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Interstate 84/Route 8
Interchange Reconstruction

**PEL Process
Alternative
Screening
Methodology
(draft)**

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1 Introduction

1.1 PLANNING CONTEXT

The Connecticut Department of Transportation (CTDOT) has initiated a Planning and Environmental Linkages (PEL) Study of the Interstate 84 (I-84)/State Route 8 (Route 8) Interchange, known as the “Mixmaster” Interchange, in Waterbury. CTDOT desires to establish a vision, or master plan, for the interchange that is articulated in a prioritized plan for the phased implementation of improvements. The overarching goal of the PEL Study is to develop this clear and supported plan of action for addressing deficiencies at the I-84/Route 8 Interchange.

The Study Team (CTDOT and its consultants), with input from the City of Waterbury, identified stakeholders, the general public, regional, state and federal agencies, and tribal nations, will develop, screen, and evaluate alternatives. These alternatives will be evaluated against design, cost, environmental, and community criteria, so that the alternative(s) that best meet the transportation needs of the corridor can be advanced into further development and reviewed under the National Environmental Policy Act (NEPA). The PEL Study Area is illustrated on Figure 1-1.

The purpose of this component of the Mixmaster Interchange PEL Study, the Alternative Screening Methodology (ASM), is to provide a decision-making tool for evaluating program alternatives in a sequential process, thereby narrowing the “Universe of Alternatives” to the “Range of Reasonable Alternatives.” The evaluation methodology will assess alternatives based on the Preliminary Purpose and Need (which consists of structural and geometric condition and traffic operations, including congestion considerations.), local street and arterial mobility, multimodal travel, constructability, transportation-related goals and objectives, and costs. Potential impacts and benefits to the community and to the natural and human environments will also be evaluated. Based on this ASM, recommendations of the PEL Study, the Range of Reasonable Alternatives, will be advanced to subsequent stages of program development in accordance with planning guidelines established in state and federal law and regulation.

The first steps in the PEL Process are to identify the transportation problems (needs or deficiencies) that exist, or are forecast to exist in the future, and to develop the Preliminary Purpose and Need of the Mixmaster Interchange Program. Then, the Universe of Alternative transportation concepts is identified, screened, and evaluated based on evaluation criteria that are established in the ASM.

1.2 PROGRAM NEEDS

The needs of the Mixmaster Interchange, expressed as existing deficiencies, have been identified as follows:

- Structural deficiencies;
- Geometric deficiencies; and
- Traffic operational deficiencies (including congestion).

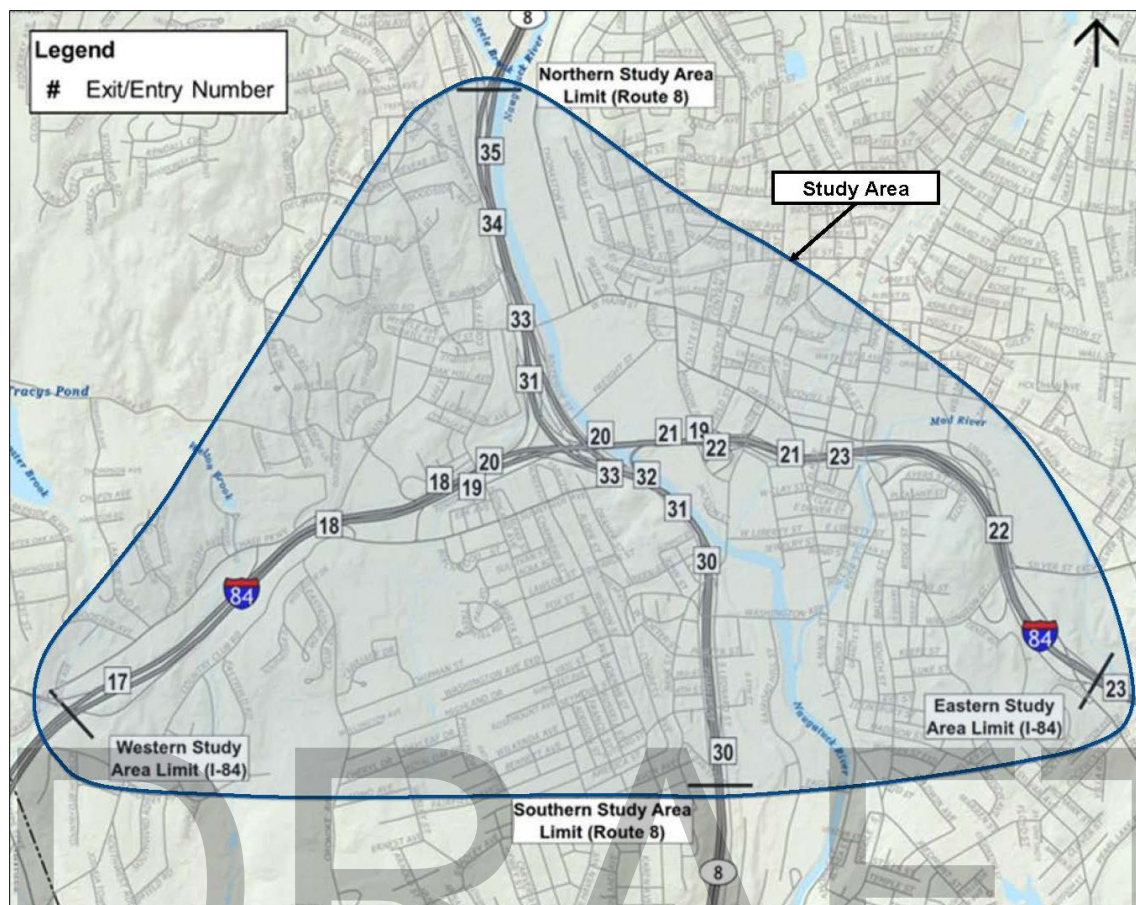


Figure 1-1 PEL Study Area

The Mixmaster Interchange Needs are more thoroughly documented in the *Preliminary Purpose and Need Statement* (October 2021), and the *Interstate 84/Route 8 “Mixmaster” Interchange Analysis, Needs and Deficiencies Report* (August 2020).

1.3 PROGRAM PURPOSE

A Preliminary Purpose has been developed and is described below. This purpose is the fundamental reason why the program is proposed.

The purpose of the Mixmaster Interchange Program is to correct the existing structural, geometric and traffic operational deficiencies of the I-84 and Route 8 interchange to achieve acceptable levels that meet current and future traffic needs and current standards of CTDOT and the American Association of State Highway and Transportation Officials (AASHTO). These corrections are expected to improve system performance, reduce congestion, enhance safety, maintain critical system linkages in Connecticut and the northeast, and facilitate connectivity with downtown Waterbury through the local road network.



1.4 OTHER TRANSPORTATION-RELATED GOALS AND OBJECTIVES

The Study Team is identifying other transportation-related goals and objectives through outreach to stakeholders, the Project Advisory Committee (PAC), the general public, regional, state and federal agencies, and tribal nations. Achieving any of these other goals and objectives may be a desirable outcome of the Mixmaster Interchange Program, but they are not the primary purpose of the program and therefore, alone, are not reasons to advance or dismiss an alternative in the screening phase. However, these transportation-related goals and objectives will be considered as the alternatives are evaluated.

Placeholder for others that may result from the public outreach plan.

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2 Alternative Screening Framework

The Study Team established a framework for this ASM to ensure that each alternative will be evaluated and screened in a consistent and unbiased manner. Alternatives include both “Build” and “No-Build” alternatives. The Build alternatives are those alternatives which would include changes and improvements to the transportation system in the study area beyond what would be expected for normal operation and maintenance activities. The No-Build Alternative represents a baseline condition where only normal operation and maintenance activities would occur. Typically, it describes the future transportation network with no improvements except those that are already programmed in the Statewide Transportation Improvement Plan (STIP). Examples of STIP projects that are included in the No-Build Alternative are the recently completed (2018) widening project of I-84 to the east of the I-84/Route 8 Interchange and the ongoing (2020) project to replace the bridge decks on Route 8 and rehabilitate the bridge decks on other bridges within the I-84/Route 8 Interchange.

The Mixmaster Interchange PEL Study alternative screening and evaluation framework and process is similar to a funnel (See Figure 2-1). During this process, the Study Team will engage, communicate with, and solicit feedback from the general public and various stakeholder groups throughout the PEL process, including screening and evaluating alternatives. Three evaluation and screening levels will be used in the Mixmaster Interchange PEL Study. Through this multi-step filtering (funnel) process, the number of alternatives to be examined is anticipated to reduce while the evaluation detail will increase with each level of screening.

2.1 LEVEL 1

Level 1 is an evaluation and screening of all potential solutions identified in the Universe of Alternatives. Level 1 will assess each alternative’s ability to meet the Preliminary Purpose and Need and determine whether they contain fatal flaws. A ‘pass’ rating at Level 1 means that the alternative meets the criteria at this conceptual level of design (approximately 5% complete) to move beyond this initial screening. An alternative that receives a ‘pass’ rating in Level 1 may be eliminated from further study in subsequent evaluations based on advanced study and design. A ‘fail’ rating at Level 1 means that the alternative clearly does not meet the criteria and therefore will not be advanced for further study. The alternatives that pass the Level 1 screening will be called *Initial Alternatives* and advance to Level 2.

2.2 LEVEL 2

The Initial Alternatives will be developed to a higher level of detail (approximately 10% complete) and will undergo a more-detailed evaluation and screening in Level 2. As described in Chapter 3 - Alternative Screening & Evaluation Criteria, evaluations related to the Preliminary Purpose and Need: structural, geometric, and traffic operations will be qualitative with some quantitative assessments. Potential impacts and benefits to the community and to the natural and human environments will primarily be qualitative, while others will be quantitative. The Initial Alternatives’ multimodal characteristics related to transit, pedestrian, and bicycle accommodations and improvement will be assessed.

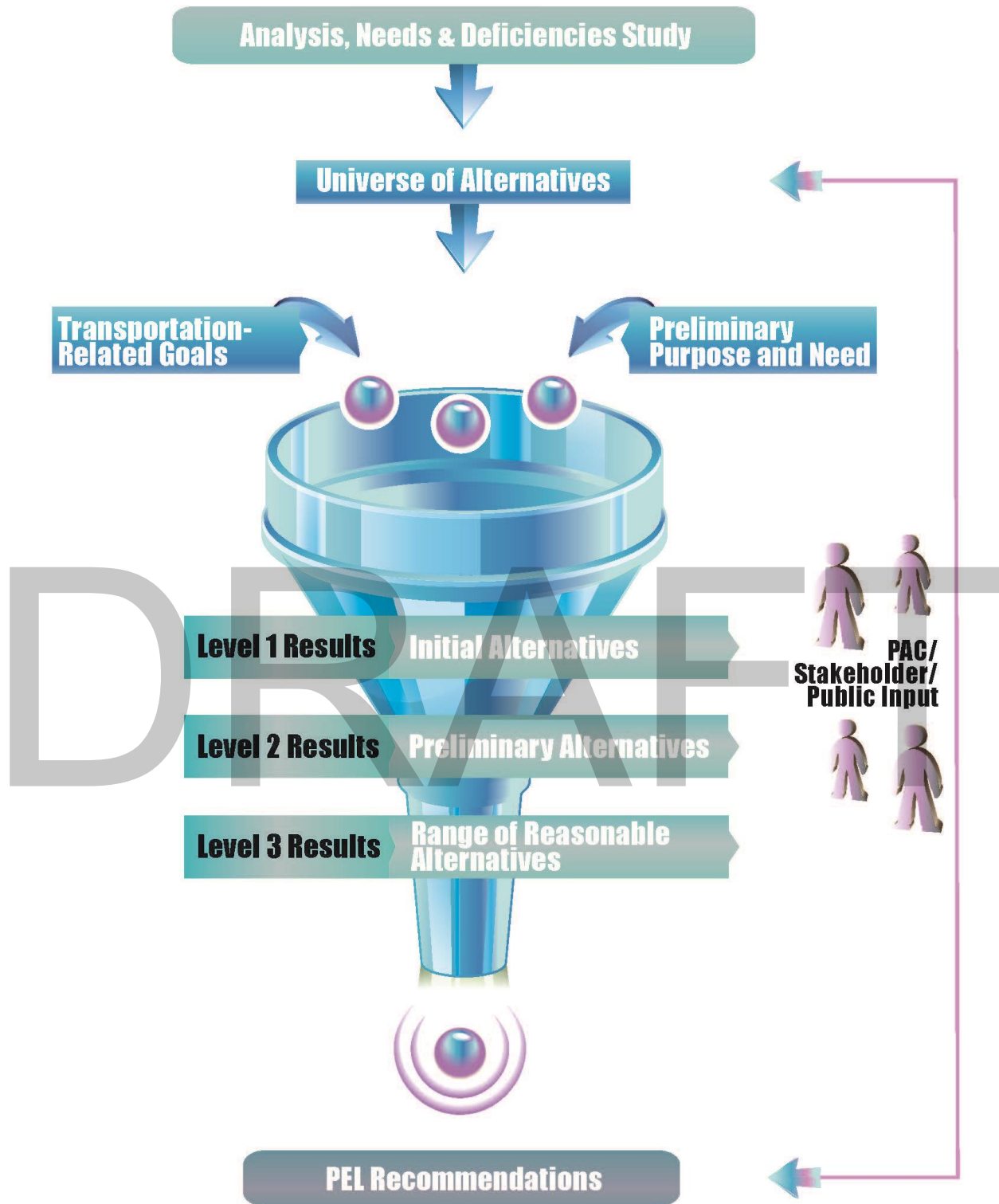


Figure 2-1 Alternatives Evaluation Process



The Level 2 evaluation will also consider factors associated with transportation-related goals and objectives.

Placeholder for goals and objectives identified in stakeholder and other outreach.

The Initial Alternatives that pass the Level 2 screening will be called *Preliminary Alternatives* and proceed to Level 3.

2.3 LEVEL 3

The Preliminary Alternatives will be further evaluated and screened in Level 3. These alternatives will be developed to 15% design and evaluated to a higher level of detail. Level 3 will include predominantly quantitative assessments. Evaluation criteria that are determined to be differentiators among alternatives during the Level 2 evaluation (e.g. specific transportation goals, rights-of-way (ROW), Historical and Cultural Resources, etc.), will be included in the Level 3 assessment. A comparative review of the Preliminary Alternatives based upon the differentiating criteria will be paralleled with the comprehensive assessment of traffic operations, simulations, and evaluation of capital and life-cycle costs of the remaining Preliminary Alternatives for a comparative evaluation.

The Level 3 screening will result in *PEL Recommended Alternative(s)*, also referred to as a *Range of Reasonable Alternatives*, for further development during the NEPA process.

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3 Alternative Screening & Evaluation Criteria

The screening and evaluation criteria for the Mixmaster Interchange PEL Study are based on the Preliminary Purpose and Need, the transportation-related goals and objectives for the Mixmaster Interchange Program, and other criteria that assess an alternative’s practicability and degree of potential impacts on the community as well as natural and human environments. The following sections describe each of the screening and evaluation criteria for Level 1, Level 2, and Level 3, respectively.

3.1 LEVEL 1

Level 1 evaluation and screening of the alternatives will be an engineering-based assessment of the Universe of Alternatives. This review will be predominantly qualitative with some quantitative assessments taken into consideration to provide a “Pass/Fail” rating. Each alternative will be screened based upon the alternative’s demonstrated ability to:

- 1) Satisfy the *Preliminary Purpose and Need* in terms of *structural*, *geometric*, and *traffic operational* deficiencies and needs.
- 2) Meet the following criteria of practicability and therefore has no apparent ‘fatal flaws’:
 - a) *Cost*: financial resources can reasonably be made available for the alternative.
 - b) *Feasibility*: the alternative is technically and logistically achievable.

3.1.1 Preliminary Purpose and Need

Structural

Ability to address the need to improve and/or replace deteriorating bridge structures that have outlived their original intended 50-year service lives.

Geometric

Ability to address and correct geometric deficiencies that do not meet current design standards (e.g. narrow lanes and shoulders) for the mainlines of I-84 and Route 8, system ramps, and service ramps. System ramps connect one limited access highway to another. Service ramps connect the local roadway network and a limited access highway.

Traffic Operations

Ability to provide system ramp connections directly between I-84 and Route 8 for high-volume movements and indirectly for lower volume movements. Additionally, the alternative must demonstrate the ability to provide adequate capacity based on current traffic and future traffic forecasts on the mainlines, system ramps and service ramps.

3.1.2 Practicability - Cost

Order of magnitude construction cost – Ability to be make financial resources available for the alternative. This will include capital construction costs and a contingency factor to account for engineering and mitigation. Right-of-way costs will not be included at Level 1.

3.1.3 Practicability - Feasibility

Ability to implement the alternative using proven technology, engineering, construction techniques, and general constructability – allowing mainlines and system ramps to continue to operate during construction.

3.2 LEVEL 2

The purpose of Level 2 is to further evaluate and screen the Initial Alternatives that remain from the Level 1 screening using design advanced to a level of approximately 10% completion. Level 2 will consider eight general categories:

- 1) Confirmation that the Initial Alternatives continue to demonstrate the ability to satisfy the *Preliminary Purpose and Need* based on the more-advanced design and study.
- 2) An assessment of the *feasibility of project phasing and associated cost*.
- 3) An assessment of the ability to *unstack existing structures*.
- 4) An assessment of the ability to *eliminate existing fracture critical structures*.
- 5) An assessment of the ability to accommodate and enhance *multimodal* travel related to transit, pedestrian, and bicycle modes.
- 6) An assessment of *constructability* including construction complexity and disruption to traffic.
- 7) An assessment of *potential impacts and benefits* to the community and to natural and human resources.
- 8) An assessment of other *transportation-related goals and objectives*.

3.2.1 Preliminary Purpose and Need

The Study Team will quantitatively and/or qualitatively assess the structural, geometric, and traffic operation components of the Initial Alternatives based on the more-advanced design of Level 2.

Structural

The Study Team will confirm that the Initial Alternatives continue to meet the structural component of the Preliminary Purpose and Need. The alternative's ability to attain a National Bridge Inspection Standards (NBIS) condition rating greater than Fair (5) for study area bridges will be assessed. NBIS bridge ratings range from Failure (0) to Excellent (9); a rating greater than Fair (5) exceeds the State of Good Repair



(SOGR) valuation as defined by CTDOT¹. The ability of the alternative to have a minimum 40-year design service life projection will be evaluated. Additionally, under this criterion, alternatives will be assessed on their ability to replace the I-84 concrete bridge decks.

Geometric

Initial Alternatives advanced to Level 2 will be reviewed based on the progressed design to determine if the geometric component of the Preliminary Purpose and Need is still met. The Study Team will conduct a comparative evaluation of the geometric features of the Initial Alternatives to determine their relative favorability. Additionally, each Initial Alternative will be evaluated based on its ability to meet design considerations of CTDOT and AASHTO for the mainlines of I-84 and Route 8, system ramps, and service ramps.

Traffic Operations

The Study Team will review the traffic operational component of the Preliminary Purpose and Need based on the advanced design of the Initial Alternatives. The ability to provide adequate capacity on mainline and system and service interchanges to accommodate current and future travel demand, provide direct or indirect movements for high or low volume movements, respectively, and provide adequate access while improving operations and safety of the mainline highways will all be evaluated.

3.2.2 Phasing Feasibility and Associated Cost

The Study Team will evaluate the feasibility of phasing and associated cost implications of the Initial Alternatives based on the advanced design. The effects of project phasing opportunities on alternative fundability and the ability to be make financial resources available will be assessed for the Initial Alternatives.

3.2.3 Unstack Existing Structures

The Study Team will assess the ability to unstack the currently stacked structures which have high maintenance costs and potential safety concerns. A “stacked” structure is one where one direction of travel is on a structure over another direction of travel, which is also on structure. For example, I-84 eastbound is on structure over I-84 westbound.

¹ “A Bridge for which the condition rating for each of the three major components for a span bridge (Substructure, Deck, and Superstructure) or the structural condition of a culvert is rated at least a 5 on a 0-9 condition scale is classified as being in a SOGR.” *Connecticut Transportation Asset Management Plan Fact Sheet* (June 2020).

3.2.4 Eliminates Existing Fracture Critical Structures

The Study Team will assess the ability to eliminate the existing fracture critical structures. Fracture critical structures are steel bridges with primary members whose individual failure could cause a portion of, or the entire bridge, to fail.

3.2.5 Multimodal Travel

The Study Team will qualitatively assess each Initial Alternative's multimodal characteristics related to transit, pedestrian, and bicycle accommodations and improvement.

3.2.6 Constructability

The Study Team will qualitatively and quantitatively assess the constructability, or ease of construction, for each Initial Alternative using two criteria. Constructability is not only a measure of construction complexity; it is also an indicator of disruption to the traveling public. Highly constructible alternatives are desirable and generally less disruptive to the public. Highly constructible alternatives have shorter durations, more opportunities for off-line construction or phased work, and/or fewer detours when compared with a less constructible alternative. The qualitative criterion that will be used to evaluate the Initial Alternative's constructability will be the potential for offline construction. The quantitative criterion for constructability will be the approximate number of mainline detours.

3.2.7 Potential Impacts to the Community and Natural and Human Environments

The Study Team will assess potential impacts to the community and to the natural and human environment. Available desktop tools and file information such as Connecticut and City of Waterbury Geographic Information System (GIS) data, will be used to establish baseline conditions in the PEL Study Area. Study areas may vary as they will be tailored to the specific resources. The Study Team will assess the potential adverse and beneficial impacts associated with each Initial Alternative. This high-level impact evaluation will involve qualitative assessments and, where appropriate, a quantitative assessment of potential impacts to resources. These preliminary impacts will be used to compare the potential impacts of each Initial Alternative. Alternatives should avoid or minimize impacts to these resources.

Community Resources

Community and Public Facilities – The Study Team will review City of Waterbury GIS records to identify and map community and public facilities that might be affected by the alternative including schools, places of worship, cemeteries, public safety facilities, other municipal buildings and similar facilities.

Neighborhoods – The Study Team will identify neighborhoods and assess the potential effects of each Initial Alternative on the nearby City of Waterbury neighborhoods. This assessment will consider potential effects on neighborhood cohesion, mobility, and access.

Land Use – The Study Team will identify existing and proposed land uses, including zoning, using resources from the Naugatuck Valley Council of Governments (NVCOG) and the City of Waterbury.



Initial Alternatives will be assessed relative to their consistency with existing land uses, zoning, and land use planning.

Socioeconomics - Socioeconomic data, including population, housing, and employment data, will be generated for the study area to establish baseline conditions. A preliminary evaluation of potential impacts upon the socioeconomic conditions of the study area will occur. Data sources include U.S. Census, Connecticut Department of Labor, NVCOG, and Connecticut Office of Policy and Management (OPM).

Environmental Justice and Title VI – Environmental Justice (EJ) analysis determines whether an alternative disproportionately and adversely affects low income and/or minority populations. Title VI is an anti-discrimination law applicable to federal-aid projects which includes limited English proficiency (LEP) populations. Through use of census data and American Community Survey (ACS) data, the Study Team will determine the current EJ and Title VI populations in the study area and will make a comparative determination of the relative effects of each Initial Alternative on those populations.

Rights of Way – The Study Team will assess rights of way (ROW) impacts including the potential number of anticipated takings, displacements, and relocations. The Study Team will utilize available property maps and data to determine the potential impacts each Initial Alternative will have to non-CTDOT ROW land.

Natural Resources

Wetlands – Using National Wetland Inventory (NWI) maps and soil maps along with aerial photographs, potential impacts and location of impacts to wetlands will be identified and an assessment of probable impact to wetlands will be developed. This assessment of Initial Alternatives will be made cognizant of guidance and future permit requirements from Connecticut Department of Energy and Environmental Protection (CTDEEP) and the U.S. Army Corps of Engineers (USACE).

Surface Waters and Ground Water – Using available United State Geologic Survey (USGS), GIS mapping, and aerial photography, the number of surface waters potentially impacted will be quantified. Potential impacts to named perennial water courses and unnamed tributaries as well as potential impacts to ground water quality will be qualitatively assessed and will consider ground water classification. Potential impacts will be assessed cognizant of CTDEEP and USACE guidance. Note that the study area is not situated within nor in immediate proximity to a sole source aquifer.

Floodplain – Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps (FIRM) will be used to identify floodplain and floodway areas within the study area. Effects in floodway and/or floodplain will be qualitatively assessed.

Farmland Soils – Farmland Soils including Prime Farmland Soils, Statewide Important Farmland Soils, and Locally Important Farmland Soils, will be identified from available mapping, and potential location of impacts to these soils will also be identified by the alternatives.

Biological Resources - The U.S. Fish and Wildlife Service (USFWS) Information for Planning and Conservation (IPaC) tool and the most recent Natural Diversity Data Base (NDDB) maps maintained by

CTDEEP will be reviewed to identify federal and state listed species and critical habitats in the study area. Through the IPaC, the Study Team also will identify birds on the USFWS' Birds of Conservation Concern List as well as those protected under the Migratory Birds Treaty Act.

Parks - Park lands and public recreation areas will be identified through GIS mapping, City of Waterbury sources, and field reconnaissance, including the potential applicability of Section 4(f) of the U.S. Department of Transportation Act and Section 6(f) of the Land and Water Conservation Fund Act. The Study Team will estimate the number of publicly owned park land and recreation areas that may be affected by each Initial Alternative.

Human Resources

Historic and Cultural Resources - Mapping from the National Register of Historic Places' unrestricted database and inventories from Connecticut State Historic Preservation Office (CTSHPO) and local resources, along with mapping compiled by the CTDOT, will be used to identify individual historic properties and historic districts in the study area. Previously recorded archaeological sites will be generally identified. The Study Team will identify the potentially impacted sites for each Initial Alternative.

Hazardous and Contamination Conditions - The potential for existing hazardous and contaminated material and environmental risk sites in the study area will be assessed through a search of federal and state databases, and CTDEEP and municipal historical records. This preliminary screening will identify the potential of the alternatives to encounter existing contamination and will assess and identify sites that may negatively affect the construction of each Initial Alternative.

Noise-sensitive receptors - Noise-sensitive receptors, such as schools, residences, and parkland, will be identified according to Federal Highway Administration (FHWA) criteria. The Study Team will determine the number of noise-sensitive receptors that exist within approximately 500 feet of an Initial Alternative for comparison.

3.2.8 Other Transportation-Related Goals and Objectives

Placeholder for goals and objectives identified in stakeholder and other outreach.

3.3 LEVEL 3

The purpose of Level 3 is to further evaluate and screen the Preliminary Alternatives using design progressed to a level of approximately 15% completion. Level 3 will consider four general categories and their evaluation will be predominantly quantitative:

- 1) A quantitative assessment of *potential impacts and benefits* to the community and to natural and human resources identified as differentiating among alternatives. Potential *mitigation strategies* will be identified.
- 2) An assessment of other *transportation-related goals and objectives*.
- 3) A detailed *traffic operational analysis* of I-84, Route 8, and selected Waterbury streets and arterials using year 2045 travel demand forecasts.



- 4) An assessment of estimated costs – both *capital costs and life-cycle costs*.

3.3.1 Potential impacts to the community, natural, and human environments

To better distinguish the effects the Preliminary Alternatives may have on the community and the natural and human environments, the Study Team will assess and quantify potential impacts for criteria that are found to be differentiators and therefore will likely influence the screening selection. These assessments will be used to further compare the potential impacts of each Preliminary Alternative. Alternatives should avoid or minimize impacts to these resources.

Placeholder for community, natural, and human environment evaluation measures found to be differentiating among the Preliminary Alternatives.

3.3.2 Other transportation related goals

This placeholder will include the transportation related goals identified in stakeholder and other outreach found to be differentiating among the Preliminary Alternatives. This evaluation criteria will be measured quantitatively.

3.3.3 Traffic Operational Analysis

The Study Team will conduct detailed analysis using traffic models of the Preliminary Alternatives for traffic operations along I-84 and Route 8 using the following parameters:

Mainlines, System and Service Ramps

Highway mainline segments will be evaluated using several parameters, including Level of Service, Travel Speed, Delay, and Density during the weekday morning and weekday afternoon commuter peaks.

- Level of service (LOS) is a qualitative performance measure of driver satisfaction and traffic operations factoring travel time/speed, traffic flow characteristics, traffic interruption, freedom of maneuverability, driver behavior, and delay. LOS is measured using the letters A through F, with LOS A representing the least congested condition and LOS F representing the most congested condition. LOS E, which represents unstable flow conditions with localized congestion, and LOS F, which represents forced or breakdown traffic flow, are typically considered deficient traffic operations.
- Travel Speed is the average travel speed (distance divided by travel time) of vehicles traversing a given section of roadway. Travel speed decreases as congestion increases. Travel speed is typically measured in miles per hour.
- Delay is the difference between travel time under free-flow conditions and travel time under congested conditions. Delay is typically measured in minutes or seconds.
- Density is a numeric measure of the spacing of vehicles equal to traffic flow divided by speed. The higher the density, the closer the vehicle spacing. Congestion increases at higher densities, and

higher densities corresponds to deteriorated LOS conditions. Density is typically measured in vehicles per mile per lane.

System Performance

System performance will be measured by evaluating vehicle miles traveled (VMT) and vehicle hours traveled (VHT). VMT and VHT will be evaluated for each Preliminary Alternative with the results compared.

Local Street and Arterial Mobility

Local streets and arterials will be evaluated using intersection LOS, measured as the weighted average delay of all approaches. Connections between the highways and the City streets and arterials in the study area will be assessed and compared for the Preliminary Alternatives in terms of their number and location. In addition, the number and location of proposed local connections over the Naugatuck River will be assessed for each Preliminary Alternative. This assessment will measure how well each alternative reduces the amount of local traffic using I-84 for short distance, local travel, often from one interchange to another, within the study area. Reduction in short-distance use of I-84 will support the fundamental purpose of an interstate highway, to accommodate long distance travel from state to state.

3.3.4 Capital costs and life-cycle costs

The capital cost of the Preliminary Alternatives will be estimated and compared. Planning level capital costs will include construction costs, rights-of-way, and engineering. Life-cycle costs will consider future maintenance and rehabilitation over the anticipated design life.



4 Evaluation and Screening Criteria

The methodology described in this document will be followed to evaluate the various alternatives to determine their comparative advantages and disadvantages. The alternative screening process depicted in Tables 4-1, 4-2 and 4-3 contain the primary evaluation categories as well as the individual criteria within those categories. Utilizing this screening process and decision-making framework will ultimately lead to the selection of the Range of Reasonable Alternatives/PEL Study Recommendations for continued development during the NEPA process.

Table 4-1 Level 1 Evaluation and Screening Criteria

Screening Criteria	Measure	Alternative Rating
Practicality – Satisfying the Preliminary Purpose and Need		
1. Structural	Does the alternative address the need to improve and/or replace deteriorating bridge structures that have outlived their original intended 50-year service lives?	Pass/Fail
2. Geometric	Does the alternative demonstrate the ability to address and correct geometric deficiencies that do not meet current design standards? (e.g. narrow lanes and shoulders)	Pass/Fail
3. Traffic Operations	Does the alternative provide connections between I-84, Route 8, and the City of Waterbury and provide adequate capacity based on current traffic and future traffic forecasts on mainlines and system and service interchanges?	Pass/Fail
Practicability – Costs	Does the cost of the alternative demonstrate viability, and can the financial resources reasonably be made available? (e.g. is the anticipated cost of the alternative feasible or insurmountable?)	Pass/Fail
Practicability – Feasibility	Does the alternative demonstrate its ability to be implemented using proven technology, engineering, construction techniques, and general constructability – allowing mainlines and system ramps to continue to operate? Is the alternative feasible? (e.g. are there factors that make the alternative impracticable?)	Pass/Fail



Table 4-2 Level 2 Evaluation and Screening Criteria

Evaluation Criteria	Measure	Analysis Type
Purpose and Need		
1. Structural	Continues to pass the Level 1 structural screening measure upon further design.	Qualitative & Quantitative
	Demonstrates ability to attain a NBIS rating greater than Fair (5).	
	Demonstrates ability to achieve minimum 40-year design service life projection.	
	Demonstrates ability to replace the I-84 concrete bridge decks.	
2. Geometric	Continues to pass the Level 1 geometric screening measure upon further design.	Qualitative & Quantitative
	Demonstrates ability to satisfy CTDOT and AASHTO geometric guidelines.	
3. Traffic Operations	Continues to pass the Level 1 traffic screening measure upon further design.	Qualitative & Quantitative
	Provides direct or semi-direct movements for high and low volume movements, respectively.	
	Provides adequate access while improving operations and safety of mainline.	
Phasing Feasibility and Associated Cost	Assessment of the feasibility of phasing and associated cost implications. Assessment of the effects of phasing opportunities on alternative fundability and the ability to be make financial resources available.	Qualitative
Unstack Existing Structures	Assessment of ability to unstack structures measured by the alternative's reduction in linear feet of stacked structures.	Quantitative
Eliminates Existing Fracture Critical Structures	Assessment of ability to eliminate existing fracture critical structures measured by the alternative's reduction in linear feet of the existing fracture critical structures.	Quantitative



Evaluation Criteria	Measure	Analysis Type
Multimodal travel	Assessment of opportunities for improvement to transit, bicycle, and pedestrian facilities and connections.	Qualitative
Constructability	Assessment of construction complexity and disruption to traffic and feasibility of traffic mitigation measures.	Qualitative & Quantitative
Potential impacts to the community, natural, and human environments*		
1. Community and public facilities	Community and public facilities will be identified. Number of facilities directly affected and/or whose access is affected.	Qualitative & Quantitative
2. Neighborhoods	Neighborhoods will be identified. Assessment of the alternative's effect on neighborhoods considering neighborhood cohesion, mobility, and access will be qualitatively assessed.	Qualitative & Quantitative
3. Land Use	Available planning reports will be compiled. Assess consistency with existing land uses, zoning, land use planning.	Qualitative
4. Socioeconomic Conditions	Socioeconomic conditions will be identified. Assess potential impacts upon the socioeconomic conditions.	Qualitative
5. Environmental Justice and Title VI	Low income, LEP, and/or minority populations will be identified. Comparative evaluation of effects on low income and minority populations.	Qualitative & Quantitative
6. Rights-of-Way (ROW)	ROW impacts will be identified including potential number of anticipated takings, displacements, and relocations.	Quantitative
7. Wetlands	Wetland systems will be identified using available mapping. Locations of potential impacts will be identified. Assessment of probable impact to wetlands will be developed.	Qualitative & Quantitative
8. Surface waters and ground water	The number of surface waters potentially impacted will be identified. Assessment of probable impact to surface waters and ground water will be developed.	Qualitative & Quantitative



Evaluation Criteria	Measure	Analysis Type
9. Floodplain	Locations of floodplain (e.g. Zone A or Zone AE) and floodway areas potentially impacted will be identified. Assessment of probable impact to floodplains will be developed.	Qualitative & Quantitative
10. Farmland Soils	The presence of farmland soils will be identified. Location of potential areas affected by soil type will be identified for each alternative.	Qualitative & Quantitative
11. Biological resources	Number of state and federally listed threatened and endangered species potentially affected will be identified.	Quantitative
12. Parks	Number of parks potentially affected will be identified.	Quantitative
13. Historic and cultural resources	Number of known sites potentially affected and cultural/archaeological sensitivity will be identified.	Qualitative & Quantitative
14. Hazardous and Contamination Conditions	Identification of potentially hazardous and contaminated parcels (e.g. brownfield sites and landfills) through search of federal and state databases, and CTDEEP and municipal historical records. Assessment of the sites that may negatively affect construction of each alternative	Qualitative & Quantitative
15. Noise-sensitive receptors	Noise-sensitive receptors will be identified. Number of noise-sensitive receptors potentially impacted by traffic noise will be identified.	Quantitative
Other transportation-related goals*	Placeholder for goals identified by stakeholders and Project Advisory Committee.	Placeholder

* Evaluation Criteria under these headers determined to be differentiators among alternatives will be carried forward for an additional assessment in the Level 3 screening.



Table 4-3 Level 3 Evaluation and Screening Criteria

Evaluation Criteria	Measure	Analysis Type
Potential impacts to the community, natural, and human environments	Placeholder for select community, natural, and human environment impact measures identified as differentiators among Preliminary Alternatives during the Level 2 analysis.	Quantitative & / or Qualitative
Other transportation-related goals	Placeholder for transportation-related goal measures identified as differentiators among Preliminary Alternatives during the Level 2 analysis.	Quantitative & / or Qualitative
Traffic Operational Analysis		
1. Mainlines, System and Service Ramps	LOS, travel speed, delay, and density.	Quantitative
2. System performance	VMT and VHT.	Quantitative
3. Local streets and arterials	Intersection LOS. Local connectivity. Reduction in use of interstate by short-distance, local traffic as measured by traffic volume.	Quantitative
Capital costs and life-cycle costs	Estimated costs for the initial capital cost of construction, right of way, and engineering. Conceptual phasing will be developed to 15% completion. Also, the annualized cost of maintaining the alternative based on the anticipated design life.	Qualitative & Quantitative

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