Ohio Department of Transportation

Statewide Strategic Transportation System
Two-Lane Operational Improvement Study
Methodology - Final

February 3, 2017

VAR-STW-STS 2-Lane Operational Improvement Study
PID No. 97881

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Prepared for:

Ohio Department of Transportation
Office of Statewide Planning and Research

Prepared by:

MOTT MACDONALD

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LIST OF ACRONYMS

ADT	Average Daily Traffic
B/C	Benefit / Cost
ECAT	Economic Crash Analysis Tool
EIM	Economic Impact Model
ESRI	Environmental Systems Research Institute
FAST Act	Fixing America's Surface Transportation Act
FIPS	Federal Information Processing Standards
GIS	Geographic Information System
HCS	Highway Capacity Software
LOS	Level of Service
MAP-21	Moving Ahead for Progress in the 21st Century Act
NPV	Net Present Value
PCR	Pavement Condition Rating
QEIM	Quick Economic Impact Module
ROI	Return on Investment
ODPS	Ohio Department of Public Safety
OSTM	Ohio Statewide Travel Model
STS	Strategic Transportation System
QA/QC	Quality Assurance / Quality Control
TAZ	Transportation Analysis Zones
TIMS	Transportation Information Management System

INTRODUCTION

As part of ODOT's implementation of an Access Ohio 2040 recommendation, Operational Studies will be performed along each of the 2-Lane highway corridors identified on the Statewide Strategic Transportation System (STS) network. The goal of these studies is to analyze portions of the 2-lane STS that are critical to freight movement. Recognizing the important role these highways play in moving freight and as critical truck routes, ODOT wishes to learn more about their operation, identify freight "bottlenecks" and develop and prioritize needed improvements.

Toward this end, this study methodology is aimed at providing a repeatable framework to conduct detailed needs assessments on all 2-Lane STS corridor freight routes, with a focus on identifying incremental system improvements that will enhance the flow of freight traffic and facilitate economic development in the State of Ohio.

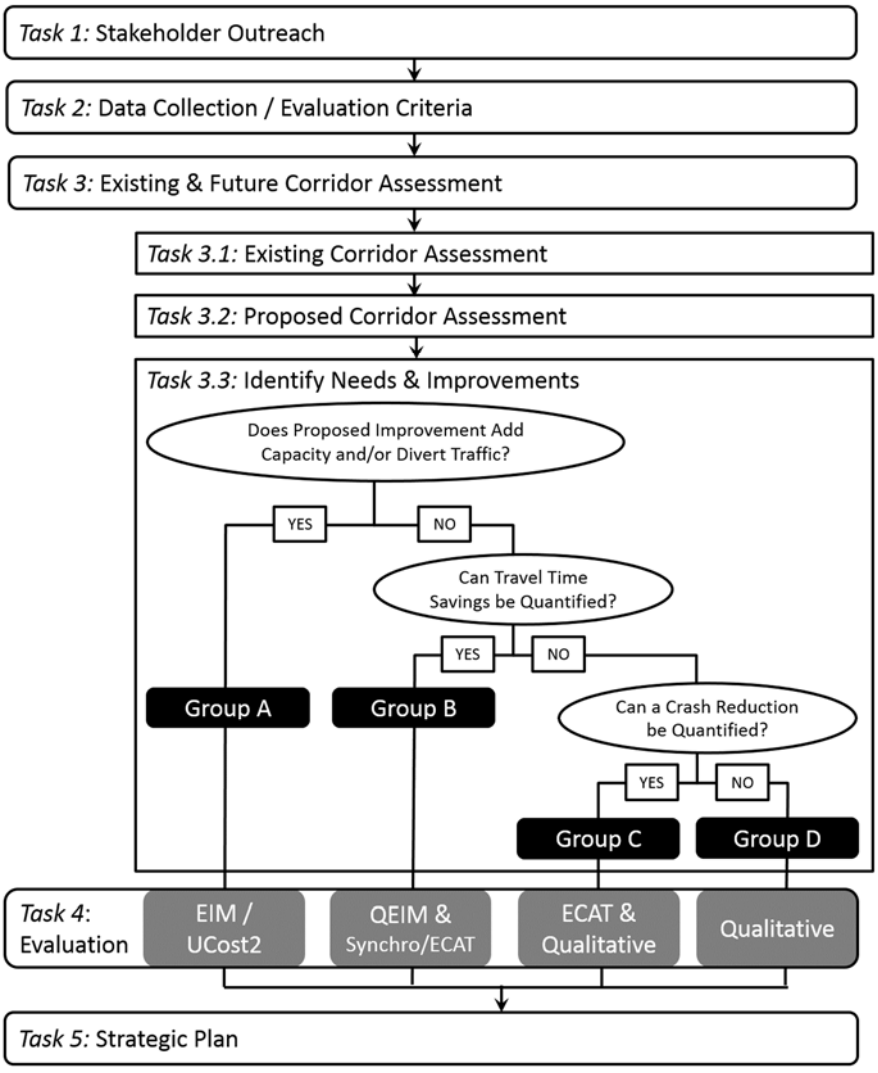

Figure 1 - Study Methodology Flowchart

As detailed herein and summarized in *Figure 1*, the methodology will be conducted in five tasks: (1) Stakeholder Outreach, (2) Data Collection / Evaluation Criteria, (3) Existing & Future Conditions Assessment, (4) Evaluation of Potential Improvements and (5) Development of a Strategic Plan. This document will be heavily utilized to develop a corridor-specific Study Methodology during Task 1.4.

ODOT's in-house expertise and planning tools will be relied upon to help shape and deliver several critical components of the study through use of the Ohio Statewide Travel Model (OSTM) and its associated standalone modules including UCost2, Economic Impact Model (EIM), and the Quick Economic Impact Module (QEIM). OSTM output forecast data, for the current year and 2040 horizon, will be used as the basis for the Task 2 operational analysis.

Consistent with the methodology contained herein, the intent for improvements that are large enough to fit within the parameters of EIM and UCost2, is to utilize EIM and UCost2 output data during the evaluation phase (Task 4). For smaller improvements and/or where EIM and UCost2 output is not available, an evaluation will be necessary to incorporate a combination of offline calculations and the QEIM, where applicable, as described under Task 4.

TASK 1 – STAKEHOLDER OUTREACH AND PARTICIPATION

During Task 1, kick-off, mobilize and organize the study, perform stakeholder outreach and develop a methodology specific to the corridor being studied using this document as a framework.

1.1 Kick-off Meeting

Arrange and conduct a project kick-off meeting among the project team. Present and discuss the scope, issues and opportunities, milestone dates, communication protocols, team responsibilities, deliverables, and other expectations. Provide a meeting agenda and prepare minutes for electronic distribution to all attendees.

1.2 Develop Project Schedule

Develop a Master Study Schedule, including a detailed task/sub-task work sequence.
The schedule should also identify all major deliverables and review times for ODOT and other agency stakeholders.

1.3 Stakeholder Interviews

ODOT's public outreach efforts during the Access Ohio 2040 study were considerable and will be incorporated into the STS 2-Lane Operational Improvement Study, as applicable. For this more focused look at freight along the individual STS corridor, identify "targeted" freight users, and other stakeholders, including ODOT district personnel, trucking logistics personnel from businesses and industries, and public agencies (e.g. economic development corporations and port authorities) familiar with the route and its operations. These interactions, either by phone or in-person as appropriate, with select shippers, agricultural representatives, manufacturers, and logistics professionals are aimed at gaining an understanding of their system performance needs (e.g., importance of cost, velocity, reliability, etc.); modal usage patterns; and changing regional/national/international trade patterns. It is assumed that ten (10) interviews will be conducted.

Prepare and maintain a contact list of stakeholders to be approved by ODOT. Services will include identifying stakeholders, preparing for and conducting individual interviews, in addition to documenting all stakeholder meetings. Develop a stakeholder survey instrument containing a list(s) of questions that will serve as a framework for guiding the interviews. A sample Stakeholder Interview Survey is provided in Appendix B. Provide, in the form of a Stakeholder Outreach Summary, a concise overview of the most pertinent stakeholder feedback, including existing operational and safety issues and any potential countermeasures put forward. A Stakeholder Summary Outline has been included as Appendix C.

1.4 Study Methodology (Corridor-specific)

Using this *VAR-STW-STS 2-Lane Operational Improvement Study – Study Methodology* as a framework, prepare a corridor-specific methodology tailored to meet the specific needs of the corridor. Once the draft corridor-specific methodology is ready, it will be presented to ODOT Central Office, District (as applicable), and other appropriate project team personnel. After review comments are received, all comments will be addressed and incorporated into the final corridor-specific methodology.

TASK 2 – DATA COLLECTION / EVALUATION CRITERIA

During Task 2, begin implementation of the corridor-specific methodology developed during Task 1.4. Collect and distill data, determine the evaluation criteria to gauge proposed improvements, develop an initial list of potential improvements, and supplement gaps in existing available data by conducting additional turning movement traffic counts at strategic locations.

2.1 Collection of Existing Data

Begin gathering existing data by taking full advantage of the abundance of secondary source data that is already available through ODOT, including available Geographic Information System (GIS) mapping, the Environmental Systems Research Institute (ESRI) State Route Inventory, and Transportation Information Management System (TIMS). A summary of available data sources is provided in Appendix D – Data Collection Checklist.

In addition, research and obtain applicable, plans, studies and reports and seek out additional data related to operational analysis, level of service (LOS), trip origins and destinations, travel time / delay studies, crash rates, safety assessments, truck fueling station and overnight parking locations, diversion analysis, historical analysis, and roadway standards.

To help limit the number of traffic count locations and extent of the data collection effort, perform a windshield survey of potential operational "hotspots" along the corridor, including intersections, segments, and other individual locations. Maintain an ongoing register of data collection efforts and prepare a memo summarizing the sources examined, contacts made and data gathered.

2.2 Site Visits

To supplement the ODOT-available data and the already-performed windshield survey, perform site visits along the STS corridor to clarify observations and identify additional opportunities not discernable directly from the data. Site visits will include quick examinations of Traffic Control / Signage, Access Points, Observed Operations, and Non-Inventory Geometrics (e.g. curve radii and sight distance).

2.3 Develop Evaluation Criteria

Develop evaluation criteria for the study. These criteria will then be used in evaluation of proposed improvements and will be revisited as part of Task 4 (Evaluate Potential Improvements) and Task 5 (Strategic Plan) and incorporated into the quantitative (i.e. Benefit/Cost(B/C)) evaluation process to ensure the project goals and objectives are being met. The set of corridor-specific evaluation criteria will be derived from the seven national performance goals established in MAP-21 and carried forward in the FAST Act, including: (1) Safety, (2) Infrastructure Condition, (3) Congestion Reduction, (4) System Reliability, (5) Freight Movement and Economic Vitality, (6) Environmental Sustainability, and (7) Reduced Project Delivery Days. The evaluation criteria will be documented in a Summary Memo.

2.4 List of Potential Improvements

Working with ODOT, including local District staff, develop a preliminary list of potential projects for incremental improvements within the STS corridor. ODOT will provide a status update for all programmed projects under development along the study corridor. The list will be further supplemented by knowledge gained during Task 1.3 (Stakeholder Interviews), Task 2.1 (Data

Collection), and Task 2.2 (Site Visits). This preliminary list will serve as the starting point for potential improvements that are considered and analyzed in Task 3.

2.5 Collection of New Traffic Data

It is anticipated that there will be a need to supplement the above data with local, more-detailed traffic count data in order to conduct the operational analyses. After a review of data already collected and the windshield survey, identify the number and location of turning movement counts that are required. Turning movements are to include individual counts for trucks and passenger vehicles. Perform the necessary Quality Assurance/ Quality Control (QA/QC) and provide the completed counts to ODOT, for incorporation into the OSTM. ODOT will run the full OSTM (or a sub-area) and provide both current year and horizon year (2040) traffic forecasts for the no-build condition, and these forecasted volumes will be used during the Task 3 operational analysis.

TASK 3 – EXISTING AND FUTURE CORRIDOR ASSESSMENT

During Task 3, perform an analysis of existing and future conditions, develop a draft list of needs and improvements, develop conceptual plans and costs for select countermeasures/improvements, calculate an initial "litmus test" B/C for these discrete improvements and determine a categorization of the improvements based on the scale of their impacts on the transportation system. The analysis, at this stage, is largely based on traffic operations. Freight considerations and economic impacts, while considered, will be incorporated via examination of EIM output and qualitative evaluation criteria during Task 4 Evaluation of Potential Improvements. Several interim deliverables will be produced during this task, and the overall findings will be summarized in a "Needs and Conditions" report.

3.1 Existing Corridor Assessment

As a first step, review OSTM forecast output data for both the current year and future year (2040) conditions. Then, to serve as a verification mechanism and lay the groundwork for the more "finite" analysis required to analyze the impacts of proposed improvements in Task 3.2, perform an operational analysis for existing conditions using the appropriate, ODOT-approved analysis software (i.e. Highway Capacity Software (HCS), Synchro, etc.) for both the current year and future year (2040) conditions. Using OSTM data supplied by ODOT as a basis, perform an operational analysis of both the intersections and roadway segments, including the following: existing year AM and PM peak hour turning movements at identified "hot spot" project study area intersections, existing year ADT for adjacent roadway segments, and existing year capacity analysis for study area intersections and roadway segments.

In addition to the operations analyses, perform a Safety Assessment, and a Standards (Roadway) review. Determine and summarize roadway segment and intersection deficiencies. Prepare a Draft Existing Conditions Report for review and incorporate comments into the Final Existing Conditions Report. An Existing Conditions Report Outline has been included as Appendix E.

3.2 Proposed Corridor Assessment

Examine and review data for the future (build) conditions analysis, including a further review of the OSTM to become more familiar with the input data related to the STS corridor. The review will also consider the OSTM input and refinements that the project team might suggest to either more accurately depict conditions along the STS corridor or incorporate more current data. Provide ODOT with the Task 3.1 operational analysis output. ODOT, at their discretion, may want to incorporate the findings into the OSTM and re-run the model (or a sub-area), with the intent of getting updated future condition / no-build output.

Starting with the initial list of improvements developed during Task 2.4, perform operational traffic analyses to determine the traffic behavior associated with each discrete improvement, for either current year or future year (2040) conditions, as appropriate. Like with existing conditions, perform a capacity analysis of both the intersections and roadway segments, including the following: existing year AM and PM peak hour turning movements at identified "hot spot" project study area intersections, existing year ADT for adjacent roadway segments, and existing year capacity analysis for study area intersections and roadway segments. Proposed improvements will be analyzed to ensure that their implementation does not adversely impact adjacent routes or merely relocate issues onto other sections of the corridor. The improvements will be refined based on the results of the initial analysis and capacity analysis.

For those resultant improvements, develop concept plans, a summary features description and planning-level costs. To limit the extent of the subsequent work in Tasks 4 and 5, perform a basic B/C evaluation of each potential improvement based on benefits derived from travel time savings and crash reductions.

3.3 Identify Needs and Improvements (Draft List)

Provide a list of recommended improvements along the STS corridor. Improvements will largely focus on operational enhancements to the infrastructure and may include, but are not limited to items such as: improved signage, signal coordination, additional signals, shoulder expansion, lane expansion, turn lane additions and lengthening, increased bridge clearance, increased load capacity, intersection reconfiguration, safety-type improvements and data integration (e.g. OHGO). Each recommended improvement will include a brief description, cost and B/C ratio. Recommended improvements will be categorized into four groups based on the scale of their impacts on the transportation system:

- *Group A* – "Larger-scale" Improvements that add capacity and/or divert traffic (e.g. adding thru lanes; construction of a bypass)
- *Group B* – "Smaller-scale" Improvements where travel time savings can be quantified (e.g. addition of turn lane(s); installation of a traffic signal; adjusting traffic signal timings)
- *Group C* – "Smaller-scale" Improvements where travel time savings cannot be quantified, but safety benefits can be quantified (e.g. installing signage; widening shoulder widths)
- *Group D* – "Smaller scale" Improvements where neither travel time savings nor safety benefits can be quantified (e.g. increasing turn radii; widening structures)

Prepare a Draft Needs and Conditions Report for review and incorporate comments into the Final Needs and Conditions Report. A Needs and Conditions Report Outline has been included as Appendix F.

TASK 4 – EVALUATE POTENTIAL IMPROVEMENTS

During Task 4, begin by reviewing the evaluation criteria, confirming their applicability, and making additions, revisions, and adjustments, as needed. The evaluation of proposed improvements recommended in Task 3.3 will vary based on their categorization (Group A, Group B, Group C, or Group D), as follows:

- *Group A* – evaluated using EIM/UCost2.
- *Group B* – evaluated using a combination of ECAT, QEIM and other tools.
- *Group C* – evaluated using a combination of ECAT, other tools and qualitative methods.
- *Group D* – evaluated using a combination of other tools and qualitative methods.

Much like the OSTM inputs and parameters examined in Task 3, review the EIM/QEIM default values for inputs and parameters and recommended refinements or adjustments, as necessary. Where applicable, ODOT will perform the direct entry, prepare the necessary EIM/QEIM inputs (e.g. travel time, cost, and physical layout) for each improvement and each model run. Upon receipt, review the EIM/QEIM final outputs, for both the individual project (i.e. incremental) and the entire system (i.e. cumulative). With this information in hand, perform the economic development analysis and evaluate goods movement for Group A and Group B improvements, utilize the Goods Movement Activity Model (see Appendix G) to make qualitative determinations regarding goods movement for all Group C and Group D improvements. Perform a review of B/C output from EIM/QEIM, making adjustments to the B/C data or performing separate, individual B/C analysis for improvements that cannot be accurately modelled in EIM/QEIM. Task 4 will culminate in preparation of a B/C Analysis Summary Report. A Benefit Cost Analysis (BCA) Report Outline has been included as Appendix H.

4.1 Review Evaluation Criteria

Revisit the Task 2.3 Evaluation Criteria Summary Memo to ensure their utility during evaluation of the net economic impacts of various project alternatives and the B/C Analysis. Review the traffic operational metrics such as delay, LOS, travel time savings, along with safety, mobility, access, and jobs/commerce evaluation criteria. At this juncture, consider reducing, weighting, and combining measures to develop ODOT-specific indices as appropriate. An attempt will be made to ascribe a quantitative factor or cost to each evaluation criteria.

4.2 Review Economic Impact Model (EIM/QEIM) Default Values

For Group A improvements, review the EIM default values for inputs and parameters and recommend refinements or adjustments, as necessary. Review EIM parameter files, including Federal Information Processing Standards (FIPS) and Transportation Analysis Zones (TAZ), demographic data files, employment data files and terminals files to determine which factors are used, their source, how they inform the EIM model output and if any adjustments are required that would provide more refined results.

For Group B improvements, review QEIM parameter files to determine which factors are used, their source, how they inform the QEIM model output and if any adjustments are required that would provide more refined results.

4.3 Inputs to EIM / UCost2 & QEIM, per Improvement

Prepare the necessary EIM/QEIM inputs for each proposed improvement and each model run based on their Task 3.3 categorization as follows:

Group A - For each of the identified "larger-scale" potential improvements, provide representative input data for use in the EIM module and obtaining "improvement-specific" EIM output. The input data will include cost, physical layout, and travel time savings data, by approach, separated by passenger vehicles and heavy trucks, and for four time periods: AM (6AM – 9AM), MD (9AM – 2PM), PM (2PM – 6PM) and NT (6PM – 6AM). Whether indirectly, via AgeAsset or UCOST2, or directly, provide the following input data in accordance with ODOT's *EIM Utility User Guide* (dated 8/11/2014) for each of the proposed improvements: Project Information, Costs (Project & Agency), and Traffic / Operations "Manual" Data Adjustments.

Group B - For each of the identified "smaller-scale" potential improvements where a travel time savings can be quantified, provide representative input data for use in the QEIM module and obtaining "improvement-specific" QEIM output. The input data will include cost, physical layout, and travel time savings data, by intersection, separated by passenger vehicles and heavy trucks, and for four time periods: AM (6AM – 9AM), MD (9AM – 2PM), PM (2PM – 6PM) and NT (6PM – 6AM). The input data will also include Project Location (i.e. County), Project Costs, and Daily Travel Time Savings.

Group C and Group D - For each of the identified "smaller-scale" potential improvements where travel time savings cannot be quantified , EIM and QEIM will not be applicable. Prepare a qualitative assessment of economic vitality and goods movement as described in Task 4.6 and Task 4.7.

4.4 EIM / UCost2 & QEIM Model Runs (ODOT)

ODOT will directly interact with the EIM / UCost2 and QEIM modules to make "manual" data input adjustments, run the EIM/UCost2 and QEIM, and provide output data. Applicability of the EIM / UCost2 or QEIM to a proposed improvement will depend on its Task 3.3 categorization as follows:

Group A - ODOT will directly interact with the EIM and UCost2 modules to make "manual" data input adjustments, run the EIM/UCost2, and provide output data. Rely upon this EIM/UCost2 output data, including but not limited to, incremental (project) and cumulative (overall) impacts, economic measures (earnings, business outputs, jobs created, value added, production, consumption, employment, and households, etc.) as the basis of the economic analysis. Rely upon the EIM and UCost2 modules for existing and forecast travel data and other output related to B/C, and Economic and Freight Analysis. Provide assistance, as needed, and refine or correct input data, as the runs are made.

Group B - ODOT will directly interact with the QEIM module to make "manual" data input adjustments, run the QEIM and provide output data which will include, for both households and freight: Income, Employment (jobs created), and Economic Output (summary of total economic activity (i.e. services provided and good produced) generated by the improvement).

Group C and Group D - EIM and QEIM will not be applicable. Prepare a qualitative assessment of economic vitality and goods movement as described in Task 4.6 and Task 4.7.

4.5 Review of EIM & QEIM Output

Perform a review of B/C output from EIM/QEIM, making adjustments to the B/C data or performing separate, individual B/C analysis for improvements that cannot be accurately modelled in EIM/QEIM:

> *Group A* - Review and analyze the output EIM data, as available. The output data will provide the basis for much of the evaluation and analysis of each proposed improvement. Examine the incremental impacts that can be associated with each individual project, including the Operational, Market Access and Construction output files. From these, derive earnings, business output, jobs created and value-added output. Examine the total cumulative impacts of each project, as provided via EIM, in the Production, Consumption, Employment, Households, and Summary data. These forecasts include baseline economic forecast data from TREDIS and Moody's. Using this data, make further determinations as necessary regarding earnings, business output and job creation.
>
> *Group B* - Review the QEIM output data which will include: Income, Employment (jobs created), and Economic Output (summary of total economic activity (i.e. services provided and good produced) generated by the improvement).
>
> *Group C and Group D* - EIM and QEIM will not be applicable. Prepare a qualitative assessment of economic vitality and goods movement as described in Task 4.6 and Task 4.7.

4.6 Economic Development Evaluation

Evaluate the economic and demographic implications of various project alternatives, including interpretation of EIM/QEIM and select improvement-specific evaluations:

> *Group A* - Take advantage of the various data and graphical outputs generated directly from EIM, with the aim of making improvement-specific determinations of the following economic impacts: Geography / Region, Sector & Industry, Labor / Jobs, Productivity/ Operations / Efficiency, Development, and Tax / Agency Benefits. The findings of Task 4.6 will be incorporated into the overall evaluation. Prepare an Economic Development Evaluation Memo, and summarize economic development evaluation language for direct insertion in the Task 5 Strategic Plan.
>
> *Group B* - Utilize QEIM to evaluate economic benefits.
>
> *Group C and Group D* - Provide a qualitative evaluation of economic vitality and goods movement, in tandem, using the Goods Movement Activity Tool. Using the tool, a weighted Goods Movement Index will be assigned to each potential improvement. This qualitative measure provides a representation of the significance of the goods movement sector and how an improvement along the corridor may affect economic activity within a given County. The qualitative evaluation will also include any information provided by stakeholders during Task 1.3 and consider how proposed improvements may affect economic activity.

The findings of Task 4.6 will be incorporated into the evaluation. Develop summary economic development evaluation language for direct insertion in the Task 5 Strategic Plan.

4.7 Goods Movement Evaluation

Evaluate the freight and goods movement implications of various project alternatives, including interpretation of EIM/QEIM and select improvement-specific evaluations:

> *Group A* - Review EIM output and identify the existing and emerging industries that are driving the state's trade based economy.
>
> *Group B* - Identify the existing and emerging industries that are driving the state's trade based economy to supplement the review of QEIM output.
>
> *Group C and Group D* - For "smaller-scale" improvements where travel time savings cannot be quantified, provide a qualitative evaluation of economic vitality and goods movement, in tandem, using the Goods Movement Activity Tool. Using the tool, a weighted Goods Movement Index will be assigned to each potential improvement. This qualitative measure provides a representation of the significance of the goods movement sector and how an improvement along the corridor may affect economic activity within a given County. This qualitative evaluation will incorporate stakeholder input gathered in Task 1.3 and consider how incremental proposed improvements affect industries and note any infrastructure deficiencies in the movement of freight along the corridor.

The findings of Task 4.7 will be incorporated into the evaluation. Develop summary goods movement evaluation language for direct insertion in the Task 5 Strategic Plan.

4.8 B/C Analysis

Develop a B/C Analysis for each proposed improvement as summarized in *Figure 2* on page 12. For each improvement, determine: Net Present Value (NPV) of the improvement cost, NPV of the benefit, and a B/C ratio. Where data is available, monetize benefits in the following categories: Safety (e.g. crashes by type - fatal, injury, and property damage), Mobility (e.g. travel time savings, travel time reliability), Access (e.g. to jobs and non-work activities), Jobs and Commerce (e.g. changes in employment and value-added output, changes in freight tonnage), environmental (e.g. emission reduction, improved air quality, habitat impacts) and Infrastructure Preservation (life cycle costs).

Develop a B/C Analysis for each proposed improvement based on its Task 3.3 categorization as follows:

> *Group A* - Entire B/C Analysis will be provided directly from EIM and UCost2 output.
>
> *Group B* - Economic benefits will be provided by QEIM output. This output will then be incorporated into the overall B/C Analysis. Transportation user benefits (e.g. fuel savings) and safety benefits (e.g. crash reduction) for "smaller-scale" improvements will be calculated using traffic analysis software and ODOT's Economic Crash Analysis Tool (ECAT), respectively. Compile the individual B/C components provided by each model/tool (e.g. QEIM, Synchro, ECAT) into a spreadsheet to provide an overall B/C Analysis.
>
> *Group C* - Safety benefits will be calculated using ECAT to quantify a B/C ratio. Transportation user benefits and economic benefits will be assessed qualitatively to supplement the quantified B/C for these improvements.
>
> *Group D* - B/C will not be developed, and benefits will be assessed qualitatively.

Prepare a Draft Benefit Cost Analysis (BCA)Summary Report for review and incorporate comments into the Final Benefit Cost Analysis (BCA)Summary Report. The Benefit Cost (BCA) Analysis will serve as the basis for evaluating each proposed improvement and to assist ODOT in determining a prioritization of improvements during Task 5.

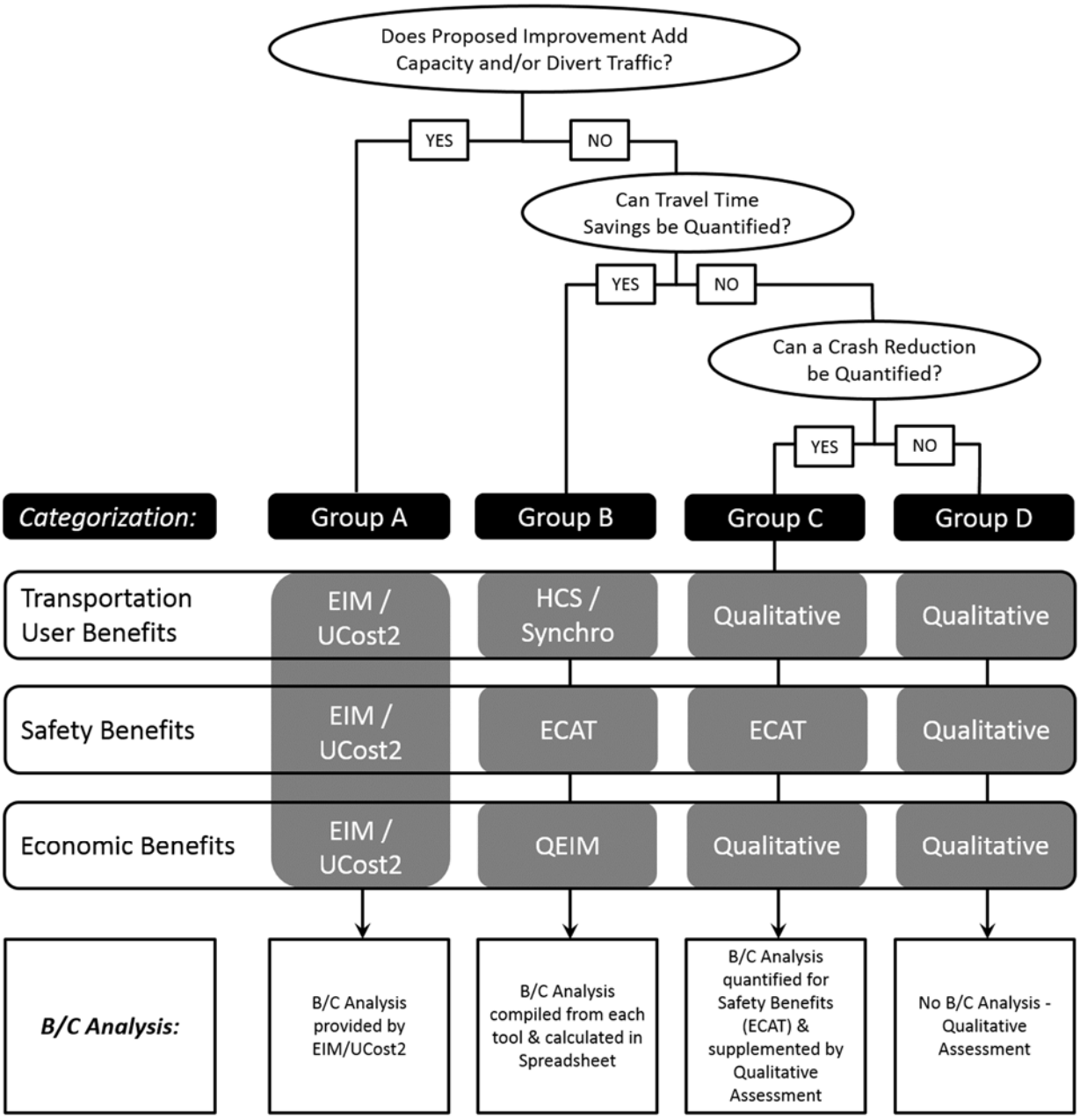

Figure 2 - B/C Analysis Flowchart

TASK 5 – STRATEGIC PLAN

During Task 5, develop a Strategic Plan and group improvements into categories, by improvement type, to help guide decision making for various programs and funding sources. Prepare a report documenting the work performed and recommendations made. The report will include an easy-to-read, stand-alone overview matrix/chart of proposed improvements complete with categorization, approximate costs, and Benefit Cost ratio. The various technical memos and reports developed in Tasks 1 through 4 will be included as appendices. The Strategic Plan, excluding appendices, should be limited to approximately 40 pages. Prepare the Strategic Plan and present, including findings and recommendations, to ODOT at a Strategic Plan workshop. A Strategic Plan Outline is included as Appendix I.

5.1 Prepare Draft Plan and Evaluation

Revisit the Task 2.3 Evaluation Criteria Summary Memo to ensure their utility during development of the Strategic Plan. A draft Strategic Plan, incorporating all findings and recommendations, will be prepared. The draft Strategic Plan will provide a summary overview of the individual deliverables, including the study methodology, stakeholder outreach, existing conditions, concept development, analysis, and evaluation. The report will demonstrate how criteria were applied, discuss data sources, analytical tools and methods, and provide an overview of the evaluation process.

A comprehensive Evaluation Matrix will be included along with a narrative description of the metrics and evaluation criteria used to evaluate proposed improvements. Improvements will be grouped into categories according to project type (e.g., intersections, signals, signing and pavement marking, bridges, pavement, and railroad crossings). To facilitate further evaluation and decision making by ODOT, the evaluation matrix will include all benefits (quantitative and qualitative). The matrix will be provided in a digital, sortable format to allow ODOT planners and decision makers to dynamically sort and view information to suit a particular program need or funding source, whether according to project type, cost, B/C, or any individual factor or sub-factor. The matrix will also include a prioritization of improvements into three categories: short-term (1 to 3 yrs.), medium-term (3 to 10 yrs.), and long-term (>10 yrs.). A sample Evaluation Matrix is included as Appendix J.

As appropriate, the draft plan will address MAP-21 funding requirements. Present the draft Strategic Plan and Evaluation Matrix at a half-day workshop to be held at Central Office. Recognizing that individual project implementation is dependent upon funding availability, need, project development time and other factors, project prioritization will be discussed during the workshop.

5.2 Submit Final Plan

Incorporate all comments made at the Task 5.1 workshop and submit a revised final report to ODOT. The Strategic Plan will be comprised of two parts: an executive summary and a main body. The executive summary should be structured to serve as a stand-alone synopsis of the Strategic Plan. The main body will include sections that speak to all elements of the study process, as follows:

- Background
- Corridor-Specific Methodology
- Stakeholder Outreach
- Evaluation Criteria
- Existing Conditions
- Future Conditions
- Needs And Improvements
- Benefit Cost Analysis
- Evaluation

The evaluation will include a stand-alone matrix and summary tables for each project category type and/or scenario.

APPENDIX A

LIST OF DELIVERABLES

Deliverable
Stakeholder Listing
Draft Study Methodology
Final Study Methodology
Evaluation Criteria Summary Memo
Data Collection Summary Memo
Draft Existing Conditions Report
Final Existing Conditions Report
Draft Needs and Conditions Report
Final Needs and Conditions Report
Cost Benefit Analysis Summary Report
Draft Strategic Plan
Final Strategic Plan
Evaluation Matrix Tool

APPENDIX B

STAKEHOLDER INTERVIEW SURVEY

US 250 FREIGHT STUDY - STAKEHOLDER INTERVIEW QUESTIONS

INTRODUCTION: The Ohio Department of Transportation (ODOT) is conducting a needs assessment on US 250 focused on identifying incremental system improvements to enhance freight flows. To ensure ODOT understands how US 250 is being utilized for freight movement, the project team is reaching out to a number of business and public agencies along the corridor to gain their insights. We have a few questions we would like to ask you.

QUESTIONS FOR COMMISSIONS/PORT AUTHORITIES:

1. Have you received any feedback from organizations/companies expressing any issues or concerns with transporting their goods along US 250?
2. Are you aware of any potential organizations/companies that have expressed interest in locating in this region that could have an impact on the freight flow along the US 250 corridor?
3. Has an organization/company indicated to you that they decided not to locate to this region because of issues/concerns with logistics, specifically as it relates to US 250?
4. Based on your experience in this region, are you aware of any incremental system improvements that could be made along the US 250 corridor that might enhance freight flows?

QUESTIONS FOR PRIVATE COMPANIES:

1. **Business --** What does **your business/agency** do? What do you make/what services do you provide? How many trucks does your company have? How many deliveries per day/week?
2. **Shipping** -- How does your company get its goods to market-- Rail, truck, water? Do you have trucking in-house? If not in-house, who are your freight forwarders, logistics partners?
3. Are there any bottlenecks? How many trucks a day arrive/depart from your facility? What are the commodity types? Where do they enter/exit the corridor?
4. **Inputs** – Where do your supplies and materials come from? From what radius is your supply chain coming from? International vs. domestic shipments? Which segment(s) of the US-250 corridor does your freight traffic most frequently travel? Are there any bottlenecks or concerns that you have experienced or suppliers have noted like roadway roughness, etc.?
5. **Permitting** – Does your company/constituents require special hauling permits for oversize/overweight loads? Have you experienced limitations with vertical clearances, bridge load limits, pavement width, geometrics were findings suitable routing is an issue on US 250?
6. **Delivery Times** – What time(s) of day do your deliveries typically arrive/depart? Do these times coincide with morning and evening "rush hours"? Does your company utilize just-in-time delivery for freight? If so, approximately what percentage of your freight utilizes just-in-time or just-in-sequence delivery? Are drivers able to make their door times consistently? If not why?
7. **Truck Size/Configuration** – What is the typical length or type of your semitrailers? What is the typical number of axels (5 or 6) on your trucks? Do you utilize Truck Tractor-Semitrailer-Trailer (Double Trailer) combinations?
8. **With respect to US 250** in particular, please describe in detail the nature and location of any:
    a. Capacity/recurring congestion issues.
    b. Signage – can drivers find your facility without issue?
    c. Operational issues – e.g. segments or junctions where truck movements are impeded
    d. Safety issues – accidents or other incidents that cause hazards and delays
    e. Reliability issues – some days it takes longer than others to travel the same segments
9. **Employees** – How many employees travel to your location? Where do they come from?
10. **Other Benefits** -- Can you think of any improvements to US 250 that may benefit your company/constituents?

APPENDIX C

STAKEHOLDER OUTREACH SUMMARY OUTLINE

STAKEHOLDER OUTREACH SUMMARY OUTLINE

1. Overview
2. Individual Stakeholder Summaries
   - 2.1. Public Agencies
   - 2.2. Trucking / Logistics
   - 2.3. Manufacturing
   - 2.4. Retail
   - 2.5. Economic Development
   - 2.6. Intermodal
   - 2.7. Oil & Gas Exploration
   - 2.8. ODOT County Managers
   - 2.9. Tourism
   - 2.10. Law Enforcement
3. Summary of Identified Operational and Safety Issues
   - 3.1. Map / Figure of Identified Operational and Safety Issues
4. Appendices
   - Stakeholder Meeting Minutes

APPENDIX D

DATA COLLECTION CHECKLIST

Data	Source	Instructions	Date Collected
Existing Traffic Data	Transportation Information Mapping System (TIMS) & Transportation Data Management System (TDMS)	Select *Layers > Roadway Information > Traffic Count Stations* Identify desired *Traffic Count Station* on map and follow *Results* weblink to *Traffic Reports* for available data at location	
Forecasted Traffic Data	Ohio Statewide Travel Demand Model (OSTM) & Simplified Highway Forecasting Tool (SHIFT)	Contact Greg Giamo Greg.Giaimo@dot.ohio.gov at ODOT Office of Statewide Planning & Research	
Safety/Crash Data	GIS Crash Analysis Tool (GCAT) & Ohio Department of Public Safety (ODPS)	GCAT: https://gcat.dot.state.oh.us/SSL/Login.aspx OPDS Crash Statistics: https://ext.dps.state.oh.us/crashstatistics/crashreports.aspx	
Speed Data	INRIX	Request ODOT Project Manager to coordinate with the ODOT Office of Traffic Operations to contact Ted Trepanier ted@inrix.com at INRIX to obtain project usage rights for consultant	
Bridge Condition Ratings	TIMS / Bridge Management System	Select *Assets > Bridge Inventory* For BMRP-191 / BR-86: http://bmsreports.dot.state.oh.us//bmsreports/jsp/defaultFrames.jsp	
Bridge Load Ratings / Bridge Clearances	Bridge Management System	http://bmsreports.dot.state.oh.us//bmsreports/jsp/defaultFrames.jsp	
Pavement Condition Ratings (PCR)	TIMS	Select *Layers > Roadway Information > PCR (State)*	
Oversize/Overweight Loads	ODOT Special Hauling Permits Section	Contact Mike Moreland Mike.Moreland2@dot.state.oh.us Supervisor of Permits	
Geometrics (for locations indicating a significant safety or operational issue only)	Record Plans / Aerial Mapping / TIMS	Record Plans: Select *Layers > Projects* in TIMS or Contact Local ODOT District Map Room Aerial Mapping: available for download by County at http://ogrip.oit.ohio.gov/ProjectsInitiatives/OSIPDataDownloads.aspx	
Historical Project Activity / Anticipated Future Projects	TIMS	Select *Layers > Projects*	
Economic Data	OSTM Economic Impact Model (EIM)	Contact Rebekah Anderson Rebekah.Anderson@dot.ohio.gov at ODOT Office of Statewide Planning & Research	
Goods Movement Consumption	2010 IMPLAN data	Contact Greg Giamo Greg.Giaimo@dot.ohio.gov at ODOT Office of Statewide Planning & Research	
Goods Movement Employment	2014 Longitudinal Employer-Household Dynamics (LEHD) data & 2016 CoStar* data	http://lehd.ces.census.gov/data/ http://www.costar.com/	
Goods Movement Truck Trips	OSTM	Contact Greg Giamo Greg.Giaimo@dot.ohio.gov at ODOT Office of Statewide Planning & Research	

APPENDIX E

EXISTING CONDITIONS REPORT OUTLINE

EXISTING CONDITIONS REPORT OUTLINE

1. Overview
2. Methodology
3. Locations with Issues Identified
   - 3.1. Traffic
   - 3.2. Safety
   - 3.3. Geometry
   - 3.4. Physical Conditions
4. Individual Location Assessments (Modular Summaries)

   For each location studied:
   - 4.1. Location Overview
   - 4.2. Existing Conditions
   - 4.3. Problem Statement
   - 4.4. Potential Countermeasures
5. Existing Corridor Assessment Summary
6. Appendices

   Operational Analysis Output (Current Year – AM Peak Hour)
   Operational Analysis Output (Current Year – PM Peak Hour)
   Operational Analysis Output (Design Year – AM Peak Hour)
   Operational Analysis Output (Design Year – PM Peak Hour)

APPENDIX F

NEEDS AND CONDITIONS REPORT OUTLINE

NEEDS AND CONDITIONS REPORT OUTLINE

1. Executive Summary
2. Overview
3. Existing Corridor Assessment
   - 3.1. Traffic
   - 3.2. Safety
   - 3.3. Geometry
   - 3.4. Physical Conditions
4. Proposed Corridor Assessment
   - 4.1. Traffic
   - 4.2. Safety
   - 4.3. Geometry
   - 4.4. Physical Conditions
   - 4.5. Cost / Preliminary Indications
5. Individual Location Assessments (Modular Summaries)

   For each location studied:
   - 5.1. Location Overview
   - 5.2. Existing Conditions
   - 5.3. Problem Statement
   - 5.4. Potential Countermeasures
   - 5.5. Concepts and Countermeasures Considered
   - 5.6. Operational Analysis
   - 5.7. Cost
   - 5.8. Preliminary Indications
6. Existing Corridor Assessment Summary
7. Proposed Corridor Assessment Summary
8. Summary of Proposed Countermeasures
9. Next Steps / Actions
10. Appendices

    Proposed Countermeasures Considered

    Evaluation Data Inputs Summary

    Operational Analysis Output (Current Year – AM Peak Hour & PM Peak Hour)

    Operational Analysis Output (Design Year – AM Peak Hour & PM Peak Hour)

APPENDIX G

GOODS MOVEMENT ACTIVITY MODEL

GOODS MOVEMENT ACTIVITY MODEL GUIDE

ODOT has developed a set of metrics designed to assess the size and economic significance of Goods Movement sectors in each of Ohio's 88 counties. The information is presented as an analytical tool to support the ODOT as it considers future infrastructure improvements along various transportation corridors in the State.

This model produces key metrics of Goods Movement activities and the significance of Goods Movement sectors in each of Ohio's 88 counties.

The Goods Movement Activity Model summarizes the preliminary scoring for all 88 counties in the State. The tool includes a weighting system to allow for varying the weights of the variables and provide flexibility on a corridor-by-corridor basis. The initial weights are set across all variables to a default weight of 5.0. At their discretion, ODOT staff may calibrate the weight for each variable with a value between 1.0 (low importance) and 5.0 (high importance).

The Goods Movement Activity Model in the accompanying Microsoft Excel workbook provides ODOT staff with the ability to calibrate the weights for each of the variables according to importance and to toggle the results accordingly. The first sheet of the workbook presents the Table of Contents:

The Goods Movement Rank and Goods Movement Summary tabs provide an overview of the outputs. The Tab 3 Weight Methodology (Calibration Tab) is where staff can calibrate the weights. Tab 3 is the only tab through which staff will alter inputs, as noted in the ensuring narrative. The Summary of Consumption, Employment, Real Estate, and Truck Trips tabs provide consolidated information for each of the Goods Movement metric categories and their input derivations. The Measure Definitions tab is a reference page for each of the variables considered in this study, and Tab 9 Data Tabs is a cover page preceding all raw input data used for this study.

WEIGHT METHODOLOGY (CALIBRATION TAB)

A copy of the Calibration Tool (Tab 3) below shows the variables that were assigned weights versus the variables that were excluded from the scoring system. As mentioned above, a default weight of 5.0 was assigned to each of the relevant variables and is to be calibrated by ODOT staff according to significance of variable. A weighting system has been introduced for each of the relevant variables, using a scale of 1 (lowest) to 5 (highest) in the order of lowest to highest degree of relevance to prevalence of the Goods Movement sector in the county. The relevant county attribute is then multiplied by the weight established for that variable to produce a variable score. All variable scores are then totaled for an overall county score. A maximum score of 40.0 is possible if all attributes are the highest possible value and if it is determined by staff that all variables should be given a weight of 5.0

ODOT and the study team should assign individual weights to each variable allows to account for corridor-specific conditions. For example, if Consumption and Real Estate are highly related to Goods Movement size, variables in those categories should be given a higher weight (4.0-5.0) than the variables in Employment and Truck Trips (2.5), or any variation thereof. If any variables are low priorities, they may be assigned a lesser weight (<2.5).

Variable	Weight (1 (low) to 5 (high))[2]	MIN WEIGHT	MAX WEIGHT	MIN ATTRIBUTE	MAX ATTRIBUTE	MIN OUTPUT	AVG OUTPUT	MAX OUTPUT
Goods Movement Consumption								
Percentile Rank against all sectors in county	1.0	1.0	5.00	0.01	1.00	0.01		5.00
Percentile Rank against other counties in State	3.0	1.0	5.00	0.01	1.00	0.01		5.00
						0.00		0.00
Goods Movement Employment						0.00		0.00
County Pct. of Total Employment/State Pct. of Total Employment[1]	4.0	1.0	5.00	0.17	1.00	0.17		5.00
						0.00		0.00
Goods Movement Related Real Estate						0.00		0.00
County GM Inventory Pct. of Total/State GM Inventory Pct. of Total[1]	1.0	1.0	5.00	0.02	1.00	0.02		5.00
County GM Sq. Ft. per Resident/State GM Sq. Ft. per Resident[1]	1.0	1.0	5.00	0.00	1.00	0.00		5.00
County GM Sq. Ft. per Employee/State GM Sq. Ft. per Employee[1]	5.0	1.0	5.00	0.01	1.00	0.01		5.00
Truck Destination								
Percentile (of 88 Ohio Counties)	1.0	1.0	5.00	0.01	1.00	0.01		5.00
County Trips per Employee/State Trips per Employee[1]	1.0	1.0	5.00	0.01	1.00	0.01		5.00
Total (max= 40.0 | average= 20.0)						**0.25**	**20.1**	**40.00**

[1] If the ratio of county to state is greater than 1.0, the county is attributed with a maximum score of 1.0.
[2] Used as a multiplier for county attribute to weight importance of measure against all other measures. The lowest possible weight is 1.0 (not important); the highest possible weight is 5.0 (very important). The default for each of the attributes is set to 5.0; to be calibrated with input from ODOT staff.

Calibration Tool (Tab 3)

APPENDIX H

BENEFIT COST ANALYSIS OUTLINE

BENEFIT COST ANALYSIS OUTLINE

1. Overview
    1.1. Purpose
    1.2. Study Evaluation Groups
2. Costs
    2.1. Cost Estimating Techniques
    2.2. Net Present Value and Discount Rate
3. Benefits
    3.1. Mobility
    3.2. Safety
    3.3. Economic
4. Benefit Cost Analysis
    4.1. Interpretation of Benefit Cost Analysis
    4.2. Results for Study Corridor
5. Next Steps
6. Appendices
        Mobility Analysis
        Safety Analysis
        Economic Analysis
        Benefit Cost Analysis Matrix

APPENDIX I

STRATEGIC PLAN OUTLINE

STRATEGIC PLAN OUTLINE

1. Executive Summary
2. Introduction
3. Study Methodology
4. Stakeholder Outreach
5. Evaluation Criteria
6. Needs and Conditions
7. Benefit Cost Analysis
8. Evaluation
9. Appendices (All Referenced Reports)
    - Study Methodology
    - Stakeholder Outreach Summary
    - Evaluation Criteria Summary Memo
    - Needs and Conditions Report
    - Benefit Cost Analysis Summary

APPENDIX J

EVALUATION MATRIX TOOL

EVALUATION MATRIX TOOL

To facilitate evaluation, an evaluation matrix tool, in the form of a Microsoft Excel workbook will be developed. The tool not only summarizes the evaluation criteria assessments but also can be used to dynamically sort and view data and aid in further evaluation. As shown in the example below, the matrix includes both numerical rating and graphical rating scales to clearly depict ratings and levels of benefits. The matrix can be sorted using various criteria such as by: location (county, district), location type (bridge/culvert, intersection, roadway segment), estimated project cost, evaluation group (A, B, C, or D), countermeasure type, B/C ratio, and estimated project timeframe. Given various criteria, the matrix allows different uses for various end users, for different perspectives and for funding purposes. A wide range of users, including planners, programmers, funders, local, ODOT district and central office personnel can sort the improvements according to their particular need or end use, as appropriate.

Proposed Countermeasures	Estimated Project Cost	Evaluation Group	Safety	Infrastructure Condition	Congestion Reduction	System reliability	Freight movement and economic vitality	Environmental Sustainability	B/C Ratio	Return on Investment (ROI)	Short Term	Medium Term	Long Term
Replace Structure / Inc. Vert. Clear.	$1,630,000	D	●	●	○	○	●	○	n/a	n/a			●
Adjust signal clearance timings	$3,000	C	●	○	○	○	○	○	45.6	44.6	●		
Adjust signal clearance timings	$3,000	C	●	○	○	○	○	○	21.0	20.0	●		
Widen Shoulders	$5,857,000	C	●	●	○	●	●	○	0.5	-0.5			●
Replace & Widen Structure	$151,000	D	●	●	○	○	●	○	n/a	n/a		●	
Widen Pavement	$65,000	D	●	●	○	●	●	○	n/a	n/a		●	

Evaluation Matrix (Example)

The tool is populated with locations where a proposed countermeasure was identified. Any sub-factors from each of the evaluation criteria are input into the tool. The matrix includes the cost and benefit calculations from the B/C Analysis. Beyond the B/C Analysis, additional evaluation criteria categories such as Infrastructure Condition (PCR, Bridge Rating, Vertical Clearance, Horizontal Clearance), Goods Movement (from the Goods Movement Activity Model described in Appendix E), and System Reliability are included.