY	$1,000,000
Roadway Excavation (Fill/Borrow)			500000	CY	$10,000,000
Subbase			56916.17	CY	$1,707,000
3/4" Aggregate	43319.65	CY	81874.1385	Ton	$2,456,000
HMA	118709.94	CY	237182.4601	Ton	$22,532,000
Concrete Barrier			11612.11	LF	$1,452,000
Curb and Gutter			11861.39	LF	$712,000
Sidwalk			13864.42	SY	$763,000
Retaining Wall			45.09	SF	$3,000
Drainage			%		$4,063,000
Incidental Items			%		$2,031,000
Traffic Control			%		$6,094,000
Environmental Items			%		$3,047,000
Signing and Pavement Marking			%		$2,031,000
			Total Roadway Items		$57,891,000

ALTERNATIVE C STRUCTURE ITEMS	Length	Width	Type	Area	
I-15 NB/SB over Broadway	285	82	PS	23,370 SF	$4,674,000
NB I-15 Ramp near Broadway	450	36	PS	16,200 SF	$3,240,000
SB I-15 Ramp near Broadway	810	36	ST	29,160 SF	$7,144,200
I-15 over Grandview	160	94	ST	15,040 SF	$3,684,800
RR Tunnel	386	1000	TUNNEL	386,000 SF	$11,580,000
Lindsay St Tunnel	300	1292	TUNNEL	387,600 SF	$11,628,000
I-15 to US-20 EB Ramp over RR	115	36	PS RR	4,140 SF	$1,076,400
I-15 to US-20 EB Ramp over Linday	130	36	PS	4,680 SF	$936,000
US-20 to I-15 SB Ramp	1290	36	ST	46,440 SF	$11,377,800
I-15 to US-20 EB Ramp over Canal	110	36	PS	3,960 SF	$792,000
I-15 to US-20 EB Ramp over Snake	326	36	PS	11,736 SF	$2,347,200
John's Hole over Snake (14' Bike Included)	185	95	PS	17,575 SF	$3,515,000
US-20 to I-15 SB Ramp over Snake	215	36	ST	7,740 SF	$1,896,300
US-20 to I-15 SB Ramp over Canal	110	36	PS	3,960 SF	$792,000
I-15 to US-20 EB Ramp over Riverside	435	36	PS	15,660 SF	$3,132,000
US20 over Riverside Interchange (length assumed)	200	82	PS	16,400 SF	$3,280,000
US-20 to I-15 SB Ramp over Riverside	242	36	PS	8,712 SF	$1,742,400
New Crossing over Snake (14' Included)	510	62	PS	31,620 SF	$6,324,000
			Total Structure Items		$79,162,000

Construction Subtotal			***$137,053,000***
Mobilization (Assume percentage of Roadway and Structures Cost)	15%		$20,558,000
Construction Engineering and Inspection	10%		$13,705,000
Total Alternative Construction Cost			**$171,316,000**

Right of Way	
Total Number of Parcels Impacted (including condominium parcels)	207
Total Number of properties (condominium parcels as one property)	171
Total Number of Parcels Assessed over $1 million	10
Total Assessed Value of all impacted properties	$53,905,000
Impacted Value of Parcel (partial impact not including relocation of property)	$18,114,000
Impacted Value of Parcel (partial impact and includes relocation for impact to building with 15' of structure)	**$40,118,000**

Project:	I-15/US20 Corridor Study	Computed:		Date:	11/30/19
Subject:	Level 3 Cost Analysis	Checked:		Date:	
Task:	Alternatve E.1 Construction Cost	Page:	1	of:	COST EST.

Note: The following is a high level cost estimate developed on a rough order of magnitude for screening purposes only.

UNIT COSTS & ASSUMPTIONS:

Roadway Preliminary Costs (based on 2019 area average unit prices)

HMA=	$95	Ton	(Assume 148 pcf, computed as $190/CY)	Curb and Gutter =	$60	LF
Conc Pav =	$100	/SY	(Assume 9" thickness, computes to $400/CY)	Sidewalk =	$55	SY
3/4" Aggr =	$30	/Ton	(Assume 140 pcf, computes to $56.7/CY	Drainage =	10%	(Assumed % of Roadway)
Subbase =	$30	/CY		Traffic Control =	15%	(Assumed % of Roadway)
Granular Borrow =	$20	/CY		Incidental Items =	5%	(Assumed % of Roadway)
Excavation =	$20	/CY		Environmental =	7.5%	(Assumed % of Roadway)
Retaining Wall =	$60	/SF		Signing and Pav Mark =	5%	(Assumed % of Roadway)
Concrete Barrier =	$125	LF				

Preliminary costs are based on ITD's Bridge Manual, Section 16.1 for estimating prestressed girders

TUNNEL =	$30	/LF/SF	this cost is based off of ITDs stiffleg culvert cost, seems very high
PS =	$200	/SF	
ST =	$245	/SF	
PS RR =	$260	/SF	

Note: All lengths and widths measured in microstation models. Approximately 5' added to most lengths measured to account length to end of slab.

CONSTRUCTION COST ALTERNATIVE E.1

ALTERNATIVE E.1 ROADWAY ITEMS			QUANTITY	UNIT	
Roadway Excavation (Cut)			50000	CY	$1,000,000
Roadway Excavation (Fill/Borrow)			500000	CY	$10,000,000
Subbase			182930.29	CY	$5,488,000
3/4" Aggregate	120760.53	CY	228237.4017	Ton	$6,847,000
HMA	81229.33	CY	162296.2013	Ton	$15,418,000
Concrete Barrier			12313.39	LF	$1,539,000
Curb and Gutter			44446.4	LF	$2,667,000
Sidwalk			38921.74	SY	$2,141,000
Retaining Wall			0	SF	$0
Drainage			%		$4,510,000
Incidental Items			%		$2,255,000
Traffic Control			%		$6,765,000
Environmental Items			%		$3,382,500
Signing and Pavement Marking			%		$2,255,000
			Total Roadway Items		$64,267,500

ALTERNATIVE E - OPTION 1	Length	Width	Type	Area	
I-15 NB/SB over Broadway	376	102	PS	38,352 SF	$7,670,400
Grandview over I-15 (14' included)	306	90	PS	27,540 SF	$5,508,000
John's Hole over Snake Ped Widening (14')	185	14	PS	2,590 SF	$518,000
I-15 NB Ramp to EB US20 over RR	1085	36	ST	39,060 SF	$9,569,700
WB US20 Ramp to SB I-15 over RR	1105	36	ST	39,780 SF	$9,746,100
I-15 NB Ramp to EB US20 over Snake	685	36	ST	24,660 SF	$6,041,700
WB US20 Ramp to SB I-15 over Snake	965	36	ST	34,740 SF	$8,511,300
Realigned Olympia St. over I-15	255	64	PS	16,320 SF	$3,264,000
Realigned Olympia St. over Canal	175	86	PS	15,050 SF	$3,010,000
Realigned Olympia St. over Snake	405	86	PS	34,830 SF	$6,966,000
Riverside over Olympa St.	190	76	PS	14,440 SF	$2,888,000
			Total Structure Items		$63,693,200

Construction Subtotal			$127,961,000
Mobilization (Assume percentage of Roadway and Structures Cost)	15%		$19,194,000
Construction Engineering and Inspection	10%		$12,796,000
Total Alternative Construction Cost			**$159,951,000**

Right of Way	
Total Number of Parcels Impacted (including condominium parcels)	209
Total Number of properties (condominium parcels as one property)	174
Total Number of Parcels Assessed over $1 million	9
Total Assessed Value of all impacted properties	$40,717,000
Impacted Value of Parcel (partial impact not including relocation of property)	$17,792,000
Impacted Value of Parcel (partial impact and includes relocation for impact to building with 15' of structure)	**$28,473,000**

Project:	I-15/US20 Corridor Study	Computed:		Date:	11/30/19
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Task:	Alternatve E.2 Construction Cost	Page:	1	of:	COST EST.

Note: The following is a high level cost estimate developed on a rough order of magnitude for screening purposes only.

UNIT COSTS & ASSUMPTIONS:

Roadway Preliminary Costs (based on 2019 area average unit prices)

HMA=	$95	Ton	(Assume 148 pcf, computed as $190/CY)	Curb and Gutter =	$60	LF
Conc Pav =	$100	/SY	(Assume 9" thickness, computes to $400/CY)	Sidewalk =	$55	SY
3/4" Aggr =	$30	/Ton	(Assume 140 pcf, computes to $56.7/CY	Drainage =	10%	(Assumed % of Roadway)
Subbase =	$30	/CY		Traffic Control =	15%	(Assumed % of Roadway)
Granular Borrow =	$20	/CY		Incidental Items =	5%	(Assumed % of Roadway)
Excavation =	$20	/CY		Environmental =	7.5%	(Assumed % of Roadway)
Retaining Wall =	$60	/SF		Signing and Pav Mark =	5%	(Assumed % of Roadway)
Concrete Barrier =	$125	LF				

Preliminary costs are based on ITD's Bridge Manual, Section 16.1 for estimating prestressed girders

TUNNEL =	$30	/LF/SF	this cost is based off of ITDs stiffleg culvert cost, seems very high
PS =	$200	/SF	
ST =	$245	/SF	
PS RR =	$260	/SF	

Note: All lengths and widths measured in microstation models. Approximately 5' added to most lengths measured to accoun length to end of slab.

CONSTRUCTION COST ALTERNATIVE E.2

ALTERNATIVE E.1 ROADWAY ITEMS			QUANTITY	UNIT	
Roadway Excavation (Cut)			50000	CY	$1,000,000
Roadway Excavation (Fill/Borrow)			500000	CY	$10,000,000
Subbase			126439.33	CY	$3,793,000
3/4" Aggregate	84953.84	CY	160562.7576	Ton	$4,817,000
HMA	61722	CY	123320.556	Ton	$11,715,000
Concrete Barrier			11779.68	LF	$1,472,000
Curb and Gutter			24370	LF	$1,462,000
Sidwalk			19948.3	SY	$1,097,000
Retaining Wall			0	SF	$0
Drainage			%		$3,536,000
Incidental Items			%		$1,768,000
Traffic Control			%		$5,303,000
Environmental Items			%		$2,652,000
Signing and Pavement Marking			%		$1,768,000
			Total Roadway Items		$50,383,000

ALTERNATIVE E - OPTION 2	Length	Width	Type	Area	
I-15 NB/SB over Broadway	376	102	PS	38,352 SF	$7,670,400
Grandview over I-15 (14' included)	200	96	PS	19,200 SF	$3,840,000
U20 WB ramp to I-15 SB Ramp over Grandview	160	36	PS	5,760 SF	$1,152,000
I-15 NB Ramp to EB US20 over RR	430	36	PS RR	15,480 SF	$4,024,800
WB US20 Ramp to SB I-15 over RR	1920	36	ST	69,120 SF	$16,934,400
I-15 NB Ramp to EB US20 over Snake (ASSUMED LENGTH)	565	36	ST	20,340 SF	$4,983,300
WB US20 Ramp to SB I-15 over Snake	565	36	ST	20,340 SF	$4,983,300
Realigned Olympia St. over I-15	205	82	PS	16,810 SF	$3,362,000
Realigned Olympia St. over Canal	175	82	PS	14,350 SF	$2,870,000
Realigned Olympia St. over Snake	405	82	PS	33,210 SF	$6,642,000
Realigned Olympia St. over Riverside	145	82	PS	11,890 SF	$2,378,000
I-15 NB Ramp to EB US20 over Riverside	215	36	PS	7,740 SF	$1,548,000
New US20 WB Exit ramp over Riverside	135	22	PS	2,970 SF	$594,000
I-15 NB Ramp to EB US20 over new Alignment	795	36	ST	28,620 SF	$7,011,900
US20 EB Exit to Local Road over new Alignment	105	22	PS	2,310 SF	$462,000
Grandview over Snake (14' included)	405	96	PS	38,880 SF	$7,776,000
US20 WB Exit to Local Road over new Alignment	125	22	PS	2,750 SF	$550,000
US20 over Science Center	160	66	PS	10,560 SF	$2,112,000
US20 EB Ramp over Science Center	165	36	PS	5,940 SF	$1,188,000
US20 WB Ramp over Science Center	150	28	PS	4,200 SF	$840,000
			Total Structure Items		$80,922,100

Construction Subtotal			***$131,305,100***
Mobilization (Assume percentage of Roadway and Structures Cost)	15%		$19,696,000
Construction Engineering and Inspection	10%		$13,131,000
Total Alternative Construction Cost			**$164,132,100**

Right of Way	
Total Number of Parcels Impacted (including condominium parcels)	254
Total Number of properties (condominium parcels as one property)	196
Total Number of Parcels Assessed over $1 million	7
Total Assessed Value of all impacted properties	$42,882,000
Impacted Value of Parcel (partial impact not including relocation of property)	$20,215,000
Impacted Value of Parcel (partial impact and includes relocation for impact to building with 15' of structure)	**$36,077,000**

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Note: The following is a high level cost estimate developed on a rough order of magnitude for screening purposes only.

UNIT COSTS & ASSUMPTIONS:

Roadway Preliminary Costs (based on 2019 area average unit prices)

HMA=	$95	Ton	(Assume 148 pcf, computed as $190/CY)	Curb and Gutter =	$60	LF	
Conc Pav =	$100	/SY	(Assume 9" thickness, computes to $400/CY)	Sidewalk =	$55	SY	
3/4" Aggr =	$30	/Ton	(Assume 140 pcf, computes to $56.7/CY	Drainage =	10%	(Assumed % of Roadway)	
Subbase =	$30	/CY		Traffic Control =	15%	(Assumed % of Roadway)	
Granular Borrow =	$20	/CY		Incidental Items =	5%	(Assumed % of Roadway)	
Excavation =	$20	/CY		Environmental =	7.5%	(Assumed % of Roadway)	
Retaining Wall =	$60	/SF		Signing and Pav Mark =	5%	(Assumed % of Roadway)	
Concrete Barrier =	$125	LF					

Preliminary costs are based on ITD's Bridge Manual, Section 16.1 for estimating prestressed girders

TUNNEL =	$30	/LF/SF	this cost is based off of ITDs stiffleg culvert cost, seems very high
PS =	$200	/SF	
ST =	$245	/SF	
PS RR =	$260	/SF	

Note: All lengths and widths measured in microstation models. Approximately 5' added to most lengths measured to account length to end of slab.

COST BREAKDOWN PER ALTERNATIVE

ALTERNATIVE E.1 ROADWAY ITEMS			QUANTITY	UNIT	
Roadway Excavation (Cut)			50000	CY	$1,000,000
Roadway Excavation (Fill/Borrow)			800000	CY	$16,000,000
Subbase			182373	CY	$5,471,000
3/4" Aggregate	120602	CY	227937.78	Ton	$6,838,000
HMA	187111	CY	373847.778	Ton	$35,516,000
Concrete Barrier			26320	LF	$3,290,000
Curb and Gutter				LF	$0
Sidwalk				SY	$0
Retaining Wall				SF	$0
Drainage			%		$6,812,000
Incidental Items			%		$3,406,000
Traffic Control			%		$10,217,000
Environmental Items			%		$5,109,000
Signing and Pavement Marking			%		$3,406,000
			Total Roadway Items		$97,065,000

ALTERNATIVE H	Length	Width	Type	Area	
SB I-15 TO EB US20 CURVED RAMP	2900	36	ST	104,400 SF	$25,578,000
WB US20 to NB I-15 CURVED RAMP	900	36	ST	32,400 SF	$7,938,000
WB US20 to SB I-15 CURVED RAMP/SNAKE	3600	36	ST	129,600 SF	$31,752,000
NB I-15 TO EB US20 CURVED RAMP/SNAKE	2900	36	ST	104,400 SF	$25,578,000
US20 over East River Road	120	72	PS	8,640 SF	$1,728,000
US20 over N 5th St.	365	72	PS	26,280 SF	$5,256,000
US20 over New Interchange	365	72	PS	26,280 SF	$5,256,000
US20 over N 15th.	95	72	PS	6,840 SF	$1,368,000
John's Hole over Snake Ped Widening (14')	185	14	PS	2,590 SF	$518,000
			Total Structure Items		$104,972,000

Construction Subtotal			***$202,037,000***
Mobilization (Assume percentage of Roadway and Structures Cost)	15%		$30,306,000
Construction Engineering and Inspection	10%		$20,204,000
Total Alternative Construction Cost			**$252,547,000**

Right of Way	
Total Number of Parcels Impacted (including condominium parcels)	165
Total Number of properties (condominium parcels as one property)	138
Total Number of Parcels Assessed over $1 million	9
Total Assessed Value of all impacted properties	$35,730,000
Impacted Value of Parcel (partial impact not including relocation of property)	$9,289,000
Impacted Value of Parcel (partial impact and includes relocation for impact to building with 15' of structure)	**$16,039,000**

Project:	I-15/US20 Corridor Study	Computed:		Date:	11/30/19
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Task:	Alternative C - Option 3 Construction Cost	Page:	1	of:	COST EST.

Note: The following is a high level cost estimate developed on a rough order of magnitude for screening purposes only.

UNIT COSTS & ASSUMPTIONS:

Roadway Preliminary Costs (based on 2019 area average unit prices)

HMA=	$95	Ton	(Assume 148 pcf, computed as $190/CY)	Curb and Gutter =	$60	LF
Conc Pav =	$100	/SY	(Assume 9" thickness, computes to $400/CY)	Sidewalk =	$55	SY
3/4" Aggr =	$30	/Ton	(Assume 140 pcf, computes to $56.7/CY	Drainage =	10%	(Assumed % of Roadway)
Subbase =	$30	/CY		Traffic Control =	15%	(Assumed % of Roadway)
Granular Borrow =	$20	/CY		Incidental Items =	5%	(Assumed % of Roadway)
Excavation =	$20	/CY		Environmental =	7.5%	(Assumed % of Roadway)
Retaining Wall =	$60	/SF		Signing and Pav Mark =	5%	(Assumed % of Roadway)
Concrete Barrier =	$125	LF				

Preliminary costs are based on ITD's Bridge Manual, Section 16.1 for estimating prestressed girders

TUNNEL =	$30	/LF/SF	this cost is based off of ITDs stiffleg culvert cost, seems very high
PS =	$200	/SF	
ST =	$245	/SF	
PS RR =	$260	/SF	

Note: All lengths and widths measured in microstation models. Approximately 5' added to most lengths measured to account length to end of slab.

CONSTRUCTION COST ALTERNATIVE C

ALTERNATIVE C ROADWAY ITEMS			QUANTITY	UNIT	
Roadway Excavation (Cut)			50000	CY	$1,000,000
Roadway Excavation (Fill/Borrow)			250000	CY	$5,000,000
Subbase			56916.17	CY	$1,707,000
3/4" Aggregate	43319.65	CY	81874.1385	Ton	$2,456,000
HMA	100000	CY	199800	Ton	$18,981,000
Concrete Barrier			11612.11	LF	$1,452,000
Curb and Gutter			11861.39	LF	$712,000
Sidwalk			13864.42	SY	$763,000
Retaining Wall			45.09	SF	$3,000
Drainage			%		$3,207,000
Incidental Items			%		$1,604,000
Traffic Control			%		$4,811,000
Environmental Items			%		$2,406,000
Signing and Pavement Marking			%		$1,604,000
			Total Roadway Items		$45,706,000

ALTERNATIVE C STRUCTURE ITEMS	Length	Width	Type	Area	
I-15 NB/SB over Broadway	285	82	PS	23,370 SF	$4,674,000
NB I-15 Ramp near Broadway	450	36	PS	16,200 SF	
SB I-15 Ramp near Broadway	810	36	ST	29,160 SF	
I-15 over Grandview	160	94	ST	15,040 SF	$3,684,800
RR Tunnel	386	1000	TUNNEL	386,000 SF	
Lindsay St Tunnel	152	1292	TUNNEL	196,384 SF	$3,400,000
I-15 to US-20 EB Ramp over RR	115	36	PS RR	4,140 SF	$1,076,400
I-15 to US-20 EB Ramp over Linday	130	36	PS	4,680 SF	$936,000
US-20 to I-15 SB Ramp	1290	36	ST	46,440 SF	$11,377,800
I-15 to US-20 EB Ramp over Canal	110	36	PS	3,960 SF	$792,000
I-15 to US-20 EB Ramp over Snake	326	36	PS	11,736 SF	$2,347,200
John's Hole over Snake (14' Bike Included)	185	95	PS	17,575 SF	$3,515,000
US-20 to I-15 SB Ramp over Snake	215	36	ST	7,740 SF	$1,896,300
US-20 to I-15 SB Ramp over Canal	110	36	PS	3,960 SF	$792,000
I-15 to US-20 EB Ramp over Riverside	435	36	PS	15,660 SF	
US20 over Riverside Interchange (length assumed)	200	82	PS	16,400 SF	$3,280,000
US 20 EB Braided Ramp Structure	242	36	PS	8,712 SF	$1,100,000
New Crossing over Snake (14' Included)	510	62	PS	31,620 SF	$5,304,000
			Total Structure Items		$44,176,000

Construction Subtotal			***$89,882,000***
Mobilization (Assume percentage of Roadway and Structures Cost)	15%		$13,482,000
Construction Engineering and Inspection	10%		$8,988,000
Total Alternative Construction Cost			**$112,352,000**

Right of Way	
Total Number of Parcels Impacted (including condominium parcels)	207
Total Number of properties (condominium parcels as one property)	171
Total Number of Parcels Assessed over $1 million	10
Total Assessed Value of all impacted properties	$49,405,000
Impacted Value of Parcel (partial impact not including relocation of property)	$18,114,000
Impacted Value of Parcel (partial impact and includes relocation for impact to building with 15' of structure)	**$40,118,000**

Alternative E – Option 3 (developed in CRAVE workshop)

Project:	I-15/US20 Corridor Study	Computed:		Date:	12/11/19
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Note: The following is a high level cost estimate developed on a rough order of magnitude for screening purposes only.

UNIT COSTS & ASSUMPTIONS:

Roadway Preliminary Costs (based on 2019 area average unit prices)

HMA=	$95	Ton	(Assume 148 pcf, computed as $190/CY)	Curb and Gutter =	$60	LF
Conc Pav =	$100	/SY	(Assume 9" thickness, computes to $400/CY)	Sidewalk =	$55	SY
3/4" Aggr =	$30	/Ton	(Assume 140 pcf, computes to $56.7/CY	Drainage =	10%	(Assumed % of Roadway)
Subbase =	$30	/CY		Traffic Control =	15%	(Assumed % of Roadway)
Granular Borrow =	$20	/CY		Incidental Items =	5%	(Assumed % of Roadway)
Excavation =	$20	/CY		Environmental =	7.5%	(Assumed % of Roadway)
Retaining Wall =	$60	/SF		Signing and Pav Mark =	5%	(Assumed % of Roadway)
Concrete Barrier =	$125	LF				

Preliminary costs are based on ITD's Bridge Manual, Section 16.1 for estimating prestressed girders

TUNNEL =	$30	/LF/SF	this cost is based off of ITDs stiffleg culvert cost, seems very high
PS =	$200	/SF	
ST =	$245	/SF	
PS RR =	$260	/SF	

Note: All lengths and widths measured in microstation models. Approximately 5' added to most lengths measured to account length to end of slab.

CONSTRUCTION COST ALTERNATIVE E.2

ALTERNATIVE E.3 ROADWAY ITEMS			QUANTITY	UNIT	
Roadway Excavation (Cut)			50000	CY	$1,000,000
Roadway Excavation (Fill/Borrow)			550000	CY	$11,000,000
Subbase			85000	CY	$2,550,000
3/4" Aggregate	60000	CY	113400	Ton	$3,402,000
HMA	40000	CY	79920	Ton	$7,592,000
Concrete Barrier			5600	LF	$700,000
Curb and Gutter			15000	LF	$900,000
Sidwalk			12599	SY	$693,000
Retaining Wall			20000	SF	$1,200,000
Drainage			%		$2,904,000
Incidental Items			%		$1,452,000
Traffic Control			%		$4,356,000
Environmental Items			%		$2,178,000
Signing and Pavement Marking			%		$1,452,000
			Total Roadway Items		$41,379,000

ALTERNATIVE E - OPTION 3	Length	Width	Type	Area	
I-15 NB/SB over Broadway	376	0	PS	SF	$0
Grandview over I-15 (14' included)	300	96	PSDBT	28,800 SF	$7,488,000
U20 WB ramp to I-15 SB Ramp over Grandview	160	0	PS	SF	$0
I-15 NB Ramp to EB US20 over RR	550	36	PS RR	19,800 SF	$5,148,000
WB US20 Ramp to SB I-15 over RR	1920	36	ST	69,120 SF	$16,934,400
I-15 NB Ramp to EB US20 over Snake (ASSUMED LENGTH)	565	0	ST	SF	$0
WB US20 Ramp to SB I-15 over Snake	565	0	ST	SF	$0
Realigned Olympia St. over I-15	217	82	PS	17,794 SF	$3,558,800
Realigned Olympia St. over Canal	175	82	PS	14,350 SF	$2,870,000
Realigned Olympia St. over Snake	350	150	PS	52,500 SF	$10,500,000
Realigned Olympia St. over Riverside	145	82	PS	11,890 SF	$2,378,000
I-15 NB Ramp to EB US20 over Riverside	215	0	PS	SF	$0
New US20 WB Exit ramp over Riverside	135	0	PS	SF	$0
I-15 NB Ramp to EB US20 over new Alignment	795	0	ST	SF	$0
US20 EB Exit to Local Road over new Alignment	105	0	PS	SF	$0
Grandview over Snake (14' included for pedestrian)	250	14	PSDBT	3,500 SF	$910,000
US20 WB Exit to Local Road over new Alignment (braid)	125	36	PS	4,500 SF	$900,000
US20 over Science Center (Widen for lane development)	270	36	PS	9,720 SF	$1,944,000
US20 EB Ramp over Science Center	165	0	PS	SF	$0
US20 WB Ramp over Science Center	150	0	PS	SF	$0
Olympia over Lindsay	100	85	PS	8,500 SF	$0
Grandview over Canal pedestrian widening	75	14	PS	1,050 SF	$0
			Total Structure Items		$52,631,200
Construction Subtotal					***$94,010,200***
Mobilization (Assume percentage of Roadway and Structures Cost)			15%		$14,102,000
Construction Engineering and Inspection			10%		$9,401,000
Total Alternative Construction Cost					**$117,513,200**

Right of Way	
Total Number of Parcels Impacted (including condominium parcels)	
Total Number of properties (condominium parcels as one property)	
Total Number of Parcels Assessed over $1 million	6
Total Assessed Value of all impacted properties	$28,549,000
Impacted Value of Parcel (partial impact not including relocation of property)	$9,800,000
Impacted Value of Parcel (partial impact and includes relocation for impact to building with 15' of structure)	**$22,220,000**

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Note: The following is a high level cost estimate developed on a rough order of magnitude for screening purposes only.

UNIT COSTS & ASSUMPTIONS:

Roadway Preliminary Costs (based on 2019 area average unit prices)

HMA=	$95	Ton	(Assume 148 pcf, computed as $190/CY)	Curb and Gutter =	$60	LF
Conc Pav =	$100	/SY	(Assume 9" thickness, computes to $400/CY)	Sidewalk =	$55	SY
3/4" Aggr =	$30	/Ton	(Assume 140 pcf, computes to $56.7/CY	Drainage =	10%	(Assumed % of Roadway)
Subbase =	$30	/CY		Traffic Control =	15%	(Assumed % of Roadway)
Granular Borrow =	$20	/CY		Incidental Items =	5%	(Assumed % of Roadway)
Excavation =	$20	/CY		Environmental =	10.0%	(Assumed % of Roadway)
Retaining Wall =	$60	/SF		Signing and Pav Mark =	5%	(Assumed % of Roadway)
Concrete Barrier =	$125	LF				

Preliminary costs are based on ITD's Bridge Manual, Section 16.1 for estimating prestressed girders

TUNNEL =	$30	/LF/SF	this cost is based off of ITDs stiffleg culvert cost, seems very high
PS =	$200	/SF	
ST =	$245	/SF	
PS RR =	$260	/SF	

Note: All lengths and widths measured in microstation models. Approximately 5' added to most lengths measured to account length to end of slab.

COST BREAKDOWN PER ALTERNATIVE

ALTERNATIVE E.1 ROADWAY ITEMS			QUANTITY	UNIT	
Roadway Excavation (Cut)			115000	CY	$2,300,000
Roadway Excavation (Fill/Borrow)			840000	CY	$16,800,000
Subbase			182373	CY	$5,471,000
3/4" Aggregate	120602	CY	227937.78	Ton	$6,838,000
HMA	187111	CY	373847.778	Ton	$35,516,000
Concrete Barrier			26320	LF	$3,290,000
Curb and Gutter				LF	$0
Sidwalk				SY	$0
Retaining Wall				SF	$0
Drainage			%		$7,022,000
Incidental Items			%		$3,511,000
Traffic Control			%		$10,532,000
Environmental Items			%		$5,266,000
Signing and Pavement Marking			%		$3,511,000
			Total Roadway Items		$100,057,000

ALTERNATIVE H	Length	Width	Type	Area	
SB I-15 TO EB US20 CURVED RAMP	2900	36	ST	104,400 SF	$10,290,000
WB US20 to NB I-15 CURVED RAMP	900	36	ST	32,400 SF	$6,468,000
WB US20 to SB I-15 CURVED RAMP/SNAKE	3600	36	ST	129,600 SF	$16,758,000
NB I-15 TO EB US20 CURVED RAMP/SNAKE	2900	36	ST	104,400 SF	$11,466,000
US20 over East River Road	120	72	PS	8,640 SF	$1,728,000
US20 over N 5th St.	365	72	PS	26,280 SF	$5,256,000
US20 over New Interchange	365	72	PS	26,280 SF	$5,256,000
US20 over N 15th.	95	72	PS	6,840 SF	$1,368,000
John's Hole over Snake Ped Widening (14')	185	14	PS	2,590 SF	$518,000
			Total Structure Items		$59,108,000

Construction Subtotal			***$159,165,000***
Mobilization (Assume percentage of Roadway and Structures Cost)	15%		$23,875,000
Construction Engineering and Inspection	10%		$15,917,000
Total Alternative Construction Cost			**$198,957,000**

Right of Way	
Total Number of Parcels Impacted (including condominium parcels)	165
Total Number of properties (condominium parcels as one property)	138
Total Number of Parcels Assessed over $1 million	9
Total Assessed Value of all impacted properties	$35,730,000
Impacted Value of Parcel (partial impact not including relocation of property)	$9,289,000
Impacted Value of Parcel (partial impact and includes relocation for impact to building with 15' of structure)	**$16,039,000**

Appendix D. Risk Analysis Sheets

Project	Alternative C	Risk ID	CNS 10.01

Construction duration

Pre-Response Quantification

Probability	Low	Most Likely	High	Risk Status	Activity Impacted	
1%				Active	Construction	
Cost ($M)				Critical Path?	EV Cost	EV Sched
Schedule (Mo)	0.10 Mo.	0.10 Mo.	0.10 Mo.		$0.00 M	0.00 Mo.

12/9/2019 Update: Assume two seasons to construct SPUI (or DDI), three packages totaling a 6 season construction.

With these options being extensive and doing construction while continuing to let traffic through. The pace of construction may be slow needing to plan for phasing. Construction could extend into multiple years. Decide how to break project up into phasing and planning for multi-year work.

Post-Response Quantification

Probability	Low	Most Likely	High	Risk Status	Risk Owner	
75%				Active	Consultant PM	
Cost ($M)				Strategy	EV Cost	EV Sched
Schedule (Mo)	-12.00 Mo.	-9.00 Mo.	-6.00 Mo.		$0.00 M	-6.75 Mo.
Cost to Mitigate						

Alternative C.3 may save a construction season, acquiring the rail line will allow that. 18 structures down to 11.

Project	Alternative C	Risk ID	CNS 10.02

Additional traffic control

Pre-Response Quantification

Probability	Low	Most Likely	High	Risk Status	Activity Impacted	
75%				Active	Construction	
Cost ($M)	$4.00 M	$6.00 M	$12.00 M	Critical Path?	EV Cost	EV Sched
Schedule (Mo)					$5.00 M	0.00 Mo.

The baseline estimate assumes approximately $6M, for Alternative C this is low. $2M for incidentals.

Post-Response Quantification

Probability	Low	Most Likely	High	Risk Status	Risk Owner	
75%				Active		
Cost ($M)	$4.00 M	$6.00 M	$12.00 M	Strategy	EV Cost	EV Sched
Schedule (Mo)					$5.00 M	0.00 Mo.
Cost to Mitigate						

Alternative C.3 will simplify TC in some areas but complicate in others, therefore may not overall make a difference.

Project	Alternative C	Risk ID	DES 50.01

Illumination

Pre-Response Quantification

Probability	Low	Most Likely	High	Risk Status	Activity Impacted	
100%				Active	Construction	
Cost ($M)	$3.00 M	$4.00 M	$5.00 M	Critical Path?	EV Cost	EV Sched
Schedule (Mo)					$4.00 M	0.00 Mo.

Currently the base estimate does not include illumination, assume an additional $3M-$5M based on recent projects in the area. Calculation based on % total base construction cost.

Post-Response Quantification

Probability	Low	Most Likely	High	Risk Status	Risk Owner	
100%				Active		
Cost ($M)	$3.00 M	$4.00 M	$5.00 M	Strategy	EV Cost	EV Sched
Schedule (Mo)					$4.00 M	0.00 Mo.
Cost to Mitigate						

Alternative C.3 increases the number of intersections but reduces the number of access points along the highway.

Project	Alternative C	Risk ID	DES 900.01

Ped Bike

Pre-Response Quantification

Probability	Low	Most Likely	High	Risk Status	Activity Impacted	
				Retired		
Cost ($M)				Critical Path?	EV Cost	EV Sched
Schedule (Mo)					$0.00 M	0.00 Mo.

12/9/2019 Update: Assume two-way bike lane on one side of the river totaling $518,000. Not including connectivity to local streets, bike lane widths, etc. Retire this risk at this time.

With 3 levels of traffic, no bike/ped facilities on upper levels? Not shown on lower? Will need to add connectivity, possibly either elevated ped structures or tunnels with I-15 and Railroad.

Post-Response Quantification

Probability	Low	Most Likely	High	Risk Status	Risk Owner	
					Consultant PM	
Cost ($M)				Strategy	EV Cost	EV Sched
Schedule (Mo)					$0.00 M	0.00 Mo.
Cost to Mitigate						

Project	Alternative C	Risk ID	DES 900.02

Additional river crossings

Pre-Response Quantification

Probability	Low	Most Likely	High	Risk Status	Activity Impacted	
50%				Active	Construction	
Cost ($M)	$5.00 M	$6.30 M	$7.00 M	Critical Path?	EV Cost	EV Sched
Schedule (Mo)					$3.10 M	0.00 Mo.

12/9/2019 Update: Current design at LOS E for Broadway crossing.

Additional river crossings will require extensive environmental documentation. Additional time to acquire environmental clearances, possibly could affect permitting to be individual permit vs. a nationwide

Post-Response Quantification

Probability	Low	Most Likely	High	Risk Status	Risk Owner	
50%				Retired	Consultant Design Lead	
Cost ($M)	$5.00 M	$6.30 M	$7.00 M	Strategy	EV Cost	EV Sched
Schedule (Mo)					$0.00 M	0.00 Mo.
Cost to Mitigate						

Alternative C.3 may eliminate the need for additional crossings.

Project	Alternative C	Risk ID	ENV 10.01

Section 4(f) impacts (public parks, recreation areas, and historical properties)

Pre-Response Quantification

Probability	Low	Most Likely	High	Risk Status	Activity Impacted	
50%				Active	Right-of-Way	
Cost ($M)	$0.50 M	$1.00 M	$1.50 M	Critical Path?	EV Cost	EV Sched
Schedule (Mo)					$0.50 M	0.00 Mo.

12/9/2019 Update: ROW costs and displacements included in current estimate. Impacts now known, but not quantified.

Section 4(f) requires transportation projects to avoid impacts or "takes" of public parks, recreation areas and/or National Historic Eligible properties. This regulation requires transportation agencies to select feasible alternatives that avoid "takes". The alternatives under consideration show "takes" to 3 certain 4(f) properties; Temple View Elementary School and Antares Park (west of I-15 between Broadway and Grandview) and Russ Freeman Park (east side of the River north of US 20). There are potentially several National Historic Eligible properties in the residential areas, irrigation and transportation systems. The risk to the project is correctly identifying the unknown historic properties and then balancing impacts to this resource with other completing issues. Increase in preliminary engineering for documentation and analysis of impacts and alternatives.
Extensive analysis must be done to consider alternatives that avoid the 4(f) properties (very high bar to get over) In almost all cases, if there is a viable alternative that avoids the impacts and meets the project purpose and need, it must be selected. Significant time to complete NEPA discipline report, must spend more time considering avoidance alternatives

Post-Response Quantification

Probability	Low	Most Likely	High	Risk Status	Risk Owner	
50%				Active	Consultant Environmental Lead	
Cost ($M)	$0.10 M	$0.20 M	$0.30 M	Strategy	EV Cost	EV Sched
Schedule (Mo)					$0.10 M	0.00 Mo.
Cost to Mitigate						

Alternative C.3 reduces 4(f) impacts along the west side of I-15 by avoiding the school and other impacts. If the railroad is deemed historic, mitigation is an option.

Start 4(f) mitigation early.

Project	Alternative C	Risk ID	ENV 50.01

Hazardous material issues

Pre-Response Quantification

Probability	Low	Most Likely	High	Risk Status	Activity Impacted	
75%				Active	Construction	
Cost ($M)	$0.50 M	$1.50 M	$2.00 M	Critical Path?	EV Cost	EV Sched
Schedule (Mo)	1.00 Mo.	2.00 Mo.	3.00 Mo.	Yes	$1.06 M	1.50 Mo.

12/9/2019 Update: No change at this time.

Potential displacements can lead to lead paint and asbestos issues in older homes and businesses Home and business displacements will potentially require lead paint and asbestos investigation and removal prior to demolition Phase I and Phase II efforts may be required on older buildings

Post-Response Quantification

Probability	Low	Most Likely	High	Risk Status	Risk Owner	
95%				Active	Consultant Environmental Lead	
Cost ($M)	$0.50 M	$1.50 M	$2.00 M	Strategy	EV Cost	EV Sched
Schedule (Mo)	1.00 Mo.	2.00 Mo.	3.00 Mo.	Transfer	$1.35 M	1.90 Mo.
Cost to Mitigate						

Higher probability from 75% to 95% by buying the railroad. Increases certainty.

Transfer risk to contractor.

Project	Alternative C	Risk ID	ENV 50.02

Hazardous materials - LUST

Pre-Response Quantification

Probability	Low	Most Likely	High	Risk Status	Activity Impacted	
50%				Active	Construction	
Cost ($M)	$0.25 M	$0.50 M	$1.00 M	Critical Path?	EV Cost	EV Sched
Schedule (Mo)	1.00 Mo.	2.00 Mo.	3.00 Mo.	Yes	$0.27 M	1.00 Mo.

12/9/2019 Update: Locations have now been identified.

Alternative C will impact LUST (leaking underground storage tank) at SW corner of Broadway Intch

Note: accounts only for agency-listed LUST and RCRA sites; additional areas may be present Hazardous materials may be present in industrial and commercial areas near the project corridor. Hazardous materials encountered during construction may require hauling of excavated materials to approved disposal sites. Additional costs can arise from hauling, disposal, and sampling analyses. Encountering unexpected hazardous materials can temporarily delay construction. In addition, investigations and negotiations with landowners and responsible parties over costs associated with discovered contamination can be time consuming.

Post-Response Quantification

Probability	Low	Most Likely	High	Risk Status	Risk Owner	
50%				Active	Consultant Environmental Lead	
Cost ($M)	$0.25 M	$0.50 M	$1.00 M	Strategy	EV Cost	EV Sched
Schedule (Mo)	1.00 Mo.	2.00 Mo.	3.00 Mo.	Transfer	$0.27 M	1.00 Mo.
Cost to Mitigate						

Transfer this risk to the contractor.

Project	Alternative C	Risk ID	ENV 50.03

Hazardous materials - Industrial

Pre-Response Quantification

Probability	Low	Most Likely	High	Risk Status	Activity Impacted	
50%				Active	Construction	
Cost ($M)	$0.25 M	$0.50 M	$1.00 M	Critical Path?	EV Cost	EV Sched
Schedule (Mo)	1.00 Mo.	2.00 Mo.	3.00 Mo.	Yes	$0.27 M	1.00 Mo.

Some of the light industrial businesses along Lindsay Blvd (including a gas station) have the potential to contain contaminated soils. Review of existing HM records with EPA and DEQ show no known sites. Increased costs for NEPA for any Phase I HM investigations.
Construction costs will increase if contaminated soils are found. Increase time to complete NEPA discipline report.

Post-Response Quantification

Probability	Low	Most Likely	High	Risk Status	Risk Owner	
50%				Active	Consultant Environmental Lead	
Cost ($M)	$0.25 M	$0.50 M	$1.00 M	Strategy	EV Cost	EV Sched
Schedule (Mo)	1.00 Mo.	2.00 Mo.	3.00 Mo.		$0.27 M	1.00 Mo.
Cost to Mitigate						

Project	Alternative C	Risk ID	ENV 60.01

Wetland mitigation

Pre-Response Quantification

Probability	Low	Most Likely	High	Risk Status	Activity Impacted	
				Active		
Cost ($M)				Critical Path?	EV Cost	EV Sched
Schedule (Mo)					$0.00 M	0.00 Mo.

12/9/2019 Update: Higham St has minimal mitigation requirements. Watchlist at this time.

Alternative C includes 2 new Porter Canal and Snake River crossings
There is no wetland bank in this service area. Wetland mitigation may have to include on-site or nearby constructed wetlands, which require long-term monitoring commitments. In-lieu fee projects may be possible (i.e., giving compensatory money to an NGO to build a wetland restoration project), but there is little to no established process for this in Idaho. Wetland mitigation monitoring requirements vary by project, but can include monitoring and ensuring the health of constructed wetlands for multiple decades. Negotiating an acceptable wetland mitigation with the Corps, FHWA, and ITD can be time-intensive. Depending on the extent of wetland impacts, developing a wetland mitigation plan could take 18 months.

Post-Response Quantification

Probability	Low	Most Likely	High	Risk Status	Risk Owner	
Cost ($M)				Strategy	EV Cost	EV Sched
Schedule (Mo)					$0.00 M	0.00 Mo.
Cost to Mitigate						

Project	Alternative C	Risk ID	ROW 10.01

Displacements

Pre-Response Quantification

Probability	Low	Most Likely	High	Risk Status	Activity Impacted	
				Retired		
Cost ($M)				Critical Path?	EV Cost	EV Sched
Schedule (Mo)					$0.00 M	0.00 Mo.

12/9/2019 Update: Displacements are included in the base estimate. Retire risk at this time.

Displacing homes and businesses and possibly school Taking of homes, businesses and land can be expensive and economic impacts to people Requires mitigation for all displacements and negotiations can be difficult and costly

Post-Response Quantification

Probability	Low	Most Likely	High	Risk Status	Risk Owner	
Cost ($M)				Strategy	EV Cost	EV Sched
Schedule (Mo)					$0.00 M	0.00 Mo.
Cost to Mitigate						

Project	Alternative C	Risk ID	ROW 900.01

City park

Pre-Response Quantification

Probability	Low	Most Likely	High	Risk Status	Activity Impacted	
				Retired		
Cost ($M)				Critical Path?	EV Cost	EV Sched
Schedule (Mo)					$0.00 M	0.00 Mo.

City Park will be impacted, included in 4(f) risk (), retire at this time.

Post-Response Quantification

Probability	Low	Most Likely	High	Risk Status	Risk Owner	
					Consultant PM	
Cost ($M)				Strategy	EV Cost	EV Sched
Schedule (Mo)					$0.00 M	0.00 Mo.
Cost to Mitigate						

Project	Alternative C	Risk ID	ROW 900.02

Additional ROW impacts

Pre-Response Quantification

Probability	Low	Most Likely	High	Risk Status	Activity Impacted	
25%				Active	Right-of-Way	
Cost ($M)	$14.00 M	$25.00 M	$35.00 M	Critical Path?	EV Cost	EV Sched
Schedule (Mo)					$6.21 M	0.00 Mo.

12/9/2019 Update: $40M included in current estimate, if all properties need to be acquired, the total could be as high as $54M. Additional impacts to businesses, assume $10M-$20M.

Possible inverse condemnation for loss of business and etc.

Post-Response Quantification

Probability	Low	Most Likely	High	Risk Status	Risk Owner	
25%				Active		
Cost ($M)	$10.00 M	$20.00 M	$30.00 M	Strategy	EV Cost	EV Sched
Schedule (Mo)					$5.00 M	0.00 Mo.
Cost to Mitigate						

The difference between purchasing all properties and just the railroad reduces the cost by 10M

Project	Alternative C	Risk ID	ROW 900.03

Environmental justice

Pre-Response Quantification

Probability	Low	Most Likely	High	Risk Status	Activity Impacted	
				Active		
Cost ($M)				Critical Path?	EV Cost	EV Sched
Schedule (Mo)					$0.00 M	0.00 Mo.

12/9/2019 Update: The City of Idaho Falls has completed some investigation. Watchlist at this time.

Home Displacements can lead to potential low income/minority EJ issues in some of the neighborhoods Several neighborhoods where home displacements will be required could potentially be low income and/or minority requiring avoidance Early determination of low income and/or minority populations should be done to identify potential avoidance alternatives

Post-Response Quantification

Probability	Low	Most Likely	High	Risk Status	Risk Owner	
Cost ($M)				Strategy	EV Cost	EV Sched
Schedule (Mo)					$0.00 M	0.00 Mo.
Cost to Mitigate						

Project	Alternative C	Risk ID	ROW 900.04

Condemnation/appraisals

Pre-Response Quantification

Probability	Low	Most Likely	High	Risk Status	Activity Impacted	
75%				Active	Right-of-Way	
Cost ($M)	$10.00 M	$20.00 M	$30.00 M	Critical Path?	EV Cost	EV Sched
Schedule (Mo)	6.00 Mo.	12.00 Mo.	24.00 Mo.	Yes	$15.00 M	9.75 Mo.

12/9/2019 Update: Assumes $40M (based off assessed value).

Post-Response Quantification

Probability	Low	Most Likely	High	Risk Status	Risk Owner	
75%				Active		
Cost ($M)	$10.00 M	$20.00 M	$30.00 M	Strategy	EV Cost	EV Sched
Schedule (Mo)					$15.00 M	0.00 Mo.
Cost to Mitigate						

Project	Alternative E.2	Risk ID	CNS 10.01

Construction duration

Pre-Response Quantification

Probability	Low	Most Likely	High	Risk Status	Activity Impacted	
75%				Active	Construction	
Cost ($M)				Critical Path?	EV Cost	EV Sched
Schedule (Mo)	-12.00 Mo.	-9.00 Mo.	-6.00 Mo.	Yes	$0.00 M	-6.75 Mo.

12/9/2019 Update: There is an opportunity that construction could be completed in 5 seasons instead of the assumed baseline of 6 seasons. Traffic control alone may save one season.

With these options being extensive and doing construction while continuing to let traffic through. The pace of construction may be slow needing to plan for phasing. Construction could extend into multiple years. Decide how to break project up into phasing and planning for multi-year work.

Post-Response Quantification

Probability	Low	Most Likely	High	Risk Status	Risk Owner	
75%				Active		
Cost ($M)				Strategy	EV Cost	EV Sched
Schedule (Mo)	-24.00 Mo.	-18.00 Mo.	-12.00 Mo.		$0.00 M	-13.50 Mo.
Cost to Mitigate						

Project	Alternative E.2	Risk ID	DES 50.01

Illumination

Pre-Response Quantification

Probability	Low	Most Likely	High	Risk Status	Activity Impacted	
100%				Active	Construction	
Cost ($M)	$2.90 M	$3.90 M	$4.80 M	Critical Path?	EV Cost	EV Sched
Schedule (Mo)					$3.88 M	0.00 Mo.

Currently the base estimate does not include illumination, assume an additional $3M-$5M based on recent projects in the area. Calculation based on % total base construction cost.

Post-Response Quantification

Probability	Low	Most Likely	High	Risk Status	Risk Owner	
100%				Active		
Cost ($M)	$2.90 M	$3.90 M	$4.80 M	Strategy	EV Cost	EV Sched
Schedule (Mo)					$3.88 M	0.00 Mo.
Cost to Mitigate						

Project	Alternative E.2	Risk ID	DES 900.01

Foote Drive connection to US 20

Pre-Response Quantification

Probability	Low	Most Likely	High	Risk Status	Activity Impacted	
100%				Active	Construction	
Cost ($M)	$0.25 M	$0.50 M	$1.00 M	Critical Path?	EV Cost	EV Sched
Schedule (Mo)					$0.54 M	0.00 Mo.

12/9/2019 Update: No change at this time, not included in current baseline cost. Foote Drive very close to interchange.

Foote Drive connection to US 20 would need to be included, possibly to Skyline. Could be in the Western States Cat dealership yard. Also near the Airport.

Post-Response Quantification

Probability	Low	Most Likely	High	Risk Status	Risk Owner	
100%				Active	Consultant PM	
Cost ($M)	$0.25 M	$0.50 M	$1.00 M	Strategy	EV Cost	EV Sched
Schedule (Mo)					$0.54 M	0.00 Mo.
Cost to Mitigate						

Project	Alternative E.2	Risk ID	DES 900.02

US 20 flyover

Pre-Response Quantification

Probability	Low	Most Likely	High	Risk Status	Activity Impacted	
				Retired		
Cost ($M)				Critical Path?	EV Cost	EV Sched
Schedule (Mo)					$0.00 M	0.00 Mo.

12/9/2019 Update: This is the assumed baseline and is included in the estimate.

US-20 flyover ramps are designed at 65 mph. Reduce design speed to decrease ramps impacts on adjacent properties.

Post-Response Quantification

Probability	Low	Most Likely	High	Risk Status	Risk Owner	
Cost ($M)				Strategy	EV Cost	EV Sched
Schedule (Mo)					$0.00 M	0.00 Mo.
Cost to Mitigate						

Project	Alternative E.2	Risk ID	DES 900.03

Science Center access to US 20

Pre-Response Quantification

Probability	Low	Most Likely	High	Risk Status	Activity Impacted	
				Retired		
Cost ($M)				Critical Path?	EV Cost	EV Sched
Schedule (Mo)					$0.00 M	0.00 Mo.

12/9/2019 Update: Existing connections remain, but not to new US 20, retain Lindsay and Fremont open. E.1 serves pass-through traffic. Retire this risk.

Need to connect Science Center to be able to access US-20 North. Expansion of the SC IC and the RR crossing, requires coordination/approvals.

Post-Response Quantification

Probability	Low	Most Likely	High	Risk Status	Risk Owner	
					Consultant PM	
Cost ($M)				Strategy	EV Cost	EV Sched
Schedule (Mo)					$0.00 M	0.00 Mo.
Cost to Mitigate						

Project	Alternative E.2	Risk ID	ENV 10.01

Section 4(f) impacts (public parks, recreation area, and historical properties)

Pre-Response Quantification

Probability	Low	Most Likely	High	Risk Status	Activity Impacted	
50%				Active	Right-of-Way	
Cost ($M)	$0.50 M	$1.00 M	$1.50 M	Critical Path?	EV Cost	EV Sched
Schedule (Mo)					$0.50 M	0.00 Mo.

Section 4(f) requires transportation projects to avoid impacts or "takes" of public parks, recreation areas and/or National Historic Eligible properties. This regulation requires transportation agencies to select feasible alternatives that avoid "takes". The alternatives under consideration show "takes" to 3 certain 4(f) properties; Temple View Elementary School and Antares Park (west of I-15 between Broadway and Grandview) and Russ Freeman Park (east side of the River north of US 20). There are potentially several Nation Historic Eligible properties in the residential areas, irrigation and transportation systems. The risk to the project is correctly identifying the unknown historic properties and then balancing impacts to this resource with other completing issues. Increase in preliminary engineering for documentation and analysis of impacts and alternatives.

Post-Response Quantification

Probability	Low	Most Likely	High	Risk Status	Risk Owner	
25%				Active	Consultant Environmental Lead	
Cost ($M)	$0.25 M	$0.50 M	$1.00 M	Strategy	EV Cost	EV Sched
Schedule (Mo)					$0.14 M	0.00 Mo.
Cost to Mitigate						

VE Alternative E.3 avoids the grain silos, eliminates improvements along the west side I-15 and minimizes EJ concerns.

Project	Alternative E.2	Risk ID	ENV 50.01

Hazardous material issues

Pre-Response Quantification

Probability	Low	Most Likely	High	Risk Status	Activity Impacted	
75%				Active	Construction	
Cost ($M)	$0.40 M	$0.80 M	$1.20 M	Critical Path?	EV Cost	EV Sched
Schedule (Mo)	1.00 Mo.	2.00 Mo.	3.00 Mo.	Yes	$0.60 M	1.50 Mo.

12/9/2019 Update: Assume cost impacts are less than Alternative C. Fertilizer plant and new river crossing.

Potential displacements can lead to lead paint and asbestos issues in older homes and businesses Home and business displacements will potentially require lead paint and asbestos investigation and removal prior to demolition Phase I and Phase II efforts may be required on older buildings

Post-Response Quantification

Probability	Low	Most Likely	High	Risk Status	Risk Owner	
75%				Active	Consultant Environmental Lead	
Cost ($M)	$0.25 M	$0.75 M	$1.00 M	Strategy	EV Cost	EV Sched
Schedule (Mo)	1.00 Mo.	2.00 Mo.	3.00 Mo.		$0.53 M	1.50 Mo.
Cost to Mitigate						

VE Alternative E.3 reduces in displacements and impacts to some businesses. Overall footprint is around 1/3 smaller than Alternative E.1 and E.2.

Project	Alternative E.2	Risk ID	ENV 50.02

Hazardous materials - LUST

Pre-Response Quantification

Probability	Low	Most Likely	High	Risk Status	Activity Impacted	
50%				Active	Construction	
Cost ($M)	$0.15 M	$0.30 M	$0.50 M	Critical Path?	EV Cost	EV Sched
Schedule (Mo)	1.00 Mo.	2.00 Mo.	3.00 Mo.	Yes	$0.15 M	1.00 Mo.

12/9/2019 Update: Assume to be half the impacts of Alternative C because avoids old gas station area.

Alternative E may impact LUST at SW corner of Broadway
Alternative E impacts LUST at Olympia and Foote and crosses industrial area with at least one RCRA site

Note: accounts only for agency-listed LUST and RCRA sites; additional areas may be present Hazardous materials may be present in industrial and commercial areas near the project corridor. Hazardous materials encountered during construction may require hauling of excavated materials to approved disposal sites. Additional costs can arise from hauling, disposal, and sampling analyses. Encountering unexpected hazardous materials can temporarily delay construction. In addition, investigations and negotiations with landowners and responsible parties over costs associated with discovered contamination can be time consuming.

Post-Response Quantification

Probability	Low	Most Likely	High	Risk Status	Risk Owner	
50%				Active	Consultant Environmental Lead	
Cost ($M)	$0.10 M	$0.30 M	$0.40 M	Strategy	EV Cost	EV Sched
Schedule (Mo)	1.00 Mo.	2.00 Mo.	3.00 Mo.		$0.14 M	1.00 Mo.
Cost to Mitigate						

Alternative E.3 may miss the southwest corner of Broadway LUST potential location. The other locations remain.

Project	Alternative E.2	Risk ID	ENV 50.03

Hazardous materials - Industrial

Pre-Response Quantification

Probability	Low	Most Likely	High	Risk Status	Activity Impacted	
50%				Active	Construction	
Cost ($M)	$0.25 M	$0.50 M	$1.00 M	Critical Path?	EV Cost	EV Sched
Schedule (Mo)	1.00 Mo.	2.00 Mo.	3.00 Mo.	Yes	$0.27 M	1.00 Mo.

12/9/2019 Update: Fertilizer plant, assume the same impact as Alternative C.

Some of the light industrial businesses along Lindsay Blvd (including a gas station) have the potential to contain contaminated soils. Review of existing HM records with EPA and DEQ show no known sites. Increased costs for NEPA for any Phase I HM investigations.
Construction costs will increase if contaminated soils are found. Increase time to complete NEPA discipline report.

Post-Response Quantification

Probability	Low	Most Likely	High	Risk Status	Risk Owner	
50%				Active	Consultant Environmental Lead	
Cost ($M)	$0.20 M	$0.40 M	$0.80 M	Strategy	EV Cost	EV Sched
Schedule (Mo)	1.00 Mo.	2.00 Mo.	3.00 Mo.		$0.22 M	1.00 Mo.
Cost to Mitigate						

Alternative E.3 reduces the overall impact of Alternatives E by around 1/3.

Project	Alternative E.2	Risk ID	ROW 900.01

Commercial property impact

Pre-Response Quantification

Probability	Low	Most Likely	High	Risk Status	Activity Impacted	
				Retired		
Cost ($M)				Critical Path?	EV Cost	EV Sched
Schedule (Mo)					$0.00 M	0.00 Mo.

12/9/2019 Update: This risk is now included in the base ROW estimate. Federal contracts with INL which may increase cost to relocate.

North IC would impact commercial business on both east and west sides of I-15. Costs would increase to acquire the multiple commercial properties for this option. Probability of public opposition of impacting properties

Post-Response Quantification

Probability	Low	Most Likely	High	Risk Status	Risk Owner	
					Consultant PM	
Cost ($M)				Strategy	EV Cost	EV Sched
Schedule (Mo)					$0.00 M	0.00 Mo.
Cost to Mitigate						

Project	Alternative E.2	Risk ID	ROW 900.02

City park

Pre-Response Quantification

Probability	Low	Most Likely	High	Risk Status	Activity Impacted	
				Retired		
Cost ($M)				Critical Path?	EV Cost	EV Sched
Schedule (Mo)					$0.00 M	0.00 Mo.

12/9/2019 Update: Retire this risk, included in 4(f) risk ().

City Park will be impacted

Post-Response Quantification

Probability	Low	Most Likely	High	Risk Status	Risk Owner	
					Consultant PM	
Cost ($M)				Strategy	EV Cost	EV Sched
Schedule (Mo)					$0.00 M	0.00 Mo.
Cost to Mitigate						

Project	Alternative E.2	Risk ID	ROW 900.03

Displacements

Pre-Response Quantification

Probability	Low	Most Likely	High	Risk Status	Activity Impacted	
				Retired		
Cost ($M)				Critical Path?	EV Cost	EV Sched
Schedule (Mo)					$0.00 M	0.00 Mo.

12/9/2019 Update: Included in ROW base estimate.

Displacing homes and businesses and possibly school Taking of homes, businesses and land can be expensive and economic impacts to people Requires mitigation for all displacements and negotiations can be difficult and costly

Post-Response Quantification

Probability	Low	Most Likely	High	Risk Status	Risk Owner	
Cost ($M)				Strategy	EV Cost	EV Sched
Schedule (Mo)					$0.00 M	0.00 Mo.
Cost to Mitigate						

Project	Alternative E.2	Risk ID	ROW 900.04

Environmental justice

Pre-Response Quantification

Probability	Low	Most Likely	High	Risk Status	Activity Impacted	
				Active		
Cost ($M)				Critical Path?	EV Cost	EV Sched
Schedule (Mo)					$0.00 M	0.00 Mo.

12/9/2019 Update: The City of Idaho Falls has completed some investigation. Watchlist at this time.

Home Displacements can lead to potential low income/minority EJ issues in some of the neighborhoods Several neighborhoods where home displacements will be required could potentially be low income and/or minority requiring avoidance Early determination of low income and/or minority populations should be done to identify potential avoidance alternatives

Post-Response Quantification

Probability	Low	Most Likely	High	Risk Status	Risk Owner	
				Active		
Cost ($M)				Strategy	EV Cost	EV Sched
Schedule (Mo)					$0.00 M	0.00 Mo.
Cost to Mitigate						

Project	Alternative E.2	Risk ID	ROW 900.05

Historic structures

Pre-Response Quantification

Probability	Low	Most Likely	High	Risk Status	Activity Impacted	
50%				Active	Right-of-Way	
Cost ($M)	$0.50 M	$1.00 M	$2.00 M	Critical Path?	EV Cost	EV Sched
Schedule (Mo)					$0.54 M	0.00 Mo.

12/9/2019 Update: There are north grain silos and possibly other structures that may be historic. South grain silos are operating, north silos are probably historic and may need to be avoided. Update tomorrow.

Business may need to be relocated Cost of Relocation Time to address in ROW

Post-Response Quantification

Probability	Low	Most Likely	High	Risk Status	Risk Owner	
50%				Active		
Cost ($M)	$0.10 M	$0.30 M	$0.50 M	Strategy	EV Cost	EV Sched
Schedule (Mo)					$0.15 M	0.00 Mo.
Cost to Mitigate						

Alternative E.3 avoids the grain silos. A portion of the property may still be impacted and mitigation may be required.

Project	Alternative E.2	Risk ID	ROW 900.06

Condemnation/appraisals

Pre-Response Quantification

Probability	Low	Most Likely	High	Risk Status	Activity Impacted	
75%				Active	Right-of-Way	
Cost ($M)	$14.00 M	$28.00 M	$42.00 M	Critical Path?	EV Cost	EV Sched
Schedule (Mo)	6.00 Mo.	12.00 Mo.	24.00 Mo.	Yes	$21.00 M	9.75 Mo.

12/9/2019 Update: Assumes $36M (based off assessed value).

Post-Response Quantification

Probability	Low	Most Likely	High	Risk Status	Risk Owner	
75%				Active		
Cost ($M)	$5.00 M	$10.00 M	$15.00 M	Strategy	EV Cost	EV Sched
Schedule (Mo)					$7.50 M	0.00 Mo.
Cost to Mitigate						

Alternative E.3 now assumes $22M.

Project	Alternative E.2	Risk ID	ROW 900.07

Additional ROW impacts

Pre-Response Quantification

Probability	Low	Most Likely	High	Risk Status	Activity Impacted	
25%				Active	Right-of-Way	
Cost ($M)	$7.00 M	$17.00 M	$27.00 M	Critical Path?	EV Cost	EV Sched
Schedule (Mo)					$4.25 M	0.00 Mo.

12/9/2019 Update: $36M included in current estimate, if all properties need to be acquired, the total could be as high as $42.8M. Additional impacts to businesses, assume $10M-$20M.

Post-Response Quantification

Probability	Low	Most Likely	High	Risk Status	Risk Owner	
25%				Active		
Cost ($M)	$6.00 M	$16.00 M	$26.00 M	Strategy	EV Cost	EV Sched
Schedule (Mo)					$4.00 M	0.00 Mo.
Cost to Mitigate						

Alternative E.3 ranges from low 9.8 to 28.6, most likely 22.2M

Project	Alternative H	Risk ID	CNS 80.01

C&D pit

Pre-Response Quantification

Probability	Low	Most Likely	High	Risk Status	Activity Impacted	
95%				Active	Construction	
Cost ($M)	$2.50 M	$20.00 M	$50.00 M	Critical Path?	EV Cost	EV Sched
Schedule (Mo)					$20.98 M	0.00 Mo.

12/9/2019 Update: Obtained DEQ records, hatch pit remediation may be required. Assume cover 2-3 feet deep over 15-20 feet deep for approximately 2500 LF. Assume $245-$250/SF for bridge costs, 70' width. Railroad ties, etc. included in waste. Ground improvements or piers may be required.

Off 33rd North – Future Park, existing construction/demolition site. Monitoring. The C&G Pit is active, possibility of contamination. Long term plan was to be a park. A shift to the north could impact residential area. Area to the west was a solid waste site.

Post-Response Quantification

Probability	Low	Most Likely	High	Risk Status	Risk Owner	
95%				Active	Consultant Environmental Lead	
Cost ($M)	$2.50 M	$20.00 M	$50.00 M	Strategy	EV Cost	EV Sched
Schedule (Mo)					$20.98 M	0.00 Mo.
Cost to Mitigate						

Project	Alternative H	Risk ID	DES 50.01

Illumination

Pre-Response Quantification

Probability	Low	Most Likely	High	Risk Status	Activity Impacted	
100%				Active	Construction	
Cost ($M)	$4.40 M	$5.90 M	$7.40 M	Critical Path?	EV Cost	EV Sched
Schedule (Mo)					$5.90 M	0.00 Mo.

Currently the base estimate does not include illumination, assume an additional $4M-$7M based on recent projects in the area. Calculation based on % total base construction cost.

Post-Response Quantification

Probability	Low	Most Likely	High	Risk Status	Risk Owner	
100%				Active		
Cost ($M)	$4.40 M	$5.90 M	$7.40 M	Strategy	EV Cost	EV Sched
Schedule (Mo)					$5.90 M	0.00 Mo.
Cost to Mitigate						

Project	Alternative H	Risk ID	DES 900.01

Access to agriculture west of I-15

Pre-Response Quantification

Probability	Low	Most Likely	High	Risk Status	Activity Impacted	
				Active	Construction	
Cost ($M)				Critical Path?	EV Cost	EV Sched
Schedule (Mo)					$0.00 M	0.00 Mo.

12/9/2019 Update: The risk is that a service interchange from 49th may need to be provided. There is an opportunity to have a service interchange instead of a system-to-system interchange. Assume $25-$31M for service interchange. This is a fatal flaw.

North of the ramps to I-15 have eliminated the overpass to access farmland west of I-15. Creating access to this farmland would increase cost by adding more structures. The extra structure and design could impact the schedule. Could be a relocation.

Post-Response Quantification

Probability	Low	Most Likely	High	Risk Status	Risk Owner	
					Consultant PM	
Cost ($M)				Strategy	EV Cost	EV Sched
Schedule (Mo)					$0.00 M	0.00 Mo.
Cost to Mitigate						

Project	Alternative H	Risk ID	DES 900.02

Airport

Pre-Response Quantification

Probability	Low	Most Likely	High	Risk Status	Activity Impacted	
				Retired		
Cost ($M)				Critical Path?	EV Cost	EV Sched
Schedule (Mo)					$0.00 M	0.00 Mo.

12/9/2019 Update: Development zoning restrictions (such as housing in potential crash zone) instead of ramps. Retire risk at this time.

The ramps to US 20 shown in the FAA zone. Could require FAA coordination and FAA may not allow elevated ramps/structure in RPZ.

Post-Response Quantification

Probability	Low	Most Likely	High	Risk Status	Risk Owner	
					Consultant PM	
Cost ($M)				Strategy	EV Cost	EV Sched
Schedule (Mo)					$0.00 M	0.00 Mo.
Cost to Mitigate						

Project	Alternative H	Risk ID	ENV 90.01

Sound barrier

Pre-Response Quantification

Probability	Low	Most Likely	High	Risk Status	Activity Impacted	
100%				Active	Construction	
Cost ($M)	$1.00 M	$1.30 M	$1.50 M	Critical Path?	EV Cost	EV Sched
Schedule (Mo)					$1.28 M	0.00 Mo.

The risk is that Alternative H will require sound walls. Assume $35/SF wall, 14' high, 2500' length.

Post-Response Quantification

Probability	Low	Most Likely	High	Risk Status	Risk Owner	
50%				Active		
Cost ($M)	$1.00 M	$1.30 M	$1.50 M	Strategy	EV Cost	EV Sched
Schedule (Mo)					$0.64 M	0.00 Mo.
Cost to Mitigate						

Alternative H.1 reduces the probability from 100% to 50%.

Project	Alternative H	Risk ID	PSP 900.01

Public opposition

Pre-Response Quantification

Probability	Low	Most Likely	High	Risk Status	Activity Impacted	
75%				Active	Right-of-Way	
Cost ($M)				Critical Path?	EV Cost	EV Sched
Schedule (Mo)	12.00 Mo.	24.00 Mo.	36.00 Mo.	Yes	$0.00 M	18.00 Mo.

12/9/2019 Update: Outreach meetings to the community (near hatch pit) have been conducted. There is a risk that this community will argue development and delay the project.

We have already received comments against siting a new roadway in these areas. Delays due to opposition can lengthen the schedule which impacts cost Neighbors who fight us tend to delay and even stop projects. Often get elected officials involved which requires time and raises the stakes.

Post-Response Quantification

Probability	Low	Most Likely	High	Risk Status	Risk Owner	
50%				Active	Consultant PR Lead	
Cost ($M)				Strategy	EV Cost	EV Sched
Schedule (Mo)	12.00 Mo.	24.00 Mo.	36.00 Mo.		$0.00 M	12.00 Mo.
Cost to Mitigate						

Splitting the difference between neighborhoods reduces the probability from 75% to 50%, mitigation will still be required.

Update risk quantification if Idea 63 comes through CRAVE.

Project	Alternative H	Risk ID	ROW 900.01

Condemnation/appraisals (cost)

Pre-Response Quantification

Probability	Low	Most Likely	High	Risk Status	Activity Impacted	
75%				Active	Right-of-Way	
Cost ($M)	$4.00 M	$8.00 M	$12.00 M	Critical Path?	EV Cost	EV Sched
Schedule (Mo)					$6.00 M	0.00 Mo.

12/9/2019 Update: There are approximately 165 +/- parcels, 138 properties. Base assumes $16M (assessed value).

Wide variety of residential, commercial, City property (Land Fill?),farm, and Railroad Purchase, Relocation, and Condemnation Need to be aware that additional time will be required to Purchase, Relocate, and take care of Condemnation

Post-Response Quantification

Probability	Low	Most Likely	High	Risk Status	Risk Owner	
75%				Active		
Cost ($M)	$4.00 M	$8.00 M	$12.00 M	Strategy	EV Cost	EV Sched
Schedule (Mo)					$6.00 M	0.00 Mo.
Cost to Mitigate						

Project	Alternative H	Risk ID	ROW 900.02

Displacements

Pre-Response Quantification

Probability	Low	Most Likely	High	Risk Status	Activity Impacted	
				Retired		
Cost ($M)				Critical Path?	EV Cost	EV Sched
Schedule (Mo)					$0.00 M	0.00 Mo.

12/9/2019 Update: Part of base, retire risk at this time.

Displacing homes and businesses and possibly school Taking of homes, businesses and land can be expensive and economic impacts to people Requires mitigation for all displacements and negotiations can be difficult and costly

Post-Response Quantification

Probability	Low	Most Likely	High	Risk Status	Risk Owner	
Cost ($M)				Strategy	EV Cost	EV Sched
Schedule (Mo)					$0.00 M	0.00 Mo.
Cost to Mitigate						

Project	Alternative H	Risk ID	ROW 900.03

Additional ROW impacts

Pre-Response Quantification

Probability	Low	Most Likely	High	Risk Status	Activity Impacted	
25%				Active	Right-of-Way	
Cost ($M)	$20.00 M	$30.00 M	$40.00 M	Critical Path?	EV Cost	EV Sched
Schedule (Mo)					$7.50 M	0.00 Mo.

12/9/2019 Update: $16M included in current estimate, if all properties need to be acquired, the total could be as high as $35.7M. Additional impacts to businesses, assume $10M-$20M.

Post-Response Quantification

Probability	Low	Most Likely	High	Risk Status	Risk Owner	
25%				Active		
Cost ($M)	$20.00 M	$30.00 M	$40.00 M	Strategy	EV Cost	EV Sched
Schedule (Mo)					$7.50 M	0.00 Mo.
Cost to Mitigate						

Project	Alternative H	Risk ID	ROW 900.04

Condemnation/appraisals (schedule)

Pre-Response Quantification

Probability	Low	Most Likely	High	Risk Status	Activity Impacted	
75%				Active	Right-of-Way	
Cost ($M)				Critical Path?	EV Cost	EV Sched
Schedule (Mo)	6.00 Mo.	12.00 Mo.	24.00 Mo.	Yes	$0.00 M	9.75 Mo.

12/9/2019 Update: There are approximately 165 +/- parcels, 138 properties. Base assumes $16M (assessed value).

Wide variety of residential, commercial, City property (Land Fill?),farm, and Railroad Purchase, Relocation, and Condemnation Need to be aware that additional time will be required to Purchase, Relocate, and take care of Condemnation

Post-Response Quantification

Probability	Low	Most Likely	High	Risk Status	Risk Owner	
				Active		
Cost ($M)				Strategy	EV Cost	EV Sched
Schedule (Mo)					$0.00 M	0.00 Mo.
Cost to Mitigate						

Appendix E. Evaluation Criteria

Criteria	Definition	Rating Scale	Unit of Measure/Quantification
Mainline Operations	An assessment of traffic operations and safety on the mainline facility(s), including off-ramps, and collector-distributor roads. Operational considerations include level of service relative to the 20 year traffic projections as well as geometric considerations such as design speed, sight distance, lane widths and shoulder widths.	10	Free flow – excellent operation
		9	Full Design standards
		8	Stable flow – very good operation
		7	Minor design exceptions
		6	Stable flow – good operation
		5	Approaching unstable flow – fair operation
		4	Design exceptions (geometry, sight distance)
		3	Unstable flow – poor operation
		2	Major Design exceptions (weaving and merging)
		1	Traffic congestion
Local Operations	An assessment of traffic operations and safety on the local roadway infrastructure, including on-ramps and frontage roads. Operational considerations include level of service relative to the 20 year traffic projections; geometric considerations such as design speed, sight distance, lane widths; bicycle and pedestrian operations and access.	10	Free flow – excellent operation
		9	Full Design standards
		8	Stable flow – very good operation
		7	
		6	Stable flow – good operation
		5	Approaching unstable flow – fair operation
		4	Design exceptions (geometry, sight distance)
		3	Unstable flow – poor operation
		2	Major Design exceptions (weaving and merging)

Criteria	Definition	Rating Scale	Unit of Measure/Quantification
		1	Traffic congestion
Maintainability	An assessment of the long-term maintainability of the transportation facility(s). Maintenance considerations include the overall durability, longevity, and maintainability of pavements, structures and systems; ease of maintenance; accessibility and safety considerations for maintenance personnel.	10	
		9	Very low maintenance
		8	
		7	Similar maintenance to the existing facility when it was in like new condition
		6	
		5	Similar maintenance to the existing facility in existing condition
		4	
		3	Maintainability is significantly increased over the existing facility when it was in like new condition
		2	
		1	
Construction Impacts	An assessment of the temporary impacts to the public during construction related to traffic disruptions, detours and delays; impacts to businesses and residents relative to access, visual, noise, vibration, dust and construction traffic; environmental impacts.	10	No impacts
		9	Minor impacts (i.e., noise, vibration, dust, or visual, requiring limited mitigation effort)
		8	
		7	Minor impacts (i.e., minor traffic delays, occasional temporary nighttime lane closures, etc.)
		6	Ramp closures of up to 30 days with acceptable detours

Criteria	Definition	Rating Scale	Unit of Measure/Quantification
		5	Moderate impacts (i.e., noise, vibration, dust, or visual, requiring significant mitigation efforts and/or inconveniences to the public)
		4	Moderate impacts (i.e., multiple minor traffic delays, lengthy detours for ramp closures up to 45 days, extended temporary night closures, etc.)
		3	Major impacts (i.e., noise, vibration, dust, or visual, requiring substantial mitigation efforts and/or inconveniences to the public with lengthy detours for ramp closures up to 60 days
		2	Major impacts (i.e., noise, vibration, dust, or visual, requiring substantial mitigation efforts and/or inconveniences to the public with lengthy detours for ramp closures up to 90 days
		1	Major impacts (i.e., noise, vibration, dust, or visual, requiring substantial mitigation efforts and/or inconveniences to the public with lengthy detours for ramp closures up to 120 days
Environmental Impacts	An assessment of the permanent impacts to the environment including ecological (i.e., flora, fauna, air quality, water quality, visual, noise); socioeconomic impacts (i.e., environmental justice, business, residents); impacts to cultural, recreational and historic resources.	10	Major improvement upon existing environmental conditions
		9	
		8	Minor improvement upon existing environmental conditions
		7	
		6	No environmental impacts
		5	Negligible degradation - does not require mitigation
		4	Minor degradation - requires some mitigation
		3	Moderate degradation - requires significant on-site mitigation
		2	
		1	Severe degradation - requires significant off-site mitigation

Appendix F. CRAVE Study Agenda

Cost Risk Assessment + Value Engineering Workshop
Idaho Transportation Department
I-15/US-20 Connector Project, Idaho Falls
December 9-12, 2019

What is CRAVE?

The CRAVE (cost and schedule risk analysis + value engineering) process includes a baseline risk assessment, value engineering and risk response, risk analysis on response strategies, and tracking, monitoring, and risk management.

During the Information Phase of the value methodology job plan a risk assessment will be performed and the quantified results are then modeled. The CRAVE Team will then brainstorm, evaluate and ultimately develop recommendations that not only add value but also mitigates and/or avoids some of the identified risks.

Considerations & Comments:

- As part of the preparation for the study, each team member should review the project information package relevant to their subject matter expertise.
- Note that all times and activities are approximate and subject to updates as the workshop progresses. The Agenda is based on typical work hours and can be adjusted as necessary.
- We all have responsibilities back at the office, however our primary responsibility and commitment during the scheduled duration is to the VE Workshop and the process. It is important that each team member actively participate in all the team activities and phases. Please be aware of this and keep any breaks or outside contacts to a minimum. If absolutely required, as a team, we can schedule breaks for our other obligations. During the workshop itself, please refrain from checking emails if you have wireless connectivity.
- If anyone has any questions regarding the upcoming workshop or the information contained herein, please contact me at 3360-742-7682 or Blane.Long@hdrinc.com. Also, do not hesitate to ask questions or clarifications regarding the VE process at any time during the study. I look forward to working with you towards a successful study.

Logistics:

The workshop will be held at the ITD District Six office, located in Rigby, Idaho.

Blane H. Long, CVS®
HDR

CRAVE Study Agenda

I-15/US-20 Connector

ITD District 6 Office, Rigby, Idaho

Monday – December 9	
Information Phase	
1:00 pm	Welcome and Introductions
1:15 pm	Overview of the CRAVE process
1:30 pm	Project Team Presentation of 4 Level Three alternatives (45 minutes each) ▪ What are the Constraints and Controlling Decisions? ▪ What are the Operational Considerations? ▪ Base Cost and Schedule Assumptions ▪ Update & Quantify Risks for each Alternative
4:30 pm	Adjourn
Tuesday – December 10	
Function Analysis Phase	
8:00 am	Define Project Functions
Creative Phase	
9:00 am	Brainstorm ideas to improve each alternative and mitigate risks
Noon	Lunch
Evaluation Phase	
1:00 pm	Evaluate the ideas from the Creative Phase
4:30 pm	Adjourn
Wednesday – December 11	
Development Phase	
8:00 am	Develop best ideas into recommendations
Noon	Lunch
1:00 pm	Complete development of recommendations
4:30 pm	Adjourn
Thursday – December 12	
Development Phase	
8:00 am	VE Team Review of recommendations
10:00 am	Reevaluate risk profile of project
Presentation Phase	
11:00 am	Prep for presentation
Noon	Lunch
1:00 pm	Present VE Findings
2:30 pm	Adjourn

Appendix G. CRAVE Study Attendee List

CRAVE Study Attendees
Idaho Transportation Department
I-15/US-20 Connector

December 2019				NAME	ORGANIZATION	POSITION/DISCIPLINE	WORK	CELL
9	10	11	12				E-MAIL	
✓	✓	✓	✓	Blane Long	HDR	Facilitator	360-570-4411	360-742-7682
							Blane.Long@hdrinc.com	
✓	✓	✓	✓	Rachel Bernhard	HDR	Assistant facilitator	360-570-7255	360-259-0787
							Rachel.Bernhard@hdrinc.com	
✓	✓	✓	✓	Will Hume	HDR	Traffic Engineer	503-727-3928	
							Will.Hume@hdrinc.com	
✓	✓	✓	✓	Kelly Hoopes	Horrocks	Deputy Consultant PM	208-522-1223	208-860-4321
							KellyH@horrocks.com	
✓	✓	✓	✓	Ben Burke	Horrocks	Traffic Engineer	708-497-7947	
							BenB@horrocks.com	
✓	✓	✓	✓	Tim Cramer	ITD	Env Planner		
							T.Cramer@itd.idaho.gov	
✓	✓	✓	✓	John Stone	Horrocks	Construction Staging		208-867-5704
							JohnSt@horrocks.com	
✓	✓	✓	✓	Mike McKee	Horrocks	Roadway Lead Design		208-932-5053
							MikeM@horrock.com	
✓	✓	✓	✓	Drew Meppen	ITD	Design/Construction	208-745-5627	208-313-4267
							Drew.Meppen@itd.idaho.gov	
✓	✓	✓	✓	Ryan Lancaster	ITD	Traffic/Standards	208-334-8528	
							Ryan.Lancaster@itd.idaho.gov	

CRAVE Study Attendees
Idaho Transportation Department
I-15/US-20 Connector

December 2019				NAME	ORGANIZATION	POSITION/DISCIPLINE	WORK	CELL
9	10	11	12				E-MAIL	
ü	✓	✓	✓	Chris Canfield	City of Idaho Falls	Assistant P.W.D	612-8259	201-5695
							CCanfield@idahofallsidaho.gov	
✓	✓	✓	✓	Curtis Calderwood	ITD DG	Design/Construct, D-6	745-5637	821-2997
							Curtis.Calderwood@itd.idaho.gov	
✓	✓	✓	✓	Paul Blackham	HDR	Bridge	208-387-7071	208-353-2320
✓	✓	✓	✓	Rick Jensen	ITD	Bridge	208-334-8589	208-871-2950
							Rick.Jensen@itd.idaho.gov	
✓	✓	✓	✓	Scot Stacey	ITD	Design/Construct, D-6		208-316-0508
							Scot.Stacey@itd.idaho.gov	
✓	✓	✓	✓	Eric Staats	ITD	Design/Construct, D-5		208-239-3320
							Eric.Staats@itd.idaho.gov	
✓	✓	✓		Darrell West	BMPO	BMPO	612-8539	
							DWest@bmpo.org	
✓	✓	✓	✓	Mark Layton	ITD	Planner		
							Mark.Layton@itd.idaho.gov	
✓	✓	✓	✓	Lance Bates	Bonneville County	Public Works Director		
							LBates@co.bonneville.id.us	
✓	✓	✓	✓	Ryan Day	ITD D6	ITD PM		
							Ryan.Day@itd.idaho.gov	

CRAVE Study Attendees
Idaho Transportation Department
I-15/US-20 Connector

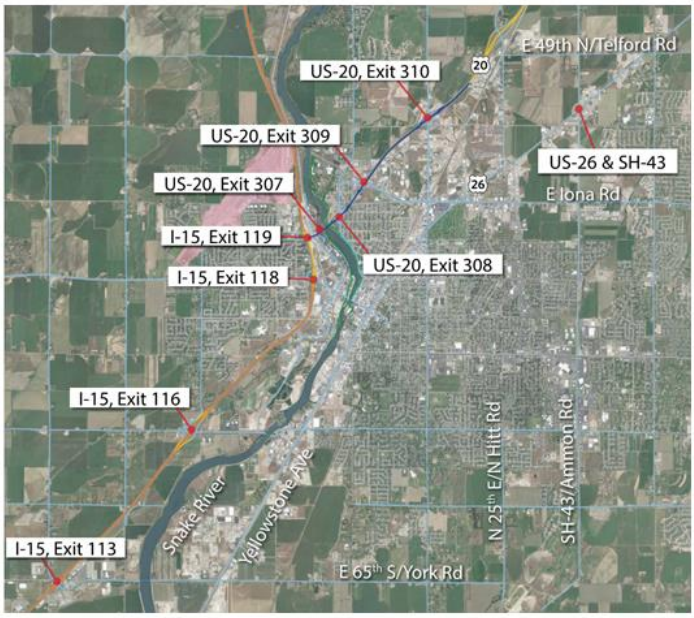
December 2019				NAME	ORGANIZATION	POSITION/DISCIPLINE	WORK	CELL
9	10	11	12				E-MAIL	
ü	✓	✓	✓	Karen Hiatt	ITD	Engineering Manager	208—745-5601	208-705-6821
							Karen.Hiatt@itd.idaho.gov	
✓	✓	✓	✓	Tracy Ellwein	HDR	Consultant PM	208-387-7052	208-863-1452
							Tracy.Ellwein@hdrinc.com	
✓	✓	✓	✓	Lisa Applebee	FHWA	Ops Engr	208-334-9180	
							Lisa.Applebee@dot.gov	
			✓	Wade Allen	ITD	Operations Engineer		
			✓	Brad Richards	ITD	Planning		
			✓	Cameron Waite	HDR	Traffic		
			✓	Stephanie Borders	HDR	Public Outreach		
			✓	Corrie Hugaboom	HDR	Environmental		
			✓	Jason Longsdorf	HDR	Environmental		

Appendix H. CRAVE Study Closing Presentation

CRAVE WORKSHOP

I-15/US-20 Connector

EXISTING CONDITION

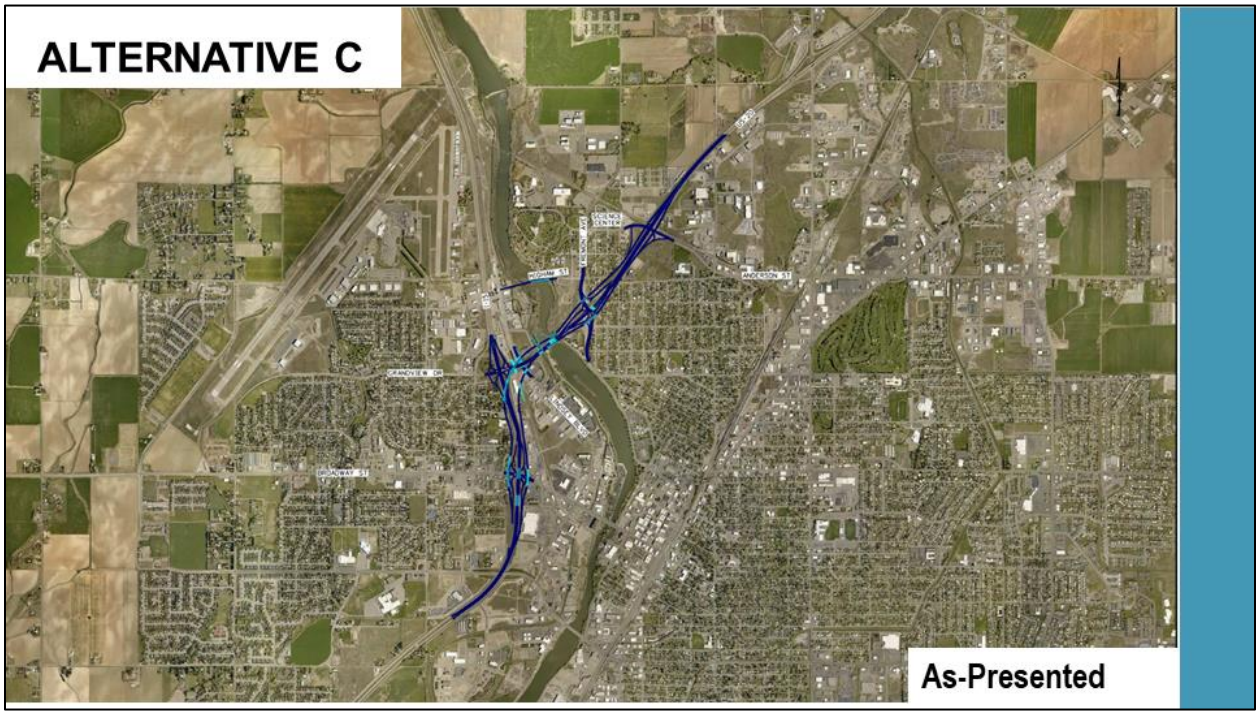


CRAVE

1. **Cost and Schedule Risk Analysis**
   Base Cost and Schedule Review, Identification and Quantification of Cost and Schedule Risks
2. **Risk Response**
   Development of Risk Response Strategies and Alternative Solutions (Value Engineering)
3. **Monitor and Control**
   Continuous Risk Tracking, Monitoring, and Reporting

→ Financial Planning
↕ Decision Support
→ Risk Allocation

3

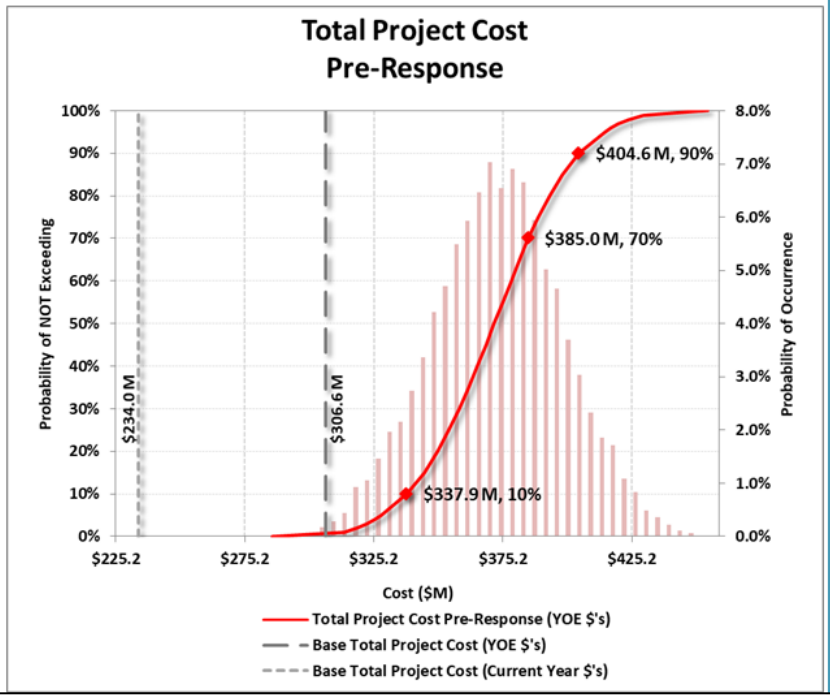


BASE COST REVIEW

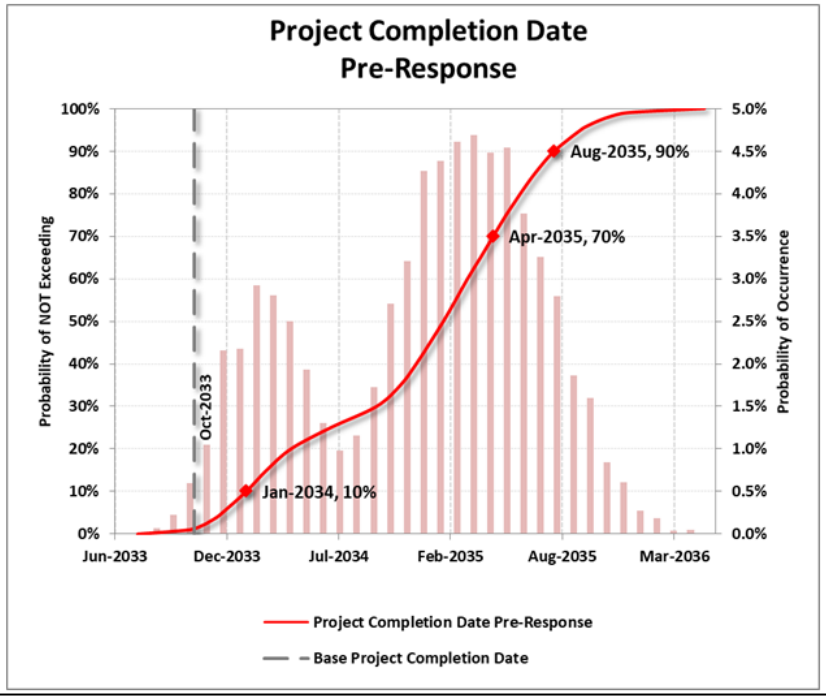
- Alternative C = $233.98M
  - Construction Cost = $157.61M
  - Right-of-Way Cost = $40.12M
  - 13% Environmental & Final Design
  - 10% Construction Engineering
  - 5% Change Order Contingency

PROJECT SCHEDULE

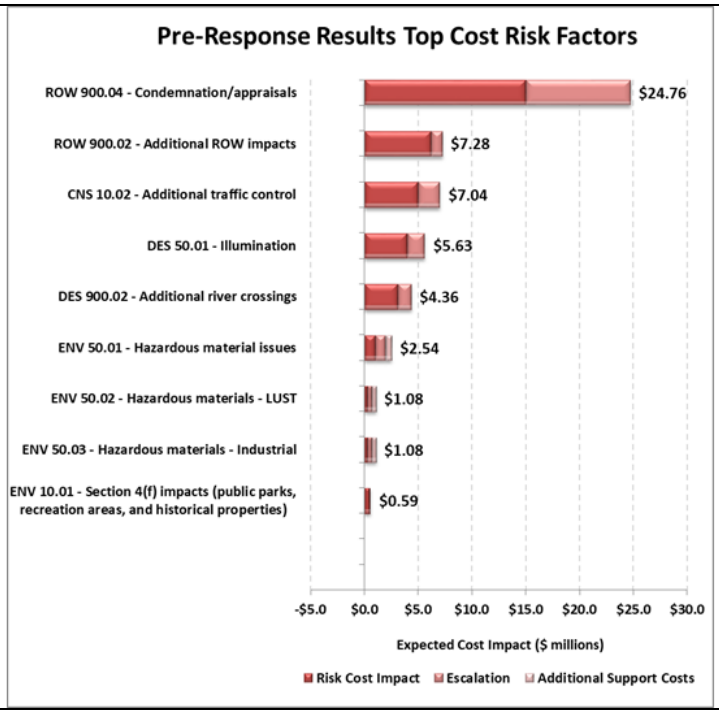
RISK RESULTS



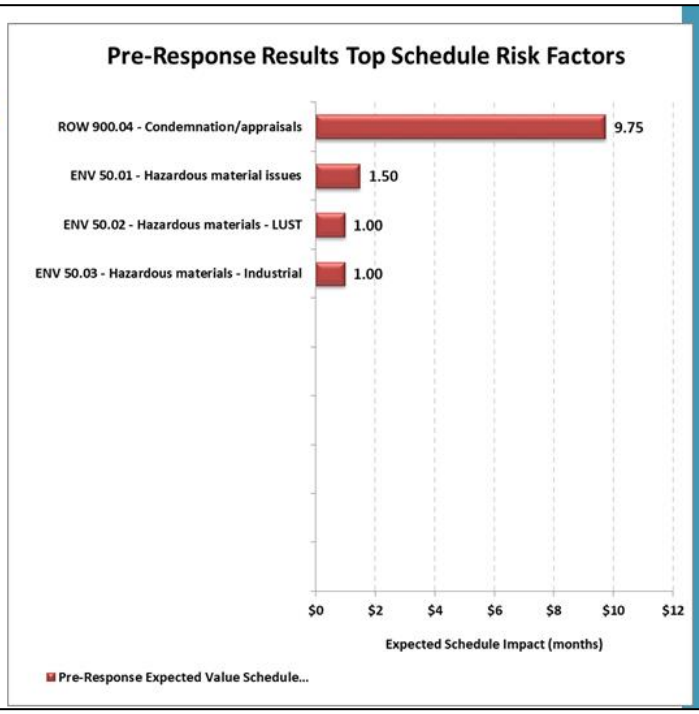
RISK RESULTS



TOP COST RISKS



TOP SCHEDULE RISKS



ALTERNATIVE C.3

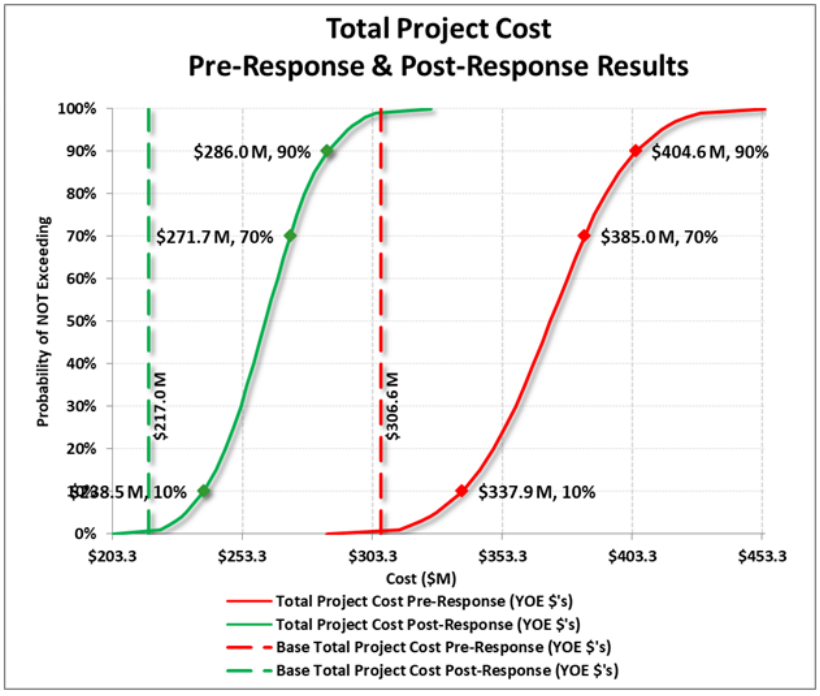
ALTERNATIVE C.3

ALTERNATIVE C.3

ALTERNATIVE C.3

ALTERNATIVE C.3

RISK RESULTS



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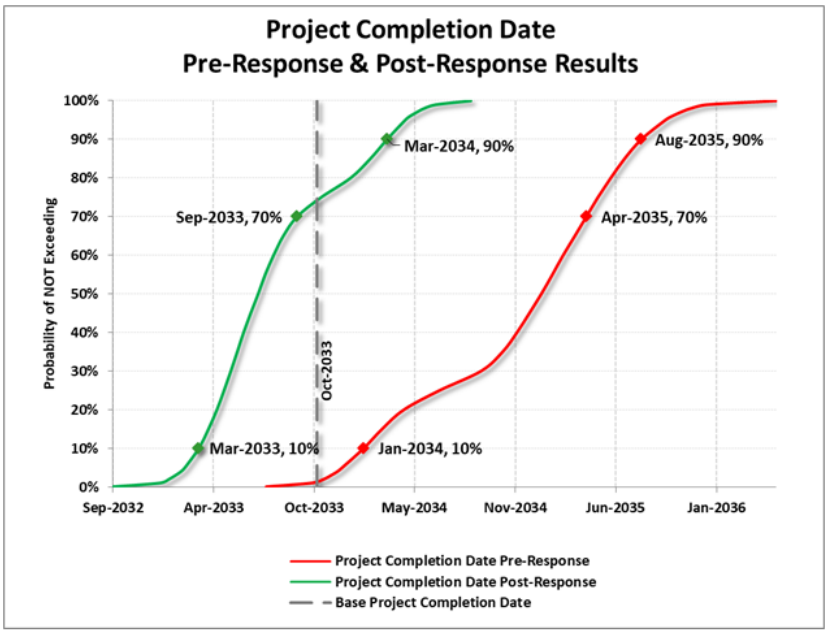
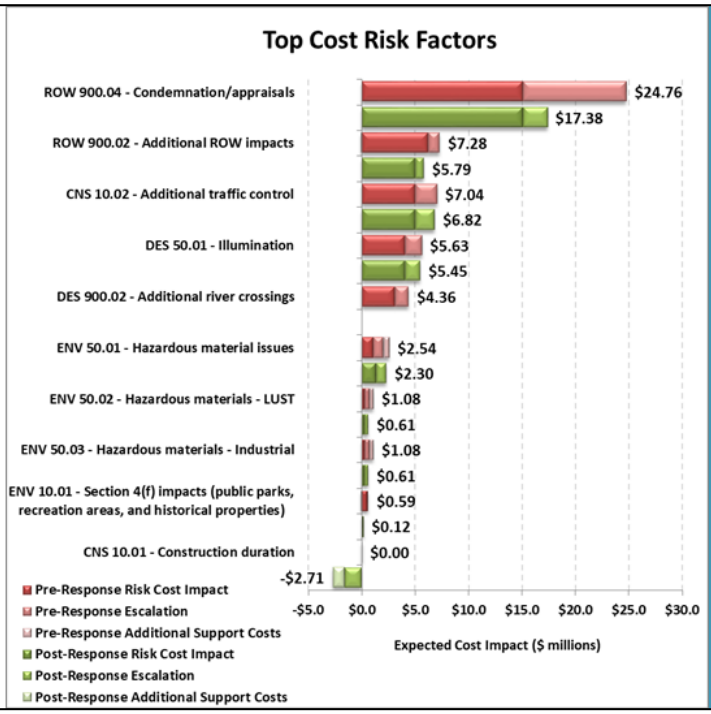
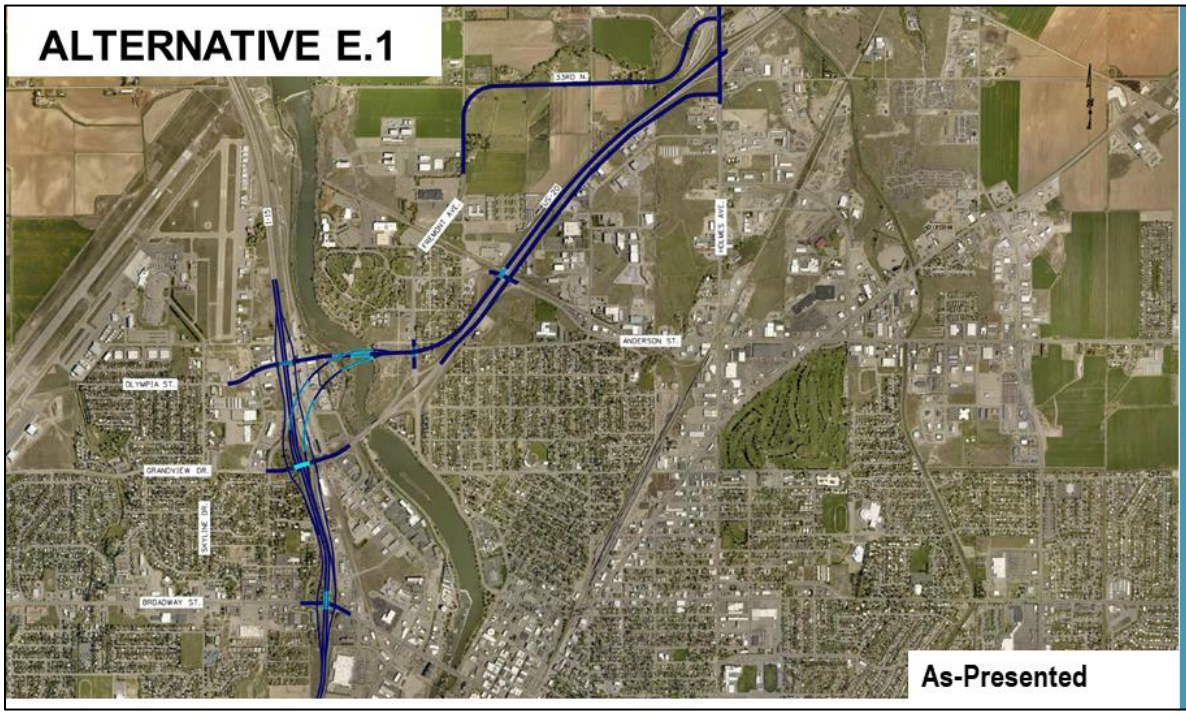


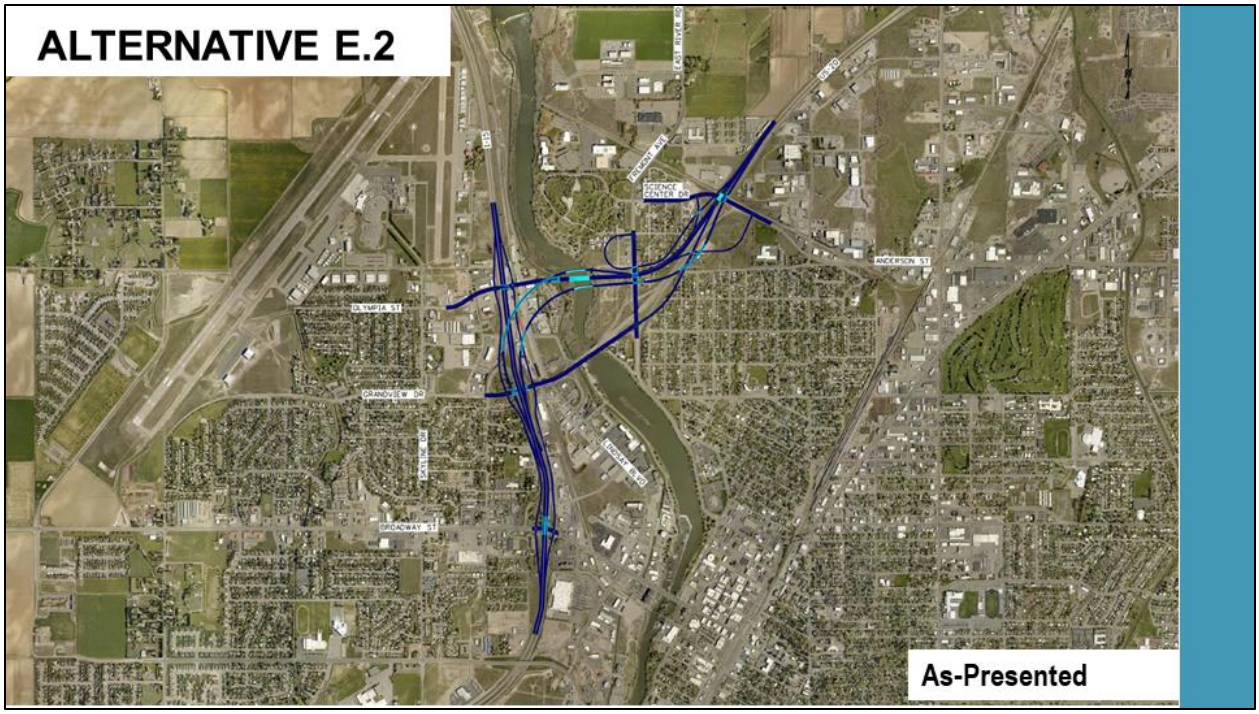
TOP COST RISKS



TOP SCHEDULE RISKS

ALTERNATIVE E.1



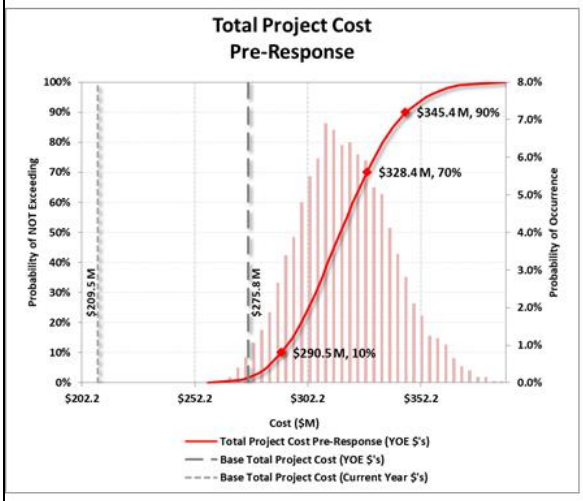


BASE COST REVIEW

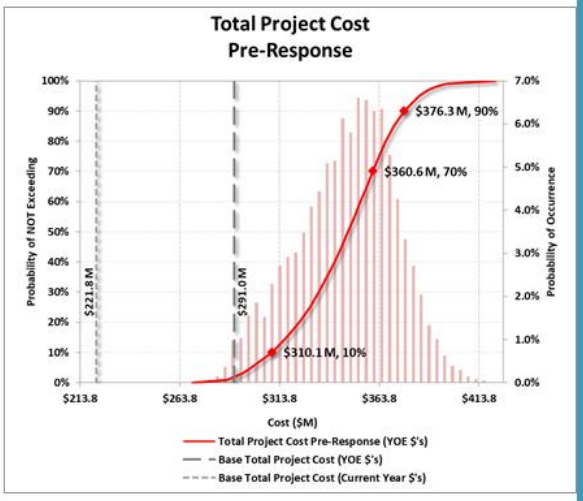
- Alternative E.1 = $209.46M
  - Construction Cost = $147.15M
  - Right-of-Way Cost = $28.47M
  - 13% Environmental & Final Design
  - 10% Construction Engineering
  - 5% Change Order Contingency
- Alternative E.2 = $221.81M
  - Construction Cost = $151.00M
  - Right-of-Way Cost = $36.08M
  - 13% Environmental & Final Design
  - 10% Construction Engineering
  - 5% Change Order Contingency

RISK RESULTS

Alternative E.1

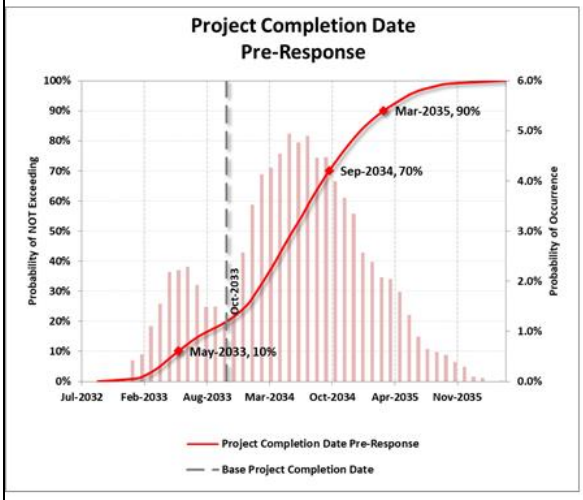


Alternative E.2

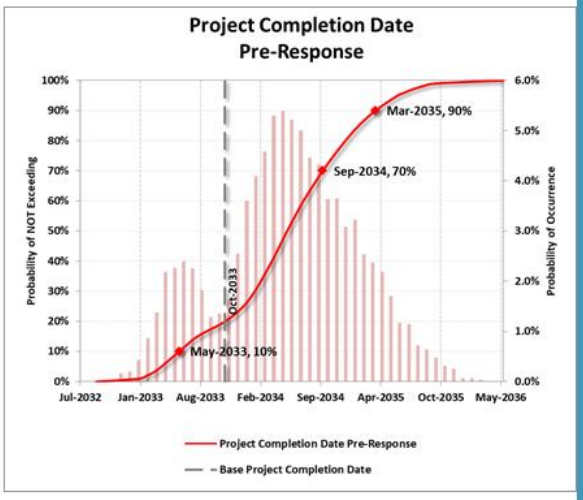


RISK RESULTS

Alternative E.1

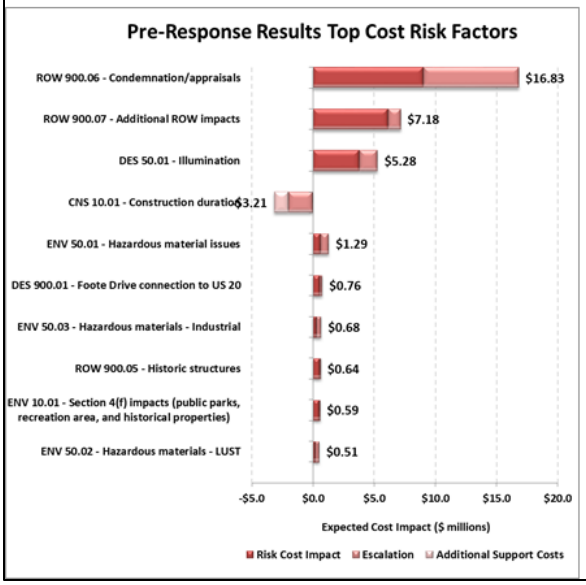


Alternative E.2

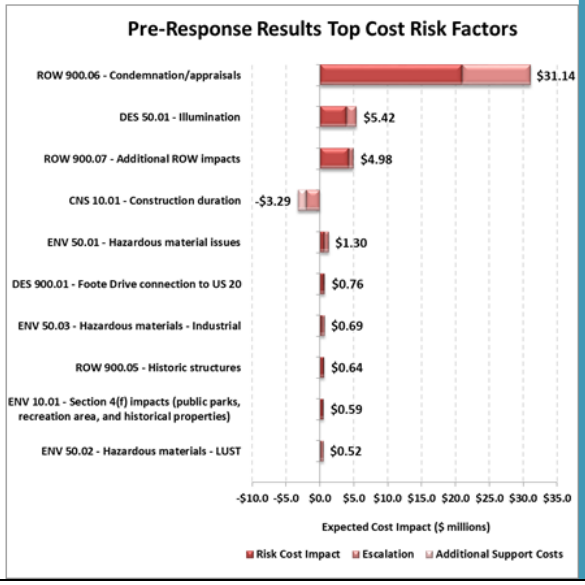


TOP COST RISKS

Alternative E.1

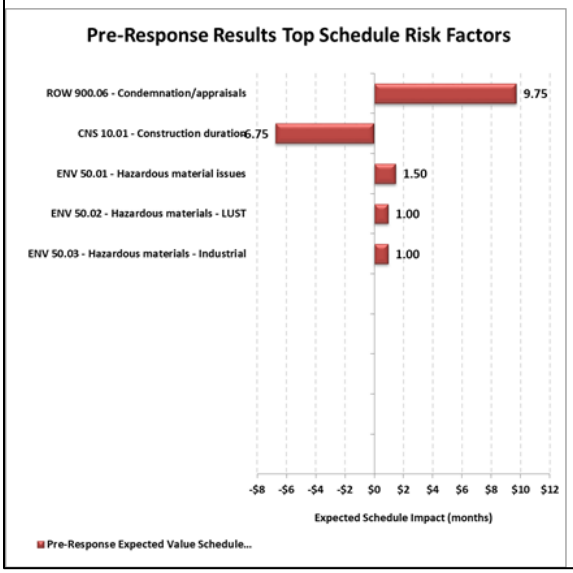


Alternative E.2

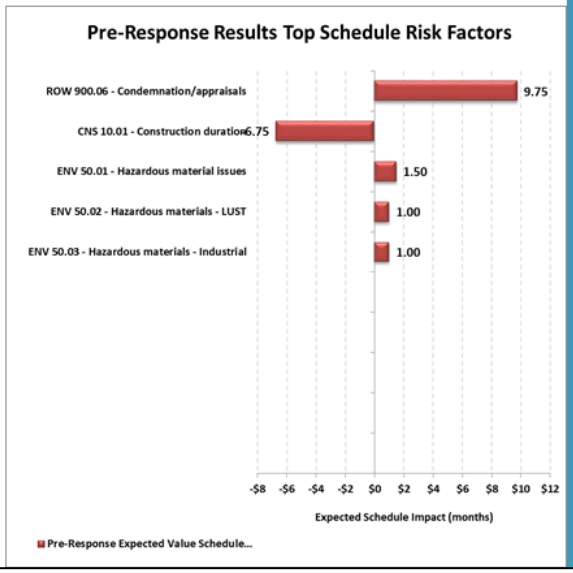


TOP SCHEDULE RISKS

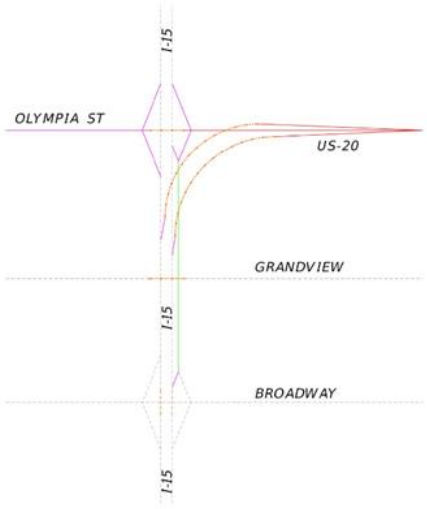
Alternative E.1



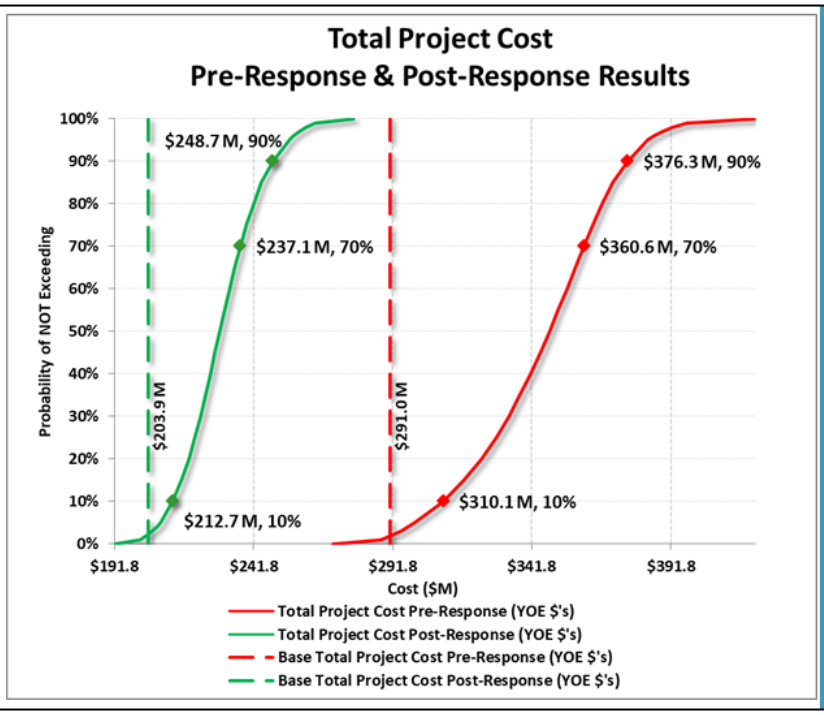
Alternative E.2



ALTERNATIVE E.3



RISK RESULTS



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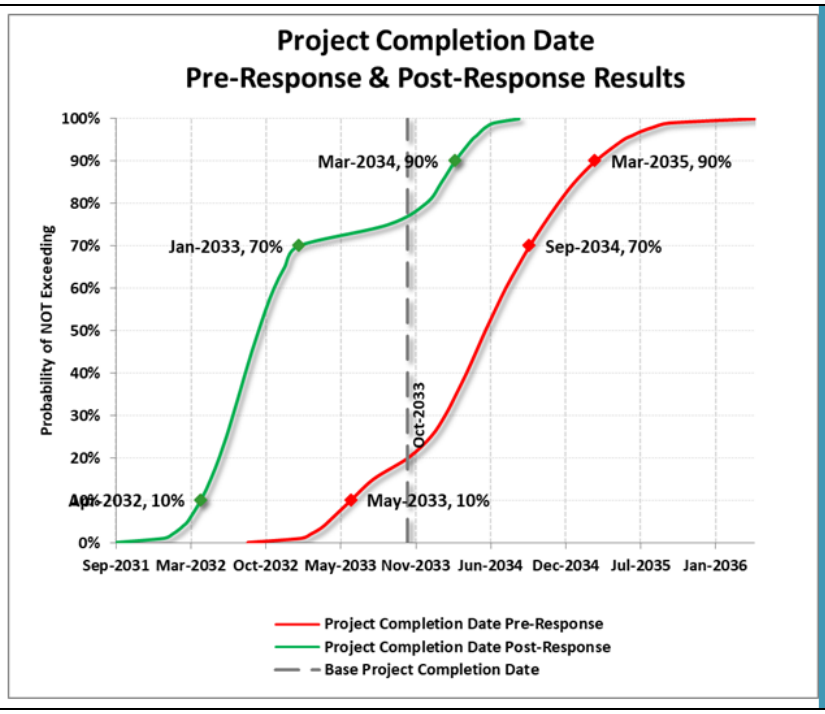

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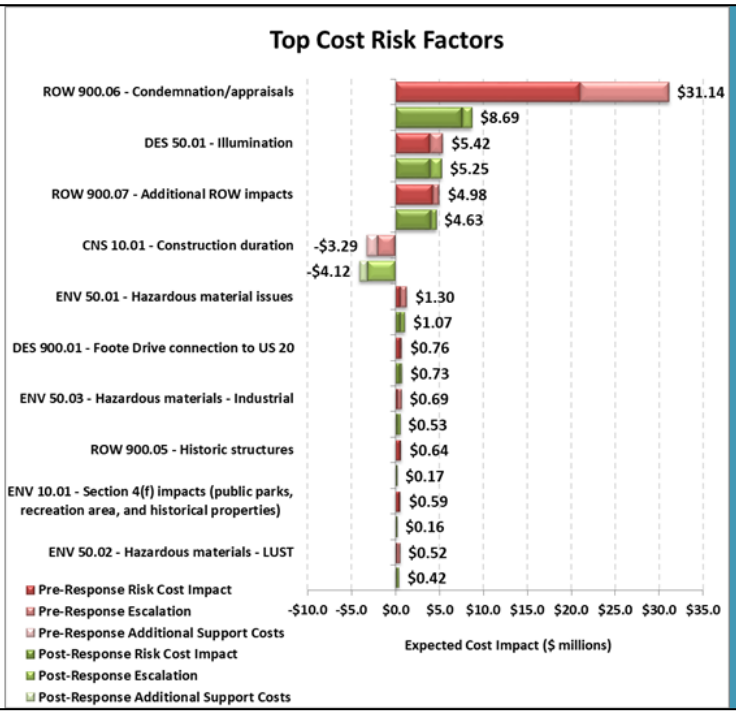

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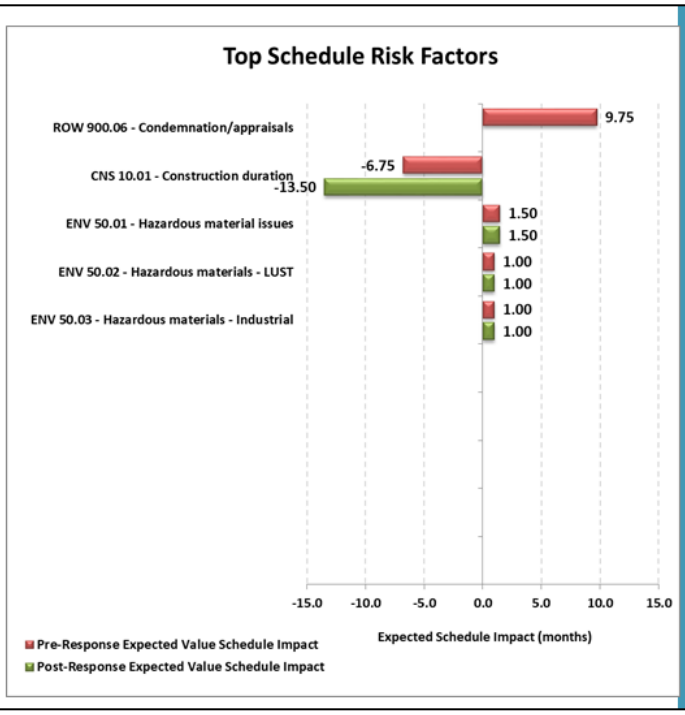
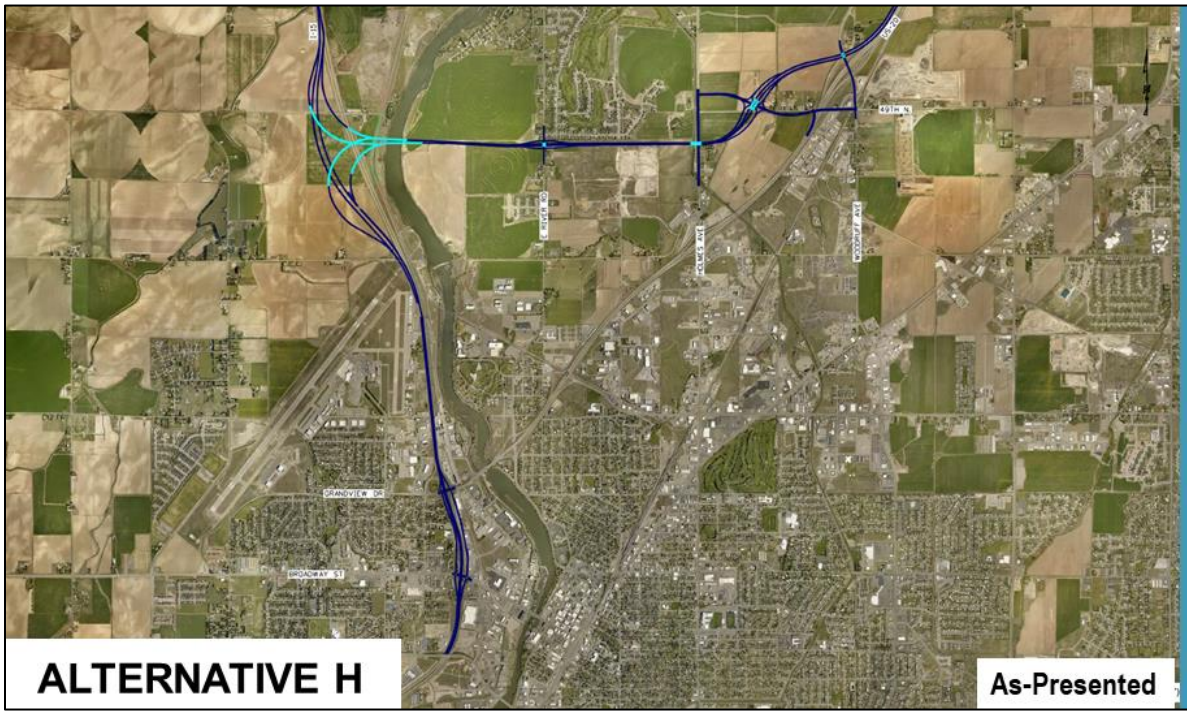
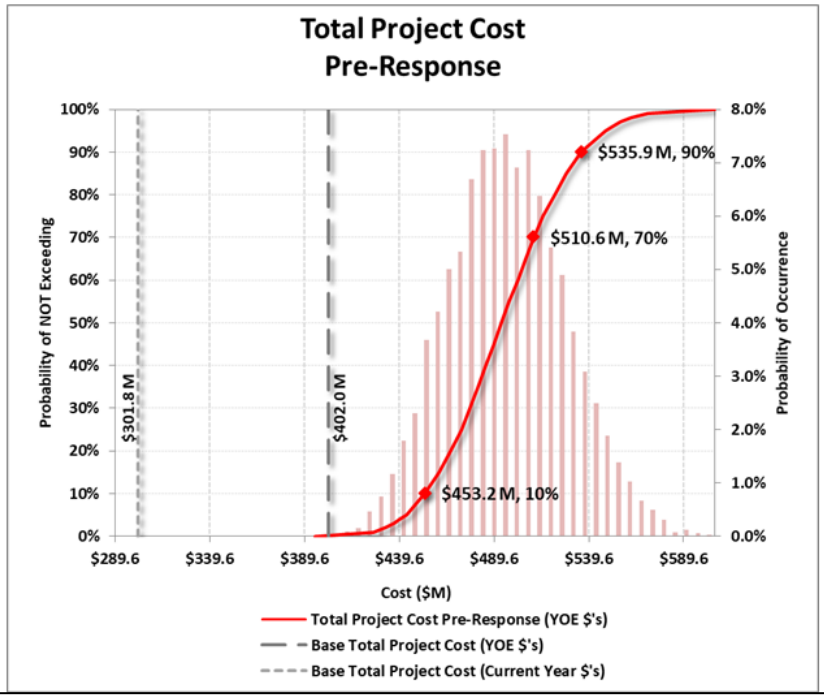




BASE COST REVIEW

- Alternative H = $301.82M
  - Construction Cost = $232.34M
  - Right-of-Way Cost = $16.04M
  - 13% Environmental & Final Design
  - 10% Construction Engineering
  - 5% Change Order Contingency

RISK RESULTS



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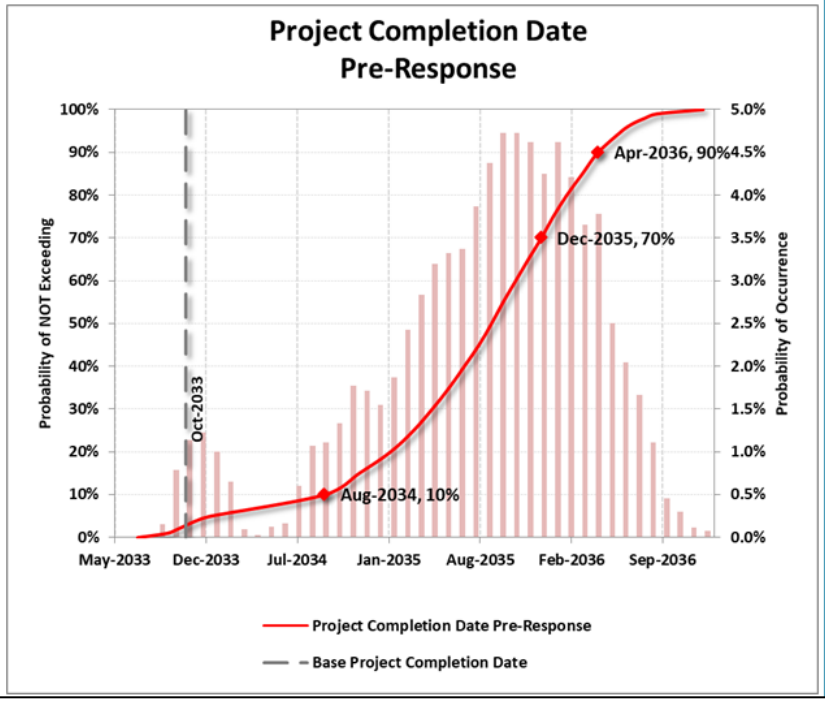

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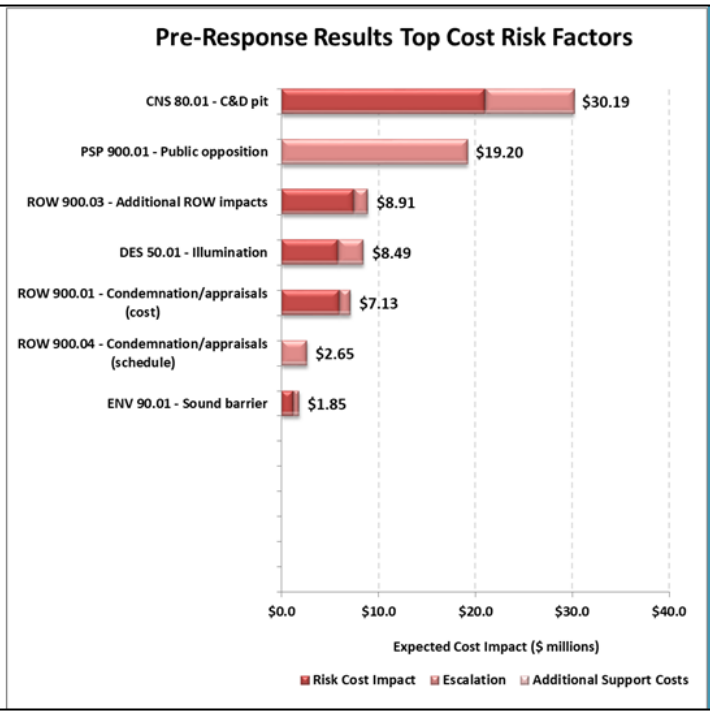

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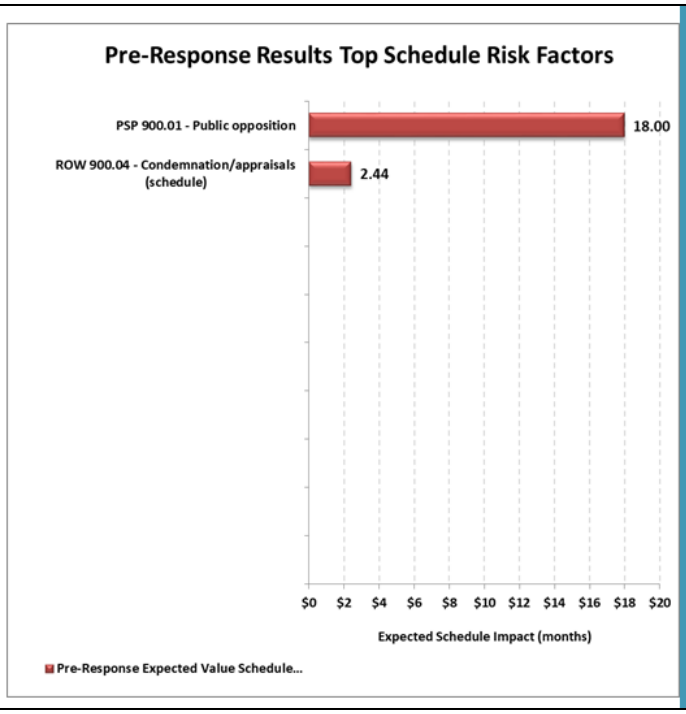
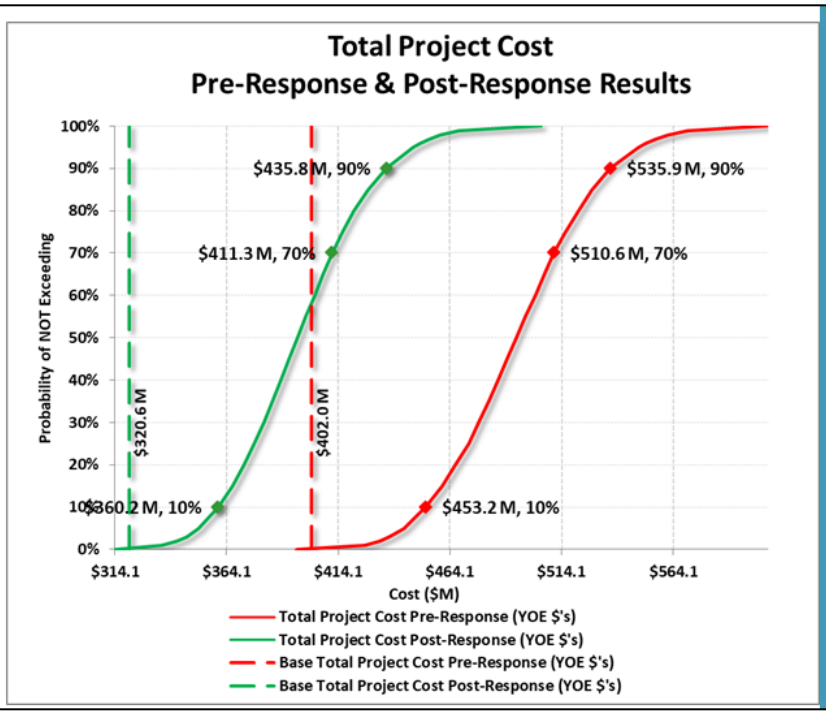
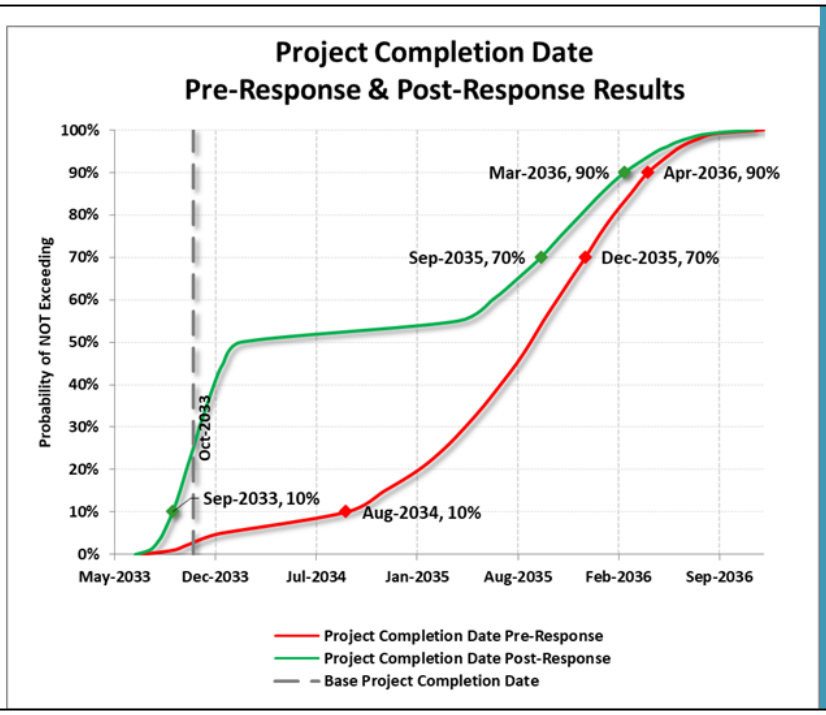


ALTERNATIVE H.1

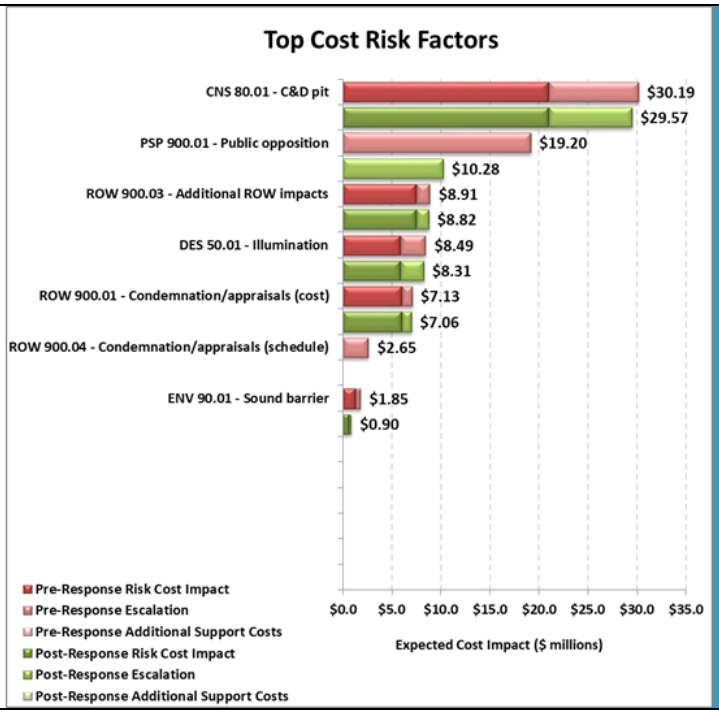
RISK RESULTS



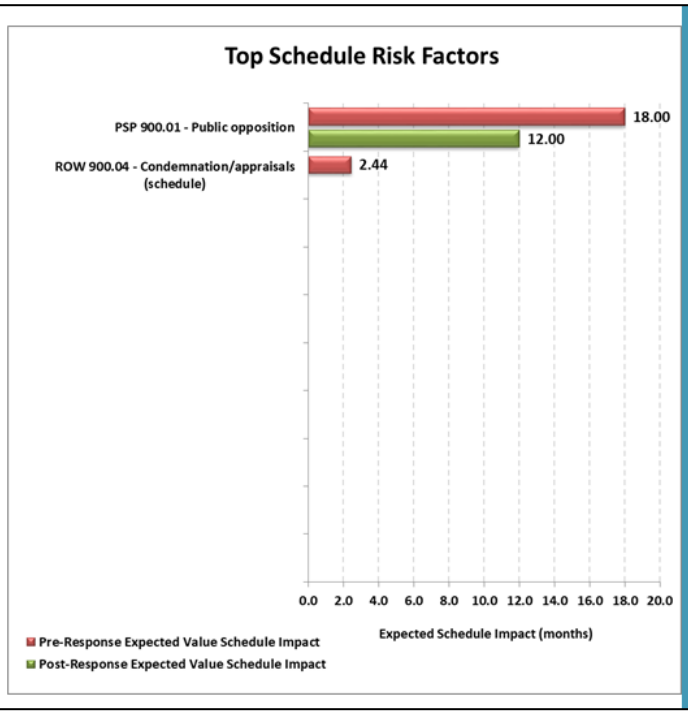
RISK RESULTS



TOP COST RISKS



TOP SCHEDULE RISKS



PERFORMANCE BASED VE

Value Engineering is not just about reducing project costs, but can also improve project performance

- Mainline Operations
- Local Operations
- Maintainability
- Construction Impacts
- Environmental Impacts

$$\text{Value} = \frac{\text{Performance}}{\text{Cost}}$$

COMPARING PERFORMANCE

Attribute	Attribute Weight	Concept	Performance Rating	Total Performance
Main Line Operations	33.5	Alternative C.3	9	301.5
		Alternative E.3	8	268.0
		Alternative H.1	8	268.0
Local Operations	26.6	Alternative C.3	7	186.2
		Alternative E.3	8	212.8
		Alternative H.1	7	186.2
Maintainability	20.0	Alternative C.3	4	80.0
		Alternative E.3	4	80.0
		Alternative H.1	3	60.0
Construction Impacts	6.6	Alternative C.3	2	13.2
		Alternative E.3	3	19.8
		Alternative H.1	8	52.8
Environmental Impacts	13.3	Alternative C.3	4	53.2
		Alternative E.3	4	53.2
		Alternative H.1	4	53.2

COMPARING VALUE

Recommendation Summary				
Recommendations		Performance (P)	Cost (C) $ millions	Value Index
	Alternative C.3	634	$297.1	2.13
	Alternative E.3	634	$253.5	2.50
	Alternative H.1	620	$411.3	1.51

Appendix I. Value Engineering Process

Value Engineering (VE) is a systematic process using a multidisciplinary team to improve the value of a project through the analysis of its functions. The VE process incorporates, to the extent possible, the values of design; construction; maintenance; contractor; state, local and federal approval agencies; other stakeholders; and the public.

The primary objective of a VE study is value improvement. The value improvements might relate to scope definition, functional design, constructability, coordination (both internal and external), or the schedule for project development. Other possible value improvements are reduced environmental impacts, reduced public inconvenience, or reduced project cost.

Value Methodology Job Plan

The Value Methodology Job Plan was employed in analyzing the project. This process is recommended by SAVE International® and is composed of the following phases:

Information - The objective of this phase was to obtain a thorough understanding of the project's design criteria and objectives by reviewing the project's documents and drawings, cost estimates, and schedules.

Function Analysis - The purpose of this phase was to identify and define the primary and secondary functions of the project. A Function Analysis System Technique (FAST) was used to quickly define the functions of the project.

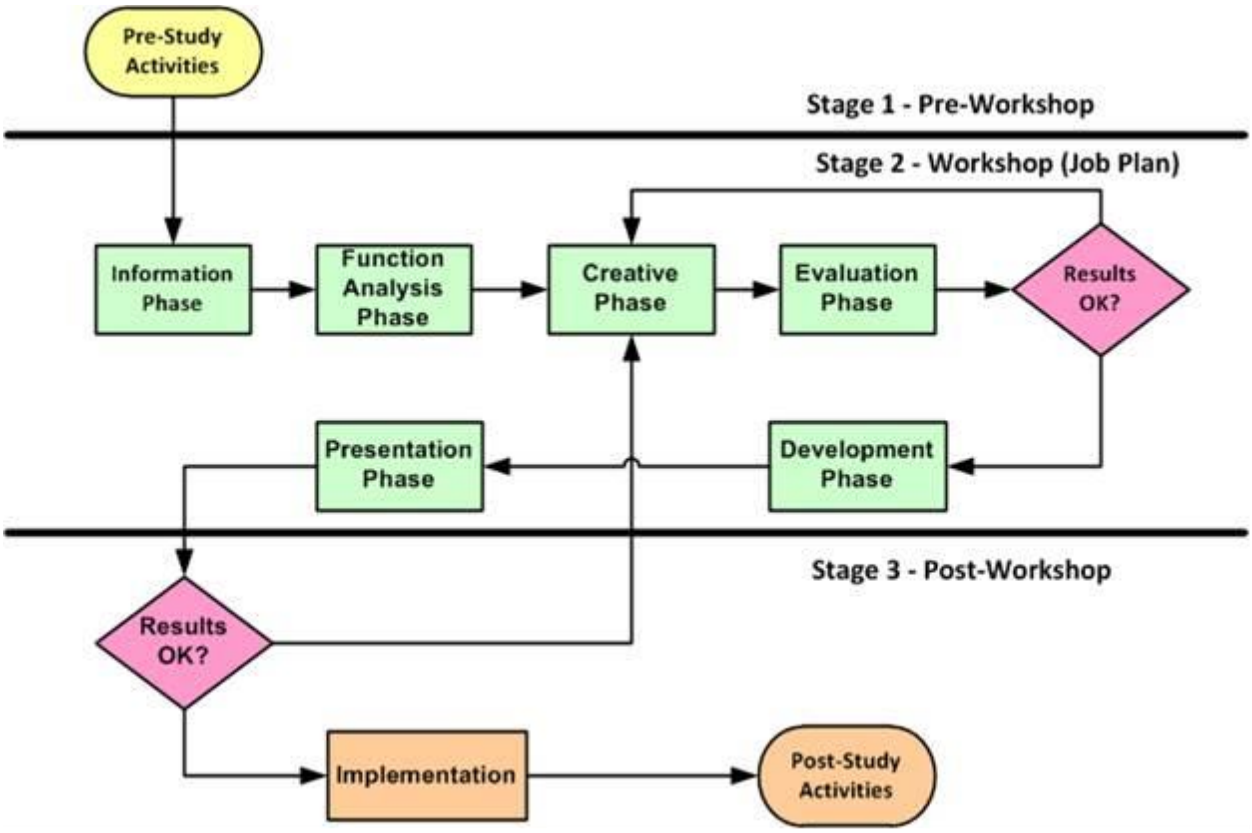
Creative - During this phase the team employed creative techniques such as team brainstorming to develop a number of alternative concepts that satisfy the project's primary functions.

Evaluation - The purpose of this phase was to evaluate the alternative concepts developed by the VE team during the brainstorming sessions. The team used a number of tools to determine the qualitative and quantitative merits of each concept.

Development - Those concepts that ranked highest in the evaluation were further developed into VE recommendations. Narratives, drawings, calculations, and cost estimates were prepared for each recommendation.

Presentation - The VE team presented their finding in the form of a written report. In addition, an oral presentation was made to the owner and the design team to discuss the VE recommendations.

Implementation/Resolution - Evaluate, resolve, document and implement all approved recommendations.



Value Methodology Job Plan

Reporting

Following the VE study the Team Leader assembles all study documentation into the draft/final reports:

- Publish Results – Prepare a draft and a final VE study report; distribute printed and electronic copies as needed.

The VE study is complete when the report is issued as a record of the VE team's analysis and development work, as well as the Project Team's implementation dispositions for the recommendations.

Appendix H.
I-15/US-20 Safety and Mobility Improvements Study
Level Three Alternative Screening Summary

20065 I-15/US-20 Safety and Mobility Study

Level Three Alternative Screening Summary

June 2020

Your Safety • Your Mobility • Your Economic Opportunity
IDAHO TRANSPORTATION DEPARTMENT

Table of Contents

Appendices

Executive Summary

The Idaho Transportation Department (ITD), District 6, is conducting the Interstate 15 (I-15) and United States Highway 20 (US-20) Safety and Mobility Study (Project No. A020(065), Key No. 20065). ITD, along with the Bonneville Metropolitan Planning Organization (BMPO) and its member agencies, have identified the need to improve the I-15/US-20 connection and the adjacent six interchanges. The project team includes ITD and their consultants, HDR Engineering and Horrocks Engineers for technical resources; BMPO; Bonneville County; and the City of Idaho Falls.

The project study includes two phases of work.

Phase A included collecting existing data and studies from previous work and initiating a public outreach program. Phase A was completed in the summer of 2018.

Phase B, the current phase, includes developing a Planning and Environmental Linkages (PEL) study. The PEL represents a collaborative and integrated approach to transportation decision-making that accomplishes the following.

1. Considers environmental, community, and economic goals early in the transportation planning process, and

2. Uses the information, analysis, and products developed during planning to inform the environmental process as the PEL recommendations move forward into a National Environmental Policy Act (NEPA) process or other project development steps.

The PEL involves three levels of screening for alternatives to develop a recommended list of alternatives to advance into a NEPA document, once funding allows. During screening level reviews, each alternative is screened against the screening criteria questions developed with the purpose, need, and project goal considerations.

Level One screening results recommended 10 alternatives be advanced into Level Two analysis. Level One screening is summarized in the Level One Alternative Screening Summary Report (April 2019). Level Two screening results recommended four alternatives be advanced into Level Three analysis. Level Two screening is summarized in the Level Two Alternative Screening Summary Report (August 2019).

This report summarizes the Level Three alternatives development, analysis, and alternatives screening process and results.

Level Three Summary

Following is a summary of the Level Three analysis, along with the referenced appendices that include greater detail at each step.

- Level Two screening resulted in five alternatives that were recommended to advance to Level Three screening (alternatives C, E, H, and the no build alternative) with Alternative E having two options for ramp connections to local streets (alternatives E1 and E2).
- Over the course of 8 months, the technical team worked on details for each alternative, including the following:
    - Further refined the geometrical layouts, structure locations, local roads and pedestrian/bicycle connectivity, and environmental impacts to known resources for each alternative.
    - Supplemented environmental information with field studies to collect information on wetland locations along the Snake River and potential cultural resource sites. The team decided not to collect baseline noise data at this time.
    - Completed micro-simulation modeling for the planning year 2045 and for an estimated construction year 2027 for each concept alternative to identify areas of delay and make adjustments to lane configurations in the geometric layouts. Preliminary TREDIS input data was also prepared based on modeling results.
    - Reviewed and modified Level Three evaluation screening questions, specifically regarding access.
    - Held an Environmental Resource Committee meeting on March 11, 2020, with the resource agencies.
    - Completed benefit cost analysis based on a high-level construction cost relative to the benefits each alternative provides.
- A cost risk assessment and value engineering (CRAVE) workshop was in held December 9-12, 2019. The primary objectives of the CRAVE study:
    - Verify or improve upon project concepts,
    - Identify high-risk areas in delivering the project,
    - Improve the value of the alternatives through innovative measures that improve the performance while reducing project costs, and
    - Perform a cost risk assessment on both the baseline alternatives and the value engineering recommendations.

  Twenty-three individuals representing ITD, BMPO, City of Idaho Falls, Bonneville County, the Federal Highway Administration (FHWA), and the consultant team participated in the workshop.

  The CRAVE study team generated over 80 ideas, which the project teams presented and evaluated against the project baseline (Level Two alternatives). The workshop group voted on which ideas to move forward to enhance the Level Three alternatives that were renamed to alternatives C3, E3, and H2. The CRAVE Executive Summary is included as part of **Appendix A**.

- Following the CRAVE workshop, the analysis team reviewed the CRAVE improved alternatives and updated the alignment geometry, traffic modeling, and impacts to prepare them for the Level Three screening. The analysis team also updated the micro-simulation modeling for the planning year 2045 for the CRAVE improved alternatives.
- The Community Working Group (CWG) Meeting #5, held on February 27, 2020, reviewed the CRAVE improved alternatives. The CWG's comments were collected and shared at the Level Three screening meeting.
- The following were provided to the analysis team for their review prior to the Level Three screening meeting, in addition to the meeting agenda. The Level Three Screening Packet is included in **Appendix A**.
    - Purpose and Need, and Project Goals
    - Level Three Screening Questions and Evaluation Matrix
    - Evaluation Summary Matrices
    - The 2045 Updated Alternatives Operational Analysis Technical Memo
    - The CRAVE Executive Summary
    - Level Three Concept Alternative Exhibits
- The Level Three screening meeting was held March 11 and 12, 2020 and included 20 individuals representing ITD, BMPO, City of Idaho Falls, Bonneville County, FHWA, a citizen, and the consultant team.
- At the Level Three screening meeting, two of the three alternatives were recommended to move into a NEPA study (**Appendix B**). The Level Three alternatives and results from the screening meeting will be presented to the public at an open house meeting on July 29, 2020. An online meeting will also be available and the information will be posted on the project website. An open house summary will then be posted on the project website.

Next Steps

To conclude the PEL, the project team will complete the following:

- Incorporate feedback from the public meeting into the final PEL report.
- Coordinate with resource agencies on the concurrence letter to include in the final PEL report.
- Submit a final PEL report to FHWA that summarizes all three levels of screening and includes a completed FHWA PEL questionnaire. Request FHWA concurrence on the PEL process and the recommended alternatives to transitioning into NEPA analysis.

A

Level Three Screening Packet

Appendix A Summary

Appendix A contains the information that was provided as part of the Level Three Screening Packet, which includes:

- Project Purpose and Need
- Level Three Exhibits
- Level Three Evaluation Questions, including the following topics:
    - Safety
    - Congestion
    - Local bicycle, pedestrian, transit and vehicle connectivity
    - Future travel demand
    - Environmental
    - Public support
    - Cost/Constructability
    - Access
    - Economics, demographics, and market impacts
- Level Three Evaluation Screening Matrix (blank)
- Level Three Screening Meeting Agenda
- Evaluation Summary Matrices
- 2045 Updated Alternatives Operational Analysis Technical Memo
- CRAVE Executive Summary

I-15/US-20 Connector
Purpose and Need
May 8, 2018

Project Purpose

The purpose of the PEL study is to identify and analyze improvements to address safety, congestion, mobility and travel time reliability for efficient movement of people, goods and services on I-15 and US-20 in or near Bonneville County and Idaho Falls.

Project Needs (details the problem, today and in the future)

The PEL will study multi-modal connections and capacity improvements to I-15 and US-20 as well as potential new roadway linkages in order to:

1. Address unsafe travel conditions on I-15 and US-20
    a. Traffic backs up at exit ramps
    b. Substandard lane change / merge space between exits
    c. Interchanges are spaced too closely together
2. Reduce congestion at the I-15/US-20 interchange, particularly for traffic exiting US-20 towards southbound I-15 at the onramp, and for northbound traffic on I-15 exiting at US-20 eastbound exchange, which both operate at a current LOS D
    a. High volumes of freight traffic
    b. High volumes of peak hour local commuter traffic
    c. Limited crossings of railroad and river funnel traffic to the I-15/US-20 corridor
3. Provide pedestrian and bicycle mobility within the I-15 and US-20 corridors
    a. Built and natural barriers limit safe connectivity to adjacent facilities and the river and adjacent multiuse trails
    b. According to the 2008 BMPO Bicycle and Pedestrian plan the corridor's "existing facilities are either inadequate, deficient, or associated with various problems."
4. Address future travel demand forecasts
    a. Current infrastructure will not accommodate travel demands of increasing local growth and regional tourism
    b. Current infrastructure is projected to operate at Level of Service E or F at the interchange of I-15/US-20 by the year 2045, which will not appropriately provide for future growth as identified in adopted local (City, County, and BMPO) land use and comprehensive plans.

Additional Goals

1. Provide transportation facilities that improve access to local schools, recreation facilities and commercial areas that support local land use plans while also reducing the negative impacts of the existing infrastructure on those community resources.
2. In addition to improvements to pedestrian and bicycle facilities in the corridor, seek to provide additional connections to the surrounding multi-modal network.
3. Provide improvements that serve all types of travelers including local commuters, freight, and regional tourism.
4. Consider new infrastructures impacts to local roads through coordination with Idaho Falls and Bonneville County.
5. In addition to identification and mitigation of any direct environmental impacts of the proposed improvements, seek to provide additional opportunities for the project to enhance local environmental resources.

ITD - Plan 03-2007

IDAHO TRANSPORTATION DEPARTMENT

I-15/US-20 CONNECTOR

PROJECT NO.

A(020)065

LEVEL 3 EXHIBIT

I-15/US-20 CONNECTOR

(I-15/US-20 SAFETY & MOBILITY STUDY)

ALTERNATIVE C
OPTION 3

English

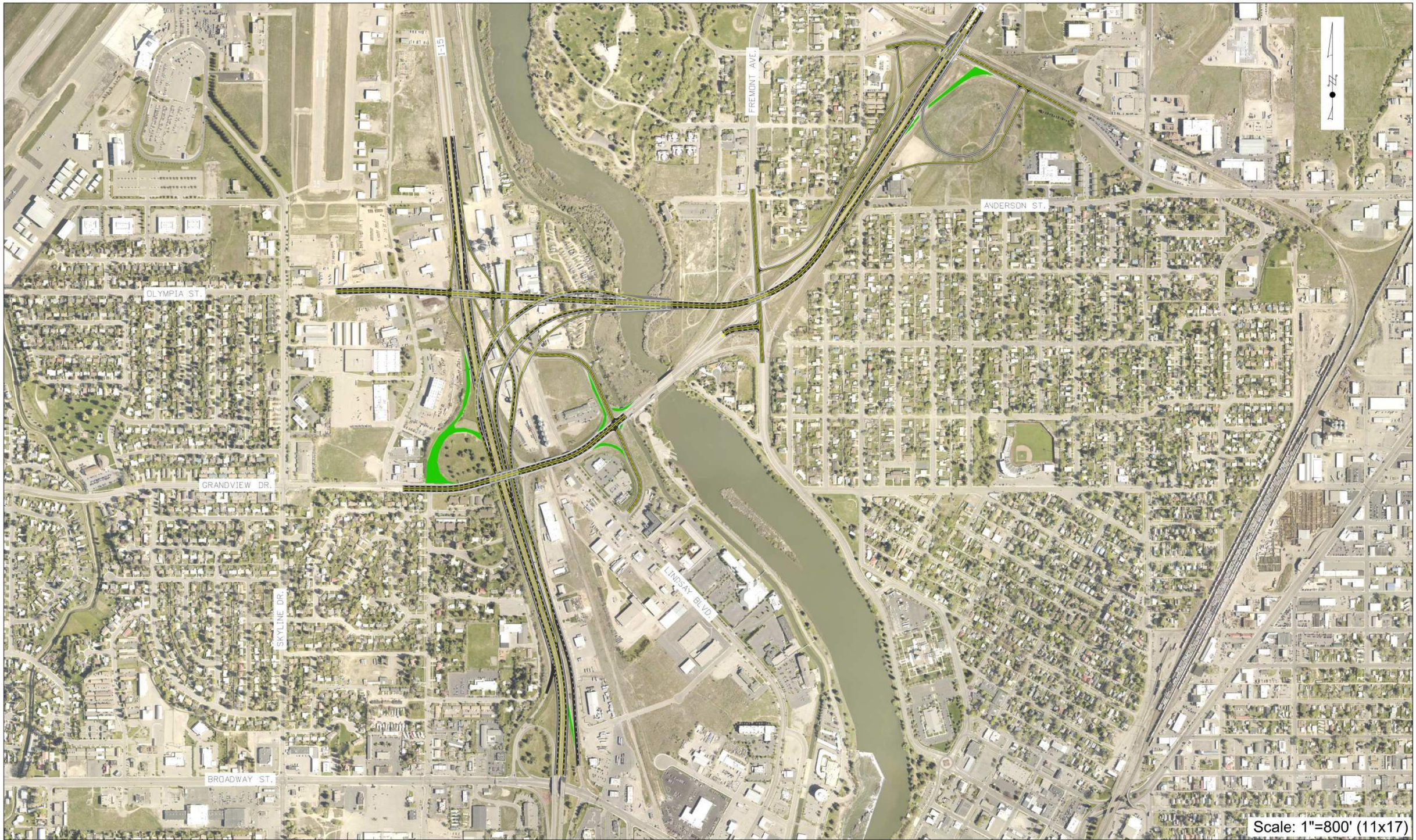
COUNTY BONNEVILLE

KEY NUMBER 20065

ROADWAY

STRUCTURE

ROADWAY OBLITERATION



IDAHO TRANSPORTATION DEPARTMENT

I-15/US-20 CONNECTOR

PROJECT NO.

A(020)065

LEVEL 3 EXHIBIT

I-15/US-20 CONNECTOR

(I-15/US-20 SAFETY & MOBILITY STUDY)

ALTERNATIVE E
OPTION 3

English

COUNTY BONNEVILLE

KEY NUMBER 20065

ROADWAY

STRUCTURE

ROADWAY OBLITERATION

Scale: 1"=2200' (11x17)

IDAHO TRANSPORTATION DEPARTMENT

I-15/US-20 CONNECTOR

INTERSTATE 15 / 20 Connector

PROJECT NO.	LEVEL 3 EXHIBIT
A(020)065	I-15/US-20 CONNECTOR (I-15/US-20 SAFETY & MOBILITY STUDY) ALTERNATIVE H OPTION 2

English

COUNTY	BONNEVILLE
KEY NUMBER	20065
SHEET	OF

ROADWAY

STRUCTURE

ITD - Plan 03-2007

Note: I-15 as shown will only be reconstructed or modified where needed. I-15 roadway lanes shown for understanding of of the alternative requirements.

Scale: 1"=800' (11x17)

IDAHO TRANSPORTATION DEPARTMENT

I-15/US-20 CONNECTOR

PROJECT NO.

A(020)065

LEVEL 3 EXHIBIT

I-15/US-20 CONNECTOR

(I-15/US-20 SAFETY & MOBILITY STUDY)

ALTERNATIVE H
OPTION 2 (Exit 118-119)

English

COUNTY BONNEVILLE

KEY NUMBER 20065

ROADWAY

STRUCTURE

ROADWAY OBLITERATION

IDAHO TRANSPORTATION DEPARTMENT

I-15/US-20 CONNECTOR

Connector

PROJECT NO.	LEVEL 3 EXHIBIT
A(020)065	I-15/US-20 CONNECTOR (I-15/US-20 SAFETY & MOBILITY STUDY) ALTERNATIVE H OPTION 2 (NORTH CONNECTOR)

English

COUNTY	BONNEVILLE
KEY NUMBER	20065

ROADWAY
STRUCTURE
ROADWAY OBLITERATION

I-15/US-20 PEL Evaluation Questions

Evaluation Questions

Needs, Goals, and Objectives	Level 1 Criteria Questions	Level 1 Responses	Level 2 Criteria Questions	Level 2 Responses (all responses include qualitative discussion)	Level 3 Criteria Questions	Level 3 Responses (quantitative data and qualitative discussion)
Safety	Does the alternative improve bike, pedestrian and vehicle safety on I-15 and US-20, including the interchange on or off-ramps?	Better/Good/Fair/Negative	Does the alternative reduce backups on the exit ramps?	Better/Good/Neutral/Fair/Worse	How well do ramp signals operate?	Ramp signal LOS
			Does the alternative provide the opportunity to address geometric deficiencies on I-15, US-20 and interchange ramps, including substandard lane width, acceleration, deceleration, and weaving distance between exits?	Better/Good/Neutral/Fair/Worse	Does the alternative provide adequate weave distance?	What is the total weave distance provided between consecutive ramps?
					Does the alternative provide standard 12-foot lane widths?	What is the total number of corridor lane-miles that are narrower than 12 feet?
			Does the alternative address substandard interchange spacing on I-15 and US-20?	Better/Good/Neutral/Fair/Worse	Does the design option provide adequate distance between ramps?	What is the total distance between ramps?
			Are changes in access (closures or relocations) expected to reduce crashes?	Better/Good/Neutral/Fair/Worse	Does the alternative reduce merges and diverges?	What is the total number of predicted crashes based on HSM analysis?
Congestion	Does the alternative reduce congestion on I-15 and US-20?	Better/Good/Fair/Negative	Does the alternative increase the capacity of I-15 and US-20?	Better/Good/Neutral/Fair/Worse	What is the capacity of I-15/US-20 in the alternative?	What is the total number of vehicles able to be moved through the corridor in a given peak period?
			Does the alternative separate regional through trips and local destination trips?	Better/Good/Neutral/Fair/Worse	Does the alternative reduce end-to-end travel times through the corridor?	What is the end to end travel time in the corridor?
			Does the alternative improve freight movement?	Better/Good/Neutral/Fair/Worse	How does the alternative affect freight traffic?	What are the out of direction movements and/or total delay for high volume freight routes?

I-15/US-20 PEL Evaluation Questions

Evaluation Questions

Needs, Goals, and Objectives	Level 1 Criteria Questions	Level 1 Responses	Level 2 Criteria Questions	Level 2 Responses (all responses include qualitative discussion)	Level 3 Criteria Questions	Level 3 Responses (quantitative data and qualitative discussion)
			Does the alternative provide improved, alternative, or additional crossings of railroad and river?	Better/Good/Neutral/Fair/Worse	Is there an alternative or redundant crossing provided in the alternative?	How many lanes cross the railroad and river?
					Does the alternative affect traffic volumes on parallel facilities?	What are the projected volumes and LOS on parallel facilities?
Local bicycle, pedestrian, transit and vehicle connectivity	Does the alternative enhance or improve bicycle, pedestrian, transit and vehicle connectivity throughout the I-15/US-20 study area?	Better/Good/Fair/Negative	Does the alternative enhance or improve bicycle, pedestrian, transit and vehicle connectivity throughout the I-15/US-20 project area?	Better/Good/Neutral/Fair/Worse	Does the alternative support current and future bicycle connection needs in the Study area?	What are the number of bicycle crossings and new trail provided?
					Does the alternative support current and future pedestrian connection needs across I-15 and US-20?	What are the total number of pedestrian crossings and/or new sidewalk or multiuse trails that meet BMPO current Bike/Ped plan standards?
					Does the alternative support current and future transit connection needs across I-15 and US-20?	What connections are supported?
					Does the alternative support current and future local vehicle connection needs across I-15/US-20?	What connections are supported?
					Does the alternative improve connections/transfers to surrounding multi-modal network?	What connections are supported?
Future Travel Demand	Does the alternative improve travel time reliability on I-15 and US-20 in the study area?	Better/Good/Fair/Negative	Does the alternative provide capacity improvements to address projected population and tourism growth?	Better/Good/Neutral/Fair/Worse	Does the alternative address 2045 peak hour congestion?	What are the 2045 peak hour congestion rates?
			Does the alternative provide LOS improvements to adequately address future growth as identified in adopted City, County, and MPO land use and comprehensive plans?	Better/Good/Neutral/Fair/Worse	Does the alternative operate at a 2045 LOS consistent with existing BMPO planning documents (LOS A-D is acceptable)?	How well does the alternative accommodate future local land use and

I-15/US-20 PEL Evaluation Questions

Evaluation Questions

Needs, Goals, and Objectives	Level 1 Criteria Questions	Level 1 Responses	Level 2 Criteria Questions	Level 2 Responses (all responses include qualitative discussion)	Level 3 Criteria Questions	Level 3 Responses (quantitative data and qualitative discussion)
			*(Acceptable LOS per BMPO Long Range Transportation Plan = LOS A-D)			population changes?
					Does the alternative provide flexibility to accommodate increases in volume beyond the planning year?	Yes/No
Environmental	Does the alternative meet the purpose and need of the project?	Better/Good/Fair/Negative	Will the environmental impacts require additional agency approvals or permits?	Better/Good/Neutral/Fair/Worse	What environmental impacts have been identified?	Identify environmental impacts.
			Does the alternative create any problematic or unmitigatable impacts to environmental resources?	Better/Good/Neutral/Fair/Worse	Are necessary mitigations for any environmental impacts likely to limit design flexibility or affect the overall schedule and cost?	Identify agency approvals and permits required (especially for 404, Section 106, 4f, 6f, etc.)
			Does the alternative provide enhancement to local environmental resources?	Better/Good/Neutral/Fair/Worse	What enhancements would the alternative provide?	Identify enhancements.
Economics, Demographics and Market Impacts	Does the alternative enhance or improve economic, demographic and market condition in accordance with city, county and MPO land use and comprehensive plan objectives and goals?	Better/Good/Fair/Negative	Not addressed in Level 2, no new additional information.		Qualitatively, what economic and demographic impacts can be anticipated with the alternative in the short-term (through construction) and the long-term (beyond 5 years)?	
Public Support			Does the alternative create any controversial issues?	Better/Good/Neutral/Fair/Worse	What are the obvious public concerns the project will have to address?	Identify public perception/support issues.
Cost/ Constructability	Does the alternative provide options for phased improvements?	Better/Good/Fair/Negative	Does the project provide logical and sequential phasing?	Better/Good/Neutral/Fair/Worse	Would phased improvements include throwaway improvements?	Identify improvements might be thrown away at a later phase of design.

I-15/US-20 PEL Evaluation Questions

Evaluation Questions

Needs, Goals, and Objectives	Level 1 Criteria Questions	Level 1 Responses	Level 2 Criteria Questions	Level 2 Responses (all responses include qualitative discussion)	Level 3 Criteria Questions	Level 3 Responses (quantitative data and qualitative discussion)
			Does the Alternative provide a reasonable cost/benefit?	Better/Good/Neutral/Fair/Worse		
					Would the alternative redirect traffic to other local roads?	Identify impacts to alternative local roads.
					What is the Benefit Cost Ratio of the alternative?	Identify BCR alternative.
Access	Does the alternative improve access to local resources including schools, recreational facilities, and commercial areas?	Better/Good/Fair/Negative	How well does the alternative improve access to local resources including schools, recreational facilities, and commercial areas?	Better/Good/Neutral/Fair/Worse	Is the improved access to local resources beneficial to the intent/use of the local resource?	Describe the change to the access and the likely impact on the resource.
					Does the alternative reduce access to local resources?	Describe how the access is reduced and the likely impact on the resource.

Level Three Evaluation Screening Matrix

Grading Scale				
◉	◓	○	◒	●
Better	<<<<<<<	<<<>>>	>>>>>>>	Worse

		Evaluation Criteria 1						Evaluation Criteria 2					
Needs, Goals, and Objectives		Safety	Safety	Safety	Safety	Safety		Congestion	Congestion	Congestion	Congestion	Congestion	
Alternatives		How well do ramp signals operate?	Does the alternative provide adequate weave distance?	Does the alternative provide standard 12-foot lane widths?	Does the design option provide adequate distance between ramps?	Does the alternative reduce merges and diverges?	**Safety Summary**	What is the capacity of I-15/US-20 in the alternative?	Does the alternative reduce end-to-end travel times through the corridor?	How does the alternative affect freight traffic?	Is there an alternative or redundant crossing provided in the alternative?	Does the alternative affect traffic volumes on parallel facilities?	**Congestion Summary**
C3	*Answer*												
	Comments												
E3	*Answer*												
	Comments												
H2	*Answer*												
	Comments												

Level Three Evaluation Screening Matrix

Needs, Goals, and Objectives / Alternatives		Evaluation Criteria 3						Evaluation Criteria 4			
		Local bicycle, pedestrian, transit and vehicle connectivity	Local bicycle, pedestrian, transit and vehicle connectivity	Local bicycle, pedestrian, transit and vehicle connectivity	Local bicycle, pedestrian, transit and vehicle connectivity	Local bicycle, pedestrian, transit and vehicle connectivity	**Local bicycle, pedestrian, transit and vehicle connectivity summary**	Future Travel Demand	Future Travel Demand	Future Travel Demand	**Future Travel Demand Overall**
		Does the alternative support current and future bicycle connection needs in the Study area?	Does the alternative support current and future pedestrian connection needs across I-15 and US-20?	Does the alternative support current and future transit connection needs across I-15 and US-20?	Does the alternative support current and future local vehicle connection needs across I-15/US-20?	Does the alternative improve connections/transfers to surrounding multi-modal network?		Does the alternative address 2045 peak hour congestion?	Does the alternative operate at a 2045 LOS consistent with existing BMPO planning documents (LOS A-D is acceptable)?	Does the alternative provide flexibility to accommodate increases in volume beyond the planning year?	
C3	*Answer*										
	Comments										
E3	*Answer*										
	Comments										
H2	*Answer*										
	Comments										

Level Three Evaluation Screening Matrix

Needs, Goals, and Objectives / Alternatives		Evaluation Criteria 5				Evaluation Criteria 6	Evaluation Criteria 7			
		Environmental	Environmental	Environmental		Public Support	Cost/Constructability	Cost/Constructability	Cost/Constructability	
		What environmental impacts have been identified?	Are necessary mitigations for any environmental impacts likely to limit design flexibility or affect the overall schedule and cost?	What enhancements would the alternative provide?	**Environmental Summary**	What are the obvious public concerns the project will have to address?	Would phased improvements include throwaway improvements?	Would the alternative redirect traffic to other local roads?	What is the Benefit Cost Ratio of the alternative?	**Constructability Summary**
C3	*Answer*									
	Comments									
E3	*Answer*									
	Comments									
H2	*Answer*									
	Comments									

Level Three Evaluation Screening Matrix

Needs, Goals, and Objectives / Alternatives		Evaluation Criteria 8			Evaluation Criteria 9			
		Access	Access	**Access Summary**	Economics/Demographics	Economics/Demographics	**Economics/Demographics Summary**	**Alternative Overall**
		Is the improved access to local resources beneficial to the intent/use of the local resource?	Does the alternative reduce access to local resources?		What economic and demographic impacts can be anticipated with the alternative in the short-term (through construction)?	What economic and demographic impacts can be anticipated with the alternative in the long-term (beyond 5 years)?		
C3	*Answer*							
	Comments							
E3	*Answer*							
	Comments							
H2	*Answer*							
	Comments							

Agenda

Project:	I-15/US-20 Connector
Subject:	Level 3 Screening of the Universe of Alternatives
Date	March 11-12, 2020
Location:	ITD District 6 Office, Rigby ID

Attendees:		
	Karen Hiatt - ITD	Tracy Ellwein – HDR
	Drew Meppen - ITD	Cameron Waite – HDR
	Ryan Day - ITD	Jason Longsdorf – HDR
	Curtis Calderwood - ITD	Stephanie Borders – HDR
	Brad Richards - ITD	Corrie Hugaboom – HDR
	Jim Lawrence – BYU Idaho	John McPherson - HDR
	Tim Cramer – ITD	Kelly Hoopes – Horrocks
	Mark Layton – ITD	Ben Burke – Horrocks
	Jet Johnston – ITD	Mike McKee - Horrocks
	Scot Stacy - ITD	Lance Bates – Bonneville Co.
		Chris Canfield – City of Idaho Falls
		Darrell West – BMPO
		Nick Contos - Citizen

Meeting Goal – Review screening results; come to general consensus on the alternative(s)

Day 1

1:00	Welcome, Introductions, Agenda Review – Tracy/Ryan
1:15	Project update – how we got from Level 2 to Level 3 – Tracy
1:30	Public Outreach / CWG overview - Stephanie
1:45	Review of screening process / Level 3 evaluation criteria /screening matrix - Jason
2:00	Overview of the 3 updated Level Three Alternatives – Kelly/Cameron
3:15	Open discussion/feedback on the screening - Jason
	Identify discrepancies in screening results

4:00 Updates to screening matrix by individuals

4:30 Adjourn

Day 2 – Goal to identify and refine top tier alternative(s) to recommend for NEPA

8:30 Recap of day 1, share items that you thought about overnight

9:00 Review compilation of screening matrix / general consensus on the alternative(s) discussions.

9:30 Review details and discuss the top tier alternative(s) – (about 1 hr/alternative). Items to consider:

- How well the alternative performs against the screen criteria
- What are the concerns of each alternative, can concerns be addressed?
- Identify refinements that could improve the alternatives.
- Are there some alternatives that could be combined to improve the alternative?
- Identify elements that could be eliminated or added to alternatives
- Identify major mitigations needed
- Identify key agencies / Stakeholders
- Discuss phasing – logical way to phase it?
- Other concerns?

12:00 Working Lunch (lunch provided)

12:30 Recap on the alternative(s) to recommend to move into NEPA

1:00 Open dialog on alternative(s) recommendation

1:30 Discussion of next steps

2:00 Adjourn the main group

2:00 Team huddle for Project Team

3:00 Adjourn

Meeting Day Materials

- Individual screening matrix & figures (packet)
- 24 x 36 prints (1 each)
- Evaluation Criteria
- Flip chart

Safety & Congestion Matrix

Alternative Improvement	Section	Level 3 Criteria Questions	Level 3 Responses (quantitative data and qualitative discussion)	Observations from TransCAD Scenarios	Observations from Exhibits & Analysis Results
C3	Safety	How well do ramp signals operate?	Ramp signal LOS		All perform adequately at LOS D or better. Exit 311 EB ramp signal is only terminal that operates at LOS D.
		Does the alternative provide adequate weave distance?	What is the total weave distance provided between consecutive ramps?		Slip ramps between Johns Hole and Science Center require increased spacing. The rest of the alternative provides adequate weave distances for the desired movements according to AASHTO minimums, however, adjustments had to be made to achieve minimums and traffic progression may be less than ideal.
		Does the alternative provide standard 12-foot lane widths?	What is the total number of corridor lane-miles that are narrower than 12 feet?		None
		Does the design option provide adequate distance between ramps?	What is the total distance between ramps?		The alternative meets the absolute minimums according to the Green Book, however, traffic progression and flow may not be ideal for the tight spacing.
		Does the alternative reduce merges and diverges?	What is the total number of predicted crashes based on HSM analysis?		The number of merges and diverges remain the same. The total is reduced through the removals of Exits 119, 307 and 308, but is added to by the new direct ramps and slip ramps. 21 total ramps in project area
	Congestion	What is the capacity of I-15/US-20 in the alternative?	What is the total number of vehicles able to be moved through the corridor in a given peak period?		6917 total vehicles cross the Snake River during peak period. This is a 35% increase in capacity compared to No-Build condition
		Does the alternative reduce end-to-end travel times through the corridor?	What is the end to end travel time in the corridor?		5.1 minutes from NB I-15 to EB US-20. 66% decrease in travel time compared to no-build
		How does the alternative affect freight traffic?	What are the out of direction movements and/or total delay for high volume freight routes?		Separates regional and local trips while maintaining access to Idaho Falls and surrounding communities.
		Is there an alternative or redundant crossing provided in the alternative?	How many lanes cross the railroad and river?		12 lanes in total provided over river
		Does the alternative affect traffic volumes on parallel facilities?	What are the projected volumes and LOS on parallel facilities?	Yes, reduces volumes on Skyline Dr. and Lindsey Blvd. and increases volume along Fremont Ave.	LOS at Grandview Dr & Skyline Dr intersection decreases from F to C compared to No-Build alternative
	Local bicycle, pedestrian, transit and vehicle connectivity	Does the alternative support current and future bicycle connection needs in the Study area?	What are the number of bicycle crossings and new trail provided?		Yes, major impact is to future Grandview shared used path and West Snake River shared use path. C3 should allow for easier implementation of these paths by removing non-local traffic from adjacent roadway. 3 new crossing must be provided
		Does the alternative support current and future pedestrian connection needs across I-15 and US-20?	What are the total number of pedestrian crossings and/or new sidewalk or multiuse trails that meet BMPO 2008 Bike/Ped plan standards?		Yes, major impact is to future Grandview shared used path and West Snake River shared use path. C3 should allow for easier implementation of these paths by removing non-local traffic from adjacent roadway. 3 new crossing must be provided
		Does the alternative support current and future transit connection needs across I-15 and US-20?	What connections are supported?		Maintains connections to current transit routes and may improve connection from Grandview to destination east of the Snake River
		Does the alternative support current and future local vehicle connection needs across I-15/US-20?	What connections are supported?		Yes, connections to Grandview Dr., Lindsey Blvd., Fremont Ave. and Science Center Blvd. are still supported.
		Does the alternative improve connections/transfers to surrounding multi-modal network?	What connections are supported?		See mobility matrix for details
	Future Travel Demand Needs, Goals, and Objectives	Does the alternative address 2045 peak hour congestion?	What are the 2045 peak hour congestion rates?		Yes, all but four intersections are estimated to operate similarly or better than no-build alternative. No merge, diverge or weave areas are estimated to operate at LOS F.
		Does the alternative operate at a 2045 LOS consistent with existing BMPO planning documents (LOS A-D is acceptable)?	How well does the alternative accommodate future local land use and population changes?		21 out of 24 intersections are estimated to operate at LOS D or better, and none estimated to operate at LOS F. 13 of 21 ramps analyzed are estimated to operate at LOS D or better, and none estimated to operate at LOS F.
		Does the alternative provide flexibility to accommodate increases in volume beyond the planning year?	Yes/No		Yes, most intersections and ramps operate at LOS D or better

Safety & Congestion Matrix

Alternative Improvement	Section	Level 3 Criteria Questions	Level 3 Responses (quantitative data and qualitative discussion)	Observations from TransCAD Scenarios	Observations from Exhibits & Analysis Results
E3	Safety	How well do ramp signals operate?	Ramp signal LOS		All perform adequately at LOS D or better, except for Exit 311 EB ramp signal which is estimate to operate at LOS F.
		Does the alternative provide adequate weave distance?	What is the total weave distance provided between consecutive ramps?		Yes, the alternative provides adequate weave distances for the desired movements according to AASHTO minimums, however, adjustments had to be made to achieve minimums and traffic progression may be less than ideal.
		Does the alternative provide standard 12-foot lane widths?	What is the total number of corridor lane-miles that are narrower than 12 feet?		None
		Does the design option provide adequate distance between ramps?	What is the total distance between ramps?		Yes, the alternative provides adequate distances between ramps according to the Green Book, however, traffic progression and flow may not be ideal for the tight spacing. Some of the EN-EN Ramps may require additional spacing
		Does the alternative reduce merges and diverges?	What is the total number of predicted crashes based on HSM analysis?		The number of merges and diverges increase slightly. The total is reduced through the removals of Exits 119, 307 and 308, but is added to by the new Olympia interchange and direct ramps. 22 total ramps in project area
	Congestion	What is the capacity of I-15/US-20 in the alternative?	What is the total number of vehicles able to be moved through the corridor in a given peak period?		6942 total vehicles cross the Snake River during peak period. This is a 36% increase in capacity compared to No-Build condition
		Does the alternative reduce end-to-end travel times through the corridor?	What is the end to end travel time in the corridor?		5.4 minutes from NB I-15 to EB US-20. 65% decrease in travel time compared to no-build
		How does the alternative affect freight traffic?	What are the out of direction movements and/or total delay for high volume freight routes?		Separates regional and local trips while maintaining access to Idaho Falls and surrounding communities.
		Is there an alternative or redundant crossing provided in the alternative?	How many lanes cross the railroad and river?		No. 14 lanes in total provided over river
		Does the alternative affect traffic volumes on parallel facilities?	What are the projected volumes and LOS on parallel facilities?	Yes, reduces volumes on Skyline Dr. and Grandview Dr.	LOS at Grandview Dr & Skyline Dr intersection decreases from F to B compared to No-Build alternative. Grandview Dr. and Saturn and Lindsey Blvd. intersections estimated to operate at LOS A.
	Local bicycle, pedestrian, transit and vehicle connectivity	Does the alternative support current and future bicycle connection needs in the Study area?	What are the number of bicycle crossings and new trail provided?		Yes, major impact is to future Grandview shared used path, future West and existing East Snake River shared use path. Project should allow for easier implementation of path by removing non-local traffic from adjacent roadway. 2 new crossing must be provided
		Does the alternative support current and future pedestrian connection needs across I-15 and US-20?	What are the total number of pedestrian crossings and/or new sidewalk or multiuse trails that meet BMPO 2008 Bike/Ped plan standards?		Yes, major impact is to future Grandview shared used path, future West and existing East Snake River shared use path. Project should allow for easier implementation of path by removing non-local traffic from adjacent roadway.
		Does the alternative support current and future transit connection needs across I-15 and US-20?	What connections are supported?		Maintains connections to current transit routes and may improve connection from Grandview to destination east of the Snake River
		Does the alternative support current and future local vehicle connection needs across I-15/US-20?	What connections are supported?		Yes, connections to Grandview Dr., Lindsey Blvd., Fremont Ave. and Science Center Blvd. are still supported.
		Does the alternative improve connections/transfers to surrounding multi-modal network?	What connections are supported?		See mobility matrix for details
	Future Travel Demand Needs, Goals, and Objectives	Does the alternative address 2045 peak hour congestion?	What are the 2045 peak hour congestion rates?		Doesn't help existing local system congestion. Helps reduce I-15/US-20 congestion through direct ramps and removal of Exits 119 and 307. Some congestion is moved downstream to Exits 309 and 310, with each having one ramp estimated to operate at LOS F.
		Does the alternative operate at a 2045 LOS consistent with existing BMPO planning documents (LOS A-D is acceptable)?	How well does the alternative accommodate future local land use and population changes?		19 out of 24 intersections are estimated to operate at LOS D or better, with two estimated to operate at LOS F. 16 of 22 ramps analyzed are estimated to operate at LOS D or better, with one estimated to operate at LOS F.
		Does the alternative provide flexibility to accommodate increases in volume beyond the planning year?	Yes/No		Yes, most intersections and ramps operate at LOS D or better

Safety & Congestion Matrix

Alternative Improvement	Section	Level 3 Criteria Questions	Level 3 Responses (quantitative data and qualitative discussion)	Observations from TransCAD Scenarios	Observations from Exhibits & Analysis Results
H2	Safety	How well do ramp signals operate?	Ramp signal LOS		All perform adequately at LOS D or better. 5 out of 7 ramp signals are estimated to operate at LOS D.
		Does the alternative provide adequate weave distance?	What is the total weave distance provided between consecutive ramps?		This alternative does provide adequate weave distances according to AASHTO Minimums. No adjustments were necessary to achieve minimums. You should have some space to make additional adjustments
		Does the alternative provide standard 12-foot lane widths?	What is the total number of corridor lane-miles that are narrower than 12 feet?		None
		Does the design option provide adequate distance between ramps?	What is the total distance between ramps?		Yes, the alternative provides adequate distances between ramps.
		Does the alternative reduce merges and diverges?	What is the total number of predicted crashes based on HSM analysis?		The number of merges and diverges increase slightly. The total is reduced through the modification of Exits 118 & 119, and removals of Exits 308, 309, 310 and 311, but is added by the new Y-interchange and River and Telford interchanges. 22 total ramps in project area
	Congestion	What is the capacity of I-15/US-20 in the alternative?	What is the total number of vehicles able to be moved through the corridor in a given peak period?		6638 total vehicles cross the Snake River during peak period. This is a 30% increase in capacity compared to No-Build condition
		Does the alternative reduce end-to-end travel times through the corridor?	What is the end to end travel time in the corridor?		6.7 minutes from NB I-15 to EB US-20. 56% decrease in travel time compared to no-build
		How does the alternative affect freight traffic?	What are the out of direction movements and/or total delay for high volume freight routes?		Separates regional and local trips while maintaining access to Idaho Falls and surrounding communities.
		Is there an alternative or redundant crossing provided in the alternative?	How many lanes cross the railroad and river?		No. 11 lanes in total provided over river
		Does the alternative affect traffic volumes on parallel facilities?	What are the projected volumes and LOS on parallel facilities?	Yes, reduces volumes on Skyline Dr. and Fremont Ave. Increases volume on Lewisville Hwy	LOS at Grandview Dr & Skyline Dr intersection decreases from F to D compared to No-Build alternative. Grandview Dr. and Saturn and Lindsey Blvd. intersections estimated to operate at LOS A.
	Local bicycle, pedestrian, transit and vehicle connectivity	Does the alternative support current and future bicycle connection needs in the Study area?	What are the number of bicycle crossings and new trail provided?		Yes, major impact is to future West and existing East Snake River shared use path. 4 new crossing must be provided
		Does the alternative support current and future pedestrian connection needs across I-15 and US-20?	What are the total number of pedestrian crossings and/or new sidewalk or multiuse trails that meet BMPO 2008 Bike/Ped plan standards?		Yes, major impact is to future West and existing East Snake River shared use path. 4 new crossing must be provided
		Does the alternative support current and future transit connection needs across I-15 and US-20?	What connections are supported?		Maintains connections to current transit routes and may improve connection from Grandview to destination east of the Snake River
		Does the alternative support current and future local vehicle connection needs across I-15/US-20?	What connections are supported?		Yes, connections to Grandview Dr., Lindsey Blvd., Fremont Ave. and Lewisville Hwy still provided. Limited connections to Science Center Blvd. and N 15th E.
		Does the alternative improve connections/transfers to surrounding multi-modal network?	What connections are supported?		See mobility matrix for details
	Future Travel Demand Needs, Goals, and Objectives	Does the alternative address 2045 peak hour congestion?	What are the 2045 peak hour congestion rates?		Yes, all but four intersections are estimated to operate similarly or better than no-build alternative. Overall congestion is reduced at the modified Exit 118 and 119 interchanges, but congestion increases along Exit 307 WB On ramp compared to No-Build condition, though is still estimate to fail.
		Does the alternative operate at a 2045 LOS consistent with existing BMPO planning documents (LOS A-D is acceptable)?	How well does the alternative accommodate future local land use and population changes?		23 out of 24 intersections are estimated to operate at LOS D or better, and none estimated to operate at LOS F. 18 of 22 ramps analyzed are estimated to operate at LOS D or better, with two estimated to operate at LOS F.
		Does the alternative provide flexibility to accommodate increases in volume beyond the planning year?	Yes/No		Yes, most intersections and ramps operate at LOS D or better

Environmental Matrix

Alternative	Needs, Goals, and Objectives	Level 3 Criteria Questions	Level 3 Responses (quantitative data and qualitative discussion)	Environmental Resources						
				Section 4(f)	Historic Resources	Hazardous Materials	Wetland Impacts	Biological Resources	Noise	Enviro
				Comments	Comments	Comments	Comments	Comments	Comments	Comments
C3	Environmental	What environmental impacts have been identified?	Identify environmental impacts.	See historic resources column for 4(f) impacts from historic Rec impacts: Greenbelt, Boat dock	Potential impacts to: Union Pacific Railroad (UPRR) Grain elevators Porter Canal Highland Park subdivision (several homes) Vissing Circle (2 homes)	Displaces several industrial facilities, most of which are not officially listed 2 underground storage tank (UST), 5 Resource Conservation and Recovery Act (RCRA) facilities impacted	Conceptual estimate of 0.7 ac wetland impact 3 new + 1 replacement river crossing 3 new Porter Canal crossing	Ute Ladies Tresses (ULT) habitat not ruled out; will need to determine at river crossings	2 likely neighborhood impacts (Highlands either side of highway) 1 possible neighborhood impact (Antares) 1 possible school impact 1 possible park impact	Approx 10-15 business displacements Approx 6 residential displacements Several apartment building displacements near Sci. Ctr. 1 church displacement
C3	Environmental	Are necessary mitigations for any environmental impacts likely to limit design flexibility or affect the overall schedule and cost?	Identify agency approvals and permits required (especially for 404, Section 106, 4f, 6f, etc.)	Negotiations to mitigate Section 4(f) impacts can be lengthy. Agency involvement will depend on historic or rec impact.	Negotiations to mitigate Section 106 impacts can be lengthy; Work with State Historic Preservation Office (SHPO), Advisory Council on Historic Preservation (ACHP), Federal Highway Administration (FHWA) would be required.	Coordination with Idaho Department of Environmental Quality (IDEQ) may be required.	No wetland mitigation banks exist in Eastern Idaho. Mitigation may involve compensatory constructed wetlands.	If ULT impacts occur, avoidance or mitigation would be necessary. Surveys recommended, U.S. Fish and Wildlife Service (USFWS) consultation may be required.	Noise walls may be required. FHWA approval will be required.	Some displacements may occur in low income or minority areas.
C3	Environmental	What enhancements would the alternative provide?	Identify enhancements.	Possible enhanced greenbelt connectivity	None	None	None	None	None	Enhanced ped/bike connectivity
C3	Economics, Demographics and Market Impacts	Qualitatively, what economic and demographic impacts can be anticipated with the alternative in the short-term (through construction) and the long-tern (beyond 5 years)?								
E3	Environmental	What environmental impacts have been identified?	Identify environmental impacts.	See historic resources column for 4(f) impacts from historic Rec impacts: Greenbelt	Potential impacts to: UPRR Grain elevators Porter Canal 2 potentially historic farmsteads Highland Park subdivision (some homes - less than C)	Displaces one industrial facility, which is not listed 1 UST, 1 closed leaking underground storage tank (LUST), 6 RCRA facilities impacted	Conceptual estimate of 0.9 to 1.2 ac wetland impact 1 new + 1 replacement river crossing 1 new Porter Canal crossing	ULT habitat not ruled out; will need to determine at river crossings	1 likely neighborhood impact (Highlands north side) 1 likely church impact 1 possible neighborhood impact (Highlands south side)	Approx 4-6 business displacements RV Park displacement Approx 3 residential displacements 1-2 apartment building displacements
E3	Environmental	Are necessary mitigations for any environmental impacts likely to limit design flexibility or affect the overall schedule and cost?	Identify agency approvals and permits required (especially for 404, Section 106, 4f, 6f, etc.)	Negotiations to mitigate Section 4(f) impacts can be lengthy. Agency involvement will depend on historic or rec impact.	Negotiations to mitigate Section 106 impacts can be lengthy; Work with SHPO, ACHP, FHWA would be required.	Coordination with IDEQ may be required.	No wetland mitigation banks exist in Eastern Idaho. Mitigation may involve compensatory constructed wetlands.	If ULT impacts occur, avoidance or mitigation would be necessary. Surveys recommended, USFWS consultation may be required.	Noise walls may be required. FHWA approval will be required.	Some displacements may occur in low income or minority areas.
E3	Environmental	What enhancements would the alternative provide?	Identify enhancements.	Possible enhanced greenbelt connectivity	None	None	None	None	None	Enhanced ped/bike connectivity
E3	Economics, Demographics and Market Impacts	Qualitatively, what economic and demographic impacts can be anticipated with the alternative in the short-term (through construction) and the long-tern (beyond 5 years)?								

Environmental Matrix

Alternative	Needs, Goals, and Objectives	Level 3 Criteria Questions	Level 3 Responses (quantitative data and qualitative discussion)	Environmental Resources						
				Section 4(f)	Historic Resources	Hazardous Materials	Wetland Impacts	Biological Resources	Noise	Enviro
				Comments	Comments	Comments	Comments	Comments	Comments	Comments
H2	Environmental	What environmental impacts have been identified?	Identify environmental impacts.	See historic resources column for 4(f) impacts from historic Possible Antares Park impact	Potential Impacts to: Farmstead at ~900 E 49th St 4 other poten. hist. farmsteads UPRR (new crossing) Idaho Canal (new crossing) Progressive Canal (new cross)	Alt H traverses Hatch Pit, which is active landfill facility 1 Brownfields facility impacted	Conceptual Estimate of 1.9 ac wetland impact 1 new + 1 replacement river crossing 1 new Idaho Canal crossing + 1 new Progressive Canal crossing	ULT habitat not ruled out; will need to determine at river crossings Some concerns expressed by USFWS about yellow-billed cuckoo (YBC) and extending urban center northward, further reducing habitat	4 likely neighborhood impacts	Approx. 4-6 business displacements Approx. 8-10 residential displacements Possible Antares Park impact
H2	Environmental	Are necessary mitigations for any environmental impacts likely to limit design flexibility or affect the overall schedule and cost?	Identify agency approvals and permits required (especially for 404, Section 106, 4f, 6f, etc.)	Negotiations to mitigate Section 4(f) impacts can be lengthy. Agency involvement will depend on historic or rec impact.	Negotiations to mitigate Section 106 impacts can be lengthy; Work with SHPO, ACHP, FHWA would be required.	Crossing Hatch Pit presents unique challenges. Coordination with IDEQ will be required.	No wetland mitigation banks exist in Eastern Idaho. Mitigation may involve compensatory constructed wetlands.	If ULT impacts occur, avoidance or mitigation would be necessary. Surveys recommended, USFWS consultation may be required.	Noise walls may be required. Alt H noise impacts includes some small groupings of houses for which noise mitigations may not be feasible. FHWA approval will be required.	Some displacements may occur in low income or minority areas.
H2	Environmental	What enhancements would the alternative provide?	Identify enhancements.	None	None	None	None	None	None	None
H2	Economics, Demographics and Market Impacts	Qualitatively, what economic and demographic impacts can be anticipated with the alternative in the short-term (through construction) and the long-tern (beyond 5 years)?								

Public Involvement Matrix

Alternative	Needs, Goals, and Objectives	Level 3 Criteria Questions	Identify public perception/support issues.	Level 3 Responses	
				Public Opinion/Support Risk	Enviro Justice/Neighborhood
				Comments	Comments
C3	PI	What are the obvious public concerns the project will have to address?	Summary comments from meeting: Commercial Impacts, Neighborhood Impacts, Environmental, Cost of New Construction, Complicated Design; Short-Term Solution; Congestion	All alternatives have risk of those displaced resisting ROW negotiations and forcing condemnation. Complicated river crossings will require education for drivers	Could have displacements that are low income areas. Apartments.
E3	PI	What are the obvious public concerns the project will have to address?	Noise; pollution; don't like converting US-20 to local street; short-term solution; pedestrian overpass needed; disrupts valuable riverfront spaces; inconvenient during construction; too complex; need to separate recreational traffic from commuters; doesn't provide link to US-26.	All alternatives have risk of those displaced resisting ROW negotiations and forcing condemnation.	RV park. Could have displacements in low income areas.
H2	PI	What are the obvious public concerns the project will have to address?	Commercial Impacts, Neighborhood Impacts, Environmental, Cost of New Construction, Noise, Traffic, Bald Eagles at Pancheri, Loss of Property Value, Pedestrian and Bicyclist Safety, Viability of Constructing over Current Landfill/Hatch Pit; FAA Rules might not allow this design; Frequent road closures due to wind/drifting dust; takes traffic away from downtown Additional Concerns: Too far away from main transportation needs; provide exit to East River Road; Needs to address the needs of INL workers; needs airport access; like if combined with E.2; no consideration of southeast side?; move this alternative to south side of Iona. Lots of public comments on the connection to US-26 at meeting last year. Heard more at CWG. People want that even though FHWA sees as a separate project.	49th Neighborhood could file lawsuit if the roadway is moved closer to them. Noise walls were suggested at CWG but neighbors might fight that as well. Business and residential displacements could go to condemnation if there is a lack of cooperation.	Possible low income area displacements.

Cost/ Constructability Matrix

Alternative	Needs, Goals, and Objectives	Level 3 Criteria Questions	Level 3 Responses (quantitative data and qualitative discussion)	Level 3 Responses Comments
C3	Cost/ Constructability	Would phased improvements include throwaway improvements?	Identify improvements might be thrown away at a later phase of design.	Alternative C is primarily located in the same location as the existing facility. It ultimately provides a more fluid flow of traffic, however, during construction there will be extensive detours and temporary crossings required. Much of this effort will be thrown away or need to be removed with subsequent phasing. The City Center/Riverside Interchange, the Lindsay Interchange, and much of the existing Exit 119 Interchange will be modified extensively and demolished as a part of the construction.
C3	Cost/ Constructability	Would the alternative redirect traffic to other local roads?	Identify impacts to alternative local roads.	Accessibility of the Lindsay Blvd Interchange (307) traffic and the existing City Center/Riverside Interchange (308) to the US-20 corridor is removed. A new crossing at Higham Street will aid in the accessibility of this traffic however, this local traffic will be required to use the new proposed C-D Ramps and the Higham Street crossing to find access to the I-15/US-20 system.
C3	Cost/ Constructability	What is the Benefit Cost Ratio of the alternative?	Identify BCR of alternative	0.93
E3	Cost/ Constructability	Would phased improvements include throwaway improvements?	Identify improvements might be thrown away at a later phase of design.	Alternative E includes the development of a new interchange with high speed direct ramps. These improvements are located north of the existing Exit 119 facility. Much of this can be constructed while the rest of the system remains in operation. Much of the existing Exit 119 structures can remain in place and serve as a local facility. Connections to I-15 south of Exit 119 and just west of the Science Center Int. (Exit 309) will require extensive construction. Some detours needed for the maintenance of traffic will become throw away components.
E3	Cost/ Constructability	Would the alternative redirect traffic to other local roads?	Identify impacts to alternative local roads.	This alternative addresses the congestion and weaving concerns by spacing out and consolidating interchanges. Traffic using the existing City Center/Riverside Interchange (Exit 308) would be redirected to the Science Center Interchange (Exit 309). Much of the Lindsay Interchange (Exit 307) local traffic would be need to access the system through at the Broadway Interchange or by using local roads connecting to Science Center Interchange (Exit 309).
E3	Cost/ Constructability	What is the Benefit Cost Ratio of the alternative?	Identify BCR of alternative	1.01
H2	Cost/ Constructability	Would phased improvements include throwaway improvements?	Identify improvements might be thrown away at a later phase of design.	Because the alternative is going to be constructed off of the existing roadways and facilities, very little will become throw away components of the maintenance of traffic during construction and phasing.
H2	Cost/ Constructability	Would the alternative redirect traffic to other local roads?	Identify impacts to alternative local roads.	Downtown traffic accessing US-20 between John's Hole and the Lewisville Highway connecting east on US-20 would be required to use the 5th West Roadway/new Interchange and the Lewisville highway and new Interchange at St. Leon. This stretch of US-20 would become a City of Idaho Falls roadway. Redirect will be required.
H2	Cost/ Constructability	What is the Benefit Cost Ratio of the alternative?	Identify BCR of alternative	0.07

	Structures Congestion/Constructability Matrix						
Alternative	Needs, Goals, and Objectives	Level 3 Criteria Questions	Congestion/Constructability - Structures				
			Opportunities	Challenges	Overall User Cost/Savings	ROW Impacts	Structure Improvements
			Comments	Comments	Comments	Comments	Comments
C3	Congestion	Does the alternative provide improved, alternate, or additional crossings of railroad and river?	Alternative adds a 3 lane bridge north of John's hole. Alternative replaces the John's Hole bridge with 4 two lane one way bridges, and 1 one lane one way bridge.				
C3	Cost/ Constructability	Does the project provide logical and sequential phasing?	*Can shift traffic on I-15 to one side of interstate while bridges at Grandview and Broadway are constructed.	*Option has a lot of construction on and around I-15. * Staging required for removing I-15 over Broadway Bridges and Grandview. *Grandview may need to be closed under interstate, as it is being changed from an overpass to being and underpass. *Lot of construction around John's Hole	*Demolition of Grandview Bridge will need careful consideration do not pollute the river.	*Removing railroad will be costly. *New ramps from I-15 to US20 are through businesses, would require a lot of ROW purchases.	23 New Bridges: *I-15 NB/SB over Broadway *I-15 NB Ramp to US20 East over Frontage Road *US20 WB Ramp to I-15 SB over Frontage Road *US20 WB Ramp to I-15 SB over I-15 NB & SB *I-15 over Grandview *I-15 NB to US-20 EB Ramp over Lindsay *Frontage Road to US-20 EB over Lindsay *US-20 to I-15 SB Ramp over Grandview *Grandview EB over Canal *Grandview WB over Canal *I-15 NB to US-20 EB Ramp over Canal & Grandview *US20 WB TO I-15 SB Ramp over Canal & Grandview *US-20 EB over Snake *US-20 WB over Snake *Grandview EB over Snake *Grandview WB over Snake *Grandview Ramp to US-20 WB *US-20 EB over Riverside *US-20 WB over Riverside *US-20 EB over Science Center Dr *US-20 WB over Science Center Dr *International Way over I-15 *International Way over Canal *International Way over Snake

	Structures Congestion/Constructability Matrix						
Alternative	Needs, Goals, and Objectives	Level 3 Criteria Questions	Congestion/Constructability - Structures				
			Opportunities	Challenges	Overall User Cost/Savings	ROW Impacts	Structure Improvements
			Comments	Comments	Comments	Comments	Comments
E3	Congestion	Does the alternative provide improved, alternate, or additional crossings of railroad and river?	*Alternative adds 5 lanes across the Snake north of Grandview, while keeping Grandview bridge in place.				
E3	Cost/ Constructability	Does the project provide logical and sequential phasing?	*Keeping Grandview as an overpass eases staging, will keep US20 open in both directions. *Much less construction on I-15. Most construction is North, reduces impacts to traffic.	*US20 WB to I-15 SB bridge is curved and very skewed. May be difficult to construct.	*No demolition in river will save costs.	*Removing railroad will be costly. *New ramps from I-15 to US20 are through businesses, would require a lot of ROW purchases.	14 New Structures: *Grandview over I-15 (14' included) *WB US20 to I-15 SB Ramp over I-15 *WB US20 to I-15 SB Ramp over Frontage Roads *I-15 NB to US20 EB Ramp over Frontage Roads *Frontage Road to US20 WB over Frontage Road *US20 (Realigned Olympia St) over I-15 *US20 (Realigned Olympia St) over Frontage Road *US20 (Realigned Olympia St) over Canal *US20 WB TO I-15 SB Ramp over US20 *US20 WB TO I-15 SB Ramp over Canal *I-15 NB TO US20 EB Ramp over Canal *US20 over Snake *US20 over Fremont *US20 EB/WB over Science Center Dr.
H2	Congestion	Does the alternative provide improved, alternate, or additional crossings of railroad and river?	*Alternative adds 4 lanes across the Snake north of Grandview, while keeping Grandview bridge in place.				
H2	Cost/ Constructability	Does the project provide logical and sequential phasing?	*Traffic on I-15 will be nearly uninterrupted. Will be able to build re-routed I-15 while existing is in service	*Tightly curved steel bridges can be difficult to construct and line-up/fit correctly.	*No demolition in river will save costs.	*Removing railroad will be costly. *Most construction in farmlands, will have much less ROW impacts.	11 new bridges: *SB I-15 TO EB US20 RAMP OVER I-15 *SB I-15 TO EB US20 RAMP OVER RAILROAD *EB US20 OVER SNAKE *NB I-15 TO EB US20 RAMP OVER RAILROAD *WB US20 to NB I-15 OVER RAILROAD *WB US20 OVER SNAKE *WB US20 to SB I-15 OVER RAMP & I-15 & RAILROAD *US20 over N 5th St. *US20 over Canal *US20 over 5th E. St. *US20 over 49th St. Interchange

Access Matrix

Alternative	Needs, Goals, and Objectives	Level 3 Criteria Questions	Level 3 Responses (quantitative data and qualitative discussion)	Level 3 Responses Comments
C3	Access	Is the improved access to local resources beneficial to the intent/use of the local resource?	Describe the change to the access and the likely impact on the resource.	Access to Downtown Idaho Falls and local resources is maintained similarly to existing conditions. Separating regional through traffic from local access traffic should make it less difficult to get to the local resources.
C3	Access	Does the alternative reduce access to local resources?	Describe how the access is reduced and the likely impact on the resource.	Maintains existing access points except for Lindsay Blvd. Exit 307. Access to and from interchanges provided via new river crossing north of US-20. I-15 Exits 118 and Exit 119 carry less traffic on ramps from I-15, so potentially easier to access local attractions. Local connectivity is separated from the I-15/US-20 thru traffic at I-15 Exit 118 and Exit 119 and US-20 Exit 308 and 309.
E3	Access	Is the improved access to local resources beneficial to the intent/use of the local resource?	Describe the change to the access and the likely impact on the resource.	The northbound one-way frontage road between the new interchange north of Grandview and the Broadway interchange enhances connectivity for local traffic and removes conflict with regional traffic. Southbound traffic will use new Olympia interchange or Broadway interchange. Local Grandview traffic now has a crossing of the Snake River without the regional traffic conflict traffic. Lindsay Blvd access. Connectivity from Grandview to US-20 would be via the existing Broadway interchange and the new interchange on the north.
E3	Access	Does the alternative reduce access to local resources?	Describe how the access is reduced and the likely impact on the resource.	Increases access to resources along Science Center Dr. by providing full interchange. Removes direct access from I-15 and US-20 to neighborhoods along Grandview Dr. and Temple View Elementary School. Both can be accessed by way of Skyline Dr or Saturn Ave from Olympia and Broadway interchanges, respectively.
H2	Access	Is the improved access to local resources beneficial to the intent/use of the local resource?	Describe the change to the access and the likely impact on the resource.	Access to Downtown Idaho Falls and local resources is maintained similarly to existing conditions except the old US-20 is now more of a local street connection with at-grade intersections. Separating regional through traffic from local access traffic should make it less difficult to get to the local resources.
H2	Access	Does the alternative reduce access to local resources?	Describe how the access is reduced and the likely impact on the resource.	Maintains existing access points from I-15. I-15 Exits 118 and Exit 119 carry less traffic on ramps from I-15, so potentially easier to access local attractions. Connectivity of I-15 and US-20 north of the urban area helps to separate the thru traffic and the in-town traffic. Opportunities to enhance connectivity and access to the new US-20 alignment would be shifted north away from the John's Hole area. This alternative also allows improved future connectivity to US-26 and for new routes to the west.

Economic and Demographic Impacts

Alternative	Needs, Goals, and Objectives	Level 3 Criteria Questions	Level 3 Responses	
			Short Term (during construction)	Long Term (beyond 5 years)
			Comments	Comments
C3	Economics	What economic and demographic impacts can be anticipated with the alternative?	Business interruption impacts due to relocation of about 10 businesses along Mercury Ave and Lindsay Blvd. Impacts for 1-2 residential relocations. Temporary boost in construction jobs and secondary supporting economy. Major traffic detours and diversions create impacts on business based on slower commuter travel and travel for freight based businesses. No discernable impact on demographics.	Improved travel times and safety along I-15 and US 20 support a growing population and economy. Improved connectivity based on Higham St bridge over the river and I-15 to the airport provides additional access and supports airport growth plans. No discernable impact on demographics.
E3	Economics	What economic and demographic impacts can be anticipated with the alternative?	Business interruption impacts due to relocation of several businesses along Lindsay Blvd north of US 20. Temporary boost in construction jobs and secondary supporting economy. Some traffic detours and diversions create impacts on business based on slower commuter travel and slower travel for freight based businesses. Minor impacts to tourism based on closure or relocation of Snake River RV park. Potential impact to developed properties along Jefferson Ave. and Canyon Ave. near Presto St. If necessary residential relocations would have a slight impact on demographics due to displacement of low income residents.	Improved travel times and safety along I-15 and US 20 support a growing population and economy. Improved connectivity based on Olympia St bridge over the river and I-15 to the airport provides additional access and supports airport growth plans. No discernable impact on demographics.
H2	Economics	What economic and demographic impacts can be anticipated with the alternative?	Temporary boost in construction jobs and secondary supporting economy. Minimal traffic detours and diversions create extremely minor impacts on business based on slower commuter travel and slower travel for freight based businesses. Impacts to several residences and farming operations, especially along East River Road. and immediately east of I-15 between 33rd and 49th. Residential relocations would have a slight impact on demographics, but are not likely to displace low income residents.	Improved travel times and safety along I-15 and US 20 support a growing population and economy. New "41st" alignment will encourage growth from Idaho Falls in this northern area, especially commercial uses around interchanges at 49th and at East River Road. Reclassification of the old US 20 roadway alignment may also encourage new types of development along that corridor from I-15 to 49th. No discernable impact on demographics.

Mobility Matrix

Calculated by: BAF **Date:** 2/21/2020

Checked by: CCW **Date:** 2/21/2020

Alternative Improvement	Bike/Pedestrian Facility	Status	Facility Opportunities with Alternative	Facility Challenges with Alternative	Difficulty of Facility Implementation with Alternative	Difficulty of Traveling on Facility Through Alternative	Additional Structures Needed with Alternative
C3	Grandview Shared Use Path Extension to Snake River	Proposed	Opportunity to implement at grade spot improvement in areas of need along Grandview Dr., along with installing portion of facility from Saturn to Snake River with alternative improvements.	Not impacting path footprint with proposed US-20 direct ramp columns	Building path with alternative improvements could make it easier to build than in existing conditions. Difficulty arises in navigating footprint of proposed direct ramps	Potential to reduce difficulty (compared to implementing with existing conditions) by consolidating Exit 307 ramp terminals into one intersection crossing	None
	Skyline Dr. Bike Lanes	Proposed	None	None	None	None	None
	Saturn Dr. Signed Bike Route	Proposed	Implementing at grade spot improvement at Saturn Ave. & Grandview Dr. with other alternative improvements along Grandview Dr.	None	Would likely make implementation easier than if were implemented with existing conditions	Less difficult than existing if grade spot improvement is implemented	Possible Pedestrian Signal
	West Snake River Shared Use Path	Existing south of US-20, Proposed north of US-20	Ability to implement facility under realigned Grandview Dr. and US-20/direct ramps, and proposed Higham St extension	Path crossing under realigned Grandview Dr. and US-20, and Higham St extension	Somewhat difficult - facility must pass under/over Grandview Dr., direct ramps, and Higham St.	Added difficulty - path crossings under roadway facilities will likely confine travelers	Structure/culverts underneath Grandview Dr. and direct ramps, as well Higham St.
	East Snake River Shared Use Path	Existing south of railroad, Proposed north of railroad	Reducing path crossing distance at existing Exit 308 WB on and EB off ramps	Ensuring path can cross under new ramp and realigned US-20, as well as extended Higham St.	Somewhat difficult - facility must pass under/over realigned US-20, new ramps and Higham St.	Added difficulty - path crossings under roadway facilities will likely confine travelers	Structure/culverts underneath US-20 and new ramps, as well Higham St.
	Science Center Shared Use Path	Proposed	Could be implemented along with alternative improvements along Science Center Blvd. and Exit 309	Making sure new off ramp columns do not interfere with path	Not difficult	Would remain relatively same if built with existing conditions	None
	Anderson St. Shared Use Path	Changes Proposed	None	None	None	None	None
	Iona St. Shared Use Path	Proposed	Ability to connect Iona St. and shared used path to improved Fremont Ave. with alternative improvements	None	None	Would reduce difficulty of travel	Signal
	Idaho Canal Shared Use Path	Proposed	None	None	None	None	None
	Freeman Park Shared Use Paths	Existing	None	None	None	None	None
	Fremont Ave. Bike Lanes	Proposed	Ability to implement portion of facility with alternative improvements to Fremont Ave.	None	None	Would reduce difficulty of travel	Possible Signal at Fremont Ave./Higham St. intersection
	N 5th West Shared Use Path	Proposed	None	None	None	None	None
	65th North Shared Use Path	Proposed	None	None	None	None	None
	Riverview Dr. Signed Bike Route	Proposed	None	None	None	None	None
	Neighborhood, School, Park sidewalks	Existing	Ability to improve/add sidewalks along Grandview Dr., Lindsey Blvd., Fremont Ave., and Science Center Blvd. with alternative improvements	Proposed Exit 309 WB off ramp would impact housing in neighborhood to east of Fremont Park	None	None	None

Mobility Matrix

Calculated by: BAF **Date:** 2/20/2020

Checked by: CCW **Date:** 2/21/2020

Alternative Improvement	Bike/Pedestrian Facility	Status	Facility Opportunities with Alternative	Facility Challenges with Alternative	Difficulty of Facility Implementation with Alternative	Difficulty of Traveling on Facility Through Alternative	Additional Structures Needed with Alternative
E3	Grandview Shared Use Path Extension to Snake River	Proposed	Could be implemented with improvements to Grandview Drive brought about with project alternative. Alternative also removes Grandview intersections with Exit 119 ramps, and consolidates Exit 307 ramps into one intersection crossing.	None	Would likely make implementation easier than if were implemented with existing conditions	Reduced difficulty by removing Grandview intersections with Exit 119 ramp terminals	None
	Skyline Dr. Bike Lanes	Proposed	Ability to implement facility near Skyline intersection and improved Olympia St intersection	Adding more crossing traffic on Olympia St because of US-20 realignment, as well as traffic on Skyline from vehicles traveling from Olympia interchange to Grandview Dr.	Keeping continuity of facilities through future, expanded, signalized intersection with Olympia St	Additional crossing traffic on Olympia St due to US-20 realignment	Signal
	Saturn Ave. Signed Bike Route	Proposed	Implementing at grade spot improvement at Saturn Ave. & Grandview Dr. with other alternative improvements along Grandview Dr.	None	Would likely make implementation easier than if were implemented with existing conditions	Less difficult than existing if grade spot improvement is implemented	Possible Pedestrian Signal
	West Snake River Shared Use Path	Existing south of US-20, Proposed north of US-20	Ability to implement facility under improved Grandview Dr. and realigned US-20	Path crossing under Grandview Dr. and realigned US-20	Somewhat difficult - facility must pass under/over Grandview Dr. and realigned US-20	Added difficulty - path crossings under Grandview Dr. and US-20 will likely confine travelers	Structure/culvert underneath Grandview Dr., realigned US-20 and direct ramps
	East Snake River Shared Use Path	Existing south of railroad, Proposed north of railroad	Removing facility crossing over existing Exit 308 WB on ramp, as well as consolidating crossing over existing EB off ramp/proposed Grandview Dr.	Ensuring path can cross realigned US-20 at two proposed crossings	Somewhat difficult - facility must pass under/over realigned US-20	Added difficulty - path crossings under US-20 will likely confine travelers	Structure/culvert underneath realigned US-20 along path paralleling river
	Science Center Shared Use Path	Proposed	Could be implemented along with alternative improvements along Science Center Blvd. and Exit 309	Making sure new off ramp columns do not interfere with path	Not difficult	Would remain relatively same if built with existing conditions	None
	Anderson St. Shared Use Path	Changes Proposed	None	None	None	None	None
	Iona St. Shared Use Path	Proposed	Ability to connect Iona St. and shared used path to improved Fremont Ave. with alternative improvements	None	None	Would reduce difficulty of travel	Signal
	Idaho Canal Shared Use Path	Proposed	None	None	None	None	None
	Freeman Park Shared Use Paths	Existing	None	None	None	None	None
	Fremont Ave. Bike Lanes	Proposed	Ability to implement portion of facility with alternative improvements to Fremont Ave.	None	None	Would reduce difficulty of travel	None
	N 5th West Shared Use Path	Proposed	None	None	None	None	None
	65th North Shared Use Path	Proposed	None	None	None	None	None
	Riverview Dr. Signed Bike Route	Proposed	None	None	None	None	None
	Neighborhood, School, Park sidewalks	Existing	Ability to improve/add sidewalks along Grandview Dr., Lindsey Blvd., Fremont Ave., and Science Center Blvd. with alternative improvements	Proposed Exit 309 WB off ramp would impact housing in neighborhood to east of Fremont Park. Exit 309 Proposed EB ramps would be much closer to AH Bush Elementary School than existing.	None	Difficulty of walking near/around elementary school with proposed layouts of Exit 309 EB ramps	None

Mobility Matrix

Calculated by: BAF **Date:** 2/20/2020
Checked by: CCW **Date:** 2/21/2020

Alternative Improvement	Bike/Pedestrian Facility	Status	Facility Opportunities with Alternative	Facility Challenges with Alternative	Difficulty of Facility Implementation with Alternative	Difficulty of Traveling on Facility Through Alternative	Additional Structures Needed with Alternative
H2	Grandview Shared Use Path Extension to Snake River	Proposed	Ability to implement faculty along Grandview Dr. where split diamond interchange improvements are proposed. This includes implement the at grade spot improvement at Grandview Dr. & I-15 NB ramps terminal	Additional intersection crossing with realignment of Exit 119 SB ramp terminal	Not difficult. Implementation of portion of facility could be wrapped into split diamond interchange constructions	Closely spaced, high traffic demand intersections. Difficulty of travel could be eased with at grade spot improvements at NB ramp terminal	None
	Skyline Dr. Bike Lanes	Proposed	None	None	None	None	None
	Saturn Dr. Signed Bike Route	Proposed	None	None	None	None	None
	West Snake River Shared Use Path	Existing south of US-20, Proposed north of US-20	Ability to implement portion of facility crossing realigned US-20	Providing clearance for peds and bikes to cross under realigned US-20	Depends on if additional structure/culvert is needed for path crossing; if needed, difficulty increases.	Added difficulty - path crossings under US-20 will likely confine travelers	Possible structure/culverts underneath realigned US-20
	East Snake River Shared Use Path	Existing south of railroad, Proposed north of railroad	Ability to implement portion of facility crossing realigned US-20	Providing clearance for peds and bikes to cross under realigned US-20	Depends on if additional structure/culvert is needed for path crossing; if needed, difficulty increases.	Added difficulty - path crossings under US-20 will likely confine travelers	Possible structure/culverts underneath realigned US-20
	Science Center Shared Use Path	Proposed	None	None	None	None	None
	Anderson St. Shared Use Path	Changes Proposed	None	None	None	None	None
	Iona St. Shared Use Path	Proposed	None	None	None	None	None
	Idaho Canal Shared Use Path	Proposed	None	None	None	None	None
	Freeman Park Shared Use Paths	Existing	None	None	None	None	None
	Fremont Ave. Bike Lanes	Proposed	Ability to implement portion of facility along River Road with proposed interchange and roadway improvements	Addition of two, likely high volume, intersections along roadway with proposed US-20 interchange	Keeping continuity of facilities through proposed US-20 interchange	Crossing through interchange ramp intersections	Possible signals
	N 5th West Shared Use Path	Proposed	None	None	None	None	None
	65th North Shared Use Path	Proposed	None	None	None	None	None
	Riverview Dr. Signed Bike Route	Proposed	None	None	None	None	None
	Neighborhood, School, Park sidewalks	Existing	Adding sidewalk along River Road through proposed improvements	Houses along River Road within proposed US-20/River Road interchange footprint would be impacted and needed to be removed	None	Traversing through interchange ramp intersections	None

Memo

Date:	Monday, March 02, 2020
Project:	KN 20065 – I-15/US-20 Connector
To:	Ryan Day, ITD District 6
From:	Cameron Waite, PE, PTOE
Subject:	PEL Level 3 2045 Updated Alternatives Operational Analysis Technical Memo

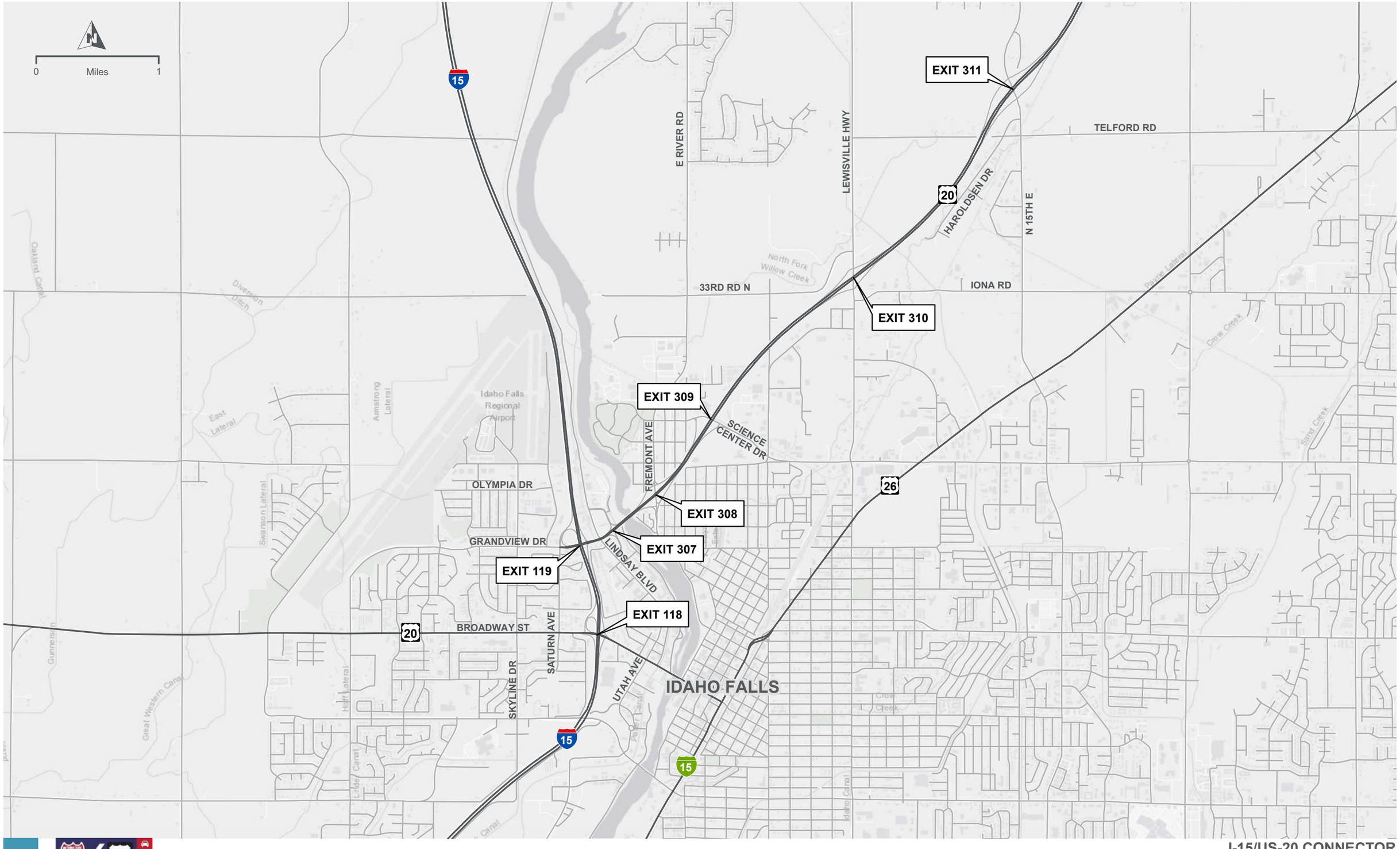
Introduction

The Idaho Transportation Department (ITD) District 6 is developing the Interstate 15 (I-15) and United States Highway 20 (US-20) Connector project (Project No. A020(065), Key No. 20065). HDR and Horrocks are the consulting team developing this planning and environmental linkages (PEL) study for ITD, who along with the Bonneville Metropolitan Planning Organization (BMPO) and member agencies in the BMPO have identified the need to improve the I-15/US-20 connection and adjacent interchanges. This memo summarizes the conceptual operational analysis for the updated I-15/US-20 Connector PEL Level 3 alternatives. These alternatives were developed through the Level 1 and Level 2 screening and public engagement processes, but then were further updated and refined since the last operational analysis through a cost risk assessment and value engineering (CRAVE) study facilitated by HDR.

The purpose of this operational analysis was to model each updated alternative, including the No-Build alternative, with planning year 2045 travel demand forecasts and identify operational measurements and capacity as well as estimated travel times for each. This analysis was completed at a high level and some individual intersection, interchange, and/or ramp models may be refined in future phases of the project to give more refined or different results. This conceptual analysis allows a comparison between the Level 3 Alternatives, including the No-Build Alternative. **Figure 1** presents the project vicinity.

Alternatives Development & Descriptions

The PEL includes three levels of screening for alternatives to develop a recommended list of alternatives to advance into a National Environmental Policy Act (NEPA) document, once funding allows. A screening level reviews each alternative against the screening criteria questions developed with the purpose and need and project goals considerations. The Level 3 Alternatives described below have been developed through the first two screening levels and the CRAVE study. Baseline concept alternatives that were moved forward from the Level 2 screening were reviewed and the CRAVE team generated 81 ideas for the project. The ideas were then evaluated and developed into three new refined alternatives: C3, E3, and H2.Details of the alternative development can be found in the summary documents for each level of screening, the CRAVE study, and public engagement activities.



I-15/US-20 CONNECTOR

VICINITY MAP

FIGURE 1

The conceptual interchange configurations for each alternative are typically assumed to be traditional diamond or split diamond unless a specific configuration is required. This allows for simplicity of modeling and comparing results between alternatives. The ultimate interchange configuration may be modified and refined in future analyses. All on and off ramps are assumed to be one lane at the merge/diverge points except for direct ramps from I-15 to US-20, which are assumed to have two lanes.

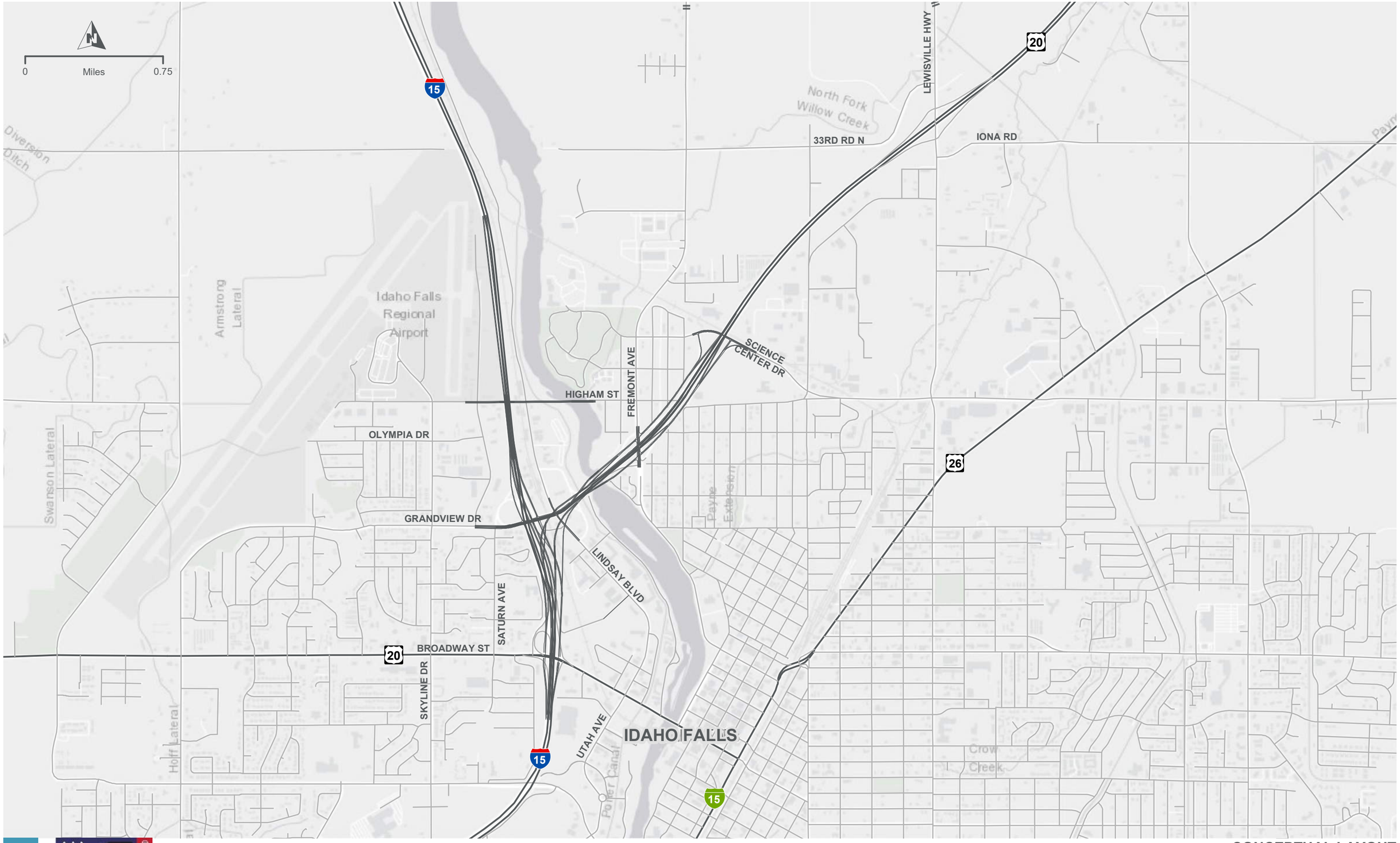
No-Build Alternative

This alternative assumed the 2045 travel demand forecast volumes travel on the existing transportation network with no changes to the I-15 or US-20 access or interchange configurations while including the following locally programmed improvement projects:

- Widen the Old Butte Road to Pancheri Drive connection to 5 lanes
- Widen 600 feet of 5th West to University Blvd. to 5 lanes
- Widen Hitt Road from Sunnyside Road to 49th South to 5 lanes
- Widen 65th South from Yellowstone Highway to Hitt Road to 5 lanes
- Widen Holmes Avenue from Sunnyside Road to 65th South to 5 lanes
- Widen 1st Street from Ammon Rd to 45th East to 5 lanes
- Widen St. Leon Road from Lincoln Road to US-20 to 5 lanes
- Widen 25th East from Lincoln Road to US-26 to 5 lanes

Alternative C3

This alternative reduces weaving concerns between I-15 Exits 118 and 119 by separating regional traffic not exiting in Idaho Falls by providing direct ramp connections from I-15 north of Exit 118 to US-20 west of Exit 309. The direct ramps go over one railroad crossing and Lindsay Blvd. before tying into the realigned US-20 west of the Snake River. Numerous slip ramps and collector/distributor roads connect I-15 Exits 118 and 119 and allow vehicles to access Grandview Dr., Lindsay Blvd., Fremont Ave. and Science Center Blvd. Exit 307 is removed from accessing US-20. A new Snake River crossing is added north of US-20 from Lindsay Blvd. to Higham Street for local street connectivity to Fremont Ave. and access to US-20 at Exit 308. Portions of Broadway St., Grandview Drive, US-20, and Fremont Ave. are rebuilt to install the proposed improvements. Broadway St. is widened from five to seven lanes between the Exit 118 northbound ramp intersection and Utah Ave. A conceptual layout is presented in **Figure 2**.



I-15 / 20 Connector

CONCEPTUAL LAYOUT

ALTERNATIVE C3

FIGURE 2

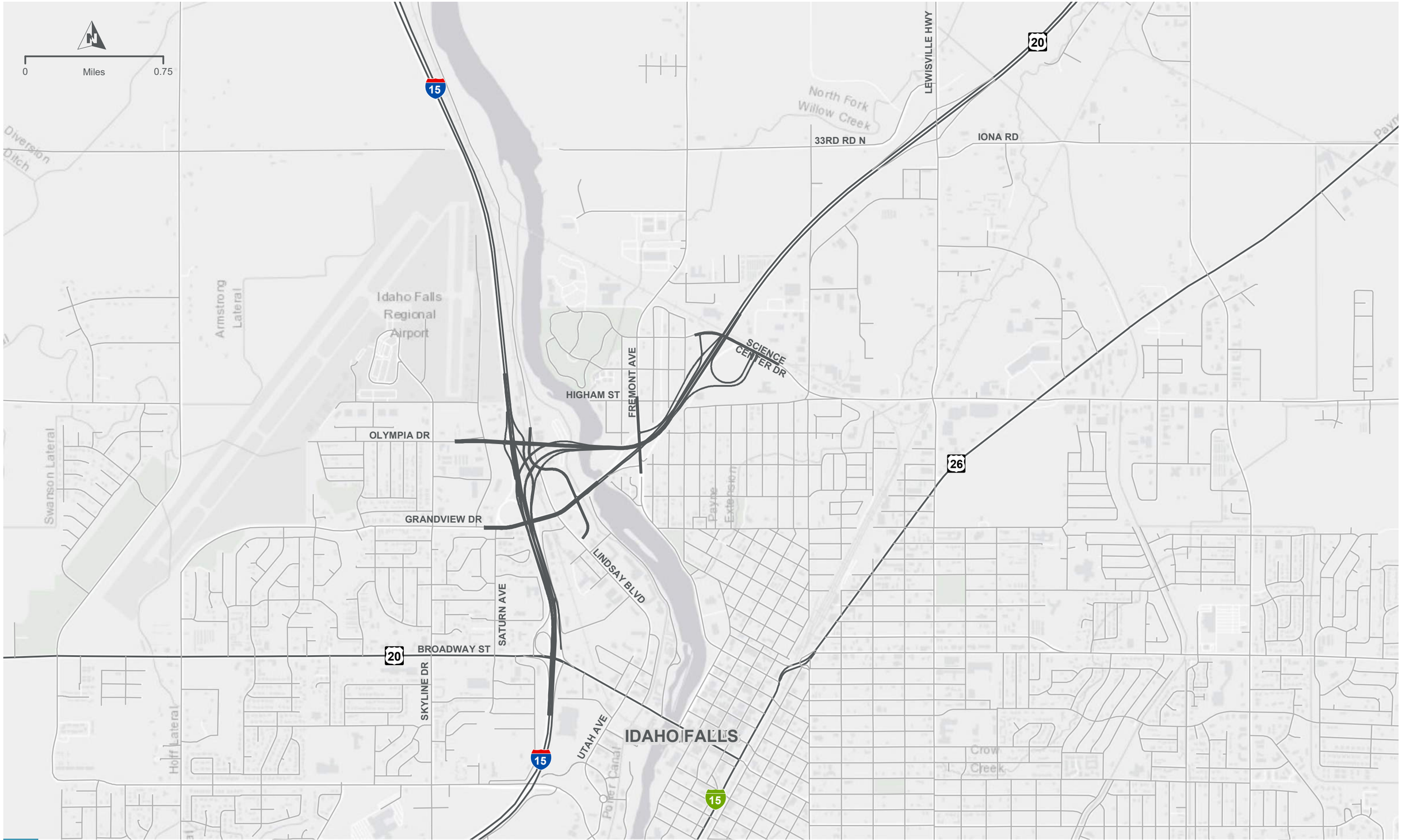
Alternative E3

This alternative reduces weaving concerns between I-15 Exits 118 and 119 by separating regional traffic not exiting in Idaho Falls by providing direct ramp connections from I-15 north of Exit 118 to a new US-20 alignment in line with the existing Olympia St. This realignment goes over Fremont Ave. and then matches into the existing US-20 alignment just to the east. The direct ramps go over Grandview Dr., one railroad crossing, Lindsay Blvd., US-20, and the Snake River before merging into the US-20 alignment west of Fremont Ave.

Exit 118 on I-15 largely remains the same, except for the northbound on ramp which is realigned into a direct ramp connecting to US-20 and new northbound I-15 collector distributor road to the new Olympia Street interchange and northbound I-15. The existing Exit 119 is totally removed from I-15 and no access is provided from Grandview Dr. The new north ramp from Exit 118 connects to the new diamond interchange at the realigned US-20 and Olympia St. interchange. Exit 307 has been removed and rebuilt into and at-grade, signalized intersection between Grandview Dr. and Lindsay Blvd. Exit 308 is also rebuilt as an at-grade, T-intersection on the old US-20 alignment, where Grandview Dr. is terminated upon intersecting Fremont Ave. Two new ramps are provided along US-20 for the Exit 309 interchange to provide full access. The new eastbound loop on-ramp connects to Science Center Blvd. east of US-20, and the westbound off-ramp diverges from US-20 south of Science Center Blvd. and connects to Fremont Ave. Portions of Broadway St., Grandview Drive, US-20, Lindsay Blvd., Fremont Ave. and Science Center Blvd. are rebuilt to install the proposed improvements. Broadway St. is widened from five to seven lanes between the Exit 118 northbound ramp intersection and Utah Ave. A conceptual layout is presented in **Figure 3**.

Alternative H2

This alternative realigns US-20 from east of Exit 311, relocating that interchange to the west, and moving US-20 to the north and parallel to 33rd North before crossing the Snake River and accessising I-15 at a system interchange with direct ramps for movements between the freeways. I-15 is realigned north of the airport to allow the system interchange to be installed on the west side of the Snake River so only two US-20 bridges are needed over the river. The Exit 311 interchange is rebuilt as a SPUI along the new alignment at Telford Road and N 15th East St. becomes an overpass over the highway. Telford Road is extended and realigned to connect through the new interchange to the Lewisville Highway. The realigned US-20 goes over Lewisville Highway and connects with River Road with a new diamond interchange to access River Road. Exits 118 and 119 on I-15 are rebuilt as a split diamond interchange and Exit 307 on the old US-20 is maintained for access. The split diamond interchange is a potential option to address concerns with the existing interchanges, and was assumed for the operational analysis performed with the 2045 Alternative H travel demand forecasts. The old US-20 alignment becomes a local road with at grade intersections with Fremont Ave., Science Center Dr., Lewisville Road, and Telford Road. Broadway St. is widened from five to seven lanes between the Exit 118 northbound ramp intersection and Utah Ave. A conceptual layout is presented in **Figure 4**.

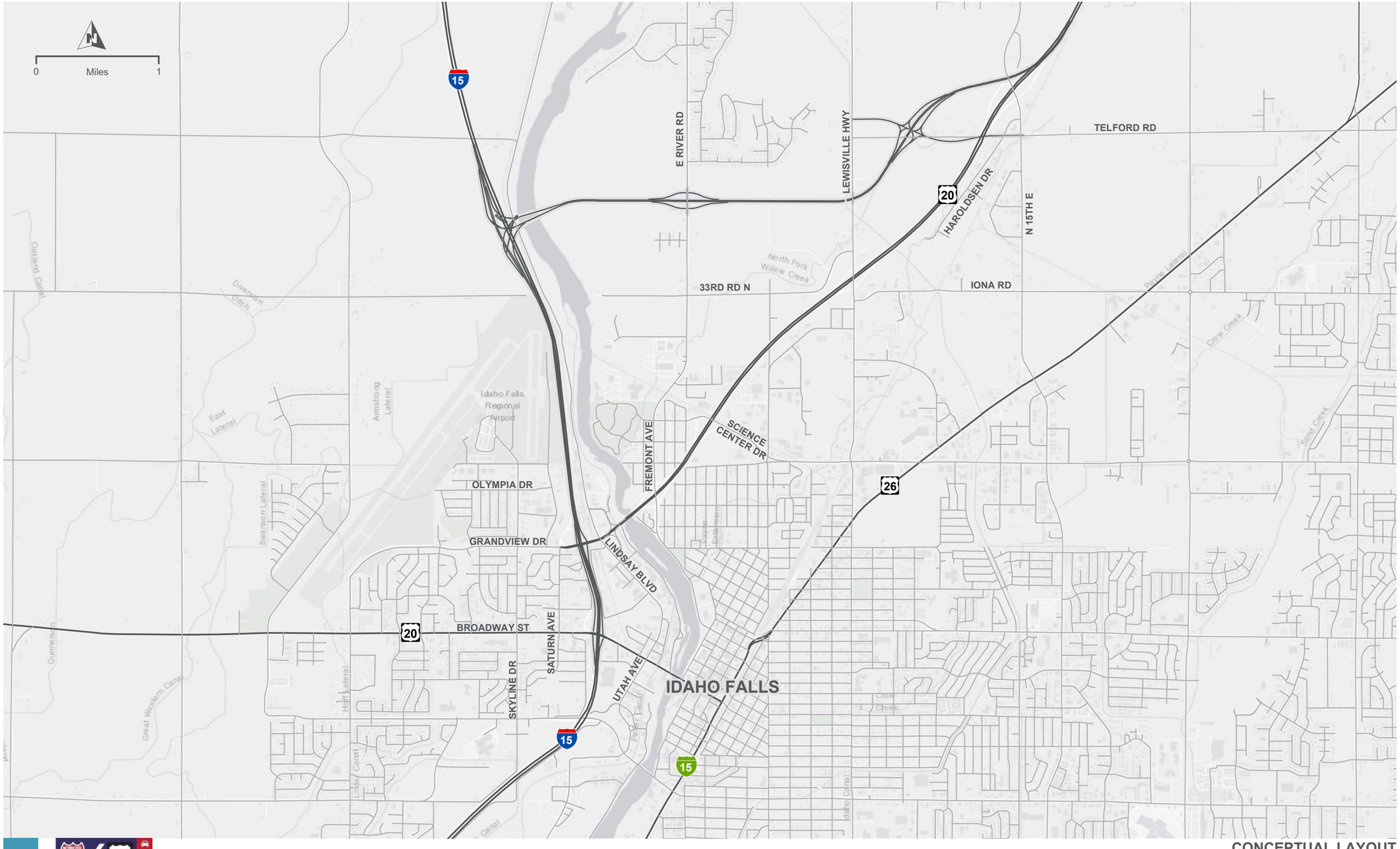


I-15 / 20 Connector

CONCEPTUAL LAYOUT

ALTERNATIVE E3

FIGURE 3



I-15/20 Connector

CONCEPTUAL LAYOUT

ALTERNATIVE H2

FIGURE 4

Planning Year

The planning year of 2045 was agreed upon through discussions with the Technical Leadership and Project Management Teams for this project. The Team members discussed the planning year with the Environmental Resources Team, which includes representatives from ITD District 6, Headquarters, FHWA, BMPO, and the City of Idaho Falls. The purpose of this planning year is to provide a large enough design window of opportunity for the PEL process and the proposed phased approach to developing improvements.

Forecast Travel Demand Volumes

The team has coordinated with BMPO to obtain a copy of their TransCAD travel demand model, which includes the estimated land uses for the years 2014, 2025, and 2040. Socioeconomic data for other years (e.g. 2017 and 2045) was obtained by straight line interpolation/ extrapolation of the data included with the model.

The 2045 No-Build and updated Level 3 Alternatives travel demand volumes were developed using modified versions of the TransCAD model with minimal changes to the transportation network for the No-Build and specific network modifications as described for each Level 3 Alternative. The forecast travel demand models created for this study are specific for these analyses and investigations and are not official BMPO models and should not be used for any other purpose.

2045 Alternatives Operational Analysis

The concept of level of service (LOS) was developed to correlate numerical traffic operational data to subjective descriptions of traffic performance. LOS is defined as the system of six designated ranges, from “A” (best) to “F” (worst), used to evaluate performance. The ITD *Roadway Design Manual* (August 2013) Section 335.06 identifies recommended minimum LOS for various roadway classifications, rural or urban settings, and terrain. I-15 and US-20 through the project area fall into the urban/suburban freeway category and are recommended to meet a LOS C threshold. The manual explains that in some cases, the cost of construction for recommended LOS may be prohibitive and lower LOS is acceptable for economic reasons. LOS D was used as the acceptable threshold for operations for the future operational and capacity analysis for comparing how the proposed alternatives will operate.

VISSIM software was used to model and analyze project area highways, roadways, interchanges, and intersections under forecast conditions. HCM 6 analysis methods were used to estimate LOS for the intersection and merge/diverge locations. As the alternatives were analyzed the existing lane configuration and intersection control of local streets were maintained unless specifically modified by the alternative improvements.

Intersection Analysis

Table 1 presents the *Highway Capacity Manual* (HCM) 6th Edition LOS thresholds at stop-controlled and signal controlled intersections. For this concept level analysis, the overall intersection LOS and delay are reported for each intersection modeled.

Table 1. LOS Thresholds for Motor Vehicles at Intersections

LOS	Stop-controlled Intersection Control Delay (s/veh)	Signal-controlled Intersection Control Delay (s/veh)
A	<= 10	<=10
B	> 10-15	> 10-20
C	> 15-25	> 20-35
D	> 25-35	> 35-55
E	> 35-50	> 55-80
F	>50	>80

Merge and Diverge Analysis

Freeway congestion usually occurs at freeway merge, diverge, and weaving segments that have the potential to develop bottlenecks, which is evident in existing operations of the I-15 and US-20 system. Average density of traffic flow in passenger cars per mile per lane (pc/mi/ln) in the merge/diverge area is the criteria that defines LOS for ramp operations. **Table 2** presents the HCM 6 LOS thresholds for ramp merge and diverge area. The ramp LOS and estimated density are reported for each ramp merge, diverge, and weaving segment for each alternative.

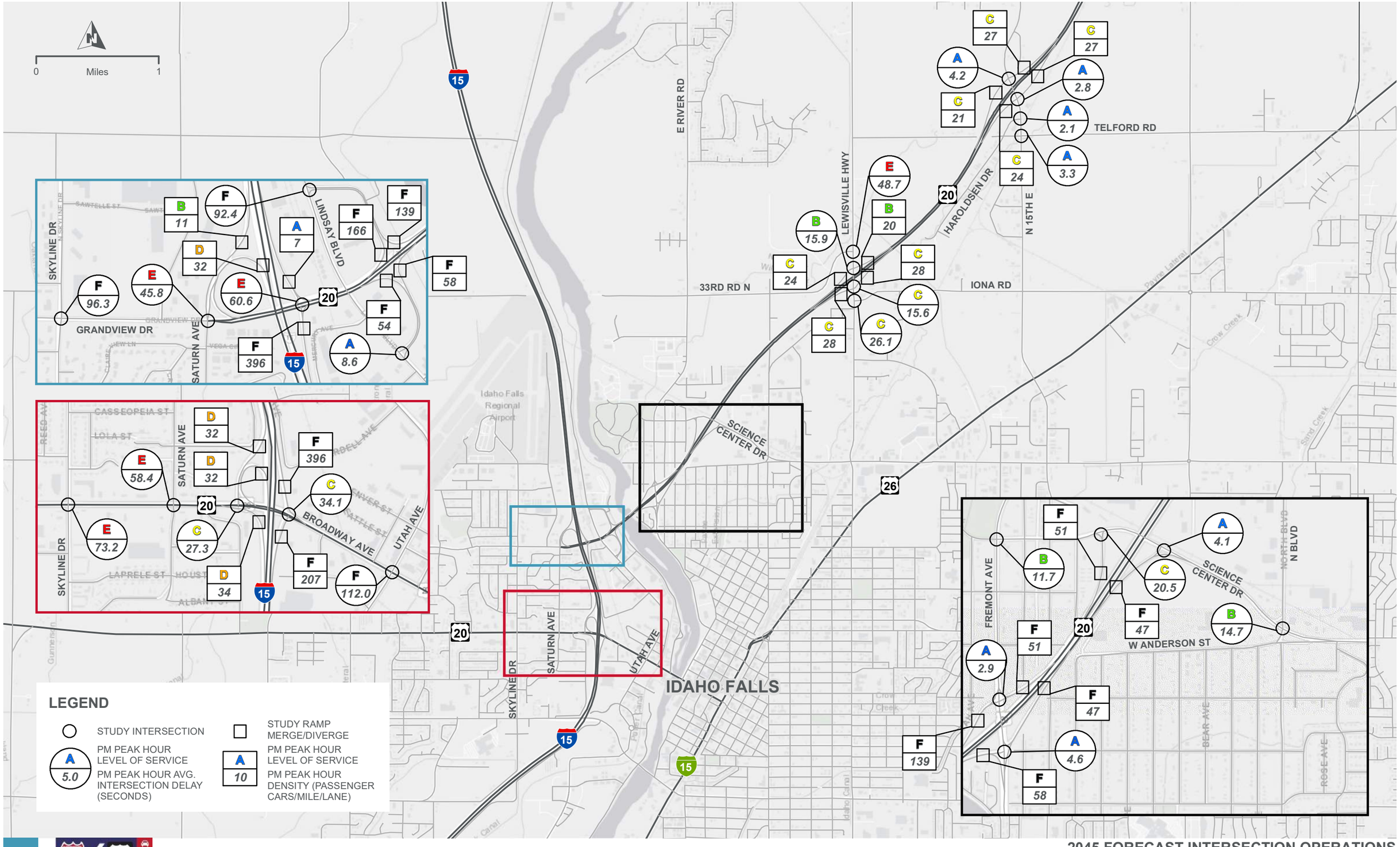
Table 2. LOS Thresholds for Motor Vehicles at Ramp Merge, Diverge, & Weaving Locations

LOS	Density (pc/mi/ln)	Description
A	<=10	Unrestricted operations
B	> 10-20	Merging and diverging maneuvers are noticeable to driver
C	> 20-28	Influence are speeds begin to decline
D	> 28-35	Influence area turbulence becomes intrusive
E	> 35	Turbulence felt by virtually all drivers
F	Demand exceeds capacity	Ramp and freeway queues form

Results

NO-BUILD ALTERNATIVE

Intersection and ramp merge/diverge operational analysis results for the 2045 No-Build Alternative are presented in **Figure 5**. During the forecast p.m. peak hour 16 out the 24 intersections analyzed are estimated to operate at an overall intersection average LOS D or better. The intersections of Broadway St. with Skyline Dr. and Saturn Ave., Grandview Dr. with the Saturn Ave./Exit 119 southbound ramp and Exit 119 northbound ramp, and Lewisville Road with 33rd North are estimated to operate at LOS E overall.



I-15/20 Connector

2045 FORECAST INTERSECTION OPERATIONS

NO BUILD ALTERNATIVE

FIGURE 5

The intersections of Broadway St. with Utah Ave., Grandview Dr. with Skyline Dr., and Lindsay Blvd. with the Exit 307 westbound ramp are all estimated to operate at LOS F overall. Significant queues are estimated to build along Broadway St., Grandview Dr., US-20, and the I-15 off ramps to Exits 118 and 119 from these poor performing intersections that will impact adjacent intersection and roadway capacity and access.

Following HCM 6 standards, several merge and diverge segments on I-15 and US-20 are estimated to operate at LOS F. At Exit 118, the northbound off ramp and on ramp both fail with significant densities of queued vehicles. The Exit 119 northbound off ramp also fails with more demand than the intersection at Grandview Dr./US-20 can handle, so the queue spills back onto I-15 and the Exit 118 northbound on ramp. This also impacts the Exit 118 northbound off ramp as do the significant queues at the Broadway St. and Utah Ave. intersection, which back up to the Exit 118 northbound ramp terminal intersection and keep vehicles from being able to turn right from the off ramp to Broadway St. All of the US-20 Exits 307, 308, and 309 on and off ramps are estimated to operate at LOS F. These ramp merges and diverges fail due to significant back up queues on US-20 from the Exit 119 intersections, inadequate weaving distances, and short acceleration lengths.

The I-15 Exit 118 southbound on and off ramps and Exit 119 southbound on ramps are estimated to operate at LOS D. The Exit 119 northbound on ramp is estimated to operate at LOS A, and the southbound off ramp estimated to operate at LOS B. The US-20 Exits 310 and 311 on and off ramps are all estimated to operate at LOS C, except for the Exit 310 westbound off ramp, which is estimated to operate at LOS B.

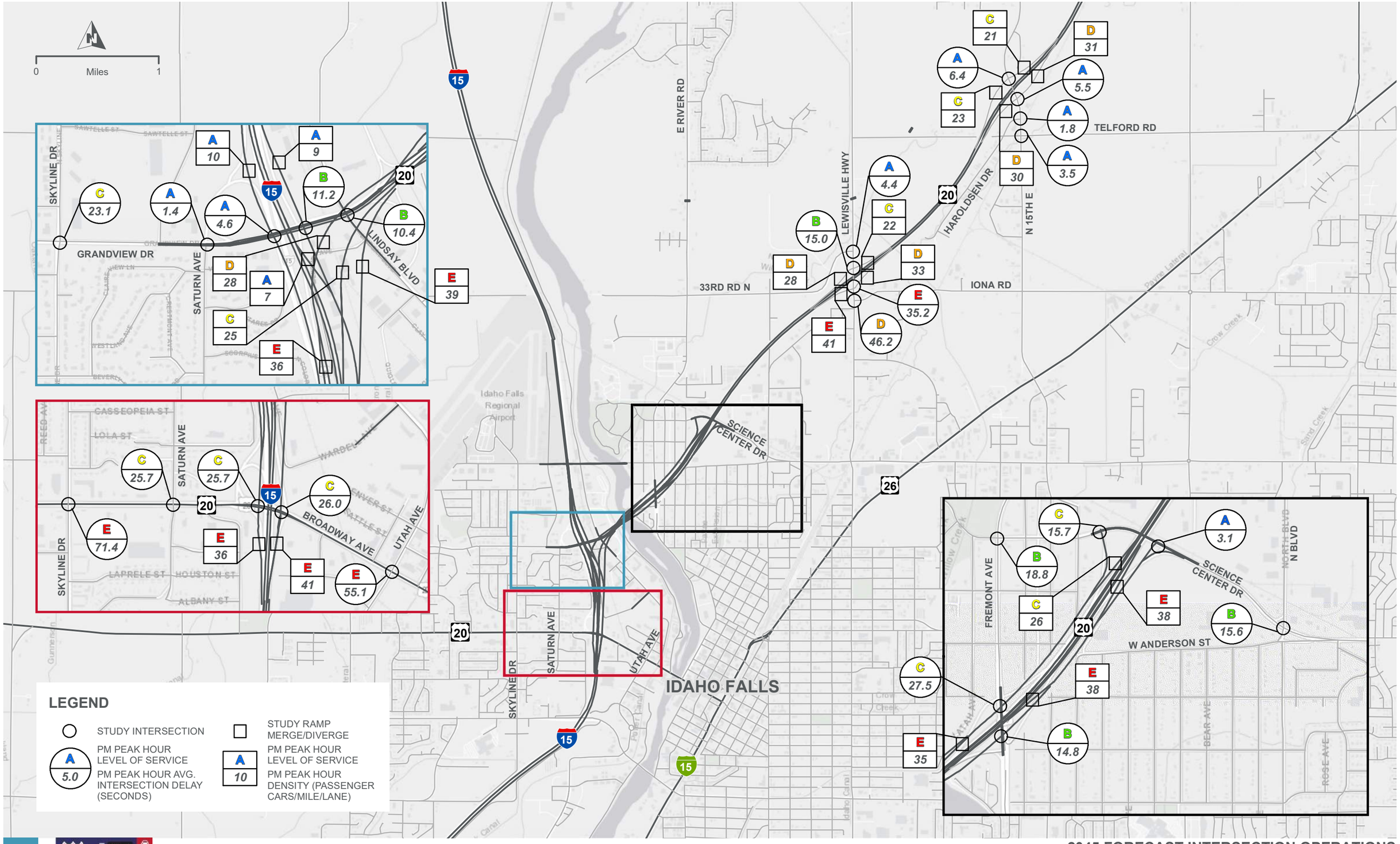
The travel time for drivers traveling on I-15 northbound through the No-Build system is estimated to be 11.2 minutes while southbound drivers are estimated to travel for 4.4 minutes to cover the same distance. Estimated travel time for drivers traveling from I-15 south of Exit 118 to US-20 east of Exit 311 is 15.2 minutes while the time for drivers traveling the same distance from US-20 to I-15 is estimated to be 6.9 minutes.

The total estimated vehicle-miles travelled (VMT) during the peak hour in the 2045 No-Build system is 38,552 miles with vehicle-hours traveled (VHT) at 1,751 hours.

The total vehicles estimated to be able to cross the Snake River under the No-Build Alternative p.m. peak hour conditions is 2,427 eastbound and 2,687 westbound for a total of 5,114. The only available crossing point in the analyzed system is the existing US-20 Bridge, commonly known as the Johns Hole Bridge.

ALTERNATIVE C3

Intersection and ramp merge/diverge operational analysis results for the 2045 Alternative C3 are presented in **Figure 6**. During the forecast p.m. peak hour 21 out the 24 intersections analyzed are estimated to operate at an overall intersection average LOS D or better, and all but four intersections are estimated to operate similarly to or better than in the No-Build Alternative. Broadway St. with Skyline Dr. and Utah Ave., and the Exit 310 EB ramp terminal are the only intersections estimated to operate worse than LOS D at LOS E overall.



2045 FORECAST INTERSECTION OPERATIONS

ALTERNATIVE C3

FIGURE 6

The intersection of Grandview Dr. with Skyline Dr. has much less delay than the No-Build alternative (23.1 seconds versus 96.3 seconds) while operating at LOS C. The intersection of Fremont Avenue and the I-15 southbound direct on ramp/Exit 309 off ramp operates worse because this intersection serves significant traffic accessing I-15 from westbound US-20. The intersection of Lewisville Road and the Exit 311 eastbound ramp operates worse in Alternative C3 because the upstream bottleneck at Exit 119 is removed and more vehicles are able to reach this intersection.

The majority of Alternative C3 merge and diverge segments on I-15 and US-20 are estimated to operate at LOS D or better. The improved ramps at I-15 Exits 118 and 119 operate better than in the No-Build Alternative, US-20 Exit 307 is removed, and Exit 308 is modified. The Alternative C3 improvements allow more eastbound US-20 traffic to reach the interchanges east of the Snake River crossing and the Exit 308 on ramps to eastbound and westbound US-20, the Exit 309 eastbound off and westbound onramps, and the Exit 310 eastbound off ramp are all estimated to operate at LOS E. This is caused by the increase in traffic reaching and using these interchanges which cannot reach them in the No-Build Alternative due to upstream bottlenecks. The direct ramp from I-15 northbound to US-20 eastbound is estimated to operate at LOS E for both the off ramp from I-15 and the on ramp to US-20.

The new direct ramps from Exit 118 to US-20 are estimated to operate at LOS E. The LOS E for the direct ramp connections to I-15 is due to the high volumes entering and exiting I-15 combined with the Exit 118 southern ramp volumes, increasing the volumes using the direct ramps above any other alternative.

The travel time for drivers traveling on I-15 northbound through the Alternative C system is estimated to be 4.4 minutes while southbound drivers are estimated to travel for 4.2 minutes to cover the same distance. The southbound drivers will see a small decrease from the No-Build Alternative and the northbound vehicles travel time is estimated to be reduced by 61%.

Estimated travel time for drivers traveling from I-15 south of Exit 118 to US-20 east of Exit 311 is 5.1 minutes while the time for drivers traveling the same distance from US-20 to I-15 is estimated to be 5.3 minutes. These are reductions of 66% and 22% from the No-Build Alternative, respectively.

The total estimated VMT during the peak hour in the 2045 Alternative C system is 45,268 miles with a total VHT of 1,328 hours. This equates to a 17% increase in VMT and a 24% decrease in VHT over the No-Build Alternative.

The total vehicles estimated to be able to cross the Snake River under Alternative C p.m. peak hour conditions is 3,611 eastbound and 3,307 westbound for a total of 6,918, which is a 35% increase over the No-Build Alternative. The available Snake River crossing points in the analyzed system includes the Johns Hole Bridge, the direct ramp bridges, and the proposed bridge to connect Lindsay Blvd. and Higham St.

ALTERNATIVE E3

Intersection and ramp merge/diverge operational analysis results for the 2045 Alternative E3 are presented in **Figure 7**. During the forecast p.m. peak hour 19 out the 24 intersections analyzed are estimated to operate at an overall intersection average LOS D or better. The intersections of Broadway St. with Skyline Dr., Lewisville Road with the Exit 310 EB ramp terminal, and Lewisville Road with Iona Road are estimated to operate at LOS F, LOS E, and LOS E, respectively, performing significantly worse compared to the No-Build Alternative. The Lewisville Road intersections operate more poorly due to more vehicle volume being able to get downstream on US-20 EB. The at-grade signalized intersections of Lindsay Blvd. and Fremont Ave. with the old US-20 alignment operate adequately at LOS A and LOS B, respectively, although the latter is worse than the ramp terminal intersection LOS at the interchange under No-Build Conditions. Intersections that are predicted to see significant improvements with the alternative are Broadway St. with Saturn Ave. and Utah Ave., Grandview Dr. with Skyline Dr. and the Exit 119 ramp terminals, and Lewisville Road and 33rd North.

The new intersections on the new US-20/Olympia St. alignment at the north end of the split diamond interchange are estimated to operate well, both at LOS A.

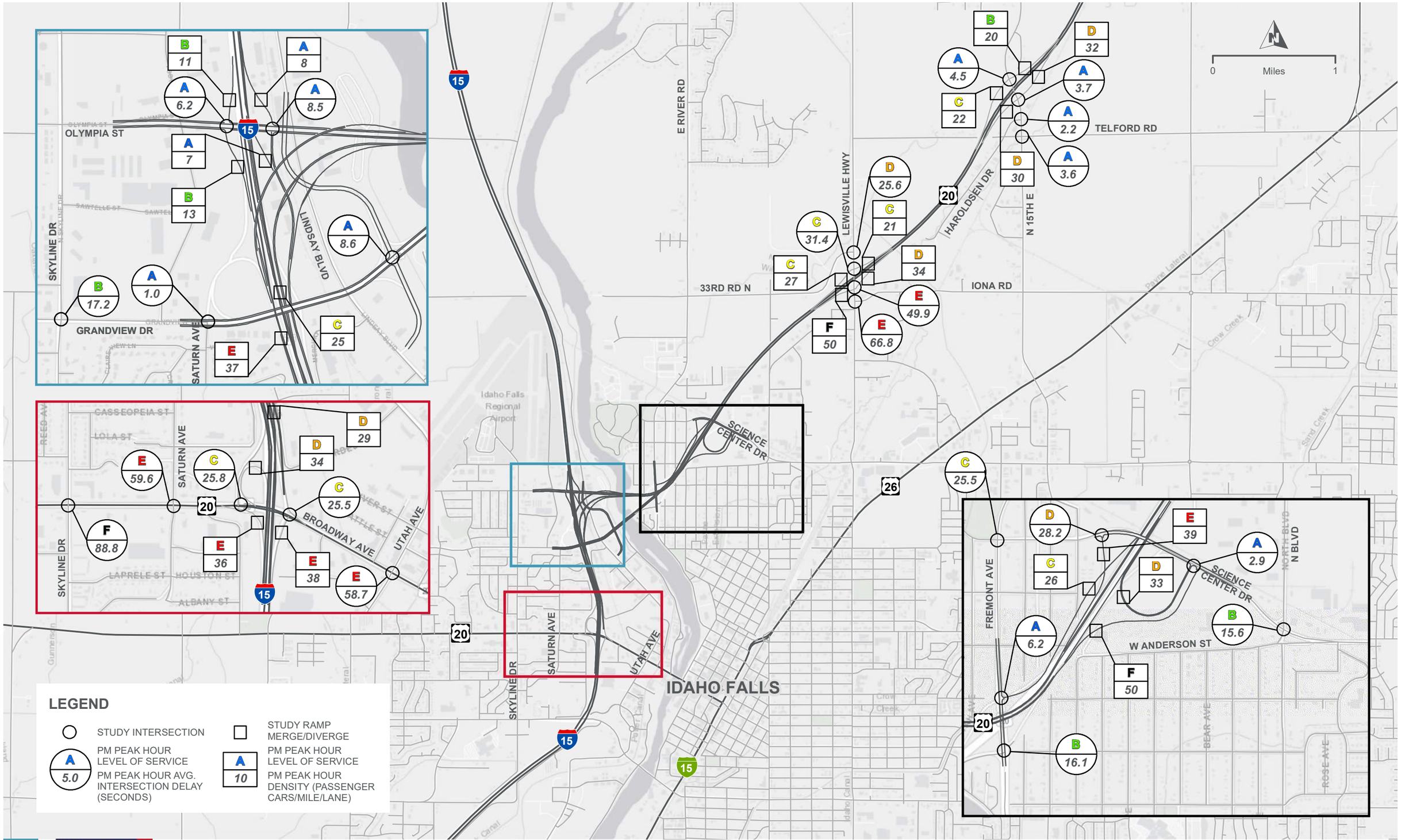
Most of the Alternative E3 merge and diverge segments on I-15 and US-20 are estimated to operate at LOS D or better. The modified configuration of the I-15 exits removes Exit 119 and includes ramps north of Exit 118 to I-15 that directly tie into realigned US-20, west of Fremont Ave. The northbound direct ramp between I-15 and US-20 is estimated to operate at LOS C, and southbound direct ramp at LOS E in the p.m. peak hour. The westbound US-20 weave from the Exit 309 on ramp to the off ramp to southbound I-15 operates at LOS F. The eastbound US-20 off ramp to Exit 310 operates at LOS F because more traffic is able to get downstream on US-20 than in the No-Build alternative.

The travel time for drivers traveling on I-15 northbound and southbound through the Alternative E3 system is estimated to be 4.4 minutes in each direction. The southbound drivers will see no improvement from the No-Build Alternative, but the northbound vehicle travel time is estimated to be reduced by 61%.

Estimated travel time for drivers traveling from I-15 south of Exit 118 to US-20 east of Exit 311 is 5.4 minutes while the time for drivers traveling the same distance from US-20 to I-15 is estimated to be 5.3 minutes. These are reductions of 65% and 22% from the No-Build Alternative, respectively.

The total estimated VMT during the peak hour in the 2045 Alternative E3 system is 44,273 miles with a total VHT of 1,376 hours. This equates to a 15% increase in VMT and a 21% decrease in VHT over the No-Build Alternative.

The total vehicles estimated to be able to cross the Snake River under Alternative E3 p.m. peak hour conditions is 3,813 eastbound and 3,129 westbound for a total of 6,942, which is a 36% increase over the No-Build Alternative. The available Snake River crossing points in the analyzed system include the existing Johns Hole Bridge, the realigned US-20 Bridge, which the direct ramps tie into.



I-15/20 Connector

2045 FORECAST INTERSECTION OPERATIONS

ALTERNATIVE E3

FIGURE 7

ALTERNATIVE H2

Intersection and ramp merge/diverge operational analysis results for the 2045 Alternative H2 are presented in **Figure 8**. During the forecast p.m. peak hour 23 out the 24 intersections analyzed are estimated to operate at an overall intersection average LOS D or better, and all but the Exit 118 ramp terminal intersections are estimated to operate similarly to or better than in the No-Build Alternative. There are no intersections estimated to operate at LOS F with this alternative. The intersection of Broadway St. with Skyline Dr. is estimated to operate at LOS E overall. This alternative shifts demand away from the Lewisville Highway interchange and the intersections along this road operate well.

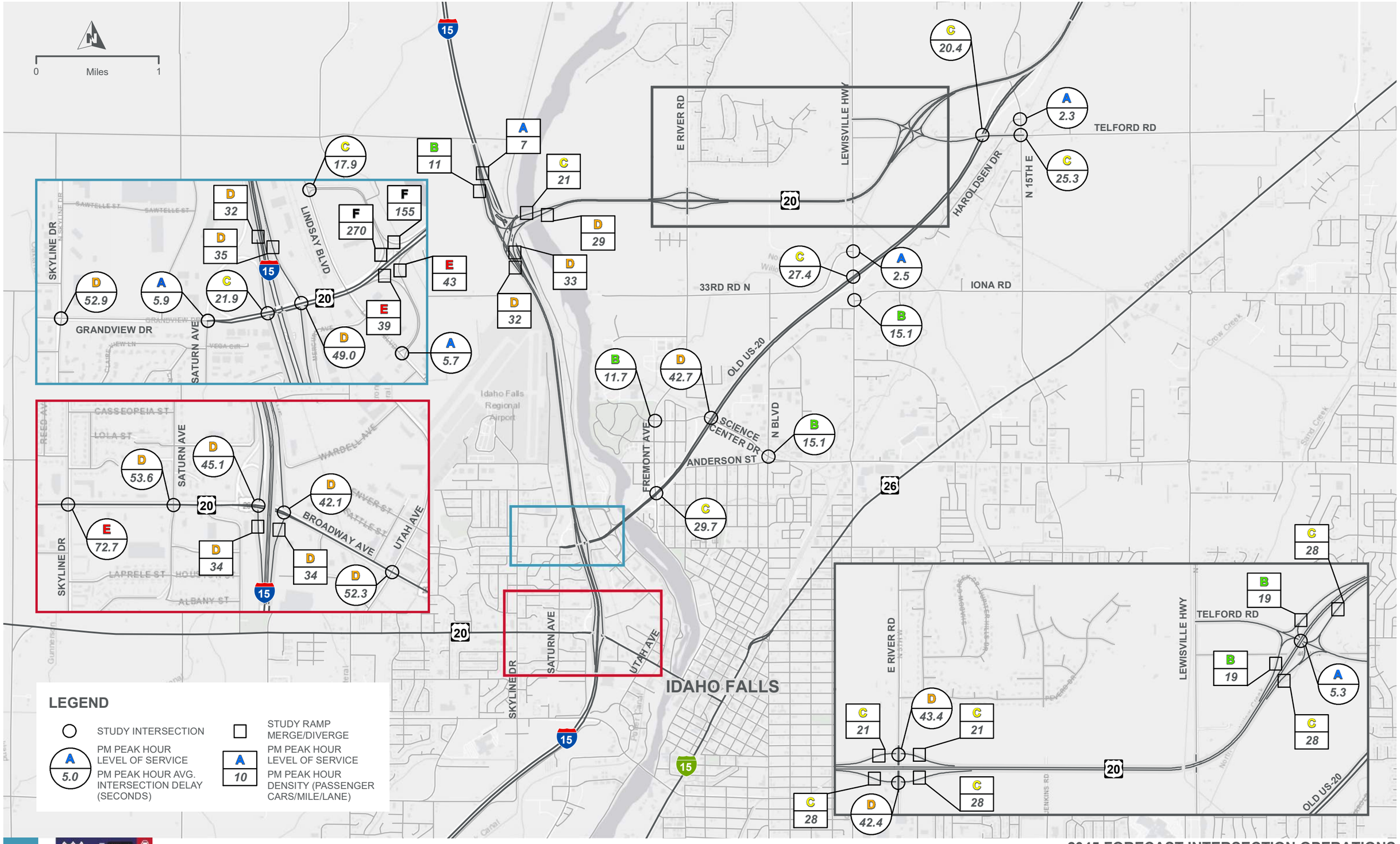
Most of the Alternative H2 merge and diverge segments on I-15 and US-20 are estimated to operate at LOS D or better. The ramps serving the split diamond configuration of the I-15 118 and 119 exits operate well with reduced demand due to the realigned US-20 mainline and better spacing between on and off ramps. The Exit 307 interchange is assumed to remain and the ramps are estimated to operate at LOS E and F. While this is better than the No-Build Alternative, similar issues with queue backups and the close spacing of the ramps to the split diamond intersections with Grandview Dr. exist with this alternative causing congestion and queue backups through the Exit 307 ramps. The direct ramps between I-15 and US-20 are estimate to operate adequately in the p.m. peak hour.

The travel time for drivers traveling on I-15 northbound and southbound through the Alternative H2 system is estimated to be 4.4 minutes in each direction. The southbound drivers will see no improvement from the No-Build Alternative but the northbound vehicles travel time is estimated to be reduced by 61%.

Estimated travel time for drivers traveling from I-15 south of Exit 118 to US-20 east of Exit 311 is 6.7 minutes while the time for drivers traveling the same distance from US-20 to I-15 is estimated to be 6.4 minutes. These are reductions of 56% and 7% from the No-Build Alternative, respectively. Drivers traveling thorough the Alternatives H2 network from I-15 to US-20 travel a farther distance than in the previous alternatives.

The total estimated VMT during the peak hour in the 2045 Alternative H2 system is 49,357 miles with a total VHT of 1,614 hours. This equates to a 28% increase in VMT and an 8% decrease in VHT over the No-Build Alternative. These measures of effectiveness are higher than previous alternatives because the I-15 to US-20 trips travel a farther distance than the previous alternatives.

The total vehicles estimated to be able to cross the Snake River under Alternative H2 p.m. peak hour conditions is 3,566 eastbound and 3,072 westbound for a total of 6,638, which is a 30% increase over the No-Build Alternative. The available Snake River crossing points in the analyzed system includes the Johns Hole Bridge and the realigned US-20 bridges.



I-15 / US-20 Connector

2045 FORECAST INTERSECTION OPERATIONS

ALTERNATIVE H2

FIGURE 8

Conclusions

This analysis was completed at a high level and some individual intersections, interchanges, and/or ramp models may be refined in future phases of the project to give more refined or different results. This conceptual analysis allows a comparison between the updated Level 3 Alternatives, including the No-Build Alternative, in the following tables. This comparison will be used to identify improvements that can be included with each alternative and evaluate which should be carried forward into a NEPA analysis.

Table 3 summarizes the estimated travel times for each alternative in minutes, **Table 4** summarizes the total VMT and VHT for each alternative, and **Table 5** summarizes the total vehicles estimated to cross the Snake River with each alternative. Each table also estimates the change in the measurement from No-Build for each alternative.

Table 3. Estimated Travel Times for Each Alternative (Minutes)

Route	No-Build	Alt. C3	% Change	Alt. E3	% Change	Alt. H2	% Change
I-15 NB Though	11.2	4.4	-61%	4.4	-61%	4.4	-61%
I-15 SB Through	4.4	4.2	-5%	4.4	0%	4.4	0%
I-15 NB to US-20 EB	15.2	5.1	-66%	5.4	-65%	6.7	-56%
US-20 WB to I-15 SB	6.9	5.3	-22%	5.3	-22%	6.4	-7%

Table 4. Estimated VMT and VHT

Measure	No-Build	Alt. C3	% Change	Alt. E3	% Change	Alt. H2	% Change
VMT	38,552	45,268	17%	44,273	15%	49,357	28%
VHT	1,751	1,328	-24%	1,376	-21%	1,614	-8%

Table 5. Total Vehicles Crossing the Snake River

Route	No-Build	Alt. C3	% Change	Alt. E3	% Change	Alt. H2	% Change
Eastbound	2,427	3,611	49%	3,813	57%	3,566	47%
Westbound	2,687	3,307	23%	3,129	16%	3,072	14%
Total	5,114	6,917	35%	6,942	36%	6,638	30%

The tables below summarize the results of the operational analysis for each alternative and allow a comparison of the measurements. LOS is reported in each table along with a color code with **LOS A = BLUE**, **LOS B = GREEN**, **LOS C = YELLOW**, **LOS D = ORANGE**, **LOS E = RED**, and **LOS F = BLACK**. **Table 6** presents the results of the analysis for the intersections included in each alternative. **Table 7** presents the results of the analysis for the merge and diverge ramps included in each alternative.

Table 6. Intersection Analysis Results

Intersection	No-Build		Alt. C3		Alt. E3		Alt. H2	
	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS
Broadway St - US-20 / Skyline Dr	73.2	E	71.4	E	88.8	F	72.7	E
Broadway St - US-20 / Saturn Ave	58.4	E	25.7	C	59.6	E	53.6	D
Broadway St - US-20 / Exit 118 SB Ramp	27.3	C	25.7	C	25.8	C	45.1	D
Broadway St - US-20 / Exit 118 NB Ramp	34.1	C	26.0	C	25.5	C	42.1	D
Broadway St / Utah Ave	112.0	F	55.1	E	58.7	E	52.3	D
Grandview Dr / Skyline Dr	96.3	F	23.1	C	17.2	B	52.9	D
Grandview Dr / Saturn Ave	NA	NA	1.4	A	1.0	A	5.9	A
Grandview Dr / Exit 119 SB Ramp	45.8	E	4.6	A	NA	NA	21.9	C
Grandview Dr / Exit 119 NB Ramp	60.6	E	11.2	B	NA	NA	49.0	D
Lindsay Blvd / Exit 307 WB Ramp	92.4	F	NA	NA	NA	NA	17.9	C
Lindsay Blvd / Exit 307 EB Ramp	8.6	A	NA	NA	NA	NA	5.7	A
Grandview Dr / Lindsay Blvd	NA	NA	10.4	B	8.6	A	NA	NA
Fremont Ave / Exit 308 WB Ramp	2.9	A	NA	NA	NA	NA	NA	NA
Fremont Ave / Exit 308 EB Ramp	4.6	A	NA	NA	NA	NA	NA	NA
Fremont Ave / Exit 309 WB Ramp	NA	NA	27.5	C	6.2	A	NA	NA
Fremont Ave / Grandview Dr	NA	NA	14.8	B	16.1	B	29.7	C
Science Center Dr / Fremont Ave	11.7	B	18.8	B	25.5	C	11.7	B
Science Center Dr / Exit 309 WB Ramp	20.5	C	15.7	C	28.2	D	42.7	D
Science Center Dr / Exit 309 EB Ramp	4.1	A	3.1	A	2.9	A		
Science Center Dr / North Blvd	14.7	B	15.6	B	15.6	B	15.1	B
Lewisville Rd / 33rd North	48.7	E	4.4	A	25.6	D	2.5	A
Lewisville Rd / Exit 310 WB Ramp	15.9	B	15.0	B	31.4	C	27.4	C
Lewisville Rd / Exit 310 EB Ramp	15.6	C	35.2	E	49.9	E		
Lewisville Rd / Iona Road	26.1	C	46.2	D	66.8	E	13.5	B
N 15th E / Exit 311 WB Ramp	4.2	A	6.4	A	4.5	A	NA	NA
N 15th E / Exit 311 EB Ramp	2.8	A	5.5	A	3.7	A	NA	NA
N 15th E / Haroldsen Dr	2.1	A	1.8	A	2.2	A	2.3	A
N 15th E / Telford Rd	3.3	A	3.5	A	3.6	A	25.3	C
Olympia St / I-15 SB Ramp	NA	NA	NA	NA	6.2	A	NA	NA
Olympia St / I-15 NB Ramp	NA	NA	NA	NA	8.5	A	NA	NA
Telford Rd / US-20	NA	NA	NA	NA	NA	NA	5.3	A
Telford Rd / Grandview Dr	NA	NA	NA	NA	NA	NA	20.4	C
E River Rd / US-20 WB	NA	NA	NA	NA	NA	NA	43.4	D
E River Rd / US-20 EB	NA	NA	NA	NA	NA	NA	42.4	D

Table 7. Merge/Diverge Analysis Results

Ramp	No-Build		Alt. C3		Alt. E3		Alt. H2	
	Density	LOS	Density	LOS	Density	LOS	Density	LOS
Exit 118 NB Off Ramp	207	F	41	E	38	E	34	D
Exit 118 EB Broadway St SB On Ramp	34	D	36	E	36	E	34	D
Exit 118 WB Broadway St SB On Ramp	32	D			34	D		
Exit 118 NB On Ramp	396	F	39	E	NA	NA	NA	NA
Exit 119 NB Off Ramp			NA	NA	NA	NA	NA	NA
Exit 118 SB Off Ramp	32	D	36	E	NA	NA	NA	NA
Exit 119 SB On Ramp			NA	NA	NA	NA	NA	NA
Exit 119 NB On Ramp	7	A	9	A	NA	NA	35	D
Exit 119 SB Off Ramp	11	B	10	A	NA	NA	32	D
Exit 307 EB Off Ramp	54	F	NA	NA	NA	NA	39	E
Exit 307 WB On Ramp	166	F	NA	NA	NA	NA	270	F
Exit 307 EB On Ramp	58	F	NA	NA	NA	NA	43	E
Exit 308 EB Off Ramp			NA	NA	NA	NA	NA	NA
Exit 307 WB Off Ramp	139	F	NA	NA	NA	NA	155	F
Exit 308 WB On Ramp			35	E	NA	NA	NA	NA
Exit 308 EB On Ramp	47	F	38	E	NA	NA	NA	NA
Exit 309 EB Off Ramp			38	E	50	F	NA	NA
Exit 308 WB Off Ramp	51	F	26	C	26	C	NA	NA
Exit 309 WB On Ramp			NA	NA	39	E	NA	NA
Exit 309 EB On Ramp	NA	NA	NA	NA	33	D	NA	NA
Exit 310 EB Off Ramp	28	C	41	E	50	F	NA	NA
Exit 310 WB On Ramp	24	C	28	D	27	C	NA	NA
Exit 310 EB On Ramp	28	C	33	D	34	D	NA	NA
Exit 310 WB Off Ramp	20	B	22	C	21	C	NA	NA
Exit 311 WB On Ramp	21	C	23	C	22	C	NA	NA
Exit 311 EB Off Ramp	25	C	30	D	30	D	NA	NA
Exit 311 EB On Ramp	27	C	31	D	32	D	NA	NA
Exit 311 WB Off Ramp	27	C	21	C	20	B	NA	NA
Direct Ramp NB I-15 Off Ramp	NA	NA	25	C	25	C	33	D
Direct Ramp SB I-15 On Ramp	NA	NA	28	D	37	E	32	D
Direct Ramp NB I-15 On Ramp	NA	NA	7	A	7	A	7	A
Direct Ramp SB I-15 Off Ramp	NA	NA	NA	NA	NA	NA	11	B
Direct Ramp EB US-20 On Ramp	NA	NA	39	E	NA	NA	29	D
Direct Ramp WB US-20 Off Ramp	NA	NA	NA	NA	NA	NA	21	C
Olympia St SB I-15 On Ramp	NA	NA	NA	NA	13	B	NA	NA
Olympia St SB I-15 Off Ramp	NA	NA	NA	NA	11	B	NA	NA
Olympia St NB I-15 On Ramp	NA	NA	NA	NA	8	A	NA	NA
Olympia St NB I-15 Off Ramp	NA	NA	NA	NA	29	D	NA	NA
E River Rd EB US 20 Off Ramp	NA	NA	NA	NA	NA	NA	28	C
E River Rd WB US 20 On Ramp	NA	NA	NA	NA	NA	NA	21	C
E River Rd WB US 20 Off Ramp	NA	NA	NA	NA	NA	NA	21	C
E River Rd EB US 20 On Ramp	NA	NA	NA	NA	NA	NA	28	C
Telford Rd EB US 20 Off Ramp	NA	NA	NA	NA	NA	NA	28	C
Telford Rd WB US 20 On Ramp	NA	NA	NA	NA	NA	NA	19	B
Telford Rd EB US 20 On Ramp	NA	NA	NA	NA	NA	NA	28	C
Telford Rd WB US 20 Off Ramp	NA	NA	NA	NA	NA	NA	19	B

Cost Risk Assessment and Value Engineering Report

I-15/US-20 Connector
Idaho Transportation Department

Idaho Falls, Idaho

December 9-12, 2019

Prepared by:

HDR Engineering, Inc.
412 E. Parkcenter Blvd
Suite 100
Boise, ID 83706

Executive Summary

Introduction

This cost risk assessment and value engineering (CRAVE) report summarizes the events of the study conducted for the Idaho Transportation Department (ITD) and facilitated by HDR Engineering, Inc. (HDR). The subject of the CRAVE study was the I-15/US-20 Connector Project.

The study was conducted December 9-12, 2019. The primary objectives of the CRAVE study were to:

- Verify or improve upon the various concepts for the project.
- Identify high risk areas in delivering the project.
- Improve the value of the project alternatives through innovative measures aimed at improving the performance while reducing costs of the project.
- Perform a cost risk assessment on both the baseline design and the Value Engineering (VE) recommendations.

Project Overview

The Idaho Transportation Department (ITD) is working with the City of Idaho Falls and Bonneville County to study ways to improve I-15 and US-20 to better serve Idaho Falls and the growing region.

ITD is conducting a PEL (Planning and Environmental Linkages) study of six interchanges within a two-mile area that have outlived their usefulness and service capacity. Traffic volumes and congestion and aging infrastructure are impacting safety and travel for all users. The purpose of the PEL study is to identify and analyze corridor improvements that address safety, congestion, mobility and travel time reliability for all users on I-15 and US-20 in Bonneville County near Idaho Falls. This study is a necessary and important preliminary step in redesigning the corridor to provide a safe and reliable commute for the next 20 years and beyond.

The CRAVE team was presented three alternatives:

- **Alternative C ‘As-Presented’**
    - Adds lanes and ramps to separate the through-traffic from the local exiting traffic between the I-15 Exit 118 (Broadway Street) and US-20 Exit 308 (Riverside Drive/City Center)
    - Requires new retaining walls, bridges, and replaces US-20 Exit 308, I-15 Exits 118 and 119
    - Maintains alignment near or in the same location as the existing I-15/US-20 roadways

- **Alternative E 'As-Presented'**
  - Moves the I-15/US-20 interchange (Exit 119) about a half mile north
  - Adds separated through-lanes and frontage roads and converts the existing US-20 from Grandview Drive to Fremont Avenue to a local street
  - *Alternative E – Option 1 'As-Presented'*
    - Removes Exits 307 and 308 and Exit 309
  - *Alternative E – Option 2 'As-Presented'*
    - Removes Exit 307 and replaces the interchange at Exit 308 and Exit 309 into one interchange with ramp modifications
- **Alternative H 'As-Presented'**
  - Moves the I-15/US-20 interchange (Exit 119) about a mile north and adds a new roadway to connect to US-20 at E 49th N (Telford Road)
  - Converts existing US-20 between Johns Hole and E 49th N to a local street
  - Includes new interchanges at I-15 and US-20 to tie new roadway back to existing roadway
  - Adds safety and capacity improvements on I-15 at Exits 118 and 119

Value Engineering Recommendations

In total, the CRAVE team generated 81 ideas for the project. These ideas were compared against the baseline concepts of each alternative and presented by the project team. The ideas evaluated were developed and then added to create new improved alternatives (options):

- Alternative C – Option 3
- Alternative E – Option 3
- Alternative H – Option 1

The performance of the improved alternatives above are shown in **Table 1** and are detailed in Section 6, Development Phase

Table 1: Summary of Recommendations

Description	Performance (P)	Cost (C) $ millions	Value Index
Alternative C – Option 3	634	$ 297.1	2.13
Alternative E – Option 3	634	$ 253.5	2.50
Alternative H – Option 1	620	$ 411.3	1.51

To facilitate implementation, a Value Engineering Recommendation Approval Form is included in **Appendix A**. If the Project Manager elects to reject or modify a recommendation, a brief explanation of why is located on the bottom of the form. Should these VE recommendations be implemented, a separate scenario risk analysis was performed to provide the project team with the additional information associated with

both base cost reduction and risk mitigation. This information is provided in the Analysis of Results section of this report.

Cost and Schedule Risk Analysis

In performing the cost risk analysis, a risk-based modeling tool was incorporated to model the cost and schedule uncertainty and the identified project risks. **Table 2** shows the projects base costs in YOE (Year of Expenditure) dollars. An escalation rate of 3% was used in this analysis. The modeled results at the 70th percentile for Alternative C 'As-Presented' were **$385.0 million**, Alternative E – Option 2 'As-Presented' **$360.6 million**, and Alternative H 'As-Presented' **$510.6 million** prior to implementation of risk management strategies and VE recommendations.

The CRAVE team identified 41 risks that carry both potential schedule and cost impacts to these alternatives. In the workshop, a likely range of schedule and costs impacts and the probability of occurrence were identified for each risk. The next step was to develop response strategies and VE recommendations for the active risks. These were added into the risk-based modeling tool as results to measure the overall impact the risk mitigation strategies would have on the project. Additional opportunities were developed to capture the magnitude of the VE recommendations developed by the team.

This secondary analysis result was presented to the audience during the Presentation Phase of the CRAVE based on the risk mitigation strategies and value engineering recommendations for each alternative as developed by the team.

Please refer to **Table 2** for additional information on additional recommendations introduced as a result of risk mitigation strategies. Additional detail is provided in Section 7, Analysis of Results.

Table 2: 'As-Presented' and Improved CRAVE Analysis – Risk Mitigation

Alternative	Base Total Project Cost (YOE $M)	Value (YOE $M)		
		10%	70%	90%
Alternative C 'As-Presented'	$306.6	$337.9	**$385.0**	$404.6
Alternative C – Option 3	*$217.0*	*$238.5*	***$271.7***	*$286.0*
Net Reduction in Projected Cost of $113.3 million				
Alternative E – Option 2 'As-Presented'	$291.0	$310.1	**$360.6**	$376.3
Alternative E – Option 3	*$203.9*	*$212.7*	***$237.1***	*$248.7*
Net Reduction in Projected Cost of $123.5 million				
Alternative H 'As-Presented'	$402.0	$453.2	**$510.6**	$535.9
Alternative H – Option 1	*$320.6*	*$360.2*	***$411.3***	*$435.8*
Net Reduction in Projected Cost of $99.3 million				

The results in **Table 2** illustrate the power of proactive management and implementation of risk mitigation strategies. In summary, implementing the risk mitigation strategies and

VE recommendations can offer an additional cost reduction beyond the direct cost of the risks themselves due to time related costs, including escalation and extended overheads.

The CRAVE team wishes to express its appreciation to the project design team and management for the excellent support they provided during the study. These recommendations and other design considerations provided will assist in the management decisions necessary to move the project forward.

Sincerely,

Blane H. Long, CVS®
HDR

B

Level Three Screening Results

Meeting Minutes

Project:	I-15/US-20 Connector	
Subject:	Level Three Screening of Alternatives	
Date:	Wednesday, March 11 – Thursday, March 12, 2020	
Location:	ITD District 6 Office, Rigby	
Attendees:	Karen Hiatt - ITD	Tracy Ellwein - HDR
	Ryan Day - ITD	Cameron Waite - HDR
	Curtis Calderwood - ITD	Jason Longsdorf - HDR
	Mark Layton - ITD	Kelly Hoopes - Horrocks
	Lisa Applebee (phone) - FHWA	Ben Burke - Horrocks
	Brent Ingram - FHWA	Mike McKee - Horrocks
	Chris Canfield - City of Idaho Falls	Darrell West - BMPO
	Lance Bates - Bonneville County	Corrie Hugaboom - HDR (phone)
	Drew Mephin - ITD	Stephanie Borders - HDR
	Nick Contos - Citizen	John McPherson - HDR

The purpose of the Level Three Screening of Alternatives meeting was for the analysis team to review the screening completed by each team member for the four alternatives carried forward and refined from the Level Two screening. The goal of this meeting was to review the screening results and come to a general consensus on the alternatives to recommend move forward in a future NEPA study.

Each member of the analysis team was provided a packet of study information and an alternatives evaluation matrix prior the screening meeting.

The first day of the meeting began with an alternatives overview, followed by a short Q&A session. Each team member received their evaluation matrix back to review their scoring based on the presentation of the alternatives. The second day of the meeting included reviewing the evaluation matrix, discussion of the screening questions and agreeing on alternatives to recommend to move into NEPA.

Day 1, March 11, 1:00 - 4:30 pm

PROJECT OVERVIEW

Tracy began the meeting with an overview of project updates from Level Two to Level Three. The updates included additional public outreach, geometric refinements to each alternative, historic resource and wetland identification research, and a Cost Risk and Value Engineering

(CRAVE) study. The five alternatives included in the review were: C, E-1, E-2,H, and the no build alternative.

PUBLIC OUTREACH AND COMMUNITY WORKING GROUP

Stephanie provided a summary of public outreach completed since the May 2019 public open house.

a. 49th East neighborhood requested a meeting to review Alternative H and one was held at the ITD District 6 office on June 10, 2019.
b. Updated the website with additional study information.
c. Worked with the school district to send 1,000 project information flyers home with school children.
d. Held the fifth CWG on February 27th, 2020. A separate meeting summary will be posted on the website. Main comments from the CWG include: the ability to connect Alternative H to the west; concerns about Alternative H cutting through farmland and the industrial dump site; airport/FAA direction in terms of where and what type of development can occur NE of the airport runways.
e. The CWG will be provided the open house displays and boards to comment on before we finalize for the next public open house.

OVERVIEW OF SCREENING PROCESS

Jason explained the Level Three screening process, how the evaluation criteria were developed through the screening phases and the screening matrix. The screening process will be captured in a PEL study and submitted to FHWA. Earlier today (3/11/2020) the Environmental Resources Committee met and the project team discussed with the resource agencies a request forthcoming for a concurrence letter that states the agencies were involved with the PEL study and agree with recommendations.

REVIEW OF THE LEVEL 3 ALTERNATIVES

The team collected LIDAR data in the fall of 2019 to aid in the geometric layout and rough modeling to establish impact areas. All alternatives meet current AASHTO standards, though some features only meet minimums. Traffic analysis included VISSIM (microsimulation) for Level 3 alternatives. The outcome of the CRAVE study, held in December 2019, led to enhancements of the Level Three alternatives to improve operations and consider ways to reduce cost while maintaining benefits. The analysis team received an overview of the revised alternatives from the CRAVE and highlights are as follows:

Alternative C – On alignment near the existing I-15/US-20 location.

- Site limitations caused the direct connect ramps to be designed to 50 mph, not the 55 mph design speed. The speed reduction helps improve geometry and minimize impacts.
- Improved local access at Fremont and Science Center ramps
- Grandview remains at ground level; therefore the Lindsay intersection is at grade.
- This design does not require major changes to the Broadway interchange.
- Slip ramp from Riverside SB to US-20 / I-15 flyover via direct connect.

- Additional River crossing (Lindsay) is beneficial but may not be critical to the overall operational benefit of Alternative C. However, there are benefits to local movements and could be useful during construction staging for the Exit 119 interchange replacement.

Alternative E-1 & E-2 – Slight shift north of existing Exit 119. E-1 and E-2 are the same configuration on the west side of the river and are different on the east side of the river.

- Impacts the potentially historically eligible grain silos.
- Improved construction staging since most new roadway is off alignment.
- Bike/pedestrian connectivity works well.
- Grandview overpass needs to be widened.
- Traffic modeling shows this alternative seems to drive much more traffic to the Broadway I-15 interchange.
- Would require removing the railroad and relocating the businesses.

Alternative H

- Minimal revisions through the CRAVE, mainly shifted the E-W US-20 alignment south, about ¼ mile.
- The I-15 direct connect ramps were reduced to 50 mph design speed.
- Geometric revisions to reduce the number of river crossings from four to two.
- This alternative does assume a split interchange at Exit 118/119.
- Even though there is additional vehicle miles traveled (VMT) with alternative H, it is handling almost 20,000 more vehicles per day.
- Travel cost savings in this scenario are not as high as anticipated due to increased VMT.

Day 2, March 12, 8:30 am - 3:00 pm

Open discussion on team member's thoughts and observations from previous day's meeting.

- Constructability is a challenge.
- What does the conversion of US-20 look like if Alternative C is not recommended? Some grade separations will remain because of the railroad crossings.
- Wetland impacts have changed through the CRAVE analysis and with the updated field studies, therefore the wetland impacts to H and E have been reduced from the screening packet.
- Impacts to the railroad and railroad supported businesses is a concern.
- Could we consider a C or E now and then long term solution would be H? Given the project size and magnitude, group determined it would be unlikely we could spend money on two options and instead suggested that we just do one that fits the purpose and need.
- Where is the growth projected in Idaho Falls? The growth will be in the north and south of the city – not as much east and west. Population is expected to grow from 120,000 to 190,000 in the next 30 years. Some policy board members thought those projections were too low.

DISCUSSION OF SUMMARIZED EVALUATIONS

Group reviewed the VISSIM traffic visualization and discussed the evaluations for each alternative.

Alternative C

Pros: Alternative is closest to town for connectivity; less impacts as it is on alignment.

Cons:

- Grades on ramps cause concerns for freight and heavy vehicles
- Railroad relocation
- Runway proximity for the new connection to Higham (is this critical?)
- Ramps may need additional lanes and slip ramps are geometrically close

Evaluation Criteria Review:

- Consider a question in the demographics about whether this is consistent with long-term plans.
- Are additional improvements likely required to accommodate 50 year traffic needs?
- Economic impacts based on construction will create problems for the downtown area.
- Concerns about the impact of the ramps and bridges over the river near downtown during construction.
- Likely requires a temporary bridge over the river.

Alternative E

Pros: Provides an additional river crossing; still close to the downtown area.

Cons:

- Operational issues at Lewisville at Exit 310
- Railroad relocation and business impacts
- Need to do something to mitigate traffic at Broadway since we don’t have the CD roads that are present in Alt C

Alternative H

Pros: Off alignment lends to good constructability with limited impacts to highway users and business; improved safety with the spacing of the access points.

Cons:

- Impacts to farmland
- Varying public support
- Impact on the existing view shed for residents

- Changes to development plans with some areas already platted, though some may be in the airport restricted zone. Concerns about expansion to the west and the possibility of US-20 extending further west across additional farmland.
- May lead to sprawling development and drawing potential business away from downtown
- Unknowns in the industrial waste site

DISCUSSION OF RECOMMENDED ALTERNATIVES

Each analysis team member gave an overview on their observations, concerns and recommendations for what alternatives met screening questions and should be recommended to move into a NEPA study.

Below is a summary of the discussion points:

- Alternative C will be very difficult to construct, impacting business, highway users and increased cost for traffic control. The alternative could pose safety risks during construction due to the congested area. It does not add a new river crossing, which is beneficial to help Broadway and also during construction. Alternative C and Alternative E are very similar, though Alternative E would provide better constructability. The geometric layout of the ramps lends to weaving concerns, possible safety issues and design challenges to make ramps meet AAHSTO standards.

- Alternative E would require railroad removal and business relocation, both north and south of Grandview. Working with the railroad could present challenges for negotiations and agreements. There would be impacts to an RV park that could be an environmental justice issue. Alternative C or Alternative E would serve the in-town needs more than Alternative H.

- Alternative H would provide the best constructability. Exits 118 and 119 will still need improvements. The alternative would provide a new river crossing and have fewer wetland and environmental justice impacts. It would impact the neighborhood to the north. Alternative H provides long-term benefits as the area grows.

The group agreed to move forward with two recommended alternatives: Alternative E and Alternative H.

STEPS FORWARD

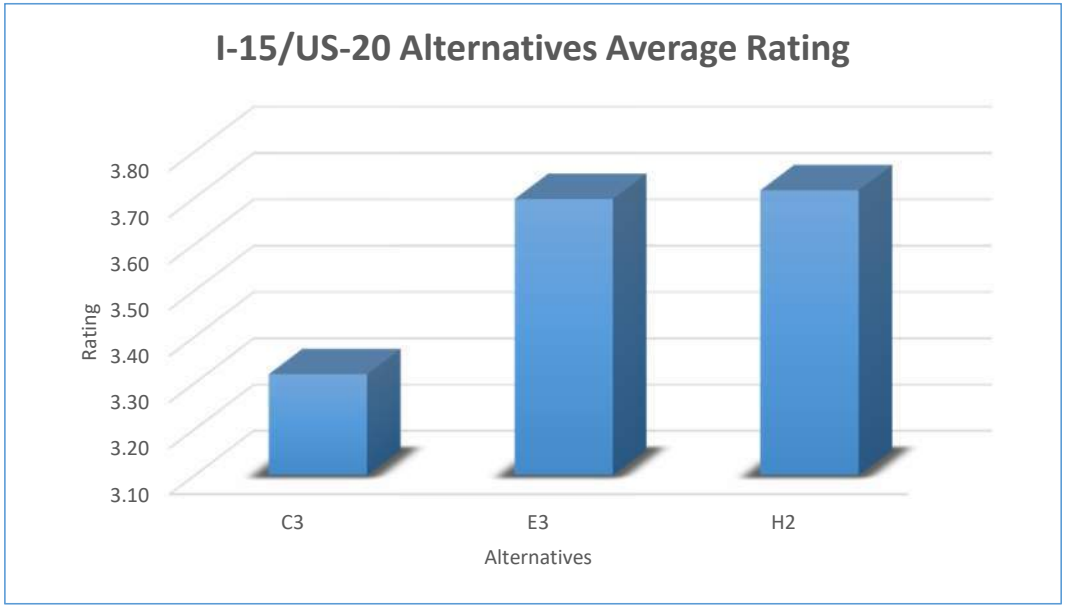
- Prepare for the public information meeting to present Level Three alternatives and the recommendation to move two alternatives forward. Collect comments and feedback.
- Consider sending a separate letter to properties within Alternative E and H impact areas as an extra outreach to suggest they attend the public information meeting.
- Consider running traffic models to look beyond the planning year horizon to determine when alternatives might fail. Include Broadway in this model.
- Consider using a planning year of 2050 in the NEPA study.
- Utilize the interim project at Exit 119. It allows acceptable LOS through 2031 with a 119 dual right to EB US-20.

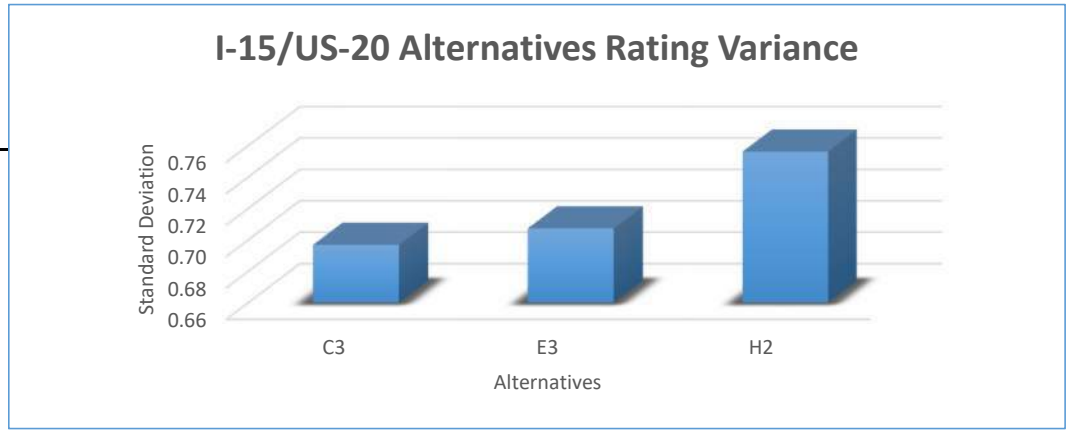
I-15/US-20 Alternatives Summary

Calculated by: [redacted] **Date:** [redacted]
Checked by: [redacted] **Date:** [redacted]

Evaluator	Alternative		
	C3	*E3*	*H2*
[redacted]	3.70	3.70	3.40
	2.80	2.90	3.60
	3.40	4.30	4.20
	4.00	4.60	2.90
	3.40	3.60	3.90
	3.10	3.15	3.60
	2.90	3.70	4.40
	2.80	4.00	3.60
	3.30	3.40	2.90
	3.00	3.90	3.70
	3.80	3.90	4.30
	3.40	4.00	4.00
	3.20	3.30	3.50
	3.80	4.00	3.85
	3.70	3.80	4.10
	2.80	2.90	3.50
Average Rating	3.32	3.70	3.72
Std. Dev.	0.70	0.71	0.76

Statistics	Avg. Rating	Std. Dev.
Max:	3.72	0.76
Min:	3.32	0.70
Mean:	3.58	0.72
Median:	3.70	0.71



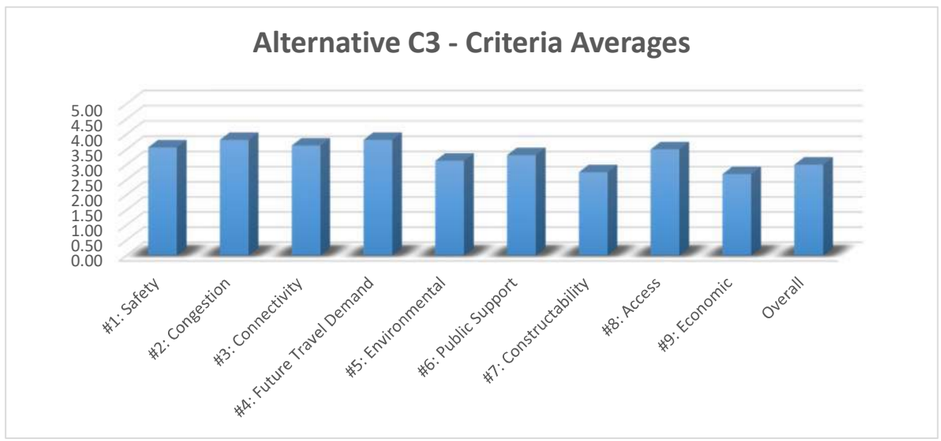


Alternative C3 Score Summary

Calculated by: [redacted] **Date:** [redacted]
Checked by: [redacted] **Date:**

Alternative	Evaluator	Criteria										*Average*
		#1: Safety	#2: Congestion	#3: Connectivity	#4: Future Travel Demand	#5: Environmental	#6: Public Support	#7: Constructability	#8: Access	#9: Economic	Overall	
C3	[redacted]	4	4	4	4	3	4	3	4	3	4	3.70
		2	3	3	3	3	3	2	4	3	2	2.80
		3	4	4	3	4	4	3	3	3	3	3.40
		4	4	4	5	3	3	4	5	4	4	4.00
		4	4	4	4	3	3	2	5	2	3	3.40
		4	3	4	4	3	3	3	3	2	2	3.10
		3	3	3	4	3	3	3	3	1	3	2.90
		3	4	3	4	3	3	1	3	2	2	2.80
		4	4	4	4	3	2	3	4	2	3	3.30
		4	3	3	3	3	3	3	2	3	3	3.00
		4	4	4	4	4	3	4	4	4	3	3.80
		4	4	4	5	3	4	2	2	3	3	3.40
		3	4	3	3	3	4	3	3	3	3	3.20
		4	5	4	5	4	4	2	4	3	3	3.80
		4	5	4	3	2	3	4	4	4	4	3.70
		3	3	3	3	3	4	2	3	1	3	2.80
	Average	3.56	3.81	3.63	3.81	3.13	3.31	2.75	3.50	2.69	3.00	3.32
	Std. Dev.	0.63	0.66	0.50	0.75	0.50	0.60	0.86	0.89	0.95	0.63	0.70

Max:	4.00
Min:	2.80
Mean:	3.32
Median:	3.35
Std. Dev.	0.70

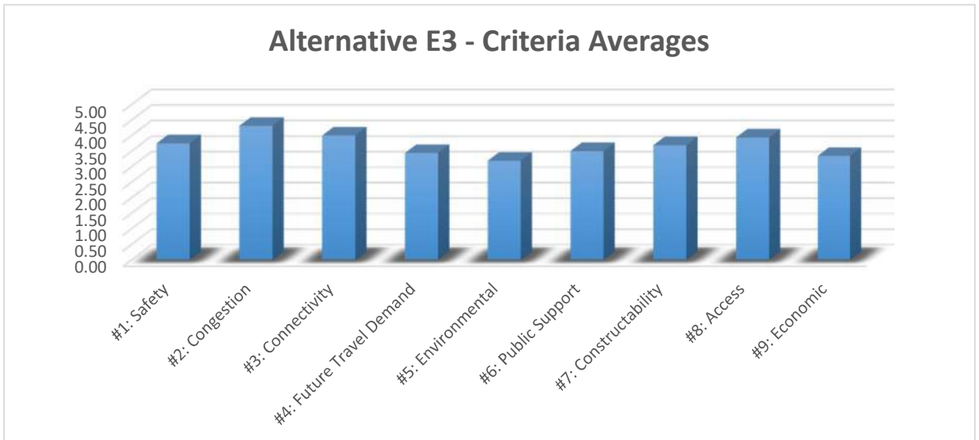


Alternative E3 Score Summary

Calculated by: [redacted] **Date:** [redacted]
Checked by: [redacted] **Date:** [redacted]

Alternative	Evaluator	Criteria										*Average*
		#1: Safety	#2: Congestion	#3: Connectivity	#4: Future Travel Demand	#5: Environmental	#6: Public Support	#7: Constructability	#8: Access	#9: Economic	Overall	
E3	[redacted]	5	4	4	4	2	3	4	4	3	4	3.70
		3	3	3	2	3	3	3	4	2	3	2.90
		4	5	5	4	4	4	4	4	4	5	4.30
		5	5	4	5	3	4	5	5	5	5	4.60
		4	4	4	3	3	4	3	4	3	4	3.60
		3	4	4	2	3	3	4	3	2.5	3	3.15
		4	4	4	4	3	3	4	4	3	4	3.70
		4	5	5	4	4	4	4	3	3	4	4.00
		3	4	4	3	3	3	4	5	1	4	3.40
		4	4	4	4	3	4	4	4	4	4	3.90
		4	5	4	3	4	3	4	5	4	3	3.90
		4	5	4	4	4	4	3	4	4	4	4.00
		3	4	3	3	2	4	3	4	4	3	3.30
		4	5	4	5	4	4	3	3	4	4	4.00
		3	5	5	3	3	3	4	4	4	4	3.80
		3	3	3	2	3	3	3	3	3	3	2.90
	Average	3.75	4.31	4.00	3.44	3.19	3.50	3.69	3.94	3.34	3.81	3.70
	Std. Dev.	0.68	0.70	0.63	0.96	0.66	0.52	0.60	0.68	0.98	0.66	0.71

Statistics	Avg. Rating
Max:	4.60
Min:	2.90
Mean:	3.70
Median:	3.75
Std. Dev.	0.71



Alternative H2 Score Summary

Calculated by: [redacted] **Date:** [redacted]
Checked by: [redacted] **Date:** [redacted]

Alternative	Evaluator	Criteria										*Average*
		#1: Safety	#2: Congestion	#3: Connectivity	#4: Future Travel Demand	#5: Environmental	#6: Public Support	#7: Constructability	#8: Access	#9: Economic	Overall	
H2	[redacted]	3	3	3	5	4	2	2	5	4	3	3.40
		4	3	5	4	3	2	2	5	4	4	3.60
		5	4	5	4	4	3	3	5	5	4	4.20
		5	3	4	4	2	1	2	2	3	3	2.90
		5	4	4	4	4	3	4	4	3	4	3.90
		3	3	4	4	4	2	3	5	4	4	3.60
		5	4	4	5	4	3	4	5	5	5	4.40
		5	3	4	4	3	2	3	5	4	3	3.60
		4	4	3	4	2	1	2	4	3	2	2.90
		4	4	3	4	2	4	4	4	4	4	3.70
		5	4	4	5	4	3	5	4	5	4	4.30
		5	4	4	5	2	3	3	5	5	4	4.00
		4	4	3	4	3	2	4	3	5	3	3.50
		5	4	3	5	3	4	4	2.5	4	4	3.85
		4	4	4	4	3	3	4	5	5	5	4.10
		4	3	4	5	2	2	3	4	4	4	3.50
	Average	4.38	3.63	3.81	4.38	3.06	2.50	3.25	4.22	4.19	3.75	3.72
	Std. Dev.	0.72	0.50	0.66	0.50	0.85	0.89	0.93	0.98	0.75	0.77	0.76

Statistics	Avg. Rating
Max:	4.40
Min:	2.90
Mean:	3.72
Median:	3.65
Std. Dev.	0.76