Chapter

6

Items to Consider When Scoping a Project

Scoping to Appropriate Design Standards (3R, 4R & CPM), Polices and the Flexibility of Design Guidelines (revised 6-24-2019)

While scoping a project, it is very important to understand the bigger picture. How does this project impact future projects? Will there be crash types or patterns to consider? Are there opportunities to provide appropriate access to all legal users and consideration of connectivity for multiple modes? Does the community or communities affected by the project have a Complete Streets policy? What Stakeholder Engagement plan is needed? Is there an opportunity to partner with local agencies to address mutual transportation needs? Will it impact the community other than just the construction? Will there be environmental impacts? Keeping this in mind, there are items that may not be analyzed based on the scope, work type or strategy being used. Based on the issues mentioned above, there may be work that should be avoided or not constructed and a design exception/variance may be appropriate. An important factor in the scoping of a project is a focus on purpose and need with complete documentation of decisions that relate to the project scope.

Each project will have its own set of design standards, policies and guidelines depending on the type of work (4R, 3R, CPM, etc.).

New construction/reconstruction (4R) projects are mainly comprised of projects that involve:

- Complete removal and replacement of pavement (including the subbase)
- Major alignment improvements
- Adding lanes for through traffic
- New roadways and/or bridges
- Complete bridge deck or superstructure replacement, and complete bridge replacement
- Intermittent grade modifications (used to correct deficiencies in the vertical alignment, by changing the paving profile for short distances while leaving the existing pavement in service for less than 50% of the total project length)
- Providing accommodations for all legal users to meet existing or future needs anticipated during the design life of the project (i.e. bridges)

Resurfacing, Restoration and Rehabilitation (3R) projects are defined as construction that extends the service life of an existing roadway or bridge and enhances highway safety. The intent of this work is to return an existing roadway or bridge, including shoulders, the roadside

and appurtenances to a condition of structural and functional adequacy. This work may include upgrading geometric features such as roadway/bridge widening (no capacity increase or increase in number of through lanes), flattening curves or improving sight distance. Examples of this work include:

Road

- Resurfacing, milling or profiling, concrete overlays and inlays (with or without removing subbase)
- Lane and/or shoulder widening (no capacity increase or increase in number of through lanes)
- Roadway base correction
- Minor alignment improvements
- Roadside safety improvements
- Signing, pavement marking and traffic signals
- Intersection and railroad crossing upgrades
- Pavement joint repairs
- Crush and shape and resurfacing
- Rubblize and resurface
- Intermittent grade modifications (used to correct deficiencies in the vertical alignment by changing the paving profile for short distances) while leaving the existing pavement in service for more than 50% of the total project length
- Passing relief lane
- Lane conversion for multi-modal accommodation.

Bridge

- Shallow and deep concrete overlays
- Superstructure repairs
- Railing replacements
- Extensive substructure repair
- Substructure replacement

Capital Preventive Maintenance (CPM) involves work that will repair and preserve the roadway or bridge. Examples of CPM work include:

Road

- Crack sealing
- Surface seals
- Thin asphalt overlays
- Concrete patching
- Diamond grinding
- Joint repair and replacement
- Pavement profiling to improve ride quality

Bridge

- Joint replacement
- Pin and hanger replacement
- Complete painting
- Zone painting
- Thin epoxy overlays
- Deck patching
- Hot Mix Asphalt (HMA) overlays
- Scour countermeasures

Gathering Information (revised 6-24-2019)

Where to find MDOT standards, guides, and policies

Standards, guides and policies for each of these different types of work can be found in the MDOT Road Design Manual (Chapter 3), MDOT Bridge Design Manual (Chapter 12), MDOT Road CPM Program Guidelines and MDOT Bridge CSM Manual. Prior to starting the estimating process, a complete review of the appropriate section should be performed. In Chapter 3, the guidelines for 3R Freeway, 3R Non-Freeway NHS and 3R Non-Freeway Non- NHS are shown. Additional information can be obtained from AASHTO documents such as "A Policy on Geometric Design of Highways and Streets" and/or "A Policy on Design Standards Interstate System". During the scoping process it is important to be familiar with the standards for each type of work and scope the project according to the detailed bridge inspection/scope, proposed corridor work, applicable standards, guidelines and polices.

The design speed used for 3R freeway projects (interstate and non-interstate) may be the design speed approved at time of original construction or reconstruction, whichever is most recent. Likewise, for 3R freeway projects, the design values for horizontal and vertical alignment, and widths of median, traveled way and shoulders may be the values approved at the time of the latest previous construction. Otherwise, standards for new construction apply for all freeway projects regardless of work type. See RDM 3.06 & 3.11 for additional information.

3R/4R freeway projects should be reviewed to determine the need for safety improvements such as: alignment modifications, superelevation modifications, sight distance improvements, ramp lengthening, shoulder widening, slope flattening, increasing underclearances, guardrail upgrading and bridge railings, shielding of obstacles and the removal or relocation of obstacles to provide a traversable roadside. See the RDM 3.11.01 for additional information.

Design speeds used for non-freeway 3R projects are shown in Section 3.09.02 of the RDM. However, if the original posted speed has been raised, the designer may use the design speed approved at the time of original construction or reconstruction, whichever is most recent. See RDM 3.06.

How to determine project classification

If a project includes, both 3R and 4R work types, the project is assigned a single classification. The single classification is derived from the work type that is greater than 50% of the total cost of the project and is considered the "controlling" classification. The single classification of combined work does not dictate the standards that apply to the project. The Applicable standards are governed by the guidelines that correspond individually to each work type (3R or 4R). The logical limits of each work type will be identified on the project information sheet to distinguish which standards apply. Work type overlap between separation limits may cause a default to 4R standards within the overlap.

How to apply standards for non-3R/4R project packed with 3R/4R projects

Projects categorized by work types such as CPM, CSM, Signal Corridor and Signing Corridor projects are governed by guidelines that differ from 3R and 4R guidelines. For information related to specific requirements for these categories of work, use the appropriate reference guides and manuals. When other work types are packaged with a 3R or 4R project, the portion of the project (separate job number combined into one proposed project) that is outside the 3R or 4R work limits is governed by the guidelines that pertain to the other work type. When describing the work type, identify the logical limits, so that the appropriate requirements are considered within those limits. Work type overlap within these separation limits may cause a default to 3R or 4R requirements. Reference RDM 3.08.01D for additional information.

When CPM minimum design requirements are applied

The use of CPM minimum design requirements is contingent on the roadway condition and program eligibility. Regardless of the funding source, CPM minimum design requirements are applied to work done on roadways that would otherwise be eligible for funding under the CPM program. Reference RDM 3.08.01D for additional information.

Importance of Project Estimates (revised 6-24-2019)

An estimate developed as part of the project scoping process is used to program the funding of the design and construction of a project. If an estimate does not take into account all items on the scoping checklist and cost participation with other agencies, cost associated with an estimate will not be accurate. When the scoping estimate is not accurate, a lack of funding may arise during the design phase of the project. A lack of funding may cause project delay, the necessity to request funds from other sources, the modification of the project scope, the need to shorten the project or potential conflicts with the region or statewide strategies and goals.

Importance of Documenting Decisions

Record project decisions and why they were made

As noted previously, and can not be stressed enough, a complete record should be kept of all items discussed, investigated and/or decided upon during the scoping process. This provides a project history that will go forward to the designers. By keeping a complete log of decisions made, the designers can be assured that all items were discussed during the scoping phase. Also, if an item comes up during design, there is a reference as to why the item was or was not included in the scope. This reference will assist in eliminating budget issues, save employee time and reduces the re-working of a problem. See Chapter 7 for additional information on documentation during the scoping process.

Items to be Considered When Scoping All Projects

Complete Streets (added 6-24-2019)

Complete Streets are roadways planned, designed and constructed to provide appropriate access to all legal users in a manner that promotes safe and efficient movement of people and goods whether by car, truck, transit, assistive device, foot or bicycle.

In compliance with the State Transportation Commission Policy on Complete Streets, dated July 26, 2012 all projects regardless of scope, or length should be considered for the accommodation of bicyclists, pedestrians and all legal users of the roadway.

Complete streets are achieved by using the principles of Context Sensitive Solutions described later in this chapter. Opportunities should be considered during planning and scoping to allow for funding consideration and meaningful stakeholder input.

Template Criteria (revised 6-24-2019)

The importance of using the correct funding template

As discussed in Chapter 2, MDOT funding is divided into several categories or "Templates", each having its own criteria for qualifying projects. The type of project and the funding template criteria must be considered when scoping a project because the proposed work may be limited by the template guidelines and policies as described in the annual CFP instructions. Typically, projects will not be able to make every desired fix on a given roadway but may be more directed to specific improvements for different strategies and goals. For instance, a CPM project will not fund the complete reconstruction of a roadway, because the strategy of CPM is to provide a life extension of a pavement or bridge in good or fair condition.

3R/4R Road Projects

Criteria for 3R/4R

Chapter 3, MDOT Road Design Manual

Road - Rehabilitation and Reconstruction template projects are classified as either 3R or 4R. Resurfacing, Restoration, and Rehabilitation projects are considered 3R. New Construction or Reconstruction projects are considered 4R. Criteria for work requirements regarding 3R and 4R fixes may be found in Chapter 3 of MDOT Road Design Manual.

Road CPM Projects

Criteria and treatment options for CPM projects

CPM Program Guidelines

Criteria for Road - CPM projects are outlined in the CPM Program Guidelines. Treatment options from the CPM Manual are included in Chapter 3 and in the Appendix. Typically, CPM fixes are limited to thin surface treatments such as HMA overlays or resurfacing (limited to an application rate of no more than 165lbs/syd), chip seals, micro-surfacing, diamond grinding, joint repairs, sealing, etc. Minor safety and drainage repairs may be included in CPM projects, however they are determined on a case by case basis.

Traffic and Safety Projects (revised 6-24-2019)

How TOR (time of return) affects funding

Traffic and Safety (Safety Project) funding is typically determined by using a Time of Return Analysis (TOR). Projects with a TOR of 10 years or less are eligible for Safety funding. Projects with a TOR of more than 10 years may still be eligible for safety funds up to the TOR of 10 years, but will require supplemental funding from other sources such as R&R, CPM for the remaining costs.

Freeway Lighting Replacement, Noise Abatement, Carpool Parking Lot, Pump Station, and Intelligent Transportation Systems (ITS)

Freeway Lighting Replacement, Noise Abatement, Carpool Parking Lot, Pump Station and Intelligent Transportation Systems (ITS) funding is typically limited to repairs or construction of only those respective physical assets or miscellaneous items that are directly affected by the repairs or construction of those features.

Bridge Projects

Bridge - The primary bridge templates include Bridge-R&R (Replacement and Rehabilitation) and Bridge-CPM and CSM (Capital Preventive Maintenance and Capital Scheduled Maintenance). Other, more specific bridge templates include Bridge - Big Bridge, Bridge - Blue Water Bridge and Bridge - Special Needs.

Work Zone Safety and Mobility (revised 6-24-2019)

Information on how to reduce traffic congestion during construction

In 2007 MDOT adopted a policy regarding user mobility. The focus of this policy is to reduce, to the greatest extent possible, the delay to the motoring public during construction projects. Heavy traffic congestion impacts both the environment and the economy. The Policy states that all projects will be reviewed for their impact to mobility and will be analyzed to reduce, eliminate or mitigate user delay as a result of construction projects. The MDOT Work Zone Safety and Mobility Manual is available and should be used as a reference. See MDOT Work Zone Safety and Mobility Manual Section 2.2

MDOT online PDF

http://www.michigan.gov/documents/mdot/MDOT_WorkZoneSafetyAndMobilityManual_233891_7.pdf

Performing a capacity analysis

Performing a baseline crash analysis

At the time a road segment is being considered for possible improvements, safety and mobility impacts of all users, including bicyclist and pedestrians of all abilities, for the proposed project and corridor are to be analyzed. A capacity analysis shall be done for the existing condition once the preliminary project limits are determined. At a minimum, the existing capacity for peak and non-peak hours shall be determined for the selected project location. This analysis shall include determination of the existing volume to capacity ratio, the existing travel times and the current operating level of service (LOS). In addition, a base line crash analysis is to be performed. Capacity, travel time and LOS will be estimated for the proposed project work-zone during construction and compared with the existing condition data.

Assessing construction alternatives

Creating/reviewing a TTCP (Temporary Traffic Control Plan)

The proposed project work type(s) should be analyzed, assessing the various construction alternatives available for each work type, as part of the scoping process. Each work type and construction alternative requires a review of the appropriate Temporary Traffic Control Plan (TTCP), taking into consideration existing operational factors within the project limits. A capacity analysis and estimate of traffic diversions for the approved project work type and construction alternative must be completed. The results of the analysis are to be compared with the existing conditions for use in the development of the TTCP. The Temporary Traffic Control Plan is also important for the environmental clearance process. For example, potential detours, especially any possible upgrades of detour routes, must be examined as part of the overall project. Early identification of the TTCP is essential for timely environmental classification. Baseline maintenance of traffic costs will be estimated, and mobility issues identified during the scoping process. The detailed scope will also include maintenance of traffic costs.

Determining whether a TMP (Transportation Management Plan) is needed

During the scoping phase, if the approved project capacity analysis yields a volume to capacity ratio greater than 0.80, an increase in travel time greater than 10 minutes, or the LOS drops below the threshold outlined in the Work Zone Safety and Mobility Policy, the project is deemed "significant" and a Transportation Management Plan (TMP) must be developed.

Developing a TMP

The TMP for a significant project must include the concept for the TTCP, the Transportation Operations Plan (TOP) and the Public Information Plan (PIP) in enough detail so a reasonable cost estimate can be developed and included in the cost of the project scope. If there are additional state or local projects being developed along the corridor or within the network influence area around the proposed project, the TMP should consider these impacts. However, local schedules may not be known at the time of scoping. The influence area generally will include an area where traffic volumes on other roadways change by 10 percent or more as a result of the proposed MDOT work.

Assessing mitigation needed to reduce traffic delay

Mitigation techniques Chapter 5, MDOT Work Zone Safety & Mobility Manual

In an effort to reduce delay on significant projects, all reasonable mitigation measures should be assessed in an effort to keep the delay below the threshold limits. Potential mitigation techniques are identified in Chapter 5 of the MDOT Work Zone Safety and Mobility Manual.

SMPT

If these mitigation measures result in the TMP costs exceeding 25% of the project costs, the project shall be submitted to the Safety and Mobility Peer Team (SMPT) for review.

CO3

Region/TSC is responsible for ensuring that the proposed project scope addresses work zone safety and mobility. TSC staff is responsible for developing the complete project level TMP, TTCP, TOP and PIP for significant projects, during the design phase. The final scoping document shall include, at a minimum, the existing capacity analysis, the information used to develop a proposed TMP, the proposed capacity analysis using the preliminary TTCP and the cost estimates for the proposed TTCP components. This is done by Region and TSC staff using the Construction, Congestion and Cost software (CO3) or comparable project level models as noted in Chapter 11of the MDOT Work Zone Safety and Mobility Manual.

Coordination with the BTP/PPS

During the design phase the Metropolitan Planning Organization (MPO) or Bureau of Transportation Planning (BTP) statewide travel demand models can be used for corridor and network level impact assessment, to identify potential alternate routes and assess detour options. The BTP/PPS is to be contacted to coordinate network and corridor modeling for major projects and traffic data for all significant projects. For projects not requiring BTP/PPS modeling,

Region and TSC staff should refer to procedures in Chapter 3 of the MDOT Work Zone safety and Mobility Manual.

Guidelines for cost review

If after all mitigation measures have been evaluated, the project still exceeds the threshold limits or the TMP costs exceed 25% of the projects costs, the Region Engineer and Region System Manager should be notified. The region is then responsible for contacting the SMPT for a project review, and later approval by the Chief Operations Officer.

Alternatives for MOT during construction

Alternatives for maintaining traffic and non-motorized user movements (where allowed) during construction should be developed during the scoping process, such as part width construction, detour routes, flag control, use of crossovers to shift traffic, temporary pavement widening, etc. An estimate for the maintaining traffic cost must be included in the scoping budget for the project.

Mitigation options

The mobility analysis may indicate that mitigation is required to improve the work schedule for the project. Some possible mitigation options include Incentive/Disincentive for early completion or open to traffic dates, lane and/or ramp rental, incentives or A+B bidding (for additional information, see the Work Zone Safety and Mobility Manual). Additional incentives are listed in Chapter 5 of the MDOT Work Zone Safety and Mobility Manual. If it is determined that a mitigation measure would be appropriate for the project, the cost for that mitigation measure must be included in the project budget at the scoping phase.

Creating a PIP

Public input needed

Communication with the public, in a planned manner, is important to getting and maintaining buy-in from the public for roadway and bridge projects. The degree to which public information campaigns are needed will depend on the project location and the potential impact to the traveling public. The Public Information Plan (PIP) of the Transportation Management Plan (TMP) is intended to create an organized and systematic process to communicate work zone information to the traveling public and respective stakeholders. The PIP will include public/stakeholder information, communications strategies and methods of delivery. The most effective means and methods for delivery of project information to the affected groups should be discussed in the PIP.

Internal Traffic Control Plan

Contractor plan needed

To help ensure the safety of the contractors working on a project, an Internal Traffic Control Plan must be developed by the contractor prior to beginning work on the project. Although this may seem like it will have little bearing on the scoping of a project, the potential cost for separating the workers and work zone from the traveling public must be considered when scoping and estimating a project.

Design Survey (revised 6-24-2019)

Coordinate Project Needs with Land Surveyor

During the scoping of a project, it is very important to consider the amount and type of survey that may be required in a project. Not only are these important items of information needed for a successful design, it is very important to have the correct cost and possible schedule impacts accounted for, during the design of a project. Some of the questions that need to be answered are:

- Do you need a partial survey?
- Do you need a full survey?
- Do you need aerial photography?
- Do you need to purchase ROW, obtain easements or obtain grading permits?
- Do you have or need a Survey Alignment?
- Do you have or need a Legal Alignment?
- Do you have or need a Construction Alignment?
- Do you need cross-section data (to obtain roadway slope or existing super-elevation information)?
- Do you need proposed drainage work?
- Do you need any hydraulic analysis for this project?
- Do you need bridge underclearance information?
- Are you going to reconstruct the roadway (or segments)?
- Do you need utility information?
- Do you need existing storm sewer or stormwater information?
- Are you proposing ditches?
- Are you proposing storm sewer?
- Are you widening the roadway (or segments - i.e. turn lanes)?
- Are you milling and resurfacing only?
- Will curb ramps be upgraded to accommodate for ADA?
- What are the existing or future needs of multimodal transportation in the project area?

The above are some of the questions that will help you understand the type and level of survey that may be needed for a project. This information should be discussed with the Region Surveyor and an estimate of hours, with cost, can then be generated for the scope. For additional information, reference Chapter 14 (14.12) of the Road Design Manual.

Design Exceptions and Variances (revised 6-24-2019)

Roadway geometrics should meet AASHTO/MDOT design criteria. It is recommended that a strategy of removing the geometric deficiency is developed, if this is not possible, proceeding to the design exception or variance process may be necessary. All possible alternatives should be reviewed to minimize the design deficiency. When designing a project, it may not be feasible to design the project to meet all current design standards. During the scoping process of 3R or 4R projects, areas of a roadway that may

not be able to meet current standards for 10 controlling criteria, should be identified as needing a design exception. Other specific elements and conditions may require a less formal design variance process when standards cannot be met. The table below defines the elements and conditions under which design exceptions and design variances are required.

Non-Standard Design Element (NHS and Non-NHS)	Applicability of Design Exception (DE) Design Variance (DV)	
	Design Speed	
	≥ 50 MPH	< 50 MPH
Design Speed < Posted Speed	DE	DE
Lane Width*	DE	DV
Shoulder Width	DE	DV
Horizontal Curve Radius*	DE	DV
Superelevation Rate*	DE	DV
Superelevation Transition*	DV	DV
Maximum Grade*	DE	DV
Stopping Sight Distance (Horizontal and Vertical) *	DE	DV
Cross Slope	DE	DV
Vertical Clearance	DE	DE
Design Loading Structural Capacity	DE	DE
Ramp Acceleration/Deceleration Length*	DV	DV

**Values based on design speeds less than posted. See previous section on Gathering Information and RDM Sections 3.08, 3.09, 3.11.01 for minimum 3R design speeds and 3R standards.*

A draft list of possible DE's and DVs is included in the scoping package for the designer. It is understood that not all design exceptions will be discovered due to the limited amount of information that may be available regarding an existing roadway or structure at the time of scoping

Documenting Design Exceptions and Variances

Scoping Report & Details Worksheet

DE Request Form DE 26

DV Request Form DV26

During the scoping of a project, the DEs and DVs shall be identified and noted on the Scoping Report & Details Worksheet. If there is sufficient information to complete the DE Request Form (DE26) or the DV Request Form (DV26), for any individual item identified, then this should be done, and a draft shall be included in the scoping documentation. Any of the remaining DEs and DVs that cannot be addressed during the scoping phase will be completed during the design phase.

The Design Exception/Variance Approval Process

Initial request and review

The Scoper/Designer initiates the DE request(s) during the scoping of a project or development of the Base Plans (Structure Study for bridge projects). The Project Manager (PM) will review the request and discuss all options with the Scoper/Designer. If merit exists, the PM will discuss all proposed DEs and DVs with the Region System Manager for concurrence or modifications.

Design Exception requests are submitted on Form DE26 and require approval by the Engineer of Design. With the exception of low speed (< 50 mph) vertical clearance, FHWA approval is required for DE elements specifically designated for federal approval in the Project Specific Oversight Agreement (PSOA). DE review and concurrence, with FHWA, should be achieved as soon as possible and official approval no later than at Plan Review.

Similarly, the Design Variance requests are submitted on form DV26. The DV requires only region level review and approval by the Associate Region Engineer, Development (System Manager).

Crash analysis and review

Region and Lansing Geometrics Traffic & Safety Engineers

At this point the PM will request that the TSC T&S Engineer provide a site specific crash analysis. The crash analysis is reviewed with the Region and Lansing Geometrics Engineers. A separate DE/DV is needed for each geometric element requested. The crash analysis must be site specific relative to the location of the geometric element(s) in question.

Completion of DE using Form DE26 – Design Exception Requests and other data

The DE or DV is completed using the latest form (DE26 or DV26) located on the MDOT website. The DE form is submitted in ProjectWise (unsigned) to the Design Exception Coordinator for review and comment. An appropriate preliminary plan (old plans if in scoping phase), profile and/or typical sheet should be included with the DE submittal. The DV form is submitted to the System Manager in ProjectWise.

Ample time must be given for review

Early DE submittal is needed to allow timely review by the Lansing Design Division and the FHWA (on FHWA oversight projects) and to provide follow up information or a re-submittal that may be required. The approved DEs and DVs are required to be included with supporting documents submitted for the Plan Review and FPC meetings in ProjectWise.

Possible Causes of DE or DV Rejection

Additional information on the design exception/variance process and DE26/DV26 form instructions

Approvals of DE or DV requests are not an absolute and should not be expected. Disapproval of a DE or DV request can result from a number of deficiencies in the request. Grounds for rejection can range from insufficient justification to the use of an outdated

request forms. It should be understood that meeting a project letting date is not acceptable justification for a design exception or a design variance and special consideration is not given for requests submitted late in the design process. Additional information on the design exception/variance process is provided in the MDOT Road Design Manual Chapters 3 and 14, and instructions for completing the DE form are available on the MDOT website (DE26 - Design Exception Request Instructions).

Safety Review, Crash Analysis and Road Safety Audit

(revised 6-24-2019)

Source of crash data

A preliminary Safety Review and Crash Analysis is done as part of the scoping process. Further reviews and detailed analysis are completed during the design phase of the project. All projects, except the sealing category of Capital Preventive Maintenance projects, should have a crash analysis and safety review by the TSC Traffic & Safety Engineer. Crash data is available in RoadSoft and is analyzed by each TSC's Traffic & Safety Engineer.

TOR calculation needed

The Safety Program is a means by which MDOT can support the goals of Michigan's Strategic Highway Safety Plan (SHSP). Proposed Safety projects and requesting Safety funding require a Time of Return (TOR) calculation be performed and submitted, usually during the Call For Projects Process. All projects are justified through this cost benefit analysis and typically involve improving safety at high crash locations, crash reduction, reducing fatalities and improving the safety and operational efficiency of the state trunkline system. To ensure equality in the identification of projects throughout the state, the Safety Improvement Program is part of MDOT's Call For Projects.

Road Safety Audits (RSAs) are warranted based on the conditions defined in the Road Safety Audit (RSA) Guidance Document, An RSA is a formal safety performance examination of an existing or future road or bridge project by an independent, multi-disciplinary RSA team. RSAs should be conducted during the scoping process and are highly recommended to be scheduled prior to the Scope Verification meeting and include consideration for all users of the roadway to help achieve strategic safety goals. RSAs contribute to road safety by providing a fresh, unbiased assessment of the area or intersection in an effort to identify potential safety issues and solutions.

Highway Safety Considerations (revised 6-24-2019)

The AASHTO Highway Safety Manual (HSM) provides methods and tools to quantitatively estimate crash frequency and severity for safety related decisions made in the planning, project alternative analysis and program development and evaluation phases. Even

with it's limitations, the HSM is the state of the art tool and can aid in the decision making process. The HSM helps identify areas and possible countermeasures for reducing crashes, potential severity and frequency levels. MDOT is utilizing this capability through its biannual high crash process. Every other Fall each Region receives a high crash list from Safety Programs. Beginning with the Fall of 2012 high crash locations were developed utilizing HSM methods.

HSM analysis is an optional method to document the safety impacts of a design exception or variance. A predictive crash analysis can be completed to demonstrate the future safety impacts of the design exception or variance itself (what will not be provided) as well as the impacts of the proposed countermeasures.

For additional information or training on the HSM methods please contact the MDOT Safety Programs unit or visit http://www.highwaysafetymanual.org.

Permanent Traffic Recorder

Determining whether PTR will need to be replaced

Region and Lansing Planning Staf f

As projects are selected, the locations of any existing Permanent Traffic Recorders (PTRs) should be identified. If it is determined that there should be replacement of existing PTR(s) or new PTR locations within the proposed project limits, costs estimates for these should be included in the project estimates. The decision for new PTR installation should be done after consultation with the Region and Lansing Planning Staff and the Commercial Vehicle Enforcement Plan within each Region. Available funding for the proposed work should be discussed and identified during the project scoping, before moving forward to design.

Seeing where PTRs are located

A map that details the PTR location, including control section and milepoint information, can be provided by each Region's Development Staff and is also available on the Connect MDOT Intranet. A link named Permanent Traffic Recorders is on the Transportation Planning main web page, displaying a map of the PTR information within each region.

For bridge projects, a PTR may be found between bridge piers or near the slope. At these locations, MDOT has loops and/or sensors usually within 20 to 100 feet of the structure.

Traffic Count Request, Timing and Process

(revised 7-18-2016)

Requesting traffic counts

TAR Form 1730

When traffic counts are required (for mobility analysis, pavement design, intersection signal warrants, turn lanes, etc.) and/or requested, fill out the Traffic Analysis Request (TAR) form (Form#1730).

Project Planning Section

The goal of the Project Planning Section is to provide the requested information within 30 days of TAR receipt, depending on data availability. Items such as turning movements and diverted detour traffic will often need a field survey and/or model runs, which require additional time and analysis. A Traffic Call For Projects Committee comprised of staff from the Data Collection Unit (Asset Management), Traffic Analysis Unit (Project Planning), Statewide and Urban Travel Analysis (SUTA) and the Region meet once a year (if needed) to discuss traffic needs. This allows the Data Collection and SUTA areas (for potential model runs on diverted traffic) to schedule/optimize their staff and prioritize their schedule based on the Region's needs. For additional information on how to complete the TAR form see Appendix for the Traffic Analysis Guidelines.

TAR form information

Federal Highway Administration Oversight

Importance of including FHWA oversight in the scoping package

Oversight Matrix

FHWA

Although Federal Highway Administration (FHWA) oversight on a project may not affect the determined fix or the estimated cost for a project, it is information that should be included in the scoping package for the project designer. Inclusion of and coordination with FHWA on federal oversight projects is required. Oversight of projects is determined on a project basis by agreement between the FHWA and the Region System Manager, reviewed on a yearly basis. For many projects, oversight will be defined as in the "Oversight Matrix". Omission of FHWA coordination on pre-determined federal oversight projects can have negative impacts to cost and project schedule.

During the scoping process, any previous discussions or agreements with FHWA should be reviewed and included in the project scoping package and be part of the documentation in the scoping record.

FHWA may be invited to the preliminary scope review, for those projects that are anticipated to be FHWA oversight. Early coordination helps to achieve FHWA concurrence with the scope and any potential DEs. This early concurrence reduces potential scope changes after a project has been selected and proceeds to design.

Hydrology/Hydraulics (revised 6-24-2019)

Culverts

Failure to identify and plan for hydrology and hydraulic issues can be one of the reasons for scope creep during design. Culverts that are undersized or in poor condition, which are not discovered during the scoping process (depending on the proposed project work type) are replaced and or resized during the design of the project, or worse, during the construction of the project. This can

often lead to an increase in project cost related to excavation, soils, peat or muck excavation and maintenance of traffic either in design or construction overruns. Additionally, culvert changes can impact natural resources such as streams, wetlands and floodplains, and require resource agency coordination and possible permits (Michigan Department of Environmental Quality, MDEQ).

As part of the scoping process (depending on the proposed project work type), existing drainage features should be identified and reviewed (actual sizing and analysis to be done during the design phase). Additional existing condition information can be obtained from the TSC or Region Maintenance Coordinators and the information documented on the Culvert Inspection Form (see Chapter 7). Culverts and sewers are reviewed for adequacy of size, length, proper end treatment and condition. An option of videotaping the culverts or sewer system as part of the design may be included in the project scope (if videotaping is recommended, it will be noted in the Scoping Report & Details Worksheet). For road 4R projects, the expected remaining life of the culverts should be considered. For example, if the culverts were placed when the segment of roadway was first built and the roadway is now proposed to be reconstructed, the removal and replacement of culverts may be considered, depending on the condition of the culverts. This could aid in coordinating the projected life span of the culverts with that of the roadway.

Pump Stations

Determining whether pump stations need upgrades or improvements

If pump stations exist within the project limits (depending on the proposed project work type), an inquiry to the Region Maintenance and/or Lansing Transportation Systems Maintenance Operations (TSMO) staff is recommended to determine the need for any upgrades or improvements. If a need has been identified, an estimate is developed during the scoping phase. Funding for the proposed work should be discussed during scoping and determined if there will be additional funds added to the project by other sources (or as a part of existing region template budgets).

Drainage

Determining whether drainage issues are causing impacts

Often, poor pavement condition is the result of poor drainage. Existing ditches should be examined for erosion issues (depending on the proposed project work type), for grades that may be too flat, the need for re-ditching or ditch clean out. If widening is to be included in the project, including ramp extension, the impacts to existing ditches must be considered (including additional ROW that may be required). In addition, grade raises greater than 4" will require a hydraulic analysis to be done. This will provide information and possible design options for drainage that may need to be addressed.

On reconstruction (4R) the drainage system needs to be designed to accommodate the runoff and to meet current standards. In some cases, this may require additional ROW for detention.

State and Federally Regulated Waterways

Determining whether a permit is required

If a culvert within the proposed project limits is part of a county drain, cold water trout stream, state designated waterway, state designated natural river or federally regulated waterway, it should be identified during the scoping process. A federally regulated waterway could include the Great Lakes, rivers, streams, tributaries and/or wetlands that are connected to a navigable waterway. Any proposed work for the culvert and/or ditch, drain, stream or channel may require permitting. For additional information or assistance to determine if a ditch or channel is defined as any of these above, contact the Region Permit Specialist and/or the Environmental Clearance Coordinator (ECC) or use the applicable quadrangle map.

County Drains

Determining whether to coordinate is required

A county drain may require coordination with the County Drain Commissioner. For example, if any of the following exist it may be beneficial to coordinate with the County Drain Commissioner (these issues may be the result of modifications made to the stream by natural or manual factors):

- The downstream drain does not have enough capacity for stormwater
- Debris sources upstream can be eliminated
- Issues or problems exist outside of MDOT Right-of-Way that affect the drain
- Any future plans for modifications or expansion could be coordinated

Flood History

Determining whether there is a history of flooding

If there is a history of flooding within or adjacent to the project limits, an effort should be made during the scoping process to determine the cause of the flooding. TSC Maintenance Coordinators may provide information about flood history. Also high water marks on structures or nearby buildings may indicate a flooding history. Flooding that overtops the roadway may be caused by culverts that are too small, ditches that are blocked (either temporarily or with a permanent obstruction), a lack of capacity of a structure that is part of the ditch or channel or other factors outside the Right-of-Way. If the culvert is the cause, it may need to be replaced. If the cause of flooding is outside of the Right-of-Way, MDOT may have little ability to resolve it.

Culvert Undermining

Cause of culvert undermining

Downstream channel head cutting may cause undermining. Head cutting is the process of a stream bottom elevation dropping along the entire length, starting downstream and working upstream (a downstream grade control may have been removed). If culvert undermining is caused by head cutting, coordination with the maintaining agency may be beneficial.

MDOT has little influence on land use zoning changes affecting upstream watersheds; although signs of changes to land use or water diversion in the upstream watershed may be reviewed at during the scoping process. An MDOT project can address the unstable conditions caused by a development by stabilizing the stream and/or slopes in MDOT right-of-way or by increasing the size of a cross culvert. These are the project improvements that may be recommended (depending on the scope of the project) to address these issues.

Floodplains

Identifying floodplains

FEMA Maps

Can a defined floodplain be identified adjacent to the project limits? Floodplains may appear as the flat area above the stream channel where water is stored during large storm events. Federal Emergency Management Agency (FEMA) floodplain maps may identify some of the larger areas. If there are obstructions, buildings or walls near the channel or within the floodplain area, these may obstruct the flow of water.

Ensuring municipal ordinances are considered

In consideration of the existing condition, the local municipality's ordinances should be reviewed. With floodplain areas within or adjacent to the proposed project limits, there may have to be consideration of balancing the removal and replacement of fill material quantities. This is done to ensure that there is a net zero difference to the high water elevation level, as a result of the project.

Stormwater Best Management Practices (BMP)

(revised 6-24-2019)

The transportation network accumulates contaminants from vehicles, road construction and maintenance. Common contaminants include sediment, oil, polyaromatic hydrocarbons (PAH) grease, deicers and fertilizer.

Water contaminant concerns

These contaminants are washed from the pavement and enter surface water during rain events and snow melts. These pollutants may cause public health concerns, harm aquatic and animal life, lead to excess growth of vegetation and produce unpleasant odors.

Reducing stormwater pollution

Stormwater Mgmt Plan

In response to this issue, MDOT is required to have a current National Pollutant Discharge Elimination System (NPDES) permit to discharge water to a waterbody. MDOT developed a Stormwater Management Plan (SWMP to achieve compliance with this permit). The SWMP is designed to enhance the way MDOT does business so that stormwater pollution is reduced or eliminated. Solutions in the SWMP are as simple as following applicable operational best management practices (BMP), or as complex as building new stormwater management structures.

Six measures to reduce stormwater pollution

The SWMP describes the procedures and practices MDOT uses throughout the planning, design, construction, operation and maintenance of transportation infrastructure to limit the discharge of pollutants from its storm drainage systems. Procedures to comply with each of the six minimum measures stated in the NPDES Permit are reviewed with MDEQ as part of the annual reporting process. The six minimum measures include the following:

- Education and outreach on stormwater impacts- public education program (PEP)
- Public involvement/participation
- Illicit discharge elimination program (IDEP)
- Post construction stormwater management program for new development and redevelopment projects
- Construction stormwater runoff control
- Pollution prevention/good housekeeping for MDOT operations

MDOT utilizes best management practices (BMPs) to minimize pollutants and control runoff from entering waterbodies. They may be structural, or operational in nature.

The post construction stormwater management portion of the SWMP requires that all MDOT projects be reviewed for stormwater impacts. If the project disturbs more than an acre or discharges to a waterbody with an established total maximum daily load (TMDL) of a particular pollutant, post construction Best Management Practices (PC-BMPs) be incorporated, to the maximum extent practicable. Additionally, projects that increase impervious area require PC-BMPs to retain the additional runoff from the newly paved areas.

PC-BMPs cost must be accounted for in estimating a project during the scoping process. A PC-BMP screening tool has been developed to aide in developing cost estimates for stormwater

controls. The latest version of the tool can be found on the Stormwater Program SharePoint site:

https://stateofmichigan.sharepoint.com/sites/mdot/Organizational/development/environmental/SitePages/Stormwater.aspx

Include the results from the PC-BMP screening tool as part of the scoping package.

The Aquatic Resource Specialist and/or Stormwater Program Manager should be consulted on this issue.

Utilities (Public and Private)

Coordinating with local authorities to replace watermain and sanitary sewer

Utility information is important to gather during the scoping process. This is true for both public and private utilities and is especially true for underground utilities. Identifying municipal water and sanitary sewer lines that may need improvement within a similar timeframe as the proposed project will provide early opportunities to coordinate the municipal utility work with the MDOT project. Early identification of potential utility relocations may be critical to the successful completion of the proposed project. Utility companies need adequate time to plan and finance utility relocations, particularly major relocations. A list of potential utility companies and the contact information should be obtained from the TSC Utility Coordinator to facilitate the information gathering activities.

ADA Compliance / MDOT Sidewalk Policy

(revised 6-24-2019)

Accessibility (i.e. curb ramps) is mandated by Act 8, P.A. of 1973. Federal mandates followed this State Law in conjunction with the Americans with Disabilities Act of 1990. The United States Access Board published the Americans with Disabilities Act Accessibility Guidelines (ADAAG) in 1991 and subsequently extended its application to Public Rights of Way in 1994. The Access Board later published the Public Rights of Way Accessibility Guidelines (PROWAG) to address issues specific to public rights of way. See MDOT's Sidewalk Policy and ADA Transition Plan to see what aspects should be considered. On projects that are within local agency jurisdiction, coordination with the local agency's ADA Transition Plan should also be attained.

Curb Ramp Design

Specs for curb ramp design

The design of curb ramps must follow Standard Plan R-28-series. There are limited acceptable exemptions for not constructing a curb ramp on a road construction project, if a sidewalk meets a curb in an obvious crosswalk situation. An "obvious crosswalk situation" would be at a street intersection, regardless of whether or not there are painted crosswalk lines or a traffic signal present. The FHWA requires that, where prepared surface pedestrian routes exist, curb ramp construction or curb ramp upgrades be incorporated with new roadway construction projects as well as alteration / resurfacing. In addition, ADA compliance shall be reviewed for bus stops within the project limits and on-street parking, for 3R, 4R and most CPM projects.

Warrants for Curb Ramps and Curb Ramp Upgrades

The FHWA requires that curb ramp construction and/or curb ramp upgrade be incorporated with new construction and roadway alterations.

- New Construction refers to the initial construction of a new facility.
- Alteration refers to changes that affect or could affect the usability of an existing roadway facility.
- Maintenance refers to routine maintenance activities that do not affect the usability of an existing roadway facility.

Curb Ramp upgrades are not required in conjunction with routine maintenance treatments. Two or more maintenance treatments may be combined and still be considered a maintenance treatment. However, if two or more of those treatments contains aggregate and/or filler, the combination will be considered an alteration.

Examples of Alterations include:

- Reconstruction
- Rehabilitation
- Open-Graded Surface Course (open graded friction course)
- Micro-surfacing (including rut filling)
- Double Chip Seal
- HMA Overlay (regardless of thickness)
- Cape Seal - (Chip seal capped with a slurry seal, micro surfacing or other treatment to fill voids in a chip seal)
- In-Place Asphalt Recycling

Other conditions requiring upgrades include;

- Altered Commercial Driveways
- Independent shared use path crossings

Examples of Maintenance Treatments include;

- Crack Filling and Sealing
- Surface Sealing (liquid sealant)
- Chip Seals
- Slurry Seals
- Fog Sealing
- Joint Crack Seals
- Joint Repairs
- Dowel Retrofit
- Spot High Friction Treatments
- Diamond Grinding
- Pavement Patching

Other operations not requiring curb ramp upgrades include;

- Signing, pavement marking projects
- Guardrail/Safety upgrade projects
- Landscape/Streetscape projects (except where existing sidewalk or curb ramp is altered)
- Independent Utility Work/Maintenance (except where an existing sidewalk or curb ramp is altered or when work is extensive such that an entire cross walk is reconstructed)

More info about curb ramps and detectable warnings

Additional warrants, examples and information on curb ramps and detectable warnings may be found in the MDOT Road Design Manual Section 6.08.05 and Standard Plan R-28-series and Bridge Design Manual Section 7.02.27 and 12.01.01.

Sidewalk

Sidewalk requests from cities, villages, and townships

Sidewalks will seldom be constructed retroactively, but will predominately be coordinated and constructed in conjunction with ongoing road or bridge work. For projects where a reasonable expectation of need cannot be determined at the time of design or over the design life of the project, the city or village shall be allowed to construct sidewalks in MDOT right-of way with their Act 51 or other funds, provided they sign an agreement as described below. Where there is a request or a demonstrated need for a sidewalk along a trunkline in a township, MDOT should work with the township to enter into an agreement as described below, prior to sidewalk construction. For more information see the Road Design Manual section 6.08.01

The local agency or MDOT can pursue grants or other federal funding to pay for sidewalks or non-motorized facilities. These grants can be coordinated with proposed projects or be developed as stand alone projects, such as streetscaping or aesthetic projects. The planning for and construction of sidewalks or non-motorized facilities shall be done per the specifications, guidelines and/or MDOT policies.

Sidewalk Maintenance

Agreements needed before sidewalks can be built

The sidewalk and curb ramp maintenance shall be the responsibility of the local unit of government, including liability, removal of debris, snow and ice and replacement of damaged segments. Any sidewalk construction shall be contingent on a written agreement that addresses ownership, liability and future maintenance. This agreement must be signed by the local agency prior to construction and the need for such an agreement shall be noted in the scoping documents.

Constraints to Meeting ADA Requirements

In situations where it is impracticable to fully achieve the current ADA requirements, either due to the scope of work proposed or due to physical barriers (such as buildings), these situations will need to be reviewed on a case-by-case basis. MDOT will need to document justification and determination of practicable compliance. This justification and determination is documented and signed on form 0370 and becomes part of the permanent project file. On FHWA oversight projects, FHWA would have to be in concurrence and approval by Plan Review.

Environmental Clearance Process (revised 6-24-2019)

Analyzing projects for environmental impact

Every project must be analyzed for environmental impacts and an environmental clearance obtained through the National Environmental Policy Act (NEPA) process before the funding is released. The depth of analysis of a project is determined by the severity of its impact upon the environment, not by the size of the project. It is possible to have a small project which has such severe impacts that extensive analysis is required. Conversely, it is possible to have a very large project which has very little impact and which requires relatively little analysis. In general, large and complex projects often require more analysis than small, simple projects, but it should be kept in mind that this is a coincidental connection, not a procedural one. The environmental clearance process is coordinated through the MDOT BTP/Environmental Section.

The Environmental Clearance Coordinator (ECC) in the Environmental Section assigned to your Region should be contacted during the scoping process and invited to attend van tours of the project, as indicated in Chapter 9 in this manual. Early coordination, especially when known resources exist (e.g. a wetland, stream, or historic property), can help to streamline the environmental classification and certification processes.

Three types of environmental analysis: CE, EA and EIS

There are three levels of environmental analysis: Categorical Exclusion (CE), Environmental Assessment (EA) and Environmental Impact Statement (EIS). Typically the R&R, CPM, Bridge and T&S templates (Call For Project Templates) are classified as CE, while the Capacity Improvement and New Roads templates will fall into either an EA or an EIS category.

The effects of the various environmental impacts can and should be mitigated by a thoughtful design process, which begins with the scoping of the project. This principle is intended to produce highways that are safe and efficient for all legal users, acceptable to non-users and are in harmony with the environment.

The two components of the Environmental Clearance process are *Environmental Classification* and *Environmental Certification*.

Environmental Classification

The *Environmental Classification* is the classification of a project as a Class I, Class II or a Class III Action, as defined under the NEPA. These are defined as:

- **Class I** - Environmental Impact Statement (EIS); for projects with significant environmental impacts, typically for new roadways or major expansions of existing state trunklines.

- **Class II** - Categorical Exclusion (CE); projects without significant environmental impacts, either individually or cumulatively, unless there are unusual circumstances. Most road and bridge rehabilitation, reconstruction, and CPM projects are Class II.

- **Class III** - Environmental Assessment (EA); Projects with unusual circumstances or in which the significance of environmental impacts is not clearly established. If through the EA process, significant impacts are found, the project may require an EIS (Class I). Generally, this Class applies to capacity improvement projects within existing state-owned right-of-way or sometimes major reconstruction projects, depending on the expected impacts and removal of historic bridges.

Environmental Classification is made cooperatively with the MDOT Environmental Section, to ensure compliance with state and federal environmental laws and regulations.

Importance of correctly determining project footprint from project beginning

This classification is determined at the beginning of project development using the best available information. During the scoping process it is very important to identify the required footprint of the proposed project to allow the classification to be as accurate as possible. Classification is done between the Scope Verification Meeting and the Base Plan Meeting. This allows the

project to proceed to final design and the required real estate to be purchased. This identification process is very important to complete, based on the strategy the project is scoped for. If there are changes in the design phase, the Environmental Clearance process may have to start over, causing delay to the project schedule and impacts to the project.

Environmental Certification

The *Environmental Certification* is the action that identifies that the mitigation measures are addressed, to allow a project to proceed to construction. Environmental Certification will verify that the project has been correctly classified, to verify all mitigation measures have been included and to verify all identified constraints have been avoided.

Using past EIS and EA documents is helpful

Information from previously completed and approved EIS or EA documents and the review of any previous engineering reports will also be helpful in the scoping process. General scope information provided in the completed EA or EIS should be used as a baseline, to perform the detailed scoping of the project work. The completed EA/EIS will also provide information about the projects constraints which need to be accounted for.

If the scoping footprint exceeds the footprint of what was previously cleared in the EA/EIS, discussions with MDOT BTP/Environmental Section will be needed to determine implications to the environmental clearance.

Title VI Requirements

Title VI of the Civil Rights Act of 1964 is the Federal law that protects individuals from discrimination on the basis of their race, color, or national origin in programs that receive Federal financial assistance.

Title VI requirements should be considered in scoping projects. Under Title VI MDOT will not locate or design a highway in a manner that requires the relocation of individuals, nor deny reasonable access or use to any person, on the basis of race, color, national origin or sex. It is not known at the time of scoping whether Federal financial assistance will or will not apply to the project, therefore Title VI should be considered when scoping all projects.

Title VI requirements and Environmental Justice guidelines will be complied with during the scoping process. MDOT will scope highway projects in a manner that will not discriminate, displace or deny reasonable access to any person, on the basis of race, color, national origin or sex.

Although the requirements of Title VI need to be considered when scoping any project, Title VI will come into play most likely on Capacity Improvement or New Road projects. For assistance on issues that may be related to Title VI contact the Region Planner.

Context Sensitive Solutions (revised 6-24-2019)

Consideration of scenic, historic, aesthetic, multi-modal, cultural and local issues

MDOT utilizes the adopted FHWA definition for Context Sensitive Solutions (CSS):

A collaborative, interdisciplinary approach that involves stakeholders to develop a transportation facility that fits its physical setting and preserves scenic, aesthetic, historic, and environmental resources, while maintaining safety and mobility.

Per the FHWA published guide, "Flexibility in Highway Design", consideration of the scenic, historic, aesthetic, non-motorized/multi-modal needs and other cultural values, as well as coordination with other local projects, is promoted along with the traditional safety and mobility goals.

MDOT has utilized a CSS approach to project development for many years. Though the term CSS was not initially used, MDOT has practiced many of its principles prior to the establishment of its nomenclature. Since the early 2000s, MDOT has embraced the full principles of CSS, and has done so on every project regardless of scale or type per the STC policy of 2005. The decentralized organizational structure is very supportive of CSS as the multiple Transportation Service Center offices put MDOT closer to customers and make it easier to gain input and to understand the local needs.

The purpose of this section, in combination with the Guidelines For Stakeholder Engagement, is to provide the tools necessary to consistently apply CSS in the program and project development. It also provides staff information to help better understand the definition of stakeholder engagement (see below) and its application to specific types of projects. It should be noted that MDOT retains decision making responsibility and that costs beyond the scope of the proposed project should be provided through other sources, such as local agencies, developers, foundations, the federal Transportation Alternatives Program (TAP) program or other non-traditional public sources.

Instances where funding is from other sources

Stakeholder Engagement (revised 6-24-2019)

Value of stakeholder engagement

Stakeholder engagement is one of the Key Fundamentals of CSS. There are many good reasons to seek stakeholder input, including minimizing late changes to projects, developing partnerships, better customer service, timely conflict resolution, incorporation of multi-modal considerations and projects with an improved community fit. Stakeholder input is valuable information that will improve the project. The goal is to have a plan, put into place a genuine dialogue, keep things moving and be flexible

For more information please reference MDOT Guidelines for Stakeholder Engagement.

Items that May Be Considered When Scoping Some Projects (revised 6-24-2019)

While scoping a project, it is very important to understand the bigger picture. How does this project impact future projects? Will it impact the community other than just the construction? Will there be environmental impacts? Keeping this in mind, there are items that may need to be analyzed based on the scope, work type or strategy being used. Based on the issues mentioned above, there may be work that should be avoided or not constructed and a design exception or variance may be appropriate. An important factor in scoping a project is the complete documentation of decisions that relate to the project scope.

Geometric Considerations (revised 6-24-2019)

During the scoping process various geometric elements must be reviewed to determine if the current standards or guidelines are met (depending on the proposed project work type). If a particular element does not meet the current standard or guideline, can it be upgraded to meet the requirements as part of the proposed project or will a design exception or design variance be required? Some of the horizontal items to review include minimum radius, stopping sight distance/horizontal sight offset, maximum rollover between pavement and shoulder cross slope, maximum rollover between pavement cross slope, and parabolic crowns. Vertical alignment items to review include maximum percent grade, stopping sight distance, and K value for both crest and sag vertical curves. Chapter 3 of the MDOT Road Design Manual is an excellent reference source for details on each of these elements.

Horizontal and vertical elements to review

Important considerations when the road profile is raised or lowered 4 inches or more

On projects proposing to raise or lower the profile four inches or more, a hydraulic analysis will be required. In addition, it is important to consider items outside the roadway that may be impacted by the proposed change. Impacts to drainage patterns, depth of fill over culverts or sewers, Right of Way, potential impacts to utilities, natural and cultural environmental impacts, etc. should all be discussed and addressed as necessary. Refer to section 2.9.11.1 of the MDOT Drainage Manual for more details on the hydraulic requirements when the roadway grade is raised four inches or more.

Some stakeholders, such as the local agency within the project limits, have been requesting lane reductions or "road diets" which will reduce capacity, by eliminating lanes. Consideration should be given for the accommodation of all legal users of the roadway. It is extremely important that a capacity analysis is done and the future use of the facility is determined. If the project proposes reduction in lane and pavement width, federal funds could be jeopardized. The decision shall be documented with the analysis showing the existing and future facility can handle the projected traffic and review of the Engineering Operations Committee (EOC) is required. Also see “Other Strategies” in Chapter 3.

Right Of Way Considerations

Determining the existing ROW

Right of Way (ROW) Map Books (updated ROW plansheets are on the MDOT website) should be reviewed to determine the existing ROW for the proposed project. In addition the Statewide ROW maps may be available in ProjectWise, under Reference Documents. Depending on the existing ROW width and the proposed fix, additional ROW may be required to construct the project. The ROW impacts and an estimate of cost for the projects should be included in the scope.

http://mdotcf.state.mi.us/public/ROWFiles/index.cfm

ROW impacts commonly include proposed ROW (to be purchased in fee or easement), grading permits, driveway permits, sidewalk permits and drainage easements. The Region Real Estate staff should be consulted with to estimate the cost of ROW needed for the scoping estimate. Additionally, ROW impacts can change the Environmental Classification of the project and should be identified early to maintain project schedule and budget.

Floodplain, Stream and/or Wetland Mitigation

Road widening in a floodplain or wetland

If a project will involve significant widening in floodplain and/or wetland locations, a review and analysis of the impacts needs to be done during the scoping process to determine if mitigation will be required. Mitigation can be done onsite, offsite at a newly determined location, or may be done at a preexisting wetland bank site. The cost of the mitigation will need to be included in the project scoping estimate. The Region Permit Coordinator and/or Lansing Environmental Section should be consulted with on this issue.

If a project will involve physical impact to a regulated watercourse, an Inland Lakes and Streams (Part 301) permit will be required. The cost for the permit requirements will need to be included in the project scoping budget. Steam Mitigation includes either a new stream enclosure (culvert) greater than 100 feet in length or stream relocation. For either of these items include 3% if construction cost < $1,000,000 or $100,000 if project cost > $1,000,000 for the permit requirements. The Region Permit Coordinator and/or Lansing Environmental Section should be consulted with on this issue.

FAA Obstruction Evaluation (section added 8-17-2015)

FAA notification of construction

Federal regulation (14 CFR Part 77.9) requires notification with the FAA (Federal Aviation Administration) when construction alteration or activity is planned in a zone that may impact aircraft flight operations. This may include change in grades, structure elevations, lighting, towers, crane heights, etc. A determination as to whether a notification is required can be made using a "Notice Criteria Tool" available on the FAA Obstruction Evaluation/Airspace Analysis web site. More information regarding this requirement is also available in section 14.17 of the Road Design Manual.

Life Cycle Cost Analysis

When a Life Cycle Cost Analysis is needed

A Life Cycle Cost Analysis (LCCA) will be completed for all projects where the estimated cost for mainline pavement, either concrete or HMA, exceeds one million dollars. Although the LCCA occurs early in the design phase, the scoping package should identify and document projects where the estimated pavement costs exceed one million dollars. The engineer should discuss with the System Manager which cost should be used in the estimate (HMA or concrete).

Value Engineering (revised 6-24-2019)

When to use value engineering and what it does

Value Engineering (VE) is a systematic multi-disciplined team review of function, cost and worth of the design elements that occurs when the design plans are approximately 30% complete. The VE review identifies where these design elements appear to be out of balance and develops alternatives to increase value (or decrease cost) in a product or service by accomplishing the same function more effectively. A VE review is required for a single project or a group of projects in a corridor (to be built over a number of years) with an individual or group total project cost of $25 million or greater. A VE review might encompass a longer corridor of similar work, but only the projects for which there are design plans (or sufficient scoping information) available will receive VE credit. Projects that require VE activities also require FHWA approval.

For bridges, the new federal regulations require a VE study on a "bridge projects" if its cost is $20 million or greater. These costs include the total costs of EPE, PE, ROW and CE. It is recommended to include projects of single structures of $16 million and road projects of $20 million in construction costs. This will ensure that projects will not be missed and allow for inflation or project increases.

Who must identify projects requiring a VE review

The MDOT Statewide VE Coordinator requests that the Region System Managers identify potential projects (Road, Bridge, Capacity Improvement, New Roads and Safety) that may require a VE review. Region System Managers are also responsible for coordinating with adjacent Regions for projects that extend to the boundary of the Region. Project identification can occur year round; however the project and larger corridor identification is generally done soon after the approval of the Call For Projects, usually in July. Job numbers for identified VE projects are sent to the VE Statewide Coordinator in the Design Division. Typically the VE coordinator will assure the VE study gets completed, whether done by consultants or in house; facilitates all decision meetings or communications and reports VE activity to the FHWA.

Identifying projects to be packaged together

During the scoping process it is important to identify the cost (depending on the proposed project work type) and if there is intent for projects to be packaged together. This will assist in the determination of potential VE candidates. Any proposed packaging should be identified on the "Scoping Report and Details Worksheet".

As the project moves into the Design Phase, there are thresholds used to identify and plan for potential candidate VE projects. This is done to avoid a project being delayed because it was over the $25m threshold late in the design phase. Projects may be added to the candidate list if project budgets increase, or are removed from this list if the budgets decreases or does not exceed required VE amounts. The following values are used to plan for the VE activity and will be reviewed on an annual basis:

Identifying projects which need VE

- Road Project with Construction Costs ≥ $18m
- Bridge Projects with Construction Costs ≥ $16m
- Corridor of Road Projects ≥ $25m
- Corridor of Bridge Projects ≥ $20m

It should be noted that VEs are mandatory on projects on the Federal-Aid system that equal or exceed the $25 million and/or $20 million for a bridge project, in order to receive federal funding for construction. For further information regarding the VE process see Section 14.27 in the Road Design Manual.

Corridor Coordination (revised 6-24-2019)

What corridor coordination is and why it is valuable

Corridor Coordination refers to the planning of multiple projects or series of projects on a given roadway to maximize efficient use of funds, ensure projects fit together, reduce mobility impacts and maintain the long term goal for the future needs of the corridor. Coordination of projects should not only be limited to MDOT projects, but also to local, city and county projects (as well as long term plans). Planning a series of projects along a roadway can minimize rework and impacts to the motoring public. If a series of adjacent projects is planned, project coordination can also give the motoring public a break in disruption if the projects alternate years, without losing sight of the long term vision for the corridor.

Where corridor coordination is most likely to be useful

A Corridor of Highest Significance is defined as a roadway which links multiple activity centers where population, employment, tourism, transportation and other economically important activities are concentrated. Corridors can be of local, regional, statewide, national or significance depending on what geographic areas they serve. These corridors provide the foundation for Michigan's economy and MDOT continues to focus investments that rebuild and modernize these roadways and the transportation facilities within them.

Reference the State Long-Range Transportation Plan (MI Transportation Plan) for additional information.

Template Coordination

Instances in which additional funding may be available for a project

While a proposed project may fall into one funding template ie (Road R&R), it is possible that different aspects of the project may fall under a different funding template (an intersection within the project limits may be eligible for funding from the T&S template). It is this type of template coordination which must be considered during the scoping process. In doing this, additional funding may be available for a project as different templates have different budgets.

Maintenance Coordination

Maintenance issues

During the scoping process, coordination should be done with the Region Maintenance staff to learn if there are any recurring maintenance issues or concerns that should be addressed in the scoping package (depending on the proposed project work type). These issues may be related to drainage (including sewer or culvert issues), soil erosion, isolated pavement failure(s), etc. Document and record maintenance issues in the scoping documentation.

As a result of the information shared, it may be beneficial for the Maintenance staff to develop a plan to assist in removing trees, brush and encroachments from the clear zones. If this is a consistent work item, it will assist in the development of projects and the impacts that can be avoided in the design process of projects.

Post Construction Reviews

Learning from past projects

TSC Delivery staff is a valuable resource that should be utilized during the scoping process. Staff can share lessons learned from previous projects that may have had construction impacts, which is useful information for the projects being scoped. Ideas on what works versus what does not work should be shared among the construction staff, designers and persons developing the scopes. Construction staff may also have knowledge of specific issues or concerns with certain roadways or bridges that should be considered during the scoping process. As with all information, construction input should be documented and recorded in the scoping document along with ideas or discussions of potential fixes.

Post Construction meetings that are held for projects should include the individuals that did the original scoping and estimating, whenever possible. This will provide valuable feedback and knowledge for future scoping efforts.

Special Provision Requirements

When a Special Provision may be required

During the scoping process any items of work that are unique and require a Special Provision should be identified. Depending on the type of work, a specialist in the area may need to be consulted during the scoping phase to determine if the proposed work is feasible.

Pure Michigan Byways (revised 6-24-2019)

The Heritage Route Program was created by legislation in 1993. The program emphasizes cooperation with government officials to preserve unique scenic, historic or recreational highways. The Heritage Route Program is a grass roots program, requiring involvement by local residents to ensure that their highway and its roadsides remain in their natural and unspoiled conditions. Michigan's residents have an opportunity as individuals, groups or entire communities to become involved in this important effort to preserve Michigan's roadsides with scenic, historic and/or recreational qualities.

There are three categories of heritage routes: scenic - a state highway having outstanding natural beauty; historic - a state highway having outstanding historic buildings, and resources along its length; and recreational - maintained not only to serve the recreational driver, but also to capture that recreational setting of the facility or area itself, and set the mood for the recreational experience. MDOT is responsible for designating (through a designated process) state heritage routes.

During the scoping process it is important to determine if the project, or a portion of the project, is a designated Heritage Route. This can be done by contacting the Bureau of Transportation Planning. If the proposed project contains a Heritage Route, coordination with the local Heritage Route committees should take place.

Access Management (revised 6-24-2019)

Access Management is an effort to maintain efficient traffic flow, preserve the roadway's capacity and maintain safety (while maintaining reasonable access to land uses), by the planning and placement of access points (i.e. driveways, development approaches, etc.).

What access management achieves

Access management is a set of proven techniques that assist with the following (depending on the proposed project work type):

- Reduce the number of crashes and improve safety by reducing potential conflict points
- Reduce traffic congestion

- Preserve the flow of traffic
- Preserve the public investment in roads
- Enhance the value of private land development

Examples of poor access management

Poor access management is most obvious along major free-access roads that have concentrated commercial development and access points. Along these routes, many separate driveways may be located too close to one another or where drives are close to intersections. This raises safety concerns for all legal users and impedes the flow of traffic. To address this, MDOT seeks to promote an understanding of access management and to improve state and local coordination.

Ways to improve access management

Issues that can provide access management opportunities are:

- All road agencies need to be notified of local rezoning or changes in land use along the trunklines
- Local site plan review and approval processes should include all responsible road agencies
- Applications for driveway permits should be reviewed by road agencies prior to the site plan approval
- Roadway reconstruction and resurfacing projects need to adequately address access issues
- Access management education could enlighten local government officials about traffic impacts that result from local land use decisions

Best time to identify and solve access issues

The scoping process is the time to identify potential opportunities for improved access management with a review of existing driveway spacing, configuration and the number of driveways per property.

Funding for access management

Opportunities may exist for the proposed project to close un-needed driveways, combine and/or reconfigure existing driveways, while maintaining adequate access to the business or residence and improving safety for the roadway. Funding for access management improvements should include financial partnerships with local agencies and property owners.

Operations and Mobility - Current Michigan Transportation Plan Goals (revised 6-24-2019)

MDOT's long-range goals

The goals in MDOT's current long-range plan were developed with the help of a Customers and Providers Committee working with MDOT staff to review and reassess the goals of the current state long-range plan. Changes were developed in a cooperative effort and represented the consensus of the group around eight core goal areas:

- **Preservation** - Within the constraints of state and federal law, direct investment in existing transportation systems to effectively provide safety, mobility, access, and intermodal connectivity or support economic activity and the viability of

older communities and ensure that the facilities and services continue to fulfill their intended functions.

- **Safety** - Promote the safety and security of the transportation system for all legal users and passengers, pedestrians, and motorized and non-motorized vehicles.
- **Basic Mobility** - Work with the general public, public agencies and private sector organizations to ensure basic mobility for all Michigan citizens whether they move via motorized or non-motorized means by (at a minimum) providing safe, effective, efficient and economical access to employment, educational opportunities and essential services.
- **Strengthening the State's Economy** - Provide transportation infrastructure and services that strengthen the economy and competitive position of Michigan and its regions for the 21st Century.
- **Transportation Services Coordination** - Create incentives for coordination between public officials, private interests and transportation agencies to improve safety, enhance or consolidate services, strengthen intermodal connectivity and maximize the effectiveness of investment for all modes by encouraging regional solutions to regional transportation problems.
- **Intermodalism** - Improve intermodal connections to provide seamless transportation for both people and products to and throughout Michigan.
- **Environment and Aesthetics** - Provide transportation systems that are environmentally responsible and aesthetically pleasing.
- **Land Use Coordination** - Coordinate local land use planning, transportation planning and development to maximize the use of the existing infrastructure, increase the effectiveness of investment and retain or enhance the vitality of the local community.

MDOT is committed to achieving the aims represented by these goals. While some are readily achieved by MDOT acting in its own areas of responsibility, others require the action and cooperation of other agencies.

Other Funding Sources

A variety of funding sources exist for specific features or aspects of a project. During scoping of a project, these various funding sources should be considered when estimating the cost of proposed improvements and the source of money these improvements may be funded by.

Transportation Economic Development Fund -- Category A

Funds to encourage economic growth in target industries

Transportation Economic Development Fund (TEDF) Category A was created to assist in the funding of highway, road and street projects necessary to support economic growth for target industries. MDOT, County Road Commissions, Cities and Villages are eligible to receive funding. Eligible projects must show a relationship between the transportation project and the development's transportation need. Contact the TEDF at 517-335-1069 to discuss potential projects with the Grant Coordinator assigned to your Region.

Transportation Alternative Program (revised 12-19-2016)

Funds for bike paths, streetscapes and historic transportation buildings

The Transportation Alternative Program (TAP) is a competitive program that funds specific projects that enhance the intermodal transportation system and proves safe alternative transportation options. Eligible activities include:

- Facilities for pedestrians and bicyclists, including traffic-calming and other safety improvements
- Safe routes for non-drivers
- Conversion and use of abandoned railroad corridors for trails
- Turnouts, overlooks and viewing areas
- Historic preservation and rehabilitation of historic transportation facilities
- Inventory, control, or removal of outdoor advertising
- Vegetation management practices in transportation rights of way
- Archaeological activities
- Environmental mitigation activities
- Boulevards in the right of way of former interstates or other divided highways

Eligible applicants include county road commissions, cities, villages, regional transportation authorities, transit agencies, state and federal natural resource or public land agencies, nonprofits responsible for the administration of local transportation safety programs, and tribal governments. MDOT may partner with a local agency to apply for funding and implement the project. Other organizations, such as townships or trail groups, may work with an eligible agency to apply.

TAP funding requires matching funds of at least 20 percent of the eligible project cost. Additional consideration is given to projects whose match exceeds the minimum required.

Contact the TAP grant coordinator at 517-335-1069 to discuss potential projects with the grant coordinator assigned to your region.

Congestion Mitigation & Air Quality

Funds to reduce emissions and improve air quality

Congestion Mitigation & Air Quality (CMAQ) funds are available for projects that will reduce emissions and improve the air quality (in designated areas, referred to as "non-attainment or attainment-maintenance areas". CMAQ funded projects generally include turning lane improvements, carpool lots, freeway ramp improvements, traffic signal upgrades or ITS.

Federal, Local and Other Sources

Funding from local agencies, developers, foundations and other state and federal non-transportation funding sources should be pursued (often by the impacted local community) for the construction and maintenance of items beyond the scope of the MDOT project.

Safe Routes to School

Funds to enable and encourage children to walk and bike to school

Safe Routes to School (SR2S) began as an international movement to make it safe, convenient and fun for children to bicycle and walk to school and to help ease traffic congestion and air pollution near schools. The Federal SR2S program, for students in grades K through 8, was created within SAFETEA-LU with limited funding to accomplish both infrastructure and non-infrastructure activities.

In Michigan, a school-based planning process must be completed as a prerequisite for federal funding eligibility. The SR2S planning process takes approximately one school year to accomplish and involves a diverse stakeholder group, including students, parents, school and local officials, and representation from all road agencies with jurisdiction over roads used or crossed by students. The resultant SR2S Action Plan lists strategies and actions expected to encourage more students to walk and bicycle to school and to increase the safety of all students walking and bicycling between home and school.

For MDOT project development, discussions with schools serving grades K through 8 about their participation in the SR2S program and the routes used by students to walk and bicycle should provide information regarding potential SR2S infrastructure improvements that should be considered when scoping a project. Typical infrastructure project components include:

- Sidewalks
- Traffic calming and speed reduction
- Pedestrian and bicycle crossing improvements
- On-street and off-street bicycle facilities
- Off-street pedestrian facilities
- Traffic diversion improvements in the vicinity of schools

The SR2S program is administered by the MDOT Office of Economic Development (OED). Call 517-335-1069 for information about the program.

Elderly Mobility

As the population ages in Michigan, the design of our transportation system must take into consideration the aging population. Older drivers can benefit from some simple changes in the design of our roadways. For example, the use of six inch edge lines for pavement markings, Clearview font on sign legends and the use of a box span design for traffic signals.

As part of the scoping process, the existing signs should be reviewed for visibility and compliance with the Clearview font. The TSC T&S engineer may check with MDOT Lansing T&S to determine when the signing on a stretch of roadway was last updated or to see if a signing contract is planned for the roadway corridor. All traffic signals that are impacted by the project will need to be redesigned to a box span layout.

Use of rumble strips on freeways

Rumble Strips (revised 6-24-2019)

Corrugations (also known as rumble strips) provide a visual and audible warning to a driver that their vehicle is either straying off the road or encroaching toward an oncoming lane of traffic. Shoulder corrugations also discourage the unauthorized use of the shoulder as a driving lane.

Freeway shoulder corrugations should be used in both the median and the outside shoulders which have a width of at least 4'. Corrugations are to be included on freeway-to-freeway ramps except for loop ramps but are otherwise not to be used on freeway exit/entrance ramp shoulders. Corrugations are also omitted where the shoulder is separated from the traveled lanes by a curb and gutter or valley gutter. See RDM 6.05.11

Use of rumble strips on non-freeways

Non-freeway shoulder corrugations should be used on all rural, 2-lane, 4-lane, and divided trunk line roadways where the posted speed is 55 mph and the paved shoulder is at least 6' wide.

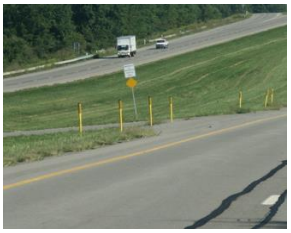
Where to use centerline rumble strips

Centerline corrugations should be used on all rural 2-lane and 4-lane trunk line roadways (in both passing and non-passing zones) where the posted speed is 55 mph and the lane plus paved shoulder width beyond the centerline corrugation is greater than 13' in width.

If safety concerns outweigh other issues such as noise and bicycle use, non-freeway shoulder and centerline corrugations can be considered for use on roadways that do not meet the criteria given above. If a project calls for placing shoulder rumble strips on a paved shoulder less than six foot in width, the State Non-motorized Coordinator must be contacted in advance of this proposed work. This is done to ensure the designation of the shoulder and if there was any funding used for non-motorized uses.

See Section 6.05.11 of the Road design Manual and Standard Plan R-112-Series for additional information.

Maintenance Crossovers (revised 6-24-2019)



If maintenance crossovers exist within the project limits of a freeway project (depending on the proposed project work type), their location should be compared to the guidelines in Chapter 12.09 of the MDOT Road Design Manual. Existing crossovers may need relocation or removal according to the current guidelines. If it is necessary to relocate the crossovers, the Region Permit Coordinator should be consulted to verify that the median does not have existing wetlands or support any endangered species, which may override the need to relocate the maintenance crossovers. When constructing new or eliminating existing crossovers, additional consideration should also be given for specific requests from local emergency response providers.

If the maintenance crossovers are located near ramps that will be extended to meet current guidelines, then the location of the crossovers should be compared to the proposed limits of the ramps.

These items shall be estimated and included in the scope.

Use of Consultants (revised 6-24-2019)

There are times when it becomes advantageous to hire consultants to assist with the scoping process, including the Call For Projects, or the design phase of a project. The need to hire consultants to assist with the scoping process or design phase may be driven by current staff workloads, time constraints, experience level of available staff or complexity of the task. The process to hire consultants may possibly take up to six months and will not relieve the MDOT staff of all responsibilities, as the staff will be responsible for the management of the consultant. The decision to hire consultants must be well thought out and planned accordingly.

The process for hiring consultants is described in Chapter 10 of this manual.

Items to Be Considered When Scoping Bridge Projects (revised 6-24-2019)

In addition to reviewing the items discussed earlier in this chapter, the following pages discuss the items which should be reviewed as part of scoping a bridge project. The NBI condition ratings and Pontis element condition ratings, discussed in earlier chapters of this manual, are most often reported as a result of the routine bridge inspection, which is primarily a visual inspection. The NBI and Pontis ratings are valuable to network bridge management and general determination of what bridges should be scoped, but in order to determine the proper fix type for a bridge, a detailed bridge inspection is needed. Each bridge and its surroundings must be visited by the scoping team. The purpose of this visit is to locate all areas of deterioration, determine feasible repair options and to compute quantities. Where necessary, high-reach equipment or an under bridge inspection crane (Michigan Structure Inspection Manual) (that will allow under the bridge inspection, from the top/deck of the bridge) must be used to get close enough to inspect the structural components.

A detailed bridge scope consists of a Site Review and Determining Repair Options. In situations where the deck, superstructure or entire bridge is beyond repair, as judged by visual indications, or where the appropriate repair option is clearly indicated, the detailed scoping inspection (site review) can be scaled back. For example, if the deck is spalled on the surface and underside to the point where deck replacement is imminent, there is no need to sound the deck for delaminations. The other bridge elements however, should still be evaluated. Likewise, when scoping for some types of CSM projects, the detailed scope may only look at the specific CSM needs of a bridge or a group of bridges, however, the scoper is always encouraged to look for unexpected deterioration.

Field Site Review (revised 6-24-2019)

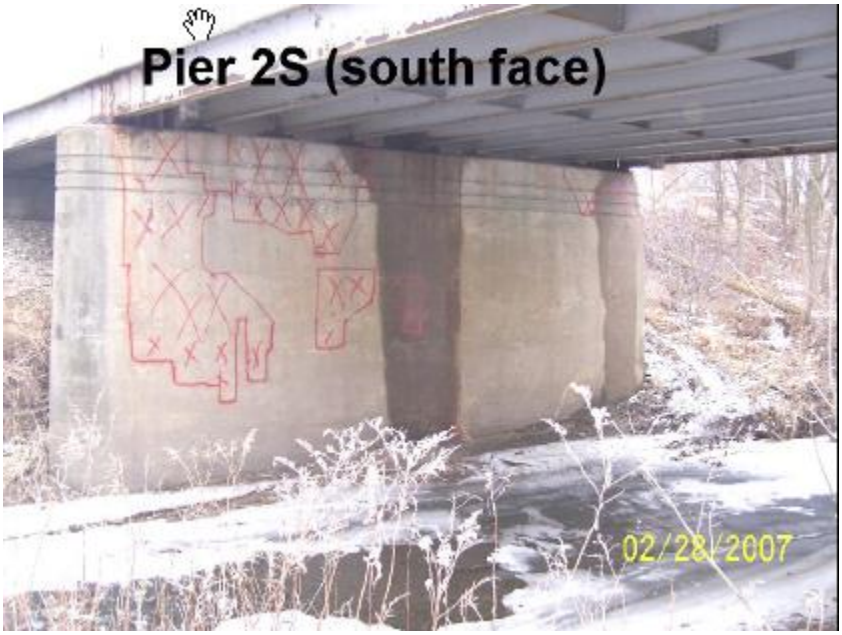
The information collected in the field must be sufficient to determine quantities and locations of repairs and improvements. It is important to take the most current Bridge Inspection Form (Form 2502) in the field for this detailed inspection. This information must be detailed on the Bridge Scoping Report & Details Worksheet and other applicable reports and/or forms. Some of these forms may include, Detailed Beam Survey Report (Form 0267), Beam End Thickness Table, Structure Inventory & Appraisal Sheet (Form 1717A) and any other applicable forms. These forms may be obtained on the MDOT website. Also refer to the Appendix of this manual for sample copies of these forms.

The following paragraphs describe the items and work that

should be completed during the site review of the bridge.

Sound all concrete elements (deck surface and underside, superstructure, substructure, etc.) for delaminations and unsound areas. All delaminated areas are to be marked with chalk, spray chalk, crayon or kiel, that will be visible (i.e. orange, pink, yellow, etc.) in the photographs. All delamination surveys are part of the site review work (not part of testing). Sketches of the deck and substructure units mapping the areas of delamination and cracking are to be included in the appendix of the scoping report. Percent of total surface area delaminations shall be calculated and shown on the sketches. The following figure (6-2) shows after sounding with a hammer, delaminations are marked on the pier wall.

Figure 6-2: Shows after sounding, delaminations are marked on Pier wall



The underside of the deck must be visually inspected for wet areas, efflorescence, transverse cracking, longitudinal cracking, map cracking, delaminations, spalling, rust along beam edges or any other evidence of deterioration. The type of cracking and severity must be described, in detail in the report. Note areas of previous repairs or where false decking is in place. Photos of the area must be taken with a written description of the deterioration and locations documented and included in the report.

Visually inspect all substructure units for signs of settlement, lateral movement, cracking, spalling, exposed reinforcement and material defects. Note the condition of the backwalls and check the bridge seat for undermining at bearing locations. In addition, check for flexural cracks and shear cracks on all pier caps.

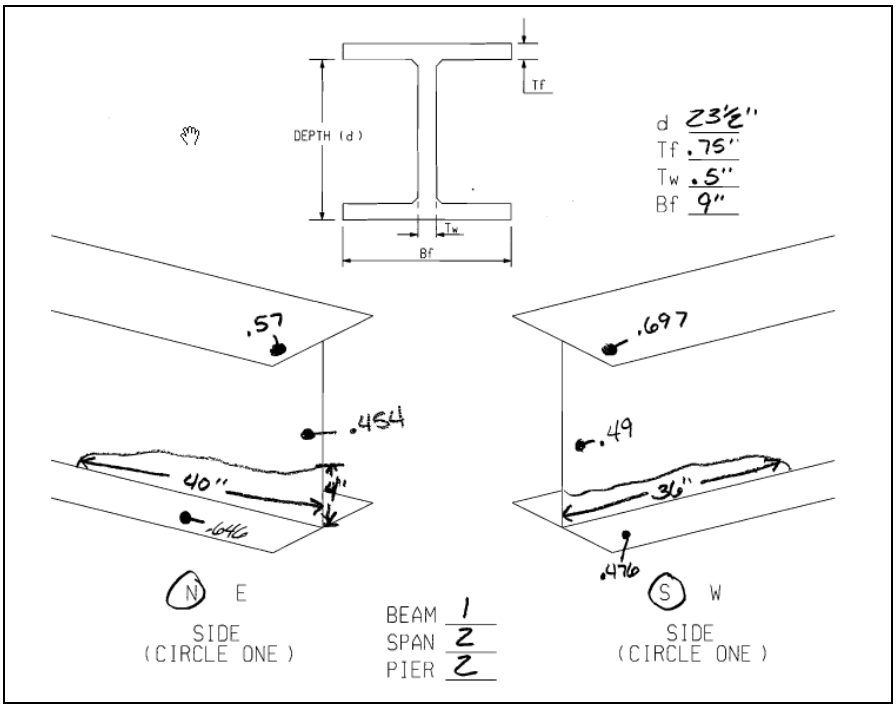
Note the type and condition of the bridge railing. Does the railing meet current standards? Is a thrie beam retrofit necessary or a railing replacement (existing condition and cost benefit must be reviewed)? Guardrail (on the structure and approaches) and pedestrian fencing, if present, should be inspected and the condition documented. In addition, the condition of brush blocks, raised shoulders/sidewalks, non-motorized pathways and how these elements transition from the approaches to the structure should be documented.

For reinforced concrete and prestressed concrete superstructures, visually inspect for shear or flexure cracking, exposed or broken prestressing strands, crushing of beam end in bearing areas, discoloration of concrete caused by corroding mild reinforcement or prestressing strands, high load hit damage and signs of previous repairs. Observe live loads crossing the structure and note excessive deflections or working cracks. Inspect the concrete diaphragms for spalling or diagonal cracking from structure movement or excessive deflection, and any other concrete defects. Document the use of temporary supports, condition of any existing temporary supports, or if temporary supports are needed for the structure until the proposed work is constructed.

For steel beam superstructures, visually inspect for areas of section loss, heavily rusted areas or any web buckling due to excessive section loss. Document any areas that are prone to trapping water or debris. Pay close attention to gusset plates. Document the condition of the paint.

Thickness readings shall be taken at each beam end using an ultra-sonic thickness gage. Preparation shall include removing all dirt, debris and rust from the ends of each of the steel beams under the joints so that the steel can be inspected for section loss. Thickness readings on the web and the bottom flange are to be taken at the thinnest locations within 12 inches of the end of the beam.
These thickness readings will be compared with the original thickness and the percentages of section loss will be calculated. This data will be tabulated in the Beam End Thickness Table (see Appendix C-3) and sketches will be prepared for major components, showing the location of the deteriorated areas. When beam end repairs are necessary, document the locations of beam ends that need to be repaired (one method would be on the existing erection diagram from the as-built plans). This information will be presented in the Appendix of the scoping report. These documents are used by the MDOT load rating engineer in the Bureau of Bridges and Structures to perform load rating analyses as needed, and by bridge design engineers to determine if repairs are needed, and to design any needed steel repairs. The following figure (6-3) shows a typical sketch of beam end section loss measurements:

Figure 6-3: Sketch of Beam End Section



Visually inspect the steel superstructure for any areas that may exhibit out of plane bending or distortion such as web to diaphragm or cross frame connections, lateral gusset plates to web connections and/or connections of any other secondary members to beams. Document any fatigue prone details, or any welding in the tension zones that are transverse to the plane of stress. Inspect all pin and hanger assemblies for proper operation. Does the pin and hanger meet current standards? Document the condition of pin plates and if the ends are touching due to pin and hanger closure.

In other areas of heavy flaking rust, clean as necessary to measure for any section loss. Thickness readings will be taken at the thinnest locations and documented. Note the condition of all bearing devices. For steel bearings such as rocker bearings or pedestal bearings, inspect for pack rust, rocker alignment, section loss and paint condition. For elastomeric bearings, check for excessive bulging of the sides (greater than 15% of bearing thickness), shear deformation due to thermal movement, splitting/tearing and discoloration from exposure to light.

For timber structures, visually inspect for checks (separations of the wood fibers parallel to the grain direction), knots and splits which are natural defects that may provide openings for decay and begin to reduce the strength of the members. Inspect for fungus, insect damage or any other effects of nature. Inspect for in-service defects such as fire damage, vehicular collision, abrasion or mechanical

wear, overload distress, excessive deflection of flexural members, weathering or warping and chemical damage. Perform a pick or penetration test at various locations, which involves lifting a small sliver of wood with a pick or pocket knife, and observing whether or not it splinters or breaks abruptly. Sound wood splinters, while decayed wood breaks abruptly. Inspect areas near the support to check for horizontal shear cracks along the grain of the member. Inspect bearing areas for crushing due to decay. Note the condition of fasteners and connections.

The vertical clearance of bridges over roadways must be field verified and documented on the Structure Clearance Measurements form (Form 1190), Bridge Scoping Report and Details Worksheet, in the executive summary and stated in the report. Additionally, a photo of any vertical clearance sign attached to the bridge must be taken.

For structures not meeting minimum vertical underclearance criteria, raising the structure to meet current standards must be considered in selecting the repair option. Any option including a deck replacement, superstructure replacement or bridge replacement must meet the minimum vertical underclearance requirement. If this is not a feasible option a Design Exception will be required. See the MDOT Bridge Design Manual, Section 7.01.08, for minimum vertical clearance requirements.

The Design Exception is not the first option however it may be used as a short term solution. One option that could be considered would be lowering the grade of the roadway under the structure. If lowering the grade is a feasible option, it could occur at a different time (later years of the Five Year Program). The cost of raising the grade of the bridge and/or lowering the roadway grade below the structure, to obtain acceptable underclearance must take into account additional approach work.

The width of the structure must be evaluated to determine whether it is functionally obsolete. If widening is necessary to upgrade the structure to current standards, or for maintaining traffic during construction, this must be stated in the report. Describe the widening that is being recommended and provide a plan view sketch showing the proposed widening. Specify if widening can be done within the existing deck width, or if additional beam lines and substructure width will be needed to accommodate the required deck cross section. When considering the widening, make sure the additional approach work (if needed) is documented and included in the estimate. For FHWA oversight projects potential DEs must receive FHWA concurrence. Refer to the MDOT Bridge Design Guides, Section 6.05 for bridge deck cross section guidelines.

During the scoping of a project, it must be determined if part-width

construction is possible or if the entire crossing must be closed and a detour used. The estimator should contact the TSC Traffic and Safety engineer for assistance in estimating the costs for maintaining traffic and the mobility analysis required. Final detailed maintaining traffic costs for construction will be documented in the Bridge Scoping Report and the Bridge Scoping Report & Details Worksheet. For additional information and guidance, refer to earlier sections in this chapter and Chapter 8 in this manual.

If the approach pavement requires replacement, it shall be included in the bridge scoping reports and these items added to the estimate. For additional information and requirements refer to the Road Standard Plans R-43 Series.

The area immediately adjacent to the structure must be evaluated to determine if there are any site issues or constraints that may impact construction. Each quadrant of the structure is to be evaluated and photo-documented (refer to the Bridge Scoping Report & Details Worksheet for the items required). The items below are an example of what should be evaluated for impacts:

- Businesses or driveways close to the approaches
- Utilities attached to or near the bridge
- Signs or sign brackets attached to the bridge (specify if the connections are bolted or welded)
- Poor alignment or geometrics
- Approach and departure guardrail terminals or the presence of impact attenuators
- Bank erosion or scour and/or unusual channel features
- Railroad track location
- Proximity of other bridge structures
- Is drainage sufficient
- Existing Right-of-Way width
- Recreational trails
- Proximity of adjacent buildings/structures
- Bicyclist and pedestrian access and facilities (including curb ramps).

If applicable, the following items must be evaluated and costs considered:

- Historical status
- Does this bridge have special structural design features which may affect the repair options, such as lack of load path redundancy, fracture critical members, category E' allowable fatigue stress details, etc. (see AASHTO Standard Specification for Highway Bridges, 17th edition, Section 10.3, tables 10.3.1A, 10.3.1B and 10.3.1C for descriptions and illustrative examples)?
- Vertical underclearance to standard
- Is the structure functionally obsolete (any widening as a part of rehabilitation)?

- Environmental issues
- If it is a pedestrian structure, does it meet current ADA criteria?

If, during the site review, structural conditions are found that may cause the bridge to be load restricted (such as holes in beams, broken prestressing strands, etc.) or which may require other immediate action (such as lane closures or emergency repairs to holes in the deck, temporary supports, false decking due to spalled concrete, etc.), the Region Bridge Engineer and the Region System Manager shall be notified immediately. Documentation of the condition (such as beam measurements, pictures taken, etc.) will be provided to the Region Bridge Engineer as soon as possible.

If, during the site review, the scoper determines there is a need for material evaluation or more advanced non-destructive testing, the Construction and Technology Division or Region Materials Unit should be contacted. Examples of material testing include taking 2 inch or 4 inch concrete cores to evaluate the strength and material properties of the concrete. Examples of non-destructive testing include ultrasonic testing or dye penetrant testing of steel to confirm if cracks exist.

Determining Repair Options

Each bridge will be evaluated to determine the most appropriate repair option based on the physical condition of the bridge, economic considerations and sound engineering judgment.

The Bridge Deck Preservation Repair Matrix in Appendix A-6 must be consulted for reasonable deck repair options based on the condition of the deck surface and underside. This is to be used as a guide and shall not substitute for sound engineering judgment. Also refer to Chapter 5 of this manual for additional repair options.

Accelerated Bridge Construction Techniques

Accelerated Bridge Construction (ABC) is the construction that uses innovative planning, design, materials and construction methods in a safe and cost-effective manner to reduce the on-site construction time for new bridges or replacement and rehabilitation of existing bridges. ABC techniques, including Prefabricated Bridge Element Systems (PBES) and Slide-In Bridge Construction, are recognized by (MDOT) and (FHWA) as important and effective methods to construct or rehabilitate highway structures, while reducing the impact of bridge construction activities on mobility, the economy, and user delay. All major rehabilitation or reconstruction bridge projects should be evaluated to determine if ABC is suitable and provides a benefit taking into consideration safety, construction cost, site conditions, life cycle cost of the structure, MDOT's mobility policy and user delays, and economic impact to the community during construction.

When considering ABC, new technologies in the form of construction techniques, innovative project management, high performance materials, and pre-fabricated structural elements should be combined to achieve the overall goals of shortening the duration of construction impacts to the public, encouraging innovation, ensuring quality construction, and expected serviceability of the completed structure. Prefabricated bridge elements can be built on-site away from traffic if site conditions warrant, or they can be fabricated off-site and shipped to the site. Both methods offer advantages in quality control compared to cast in place construction where schedule or staging dictate the work progression. Special attention will need to be paid to the erection of prefabricated elements and the connection details.

All proposed ABC candidate projects are subject to Statewide Alignment Team Bridge (Bridge Committee) approval. Candidate projects, during the scoping or structure study phases, are to be presented at the monthly Bridge Committee meeting, The Bridge Committee will review candidate projects for further evaluation, and grant approval to pursue ABC techniques and determine availability of Bridge Emerging Technology funding.

Strategic implementation of ABC is required to ensure the application is appropriate for the project location and objectives. The following criteria should be considered during the bridge project scoping process to determine if ABC is appropriate.

Criteria Consideration

Site:

- Is the bridge located in a remote area?
- What are the existing structure characteristics and foundation type? Often, the existing substructures may be in the way of achieving full prefabricated or accelerated construction.
- Is the existing terrain difficult to traverse?

- Are there pre-casting and concrete readi-mix facilities in the area?
- Is there access for equipment and/or sufficient space for a pre-casting operation?
- Can the pre-casting site and subsequent structure move path be completed successfully without significant impacts to adjacent residents and businesses?
- Is there ROW available to build on site away from traffic then move into place?

Average Daily Traffic:

- Is the bridge located on a high ADTT route?
- Would delays have impacts to local economy and community services?

Delay or Detour Time:

- Does closure of the bridge require a long detour?
- Are large delays expected due to part-width construction?
- Are emergency services adversely impacted?
- How is the MDOT mobility policy impacted?

User Costs:

- What is the value of maintaining traffic on an interstate route?
- What is the duration of the impact for conventional construction vs. ABC?
- What is the user delay cost given the staging?
- What possible savings can be realized by shortening the construction duration?

Impact to the Local Economy During Construction:

- Will a detour or maintenance of traffic scheme result in serious impacts to the local economy and businesses?
- Will conventional construction impact any significant local/public events to where considering ABC options could avoid them?

Safety:

- Does staged construction on the interstate require working adjacent to traffic?
- What posted speed is proposed in the construction zone?
- Does complex staging expose the public and workers to unsafe conditions?

Environmental Issues:

- Are there seasonal issues limiting construction (i.e. bridges over waterways)?
- Are air quality, ambient noise, and other quality of life issues a factor?

Technical Feasibility:

- Is part width construction proposed on structure with spread footings?

- Is part width construction proposed on structure founded on sandy soils?
- Is the bridge on a river crossing with scour or hydraulic issues?
- Is the structural capacity of the existing substructure known?
- Will removal of portions of existing bridge during staged construction have an adverse impact on the remaining portions of the bridge?

Quality Concerns:

- Would part width construction affect the expected service life of the structure?
- Would the use of innovative materials increase the expected service life of the structure?
- If the initial cost of ABC construction is more than conventional construction, is there overall life cycle benefit?

The above criteria and questions must be carefully evaluated during project scoping and preliminary design to determine if ABC implementation will be of benefit. An ABC decision making tool is currently under development that will help evaluate the above criteria.

If the determination has been made that ABC will be implemented on a specific project, the next step is to choose the methods that are technically and economically feasible. ABC can be PBES or it can be full structural placement methods such as Self-Propelled Modular Transporter (SPMT) or building a bridge on temporary false work and sliding into place.

PBES can be built on site away from traffic if site conditions warrant, or they can be fabricated off site and shipped to the site. Both methods offer advantages in quality control compared to cast in place construction where schedule or staging dictate the work progression. Erection of prefabricated elements and the connection details will require special attention being paid to the following:

Detailing Considerations

Dimensional Tolerances:

- Connections between elements must accommodate field erection
- Elements fabricated off site should be test fit or otherwise confirmed to be of the correct dimensions prior to shipping
- Templates should be used to ensure correct fit up between prefabricated elements or between a prefabricated element and a cast in place element
- Connection details should be standardized

The weight and size of precast elements:

- Need to ensure elements can be erected with contractor's equipment
- Need to ensure elements can be shipped to the site

- Need to ensure elements can be erected without long term lane closures

The following prefabricated elements may be considered for use on MDOT bridge projects:

- Precast Full Depth Deck Panels
    - These may be transverse or longitudinally post tensioned
    - Panels are sensitive to skew and beam camber and haunches
    - May have long term maintenance concerns
    - Riding/wearing surface material to be used
    - Dimensional tolerances are very tight
- Decked Beam Elements
    - Two steel beams connected with deck (modular beams)
    - Decked bulb T beams
    - Decked prestressed spread box beams
    - Systems rely on full shear and moment capacity joints and closure pours
    - Camber control required
- Pier Elements
    - Precast pier caps
    - Precast columns
    - Precast pile caps
    - Systems rely on grouted or mechanical reinforcement splices to develop reinforcement sufficiently to transfer reactions from one element to the next
    - Multiple smaller caps spanning two columns as opposed to one large cap should be considered
    - Pier columns that directly support beams without pier caps may be considered
- Abutment and Other Elements
    - Precast abutment panels
    - Precast footings
    - Precast backwalls and wingwalls
    - Systems rely on grouted or mechanical reinforcement splices to develop reinforcement sufficiently to transfer reactions from one element to the next
    - Voids can be considered to reduce weight
- Precast Approach Slabs

Dimensional tolerances are very tight for all PBES. The tolerance sensitivity required when erecting prefabricated elements may require dual or independent survey contracts to ensure proper fit up, camber, deflections and finished grades.

The following full structural placement methods may be considered for use on MDOT bridge projects:

Placement Methods

Self Propelled Modular Transport (SPMT):

- Computer controlled platform vehicle with movement precision to within a fraction of an inch
- Capable of lifting 165 to 3,600 tons
- Vertical lift range of 36 to 60 inches
- Axle units can be rigidly coupled longitudinally and laterally
- Move costs range from $50,000 to $500,000 (mobilization costs are significant, so SPMTs should be considered on corridors where multiple bridges may be moved)
- Limited to use on sites with minimal grade changes
- During design, need to consider dynamic effects of move on structure
- If using multiple SPMT's, need to ensure proper bracing for overall stability during move

Lateral Bridge Slide:

- Bridge section is built on temporary supports adjacent to existing substructure
- Bridge section bears on stainless steel, or other low friction surface such as Teflon
- Existing substructure units can be reused or new units constructed with minimal impact to traffic
- Bridge section is laterally jacked into place
- Cost to slide a bridge is approximately $50,000 to $80,000 depending on the size of the bridge
- Additional stiffeners and/or diaphragms may be required on beams at point of jacking force application
- Additional reinforcement in concrete elements may be required to control jacking stresses, or other ABC related construction loads

Incremental Launching:

- Bridge section is built near approaches, then longitudinally launched into place
- Prestressing may be required for concrete elements due to alternating bending moments generated during launch

Allowing the contractor to select methods of placement may also lead to additional innovations and acceleration to the project schedule. Depending on the complexity of the overall project, innovative contracting methods may also be used in conjunction with ABC/PBES techniques. Innovative contracting methods are approved on a project by project basis by the MDOT Innovative Contracting Committee and the MDOT Engineering Operations Committee.

The Federal Highway Administration provides additional information about ABC and PBES at the following website: http://www.fhwa.dot.gov/bridge/abc/index.cfm

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