Reducing Scope Creeps on Emergency Relief Projects in Eastern Federal Lands Highway during the Design Stage

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Abstract *— Eastern Federal Lands Highway Division (EFLHD) has experienced significant scope creep on projects funded by the Emergency Relief for Federally Owned Roads (ERFO) Program. This project identifies the specific issues each project experienced during the design stage that could have been avoided or addressed during the initial assessment stage. To accomplish this, a meeting with the Project Managers at EFLHD associated which each project was conducted. A new assessment checklist was recommended to help remind engineers of things to consider during the pre-assessment, assessment, and post-assessment phases.*

Key Terms *— ERFO Program, Eligibility, Assessment Process, Recommendations*

INTRODUCTION

The Emergency Relief for Federally Owned Roads (ERFO) is a program developed to help federal agencies to repair and reconstruct transportation facilities that were damaged during natural disasters. This special type of funding is authorized under Title 23, Section 125 – Highway Trust Funds [1]. It's eligibility for the funding depends on meeting the following requirements:

- Road needs to be owned by a Federal Land or a Tribal Transportation facility and be opened to the public.
- Damages were caused by the natural disaster

The ERFO Program allocates funds for design, construction and construction oversight; typically administered by the roadway owner or Federal Lands Highway (FLH) Division Office upon request. The Eastern Federal Lands Highway Division (EFLHD) Office [2] delivers annually numerous of ERFO funded projects. The Agency's role is to deliver the design and reconstruction of the roadway facilities within two-years of the disaster. A constant issue that has been identified by the project team within EFLHD during the design process is that there are significant scope changes from the assessment to the final design stage, causing the final estimate to be significantly higher than the estimate developed during the initial assessment.

OBJECTIVE

The objective of this project is to identify the causes of significant scope and cost changes, and propose improvements to the process that will allow the project team to conduct better assessment of the damages to minimize significant scope creeps and provide a more accurate cost estimate during an earlier design stage.

CURRENT ASSESSMENT PROCESS

Assessment Stage

To apply for the funding the owners needs to submit a Notice of Intent to the FLH Division Office, which will initiate the process and proceed with the damage assessment stage. The Partners have the option of conducting the assessment themselves or request assistance from Federal Lands Highway Division. During the assessment stage, a team of experts in the field goes to the site to assess the damages caused by the event. During the site visit, the team will document their observations by taking pictures, measurements and drawing sketches of the damages.

Post Assessment

After returning to the office, the team develops an assessment report that is used to determine the magnitude of the damages (scope), estimated cost of repairs, and funding needed to complete the design and construction oversight of the project. The Program Manager evaluates the report to determines its funding eligibility. The reports considered eligible will then become part of a Programs of Projects (POP) request, which is the first step to obtain funds and initiate the design process. The POP request is later revised to obtain additional funds needed to complete the project.

METHODOLOGY

A research was conducted to identify previous projects completed by EFLHD that had significant cost changes. The initial and the final POP requests generated to obtain funds for the disasters were used to identify these projects. The data was evaluated for disaster damages completed during the years of 2015 thru 2017. A closed analysis of the information helped identify the Project Managers of each individual disaster. A meeting was conducted to discuss the specific issues faced during the different design stages that caused a change in the scope. During the meeting, inefficiencies during the initial assessment were identified, which eventually led to the recommendations and improvements proposed in this project.

ANALYSIS OF DATA

During the research stage, the initial and final POP letters were compared. Table 1 shows the events that experienced a 15% cost increase when comparing the initial cost estimate to the final cost estimate. In 2015, there were a total of three disasters that were delivered by EFLHD. In this year, 33% of the events experienced cost increase. The highest increase was on event AR2015-1-COE, which increased by 36%. In 2016, there were a total of eight disasters that were delivered by EFLHD. In this year, 56% of the events experienced a cost increase. The highest increase was on event KY2016-1-FS, which increased by 204%. In 2017, there were a total of three disasters that had final data available. In this year, 100% of the events analyzed had significant cost increase. The highest increase was on event GA2017-1-NPS, which increased by 97%.

Table 1
POP Letters Cost Comparison

Year	Event Number	Initial Cost	Final Cost
2015	AR2015-1-COE	$3,476,221	$4,735,788
2016	KY2016-1-FS	$779,985	$2,373,369
2016	WI2016-1-FS	$18,728,464	$24,258,749
2016	WV-2016-FS	$25,227,664	$28,655,140
2017	MO2017-1-NPS	$3,608,912	$4,965,913
2017	GA2017-1-NPS	$903,550	$1,781,000
2017	PR2017-1-FS	$25,072,948	$33,643,453

After meeting with the Project Managers, it was mutually agreed that the most common issues were caused by inefficiencies during the assessment stage. The following are some of the issues identified:

- Sites were missed during the initial assessment.
- It was assumed that the bridges could be reset while no as-built information was available to confirm the bridge substructure would support the loads.
- Pedestrian bridge approaches were not meeting American Disability Act (ADA) slope requirements, therefore significant grading was later proposed.
- Quantities for numerous pay items were underestimated.
- Aquatic Organism Passage (AOP) requirements were not considered during design stage. Culverts sitting on rock were upgraded to bridges to accommodate an open bottom structure.
- Resizing culverts to meet current standards was not considered during the assessment. Upsizing culverts required significant grading, causing

impacts to endangered species living near the roadway prism. To mitigate impacts the roadway was realigned away from the area.

- Other environmental considerations were missed.

OBSERVATIONS AND RECOMMENDATIONS

It is important to evaluate the current assessment process to understand why these issues arise on the first place. This section provides the observations made on the current process based on the discussions with the Project Manager and identifies areas of improvement for each phase of the assessment process.

Pre-Assessment Preparation

First, during the pre-assessment phase there is minimal in-office preparation prior to the site visits. In most cases, the teams are unfamiliar with project area and have limited information on the type of damages that will be encountered. Therefore, they don't bring the necessary equipment or gear to properly obtain the information needed to prepare the reports. As part of the recommendations, a pre-assessment checklist that will help mitigate the risk associated with the preparation phase:

- **Research:** Get familiarized with the area by obtaining information of previous projects and contacting the Environment team in EFLHD to see if there are environmental considerations in the project vicinities that they are aware of.
- **Equipment:** Suggest a list of proper equipment and gear to bring depending on the location of the sites, type of damages and weather.
- **Understanding the ERFO Program:** It is important to read the ERFO Manual [3] before heading to the sites. Having a good understanding of the ERFO Program, the process, eligibility and exceptions will help recognize when is required to replace damaged areas in-kind and when is acceptable to upgrade to meet current design guidelines.
- **Data:** Obtaining data prior to going to the sites will allow for a better use of the time in the field. Pre-downloading maps and bringing hard copies of the report will help the team understand what information needs to be obtained and visit the sites in a practical order.

Assessment

Depending on the magnitude and impact of the disaster in the area, there are numerous amounts of sites visits that the team must assess during this phase. The teams are grouped in sub-teams by area of expertise for example: bridge engineers perform all the bridge assessments, hydraulic engineers perform all the culverts and stream assessment, geotechnical engineers perform all the landslide assessment and highway engineers perform all the highway related assessment. Although this is a very effective way to conduct all the assessment, there are occasions when a team is asked to conduct an assessment outside of their area of expertise. Not knowing what to look for, they may miss documenting important details of the site visit. As part of the recommendations to mitigate the risk, an assessment design checklist was developed by area of expertise. The purpose is to facilitate non-experts in the field to conduct the assessment without missing important items:

- **Geotechnical:** Draw a cross-section with dimensions of the roadway elements including vertical and horizontal distances from the top to the toe of landslide. Obtain measurements of the side slopes 15-feet before and after the failure. Identifying the cause of the failure, document any soil instability observed in the field.
- **Hydraulic:** Draw a profile and cross-section of the stream. Obtain pipe and ditch dimensions and document any signs of poor maintenance (corrosion, debris). Verify if the pipe is sitting on bedrock, or if headwall/wingwall configuration is needed. Ask the Partner if the stream needs to be re-graded or if Aquatic Organism Passage requirements need to be considered and if they have preferred scour/erosion countermeasures.

- **Bridge:** Obtaining as-built information and bridge inspection reports will help the engineer confirm that none of the damages were pre-disaster or due to lack of maintenance.
- **Environmental:** Verify with the Partner the following information: are there elements considered historic; are there endangered species nearby; is Archaeological assessment or wetland delineation needed; and if the project requires an Environmental Assessment (EA) or a Categorical Exclusion (CE).
- **Highway Design:** Document the roadway elements in a cross-section with dimensions. Verify that design criteria are being met; by looking for signs of skid marks which may indicate vehicles are departing off the road. This could be a sign of sharp curves, narrow lane widths or high superelevation rates that are not meeting the design standards. Measure the width, depth and length of roadway washouts. If possible obtain information of the depth of the asphalt, base and embankment reconstruction needed.

Not all the information needs to be obtained in the field; it is recommended that the team include time in the agenda to conduct a closeout meeting at the end of the site visit. Other issues like traffic control, construction restrictions, upcoming projects and next steps in the process could be discussed during this meeting.

Post - Assessment

The most significant issues encountered during the post-assessment phase are caused by quantity under-runs and low unit prices used to estimate the cost of the permanent repairs. As part of the recommendation for this phase, a list of items to be considered was develop:

- **Unit Prices:** The project will likely be advertised two years after the report was developed; therefore applying a growth rate to unit prices is practical.
- **Quantity Computations:** Quantities are often underestimated. Instead of using a 10% allowance as directed by FLH design guidelines; consider using a 20% allowance.
- **Other Quantity Considerations:** Upsizing culverts that are not meeting the minimum design standards. For AOP, consider excavation quantities to embed the culvert below grade. Adding new headwall to culverts 60-inches or larger. Consider low cost countermeasures to improve elements that are not meeting design standards.

CONCLUSION

After evaluating the issues faced during the design process for the projects funded through the ERFO Program it was concluded that most of the issues could have been prevented during the assessment phase. An evaluation of project specific issues and the current process led to multiple recommendations to improve the process. Recommendations were divided into three sub categories: the pre-assessment, assessment and post-assessment phases. For future considerations, it is suggested that the project cost increase gets tracked yearly to continue improving the assessments by considering new issues that may result during the upcoming years.

REFERENCES

[1] Federal Highway Administration, Office of Federal Lands Highway. *Emergency Relief Program*. Updated 03 October 2019. Retrieved from https://www.fhwa.dot.gov/programadmin/erelief.cfm

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