

Appendix A: Criteria and Evaluation Framework for Priority Site Selection

SEACOAST TRANSPORTATION CORRIDOR VULNERABILITY ASSESSMENT

INTRODUCTION - PHASED APPROACH TO PRIORITY SITE SELECTION AND EVALUATION

The Seacoast Transportation Corridor Vulnerability Assessment (STCVA) project employed a multi-step approach to prioritize sites for the vulnerability assessment component of the study. The process was designed to consider multiple factors and expert input to determine which of the identified inundation sites are the most critical to function of the transportation network and, adding consideration of other factors, would be priorities for conducting the vulnerability assessments. A set of evaluation criteria was developed to establish “criticality” of each location and identify an initial set of priorities. This was followed by gathering expertise and site knowledge from NH Department of Transportation and NH Coastal Program staff as well as the study team. Based on the initial assessment and the input from experts, a final set of priorities was set for the vulnerability assessment and the locations of the two case studies identified.

STEP 1: ESTABLISH NETWORK CRITICALITY

A set of factors were assembled and weighted to assess the importance of each site to the local and regional transportation network. Early travel demand model network development and testing efforts indicated that there were significant problems completing the analysis at 6.3 feet of sea-level rise due to the number of disabled network links. For that reason, the prioritization process focused on just those locations inundated at 1.0, 1.7, and 4.0 feet of sea-level rise. This established a list of 25 sites to weigh against the set of criteria that included operational, health and safety, and socio-economic considerations. Included in initial assessment was an understanding that those locations impacted in the lowest sea-level rise scenarios would be priorities as they represent the most vulnerable areas of the transportation network. From this assessment a composite score was developed, and a draft priority listing was established.

$$\text{Criticality} = \text{Operations} + \text{Socioeconomics} + \text{Health \& Safety/Services}$$

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').

Objectives

- Identify which roadway segments are vulnerable to sea level rise impacts under each scenario
- Prioritize segments in terms of importance to the functionality of the transportation network in the seacoast.

1. Operational Considerations

1.1. 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. Available for all roadways (NHDOT Roads Database).

Table 1: Functional Classification Scoring

Functional Classification	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	

1.1.1. 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 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

1.1. 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).

1.1.1. Scoring - 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.

2. Health and Safety/Services Factors

1.2. 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.

1.2.1. Scoring - 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

1.3. 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 (including local road links not included in the travel model).

1.3.1. Scoring - 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	3	0

3. Socioeconomic Considerations

3.1. 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.

3.1.1. Scoring - 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

3.2. 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.

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

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

3.2.1. Scoring – 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.

3.3. 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.

3.3.1. Scoring – Areas are binned into quantile ranges based on values with the greatest value per acre receiving the highest scores. See Table 7.

4. Criteria Weights

The selection criteria were weighted to create a composite score for each location under consideration and these weightings are included in Table 8. Weights have been set so that Operational factors are 40% of the total score, while socio-economic and health and safety components are each 30% of the total score.

The application of the scoring criteria developed to establish network criticality were applied and the sites ranked to set a preliminary list of priorities. Table 9 includes the scoring of each site inundated at the 1.0 foot, 1.7 feet, and 4.0 feet of sea-level rise scenarios.

Table 8: Criteria Weights

Category	Criterion	Weight
Operational Considerations	Functional Classification	20%
	Average Daily Volume (AADT)	20%
Health and Safety Factors	Distance to Emergency Services	15%
	Alternate Route Availability	15%
Socio-Economic Factors	Social Vulnerability Index (SVI)	10%
	Distance to Community Facilities	10%
	Average Land Value per Acre	10%

Table 9: Initial Scoring Results using Criticality Criteria

			Overall Score	Functional Classification	Traffic Volume	Access to Emergency Services	Alternate Route Available	Social-Vulnerability Index	Access to Community Services	Land Value
		Weight	100%	20%	20%	15%	15%	10%	10%	10%
Site #	Community	Roadways	score (0-50)	score (1-5)	score (1-5)	score (1-5)	score (1-5)	score (1-5)	score (1-5)	score (1-5)
20	Hampton	Lafayette Rd	40.0	4.0	5.0	3.0	5.0	5.0	4.0	1.0
22	Seabrook	NH 286	39.5	3.0	5.0	4.0	5.0	4.0	4.0	2.0
19	Hampton	Ashworth Ave	38.0	4.0	4.0	3.0	5.0	5.0	1.0	4.0
18	Hampton	Brown Ave, NH 101, Highland Ave, Church St	37.6	4.3	4.0	3.0	5.0	4.0	2.0	3.0
16	Hampton	High St	37.5	4.0	5.0	2.0	5.0	2.0	4.0	3.0
1	Portsmouth	State St	36.5	4.0	2.0	4.0	5.0	3.0	3.0	5.0
5	New Castle	Wentworth Rd	34.5	4.0	4.0	2.0	5.0	4.0	2.0	2.0
7	Rye	Wentworth Rd	34.5	4.0	4.0	2.0	5.0	4.0	2.0	2.0
2	Portsmouth	Marcy St	34.0	4.0	2.0	3.0	5.0	3.0	4.0	3.0
6	Rye	Wentworth Rd	34.0	4.0	4.0	3.0	5.0	4.0	1.0	1.0
24	Stratham	Squamscott Rd	34.0	4.0	5.0	3.0	5.0	2.0	1.0	1.0
4	Portsmouth/ New Castle	Marcy St, Newcastle Ave, Portsmouth Ave	33.0	4.0	2.0	3.0	5.0	4.0	1.0	4.0
17	Hampton	NH 1A, Winnacunnet Rd	32.9	3.9	4.0	3.0	5.0	1.0	1.0	3.0
3	Portsmouth	Junkins Ave, Parrott Ave	32.2	3.6	2.0	3.0	5.0	3.0	2.0	4.0
14	North Hampton/ Hampton	Ocean Blvd	31.0	3.0	5.0	1.0	5.0	2.0	1.0	3.0
25	Portsmouth	Lafayette Rd	31.0	5.0	5.0	2.0	0.0	4.0	2.0	2.0
13	Rye	Ocean Blvd, Locke Rd	27.8	3.2	2.0	2.0	5.0	2.0	3.0	2.0
23	Exeter	Water St	27.0	3.0	4.0	2.0	0.0	5.0	4.0	1.0
8	Rye	Pioneer Rd, Ocean Blvd	26.5	3.0	2.0	2.0	5.0	2.0	3.0	1.0
21	Seabrook	South Main St	26.5	3.0	1.0	2.0	5.0	4.0	3.0	1.0
11	Rye	Ocean Blvd, Wallis Rd	25.3	3.1	1.0	3.0	5.0	2.0	0.0	3.0
12	Rye	Brackett Rd	24.5	4.0	1.0	2.0	5.0	2.0	1.0	1.0
10	Rye	Parsons Rd, Marsh Rd	24.0	3.0	1.0	1.0	5.0	2.0	4.0	1.0
9	Rye	Ocean Blvd	22.0	3.0	1.0	1.0	5.0	2.0	1.0	2.0
15	Hampton	Cusack Rd	20.0	3.0	1.0	2.0	0.0	2.0	5.0	2.0

STEP 2: SELECTION OF PRELIMINARY PRIORITY SITE LIST

Based on the outputs of the criticality assessment, a preliminary prioritization of the identified 25 sites was generated and reviewed for accuracy against available data and known site conditions. This review engaged NH Department of Transportation and Coastal Program staff as well as the project team and involved a workshop where options were considered.

The draft priority listing of the 25 sites based on the scoring process formed the starting point for discussions of priority locations with NH Department of Transportation and the NH Coastal Program. This discussion incorporated other factors beyond the scoring criteria in establishing priorities for the vulnerability assessments. This coordination between partners involved discussion of the following aspects:

- The results of the recently completed Hampton Harbor and Meadow Pond Flood Studies
- The ongoing NHDOT study of options for the NH 1B bridges and causeways
- The ongoing analysis of coastal revetments
- Concerns about the viability of transportation solutions due to substantial adjacent development
- The viability of detours around inundated locations

Based on that discussion and further information, some sites that scored lower in Step 1 were reconsidered as options for the vulnerability assessment and case studies while other locations were taken out of consideration factoring in the importance to the transportation network with the desire to minimize duplicative efforts.

STEP 3: DETERMINE FINAL PRIORITY SITE LIST

The input received under step 2 was utilized to adjust the initial set of priorities into a final prioritized list. In the end, factors such as local site conditions, ongoing analysis and engineering in some locations, and the potential applicability of results to more than one location played an important role in determining the sites selected. Once priority sites were selected, visits to each location occurred with NH Department of Transportation and NH Coastal Program staff to verify understanding of site-specific conditions and obtain additional information and insight for possible adaptation options. The result was a list of thirteen sites selected for inclusion in the vulnerability assessment (shown in Table 10). In the case of the sites on NH 1B in New Castle and Rye (sites 5, 6, and 7), all three locations would need to be addressed to maintain access to New Castle Island and therefor the three were combined into a single analysis location. This resulted in eleven locations for the vulnerability assessment from which, two were chosen for more detailed case studies. The sites were chosen to broadly represent the different types of situations encountered in the region as well as a broad swath of adaptation alternatives.

The two sites selected for the case studies; Marsh Road/Parsons Road in Rye, and Lafayette Road in Hampton, are representative of different approaches to mitigating the impacts of SLR on the roadway network. The Rye site is an example where the impacts to other network assets may play a role in the decisions made about addressing SLR at that site, while the Hampton site is a critical component of the regional network and will need to be addressed directly to maintain function.

Table 10: Priority Sites for Vulnerability Assessments

Town	Site	Site number	SLR Impact level
New Castle/ Rye	NH 1B/Wentworth Rd	5,6,7	4'
Rye	Marsh Rd, Parsons Rd		
(Case Study)	10	1'	
Rye	NH 1A and Wallis Rd	11	4'
Rye	NH 1A and Locke Rd	13	4'
Hampton	Cusack Rd	15	1.7'
Hampton	High St	16	1'
Hampton	NH 1A and Winnacunnet Rd	17	4'
Hampton	NH 101 (Church St, Highland Ave) and Brown Ave	18	1'
Hampton	US Route 1 (Lafayette Rd) (Case Study)	20	4'
Seabrook	South Main St	21	4'
Seabrook	NH 286	22	4'