



Appendix I

Quantitative Evaluation Calculations

Contents:

Description of quantitative calculations conducted for the Phase 2 evaluations.

QUANTITATIVE EVALUATION OF PHASE 2 EVALUATION CRITERIA

The Phase 2 evaluation criteria were assessed in three major categories:

- Transportation System Impacts
- Environment/Resource Impacts
- Local and Regional Issues

This appendix provides the detailed quantitative analysis for the analysis of factors within each of these categories.

Transportation System Impacts

Transportation System Impacts are evaluated across 4 modes: bike/ped; railyard; traffic; and transit. Table I- 1 lists the specific measures applied to each mode, and the thresholds used in the quantitative analysis.

TABLE I- 1: TRANSPORTATION SYSTEM IMPACTS, THRESHOLDS FOR EVALUATION

	Criteria	Specific Measure	Threshold
TRANSPORTATION SYSTEM IMPACTS	Bike/Ped Impacts	Linear feet of separated paths (multiuse paths)	2000
		Linear feet of sidewalk	3000
		Number of additional street crossings	10
	Railyard Impact	Impact to Switching Operations	see description
		Impact to Commercial Operations	see description
	Traffic Impact	Vehicle Mobility Index - 2035	0.45
		Diversion of Traffic from Pine (%) - 2035	0.38
	Transit Impact	from CCTA	see description

Bike/Ped Impacts

Bike/Ped impacts are evaluated for 3 specific measures. First, the linear feet of separated paths, or multiuse paths, was given a threshold of 2000 feet. For evaluation purposes, an alternative that provided equal to or greater than 2000 feet of multiuse paths was given a qualitative ranking of “++”; an alternative that provided less than 2000 feet of multiuse paths was given a qualitative ranking of “+”. All alternatives scored “+” or “++” for this measure.

The linear feet of new sidewalk are evaluated in a similar fashion, with 3000 linear feet being the threshold between a “+” and “++” ranking.

Finally, the number of additional street crossings, where new pedestrian/vehicle conflicts could occur, is negatively correlated. For alternatives with less than 10 new street crossings, a ranking of “-” is provided. Alternatives with 10 or more new street crossings are given a ranking of “- -”.

Table I- 2 provides the quantitative measurements of the bike/ped criteria.

TABLE I- 2: QUANTITATIVE MEASUREMENTS OF THE BIKE/PED CRITERIA

	Multi-use path (LF)	Sidewalk (LF)	Additional Crossings
Alt 1A	1331	864	4
Alt 1B	1401	928	4
Alt 2	1303	3447	10
Alt 3	1678	3987	8
Alt 4	2219	6317	15
Alt 5A	2135	2362	8
Alt 5B	2087	2563	8

Railyard Impacts

Railyard impacts were evaluated jointly by a group consisting of VTrans Rail Section staff, Vermont Rail System staff, and VHB, a project team subcontractor. The Phase 2 alternatives were evaluated for their impact on switching operations and commercial yard operations. As shown impacts the switching operations are neutral for Alternatives 1A, 1B, 2 and 3; negative (-) for Alternative 4, which would necessitate a total relocation of the railyard; and “+” for alternatives 5A and 5B.

Traffic Impacts

Traffic impacts are evaluated through the use of two indices, the vehicle mobility index and the diversion of traffic from the Pine Street corridor. In both cases, projected 2035 traffic conditions are used to develop these indices.

The vehicle mobility index uses the sum of total intersection delay (seconds/vehicle) for 11 intersections in the project area:

1. Battery/King
2. Battery/Maple
3. Champlain/King
4. Champlain/Maple
5. Pine/King
6. Pine/Maple
7. Pine/Kilburn
8. Pine/Pine Place
9. Pine/Marble
10. Champlain/New Street
11. Pine/New Street

The index is constructed by taking the sum for each Phase 2 alternative as a ratio to the sum of delay for the No Build (2035 PM peak hour). A ratio of 0.45 is used as a threshold to determine the relative mobility of the Phase 2 alternatives. All Phase 2 alternatives show significantly less congestion than the No Build. Alternatives with a vehicle mobility index of less than 0.45 are evaluated as a “++”; alternatives with a vehicle mobility index of 0.45 or greater are evaluated as a “+”.

Diversion of traffic from Pine Street is a measure of two-way traffic flow for the PM peak hour (projected 2035 conditions) at a point on Pine Street south of Maple Street. All of the alternatives divert 32-37% of traffic from Pine Street, and are thus evaluated as a “+” for this factor. None of the alternatives diverts greater than 37%.

Environment/Resource Impacts

Table I- 3 shows the dimensions along which each Phase 2 alternative is evaluated relative to environmental and resource impacts.

TABLE I- 3: ENVIRONMENT/RESOURCE IMPACTS, THRESHOLDS FOR EVALUATION

	Criteria	Specific Measure	Threshold
ENVIRONMENT/RESOURCES	Agricultural Lands	GIS	see description
	Archaeological	Vtrans Review	see description
	Historic Structures/Sites	Vtrans Review	see description
	Floodplain	Area within Floodway (SF)	20000
	Fish and Wildlife	Not evaluated	not evaluated
	Noise	Not evaluated	not evaluated
	Pervious Areas (Possibilities for Green Infrastructure)	Increase in Pervious Area Relative to No Build (SF)	1000
	Public Lands	GIS	see description
	Rare, Threatened & Endangered	Area within a RTE Area (SF)	see description
	Wetlands	Area within 50' of Wetlands (SF)	50000
	Hazardous Waste Sites	# of DEC Hazardous Waste Sites Impacted**	2
	Underground Utilities	Not evaluated	not evaluated
	Overhead Utilities	Number of utility poles affected	see description
	Right of Way Impacts	ROW Impact - Railyard only (SF)	10000
		ROW Impact - Non-Railyard Partial Takings (SF)*	100000
		# of Partial Takings - Non-Railyard	5
# of Full Takings - Non-Railyard		2	

Agricultural lands were evaluated using GIS shapefiles from the Vermont Agency of Natural Resources. No soils of statewide significance are within the project area, so all alternatives are evaluated as neutral (“0”).

For archaeological and historic resource impacts, expert staff at VTrans were consulted and provided their qualitative evaluation to the project team, after consulting the research record.

Floodplain impacts were evaluated using GIS shapefiles from Vermont ANR. Impacts into the floodplain area were evaluated with a 20,000 square feet threshold, approximately 0.5 acres. Alternatives 1A and 1B have no impact on floodplains; alternatives 2, 3, 5A, and 5B have impacts of less than 20,000 square feet and are thus evaluated at “-“. Alternative 4 has the highest degree of impact (>85,000 sf) and is evaluated at “- -“.

Fish and wildlife and noise impacts were not evaluated in this process.

All alternatives were evaluated for the increase in pervious soils associated with each. Due to the recommended Complete and Slow Street cross-sections, new pervious areas are introduced into the project area. A threshold of 1000 square feet is used to develop a qualitative evaluation. All alternatives except for Alternative 4 introduce significantly more than 1000 square feet of pervious soil and are thus evaluated at “++” for this criteria. Alternative 4 provides the least amount of new

pervious soil, 900 s.f., and is evaluated at “+”. Table I- 4 provides the estimates of increase in pervious areas associated with each Phase 2 alternative.

TABLE I- 4: ESTIMATED INCREASE IN PERVIOUS AREAS

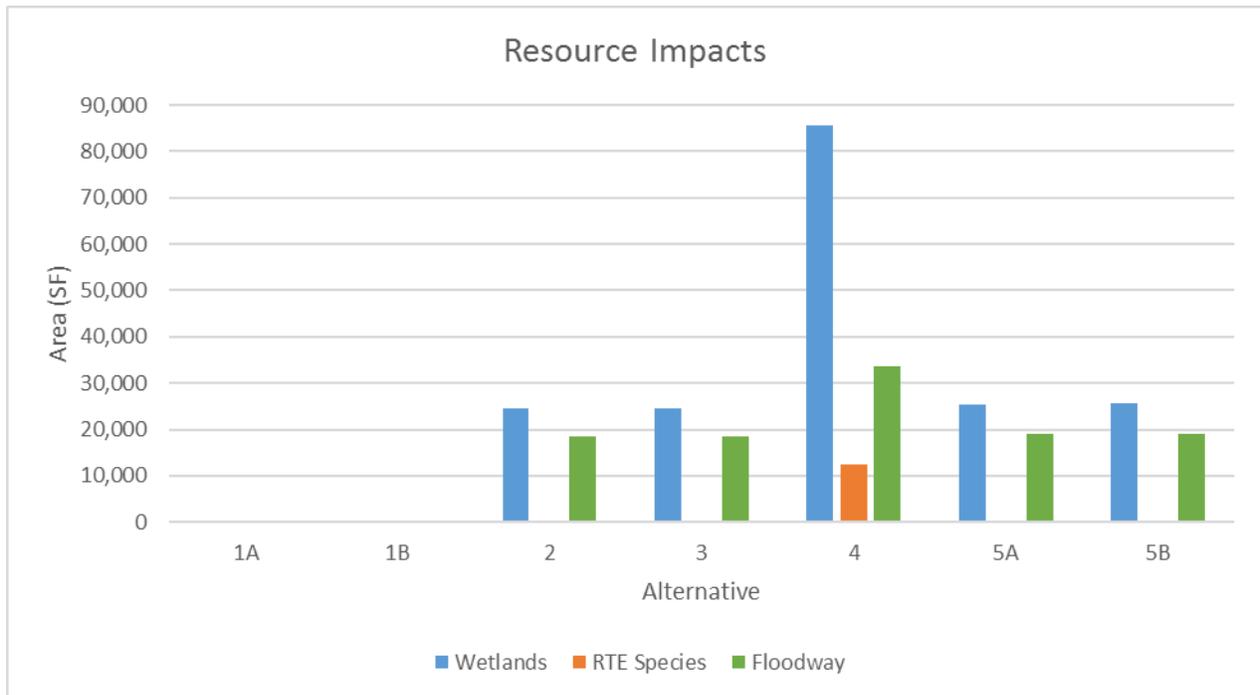
Increase in Pervious Area (SF)						
1A	1B	2	3	4	5A	5B
13,655	15,623	9,692	14,296	900	10,153	14,941

The public lands within the project area include the Burlington Bike Path and the Perkins Pier recreation area. None of the alternatives intrude upon these public land resources. All are evaluated as neutral for this criteria.

With regard to Rare, Threatened, or Endangered species, only Alternative 4 is indicated as overlapping with this resource and is thus evaluated as “- -”. All other alternatives are neutral.

Wetlands are evaluated based on GIS data available from the Vermont ANR. Alternatives which require street development within 50’ of wetlands are negatively evaluated based on the area of intrusion, with 50,000 square feet being the threshold. (see Figure I- 1: Estimated Impacts to Wetlands, Rare/Threatened/Endangered Species, and FloodDwayFigure I- 1).

FIGURE I- 1: ESTIMATED IMPACTS TO WETLANDS, RARE/THREATENED/ENDANGERED SPECIES, AND FLOODWAY



Hazardous waste sites are enumerated based on data from the Vermont ANR (<http://anrmaps.vermont.gov/websites/anra5>). Alternatives that impact 2 or more sites are evaluated as “- -”. Alternatives impacting only 1 site are evaluated as “-”.

Underground utilities are not evaluated in this study due to the lack of comprehensive utility information. This information will be a significant field investigation for subsequent studies.

Overhead utilities are evaluated through enumerating the number of utility poles that would need to be relocated due to an alternative. A threshold of 10 utility poles is used to determine maximum negative impact (through relocation cost), “- -”.

Table I- 5 provides the number of utility poles that would need to be relocated for each alternative.

TABLE I- 5: NUMBER OF AFFECTED UTILITY POLES

	1A	1B	2	3	4	5A	5B
No. Utility Poles	6	6	8	12	14	10	11

Right of way impacts are evaluated for the railyard and non-railyard property impacts. For the railyard, right of way impacts of greater than 10,000 square feet are evaluated as “-”, and impacts of greater than 50,000 square feet (Alternative 4 only) are evaluated as “- -”.

Non-railyard partial takings are also evaluated for their square foot takings impacts. Alternatives where greater than 100,000 square feet of takings would be necessary – 3, 4, 5A and 5B - are evaluated as “- -”. Alternatives 1A, 1B and 2 are evaluated as “-”.

Right of way takings are also evaluated according to the number of properties affected for partial or full takings, with 5 being the threshold for partial takings and 2 being the threshold for full takings.

Table I- 6 provides the quantitative measurements for right-of-way takings for each alternative. The amount of takings differs for Slow Streets and Complete Streets based on the design criteria.

TABLE I- 6: QUANTITATIVE MEASUREMENTS OF RIGHT-OF-TAKINGS

	1A		1B		2		3		4		5A		5B	
	SS	CS	SS	CS	SS	CS	SS	CS	SS	CS	SS	CS	SS	CS
RAILYARD IMPACTS:														
#6478	1,135	25,845	930	25,835	12,995	23,255	10,285	26,445	24,675	62,150		4,970		6,280
FULL TAKINGS:														
Curtis Lumber (#6660)						139,314			139,314					
Independent Block (#6490)												92,875		92,875
216 Battery St (#6508)												3,423		3,423
PARTIAL TAKINGS:														
#6529												870		1,710
#6642						80			1,245					
Curtis Lumber (#6660)		14,920		14,865			6,495	34,120				15,650		15,485
#6710		1,530		1,395		160								
#6723					25,135		25,185		12,455	45,185		27,960		27,960
#6747		8,495		14,290	43,870		17,345	18,120	38,200		20,780	20,425	20,780	20,425
#6815					12,205		12,205			12,445		15,145		15,125
#6889										385		670		790
#6928					6,655		6,655		6,550		475			1,745
#6940					290		290			290				
#6941										35				
TOTALS:														
Non-rail PT Area	0	24,945	0	30,550	88,155	240	68,175	52,240	51,900	64,890	20,780	81,195	20,780	83,240
Non-rail PT Count	0	3	0	3	5	2	6	2	3	6	1	7	1	7
Non-rail FT Area	0	0	0	0	0	139,314	0	0	139,314	0	0	96,297	0	96,297
Non-rail FT Count	0	0	0	0	0	1	0	0	1	0	0	2	0	2

There were communications with one affected landowner that took place, primarily through email exchanges, after the evaluation matrix was completed. Through these communications it was determined that the Burlington Grand List may have some inaccuracies regarding property ownership that involve this property.

Local and Regional Issues

Local and regional issues were primarily evaluated using expert input (Table I- 7).

TABLE I- 7: LOCAL AND REGIONAL ISSUES, THRESHOLDS FOR EVALUATION

	Criteria	Specific Measure	Threshold
LOCAL & REGIONAL ISSUES	Satisfies Purpose & Need	See Purpose and Need Statement	see description
	Economic Benefits	Assessed Value of 20-Year Build-Out	20,000,000
		Estimated Employment, 20-Year Build-Out	500
	Conformance to Local/Regional Plans	PlanBTV & ECOS plans	see description
	Environmental Justice		see description

With regard to meeting the Purpose and Need Statement, all of the alternatives except for Alternative 4, which requires full displacement and relocation of the railyard, are judged to meet the Purpose and Need of the Railyard Enterprise Project.

Conformance to Local and Regional plans were evaluated by Burlington Planning staff using the local Burlington long range comprehensive plan, PlanBTV. The regional plan, ECOS, was evaluated by CCRPC staff. As with the Purpose and Need Statement, all of the alternatives except for Alternative 4 are judged as being consistent with these comprehensive plans.

Economic benefits associated with each Phase 2 alternative were evaluated jointly by the project team and by City of Burlington planning staff. For each alternative, a development pro-forma was developed using specified building envelopes and accounting for required street frontage and area for onsite parking. A 20-year build out was developed resulting in new commercial square footage and an estimate of new jobs. For the new commercial square footage, an estimate of new assessed valuation was derived in consultation with the City Assessor. For this criteria, a threshold of \$20 million of new assessed valuation was used as a threshold for determining positive (“+”) and very positive (“++”) impact. Regarding new employment, a threshold of 500 new jobs was used as a threshold for determining positive (“+”) and very positive (“++”) impact.

Finally, environmental justice was evaluated qualitatively based on providing environmental relief to disadvantaged populations and on improving access to jobs and recreational resources for the same populations. All alternatives are judged to positively impact environmental justice.