



NORTH CAROLINA

Department of Transportation



Project Manager Value Engineering Training

Transportation Program Management – Value Management Office

FFY 2019

Training Objectives

- To inform participants about VE practices and the VE Process
- Gain awareness of the benefits of VE
- Prepare participants for future VE Studies



Value Management Team

Alyson Tamer, PE, CPM



Clare Fullerton, PE



Dan Snoke, PE



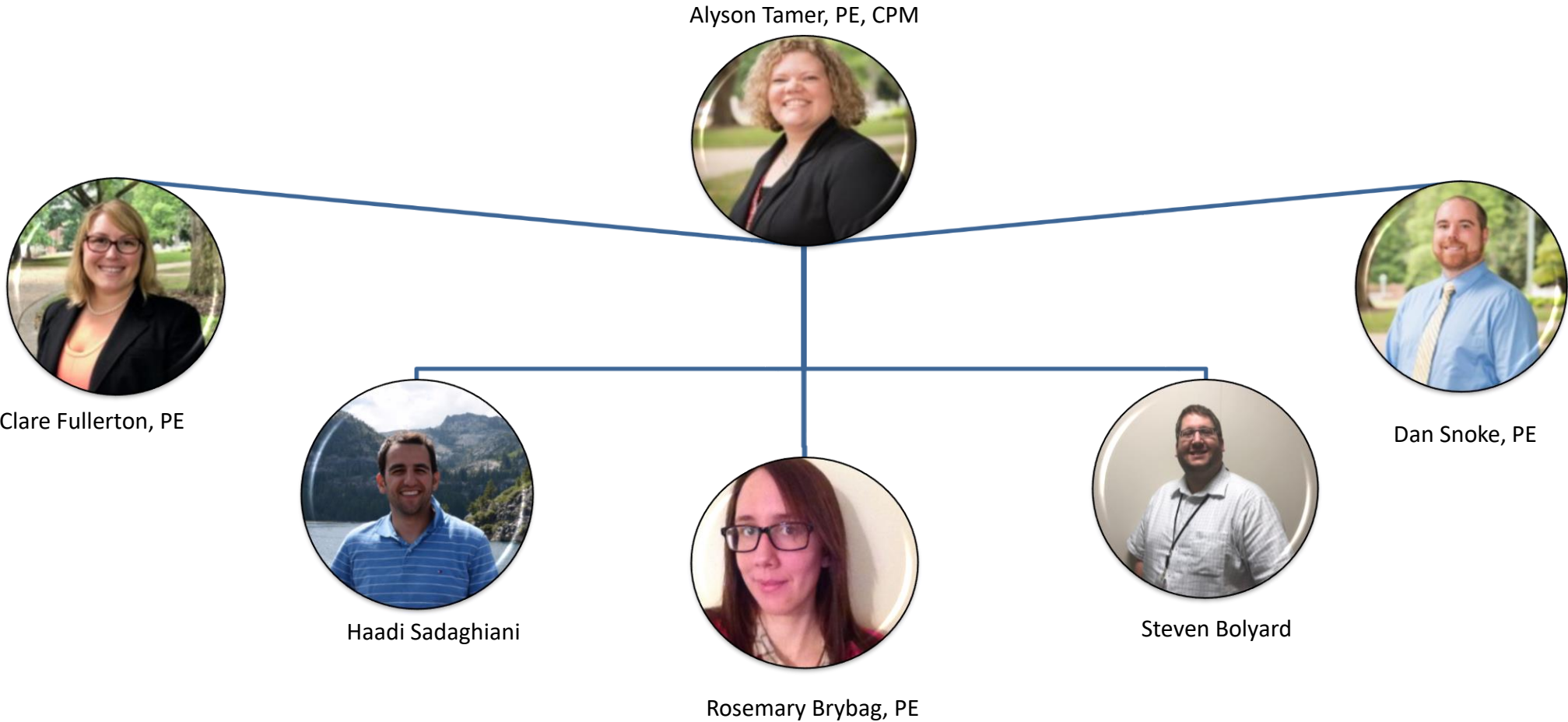
Haadi Sadaghiani



Rosemary Brybag, PE



Steven Bolyard



What is Value Engineering?

VE is an organized application of common sense and technical knowledge directed at finding and developing alternative ideas that can add value to a project.



Through this collaboration, recommendations can be developed that:

1. Provide the needed functions
2. Improve the quality
3. Reduce the Project Delivery time
4. Seek Innovative Alternatives
5. Reduce Impacts
6. Reduce Risks
7. Improve Constructability
8. Address inefficiencies

Objectives of Value Engineering Program



Meet CFR 23, 627 – NCDOT is required to have a VE program that:

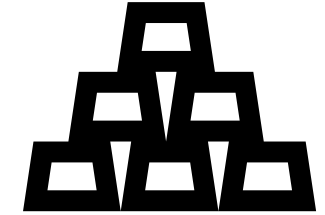
- Provides the means for the NCDOT to utilize VE Techniques during project development;
- Provides the means for the NCDOT to implement lessons learned into project design and construction;
- Provides an effective resource to evaluate innovations in transportation;
- And trains staff on VE process and resources available.

Value Engineering Program

- Federal Program, required by FWHA – 23 CFR Part 627
 - Updated periodically with directives
- Required on all Design-Bid-Build projects and CMGC...
 - located on or intersecting with the National Highway System *AND*
 - With an estimated **TOTAL** costs >\$50M or > \$40M for projects with a structure *OR*
 - Major projects over \$500M on or off the NHS



Definitions



What is the TOTAL Cost?

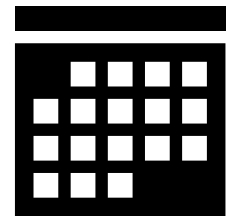
- Preliminary Engineering + Utilities + Construction + ROW
- Total Cost includes total cost of projects that are combined

What is a Structure?

- Structure is a Bridge, Large Culverts, Large Pipes and Groupings
 - Construct, reconstruct, rehabilitate, resurface, or restore

When should VE Studies be conducted?

- Can be completed when analyzing project alternatives;
- Can be completed prior to preliminary design – after public hearing maps;
- Aim to complete at a minimum following preliminary design prior to 25% (30%) completion;
- Analysis must be applied regardless of design status.



VMO Responsibilities

- Review projects to determine if VE may be needed
- Review current and draft STIP
- Eliminate Design-Build projects
- Identify if on the National Highway System



<http://ncdot.maps.arcgis.com/home/webmap/viewer.html?webmap=683e22735d324c89abe812d4db9d6838>

NHS Map

The screenshot shows a web browser window displaying an ArcGIS web map. The browser's address bar shows the URL: <http://ncdot.maps.arcgis.com/home/webmap/viewer.html?webmap=683e22735d324c89abe812d44db9d6838>. The browser tabs include "NCDOT: Draft STIP Projects Map" and "NCDOT STI Results - P5.0 All...".

Below the browser window, the map interface features a search bar with the text "Find address or place" and a search icon. The main map area displays a network of roads in various colors (red, blue, green, yellow) across the Southeastern United States, primarily in North Carolina and Virginia. Major cities like Charlotte, Raleigh, and Virginia Beach are visible, along with interstate highways and state routes.

On the left side, there is a "Contents" panel with the following layers:

- NCDOT NHS
- NCDOT P5.0 Projects
- NCDOT North Carolina Railroads
- NCDOT Division Boundaries
- NCDOT County Boundaries
- NCDOT MPO & RPO Boundaries
- Navigation

At the bottom of the map, there is a scale bar (0 to 60 miles) and a copyright notice: "NCDOT GIS Unit | NCDOT | Esri, HERE, Garmin, FAO, NOAA, USGS, EPA, NPS". The Esri logo is also present in the bottom right corner.



Project Selection

- Review the latest cost estimates based on SAP information
 - Projects that have a projected construction cost of \$20 Million are added to the list to start.
- Send List to Project Managers, Leads, and Technical Units
 - Get feedback on project information including estimate, if projects are getting combined, if a project is not moving forward, etc.

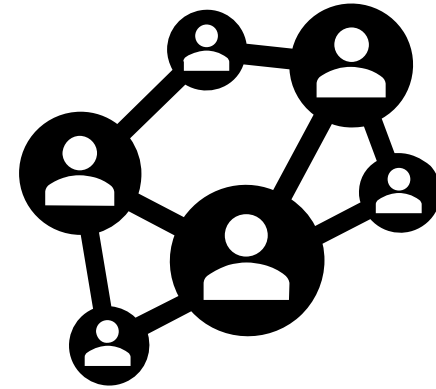


Project Scheduling

- How are projects scheduled?
 - Scheduled based on project development dates – i.e., environmental document completion, 25% plans, etc.
- How many studies are done?
 - This Federal Fiscal Year we will have completed over 40 studies.
 - Use consultants to facilitate and provide team members to implement the Value Engineering principals.

VMO Responsibilities

- Schedule VE Study
- Assemble a multi-disciplined team
- Facilitate the VE study
- Compile VE recommendations and generate a VE report
- Provide third-party verification of recommendation implementation
- Report annually to FHWA and auditors



PM/Lead Responsibilities

- Review monthly schedule sent by VMO and provide feedback
- Provide project and design information, cost estimates
- Present information during VE study and answer questions
- Ensure conceptual reviews are completed by relevant design team members
- Provide Final Dispositions within the time requested
- Upon Final Design acceptance, provide implementation documentation for accepted recommendations



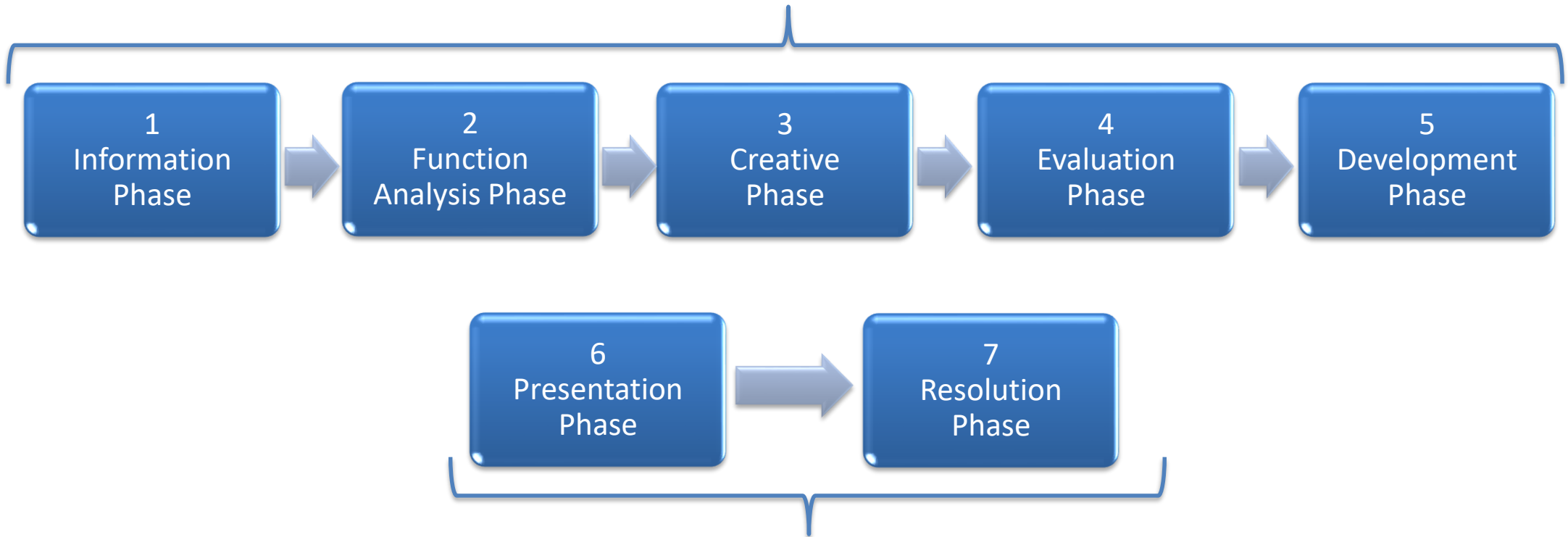
VE Study Participant Responsibilities

- Attend the study and work through 5 steps of the process
- Professionals from various disciplines, resident engineer, and CME as available.
- Are not directly involved in the specific project being studied
- Work collaboratively
- Stay open minded



Value Engineering Study Process

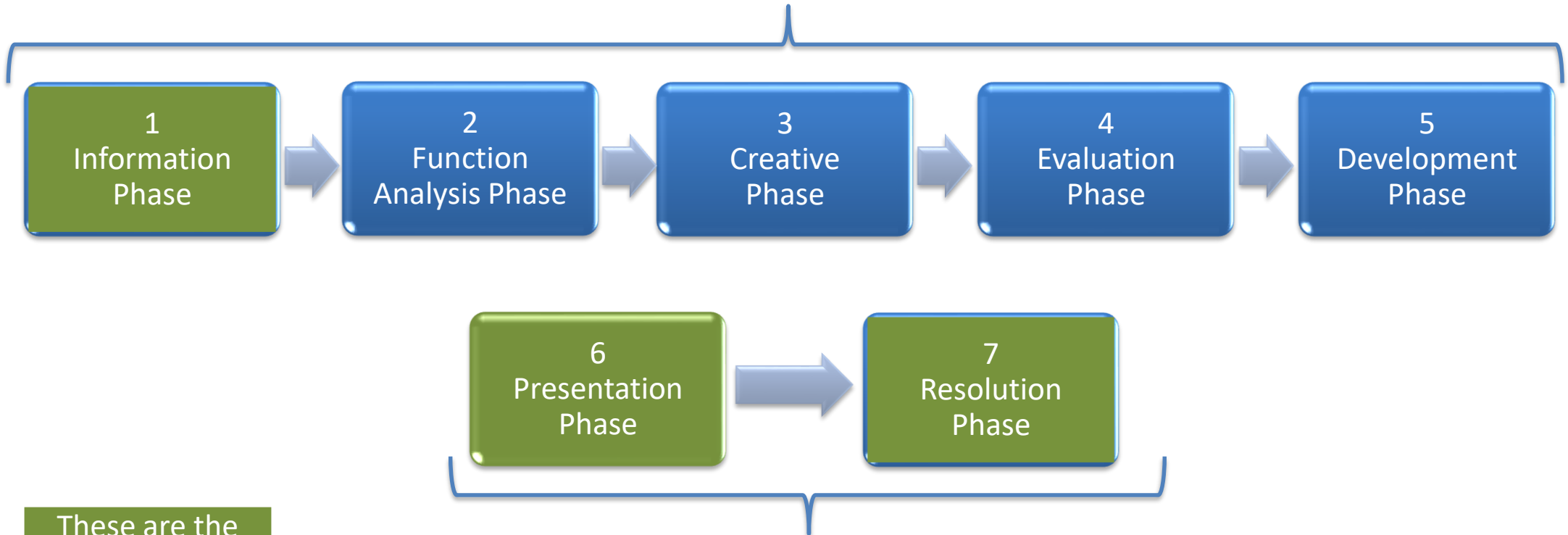
The First 5 Phases are applied during the VE Study



The last 2 phases are at later dates.

Value Engineering Study Process

The First 5 Phases are applied during the VE Study



These are the phases the Project Lead is involved in.

The last 2 phases are at later dates.

Information Phase



- Project Manager/Design team provides overview of project via phone or in-person
- Project Manager answers questions
- Confirms project concept and scope
- Identifies any constraints/commitments
- Identifies and prioritizes issues



What is needed during the information phase?

- Alternatives already reviewed
- Historic Areas/ Archeological
- ROW concerns
- Environmental Concerns
- Multi-modal accommodations
- MPO/RPO Agreements or discussions
- Drainage concerns
- Known utilities
- Non-negotiables
- Soil conditions – rock, sand, etc
- Division specific requirements
- Public concerns or discussions
- Adjacent projects
- Alternative materials or innovations being used



Function Analysis Phase

During this phase the Purpose and Need statement is evaluated. Our goal is not to change the purpose and need but to explore ways to enhance it.

If warranted, a Risk Analysis can be incorporated as part of this phase to begin the creative process.



Creative Phase

Identify creative ideas that will add value to the project– Value Opportunities

- What are alternative ways the functions of the project can be accomplished?
- Are there any constructability issues?
- Is this project a good candidate for an innovative idea?
- Can ROW, Environmental, Utility impacts be reduced?
- What is the best alternative?
- Are there risks that need to be mitigated/avoided?



How are Value Opportunities Evaluated?

Based on FHWA - Recommendations are made to:

- Provide the needed functions safely, reliably, efficiently, and at the lowest overall cost;
- Improve the value and quality of the project; or
- Reducing the time to complete the project.



Evaluation Phase

- Clarify and categorize each idea to develop a shared understanding
- Consider how ideas affect project cost and performance parameters
- List the disadvantages and advantages of the idea
- Rate and select ideas for further development

-1 OR 1



Development Phase

- Value Opportunities that received a “1” during Evaluation phase are now Recommendations that need development.
- Development is additional information provided that:
 - 1- Indicates how the recommendation is a better choice for the project than current design
 - 2- Includes a sketch, picture, or visualization for clarification purposes (if needed).
 - 3- Review Life Cycle Costs



Questions to Ask During Development Phase


- How will the recommendation work?
- Can the design engineers clearly understand the concept of the recommendation?
- Are there existing projects that have this same scenario?
- How can potential issues be overcome?
- Why is the innovation better?
- Will it meet the requirements?
- What will be the total cost?
- What are the life cycle costs?
- What documents contain the item/idea being altered?

Explain
Everything




Presentation Phase

- VE Study information is compiled into a VE Report
- Report is distributed to Project Manager and the VE Team
- Recommendations with development information is given to the project managers and leads for evaluation
- Can be a presentation on request



Value Management Office
Value Engineering Program



I-5986B/I-5877/I-5878/I-5883 Value Engineering Report

August 23, 2018

Date of VE Study
August 7-9, 2018

Right of Way Date
May 1, 2019

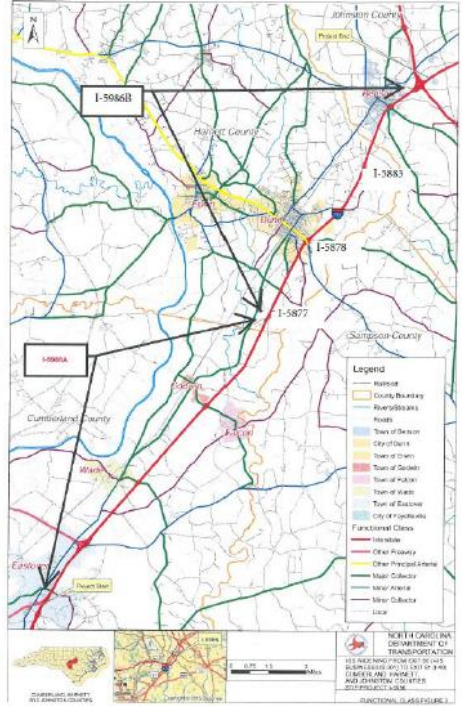
Let Date
July 21, 2020

County
Harnett and Johnston

Total Estimated Cost
\$247 Million

Project Description
I-95 from SR 1811 Bud Hawkins Road (Exit 70) to I-40 (Exit 81) Widening and Interchanges at Exits 70, 71, 72, 73, 75, 77, and 79.

Project Information
NCDOT STIP Project I-5986B proposes to widen I-95 to eight lanes. The project will also include interchange and overpasses improvements. Interchange improvements in Harnett County were included in STIP Projects I-5877, I-5878, and I-5883. Service roads may also be realigned to make room for widening and ramp improvements or to bring interchanges up to current standards.



For more information regarding this Value Engineering Report, please contact: 1

Alyson Tamer, PE, CPM at 919-707-4806 or awtamer@ncdot.gov



Recommendation Form



North Carolina Department of Transportation
Transportation Program Management - Value Management
Value Engineering Program Recommendation Form



Section 1: Project Details (to be filled out by the VM Engineer)	
STIP No.	Project Description:
County	
Let Date	Project Lead Name:
Total Est.	Contact:
Section 2: Recommendation Description (to be filled out by the VM Engineer)	
Recommendation Number	
Existing condition	
Recommendation Description	
Reference	
Applicable Discipline	<input type="checkbox"/> Construction <input type="checkbox"/> Roadway <input type="checkbox"/> Right of Way <input type="checkbox"/> Geotechnical <input type="checkbox"/> Utilities <input type="checkbox"/> Division <input type="checkbox"/> Hydraulics <input type="checkbox"/> Structures <input type="checkbox"/> Maintenance <input type="checkbox"/> Traffic Operations <input type="checkbox"/> Other: <input type="checkbox"/> Planning
Section 3: Cost Analysis (to be filled out by the VM Engineer and verified by the Project Manager)	
Original	
VE Recommendation	
Savings	



North Carolina Department of Transportation
Transportation Program Management - Value Management
Value Engineering Program Recommendation Form



Section 4: Conceptual Review Coordination (to be filled out by Project Manager)			
Applicable Discipline	Name	Contact	Comments
Section 5: Summary of Recommendation Review (to be filled out by the Project Manager)			
Final Disposition	Project Manager Sign Off	Comments	
	Decision		
	<input type="checkbox"/> Accept <input type="checkbox"/> Accept as Modified <input type="checkbox"/> Reject		
Implement	Project Manager Sign Off	Explanation (Reference Project Document)	
Close Out	Date:	VMO Signature:	

Recommendations/Design Considerations

- **Recommendation:**
 - A developed idea with the information including a cost analysis and engineering principles.
- **Design Consideration:**
 - Something to keep in mind during the ongoing development.
 - Usually insufficient design data to be able to make a formal recommendation.

Time between Presentation and Resolution

- The project design engineers review the recommendations and provide comments to the project manager within 60 days.
- The project manager reviews the documentation and comments then makes the final decision to either:
 - Accept the recommendation,
 - Accept the recommendation with some modifications, or
 - Reject the recommendation.
- Justification is provided as to why a decision to reject or modify is made.

Project Manager Final Disposition



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Section 1: Project Details (to be filled out by the VM Engineer)	
STIP No.	U-5731
WBS No.	54022.1.1
County	New Hanover
Let Date	2022
RW Est.	\$5,146,700
Const. Est.	\$25,800,000
Project Description: NCDOT proposes to improve the intersection of US 74 and US 17/US 421 in New Hanover County by constructing a loop ramp. Scheduled for right-of-way and utilities in FY 2020 with construction beginning in FY	
Project Lead Name: Brian Harding, PE Contact: 910-341-2000-bjharding@ncdot.gov	
Section 2: Recommendation Description (to be filled out by the Participant)	
Recommendation Number and Title	5 - Use Walls in Lieu of Rock Plating
Baseline Design	Original design indicates 2:1 slopes with rock plating along -L-, -Y1-, and the ramps.
Recommendation Description	Idea No. 9 - Consider 3:1 slopes wherever applicable without impacting the wetlands. Consider Mechanically Stabilized Earth (MSE) walls along -Y1- from Station 24+40 to 30+00, and along -RPD- from Station 15+00 to 18+50 in order to minimize wetland impacts. Consider Reinforced Soil Slopes (RSS) for the remaining areas to help eliminate wetland impact.
Reference Project Document	U-5731 Combined 25 Percent Plans
Applicable Discipline	<input type="checkbox"/> Construction <input type="checkbox"/> PDEA <input type="checkbox"/> Right of Way <input checked="" type="checkbox"/> Geotechnical <input type="checkbox"/> Utilities <input type="checkbox"/> Division <input type="checkbox"/> Hydraulics <input checked="" type="checkbox"/> Structures <input type="checkbox"/> Maintenance <input checked="" type="checkbox"/> Roadway <input checked="" type="checkbox"/> Roadside Environmental <input type="checkbox"/> Planning <input type="checkbox"/> Traffic Operations <input type="checkbox"/> Other:
Section 3: Cost Analysis (to be filled out by the Participant)	
Original	Base line design estimate includes the cost for rock plating along -L-, -Y1-, and Ramps A&D. Cost \$843,180
VE Recommendation	Consider 3:1 slopes wherever applicable without impacting the wetlands. Consider Mechanically Stabilized Earth (MSE) walls along -Y1-. Consider Reinforced Soil Slopes (RSS) for the remaining areas to help eliminate wetland impact. Estimated Cost \$4,776,898
Savings/(Value Added)	Added value to the project \$3,933,718



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Section 4: Conceptual Review Coordination (to be filled out by Project Manager)			
Applicable Discipline	Name	Contact	Comments
Roadway	Sean Kortovich		Adding a wall in locations of 2:1 along -L- would provide more impacts than what is currently shown. Retaining walls are required to be 5.5' away from the face of the guardrail with an additional berm behind the wall. In most locations this is going to out into the wetlands more than the 2:1 slopes are now. -RPD- station range will be in conflict with any temporary traffic control measures that may be put in place. Maintenance for such a short wall would need to be considered as well. -Y1- station range will be investigated and implemented as needed.
Section 5: Summary of Recommendation Review (to be filled out by the Project Manager)			
Final Disposition	Project Manager Sign Off	Comments	
	<input type="checkbox"/> Accept <input checked="" type="checkbox"/> Accept as Modified <input type="checkbox"/> Reject	Brian Harding Adding a wall in locations of 2:1 along -L- would provide more impacts than what is currently shown. Retaining walls are required to be 5.5' away from the face of the guardrail with an additional berm behind the wall. In most locations this is going to out into the wetlands more than the 2:1 slopes are now. -Y1- station range will be investigated and implemented as needed. (See notes above)	
Implement	Project Manager Sign Off	Explanation (Reference Project Document)	
Close Out	Date:	VMO Signature:	

Resolution Phase


- This phase occurs at Final Design stage.
- Project Manager
 - Provides document(s) relevant to accepted recommendation
 - Signs off on Implementation Section of form
- Value Management Office
 - Verifies that accepted recommendations have been implemented into final plan document



Project Manager Implementation Sign-Off

Section 5: Summary of Recommendation Review (to be filled out by the Project Manager)

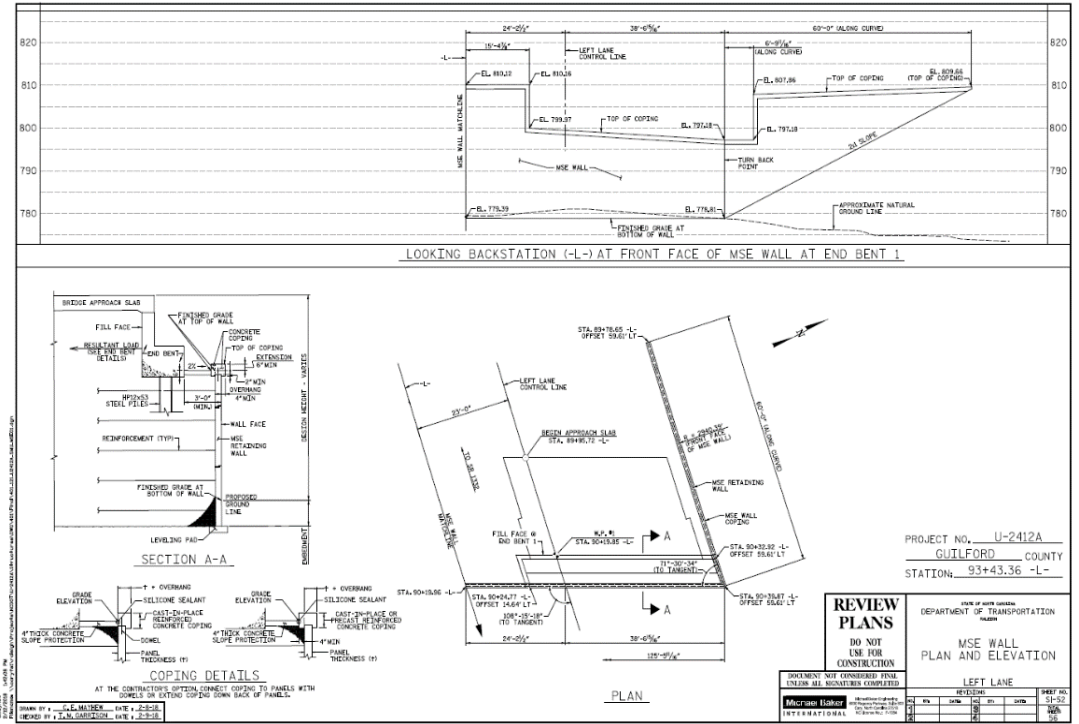
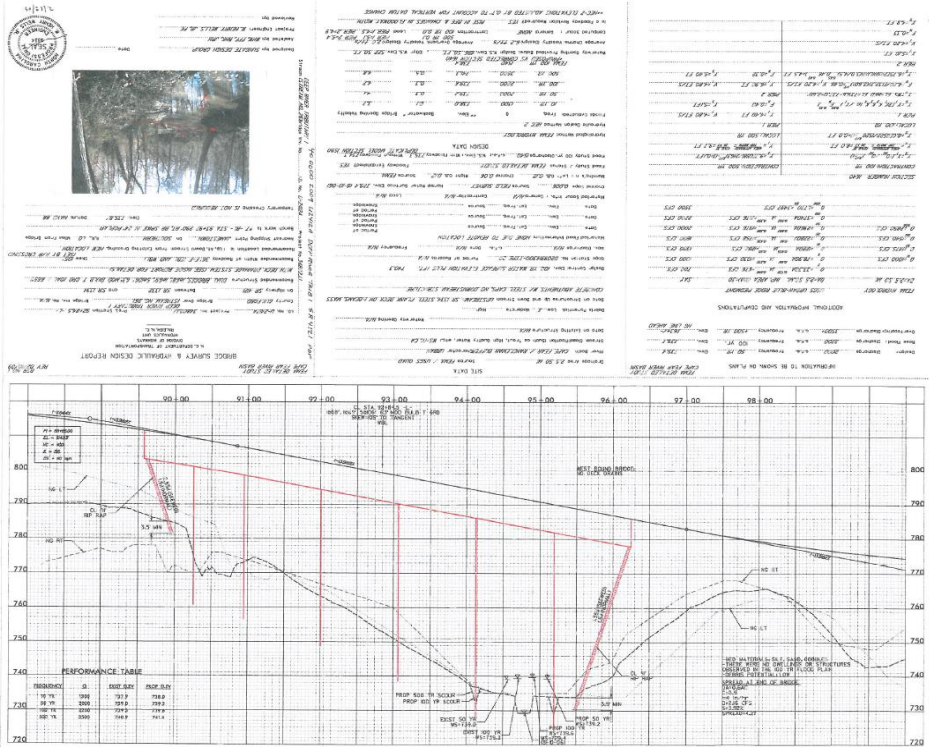
Conceptual Review	Sign Off	Comments (Coordination Details on following Page)
Final Disposition	Project Manager Sign Off	Comments
	Brett Abernathy	ICT's will be included to preclude traffic being in a head to head pattern between 12/15 and 3/15. Bonus incentives included to complete structure construction in one construction season. Contract office was involved and this item has been implemented.
	Decision <input type="checkbox"/> Accept <input checked="" type="checkbox"/> Accept as Modified <input type="checkbox"/> Reject	

	Project Manager Sign Off	Explanation (Reference Project Document)
Implement	DocuSigned by:  9F9F109546A54F5... 1/18/2019	

VMO Verification

Initial documentation included in the development of the recommendation.

Final plan documentation, showing the implementation of the recommendation.



What questions do you have about VE?



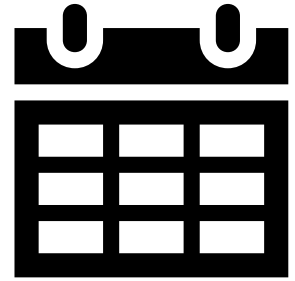
Constructability Review Program

- Work out potential field issues while the project is still being designed
- Provide a better understanding between design and construction
- Provide contractor input on design issues (coordinate with the AGC)
- Potential cost savings, risk reduction and/or time reduction



Constructability Review Scheduling

- Project manager requests from Value Management;
- Can be scheduled in as little as 2 weeks;
- Can be done at any point of the project development;
- Includes project team, Division representatives, regional NCDOT staff;
- Design leads are responsible for sending VMO the project documents to be used during the review.



Program	Contact
State Value Management Engineer	Alyson Tamer, PE, CPM awtamer@ncdot.gov
Communicate Lessons, Exchange Advice, Record Program (CLEAR) Constructability Review Program (CRP) Value Engineering Program (VEP) Value Engineering Proposal Program (VEPP)	Clare Fullerton, PE cefullerton@ncdot.gov
Product Evaluation Program (PEP) Constructability Review Program (CRP)	Dan Snoke, PE djsnoke@ncdot.gov
Value Engineering Proposal Program (VEPP)	Rosemary Brybag, PE rbrybag@ncdot.gov
Risk Assessment Program (RAP) Value Engineering Program (VEP)	Haadi Sadaghiani hsadaghiani@ncdot.gov
Resource Conservation Program (RCP) Product Evaluation Program (PEP)	Steven Bolyard sbolyard@ncdot.gov