appendix B

Destination 2040 Project Evaluation Methodology

INTRODUCTION

The major infrastructure projects evaluated for the *Destination 2040* Long-Range Transportation Plan (LRTP) were selected from the Universe of Projects list (Appendix A) that was presented to the Boston Region Metropolitan Planning Organization (MPO) in December 2018. This list includes all major infrastructure projects (projects that add capacity to the transportation system or those that cost more than $20 million) that were considered for funding by the MPO. A major infrastructure project must be listed in the LRTP before it can be funded in the Transportation Improvement Program.

MPO staff developed a detailed spreadsheet of the Massachusetts-approved projects and a select number of conceptual projects where enough information was available from the Universe of Projects list. At the time of LRTP evaluation, a project can range from the 25 percent design level to an idea of a project location and how it will improve the project area. With the planning horizon to 2040, even projects with a design already prepared can undergo significant changes, redesign, or rethinking before construction actually begins.

For these reasons, the evaluated projects are compared using a limited number of broad quantitative measurements. These measurements examine the level of detail on what is known about existing conditions in the proposed project area. The effectiveness with which a project will address future project area deficiencies must be estimated by applying professional judgement to consider extremely preliminary project concepts. Cost estimates, in most instances developed by other agencies than the MPO, are similarly preliminary.

The projects were evaluated according to four of the six MPO goal areas and evaluation criteria based on the objectives within each goal area. These criteria help to determine if the project will address the needs identified in the *Destination 2040* Needs Assessment. The four MPO goal areas chosen were:

1. Safety
2. System Preservation and Modernization
3. Capacity Management and Mobility
4. Economic Vitality

The Transportation Equity and Clean Air and Sustainable Communities goals were not included in the evaluation. Since many projects are conceptual and are at the pre-25 percent design, there is not enough information to perform transportation equity or air quality analyses. MPO staff could have noted if the project was located in an equity area but that does not indicate how the project would affect equity populations. However, once projects are selected, they are included in the transportation equity and air quality analyses performed for the overall plan.

This appendix describes the six scores developed by MPO staff for each proposed major infrastructure project. The data available to inform each score is described and the formation of these data into indices is discussed. In addition, the specific points in the scoring process where the use of judgement is required are identified.

Scores are prepared for six categories:

- Safety
- System preservation and modernization
- Capacity management and mobility: automobiles
- Capacity management and mobility: buses
- Capacity management and mobility: pedestrians and bicycles
- Economic vitality

For each of these six categories, the evaluated projects are divided into three groups characterized as generating project benefits that are high, medium, or low. These ratings are given a value of three, two, or one respectively, and then combined to provide a single numeric score.

Assessing how well projects would address the MPO's goals and objectives helped the MPO identify priority projects for its Major Infrastructure Program. Table B-1 shows the detailed major infrastructure project evaluations and Table B-2 provides a summary of the evaluated projects.

SAFETY

The development of the safety scores is shown in the left-most section of Table B-1. The final safety score for each project is shown first, in the most saturated or darkest color. The calculations that determined the safety score are grouped in columns with medium color saturation. Additional data not used directly in scoring, but that informs and corroborates the safety score, are shown with the lightest color saturation.

The safety score is developed by considering the project area's number and severity of crashes, number of vehicles, expected project cost, and nature of the roadway improvement proposed. Characterizing the nature of the proposed improvements is the scoring aspect that is most dependent on judgement.

Crashes and Crash Severity (shown as EPDO in Table B-1)

The Massachusetts Department of Transportation (MassDOT) maintains a database of statewide crashes that is updated annually. Crash data from 2016 is now available and crashes over the 2014–16 period were used in developing safety scores. Crashes range widely in severity and are measured using the concept of equivalent property damage only (EPDO).

The EPDO formula used for the evaluations has recently been revised. It uses crash weighting which was aligned with calculated crash costs based on a 2017 Federal Highway Administration report, *Crash Costs for Highway Safety Analyses*. The EPDO formula used in this evaluation counts all crashes that occured in a project area over the three-year period and adds the number of crashes involving bodily injury multiplied by 20.

Crash Risk (Risk Group)

Crash risk is calculated by comparing the EPDO value with the number of vehicles that enter the project area during an average weekday. Project area traffic volumes are estimated using recent traffic studies by the Central Transportation Planning Staff, project development proponents, MassDOT's online traffic count database, or the MPO's travel demand model.

Dividing the EPDO value by vehicles per year is a measurement of risk. This fraction is usually multiplied by 100,000,000 to give EPDO per hundred million vehicles. The evaluated projects are then divided into two equal-sized groups, high-risk (score=1) and low-risk (score=2), based solely on this risk calculation.

Cost per EPDO (Cost/Benefit Group)

The second scoring index is project cost divided by the project area EPDO. This quotient resembles a cost-benefit ratio, but its meaning is more limited. A large EPDO value implies

some degree of obsolete or deficient roadway design in the project area. Any reconstruction activity is required to meet current design and safety standards, so it is assumed that the project will improve safety.

There is no expectation that bringing the project area up to current design standards will eliminate all crashes, but the EPDO serves as a proxy for potential safety improvement. A low cost per EPDO implies that the proposed investment that will bring the entire project area up to current standards will improve safety and will help to reduce a comparatively large number of crashes. The evaluated projects are divided into two equal-sized groups; low cost per EPDO (score=1) and high cost per EPDO (score=2).

Characterizing Project Improvements (Project Impact Group)

The third scoring measurement is achieved by characterizing the expected impact of the project. For instance, demolishing a cloverleaf interchange that was designed during the 1950's and replacing it with a new interchange with larger turning radii and longer acceleration lanes, conforming with modern standards, would be expected to have a significant safety impact. Reconstructing an arterial roadway within its existing right-of-way would be assumed to have a smaller impact. Some investments, such as adding a highway on-ramp where one currently does not exist, may improve mobility but do not necessarily improve safety in the project area even if adhering to modern design standards.

Each of the evaluated projects were placed in one of three groups based on the types of physical improvements proposed:

- Group 1: Grade separation or totally new alignment
- Group 2: Reconstruction or modernization in current alignment
- Group 3: Low-impact improvements

Placing projects in these groups requires judgement and often knowledge of the project area and its planning history. As mentioned above, descriptions of projects planned for future decades can be conceptual and MPO staff must predict the types of improvements likely to appear in plans as the project gets closer. Defining a project area, necessary for calculating the EPDO, also requires this type of judgement.

Scoring

Evaluated projects can score "one" or "two" for risk based on whether they are in the high-risk or low-risk group; a "one" or "two" for cost per EPDO based on whether they are in the high cost/benefit or low cost/benefit group; and a "one," "two," or "three" for expected project impact. Projects scoring two or three "one" scores are rated as high. Projects scoring one "one" score are rated as medium, and projects receiving no scores in the top group are rated as low.

Corroborating Data

Some Massachusetts locations are eligible for project funding through the Highway Safety Improvement Program (HSIP). Eligibility of projects for HSIP funding is determined by MassDOT. However, almost all HSIP locations were located in project areas that scored high under the three scoring criteria (risk, cost-benefit, and project impact.) HSIP locations were identified for total crashes, bicycle-involved crashes, and pedestrian-involved crashes.

SYSTEM PRESERVATION AND MODERNIZATION

Maintenance Needs

In Table B-1, the second goal area evaluated is the development of the system preservation scores. The system preservation score for each project is shown first in the most saturated color. The calculations that determined this score are grouped in columns with medium color saturation. Several intermediate calculations were required to develop the key scoring metric, the cost per index point. Data from these intermediate calculations are shown with the lightest color saturation.

Ongoing expenditures in routine maintenance, refurbishment, and total reconstruction are necessary to preserve the safety and efficiency of transportation systems. Projects are evaluated using available data on current project area conditions in order to place them into the high, medium, and low groups used to compare projects for incorporation into the LRTP. Three rating groups were based on available data: pavement condition, resiliency, and bridge condition.

Calculating Pavement Condition Deficiency (Weighted Deficiency Index)

Determining a score in this category first requires the calculation of the weighted deficiency index (shown in the lightest color saturation). MassDOT maintains a pavement condition database; the latest data is from 2017. The condition of pavement on state numbered routes is measured regularly with measurements expressed using the International Roughness Index (IRI). MPO staff calculated an average IRI for the lane-miles in each project area, shown in Table B-1 as weighted IRI.

Average project area IRIs ranged from 45 (best project area pavement) to 282 (worst). The average IRI of each project was adjusted downwards by 45 and then multiplied by the number of project area lane-miles. This gave staff an estimate of the total amount of project area pavement deficiency, shown in Table B-1 as weighted deficiency index.

Estimating Cost-Effectiveness (Cost per Index Point Adjusted for Resiliency)

This analysis assumes that at the completion of a project, the total pavement deficiency calculated above will be eliminated. Dividing the total project cost by the total project area pavement deficiency index gives a preliminary estimate of system preservation cost-effectiveness (not shown in Table B-1).

The preliminary estimate can be considered an oversimplification because structures unrelated to pavement such as bridges and culverts may also need to be replaced. Two adjustments are made to the initial cost-effectiveness estimate in determining the final score. One adjustment accounts for flood hazard resiliency and a second adjustment reflects deficient bridges.

The pavement condition database also indicates whether sections of roadway are within the 100-year flood zone. MPO staff calculated the portion of project-area roadway located within this area. It is assumed that any future roadway reconstruction in this flood-hazard area will be done in accordance with resiliency standards in effect at the time of construction.

In this analysis, the total cost per index point was adjusted by the percentage, if any, of the project in a 100-year flood zone. This adjustment can improve a project's cost-effectiveness to reflect the fact that part of the project addresses two MPO objectives: system preservation and climate resiliency. The cost per index point shown in Table B-1 incorporates this resiliency adjustment.

Final Rank Order and Scores (Adjusted for Structurally-Deficient Bridges)

The last part of the analysis adjusts for structurally deficient bridges. Projects are sorted based on the lowest cost per pavement deficiency point (adjusted for resiliency) to the highest. Natural break points in the ranking are used to divide high, medium, and low groups.

Once the high, medium, and low groups are established, bridge information is added to the evaluation. The MassDOT Bridge Section maintains a database of detailed information from periodic inspections of all bridges in Massachusetts. Structurally deficient bridges must be inspected frequently and if a bridge is in danger of failure, it is closed.

If there are one or more structurally deficient bridges in a project area, the project score can be increased one level, for example, from low to medium or from medium to high. After reassigning selected projects to higher groups, new scoring groups of roughly equal size are designated. This is an extremely simplistic adjustment and only reflects that a substantial portion of the project costs are expected to be used for bridge replacement or refurbishment.

CAPACITY MANAGEMENT AND MOBILITY: AUTOMOBILES

Estimating project benefits for vehicular traffic using the region's roadway system depends on data entirely derived from the MPO's travel demand model. The model is developed and calibrated with data on directly observed traffic at a large sample of regional locations. Only the model can provide a region wide snapshot of all important roadways at critical time periods. The travel demand model can also generate a region wide traffic snapshot for a future year, in this case 2040.

The most useful metric for evaluating regional capacity management issues is the volume over capacity ratio (V/C) on roadways during the AM and PM peak periods. Each model roadway segment has an estimated capacity in vehicles per hour based on current traffic engineering standards. The model estimates volumes for the AM, PM, midday, and night periods and the V/C is calculated by dividing these volumes by the capacity. In the MPO's travel demand model, the AM peak period is defined as 6:00 AM to 9:00 AM and the PM peak period is 3:00 PM to 6:00 PM.

The analysis begins by identifying for each directional link whether the V/C is higher in the AM or PM. For reference, two-way roads are considered to be two links. Almost invariably, if one direction has its highest V/C in the AM, the reciprocal direction will have its highest V/C in the PM.

The base year (2016) and future year (2040) V/C were estimated and depicted graphically on a region wide basis. Together, the AM and PM periods indicated both commuting patterns and bottlenecks in a single graphic. Locations with regionally significant congestion problems were easily identified by inspection. Congestion at these locations was characterized as severe, moderate, or inconsequential by balancing the V/C value with the length of the congested segments.

Projects that include roadways in the severe category were scored as high, projects with moderately congested roadways were scored medium, and all other projects were scored as low. The projects at these locations are anticipated to reduce congestion within the project areas.

CAPACITY MANAGEMENT AND MOBILITY: BUSES

Project benefits for buses were estimated by calculating the number of local and regional buses that travel through a project area with scheduled service on a typical weekday. These numbers were developed from published schedules. Projects with bus routes are assumed to either improve traffic flow or improve the streetscape, allowing better pedestrian access to local buses.

Projects were ranked by the combined total of local and regional buses, including the Logan Express. Break points were designated to divide projects into groups with high, medium, or low benefits for bus users. Ridership was known for the local buses but not for the regional buses. Local bus ridership was one of the factors used to designate break points.

CAPACITY MANAGEMENT AND MOBILITY: PEDESTRIANS AND BICYCLES

Investments sufficiently large to be classified as major investments for MPO planning purposes tend to have extended project areas and involve some level of improvement or refurbishment benefiting both motorized and nonmotorized modes. Often the name of the project reflects primarily the roadway improvements and unless more detailed descriptions have been prepared by proponents, the nature of ancillary improvements to nonmotorized modes can only be surmised.

MPO staff evaluated each project using available project descriptions and supplemented these sources using sketch planning analyses. In this approach, staff considered project area geography and current infrastructure configuration and condition to anticipate what types of improvements for nonmotorized modes would likely be incorporated into future plans as they develop. Points were awarded on these bases:

- 2 points: Adds or substantially improves an existing pedestrian route
- 1 point: Improves an existing pedestrian route
- 2 points: Adds or substantially improves an existing bicycle route
- 1 point: Improves an existing bicycle route
- 1 point: Improves access to transit for nonmotorized modes

Scores can range from zero to five. Projects with a zero score are in the low benefit group. Scores of one and two are in the medium group, and scores of three or more are in the high group.

ECONOMIC VITALITY

The last group of Table B-1 concerns economic vitality. Economic vitality scores result from a point system with "zero" or "one" point being low, "two," "three," or "four" points being medium, and "five," "six," or "seven" points being high. The columns with the final score and the point count are shown in the most saturated color. The columns with medium color saturation are points awarded solely on the basis of the proposed project's location. The columns with the lightest color saturation have points awarded on the basis of an assessment of proposed transportation improvements.

While any major transportation improvement can be expected to contribute to economic vitality, the ratings in this category reflect to what degree the improvements support the land use objectives embraced by the MPO. A candidate project can support these objectives if it

- **Serves an existing area of concentrated development**: High population and employment density for the type of community
- **Facilitates new development:** Transportation project is tied to new development proposals
- **Provides access to target development area:** Vehicle, transit, bicycle, or pedestrian access improvements

Serves Concentrated Development

A project could receive one or two points for serving an area of concentrated development, depending on whether the project was entirely or only partially located within an area with this designation.

Facilitates New Development

A project could be awarded a point if progress on a nearby development is contingent upon the implementation of the transportation improvement.

Provides Access to Targeted Development Areas

A project could be awarded up to four points for improving access to designated targeted development areas for specific modes with one point awarded to each mode with improved access. The four modes are motor vehicles, transit, bicycle, and pedestrian.

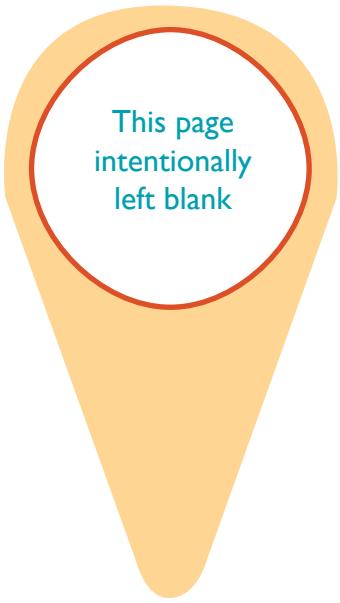
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Table B-1

Evaluated Major Infrastructure Projects for the *Destination 2040* LRTP

			SAFETY SCORING											SYSTEM PRESERVATION SCORING								CAPACITY MANAGEMENT SCORING																ECONOMIC VITALITY SCORING							
Project Name	Estimated Project Cost (2018 Dollars)	Annual Average Daily Traffic	Safety	EPDO	EPDO per 100,000,000 vehicles (Risk)	Cost per EPDO (Cost/Benefit)	Risk Group	Cost/Benefit Group	Project Impact Group	Top 200 Crash Location (Total EPDO)	HSIP Cluster (Total EPDO)	HSIP Bicycle Cluster (Bike-involved EPDO)	HSIP Pedestrian Cluster (Ped-involved EPDO)	System Preservation and Modernization	Cost per Index Point (000s)	Percent Resilience Related	Structurally Deficient Bridges	Weighted IRI	Total Project Roadway-miles	Total Project Lane-miles	Weighted Deficiency Index	Capacity Management and Mobility (Autos)	MPO-identified Express Highway Bottleneck Location	MPO-identified Arterial Bottleneck Location	Capacity Management and Mobility (Buses)	Regional and Local Bus Trips (Daily)	Total Regional Bus Trips (Daily)	Total Local Bus Trips (Daily)	Number of Regional Bus Routes Served	Number of Local Bus Routes Served	Capacity Management and Mobility (Peds/Bikes)	Nonmotorized Total	Pedestrian Improvements	Bicycle Improvements	Improves Transit Access	Economic Vitality	Total points	Mostly Serves Existing Area of Concentrated Development	Partly Serves Existing Area of Concentrated Development	Facilitates New Development	Provides Vehicle Acess to Target Development Area	Provides Transit Acess to Target Development Area	Provides Bicycle Acess to Target Development Area	Provides Pedestrian Acess to Target Development Area
Route 60 Improvements (Medford, Arlington) est	$40,000,000	20,400	high	3360	16637	$11,905	1	1	2		2		5	high	$12	0.3		252	8.2	16.3	3374	medium		moderate	high	508		508		8	high	4	2	1	1	medium	2					1		1
Improvements to Sweetser Circle (Routes 16/99) (Everett) est	$22,000,000	45,000	high	641	1439	$34,321	1	1	2					high	$18	0	1	274	1.7	5.4	1237	medium		moderate	high	497		497		8	medium	1	1			high	7	2		1	1	1	1	1
Widening on Route 1 (Malden, Revere, Saugus)	$172,500,000	115,000	high	2063	1812	$83,616	1	2	1					medium	$34	0.3		191	8.7	34.8	5081	high	severe		high	168	168		4		medium	2	1	1		medium	4	2		1	1			
Southeast Expressway Modification (Southampton) (Boston)	$143,750,000	225,000	high	4662	2093	$30,834	1	1	1				1	medium	$59	0		121	4.5	31.8	2417	high	severe		high	464	250	214	6	4	low					medium	2	2						
Reconstruction of Route 107 (Western Avenue) (Lynn)	$36,205,000	18,400	high	4660	25582	$7,769	1	1	2	4	10		7	medium	$42	0		259	2.0	4.0	856	low			high	202		202		7	high	3	2	1		medium	3	2		1				
Route 4/225 (Bedford Street) and Hartwell Avenue (Lexington)	$30,557,000	40,200	high	2335	5867	$13,087	1	1	2		4			high	$19	2.5		185	4.5	11.1	1554	low			medium	48		48		1	high	5	2	2	1	medium	2		1	1				
I-90/Interchange 17 (Newton)	$14,000,000	141,000	medium	1641	1176	$8,531	2	1	2					high	$35	0		121	2.8	5.3	403	high		severe	high	673		673		12	medium	1	1			low	1		1					
Improvements at Routes 16 and 2A (Arlington, Cambridge) est	$14,000,000	66,000	low	179	274	$78,212	2	2	2		1			medium	$88	15.95		167	.3	1.1	134	high		severe	high	359		359		3	medium	1	1			high	7	2		1	1	1	1	1
Improvements to Route 30 (Framingham, Natick) est	$14,000,000	42,000	high	868	2088	$16,129	1	1	2		3			high	$10	0.41		229	2.1	7.4	1362	low			medium	106	106		2		medium	2	1	1		high	6		1	1	1	1	1	1
McGrath Boulevard (Somerville)	$66,170,710	38,000	low	536	1425	$123,453	2	2	3	1	1	1	1	high	$66	0	2	218	1.3	5.8	1003	low			high	329		329		4	high	5	2	2	1	high	7	2		1	1	1	1	1
Replacement of Allston I-90 Elevated Viaduct (Boston)	$1,200,000,000	174,000	low	1246	723	$963,082	2	2	2		1	1		medium	$370	0	1	142	8.4	33.4	3240	low			high	542	112	430	3	10	high	3	1	1	1	high	7	2		1	1	1	1	1
I-93 and I-95 (Woburn)	$276,708,768	373,000	high	8202	2221	$33,737	1	1	1		2			low	$156	0		61	24.2	111.0	1776	high	severe		high	194	177	17	5	1	low					medium	3		1	1	1			
I-93/Route 3 Interchange (Braintree Split)	$53,289,000	282,000	high	4559	1633	$11,689	1	1	2	1	1			medium	$68	2.5		63	7.8	42.2	760	high	severe		high	250	250		6		low					low	1		1					
Route 1A/16 Connector (Revere)	$73,080,000	36,700	high	1285	3537	$56,872	1	2	1					low	$163	0		259	.5	2.1	449	high		severe	medium	85		85		6	medium	1	1			medium	3	2			1			
Bridge Replacement Route 27 over Route 9 (Natick)	$25,793,370	80,000	medium	1102	1391	$23,406	2	1	2					high	$97	0	1	137	1.6	2.9	267	low			medium	18		18		2	high	5	2	2	1	medium	2	2						
Boardman Street at Route 1A (Boston)	$13,686,000	59,500	medium	100	170	$136,860	2	2	1					low	$204	0		179	.2	.5	67	high		severe	high	124		124		7	medium	2	1		1	medium	2		1		1			
Interchange Improvements I-95/I-93 (Canton, Dedham, Norwood)	$202,205,994	240,000	medium	1309	551	$154,474	2	2	1					medium	$235	1.3	1	61	12.4	53.0	848	medium	moderate		medium	24	24		2		high	3	1	1	1	medium	3		1	1	1			
Improvements at Route 126/135/MBTA (Framingham)	$115,000,000	35,400	high	533	1521	$215,760	1	2	1		2	1	1	low	$1133	0		248	.2	.5	102	low			medium	40		40		5	medium	2	1		1	high	7	2		1	1	1	1	1
Route 128/I-95 Improvements, exits 37 to 40 (Reading to Wakefield)	$38,488,347	164,000	medium	2223	1369	$17,314	2	1	2					high	$41	0	1	72	6.0	34.7	937	high	severe		low						low					medium	2		1		1			
Route 1/Route 16 Connector (Chelsea, Revere)	$7,360,000	40,200	high	764	1920	$9,634	1	1	3					high	$7	62.9		153	1.5	3.8	410	low			medium	60		60		2	low					medium	4	2			1	1		
Route 128 Mainline Improvements (Danvers, Peabody)	$24,031,419	102,000	high	1546	1531	$15,544	1	1	2	1	1			high	$20	5	1	127	3.4	13.8	1132	medium	moderate		low						low					low	1		1					
Mahoney Circle Grade Separation (Revere)	$60,000,000	56,000	medium	823	1484	$72,904	1	2	1					low	$166	0		258	.5	1.7	362	low			high	333		333		11	medium	2	1	1		medium	3		1		1	1		

			SAFETY SCORING											SYSTEM PRESERVATION SCORING								CAPACITY MANAGEMENT SCORING												ECONOMIC VITAILITY SCORING							
Project Name	Estimated Project Cost (2018 Dollars)	Annual Average Daily Traffic	Safety	EPDO	EPDO per 100,000,000 vehicles (Risk)	Cost per EPDO (Cost/Benefit)	Risk Group	Cost/Benefit Group	Project Impact Group	Top 200 Crash Location (Total EPDO)	HSIP Cluster (Total EPDO)	HSIP Bicycle Cluster (Bike-involved EPDO)	HSIP Pedestrian Cluster (Ped-involved EPDO)	System Preservation and Modernization	Cost per Index Point (000s)	Percent Resilience Related	Structurally Deficient Bridges	Weighted IRI	Total Project Roadway-miles	Total Project Lane-miles	Weighted Deficiency Index	Capacity Management and Mobility (Autos)	MPO-identified Express Highway Bottleneck Location	MPO-identified Arterial Bottleneck Location	Capacity Management and Mobility (Buses)	Regional and Local Bus Trips (Daily)	Total Regional Bus Trips (Daily)	Total Local Bus Trips (Daily)	Number of Regional Bus Routes Served	Number of Local Bus Routes Served	Capacity Management and Mobility (Peds/Bikes)	Nonmotorized Total	Pedestrian Improvements	Bicycle Improvements	Improves Transit Access	Economic Vitality	Total points	Mostly Serves Existing Area of Concentrated Development	Partly Serves Existing Area of Concentrated Development	Facilitates New Development	Provides Vehicle Access to Target Development Area	Provides Transit Acess to Target Development Area	Provides Bicycle Acess to Target Development Area	Provides Pedestrian Acess to Target Development Area
I-95 Capacity Improvements (Lynnfield, Reading)	$10,500,000	157,000	medium	2149	1383	$4,886	2	1	2					high	$8	3.1		60	14.9	89.4	1341	medium	moderate		low						low					medium	3		1	1	1			
Reconstruction of Bridge Street (Salem)	$24,810,210	17,800	medium	255	1447	$97,295	1	2	2					medium	$57	50.8		282	.4	.9	213	low			medium	85		85		6	medium	2	1		1	medium	4	2			1			1
Walnut Street and Route 1 Interchange (Saugus)	$19,581,123	136,000	medium	679	504	$28,838	2	1	2					medium	$24	0		200	1.7	5.2	806	low			medium	42		42		1	medium	2	1		1	low	1		1				
Cypher St Extension (Boston)	$9,700,000	3,000	medium	69	2323	$140,580	1	2	2					medium	$51	0		205	.7	1.2	192	low			low						medium	2	1	1		medium	3	2		1				
I-495 and Route 126 (Hartford Avenue) Interchange (Bellingham)	$22,000,000	36,000	high	850	2385	$25,882	1	1	1		1			low	$248	0		82	1.8	2.4	89	low			low	6		6		1	medium	2	2			medium	4		1		1		1	1
Route 3 South Widening (Braintree to Weymouth)	$800,000,000	159,000	medium	5114	3249	$156,433	1	2	3					medium	$191	1	3	87	24.2	98.7	4145	low			medium	50	50		1		low					low	1		1					
Sumner Tunnel Refurbishment (Boston)	$126,544,931	40,000	low	393	992	$321,997	2	2	3					low	$151	36.46		276	1.2	2.3	531	low			medium	20		20		1	low					high	6	2		2	1	1		
Concord Rotary (Concord)	$103,931,250	48,000	high	850	1789	$122,272	1	2	1					low	$142	4.4		172	2.1	5.5	699	low			low	2	2		1		medium	1	1			low	1		1					
128 Capacity Improvements (Peabody)	$24,634,000	110,000	medium	618	567	$39,861	2	1	2					medium	$24	0		127	3.2	12.6	1033	medium	moderate		low						low					low	1		1					
Washington Street Bridge Replacement (Woburn)	$12,200,000	38,800	medium	268	698	$45,522	2	1	3					low	$3389	0		63	.1	.2	4	medium		moderate	low						medium	1	1			low	1		1					
Route 2 Widening (Concord)	$8,000,000	70,000	medium	277	400	$28,881	2	1	3					high	$11	0		112	3.0	10.5	704	low			low	2	2		1		low					low	1			1				
Route 128/Riverside Ramp (Newton)	$10,000,055	23,500	low	65	279	$153,847	2	2	3					low	$206	0		142	.3	.5	49	low			medium	20		20		1	low					medium	3		1	1	1			
New Summer Street/Haul Road Connector (Boston)	$9,700,000	4,000	low	39	985	$248,718	2	2	3					medium	$101	0		205	.3	.6	96	low			low						low					medium	3	2			1			
I-290/495 Reconstruction (Hudson, Marlborough)	$125,000,000	162,500	medium	1714	1065	$72,929	2	2	1					low	$1351	1.4		61	2.7	5.7	91	low			low						low					low	0							
Route 128/Brimbal Ave, Phase II (Beverly)	$23,000,000	73,500	low	209	287	$110,048	2	2	3					low	nm	0		45	1.4	1.8	0	low			low						low					medium	3		1	1	1			

EPDO = Equivalent Property Damage Only. est = estimated cost. HSIP = Highway Safety Improvement Program. I = Interstate. IRI = International Roughness Index. LRTP = Long-Range Transportation Plan. MBTA = Massachusetts Bay Transportation Authority. MPO = Metropolitan Planning Organization.
Source: Boston Region MPO.

Table B-2

Summary of Evaluated Major Infrastructure Projects for the *Destination 2040* LRTP

Location	Project Name	Estimated Project Cost (2018 Dollars)	Annual Average Daily Traffic	Safety	System Preservation	Capacity Management/Mobility (Autos)	Capacity Management/Mobility (Buses)	Capacity Management/Mobility (Peds/Bikes)	Economic Vitality	Total Rating	5 or more low ratings	4 low ratings	3 low ratings	2 low ratings	2 high ratings	3 or more high ratings
Arlington, Medford	Route 60 improvements	$40,000,000	20,400	3	3	2	3	3	2	16						X
Everett	Improvements to Sweetser Circle (Routes 16 and 99)	$22,000,000	45,000	3	3	2	3	2	3	16						X
Malden, Revere, Saugus	Reconstruction and Widening on Route 1, from Route 60 to Route 99	$172,500,000	115,000	3	2	3	3	2	2	15						X
Boston	Southeast Expressway Modification (Southampton Interchange)	$143,750,000	225,000	3	2	3	3	1	2	14						X
Lynn	Reconstruction of Route 107 (Western Avenue)	$36,205,000	18,400	3	2	1	3	3	2	14						X
Lexington	Route 4/225 (Bedford Street) and Hartwell Avenue	$30,557,000	40,200	3	3	1	2	3	2	14						X
Newton	I-90/Interchange 17	$14,000,000	141,000	2	3	3	3	2	1	14						X
Arlington and Cambridge	Improvements to intersection of Routes 16 and 2A (Alewife Brook Parkway and Massachusetts Avenue)	$14,000,000	66,000	1	2	3	3	2	3	14						X
Framingham and Natick	Improvements to Route 30 (Cochituate Road)	$14,000,000	42,000	3	3	1	2	2	3	14						X
Somerville	McGrath Boulevard Project	$82,500,000	38,000	1	3	1	3	3	3	14				X		X
Boston	Replacement of Allston I-90 Elevated Viaduct	$1,200,000,000	174,000	1	2	1	3	3	3	13				X		X
Reading, Stoneham, Wakefield, Woburn	Interchange Improvements to I-93/I-95 (Bridge Replacement and Related Work)	$276,708,768	373,000	3	1	3	3	1	2	13				X		X
Braintree	I-93/Route 3 Interchange (Braintree Split)	$53,289,000	282,000	3	2	3	3	1	1	13				X		X
Revere	Route 1A/Route 16 Connector	$73,080,000	36,700	3	1	3	2	2	2	13					X	
Natick	Bridge Replacement, Route 27 (North Main Street) over Route 9 (Worcester Street)	$25,793,370	80,000	2	3	1	2	3	2	13					X	
Boston	Boardman Street at Route 1A	$13,686,000	59,500	2	1	3	3	2	2	13					X	
Canton, Dedham, Norwood	Interchange Improvements at I-95/I-93/University Avenue/I-95 Widening	$202,205,994	240,000	2	2	2	2	3	2	13						
Framingham	Intersection Improvements at Route 126/135/MBTA	$115,000,000	35,400	3	1	1	2	2	3	12				X	X	
Reading, Stoneham, Wakefield	Improvements along Route 128/95—from north of Interchange 37 to Interchange 40	$38,488,347	164,000	2	3	3	1	1	2	12				X	X	
Chelsea and Revere	Route 1/Route 16 Connector	$7,360,000	40,200	3	3	1	2	1	2	12				X	X	
Danvers and Peabody	Mainline Improvements on Route 128 (Phase II)	$24,031,419	102,000	3	3	2	1	1	1	11		X			X	

Location	Project Name	Estimated Project Cost (2018 Dollars)	Annual Average Daily Traffic	Safety	System Preservation	Capacity Management/Mobility (Autos)	Capacity Management/Mobility (Buses)	Capacity Management/Mobility (Peds/Bikes)	Economic Vitality	Total Rating	5 or more low ratings	4 low ratings	3 low ratings	2 low ratings	2 high ratings	3 or more high ratings
Revere	Mahoney Circle Grade Separation	$60,000,000	56,000	2	1	1	3	2	2	11				X		
Lynnfield and Reading	I-95 Capacity Improvements, Lynnfield to Reading	$10,500,000	157,000	2	3	2	1	1	2	11				X		
Salem	Reconstruction of Bridge Street, from Flint Street to Washington Street	$24,810,210	17,800	2	2	1	2	2	2	11						
Saugus	Interchange Reconstruction at Walnut Street and Route 1 (Phase II)	$19,581,123	136,000	2	2	1	2	2	1	10				X		
Boston	Cypher Street Extension	$9,700,000	3,000	2	2	1	1	2	2	10				X		
Bellingham	Ramp construction and relocation, I-495 at Route 126 (Hartford Avenue)	$22,000,000	36,000	3	1	1	1	2	2	10			X			
Braintree to Weymouth	Route 3 South Widening	$800,000,000	159,000	2	2	1	2	1	1	9			X			
Boston	Sumner Tunnel roadway, ceiling, and wall reconstruction, and new systems installation	$126,544,931	40,000	1	1	1	2	1	3	9		X				
Concord	Improvements and Upgrades to Concord Rotary (Routes 2/2A/119)	$103,931,250	48,000	3	1	1	1	2	1	9		X				
Peabody	Route 128 Capacity Improvements: Exit 26 to Exit 28	$24,634,000	110,000	2	2	2	1	1	1	9			X			
Woburn	Bridge Replacement and Related Work, W-43-028, Washington Street over I-95	$12,200,000	38,800	2	1	2	1	2	1	9			X			
Concord	Reconstruction and widening on Route 2 from Sandy Pond Road to bridge over MBTA rail line	$8,000,000	70,000	2	3	1	1	1	1	9		X				
Newton	New Route 128 Ramp to Riverside Station	$10,000,055	23,500	1	1	1	2	1	2	8		X				
Boston	New Summer Street north/south connection to Haul Road and Northern and Drydock Avenues	$9,700,000	4,000	1	2	1	1	1	2	8		X				
Hudson and Marlborough	Reconstruction on Routes I-290 and 495 and Bridge Replacement	$125,000,000	162,500	2	1	1	1	1	1	7	X					
Beverly	Interchange Reconstruction at Route 128/Exit 19 at Brimbal Avenue (Phase II)	$23,000,000	73,500	1	1	1	1	1	2	7	X					

I = Interstate. MBTA = Massachusetts Bay Transportation Authority. LRTP = Long-Range Transportation Plan.
Source: Boston Region MPO.