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|  |  | |  | |
|  |  |  |  | |
|  | DRAFT Value Engineering Study Report  Project Name  Enter Project Description or Caption  Enter Project Location  [Study dates] |
|  | Prepared by:  VMF Engineering, Inc.  [Address  Suite xx  City, State, Zip | |  |
|  |  | |  |

Disclaimer

The information contained in this report is based on the professional opinions of the Value Engineering (VE) team members as developed during the study. These opinions are based on the information that was provided to the team at the time of the study. As the project continues to develop, recommendations and findings should be reevaluated as new information is received.

All costs displayed in the report are based on best available information at the time of the study and, unless otherwise noted, used the estimate as provided to the VE team. All drawings, graphics, maps, photos, etc., used in the report were supplied by the study sponsor or developed during the study.

The disposition of recommendations is based on the information in this report; it is independent of the resolutions generated after the study. HDR has no participation, direct or indirect, in such decisions.

For any recommendations that are accepted by the owner and design team as a result of this VE study, the responsibility for implementation into the design rests with the designer of record.

[Statistics table below used for some DOT reports]

|  |
| --- |
| Study Statistics  Baseline Cost: $  Number of Recommendations: xx  Recommended Cost Savings: $  Recommended Value Added: $  Total Number of Team Members: xx  [Federal Employees]: xx  [Client] Employees: xx  Others: xx  Facilitator Consultant: HDR |

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Acronyms and Abbreviations

|  |  |
| --- | --- |
| ATCS | Adaptive Traffic Control System |
| CCTV | closed circuit television |
| CIP | cast in place |
| CVS | Certified Value Specialist |
| CY | cubic yard |
| DDI | diverging diamond interchange |
| DMS | dynamic message sign |
| FAST | Function Analysis System Technique |
| FDOT | Florida Department of Transportation |
| FHWA | Federal Highway Administration |
| FPL | Florida Power & Light |
| FRP | fiberglass-reinforced plastic |
| FSB | Florida slab beam |
| GRS | geosynthetic reinforcement soil |
| IMR | Interchange Modification Report |
| ITS | Intelligent Traffic System |
| LDCA | Location and Design Concept Acceptance |
| LF | linear feet |
| LOS | level of service |
| LRE | long range estimate |
| MOT | maintenance of traffic |
| MSE | mechanically stabilized earth |
| MVDS | microwave vehicle detection sensor |
| OBG | optional base group |
| PD&E | Project Development and Environment |
| SF | square feet |
| SFRC | South Florida Rail Corridor |
| SIS | strategic intermodal system |
| SR | State Road |
| SY | square yard |
| TSM&O | Traffic System Management and Operation |
| VE | Value Engineering |
| VMA | Value Methodology Associate |

Executive Summary

Introduction

This report summarizes the events and results of the [virtual] VE study conducted by HDR Engineering, Inc. for [Client Name] on the project in . The VE study consisted of a [5] [4] [3]‑day workshop that was conducted [virtually] with a multidisciplinary team [at the workshop location.] [using a WebEx and OneDrive platform.] [using Microsoft Teams.]

Project Overview

The purpose of the project is to [\_\_\_\_\_\_\_]

At the time of the VE study, the total cost of the project, including design, construction, right-of-way, utilities, and construction engineering was estimated at [$xx] million.

Scope of VE Study

The primary objectives of the study, through execution of the Value Methodology Job Plan (Appendix A), were to:

* Verify or improve on the various design concepts for the identified section of the project.
* Conduct a thorough review and analysis of the key project functions using an independent, multidiscipline, cross-functional team.
* Improve the value of the project through innovative measures aimed at improving the performance while reducing costs of the project.

VE [Recommendations] [Alternatives] [Proposals]

The VE team generated [xx] ideas for the project. These concepts were compared against the baseline developed by the project team. The concepts that resulted in improved performance were further developed by the VE team and resulted in [xx] recommendations (Table 1).

| Table 1. Summary of Recommendations | | | |
| --- | --- | --- | --- |
| # | Recommendation Title | Cost Savings/ (Cost Added) ($M) | Performance Improvement (%) |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |

The individual recommendations are summarized below; the detailed information about each recommendation is included in Section 7.3.

1—Recommendation Title – [Brief synopsis] body text body text body text body text body text body text body text body text body text.

2—Recommendation Title – [Brief synopsis] body text body text body text body text body text body text body text body text body text.

3—Recommendation Title – [Brief synopsis] body text body text body text body text body text body text body text body text body text.

4—Recommendation Title – [Brief synopsis] body text body text body text body text body text body text body text body text body text.

5—Recommendation Title – [Brief synopsis] body text body text body text body text body text body text body text body text body text.

6—Recommendation Title – [Brief synopsis] body text body text body text body text body text body text body text body text body text.

[VE Study Results

After developing the VE recommendations, the VE team reviewed and discussed each alternative and developed a consensus relative to its prioritization for implementation. The prioritization was based on factors that include improved performance, likelihood of implementation, cost savings, or any combination thereof. A VE strategy consisting of complimentary combinations of individual VE recommendations that were deemed the highest in priority was developed.

A summary of the cost, performance, and value change of the VE strategy is provided in Table 2. The performance scores for each VE strategy were divided by the total cost scores to derive a value index. The value indices for the VE strategy were then compared against the value index of the baseline concept and the difference is expressed as a percent (±%) deviation. Please refer to Section 3, Project Analysis, for more information on the value comparison of the VE strategy.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Table 2. Summary of VE Strategy | | | | |
| Strategy Description | Initial Cost Savings | Added Costs | Performance Change | Value Change | |
|  |  |  |  |  | |
|  |  |  |  |  | |
|  |  |  |  |  | |

The Comparison of Value chart below illustrates the relative trade-offs between performance (shown by the blue columns) versus cost (shown by the green columns). The red value line indicates the net percent change in total value relative to the baseline concept.]

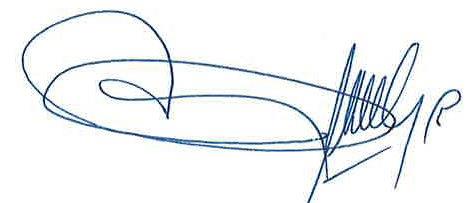
Figure 1. Comparison of Value

[insert chart]

Implementation of Recommendations

[To facilitate implementation, a Value Engineering Recommendation Approval Form is included as Appendix B. If the state elects to reject or modify a recommendation, please include a brief explanation of the decision.]

[To facilitate implementation, TxDOT Form 2502, Executive Decision Summary of VE Team Recommendations, is attached. This form is to be provided to the design division for final approval of all recommendations.]

The VE team wishes to express its appreciation to the project design managers for the excellent support they provided during the study. We hope that the recommendations and design considerations provided will assist in the management decisions necessary to move the project forward through the project delivery process.



|  |  |  |  |
| --- | --- | --- | --- |
| Blane Long, CVS®  *VE Facilitator* | Jose Theiler, PE, CVS®  *VE Facilitator* | Mark Watson, PE, CVS®  *VE Facilitator* | Paul Johnson  *Risk Manager* |

# Introduction

This VE report summarizes the events of the [virtual] VE study conducted for [Client Name] and facilitated [virtually] by HDR [using WebEx] [using Microsoft Teams]. The subject of the study was . The VE study was conducted while the project was in the [30 percent to 35 percent design phase] [PD&E phase].

## Scope of VE Study

Value is expressed as the relationship between functions and resources, where function is measured by the performance attributes defined by the customer, and resources are measured in materials, labor, price, and time required to accomplish that function. VE focuses on improving value by identifying the most resource-efficient way to reliably accomplish a function that meets the performance expectations of the customer.

The primary objectives of the study, through execution of the Value Methodology Job Plan (Appendix A), were to:

* Verify or improve on the various concepts for the identified section of the project.
* Conduct a thorough review and analysis of the key project functions using a multidiscipline, cross-functional team.
* Improve the value of the project through innovative measures aimed at improving the performance while reducing costs of the project.

With this process, the VE team identified the essential project functions and alternative ways to achieve those functions; the team then selected the optimal recommendations to develop into workable solutions for value improvements.

## VE Team Members

The VE study was facilitated by a Certified Value Specialist (CVS) from HDR. Multiple representatives and members of the [Client Name/Acronym] project team also participated in the VE process to provide insight into the project’s background and design development, as well as their requirements for the project and expectations for the VE study. Their support of this study is greatly appreciated and the results provided herein reflect the information they provided throughout the study.

The VE team included the following. See Appendix C for details of attendees.

* Christopher Johnson, CVS

Include team photo here.

# Information Phase

The VE team received the documentation and drawings from the project design team as shown in Table 3. The design team also introduced the project and its characteristics on the first day of the study. Project details and challenges as presented by the design team are summarized below.

## Information Provided to VE Team

Table 3 lists the project documents provided to the VE team for use during the study.

|  |  |
| --- | --- |
| Table 3. Information Provided to the VE Team | |
| Document/Drawing/Schematic | Document Date | |
|  |  | |
|  |  | |
|  |  | |
|  |  | |

## [Project History/Information] [Project Location] [Purpose and Need]

[Body text body text body text body *emphasis emphasis emphasis* text body text body text body text body text body text body text body style body text body text body text body text body text body text body text body text body text.]

Figure 2. Project Location [if applicable]

## [Proposed Improvements]

[Run-In Heading. Body text body text body text body text body text body text body text body text body text body text body text body text body text body text body text body text body text body text body text body text body text body text body text body text body text.

* List bullet
  + List bullet 2
    - List bullet 3

1. List
   1. List 2
      1. List 3 ]

## Constraints and Controlling Decisions

As part of the project briefing, the VE team was given the following project constraints and controlling factors that needed to be considered when evaluating ideas:

* List bullet
* List bullet

## [Risk Identification]

[A risk analysis was not completed as part of this VE project; however, during the VE study, the team identified several risks:]

[A risk analysis was not completed as part of this project; however, risk identification was performed by soliciting potential project risks from the stakeholders, project team, and VE team on the first day of the study. The following risks were identified:]

* [List bullet
  + List bullet 2
    - List bullet 3]

## [Site Visit Observations] [Project Observations]

[As part of the project overview, the VE team, project team, and stakeholders visited the project site. The following observations were made as a result of the site visit:] [The first day of the study included a presentation from the project design team [and a virtual tour of the project using Google Earth and KMZ files]. The following summarizes key project issues, project drivers, and observations identified during this session:]

* [List bullet
  + List bullet 2]

## Project Schedule

The project was [entering the PS&E design phase] [in design–30 to 35 percent complete with final design expected to be completed later this year]. The current schedule is shown in Table 4. [It was assumed that the project will be constructed using the design build (DB) delivery method.] [The project was in the PD&E phase with the DB procurement anticipated to occur in late 2019 with construction starting in 2020.]

|  |  |
| --- | --- |
| Table 4. Project Schedule | |
| Project Phase | Date |
|  |  |
|  |  |
|  |  |

## Project Cost Estimate

At the time of the study, the VE team was provided [with the most recent cost estimate] [a project estimate file that was developed for the project risk assessment]. [An abbreviated estimate is shown in Table 5.] See Appendix D for a detailed estimate.

|  |  |  |  |
| --- | --- | --- | --- |
| Table 5. Cost Estimate – Baseline Concept | | | |
| Cost Item | Cost | Percent of Total | Cumulative Percentage |
|  | $x,xxx,xxx | xx.x | xx |
|  |  |  |  |
|  |  |  |  |

# Project Analysis

## VE Focus Points and Observations

Prior to the VE study and during the Information Phase, a number of activities were conducted to better understand the baseline concept. The following summarizes key focus points and observations identified during these sessions and during the VE team’s initial analysis.

* [List Bullet
* List Bullet]

## Cost Model

The VE facilitator prepared a cost model from the cost estimate, which was provided by the project team. The model was organized to identify major construction elements or trade categories, the design team’s estimated costs, and the percent of total project cost for the significant cost items (Figure 3).

The cost model allows the team to focus on project elements with the highest degree of impact and utilize their time most effectively.

Insert Cost Model

Figure 3. Cost Model

## [Risk Analysis]

During the Information Phase individual risks were identified by the project and VE teams. The VE team sought to mitigate, through the VE process, those risks that pose the biggest impacts to the project cost or schedule.

The first step was to identify project-specific risks. The team then qualitatively evaluated the likelihood of each risk occurring and its potential impact to cost, schedule, or performance. The risks identified were qualified using a calculated indexing scheme that took into account the range of probability and impact in terms of the qualitative ratings (very low to very high). The expected total severity of each of the individual risks are calculated from the indexed values associated with the qualitatively-defined probabilities and impacts as shown in Figure 4, below.

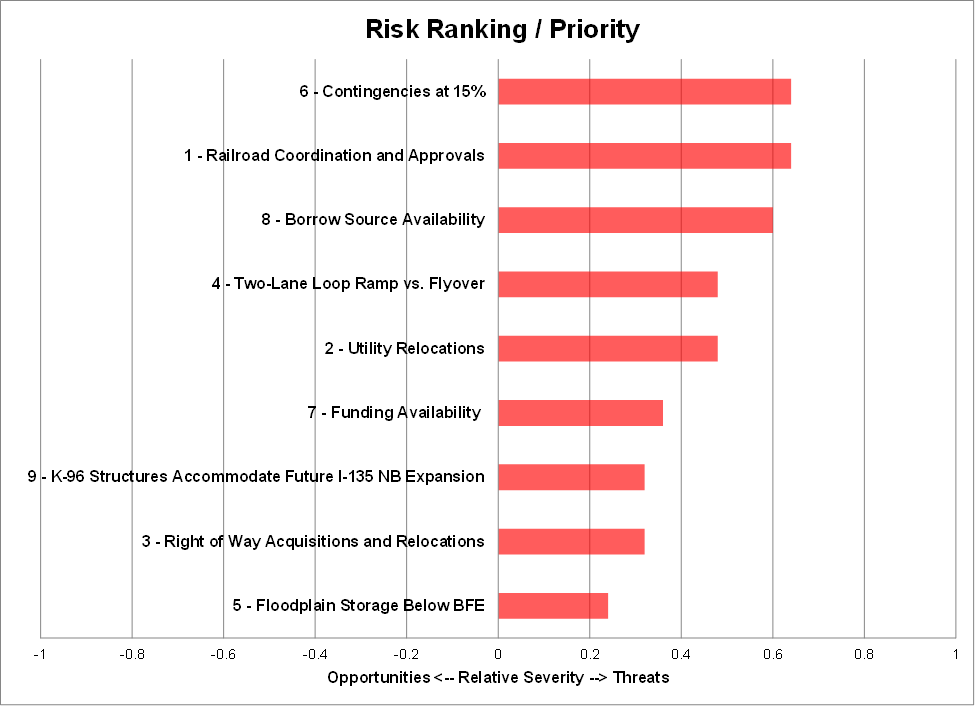
Figure 4. Risk Index Values



Tornado diagrams were then utilized to visually demonstrate the relative ranking of risks against one another in terms of the anticipated project impact. Threats are plotted on the right of the central axis, while opportunities are plotted to the left. The highest threats or opportunities are located at the top of the tornado diagram, while the lowest risk threats or opportunities are at the bottom.

The greatest opportunities should actively be exploited and capitalized. The greatest threats require proactive risk management and the appropriate risk response strategies should be implemented. The tornado diagrams display the risks prior to response and implementation of risk response strategies in the form of VE recommendations.

Figure 5. Risk Ranking



The risk analysis performed in conjunction with this VE study highlights the risks most in need of management and key delivery stakeholder attention by producing tornado diagrams. Project management and the design team should utilize this information to proactively manage project risk as the project is developed.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Table 6. Risk Register | | | | | | |
| Risk Information | | | | Risk Exposure | | |
| Risk ID | Threat/ Opportunity | Risk Description | Cost or Schedule | Probability | Impact | Severity |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
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## Value Metrics

The value metrics process was used as an analysis tool to evaluate the baseline project and the VE recommendations. Value metrics is a system of techniques predicated on the theory that value is an expression of the relationship between the performance of a function and the cost of acquiring it. It provides a standardized means of identifying, defining, evaluating, and measuring performance. Performance is quantified in terms of how well a set of attributes contribute to the overall functional purpose of a given project.

The basic equation used for calculating value is:

*Value =*

|  |
| --- |
| *Performance* |
| *Cost + Time* |

In other words, value is equivalent to the relationship of the resources needed to provide a certain level of performance for a given function. Performance is defined as a set of requirements and attributes of a project’s scope that are pertinent to the project's purpose and need. Participant responses are elicited for a series of paired comparisons in which the performance of alternatives are compared, with consideration of the project purpose and need, while taking into account the relative intensity of preference of one criterion over another.

The following pages describe the steps in the value metrics process.

### Performance Requirements

Performance requirements represent essential, nondiscretionary aspects of project performance. Any concept that fails to meet the project’s performance requirements, regardless of whether it was developed during the project’s design process or during the VE study, cannot be considered a viable solution.

Concepts that do not meet a performance requirement cannot be considered further unless such shortcomings are addressed through the VE study process in the form of VE recommendations. It should be noted that in some cases, a performance requirement may also represent the minimum acceptable level of a performance attribute.

### Performance Attributes

Performance attributes are an integral part of the value analysis process. The performance of each project must be properly defined and agreed on by the project team, VE team, and representatives at the beginning of the 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 (highway operations, environmental impacts, maintainability, and system preservation) 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 alternative concept 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 VE 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 performance attributes shown in Table 7 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 7.3, Individual Recommendations.]

[Typical standardized project performance attributes are shown below. The VE 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 (Table 7). The following performance attributes were used throughout the study to identify, evaluate, and document ideas and recommendations.]

| Table 7. Performance Attributes and Description | | |
| --- | --- | --- |
| Performance Attribute | Description of Attribute | Baseline Concept |
| Main Line Operations | An assessment of traffic operations and safety on the main line within the project limits.  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. |  |
| Local Operations | An assessment of traffic operations and safety on the local roadway infrastructure. Local Operations include frontage roads as well as cross roads.  Operational considerations include level of service relative to the 20-year traffic projections; geometric considerations such as design speed, sight distance, lane and shoulder widths; bicycle and pedestrian operations and access. |  |
| Maintainability | An assessment of the long-term maintainability of the facilities and equipment. Maintenance considerations include the overall durability, longevity, and maintainability of structures and systems; ease of maintenance; accessibility and safety considerations for maintenance personnel. |  |
| Construction Impacts | 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. |  |
| 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; impacts to shore edge; impacts to cultural, recreational and historic resources. |  |
| Project Schedule | An assessment of the total project delivery from the time as measured from the time of the VE Study to completion of construction. |  |

### Performance Attribute Matrix

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

These attributes were compared in pairs ([Figure 6] [Table 8]), asking the question: “Which one is more important to the purpose and need of the project?” (e.g., A or B, A or C, A or D, etc.) The letter code (e.g., “A”) was entered into the matrix for each pair. 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 VE team’s performance evaluation scoring (Section 6).

Figure 6. Performance Attribute Matrix

*[Insert Performance Attribute Matrix (paired comparison)]*

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Table 8. Performance Attribute Matrix | | | | | | | | | |
| Paired Comparison | | | | | | |  | Total Points | % of Total |
| **Main Line Operations** |  |  |  |  |  |  |  |  |
| **Local Operations** | |  |  |  |  |  |  |  |
| **Maintainability** | | |  |  |  |  |  |  |
| **Construction Impacts** | | | |  |  |  |  |  |
| **Environmental Impacts** | | | | |  |  |  |  |
| **Project Schedule** | | | | | |  |  |  |
| **Total** | | | | | | |  |  |

# Function Analysis Phase

## Overview

Function analysis results in a unique view of the project. It transforms project elements into functions, which help guide the VE team in considering the functional concepts of the project–independent of the current design. Functions are defined in verb-noun statements to reduce the needs of the project to their most elemental level (Table 9). Identifying the functions of the major design elements of the project allows a broader consideration of alternative ways to accomplish the functions.

| Table 9. Random Function Identification | |
| --- | --- |
| Project Element | Functions | |
| Project Purpose | Alleviate Congestion Increase Capacity Add Lanes Separate Traffic Reduce Conflicts Reduce Signal Phasing Improve Operations Change Speed Deliver Project Maintain Traffic Deploy Resources | |
| Barriers | Separate Traffic | |
| Clearing and Grubbing | Prepare Site | |
| Contingency | Mitigate Risks | |
| Drainage | Collect Runoff Convey Runoff Remove Runoff Treat Runoff Store Runoff | |
| Earthwork | Create Profile Move Earth Support Roadway Widen Roadway Add Lanes | |
| Erosion Control | Control Erosion | |
| Illumination | Increase Visibility | |
| Landscaping | Improve Appearance | |
| Lighting | Illuminate Roadway | |
| Median | Create Separation | |
| Mobilization | Deploy Resources Mobilize Equipment | |
| Pavement | Support Loads Protect Base | |
| Right-of-way | Create Space | |
| Roadway | Pave Roadway Smooth Surface | |
| Shoulder | Control Erosion Create Pedestrian Path | |
| Sidewalk | Accommodate Pedestrians | |
| Signage | Convey Information | |
| Signalization | Control Traffic | |
| Structures | Support Loads Span Distance | |
| Traffic Control | Protect Highway User Protect Highway Worker Maintain Traffic | |

## Function Analysis System Technique 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 (Figure 7) provided the VE team with an understanding of which functions offer the best opportunity for cost or performance improvement.

Figure 7. FAST Diagram

*[Insert FAST Diagram]*

# Creativity Phase

During the Creativity Phase, the VE team generated ideas on how to perform the various functions. The idea list was grouped by function or major project element. All of the ideas generated are recorded in Table 10. The final disposition of each idea is included at the end of Section 6.

| Table 10. Creative Idea List | |
| --- | --- |
| Idea No. | Description |
| Function: | |
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| Function: | |
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| Function: | |
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#### [Function

* Idea
* Idea

#### Function

* Idea
* Idea]

# Evaluation Phase

Although each project is different, the evaluation process for each VE effort can be thought of in its simplest form as a way of combining, evaluating, and narrowing ideas until the VE team agrees on the recommendations to be forwarded. Figure 8 depicts the typical information flow for this part of the Value Methodology Job Plan.

Figure 8. VE Process Information Flow



## Evaluation Process

The evaluation process begins by going through the ideas brainstormed during the Creativity Phase. Considering the information provided to the VE team at the time of the study and the constraints and controlling decisions that were also given to them, the team discussed the ideas and documented their advantages and disadvantages based on their relationship to the baseline concept.

The VE team also compared each idea with its baseline concept to determine whether the performance of the attribute (as introduced in Section 3.3) was better than, equal to, or worse than the baseline concept.

Each idea was then carefully evaluated, with the VE team reaching consensus on the overall ranking of the idea (ranking values 0 through 3, as defined below).

3 = Advance for further development

2 = Design consideration; include as a comment or consideration for design team

1 = Poor Opportunity/dropped from further development

0 = Unacceptable impact/fatal flaw

This ranking resulted in the initial disposition of the idea. Those ideas ranked as a 3 were developed further; low-ranking ideas (those ranked 0 or 1) were dropped from further consideration; and those that were ranked 2 were brought forward as ideas the design team should pursue.

[Once ideas were evaluated, the VE facilitator held a mid-point review with the [project manager] [client] to validate the evaluation results and ensure the ideas moving forward aligned with the goals and objectives of the project. Some ideas that were originally scored a 3 were dropped from further consideration as they did not meet the long-term vision of the project.]

## Evaluation Summary

All of the ideas that were generated during the Creativity Phase using brainstorming techniques are detailed in Table 12. [Each idea received an idea code based on the function statement under which it was brainstormed. Table 11 indicates the functions related to each idea code.]

|  |  |
| --- | --- |
| Table 11. Function Codes | |
| Idea Code | Related Function |
| [CR-] | [Capture/control runoff] |
| [IM-] | [Improve mobility] |
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| --- | --- | --- | --- | --- | --- |
| Table 12. Idea Evaluation Summary Table | | | | | |
| Idea # | Description | Advantages | Disadvantages | Rating | Comments |
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# Development Phase

This phase of the Value Methodology Job Plan takes the ideas that ranked the highest in the Evaluation Phase and further develops them into full VE recommendations. In many cases, it is possible that one or more ideas were combined to form an overall recommendation, which was then evaluated further by the VE team.

In the case of this project, of the [xx] ideas that were generated during the Creativity Phase, [xx] of those ideas were evaluated high enough to be taken forward, combined, and developed further. Some of the ideas were deemed more appropriate as a design consideration for the project team, rather than developed into a VE recommendation (Section 7.5). For the Development Phase, narratives, drawings, calculations, and cost estimates were prepared for each recommendation.

The VE recommendation documents in this section are presented as written by the team during the VE study. While they have been edited from the draft VE report to correct errors or better clarify the recommendation, they represent the VE team’s findings during the VE study.

Each recommendation consists of a summary of the baseline concept, a description of the suggested change, a listing of its advantages and disadvantages, discussion of schedule and risk impacts (if applicable), a cost comparison, change in performance, and a brief narrative comparing the baseline design with the recommendation. Sketches, calculations, and performance measure ratings are also presented. The cost comparisons reflect a comparable level of detail as in the baseline estimate.

## Summary of Recommendations

[Table 13 is a summary of all recommendations generated and their cost impact to the project.]

The recommendations developed by the VE team are shown in Table 13. [The table summarizes each recommendation’s cost impact and performance improvement.] [The recommendations are organized by category based on the project feature/project location or aspect of the project being addressed. Each recommendation received a unique idea code during the Evaluation Phase based on the project function being considered by the idea.

The recommendations identified all consider multiple aspects of total value, including assessing the impacts to performance, cost, time, and risk in comparison to the baseline concept. The potential of each recommendation summarized in Table 13 is based on the following:

* Initial Cost Savings Potential – A quantified indication of the recommendation’s impact to the project’s initial cost in comparison with the baseline concept. Initial cost savings are conceptual and reflective of the VE team’s parametric estimation of possible savings and represent orders of magnitude cost impact of the VE recommendation. Because the cost data depicted represent savings, a number in parentheses represents a cost increase.]
* [Performance/Risk – A qualitative summary of the performance impacts of the VE recommendation in comparison with the baseline concept. Performance attributes include the following: MO – Main Line Operations, LO – Local Operations, PI ‑ Property Impacts, C – Temporary Construction Impacts, E – Environmental Impacts. Refer to the Project Analysis section of this report (Section 0) for additional explanation of the performance attributes identified. Certain recommendations include a qualitative summary of the result of VE recommendation to change the probability or degree of magnitude/impact on the project’s total risk exposure relative to the baseline concept.]

| Table 13. Summary of Recommendations | | | |
| --- | --- | --- | --- |
| # | Recommendation Title | Cost Savings/ (Cost Added)  ($M) | Performance Improvement (%) [Performance/Risk] |
|  |  |  |  |
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### FHWA Functional Benefit Criteria

Each year, state departments of transportation are required to report on VE recommendations to the Federal Highway Administration (FHWA). In addition to cost implications, FHWA requires state departments of transportation to evaluate each approved recommendation in terms of the project 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.

## Value Engineering Recommendation Approval

The resolution or disposition of recommendations is based on the information in this report and is independent of the proceeding of the VE study. HDR has no participation, direct or indirect, in such decisions. [The VE Recommendation Approval form] [TxDOT Form 2502, Executive Decision Summary – VE Team Recommendations] shown in Appendix B is intended to aid the project manager in tracking and informing the state Value Engineer in annual reporting of VE activities to FHWA. Resolution and disposition of recommendations contained in Appendix B are pending.

## Individual Recommendations

Based on the evaluation process, individual recommendations were developed. Each recommendation consists of a summary of the baseline concept, a description of the recommendation, a listing of its advantages and disadvantages, and a brief narrative that includes justification, sketches, photos, assumptions, and calculations as developed by the VE team. Final recommendations can be found beginning on page [7-5].

| VE Recommendation No. x:  [Recommendation Title] | | | | | | Idea No(s). x | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Baseline Concept | | | | | | | | |
| [What is currently planned? Describe the project element(s) as presented in the kickoff meeting and available drawings and cost estimates. Be as descriptive and specific as possible, but only include those elements that are relevant to the alternative concept being proposed below. | | | | | | | | |
| Recommendation Concept | | | | | | | | |
| [What is the change(s) proposed by the VE team? Describe the proposed change(s) to the baseline concept described above. Be as descriptive and specific as possible, but do not discuss the rationale for the change or its benefits.] | | | | | | | | |
| Advantages | | | | Disadvantages | | | | |
| [Why is the Recommendation Concept better?]   * Benefits (“Pros”) of implementing the Alternative Concept * Use concise statements (one per line), not full sentences | | | | [What challenges or disadvantages does the Alternative Concept introduce?]   * Detriments (“Cons”) of implementing the Alternative Concept * Use concise statements (one per line), not full sentences | | | | |
| Cost Summary | | Capital Cost | | [Life Cycle] [Right-of-way] Costs | | | Total Cost | |
| Baseline | |  | |  | | |  | |
| Recommendation | |  | |  | | |  | |
| Cost Savings/(Cost Added) | |  | |  | | |  | |
| FHWA Function Benefit | | | | | | | | |
| Safety | Operations | | Environment | | Construction | | | Right-of-way |
|  | **✓** | | **✓** | |  | | | **✓** |
| Discussion/Sketches/Photos/Calculations | | | | | | | | |
| **Discussion of Recommendation Concept**  [Describe IN DETAIL why the recommendation concept should be implemented. Provide an in-depth narrative about the baseline and recommendation concepts and thorough analysis of the advantages and disadvantages. For instance, if you listed “Reduces required retaining wall maintenance” in the advantages above, it is critical to describe why and how in this section. The Discussion section is intended to PROVE to project stakeholders, owners, and the project team that this alternative should be implemented.]  **VE Recommendation Concept Sketch(es)**  [Provide a visual depiction of the recommendation concept. This could include marked-up plans/drawings, hand-drawn sketches, photos, or figures. Scale and precision are not required, though it is encouraged if it is available.]  **Discussion of Schedule Impacts**  [Describe how implementing the recommendation concept will impact the project schedule. Be specific as to the phases, activities, etc., to be impacted. Providing exact durations for every potential impact is not always possible; therefore, if necessary, estimate lengths of time based on best judgment and expertise.]  **Discussion of Risk Impacts**  [Describe how the recommendation concept will address existing risks and/or opportunities, as well as any new risks/opportunities introduced by implementing this recommendation. It is possible for a recommendation to simultaneously address an existing risk and introduce a new one. In this case, discuss the trade-offs and demonstrate why it is still good practice to implement the recommendation concept.]  **Assumptions and Calculations**  [What was assumed to develop the cost impact of this VE recommendation? Provide assumed quantities, unit costs, calculations, and/or activities that must be (or must not be) performed. This enables development of the recommendation and the cost estimate/comparison.  If the relevant information is available and there is a high likelihood that life cycle cost savings can be realized by implementing the VE recommendation, then a life cycle cost analysis can be performed. Therefore, also provide assumptions and calculations for performing this analysis.]  **Initial Cost Estimate**  [Once finalized, insert the Excel Cost Worksheet here.]  **Performance Assessment**  [How will the recommendation impact each of the various performance attributes? Is performance better or worse? Explain why. At times, this information is captured from discussions during group Idea Evaluation; elaborate on this information.]  Performance Attribute Rationale for Change in Performance  Is performance better or worse? Explain why. (If no impact, enter “No change from the baseline” or “No significant impact to performance.”)  **Attachments**  Please label attachments with the Alternative number, “Baseline” or “Alternative”, and the order in which multiples of either should appear (e.g., “ALT SP-1 Baseline 1”, “ALT SP-1 Baseline 2”, “ALT SP-1 Alternative 1”, “ALT SP-1 Alternative 2”, “ALT SP-1 Alternative 3”) | | | | | | | | |

## [Performance Assessment]

[As the VE team developed recommendations, the performance of each was compared to the baseline for potential value improvement. The baseline was evaluated and given a number based on the criteria found in Appendix E, Performance Criteria Rating.]

[As the VE team developed recommendations, the performance of each was compared to the baseline for potential value improvement. For this exercise, the baseline was given a score of 5. Table 14 shows the criteria used to evaluate the performance of the alternative concepts relative to the baseline concept.

| Table 14. Performance Attribute Rating Scale | |
| --- | --- |
| Rating | Performance Attribute Scales |
| 10 | Alternative concept is extremely preferred |
| 9 | Alternative concept is very strongly preferred |
| 8 | Alternative concept is strongly preferred |
| 7 | Alternative concept is moderately preferred |
| 6 | Alternative concept is slightly preferred |
| 5 | ***Concepts are equally preferred*** |
| 4 | Baseline concept is slightly preferred |
| 3 | Baseline concept is moderately preferred |
| 2 | Baseline concept is strongly preferred |
| 1 | Baseline concept is very strongly preferred |
| 0 | Baseline concept is extremely preferred |

]

### Performance Rating

The performance matrix (Table 15) permits the comparison of various recommendations against the baseline concept by organizing the data developed for the performance attributes into a matrix format to yield value indices.

The matrix is essential for understanding the performance and value of the baseline and VE concepts. Comparing the performance suggest which recommendations are potentially as good as, or better than, the baseline concept, in terms of overall value. Comparison at the value index level suggest which recommendations have the best functionality, or provides the project with the best value.

The performance rating and rationale for each alternative generated by the VE team is located on the individual recommendation forms in Section 7.3.

| Table 15. Performance Matrix | | | | |
| --- | --- | --- | --- | --- |
| Attribute | Attribute Weight | Concept | Performance Rating | Total  Performance |
| Main Line Operations | 26.1 | Baseline | 5 | 130.5 |
| 1 | 5 | 130.5 |
| 2 | 8 | 208.8 |
| 3 | 7.5 | 195.8 |
| 4 | 5 | 130.5 |
| 5 | 6 | 156.6 |
| 6 | 5 | 130.5 |
| 7 | 5 | 130.5 |
| 8 | 5.5 | 143.6 |
| 9 | 8 | 208.8 |
| 10 | 5 | 130.5 |
| 11 | 5 | 130.5 |
| Local Operations | 26.1 | Baseline | 5 | 130.5 |
| 1 | 5 | 130.5 |
| 2 | 5.5 | 143.6 |
| 3 | 8 | 208.8 |
| 4 | 5.5 | 143.6 |
| 5 | 4.5 | 117.5 |
| 6 | 5 | 130.5 |
| 7 | 5 | 130.5 |
| 8 | 4.5 | 117.5 |
| 9 | 6 | 156.6 |
| 10 | 5 | 130.5 |
| 11 | 5 | 130.5 |
| Maintainability | 14.2 | Baseline | 5 | 71.0 |
| 1 | 5 | 71.0 |
| 2 | 4.5 | 63.9 |
| 3 | 4.5 | 63.9 |
| 4 | 4.5 | 63.9 |
| 5 | 4.5 | 63.9 |
| 6 | 5 | 71.0 |
| 7 | 5 | 71.0 |
| 8 | 5 | 71.0 |
| 9 | 3 | 42.6 |
| 10 | 8 | 113.6 |
| 11 | 4 | 56.8 |
| Construction Impacts | 9.5 | Baseline | 5 | 47.5 |
| 1 | 7 | 66.5 |
| 2 | 4 | 38.0 |
| 3 | 4.5 | 42.8 |
| 4 | 5 | 47.5 |
| 5 | 5 | 47.5 |
| 6 | 5 | 47.5 |
| 7 | 5.5 | 52.3 |
| 8 | 5 | 47.5 |
| 9 | 4 | 38.0 |
| 10 | 4 | 38.0 |
| 11 | 5 | 47.5 |
| Environmental Impacts | 19.4 | Baseline | 5 | 97.0 |
| 1 | 5 | 97.0 |
| 2 | 5.5 | 106.7 |
| 3 | 6 | 116.4 |
| 4 | 5 | 97.0 |
| 5 | 5.5 | 106.7 |
| 6 | 5 | 97.0 |
| 7 | 5.5 | 106.7 |
| 8 | 6 | 116.4 |
| 9 | 6 | 116.4 |
| 10 | 5 | 97.0 |
| 11 | 8 | 155.2 |
| Project Schedule | 4.7 | Baseline | 5 | 23.5 |
| 1 | 5 | 23.5 |
| 2 | 5 | 23.5 |
| 3 | 5 | 23.5 |
| 4 | 5 | 23.5 |
| 5 | 5 | 23.5 |
| 6 | 5 | 23.5 |
| 7 | 5 | 23.5 |
| 8 | 5 | 23.5 |
| 9 | 5 | 23.5 |
| 10 | 5 | 23.5 |
| 11 | 5 | 23.5 |

### Compare Value

Understanding the relationship of cost, performance, and value of the project baseline and VE concepts is essential in evaluating VE recommendations. Comparing the performance and cost suggests which recommendations are potentially as good as or better than the project baseline concept in terms of overall value.

| Table 16. Value Index | | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Recommendations | | Performance (P) | % Change Performance | Cost (C) $ millions | Cost Change $ millions | % Change Cost | Value  Index | % Value  Improvement |
|  | Baseline | 500 | — |  |  |  |  |  |
| **1** |  |  |  |  |  |  |  |  |
| **2** |  |  |  |  |  |  |  |  |
| **3** |  |  |  |  |  |  |  |  |
| **4** |  |  |  |  |  |  |  |  |
| **5** |  |  |  |  |  |  |  |  |
| **6** |  |  |  |  |  |  |  |  |
| **7** |  |  |  |  |  |  |  |  |
| **8** |  |  |  |  |  |  |  |  |
| **9** |  |  |  |  |  |  |  |  |
|  | **Total** | | |  |  |  |  |  |

## [Design Considerations]

The VE team generated the following design suggestions for the project design team’s consideration. These items represent ideas that are general in nature and are listed below in Table 17. [Additional details can be found in the evaluation form in Section 6.2]. [One idea was initially brought forward as a recommendation; however, after further evaluation, the VE team felt it should be presented to the design team for further investigation and design. The write-up for this design consideration can be found following the recommendations in Section 7.3.

|  |  |
| --- | --- |
| Table 17. Design Considerations | |
| Idea No. | Description |
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## [Design Validations]

Several ideas the VE team initially brought forward as recommendations were dropped from consideration after it was determined the [current geometry] [baseline design] was more economical and feasible. [These validations are shown in Table 12. [; the write-up justifications can be found in Appendix F.]

1. Value Methodology Process

Value Methodology is a systematic process using a multidisciplinary team to improve the value of a project through the analysis of its functions. This 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 Value Engineering (VE) study is value improvement. 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 (traffic) inconvenience, or reduced project cost.

The VE team employed the eight-phase Value Methodology in analyzing the project. This process is recommended by SAVE International® and is composed of the following phases:

**Pre-VE Study**

Preparation Phase - Prior to the start of a VE study, the Project Manager, and the VE facilitator carry out the following activities:

* Initiate study – Identify study project and define study goals
* Organize study – Conduct pre-VE study meeting and select team members
* Prepare data – Collect and distribute data and prepare cost models.

All the information gathered prior to the VE study is given to the team members for their use.

**Workshop Phases**

Information **–** The team reviews and defines the current conditions of the project and identifies the goals of the study.

Function Analysis **–** The team defines the project functions using a two-word active verb/ measurable noun context. The team reviews and analyzes these functions to determine which need improvement, elimination, or creation to meet the project’s goals.

Creativity **–** The team employs creative techniques to identify other ways to perform the project’s function(s).

Evaluation **–** The team follows a structured evaluation process to select those ideas that offer the potential for value improvement while delivering the project’s function(s) and considering performance requirements and resource limits.

Development **–** The team develops the selected ideas into alternatives (or proposals) with a sufficient level of documentation to allow decision makers to determine if the alternative should be implemented.

Presentation **–** The VE facilitator develops a report and/or presentation that documents and conveys the adequacy of the alternative(s) developed by the team and the associated value improvement opportunity.

**Post-Study**

Implementation Phase - The project team is then charged with reviewing the report and may hold a Disposition Meeting with management and other stakeholders, to determine which recommendations will be implemented in the design. The project team then tracks their implementation into the plans.

**Performance-Based Value Engineering**

The following is a general discussion and overview of the Performance-Based VE process. Ideas that have been introduced and warrant further consideration, will be documented with their advantages and disadvantages; each idea will then be carefully evaluated against project-specific attributes.

Performance measures an integral part of the VE process. It provides the cornerstone of the VE process by giving a systematic and structured way of considering the relationship of a project’s performance and cost as they relate to value. Project performance must be properly defined and agreed on by the stakeholders at the beginning of the VE study. The performance attributes and requirements that are developed are then used throughout the study to identify, evaluate, and document alternatives.

**Introduction**

Value engineering has traditionally been perceived as an effective means for reducing project costs. This paradigm only addresses one part of the value equation, oftentimes at the expense of overlooking the role that VE can play related to improving project performance. Project costs are relatively easy to quantify and compare through traditional estimating techniques. Performance is not so easily quantifiable.

The VE facilitator will lead the team and external stakeholders through the methodology, using the power of the process to distill subjective thought into an objective language that everyone can relate to and understand. The dialogue that develops forms the basis for the VE teams understanding of the performance requirements of the project and to what degree the current design concept is meeting those requirements. From this baseline, the VE team can focus on developing alternative concepts that will quantify both performance and cost and contribute to overall project value.

Performance-based VE yields the following benefits:

* Builds consensus among project stakeholders (especially those holding conflicting views)
* Develops a better understanding of a project’s goals and objectives
* Develops a baseline understanding of how the project is meeting performance goals and objectives
* Identifies areas where project performance can be improved through the VE process
* Develops a better understanding of a VE alternative’s effect on project performance
* Develops an understanding of the relationship between performance and cost in determining value
* Uses value as the true measurement for the basis of selecting the right project or design concept
* Provides decision-makers with a means of comparing costs and performance (i.e., costs vs. benefits) in a way that can assist them in making better decisions.

**Methodology**

The application of Performance-based VE consists of the following steps:

1. Identify key project (scope and delivery) performance attributes and requirements for the project.
2. Establish the hierarchy and impact of these attributes on the project.
3. Establish the baseline of the current project performance by evaluating and rating the effectiveness of the current design concepts.
4. Identify the change in performance of alternative project concepts generated by the study.
5. Measure the aggregate effect of alternative concepts relative to the baseline project’s performance as a measure of overall value improvement.

The primary goal of value engineering is to improve the value of the project. A simple way to think of value in terms of an equation is as follows:



**Assumptions**

Before embarking on the details of this methodology, some assumptions need to be identified. The methodology described in the following steps assumes the project functions are well established. Project functions are defined as what the project delivers to its users and stakeholders; a good reference for the project functions can be found in the environmental document’s purpose and need statement. Project functions are generally well defined prior to the start of the VE study. If project functions have been substantially modified, the methodology must begin anew (Step 1).

**Step 1 – Determine the Major Performance Attributes**

Performance attributes can generally be divided between project scope components (highway operations, environmental impacts, and system preservation) 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 alternative concept 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 meets 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 VE facilitator will initially request representatives from project team and external stakeholders identify performance attributes that they feel are essential to meeting the overall need and purpose of the project. Usually, four to seven attributes are selected. It is important that all potential attributes be thoroughly discussed. The information that comes out of this discussion will be valuable to both the VE team and the project owner. It is important that each attribute be discretely defined and be quantifiable in some form. Most performance attributes that typically appear in transportation VE studies have been standardized. This standardized list can be used “as is” or adopted with minor adjustments as required.

Typical standardized project performance attributes are shown below. Specific definitions of each attribute can be found below.

* Main Line Operations
* Local Operations
* Maintainability
* Construction Impacts
* Environmental Impacts
* Project Schedule

| PERFORMANCE ATTRIBUTE AND DEFINITIONS | |
| --- | --- |
| Performance Attribute | Description of Attribute |
| Main Line Operations | An assessment of traffic operations and safety on the main line. 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. |
| Local Operations | An assessment of traffic operations and safety on the local roadway infrastructure. 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, including shared use path. |
| 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. |
| 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.  Temporary environmental impacts related to water quality, air quality, soil erosion, and local flora and fauna. |
| 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. |
| Project Schedule | An assessment of the total project delivery as measured from the time of the VE study to completion of construction. |

**Step 2 – Determine the Relative Importance of the Attributes**

Once the group has agreed on the project’s performance attributes, the next step is to determine their relative importance in relation to each other. This is accomplished using an evaluative tool termed in this report as the “Performance Attribute Matrix.” This matrix compares the performance attributes in pairs, asking the question: “An improvement in which attribute will provide the greatest benefit to the project relative to purpose and need?”

A letter code (e.g., “A”) is entered into the matrix for each pair, identifying which of the two is more important. If a pair of attributes is of essentially equal importance, both letters (e.g., “A/B”) are entered into the appropriate box. This, however, should be discouraged, as it has been found that in practice a tie usually indicates that the pairs have not been adequately discussed. When all pairs have been discussed, the number of “votes” for each is tallied and percentages (which will be used as weighted multipliers later in the process) are calculated. It is not uncommon for one attribute to not receive any “votes.” If this occurs, the attribute is given a token “vote,” as it made the list in the first place and should be given some degree of importance.

An example of this exercise is shown below.



For the example project above, the project owner, design team, and stakeholders determined that Main Line Operations, followed by Environmental, gave the greatest improvement relative to the projects purpose and need, while Construction Impacts and Project Schedule gave the least improvement.

**Step 3 – Establish the Performance Baseline for the Original Design**

The next step in the process is to document the project-specific elements for the performance attributes developed in Step 1. This step establishes a baseline against which the VE alternative concepts can be compared. An example of project-specific elements is shown below.

| Evaluation of Baseline Project | | |
| --- | --- | --- |
| Standard Performance Attribute | Description of Attribute | Baseline Design Rating Rational |
| Main Line Operations | An assessment of traffic operations and safety on the project. 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. | Design Speed - \_\_ MPH Bridge – \_\_' Lanes, \_\_' shoulders Roadway - \_\_' Lanes, \_\_' shoulders Bridge \_\_\_ Loading |
| Local Operations | An assessment of traffic operations and safety on the local roadway infrastructure. 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.  EXAMPLE | Revisions will need to be made to the existing streets and private approaches due to vertical alignment |
| 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. | Baseline design assumes a replacement bridge Bridge design – low slump overlay on a 7" deck Steel welded plate girder 100' - 150' - 250' - 250' - 150' - 100' spans |
| 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. | Maintain traffic across river Noise permit required  Short term detour to construct tie-ins to existing highways |
| 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. | In-water window  Considered a navigable body of water Existing bridge is under consideration for historical significance |
| Project Schedule | An assessment of the total project delivery from the time as measured from the time of the study to completion of construction. | Advertisement date \_\_\_\_ Construction start of \_\_\_\_ 26-month overall construction duration |

Once the baseline definitions for the various attributes have been established, their total performance should be calculated by multiplying the attribute’s weight (which was developed in Step 2) by its rating. While one could assign a 0 to 10 rating for each attribute, using the definitions and scales developed in Step 1, a baseline rating of 5 is typically used as a mid-point so that alternatives can be evaluated – better than or worse than the baseline.

Total baseline performance is calculated by multiplying the attribute’s weight (which was developed in Step 2) by its rating (5). The baseline design’s total performance of 500 points can be calculated by adding all of the scores for the attributes. This numerical expression of the original designs performance forms the baseline against which all alternative concepts will be compared.

**Step 4 – Evaluate the Performance of the VE Alternative Concepts**

Once the performance of the baseline has been established for the original design concept, it can be used to help the VE team develop performance ratings for individual VE alternative concepts as they are developed during the study. The Performance Measures Form is used to capture this information. This form allows a side-by-side comparison of the original design and VE alternative concepts to be performed.

It is important to consider the alternative concept’s impact on the entire project (rather than on discrete components) when developing performance ratings for the alternative concept.

Proposals are evaluated against the baseline for all attributes to compare the potential for value improvement. As discussed in Step 3, the baseline is given a rating of 5. The following ratings were used to evaluate the performance of the alternative concepts relative to the baseline concept.

|  |  |
| --- | --- |
| Rating | Performance Attribute Scale |
| 10 | Alternative concept is extremely preferred |
| 9 | Alternative concept is very strongly preferred |
| 8 | Alternative concept is strongly preferred |
| 7 | Alternative concept is moderately preferred |
| 6 | Alternative concept is slightly preferred |
| 5 | ***Baseline*** |
| 4 | Baseline concept is slightly preferred |
| 3 | Baseline concept is moderately preferred |
| 2 | Baseline concept is strongly preferred |
| 1 | Baseline concept is very strongly preferred |
| 0 | Baseline concept is extremely preferred |

**Step 5 – Compare the Performance Ratings of Alternative Concepts to the Baseline Project**

As the VE team develops alternatives, the performance of each is rated against the original design concept (baseline). Changes in performance are always based on the overall impact to the total project. Once performance and cost data have been developed by the VE team, the net change in value of the VE alternatives can be compared to the baseline design concept. The resulting “Value Matrix” provides a summary of these changes and allows a way for the Project Team to assess the potential impact of the VE recommendations on total project value.

The VE team groups the VE alternatives into a strategy (or strategies) to provide the decision-makers a clear picture of how the alternatives fit together into possible solutions. At least one strategy is developed to present the VE team’s consensus of what should be implemented. Additional strategies are developed as necessary to present other combinations to the decision-makers that should be considered. The strategy(s) of VE alternatives are rated and compared against the baseline concept. The performance ratings developed for the VE strategies are entered into the matrix, and the summary portion of the Value Matrix is completed. The summary provides details on net changes to cost, performance, and value, using the following calculations:

* % Performance Improvement = Δ Performance VE Strategy/Total Performance Original Concept

EXAMPLE

* Value Index = Total Performance/Total Cost (in Millions)
* % Value Improvement = ΔValue Index VE Strategy/Value Index Original Concept.

The following is an example of a Value Matrix worksheet.





1. VE Recommendation Approval Form

[This is an Alaska Standard]

|  |  |
| --- | --- |
| Project: | Dalton Highway MP 18–37 |
| VE Study Date: | August 10–13, 2021 |

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | | **FHWA Functional Benefit** | | | | |  | |
| **Recommendation** | | **Approved Y/N** | **Safety** | **Operations** | **Environment** | **Construction** | **Right-of-way** | **Estimated Cost Avoidance or Cost** **Added** | **Justification for Not Recommending or Potential Implementation Issues** |
| 1 |  |  | ✓ | ✓ | ✓ | ✓ | ✓ |  |  |
| 2 |  |  |  | ✓ | ✓ | ✓ |  |  |  |
| 3 |  |  |  | ✓ |  | ✓ |  |  |  |
| 4 |  |  |  | ✓ | ✓ | ✓ |  |  |  |
| 5 |  |  |  | ✓ | ✓ | ✓ |  |  |  |
| 6 |  |  |  |  |  |  |  |  |  |
| **TOTALS** | |  |  |  |  |  |  |  |  |

Justification for the value engineering workshop recommendations **not** approved or implemented is provided in the table above.

The completed VE Recommendation Approval form, including justification for any recommendations not approved or modified, will be sent to the State Value Engineering Coordinator/Manager 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.

[End of Alaska Standard]

[This is a Florida Standard **FOR DISTRICT 1 ONLY —see following pages for other District forms**]

|  |  |
| --- | --- |
| Project: | Project Name |
| VE Study Date: | [Study dates] |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Implementation of Value Engineering Recommendations | | | | | |
| Recommendation | | VE Estimated Savings (+) Value Added Cost (-) | Performance Improvement (%) | Decision\* | Comments\*\* |
| 1 |  | +/-$x.x million | +x.x |  |  |
| 2 |  | +/-$x.x million | +x.x |  |  |
| 3 |  | +/-$x.x million | +x.x |  |  |
| 4 |  | +/-$x.x million | +x.x |  |  |
| 5 |  | +/-$x.x million | +x.x |  |  |
| 6 |  | +/-$x.x million | +x.x |  |  |
| 7 |  | +/-$x.x million | +x.x |  |  |
| 8 |  | +/-$x.x million | +x.x |  |  |
| 9 |  | +/-$x.x million | +x.x |  |  |
| 10 |  | +/-$x.x million | +x.x |  |  |
| **TOTALS** | | +/-$x.x million |  |  |  |

\* Decision to accept, decline, or accept with modifications.

\*\* Reason for declining or explanation of modification if required.

John Kubler, P.E. Date

District One Director of Transportation Development

[This is a Florida Standard **FOR ALL OTHER DISTRICTS, EXCLUDING DISTRICT** 7]

|  |  |
| --- | --- |
| Project: | Project Name |
| VE Study Date: | [Study dates] |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | | | **FHWA Functional Benefit** | | | | |
| Recommendation | | Approved  Y/N | Safety | Operations | Environment | Construction | Right-of-way | VE Team Estimated Cost Avoidance or Cost Added | Actual Estimated Cost Avoidance or Cost Added |
| 1 |  |  | ✓ | ✓ | ✓ |  | ✓ |  |  |
| 2 |  |  | ✓ | ✓ | ✓ |  | ✓ |  |  |
| 3 |  |  | ✓ |  | ✓ |  | ✓ |  |  |
| 4 |  |  | ✓ | ✓ | ✓ |  | ✓ |  |  |
| 5 |  |  | ✓ | ✓ | ✓ |  | ✓ |  |  |
|  |  |  |  |  |  |  |  |  |  |
| **TOTALS** | |  |  |  |  |  |  |  |  |

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

Florida DOT is required to report Value Engineering results annually to FHWA. To facilitate this reporting requirement, the Value Engineering Recommendation Approval Form is included herein. If the region elects to reject or modify a recommendation, please include a brief explanation of why. Please complete the form and return it to [xxx], Florida DOT State Value Engineer.

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.

[End of Florida Standard]

[This is a Minnesota Standard– this MUST be the last appendix when creating a Minnesota DOT report!]

|  |  |
| --- | --- |
| Project: | Project Name |
| VE Study Date: | [Study dates] |

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | | | | **FHWA Functional Benefit** | | | | |  | |
| **Recommendation** | **Accept** | **Reject** | **Accept for Further Review** | **Reason (or use the pages at the end of this memo)** | **Safety** | **Operations** | **Environment** | **Construction** | **Right-of-way** | **Estimated Savings** | **Added Cost** |
| 1 |  |  |  |  |  | ✓ | ✓ | ✓ |  |  |  |
| 2 |  |  |  |  |  | ✓ | ✓ | ✓ |  |  |  |
| 3 |  |  |  |  |  | ✓ |  | ✓ |  |  |  |
| 4 |  |  |  |  |  | ✓ | ✓ | ✓ |  |  |  |
| 5 |  |  |  |  |  | ✓ | ✓ | ✓ |  |  |  |
| 6 |  |  |  |  |  |  |  |  |  |  |  |
|  | | | | Total for xx recommendations | 0 | 5 | 5 | 5 | 0 |  |  |
|  | | | | Total for [?] accepted recommendations | 0 | 0 | 0 | 0 | 0 |  |  |

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

MnDOT is required to report Value Engineering results annually to FHWA. To facilitate this reporting requirement, the Value Engineering Recommendation Approval Form is included herein. If the region elects to reject or modify a recommendation, please include a brief explanation of why. Please complete the form and return it to Minnie Milkert, MnDOT State Value Engineer, MS 696.

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.

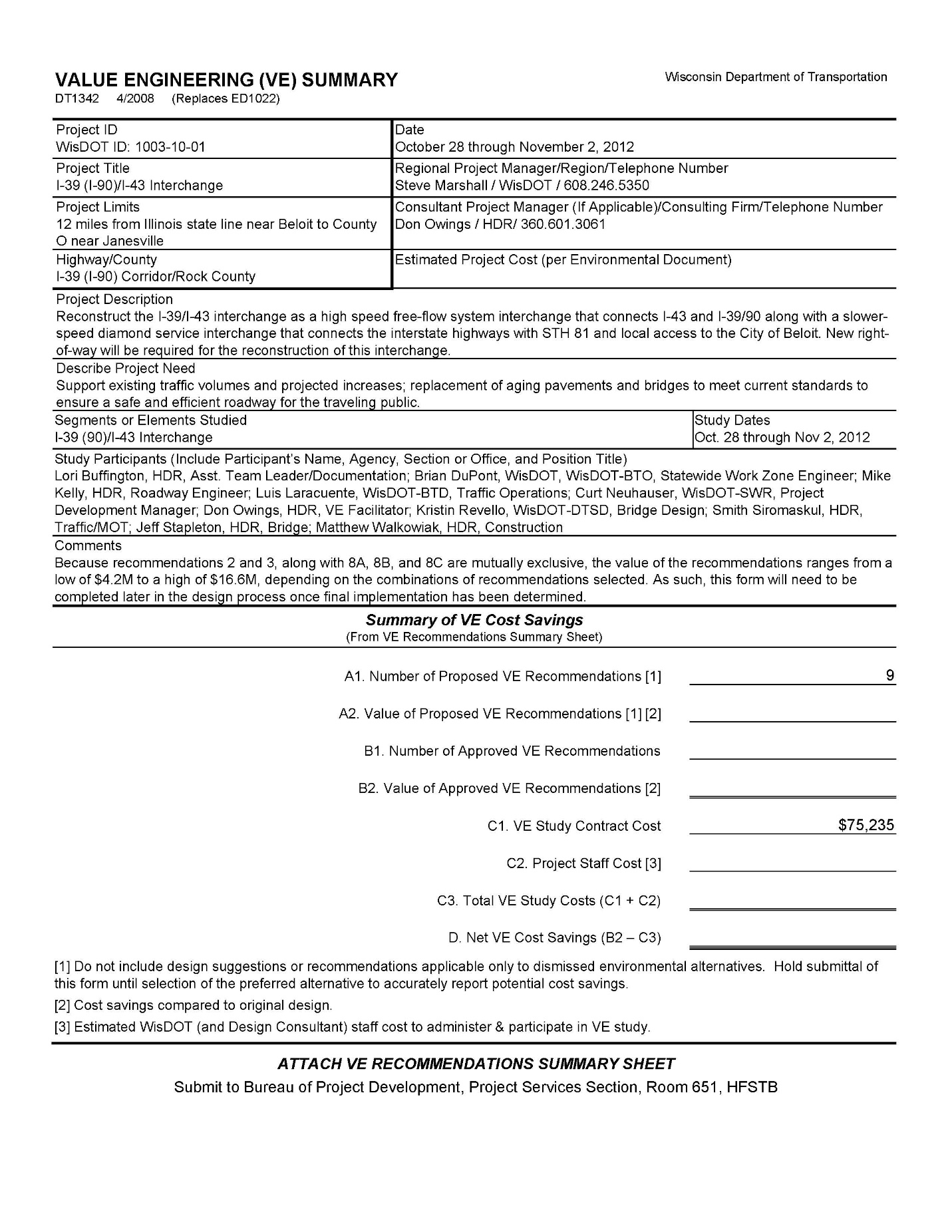
Right-of-way: Recommendations that lower the impacts or costs of right-of-way.

[End of Minnesota Standard]

[Texas Standard is an Access file (Form 2502) found in the template folder.]

[This is a Wisconsin Standard. See template folder [(WisDOT)](../../WisDOT) for Excel and Word examples.]





[End of Wisconsin Standard]

1. VE Study Memo, Agenda, and Attendees

QC Reviewer: Please see the full PDF for the memo and agenda.

[The memo gets PDF’d as Appendix B1 and inserted at final production.]

[Insert sign-in sheet, alphabetized and completed. Check page numbering – typically the sign-in sheet starts on page 5 or 7, depending on the size of the memo.]

1. Project Estimate

QC Reviewer: See PDF for full appendices.

1. Performance Criteria Rating

| Criteria | Definition | Rating Scale | Unit of Measure/Quantification | Base Evaluation |
| --- | --- | --- | --- | --- |
| **Main Line Operations** | An assessment of traffic operations and safety on the main line 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 | 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 |
| **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 |
| 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 |
| **Schedule** | An assessment of whether the schedule of the project, from the time of the study through open to traffic, is conservative or has no remaining positive float and activities are already critical. Consideration should be given to whether the project is a critical component of program of projects or a corridor and its implementation may impact the network operations performance. | 10 | No dependencies and ample positive float |  |
| 9 |  |
| 8 | Moderate float available |
| 7 |  |
| 6 | Little (under 30 days) or no float remaining |
| 5 |  |
| 4 | Project is super critical. Other projects depend on the implementation of this project |
| 3 |  |
| 2 | Significant risks threaten the ability to deliver the project on time, schedule is too aggressive and is unlikely to be met. |
| 1 | Network Operations are severely threatened if project is not delivered on time. Commitments are broken. |

1. Design Validations

| DESIGN CONSIDERATION X [TITLE] | | IDEA NO(S). x |
| --- | --- | --- |
| Baseline Concept | | |
|  | | |
| Suggested Concept | | |
|  | | |
| Advantages | Disadvantages | |
|  |  | |
| Discussion | | |
|  | | |

1. Closing Presentation

QC Reviewer: See PDF for full appendices.