SEACOAST TRANSPORTATION CORRIDOR VULNERABILITY ASSESSMENT

Draft Criteria and Evaluation Framework for Priority Site Selection

INTRODUCTION - PHASED APPROACH TO PRIORITY SITE SELECTION AND EVALUATION

The Seacoast Transportation Corridor Vulnerability Assessment (STCVA) project will employ a four phased approach to priority site selection and evaluation. The model will evaluate specific flood conditions based on projected sea-level rise scenarios of 1.0 feet, 1.7 feet and 4.0 feet. [Note: The transportation model is unable to produce results for the 6.3 feet sea-level rise scenario due to the prevalence of impacted road segments throughout the network.]

Each phase is designed to maximize the application of RPC's transportation model and best available data and science to determine which sites in the coastal region transportation network are subject to greatest flood risk, vulnerability and impacts, and when impacted roadways render portions of the network functionally impaired or nonfunctional.

PHASE 1: TRANSPORATION MODEL CRITERIA AND OUTPUTS

Model outputs used to evaluate network functionality elements such as flood risk and exposure to identify a first cut of key sites impacted. Site evaluation criteria will include:

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PHASE 2: SELECTION OF DRAFT LIST OF PRIORITY SITES

From the model outputs in Phase 1, a draft list of priority sites (up to 25 sites) will be generated and reviewed for accuracy with model criteria inputs and known site conditions. This phase will engage the NHDOT and Coastal Program staff and possibly other regional technical experts to provide and evaluate/verify site specific data and conditions.

Input from the Advisory Committee, NHDOT and Coastal Program on the draft priority site list will be solicited via an online survey and/or phone interviews and video conferences to gather information about local priorities and needs and additional site specific information. This activity will include a scoring mechanism to rank sites in each of the coastal municipalities.

PHASE 3: DETERMINE DRAFT FINAL PRIORITY SITE LIST

Create a 2nd tier of evaluation criteria (e.g. everything not scored in the model outputs in Phase 1) to determine final list of priority sites (up to 10 sites). This will likely be more of a manual exercise, using subjective analyses, ground truthing with site visits and site specific data, and agency expertise of site specific conditions. 2nd tier criteria may include but are not limited to:

- Social Vulnerability Index score
- Salt marsh migration pathways in response to sea-level rise
- Presence and proximity of infrastructure and critical facilities
- Natural/living shorelines and coastal buffers
- Critical wildlife habitat
- Recreational facilities and areas

- Presence of red listed bridges
- Increased traffic volume on alternate routes
- Groundwater rise impacts to roadways
- Presence of sites in MS4 areas and Urban Compact Areas

The Phase 3 analyses will include a scoring mechanism to rank the draft list of priority sites based on results of the 2nd tier criteria analyses.

Follow up input from the Advisory Committee, NHDOT and Coastal Program on the final draft priority site list will be solicited via an online survey and/or phone interviews and video conferences to gather information about local priorities and needs and additional site specific information.

PHASE 4: SELECT FINAL PRIORITY SITES AND EVALUATE CLIMATE ADAPATION AND RESILIENCE OPTIONS

Evaluate final priority sites in detail considering other factors such as co-benefits and impacts associated with adaptation and resilience potential. These considerations may include but are not limited to:

- Feasibility of site improvements and adaptative capacity (e.g. presence of barriers, regulated areas, private property)
- Cost of short term and long term adaptation and resilience measures
- Impacts to surrounding infrastructure, development, private property, and environmental and other resources
- Short term and long term benefits (or lack of benefit to adaptation)
- Alternatives available to modify the transportation network elsewhere to maintain acceptable service and function
- Consider a “do nothing” approach and adopt adaptive management measures for as long as possible
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Consultants from the University of New Hampshire will provide technical analyses to the project team about climate adaptation and resilience potential for each site or groups of similar sites including structural improvements, adaptation and resilience strategies, and short and long term protection measures.

PHASE 1. TRANSPORATION MODEL CRITERIA AND OUTPUTS

A. Evaluate Roadway Network Criticality

Criticality = Operations + Socioeconomics + Health & Safety/Services

This first step of the process will evaluate the roadways in the region utilizing the criteria listed in this section. While all roads will be measured against the criteria, the list will be filtered to include only those links expected to be impacted under sea level rise scenarios being considered in this project (1', 1.7', and 4').

1. Operational Considerations

Functional classification – The functional classification is a grouping of streets and roadways (both state and community owned and maintained) into sets according to the role the particular highway plays in serving travel on the system as defined by the Federal DOT and implemented by State DOTs and communities. Local roads are the lowest class and these roadways provide local circulation and direct access to properties. Collectors gather traffic from local streets and so carry more traffic and provide somewhat less direct access to property. Collectors connect between Arterials which are the primary surface roadways in an area. These roads carry more traffic and provide connections between communities and regions. Interstates and Freeways are the highest functional class and these serve the greatest volumes of traffic as they provide both intra- and inter-regional connections. They do not generally provide direct access to individual properties. All roadways (NHDOT Roads Database). The scoring system based on Federal Functional Classification (Interstate, Arterial, Collector, Local) awards the greatest number of points(1-5 Scale) to the highest class. Only travel demand mode links in the study region that are expected to be inundated by water due to sea level rise are evaluated (125 observations out of 2396 links in the study area) and so not all classes of roadway are represented, and the scoring is adjusted accordingly. See Table 1.

Table 1: Functional Classification Scoring

FUNCCLASS	Inundated Model Links	Score
Interstate/Freeway	0	
Principal Arterial	12	5
Minor Arterial	66	4
Major Collector	46	3
Minor Collector	0	
High Capacity Ramp	0	
Low Capacity Ramp	1	2
Local	0	
Total	125	

Trips/Traffic volume served – The travel demand model calculates an estimated daily traffic volume for each direction on each included roadway. As the model is regional in nature and is intended to be looked at very broadly, it does not always assign volumes that are equivalent to what is has been physically counted. In these cases, the model data is supplemented with traffic volume count data from RPC and NHDOT to ensure that each roadway has a reasonable assumption regarding volume of traffic carried. Available for all roadways in the travel demand model (Travel Demand Model/Traffic Counts database) The scoring system for this criterion bins traffic volumes into quantile ranges with the inundated links having the highest volumes receiving the greatest number of points (1-5 scale). See Table 2.

Table 2: Volume Scoring

Min Volume	Max Volume	Inundated Links	Score
0	2,151	25	1
2,152	3,307	25	2
3,308	3,377	25	3
3,378	4,937	25	4
4,938	20,220	25	5

2. Health and Safety/Services Factors

Proximity to emergency services and health care facilities. This criterion uses the data collected as part of the RPC Hazard Mitigation Plans to identify the location of emergency services facilities. Network Analyst is utilized to calculate the shortest path between each link and the nearest emergency services facility. Inundated links are binned into quantile ranges and locations with the greatest proximity to emergency services facilities receive higher scores on a 1-5 point scale. See Table 3.

Table 3: Distance to Emergency Services Scoring

Min Distance	Max Distance	Inundated Links	Score
0	0.271	25	5
0.272	0.51	25	4
0.52	1.58	25	3
1.59	2.46	25	2
2.47	4.2	25	1

Availability of alternative routes if the link is closed – Network Analyst is utilized to calculate the availability of alternate routes to get to/from each link under each scenario. If a link is inaccessible in a particular scenario it is considered that no alternate route is available. Scoring is binary Yes/No

with links with no alternative routes receiving the full five points, and those with alternatives available receiving zero. See Table 4.

Table 4: Presence of Alternate Routes Scoring

Alternate_Routes	Inundated Links	Score
No	123	5
Yes	2	0

3. Socioeconomic Considerations

Social Vulnerability Index – SVI is an aggregate value that indicates magnitude of presence of socially vulnerable populations such as elderly, young children, disabled, and those in poverty. The measure was used for Level of Traffic Stress (LTS – Bike Accessibility Study) project so data is available but is limited to Census block or greater areas. Higher SVI values indicate a more vulnerable population, lower indicate less vulnerable. Scoring is binned into groups based on natural breaks between SVI numbers with higher values receiving a higher score. Because SVI is applied to census block areas the distribution of the observations is not equal between bins. See Table 5.

Table 5: Social Vulnerability Index Scoring

Min Index Value	Max Index Value	Inundated Links	Score
0	0.0756	23	1
0.7561	0.1821	40	2
0.18211	0.268	10	3
0.2681	0.543	11	4
0.5431	0.7973	41	5

Community facilities are accessed by each link. The location of community facilities (schools, libraries, beach, recreation) as derived from other projects. Network Analyst is utilized to calculate the shortest path between each link and the nearest emergency services facility. Inundated links are binned into quantile ranges and locations with the greatest proximity to emergency services facilities receive higher scores on a 1-5 point scale. See Table 6.

Table 6: Distance to Community Facilities

Min Distance	Max Distance	Inundated Links	Score
0	0.23	25	5
0.231	0.39	25	4
0.391	0.54	25	3
0.541	0.77	25	2
0.771	1.59	25	1

Assessed value of property along each link – The value per acre of each parcel adjacent to inundated links is calculated as a proxy for population/businesses served which is only available in larger blocks. Areas are binned into quantile ranges based on values with the greatest value per acre receiving the highest scores. See Table 7.

Table 7: Land Value Scoring

Min Value	Max Value	Inundated Links	Score
$0	$233,957	25	1
$233,958	$877,933	25	2
$877,934	$1,510,487	25	3
$1,510,488	$3,313,868	25	4
$3,313,869	$6,701,743	25	5

Criteria Weights

- Each of the selection criteria needs to be weighted to create a score. RPC has developed placeholder weightings to assist in the creation of the evaluation model shown in Table 8.
- Weights will be set using a survey instrument that asks respondents to prioritize the criteria from most important to least. As illustrated in the graphic below, once all responses have been tallied the count of the number of times each criterion is given each rank is multiplied by the points provided to each rank. The total score of each criterion is calculated and the scores for all criteria are added. The score for each criterion is divided by the total score for all criteria to determine the percent weight each is given. Weights will be rounded to the nearest whole percentage for a final value for each criterion.

Table 8: Draft Criteria Weights

Criterion	Weight
Functional Classification	20%
Average Daily Volume (AADT)	20%
Distance to Emergency Services	15%
Alternate Route Availability	15%
Social Vulnerability Index (SVI)	10%
Distance to Community Facilities	10%
Average Land Value per Acre	10%

	Votes for each Rank			Total	Weighted	Rounded
	Rank 1	Rank 2	Rank 3	Score	Share	Weight
Criteria A	5	10	5	15+20+5 = 40	40/120 = 33.33%	33%
Criteria B	10	5	5	30+10+5 = 45	45/120 = 37.50%	38%
Criteria C	5	5	10	15+10+10 = 35	35/12 = 29.17%	29%
	*	*	*	40+45+35 = 120	100%	100%
Points	3	2	1			

B. Draft List of Priority Sites

Based on the outputs of the travel demand model and the application of other quantitative data, a prioritized list of all impacted locations will be developed. Rather than consider each model link individually, adjacent impacted links will be grouped into larger segments of road or roads for prioritization.

Scenario	Impacted Locations
1 Foot	3 (4 model links)
1.7 Feet	5 (13 model links)
4 Feet	24 (125 model links)

C. Evaluation for Priority Site Selection

Once all roadway links have been evaluated from an operational perspective and assembled into a first-cut priority list of impacted areas, a more qualitative effort will be undertaken to create a short-list of the highest priority locations for more detailed assessment and analysis.

1. **Locally Identified Priorities (To Be Determined)**

   1.1. **Which locations have the communities identified as most critical** –Based on feedback from the community on importance.

      1.1.1. Scoring – A survey instrument will be fielded that asks respondents to prioritize locations within a town and then to select the top 10 (?) within the region as a whole.

2. **Environment and Natural Resources**

   2.1. Proximity to tidal marsh, freshwater wetlands, surface waters (GRANIT data)
   2.2. Presence of WAP high value habitat /CCP Core Focus Areas (GRANIT data)
   2.3. Natural/living shoreline buffer (NHDES shoreline structure inventory)
   2.4. Area of projected groundwater rise (J. Knott/UNH studies)
   2.5. Regulated MS4 area, water quality issues (existing MS4 maps and 304(d) impaired waters lists)

3. **Other Factors?**

   Create a Profile for each location

   Data from scoring process

   Population

   Housing units

   Employment

D. Detailed Site Evaluation and Assessment

1. **Type and Degree of Impact**

   1.1. Flood impact to pavement, shoulder, road base

   1.2. Evidence of erosion and/or sedimentation (refer to tidal crossing inventory)

   1.3. Structural compromise (road, bridge, culvert, other crossing, approach) (NHDOT Roads Database and NHDES Culvert Inventory)

1.4. Compromise of protective barrier (shale piles, seawall, other constructed barrier, natural shoreline) (DES Shoreline Structure Inventory)

1.5. Compromise of stormwater infrastructure or drainage control structures

2. <u>Recommended Improvement Type</u>

2.1. Assess whether a roadway infrastructure project is appropriate for solving the problem or if other approaches need to be considered.

2.2. Address environmental impacts resulting from flooding and possible adaptation and management options to address them as part of any improvements proposed.

PHASE 2. SELECTION OF DRAFT LIST OF PRIORITY SITES

IN PROGRESS WITH PROJECT PARTNERS

PHASE 3. DETERMINE FINAL DRAFT PRIORITY SITE LIST

IN PROGRESS WITH PROJECT PARTNERS

PHASE 4: SELECT FINAL PRIORITY SITES AND EVALUATE CLIMATE ADAPATION AND RESILIENCE OPTIONS

NO ACTIVITY DURING THIS BILLING PERIOD

GLOSSARY

Alternate Route

Critical Infrastructure or Facility

Risk Exposure

Thresholds (numerical such as # of households impacted)

Travel Time

Vulnerability