ES.5 ENVIRONMENTAL IMPACTS

ES.5.1 TRAFFIC AND TRANSPORTATION

A total of fourteen potential transportation improvement alternatives, plus the no build alternative, were evaluated in the DEIS. To evaluate anticipated traffic conditions and safety deficiencies relative to specific transportation strategies, the fourteen alternatives were grouped based on transportation-related factors: For transportation evaluation purposes, the alternative strategies consist of TSM,TDM/transit, $W_{(4)}$, the full build expressway alternatives and the partial build expressway alternatives. Note that for purposes of analyzing operational efficiency, implementation of all TSM recommendations would approximate conditions after widening shoulders and adding lanes as proposed under the $W_{(2)}$ alternative.

Route 82 and 85 Four-Lane Widening Alternatives: Future traffic volumes were forecasted for the year 2020 based upon the travel demand model process. In an effort to gain an understanding of the impact of the Route 82 and Route 85 four-lane widening alternative on travel patterns in the area, Table ES-16 presents a volume comparison between the 2020 no build and 2020 Route 82 and Route 85 four-lane widening alternative at select locations. Traffic volumes would, for the most part, increase following the widening of Routes 82 and 85 when compared to the no build condition.

TABLE ES-16
VOLUME COMPARISON: FOUR-LANE WIDENING VS NO BUILD

LOCATION	2020 ADT		2020 AM PEAK HOUR		2020 PM PEAK HOUR	
	NO BUILD	4-LANE	NO BUILD	4-LANE	NO BUILD	4-LANE
Rt. 82 e/o Rt. 11	11,800	12,600	990	1,080	1,420	1,530
Rt. 82 w/o Rt. 11	4,600	4,600	330	330	430	430
Rt. 82 e/o Rt. 85	7,000	7,000	530	530	560	560
Rt. 85 s/o Rt. 82	16,800	17,600	1,620	1,710	2,220	2,330
Rt. 85 n/o Rt. 82	6,000	6,000	510	510	790	790
Rt. 85 n/o Rt. 161	21,600	22,400	1,640	1,730	2,210	2,320
Rt. 85 s/o Turner Rd.	15,100	15,700	1,250	1,320	1,670	1,760
Rt. 85 n/o Industrial Dr.	15,500	16,100	1,390	1,460	1,760	1,850
Rt. 85 n/o Cross Rd.	29,400	30,000	2,220	2,290	3,210	3,300
Rt. 85 n/o I-95	40,800	41,400	2,400	2,470	4,450	4,540
Rt. 161 n/o Walnut Hill	6,600	6,800	620	640	820	840
Rt. 161 n/o Mayfield	9,000	9,200	780	800	910	930
Rt. 161 s/o Egret	13,200	13,400	950	970	1,380	1,400
Rt. 161 n/o I-95	17,200	17,400	1,250	1,270	1,840	1,860

An evaluation of operating conditions at the study area intersections was performed for the four-lane widening alternative. The analysis revealed that six of the signalized intersections and eight of the unsignalized intersections would operate at unacceptable levels of service following completion of the four-lane widening alternative. These substandard intersections include:

SIGNALIZED INTERSECTIONS

- Route 85/Route 82
- Route 85/Route I-95 Northbound ramps
- Route 85/Route I-95 Southbound ramps
- Cross Road Extension/Parkway North
- Cross Road/Parkway South
- Route 1/Route 161

UNSIGNALIZED INTERSECTIONS

- Route 85/Forsyth Road
- Route 82/Route 11 Off-Ramp
- Route 85/Salem Turnpike/Beckwith Road
- Route 85/Turner Road
- Route 85/Route I-395 Northbound Ramps
- Route 161/Route I-95 Southbound Ramps
- Route 1/Route I-95 Southbound Off-Ramp
- Route 161/Egret Road

Some of the unsignalized intersections would be expected to experience longer delays when compared to the no build condition. This increase in delay is caused by the attraction of new motorists to the Route 85 corridor as result of improved travel conditions created by the widening. Motorists attempting to enter the main flow of traffic on Route 85, not only from side streets, but also from commercial and residential driveways, would likely experience longer delays. A tendency by drivers to attempt a turn into traffic with less than safe separation distances from oncoming traffic may also lead to an increase in accident frequency.

TSM Alternative: TSM improvements that were considered for the 2020 future year would provide traffic signals at the Route 82/Route 11 off-ramp; additional turning lanes at Salem Four Corners; left turn lanes at Route 85/Grassy Hill Road/Chesterfield Road; and a left turn lane at Route 85 and Route 161. For the intersections receiving TSM improvements, acceptable levels of service (LOS D or better) are expected. Spot safety improvements and intersection TSM improvements will not substantially alter roadway segment capacity. In 2020, traffic volumes are expected to approach or exceed roadway capacity on Route 85 and on portions of Route 161.

TDM/Transit Alternative: Implementation of TDM and transit strategies would be expected to have little, if any, effect upon roadway capacity.

New Location - Full Build Alternatives: Table ES-17 presents a volume comparison between the 2020 no build and 2020 full build alternative at select locations.

TABLE ES-17
VOLUME COMPARISON: FULL BUILD EXPRESSWAY VS NO BUILD

LOCATION	2020 ADT		2020 AM PEAK HOUR		2020 PM PEAK HOUR	
	NO BUILD	FULL BUILD	NO BUILD	FULL BUILD	NO BUILD	FULL BUILD
Rt. 82 e/o Rt. 11	11,800	5,200	990	450	1,420	580
Rt. 82 w/o Rt. 11	4,600	5,000	330	430	430	520
Rt. 82 e/o Rt. 85	7,000	6,200	530	500	560	520
Rt. 85 s/o Rt. 82	16,800	6,800	1,620	620	2,220	750
Rt. 85 n/o Rt. 82	6,000	6,000	510	510	790	790
Rt. 85 n/o Rt. 161	21,600	10,000	1,640	790	2,210	880
Rt. 85 s/o Turner Rd.	15,100	7,700	1,250	690	1,670	740
Rt. 85 n/o Industrial Dr.	15,500	7,900	1,390	750	1,760	790
Rt. 85 n/o Cross Rd.	29,400	21,000	2,220	1,610	3,210	2,200
Rt. 85 n/o I-95	40,800	35,800	2,400	2,040	4,450	3,950
Rt. 161 n/o Walnut Hill	6,600	3,400	620	260	820	330
Rt. 161 n/o Mayfield	9,000	5,800	780	410	910	450
Rt. 161 s/o Egret	13,200	9,200	950	560	1,380	750
Rt. 161 n/o I-95	17,200	33,100	1,250	2,470	1,840	3,190

Three signalized intersections and two unsignalized intersections would operate at unacceptable levels of service under the full build alternative. These substandard intersections include:

SIGNALIZED INTERSECTIONS

- Cross Road Extension/Parkway North
- Cross Road/Parkway South
- Route 1/Route 161

UNSIGNALIZED INTERSECTIONS

- Route 85/Route I-395 northbound ramps
- Route 161/Route I-95 southbound ramps

The full build expressway would divert a substantial amount of traffic from Route 85. This shift in traffic would result in acceptable operating conditions on Route 85 north of I-395. In addition, the reduction in traffic would help to reduce opportunities for accidents. South of I-395 poor operating conditions are forecasted, but when compared to the no build condition, traffic volumes would decrease and therefore benefits would be realized. Additionally, Route 161 volumes are also forecasted to approach capacity in the vicinity of Route 1, although the volumes would decline when compared to the no build condition if the full build expressway alternative were implemented.

New Location - Partial Build Alternatives: Future traffic volumes were forecasted for the year 2020 for the partial build alternative. Table ES-18 presents a volume comparison between the 2020 no build and 2020 partial build alternative at select locations.

TABLE ES-18
VOLUME COMPARISON: PARTIAL BUILD EXPRESSWAY VS NO BUILD

LOCATION	2020 ADT		2020 AM PEAK HOUR		2020 PM PEAK HOUR	
	NO BUILD	PARTIAL BUILD	NO BUILD	PARTIAL BUILD	NO BUILD	PARTIAL BUILD
Rt. 82 e/o Rt. 11	11,800	8,000	990	690	1,420	950
Rt. 82 w/o Rt. 11	4,600	5,000	330	430	430	520
Rt. 82 e/o Rt. 85	7,000	6,200	530	500	560	520
Rt. 85 s/o Rt. 82	16,800	10,400	1,620	940	2,220	1,200
Rt. 85 n/o Rt. 82	6,000	6,000	510	510	790	790
Rt. 85 n/o Rt. 161	21,600	12,800	1,640	1,020	2,210	1,210
Rt. 85 s/o Turner Rd.	15,100	9,300	1,250	850	1,670	920
Rt. 85 n/o Industrial Dr.	15,500	18,900	1,390	1,740	1,760	2,040
Rt. 85 n/o Cross Rd.	29,400	31,400	2,220	2,550	3,210	3,390
Rt. 85 n/o I-95	40,800	43,600	2,400	2,950	4,450	4,800
Rt. 161 n/o Walnut Hill	6,600	4,200	620	320	820	400
Rt. 161 n/o Mayfield	9,000	6,600	780	490	910	530
Rt. 161 s/o Egret	13,200	10,400	950	680	1,380	890
Rt. 161 n/o I-95	17,200	16,400	1,250	1,210	1,840	1,800

Four of the signalized intersections would operate at unacceptable levels of service following completion of the partial build alternative. For unsignalized intersections, five locations would operate unacceptably, as follows:

SIGNALIZED INTERSECTIONS

- Route 85/Route I-95 northbound ramps
- Route 85/Route I-95 southbound ramps
- Cross Road Extension/Parkway North
- Cross Road/Parkway South

UNSIGNALIZED INTERSECTIONS

- Route 82/Route 11 off-ramp
- Route 85/Route I-395 northbound ramps
- Route 85/Way Hill Road/Industrial Drive
- Route 161/Route I-95 southbound ramps
- Route 1/Route I-95 southbound off-ramp

Table ES-19 presents projected traffic volumes on Route 11 for the 2020 no build condition and each of the alternatives. Traffic volumes are noted at various locations during the AM and PM peak hours and on a daily basis; the varying volume levels for each alternative are depicted.

Pedestrian and Bicycle Facilities: Local interests have articulated a desire to construct pedestrian/bicycle trails and/or a "greenway" recreational corridor in conjunction with highway construction on a new location to preserve contiguous tracts of undeveloped land. This plan would increase recreational oppportunities and would represent a positive impact on pedestrian and bicycle facilities. However, provision of a bikeway in the right-of-way would also require a wider footprint for a highway, resulting in a greater impact on the wetlands and other resources. It could also influence the design and cost of bridges that would be incorporated to avoid wetlands. Temporary adverse impacts to pedestrian/bicycle travel would be likely during construction. Under any of the widening scenarios, pedestrians and cyclists would be affected by construction along Routes 82 and 85; for the expressway alternatives, construction impacts would be most pronounced at intersections with existing roadways (i.e., the interchanges at Route 82 and at Route 161.

The feasibility of a bikeway would be considered during subsequent planning and design phases, following selection of a preferred alternative.

Emergency Management: The type of disaster that would put the greatest traffic burden on the Route 82/85/11 corridor would appear to be a major nuclear accident at Millstone. In summary, any of the widening alternatives would provide some incremental improvement in the ability of the corridor to handle an emergency evacuation. Because of their greater capacity, either of the four-lane alternatives would handle evacuation traffic better than the two-lane option with full shoulders and turning lanes.

TABLE ES-19
PROJECTED ROUTE 11 TRAFFIC VOLUMES (2020)

	2020 NO BUILD	TDM/TRANSIT	TSM	WIDENING	FULL BUILD EXPRESSWAY		PARTIAL BUILD EXPRESSWAY	
					FOUR-LANE	TWO-LANE	FOUR-LANE	TWO-LANE
Route 11 north of Route 82								
Daily (ADT)	10,800	10,800	10,800	11,600	14,600	14,600	12,800	12,800
AM Peak Hour	980	980	980	1,170	1,310	1,310	1,150	1,150
PM Peak Hour	1,310	1,310	1,310	1,420	1,750	1,750	1,540	1,540
Route 11 south of Route 82								
Daily (ADT)	N/A	N/A	N/A	N/A	14,800	14,800	13,000	13,000
AM Peak Hour	N/A	N/A	N/A	N/A	1,310	1,310	1,150	1,150
PM Peak Hour	N/A	N/A	N/A	N/A	1,730	1,730	1,520	1,520
Route 11 south of Route 161								
Daily (ADT)	N/A	N/A	N/A	N/A	14,000	14,000	9,400	9,400
AM Peak Hour	N/A	N/A	N/A	N/A	1,270	1,270	830	830
PM Peak Hour	N/A	N/A	N/A	N/A	1,590	1,590	1,070	1,070

N/A = Not Applicable

The full build alternatives would provide the greatest advantage in avoiding congestion and delays in the corridor study area during a major evacuation by providing greatly increased capacity, especially in the four-lane configurations. Any of these alternatives also would improve conditions at the two intersections in Waterford found to be congested during evacuation modeling, specifically, Route 85 at the I-395 interchange and Route 85 at Cross Road. The partial build alternatives would also provide a second highway, parallel to Route 85, reducing potential congestion at the intersection of Route 85 at Route 161 in Chesterfield and at Route 85 at Route 82 in Salem.

ES.5.2 NOISE

The results of the noise impact analysis revealed that FHWA's noise abatement criteria (NAC) would be exceeded at several of the 51 noise receptor locations. The results of the noise impact analysis indicate that Alternative H, the partial build alternative, would have the most impact on area receptors because it would affect properties along the overland route as well as at the touchdown point in the vicinity of Route 161 and along Route 85. The receptors exceeding current conditions are shown together with the receptors that would be impacted *in addition* to these, after implementation of the various alternatives, on Table ES-20.

Mitigation Measures: Until a preferred alternative is forwarded and preliminary design plans are developed, a precise mitigation program (if warranted) cannot be specified. However, measures that would likely be used to reduce the noise impacts associated with construction of a new roadway might include the following: construction of noise walls, earthen berms, possible changes to the roadway design, and/or condemnation and purchase of private property. A more detailed assessment of specific mitigation strategies for the preferred alternative named in the FEIS will be based on roadway cross sections, profile grades, cut slopes, typical sections, detailed topographic data, and other pertinent information. Abatement, if warranted, will be assessed and provided in accordance with current abatement policies.

ES.5.3 AIR QUALITY

A microscale analysis of the worst case CO concentrations from motor vehicles was conducted for both 1998 and 2020 at 28 receptor sites at seven intersections within the study corridor. The microscale analyses focused, specifically, on the intersections that were currently functioning or are projected to function at a poor LOS.

The results indicate that there will be no exceedances for the one-hour and eight-hour NAAQS for each scenario investigated. Concentrations do not vary much between alternatives except between the full/partial build and the four-lane widening alternative,

TABLE ES-20
NOISE IMPACT ANALYSIS - FUTURE NOISE LEVELS APPROACHING OR EXCEEDING NAC [1]

RECEPTOR SITE NUMBER	LOCATION	LAND USE TYPE	CURRENTLY APPROACHES OR EXCEEDS NAC (1998)	PREDICTED NOISE LEVELS - DESIGN YEAR 2020 - L_{eq} (dBA)					
				NO BUILD, TSM, TDM/TRANSIT, $W_{(4)}$, $W_{(4)}M$, $W_{(2)}$	92PD	$E_{(4)}$	$F_{(4)}$	$G_{(4)}$	$H_{(4)}$
1	66 Route 82	Residential/ Commercial	✔	**66***	**68***	**68***	**68***	**68***	**68***
3	209 Route 85	Residential		**69***	**69***	**69***	**69***	**69***	**69***
4	Rest Area on Route 85	Park	✔	**72***	**72***	**72***	**73***	**72***	**72***
5	412 Route 85	Residential	✔	**68***	**68***	**68***	**69***	**68***	**68***
7	1830 Route 85/Salem Tnpk	Residential	✔	**70***	**70***	**70***	**70***	**70***	**70***
8	1605 Route 85	Residential	✔	**75***	**75***	**75***	**75***	**76***	**75***
9	1596 Route 85	Commercial	✔	**71***	**71***	**71***	**71***	**72***	**71***
11	1394 Route 85	Residential	✔	**69***	**69***	**69***	**69***	**69***	**69***
12	1214 Route 85	Residential	✔	**76***	**76***	**76***	**76***	**76***	**76***
14	1081 Route 85	Residential	✔	**71***	**71***	**71***	**71***	**71***	**73***
15	Oakdell Motel, Route 85	Commercial		65	64	64	64	64	**68***
16	964 Route 85	Residential	✔	64	64	64	64	64	**67***
17	Rt. 85 (near Crystal Mall)	Residential	✔	**76***	**79***	**76***	**76***	**76***	**76***
18	105 Beckwith Hill Drive	Residential		46	49	**66****	57	55	58
21	Fawn Run (at cul-de-sac)	Residential		46	47	56	**70****	**70****	**69****

TABLE ES-20 -- CONTINUED
NOISE IMPACT ANALYSIS - FUTURE NOISE LEVELS APPROACHING OR EXCEEDING NAC [1]

RECEPTOR SITE NUMBER	LOCATION	LAND USE TYPE	CURRENTLY APPROACHES OR EXCEEDS NAC (1998)	PREDICTED NOISE LEVELS - DESIGN YEAR 2020 - L_{eq} (dBA)					
				NO BUILD, TSM, TDM/TRANSIT, $W_{(4)}$, $W_{(4)}M$, $W_{(2)}$	92PD	$E_{(4)}$	$F_{(4)}$	$G_{(4)}$	$H_{(4)}$
25	39 Daisy Hill Drive	Residential		47	**74****	58	49	51	56
27	947 Grassy Hill Road	Residential		54	**73****	**74****	54	56	**72****
29	East of Silver Falls Road	Residential		51	**73****	**73****	51	56	58
31	13 Gurley Road	Residential	✔	**74***	**71***	**71***	**71***	**71***	**75***
32	Cemetery off of Route 85	Cemetery	✔	**73***	**73***	**73***	**73***	**73***	**74***
33	Route 85, No. 1422 - 1461	Residential	✔	**68***	**68***	**68***	**68***	**68***	**71***
34	71 Oil Mill Road	Residential		**68***	65	65	65	65	**71***
35	Oil Mill Rd., north of No. 71	Residential		**70***	**67***	**67***	**67***	**67***	**73***
36	Gurley Road, south of No. 13	Residential		**71***	**68***	**68***	**68***	**68***	**73***
37	Fawn Run (west of cul-de-sac)	Residential		46	47	54	**67****	**67****	**67****
39	31 Holmes Road	Residential		43	48	49	**74****	**74****	65
44	1 Walnut Hill Road	Residential		61	61	61	**66***	63	61
45	325 Route 161	Residential		55	55	55	63	**74****	55
51	Silver Falls Road	Residential		50	**66****	**66****	51	55	64**

Source: MGI/VN
[1] Approaches or exceeds criteria for one or more alternatives; values approaching (within 1 dBA) or exceeding the NAC of 67 dBA are indicated in bold type
* Noise level an "absolute impact", approaching (within 1 dBA) or exceeding the NAC of 67 dBA
** Noise level a "relative impact", exceeding the existing condition by 15 dBA or more

which exhibits slightly higher CO levels. The higher travel speeds expected under the full build scenarios would result in less idle emissions. Idle emissions are generally greater under the four-lane widening alternative, however, delay at existing intersections would decrease as compared with the 1998 existing and 2020 no build scenarios due to increased capacity, improved LOS and decreased delay.

ES.5.4 BIOLOGICAL DIVERSITY

Biological Impacts - Vegetation: Impacts to vegetation typically associated with highway construction projects include direct impacts resulting from land clearing for the roadway as well as impacts associated with forest fragmentation, the introduction of non-native species, and sediment and toxicant impacts. Each of these potential impacts may affect the vegetational communities within the project corridor. A primary focus of the analysis was on the impacts associated with bisecting or infringing upon large, contiguous parcels of vegetated habitats, or forest blocks (Figure ES-11). Table ES-21 compares area of impact upon forest blocks, by alternative.

TABLE ES-21
IMPACTS TO FOREST BLOCKS

	LARGER BLOCKS (> 200 ha. Forest Blocks)			SMALLER BLOCKS (50 - 200 ha. Forest Blocks)				
ALTERNATIVE	BLOCK #1 ha. (ac.)	BLOCK #2 ha. (ac.)	TOTAL (LARGER) ha. (ac.)	BLOCK #3 ha. (ac.)	BLOCK #4 ha. (ac.)	BLOCK #5 ha. (ac.)	BLOCK #6 ha. (ac.)	TOTAL (SMALLER) ha. (ac.)
No build	N/I	N/I	N/I	N/I	N/I	N/I	N/I	N/I
TSM	N/I	N/I	N/I	N/I	N/I	N/I	N/I	N/I
TDM/Transit	N/I	N/I	N/I	N/I	N/I	N/I	N/I	N/I
$W_{(4)}$	0.9 (2.2)	0.9 (2.2)	2.9 (7.2)	N/I	N/I	N/I	N/I	N/I
$W_{(4)}m$	0.7 (1.7)	0.7 (1.7)	1.4 (3.5)	N/I	N/I	N/I	N/I	N/I
$W_{(2)}$	0.6 (1.5)	0.6 (1.5)	1.2 (3.0)	N/I	N/I	N/I	N/I	N/I
92PD	12.5 (30.9)	34.2 (84.5)	46.7 (115.3)	8.0 (19.8)	N/I	4.5 (11.1)	N/I	12.5 (30.9)
$E_{(4)}$	12.5 (30.9)	34.2 (84.5)	46.7 (115.3)	8.0 (19.8)	3.4 (8.4)	5.7 (14.1)	N/I	17.1 (42.2)
$E_{(2)}$	9.5 (23.5)	25.7 (63.5)	35.2 (86.9)	6.0 (14.8)	2.0 (4.9)	4.3 (10.6)	N/I	12.3 (30.4)
$F_{(4)}$	12.5 (30.9)	27.3 (67.4)	39.8 (98.3)	7.4 (18.3)	4.0 (9.9)	9.1 (22.2)	8.0 (19.8)	28.5 (70.4)

TABLE ES-21 - CONTINUED
IMPACTS TO FOREST BLOCKS

ALTERNATIVE	LARGER BLOCKS (> 200 ha. Forest Blocks)			SMALLER BLOCKS (50 - 200 ha. Forest Blocks)				
	BLOCK #1 ha. (ac.)	BLOCK #2 ha. (ac.)	TOTAL (LARGER) ha. (ac.)	BLOCK #3 ha. (ac.)	BLOCK #4 ha. (ac.)	BLOCK #5 ha. (ac.)	BLOCK #6 ha. (ac.)	TOTAL (SMALLER) ha. (ac.)
$F_{(2)}$	9.5 (23.5)	20.6 (50.9)	30.1 (74.3)	5.6 (13.8)	3.0 (7.4)	6.9 (17.0)	6.0 (14.8)	21.5 (53.1)
$G_{(4)}$	12.5 (30.9)	27.3 (67.4)	39.8 (98.3)	7.4 (18.3)	5.7 (14.1)	6.3 (15.6)	9.1 (22.2)	28.5 (70.4)
$G_{(2)}$	9.5 (23.5)	20.6 (50.9)	30.1 (74.3)	5.6 (13.8)	4.3 (10.6)	4.7 (11.6)	6.9 (17.0)	21.5 (53.1)
$H_{(4)}$	12.5 (30.9)	2.3 (5.7)	14.8 (36.6)	7.4 (18.3)	10.2 (25.2)	5.7 (14.1)	N/I	23.3 (57.6)
$H_{(2)}$	9.5 (23.5)	1.7 (4.2)	11.2 (27.7)	5.6 (13.8)	7.7 (10.6)	4.3 (10.6)	N/I	17.6 (43.5)

N/I = no impact or negligible impact

- ! Mitigation Measures - Vegetation: Measures that could be employed to minimize impact to vegetation include narrowing the clear zone of the roadway to reduce the amount of land cleared. Colonization or establishment of alien species could be discouraged by ensuring ground covers are seeded or applied to the proper application densities, and by obtaining well-established shrub or tree planting stock from local nurseries to avoid introduction of young or genetically inferior propagules that may be out-competed by aggressive or opportunistic alien colonizers.

- ! Threatened and Endangered Vegetation Species: DEP has indicated that three state-listed species of plants may exist in the project area: Small's yellow-eyed grass (*Xyris smalliana*), a state-endangered species; American chaffseed (*Schwalbia americana*), a federally-endangered and state special concern (historic) species; and the thread-leaved sundew (*Drosera filiformis*), a state-endangered species. Both *S. americana* and *X. smalliana* are believed to still be present, however, field verification of their presence would be required before accurate predictions of impact to these species could be made. Field verification with ConnDOT and DEP would be made prior to the FEIS if the preferred alternative has the potential to affect an endangered species area.

Biological Impacts - Fisheries and Aquatic Biota: Potential impacts to fisheries and aquatic resources are ultimately related to a reduction or impairment of water quality, quantity, flow rates, or through the construction of barriers to fish movement. The ecological impact of human-induced alterations can negatively affect the food sources, water quality, habitat structure, stream flow characteristics, and species interactions of aquatic communities. Most of the potential impacts to fisheries and aquatic biota identified are related to water quality issues or disturbances to stream channels associated with culvert construction.

- Mitigation Measures - Fisheries and Aquatic Biota: Stream crossings within the project corridor cannot be avoided based on the length of the corridor and the abundance of tributaries within the four subregional drainage basins. However, various impact minimization measures could be employed to prevent adverse effects to watercourses that would be detrimental to fish and aquatic biota, such as limiting the amount of land area disturbed, enhancing habitat or constructing stream crossings to facilitate fish movement.

Biological Impacts - Terrestrial: The ability of certain species to thrive even though their habitat may be disrupted by construction activities or by the presence of a new road or more paved surface area, is dependent on a number of overall habitat factors. Some of these habitat attributes are noted and compared in Table ES-22 with respect to each alternative. Direct impacts to wildlife occur as a result of habitat loss, fragmentation or significant degradation. Habitat loss can be caused by development of the existing land area, or large scale changes in community composition. Construction of a new highway alignment associated with the full build and partial build alternatives would cause direct loss and degradation of both upland and wetland habitat, impacting various wildlife groups. Figure ES-15 depicts the area of impacted wetlands, by alternative, in which wildlife habitat was identified as a principal function.

TABLE ES-22
WILDLIFE HABITAT ATTRIBUTES POTENTIALLY IMPACTED BY ALTERNATIVE

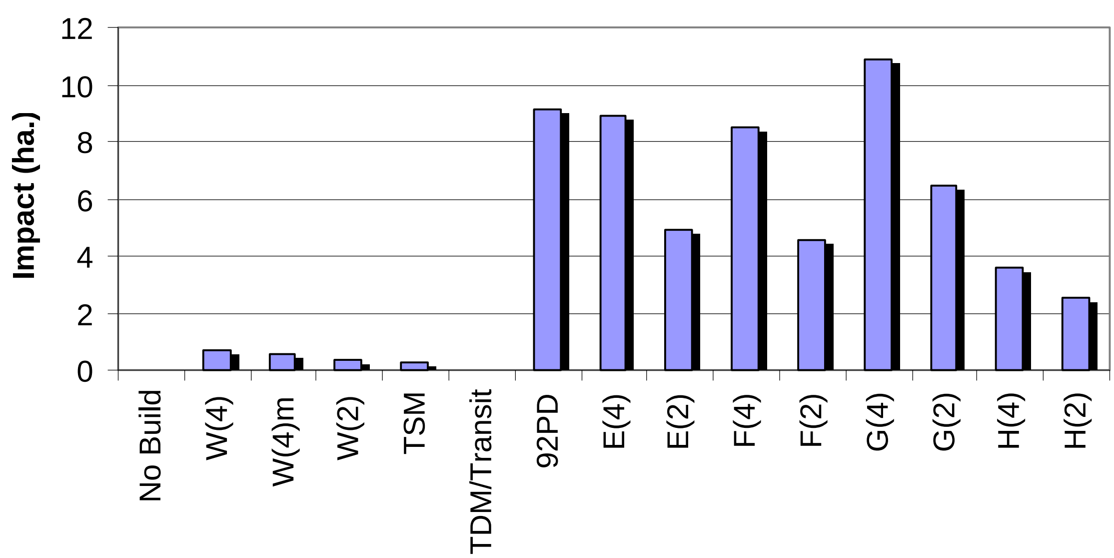
ALTERNATIVE	NUMBER OF VERNAL POOLS	NUMBER OF FOREST BLOCKS > 200 ha.	NUMBER OF FOREST BLOCKS 50-200 ha.	WILDLIFE CORRIDORS	ENDANGERED SPECIES SITES
No build	N/I	N/I	N/I	N/I	N/I
TSM	N/I	N/I	N/I	N/I	N/I
TDM/Transit	N/I	N/I	N/I	N/I	N/I
$W_{(4)}$	1	2	0	0	0
$W_{(4)}m$	1	2	0	0	0
$W_{(2)}$	1	2	0	0	0
92PD	1	2	2	3	0
$E_{(4)}$	1	2	3	3	0

TABLE ES-22 - CONTINUED
WILDLIFE HABITAT ATTRIBUTES POTENTIALLY IMPACTED BY ALTERNATIVE

ALTERNATIVE	NUMBER OF VERNAL POOLS	NUMBER OF FOREST BLOCKS > 200 ha.	50-200 ha.	WILDLIFE CORRIDORS	ENDANGERED SPECIES SITES
$E_{(2)}$	0	2	3	3	0
$F_{(4)}$	2	2	4	0	0
$F_{(2)}$	2	2	4	0	0
$G_{(4)}$	2	2	4	1	0
$G_{(2)}$	1	2	4	1	0
$H_{(4)}$	2	2	3	1	0
$H_{(2)}$	1	2	3	1	0

N/I = no impact or negligible impact

Figure ES-15
Impact to Wetlands With Wildlife Habitat as Principal Function



Note: 1 hectare (ha.) = approximately 2.47 acres

- Mitigation Measures - Terrestrial Impacts: Minimization strategies used to protect terrestrial species include reducing clear zones and cut and fill slopes; spanning wildlife corridors with bridges or large archways; constructing barriers to wildlife movement to prevent accidents/road kills; specialized plantings or, although less desirable, off-site habitat acquisition.

ES.5.5 TOPOGRAPHY, GEOLOGY AND SURFACE/GROUNDWATER RESOURCES

Alterations of topographical features could result in hydrologic and aesthetic impacts. Although standard engineering practice seeks to maintain existing drainage patterns to the maximum extent possible, hydrologic impacts could be incurred through cuts at hilltop groundwater recharge areas, fills within low-lying discharge areas, and diversions of surface water drainage patterns. Deep cuts may alter groundwater flow regimes and potentially have an adverse effect on the quantity of groundwater available to nearby private residences that utilize groundwater supply wells. Areas of potential topographic impacts associated with each alternative alignment are described below and summarized in Table ES-23.

TABLE ES-23
COMPARISON OF TOPOGRAPHY IMPACTS

ALTERNATIVE	TOTAL VOLUME OF EARTH CUT	TOTAL VOLUME OF FILL	NUMBER OF CUTS > 5 M. (15 FT.)	DEEPEST CUT	HIGHEST FILL
$W_{(4)}$	225,000 m^3 (294,300 yd^3)	107,500 m^3 (140,600 yd^3)	7	24± m. (80± ft.)	3.5± m. (11± ft.)
$W_{(4)}$m	160,500 m^3 (209,900 yd^3)	115,500 m^3 (151,100 yd^3)	7	24± m. (80± ft.)	3.5 m. (11± ft.)
$W_{(2)}$	151,100 m^3 (197,600 yd^3)	99,900 m^3 (130,700 yd^3)	7	24± m. (80± ft.)	3.5± m. (11± ft.)
92PD	4,495,000 m^3 (5,878,900 yd^3)	1,990,600 m^3 (2,603,400 yd^3)	8	25± m. (81± ft.)	11± m. (36± ft.)
$E_{(4)}$	4,560,300 m^3 (5,964,300 yd^3)	2,889,100 m^3 (3,778,600 yd^3)	8	25± m. (81± ft.)	11± m. (36± ft.)
$E_{(2)}$	2,711,300 m^3 (3,546,100 yd^3)	1,023,700 m^3 (1,338,800 yd^3)	8	25± m. (81± ft.)	11± m. (36± ft.)
$F_{(4)}$	9,490,400 m^3 (12,412,200 yd^3)	1,374,300 m^3 (1,797,300 yd^3)	12	49± m. (160± ft.)	15± m. (48± ft.)
$F_{(2)}$	6,914,600 m^3 (9,043,400 yd^3)	757,400 m^3 (990,600 yd^3)	12	49± m. (160± ft.)	15± m. (48± ft.)

TABLE ES-23
COMPARISON OF TOPOGRAPHY IMPACTS

ALTERNATIVE	TOTAL VOLUME OF EARTH CUT	TOTAL VOLUME OF FILL	NUMBER OF CUTS > 5 M. (15 FT.)	DEEPEST CUT	HIGHEST FILL
$G_{(4)}$	10,328,800 m^3 (13,508,800 yd^3)	1,783,900 m^3 (2,333,000 yd^3)	11	49± m. (160± ft.)	17± m. (55± ft.)
$G_{(2)}$	7,396,000 m^3 (9,673,000 yd^3)	1,054,200 m^3 (1,378,700 yd^3)	11	49± m. (160± ft.)	17± m. (55± ft.)
$H_{(4)}$	2,754,900 m^3 (3,603,000 yd^3)	403,100 m^3 (527,200 yd^3)	7	25± m. (81± ft.)	5± m. (17±ft.)
$H_{(2)}$	2,029,200 m^3 (2,653,900 yd^3)	275,800 m^3 (360,700 yd^3)	7	25± m. (81± ft.)	5± m. (17±ft.)

Geologic Features: The greatest amount of impact to geologic units occurs with the $F_{(4)}$, $F_{(2)}$, $G_{(4)}$ and $G_{(2)}$ alternatives as they would require the deepest rock cuts. The 92PD, $E_{(4)}$ and $E_{(2)}$ alternatives would require cuts into rock outcrops of Plainfield schist and gneiss; these formations are considered "locally pyritic" in areas of central Montville. This geologic formation or similar formations contain an iron sulfide component that may create acidic conditions when in contact with the atmosphere and surface waters; this condition has been problematic in other areas, including the built section of Route 11 north of the study area. The widening alternatives involve less volume of cuts into geologic units than the expressway alternatives, but the frequency of areas of contact with bedrock is similar. Notable rock cut areas are described in Table ES-24.

Water Resources and Water Quality - Surface Waters: New roadway construction and operation can be expected to affect surface and groundwater supplies by increasing stormwater flow, decreasing flood storage area and degrading water quality through discharge of roadway pollutants and potentially acidic leachate from rock cuts. Discharges into the surface water bodies within the project area must meet acceptable water quality criteria prior to discharge since most of the water bodies are used as a source for a public water supply.

! Mitigation Measures: It would be necessary to incorporate mitigation measures into design plans for any of the build alternatives selected to reduce pollutant concentrations of the roadway storm water runoff before it enters the receiving water body. Generally these methods are referred to as BMPs; they are structural and nonstructural techniques which can prevent or reduce nonpoint source pollutants from entering receiving waters. Structural techniques include

TABLE ES-24
LOCATION AND GEOLOGIC DESCRIPTION OF NOTABLE ROCK CUT AREAS BY ALTERNATIVE

AREA ID#	DESCRIPTION	ALTERNATIVE														
		NO BUILD	TSM	TDM/ Transit	$W_{(4)}$	$W_{(4)}m$	$W_{(2)}$	92PD	$E_{(4)}$	$E_{(2)}$	$F_{(4)}$	$F_{(2)}$	$G_{(4)}$	$G_{(2)}$	$H_{(4)}$	$H_{(2)}$
1	**Walnut Hill, north summit, and Holmes Road:** Underlain by the Brimfield Formation of the Hunts Brook Syncline. No outcrops indicated, but cuts over 6 m. (25 ft.) may contact bedrock. This unit contains rusty weathering, sulfide-bearing schists.										✘	✘	✘	✘	✘	✘
2	**Pigeon Hill, west and east ridge, south of Grassy Hill Road:** cuts may involve the underlying Plainfield schist and gneiss (this unit is locally "pyritic" in central Montville but is not identified as such in this location).										✘	✘	✘	✘		
3	**East of Butlertown Road and south of the junction of Routes 161 and 85:** area of cut is covered by thick glacial till and underlain by the Plainfield schist, gneiss and quartzite (this unit is locally "pyritic" in central Montville but is not identified as such in this location).														✘	✘
4	**East Lyme, East of Route 161 and Latimer Brook**: numerous outcrops of Plainfield schist and gneiss (this unit is locally "pyritic" in central Montville but is not identified as such in this location) and nodular granite outcrops.										✘	✘	✘	✘		
5	**Waterford, south of Montville/Waterford town line**: numerous outcrops of Plainfield schist and gneiss (this unit is locally "pyritic" in central Montville but is not identified as such in this location) and nodular granite outcrops.							✘	✘	✘						

✘ = impacted areas

the use of built structures designed to separate sediment from the storm water prior to the storm water being discharged into surface waters. The effectiveness of vegetated basins and swales in treating roadway runoff has been demonstrated and documented in many studies. Vegetated basins and swales, augmented with use of sedimentation separation chambers, are considered the most suitable methods for stormwater management and water quality mitigation for the widening alternatives. Non-structural techniques (e.g., sweeping of roadway areas) are operational activities, which prevent the introduction of sediment into surface waters.

Mitigation for potential acidic leachate from rock cuts would include, where feasible, placement of inert rock or loamy material around newly exposed rock units that test positively for iron sulfide content to prevent contamination of surface waters or interception of leachate by stratified drift aquifers.

Water Resources and Water Quality - Groundwater: Groundwater aquifers are not as threatened by pollutants in roadway runoff as are streams. Soils, principally the upper layers, function as a filter by removing pollutants from runoff before they can entry into the groundwater. Heavy metals are readily immobilized and absorbed within the first centimeters of soil. Deicing chemicals such as sodium and chloride are not as readily absorbed by soil particles; potential impacts to groundwater quality would be confined to the runoff of salts during deicing of roadway surfaces. These impacts would be localized and limited given that sufficient dilution occurs within the regional groundwater system.

The proposed increases in impervious surface would result in the loss of recharge areas associated with high water production coarse-grained stratified drift aquifers. The area of the roadway alternatives over the aquifer was measured to assess the potential for impact of each of the alternatives. Table ES-25 shows the roadway area over the high yield aquifer for each of the alternatives.

TABLE ES-25
AREA OF IMPACT TO HIGH YIELD AQUIFERS BY ALTERNATIVE

ALTERNATIVE	AREA HECTARES	AREA ACRES
No build	N/I	N/I
$W_{(4)}$	3.5	8.7
$W_{(4)}$m	1.8	4.3
$W_{(2)}$	1.3	3.3
TSM	0.2	0.5
TDM/Transit	N/I	N/I

TABLE ES-25 - CONTINUED
AREA OF IMPACT TO HIGH YIELD AQUIFERS BY ALTERNATIVE

ALTERNATIVE	AREA HECTARES	ACRES
92PD	1.6	4.1
$E_{(4)}$	1.4	3.5
$F_{(4)}$	1.9	4.6
$G_{(4)}$	2.9	7.2
$H_{(4)}$	3.0	7.3
$E_{(2)}$	0.5	1.1
$F_{(2)}$	0.8	2.1
$G_{(2)}$	1.1	2.6
$H_{(2)}$	1.0	2.5

N/I = No impact or negligible impact

Public Water Supply: Surface water and groundwater resources associated with the PSGNLU water system are considered one of the most important water resources within the project area. The water quality analysis showed that the contaminants generated by roadway runoff, such as heavy metals and deicing chemicals, would be all well below the established drinking water criteria. Nevertheless, stormwater management systems would be designed to minimize discharge of pollutants to water supply areas.

! Stormwater Management: The new alignment alternatives would use grass channels to intercept runoff and convey stormwater to detention basins. For the widening alternatives, the existing storm water closed pipe system would be upgraded by adding water enhancement structures. Where the roadway is over the high yield aquifer, lined grass channels would be used. At the outlet of the grass channels, detention/retention wet ponds may be provided to contain the runoff before discharging it into surface waters.

! Accidental Hazardous Release: Another area of concern to the PSGNLU water system is the potential for an accidental spill of toxic or hazardous substances. Existing Route 85 and all the widen/upgrade alternatives would be adjacent to Fairy Lake and Lake Konomoc. It is anticipated that the stormwater management system would have a positive impact on purity of the water supply. The system would be designed to ensure adequate pretreatment of stormwater runoff prior to discharge to the reservoirs. It would also incorporate a spill containment structure(s) and retention basin(s) which would receive and treat all roadway runoff. The basins would be designed with sufficient capacity to contain not only

100-year storm flows, but also spills that could occur during an accident event and lead to degradation of the public water supply lands. The system would allow for isolation of spills so that clean-up procedures could be initiated before there is an opportunity for the reservoirs to become contaminated.

Public Water Supply Watershed Lands (Class I and Class II Lands): Any of the alternatives that involve the widening of Route 85 would require the taking/change in use of water company lands owned by the City of New London and managed by PSGNLU. Potential area impacts upon designated Class I and Class II water supply watershed lands are tabulated in Table ES-26.

- Mitigation Measures: Selection of any alternative that would require the taking of water company-owned lands for construction in the vicinity of the public water supply reservoirs would require a change of use permit from DPH and development of a comprehensive construction mitigation program describing measures that would be employed before, during, and after construction on Route 85. The overall sensitivity of the project area, especially in the immediate vicinity of the reservoirs, would require strict safeguards to protect the public water supply and watershed resources.

  Several supplementary protection measures and/or restrictions will be developed for the immediate vicinity of the reservoirs; however, most of the road construction, excavation and grading within the subject parcels would be far enough from critical resource features so that additional restrictions would not be necessary. A spill prevention and response plan would be developed for any water company-owned land subject to taking in conjunction with a roadway improvement.

ES.5.6 WETLAND RESOURCES

Direct, indirect, permanent and temporary wetland impacts can be expected in conjunction with any of the proposed alternatives outlined, herein. Direct, permanent impacts would occur primarily as a result of placement of clean fill material within wetlands and the excavation of wetland soils. Along the widening alternatives, the existing toe of slope would be extended to various widths to accommodate the two- and four-lane alternatives. The alternatives on new location would involve the placement of fill in primarily undisturbed wetland areas. Concrete abutments and piers associated with bridge structures would also be constructed within wetlands. Fill material would be placed across the entire cross-section of the road rather than adjacent to previously disturbed areas, as in the widening alternatives. For this reason, the alternatives on new alignment would each have greater overall direct impact areas than the widening alternatives.

TABLE ES-26
PUBLIC WATER SUPPLY WATERSHED LANDS (CLASS I & CLASS II) SUBJECT TO TAKING/CHANGE OF USE

PARCEL NUMBER	LOCATION	LAND CLASS	ALTERNATIVE				
			$W_{(4)}$	$W_{(2)}$	$W_{(4)}M$	$H_{(4)}$	$H_{(2)}$
1	Fairy Lake, Salem	Class I	0.01 ha. (0.03 ac.)	0.01 ha. (0.01 ac.)	0.01 ha. (0.01 ac.)	N/I	N/I
2	North of Lake Konomoc, Montville	Class I	0.01 ha. (0.03 ac.)	<0.01 ha. (0.01 ac.)	0.01 ha. (0.01 ac.)	0.01 ha. (0.03 ac.)	<0.01 ha. (0.01 ac.)
3	Lake Konomoc, Montville	Class I	1.15 ha. (2.85 ac.)	1.21 ha. (3.00 ac.)	1.18 ha. (2.91 ac.)	1.15 ha. (2.85 ac.)	1.21 ha. (3.00 ac.)
		Class II	0.35 ha. (0.87 ac.)	0.38 ha. (0.95 ac.)	0.34 ha. (0.84 ac.)	0.35 ha. (0.87 ac.)	0.38 ha. (0.95 ac.)
4	West of Route 85, Montville	Class I	0.22 ha. (0.54 ac.)	0.03 ha. (0.07 ac.)	0.03 ha. (0.06 ac.)	0.22 ha. (0.54 ac.)	0.03 ha. (0.07 ac.)
5	West of Route 85, Waterford	Class I	0.14 ha. (0.34 ac.)	0.05 ha. (0.11 ac.)	0.01 ha. (0.02 ac.)	0.14 ha. (0.34 ac.)	0.05 ha. (0.11 ac.)
6	Lake Konomoc, Waterford	Class I	1.13 ha. (2.80 ac.)	1.05 ha. (2.58 ac.)	1.12 ha. (2.77 ac.)	1.13 ha. (2.80 ac.)	1.05 ha. (2.58 ac.)
		Class II	0.16 ha. (0.40 ac.)	0.08 ha. (0.20 ac.)	0.10 ha. (0.24 ac.)	0.16 ha. (0.40 ac.)	0.08 ha. (0.20 ac.)
7	West of Route 85, Waterford	Class I	0.25 ha. (0.61 ac.)	0.04 ha. (0.10 ac.)	0.08 ha. (0.19 ac.)	0.25 ha. (0.61 ac.)	0.04 ha. (0.10 ac.)
8	West of Route 85, Across from Lake Konomoc spillway, Waterford	Class I	0.03 ha. (0.07 ac.)	N/I	<0.01 ha. (0.01 ac.)	0.03 ha. (0.07 ac.)	N/I
		Class II	0.01 ha. (0.01 ac.)	N/I	<0.01 ha. (<0.01 ac.)	0.01 ha. (0.01 ac.)	N/I
9	Polly Brook well area, Waterford	Class I	0.05 ha. (0.12 ac.)	0.03 ha. (0.08 ac.)	0.03 ha. (0.08 ac.)	0.05 ha. (0.12 ac.)	0.03 ha. (0.08 ac.)
TOTAL		Class I	2.99 ha. (7.39 ac.)	2.42 ha. (5.96 ac.)	2.47 ha. (6.06 ac.)	2.98 ha. (7.36 ac.)	2.41 ha. (5.95 ac.)
		Class II	0.52 ha. (1.28 ac.)	0.46 ha. (1.15 ac.)	0.44 ha. (1.09 ac.)	0.52 ha. (1.28 ac.)	0.46 ha. (1.15 ac.)

*Water Company Lands (City of New London)
N/I = No impact or negligible impact

Indirect permanent impacts would include impacts such as alteration in hydrology, stormwater discharge, potential drainage of wetlands in proximity to large roadway cuts, and the introduction of invasive species within wetlands along the roadway. Fill placed in wetland and upland areas could alter groundwater flow patterns, disrupting hydrological inputs to some wetlands, while increasing it to others. The compaction of roadway base material affords little groundwater movement. The installation of bridges, and especially culverts, may alter or impede flow velocities from existing conditions. Ponded areas and increased water levels during storm events could be created in areas which are crossed by the roadway and fitted with a culvert. Channelization of watercourses could increase flow velocities, and in turn, increase the potential for erosion and the need for future maintenance.

Comparison of Wetland Impacts: The no build and TDM/transit alternatives would have no quantifiable wetland impacts since they do not involve planned new construction. The TSM alternative would include minor intersection improvements, and therefore would have minor quantifiable impacts to wetlands. Unlike the widening alternatives which focus on an established transportation corridor, the new alignments on new location would impact both previously disturbed and undisturbed wetlands since they are aligned through developed and undeveloped areas.

Each of the new alignment alternatives were located to avoid as many major wetland areas as possible and still maintain appropriate geometric standards. The alignments were shifted to avoid wetlands or, if avoidance was not possible, the alternatives were generally aligned across the narrower portions of the wetlands. Estimated areas of unavoidable impact are tabulated in Table ES-27.

! Mitigation Measures: Given the degree of impact associated with any of the build alternatives, a comprehensive short-term and long-term mitigation program will be necessary to offset physical and functional loss of wetlands. An intensive and comprehensive mitigation program would be necessary during construction of any of the roadway alignment alternatives to stabilize disturbed areas and prevent pollution of wetlands by sedimentation. Also, long-term mitigation is needed to ensure maintenance of fully functional wetland systems in the corridor.

Compensatory Mitigation/Constructed Wetlands: Compensatory mitigation includes wetland restoration, creation, enhancement, exchange/banking and preservation. Where compensation is required, the objective is to replace functions and values on an in-kind basis and at an equal or greater area ratio of area. Several candidate sites were evaluated during corridor wetland investigations to determine their viability as wetland creation sites; of those, thirteen were identified as potential mitigation sites.

TABLE ES-27
WETLAND IMPACT SUMMARY [1] BY ALTERNATIVE

ALTERNATIVE	ALL WETLANDS		NOTABLE WETLANDS		CROSSINGS [2]
	NUMBER OF IMPACT AREAS	TOTAL IMPACTED AREA	NUMBER OF IMPACT AREAS[4]	TOTAL IMPACTED AREA	NUMBER OF IMPACT AREAS
No build	N/I [3]	N/I	N/I	N/I	N/I
TSM	7	0.26 ha (0.65 ac)	4	0.22 ha (0.54 ac)	2
TDM/Transit	N/I	N/I	N/I	N/I	N/I
$W_{(4)}$	62	2.07 ha. (5.12 ac.)	9	0.81 ha. (1.99 ac.)	10
$W_{(4)}m$	55	1.52 ha. (3.77 ac.)	10	0.60 ha. (1.48 ac.)	10
$W_{(2)}$	53	1.37 ha. (3.37 ac.)	9	0.61 ha. (1.49 ac.)	10
92PD	46	14.17 ha. (35.01 ac.)	4	0.69 ha. (1.70 ac.)	8
$E_{(4)}$	44	14.27 ha. (35.26 ac.)	4	0.69 ha. (1.70 ac.)	8
$E_{(2)}$	33	7.89 ha. (19.50 ac.)	4	0.31 ha. (0.76 ac.)	8
$F_{(4)}$	37	11.62 ha. (28.72 ac.)	3	1.88 ha. (4.64 ac.)	5
$F_{(2)}$	24	6.21 ha. (15.35 ac.)	4	1.22 ha. (3.02 ac.)	5
$G_{(4)}$	35	13.23 ha. (32.69 ac.)	3	1.88 ha. (4.64 ac.)	5
$G_{(2)}$	24	7.93 ha. (19.59 ac.)	4	1.22 ha. (3.02 ac.)	5
$H_{(4)}$	36	4.40 ha. (10.87 ac.)	3	0.93 ha. (2.30 ac.)	5
$H_{(2)}$	30	3.0 ha. (7.41 ac.)	3	0.66 ha. (1.64 ac.)	5

[1] ACOE §404 wetland permit application
[2] Refers to perennial stream crossings
[3] N/I = no impact or negligible impact
[4] In some cases, a wetland may be impacted in more than one area

ES.5.7 FLOODPLAINS AND FLOODWAYS

Construction associated with any of the roadway alternatives would impact floodplain areas by encroaching upon the storage area for flood waters. Increased flood heights and increased downstream flooding could result from a loss of flood storage capacity. The floodplain areas impacted by the construction of the roadway alternatives are shown on Table ES-28.

TABLE ES-28
IMPACTS TO DESIGNATED FLOODPLAINS BY ALTERNATIVE

ALTERNATIVE	AREA	
	HECTARES	ACRES
No build	N/I	N/I
$W_{(4)}$	1.6	3.9
$W_{(4)}m$	1.1	2.7
$W_{(2)}$	1.0	2.4
TSM	0.2	0.5
TDM/transit	N/I	N/I
92PD	2.7	6.6
$E_{(4)}$	2.3	5.6
$E_{(2)}$	1.2	3.0
$F_{(4)}$	1.8	4.5
$F_{(2)}$	0.7	1.6
$G_{(4)}$	2.3	5.8
$G_{(2)}$	1.0	2.4
$H_{(4)}$	1.2	3.0
$H_{(2)}$	0.6	1.5

N/I = No impact or negligible impact

Most of the floodplain areas that would be impacted are not, as discreet impacts, considered serious because the relative areas are small and mitigative measures would offset the loss. However, the cumulative effect of incremental losses in flood storage area should be examined as part of subsequent hydrologic analyses undertaken during the project design phase.

- Mitigation Measures: Compensatory flood storage area would be designated outside the roadway, as necessary, to balance the loss. In all cases, the compensatory storage would be located in the same reach of the same waterway as the affected floodplain. Any excavation of compensatory flood storage area within existing floodplain soils would produce additional wetland impacts since floodplain soils are defined as wetlands in Connecticut.

ES.5.8 LAND USE AND COMMUNITY CHARACTERISTICS

Improved safety conditions, as the result of improved roadway geometry and more efficient distribution of traffic volumes, may reduce accident rates, translating to a reduction in associated expenditures (e.g., personal (injury/fatality), medical, property damage, vehicle repair, and all costs related to the insurance industry). The efficient distribution of traffic burden throughout a community also improves the movement of goods and services, while promoting increased safety for pedestrian movements as well as vehicles, and becomes an integral part of the local aesthetic.

Transportation improvements also increase opportunities for development of services like commuter lots and public transit related to limited access highways adding conveniences for local users.

Potential disadvantages may occur with selected transportation improvements. Changes in transportation patterns can cause rerouting of high volume traffic such that businesses experience diminished patronage. Transportation improvements that create physical barriers (large earth cuts and fills) tend to inhibit road and utility expansion.

Community Goals and Neighborhood Cohesion: The goals expressed by each of the four towns in their respective Plans of Development are fundamentally very similar. Transportation improvements may have potential positive impacts on these community goals. Improved access to the region may increase housing demand, and proximity of land areas to high volume traffic corridors may create housing density options. High volume transportation corridors may also provide immediate venues for commercial/business and industrial growth as well as demand for residential development in those areas serviced by the corridor.

Negative impacts may also occur as improvements to existing roads and/or construction of new roads result in physical change to the original environment. The nature of that change may be subject to criticism based on the perception of its impact to traffic volume increases and physical alteration of the visual surroundings. Concentrations of development tend to occur along high volume roadways and at points of access/egress to limited access highways. If this consequence is not a part of a general plan of development, the effect on a given community may be considered adverse.

Either the construction of a new highway on a new location or the widening of the existing Routes 82 and 85 have the potential to impact local neighborhood characteristics. Private property takings from developed areas as a result of transportation improvements have a greater potential to bisect or infringe upon the existing community structure and impact a larger population than would similar construction in undeveloped areas.

Widening of Routes 82 and 85 could impact local communities by creating a greater barrier to pedestrian, bicycle, and automobile traffic by creating a more dangerous arrangement for these modes of transportation to cross the road. This may, in time, lead to isolation of certain residential and commercial land uses located on opposite sides of the arterial. In addition, property taking necessary to widen the roadway would infringe upon front yards and, in some cases, take nearby dwellings or commercial establishments currently located in close proximity to the roadway. Such property taking may be perceived by local residents and business persons as an undesirable impact to the character of the community. In the case of a new, limited access expressway on new location, the highway would serve as a physical barrier to block movement from one neighborhood to another.

! Mitigation Measures: For all build alternatives, the design phase should seek to minimize impacts to established developments and avoid bisecting established communities. Should widening of Routes 82 and 85 occur, cross walks and sidewalks may be useful in permitting ease of movement from one side of the road to the other. A four-lane widening scenario and its associated property takes would substantively change the character of community centers located at Salem Four Corners and Chesterfield Four Corners. In this case, post-widening development may focus on the redesign and reconstruction of a new commercial area that satisfies local community needs.

  In an effort to maintain community cohesion in the case of a full build expressway alternative, attempts should be made to minimize private property takings in established residential areas and to provide highway over- and underpasses for existing local roads where practicable.

Private Property Impacts (Takings): Takings impacts vary in both number and type, based on the nature of the transportation improvement considered. Widening generally requires an incremental taking along a corridor with established land uses that may not vary appreciably as a result of the taking action. While a widening can result in the taking of structures as well as land area, and can also require earth cuts and fills, takings required to construct a new transportation corridor are typically more extensive in terms of overall impact.

Although implementation of a widening alternative would impact the greatest number of parcels in the corridor, the amount of land that would need to be acquired would be relatively small. Land acquisition requirements, in area, are variable for the new location alternatives. For land use discussion purposes, takings are differentiated to show the number and type of structural takings as well as residential and non-residential categories of acreage impacted (Table ES-29; Table ES-30). Areas shown on the tables indicate the acreage that would be taken both as the minimum required for highway right-of-way purposes as well as from adjoining land that would be taken as a consequence of land-locking a parcel, leaving an unusable portion of land, or creating a lot that is non-conforming to local zoning regulations.

TABLE ES-29
SUMMARY OF PROPERTY TAKES BY LAND USE (ALL FOUR TOWNS)

ALTERNATIVE	PARTIAL TAKES					COMPLETE TAKES					TOTAL NUMBER OF AFFECTED PARCELS
	TOTAL	DEVELOPED PARCELS			UNDEVELOPED PARCELS	TOTAL	DEVELOPED PARCELS			UNDEVELOPED PARCELS	
		RESIDENTIAL	COMMERCIAL/ INDUSTRIAL	OTHER[1]			RESIDENTIAL	COMMERCIAL/ INDUSTRIAL	OTHER[1]		
No Build	0	0	0	0	0	0	0	0	0	0	0
$W_{(4)}$	153	93	17	16	27	25	18	5	1	1	178
$W_{(4)}$m	135	79	17	15	24	21	15	5	0	1	156
$W_{(2)}$	118	72	17	11	18	10	9	1	0	0	128
TSM	12	3	7	1	1	3	2	1	0	0	15
TDM/Transit	0	0	0	0	0	0	0	0	0	0	0
92PD	51	19	5	0	27	51	31	5	1	14	102
$E_{(4)}$	52	18	5	0	29	41	18	5	1	17	93
$E_{(2)}$	26	5	0	0	21	21	12	0	1	8	47
$F_{(4)}$	47	10	5	4	28	47	24	5	1	17	94
$F_{(2)}$	31	6	0	4	21	24	14	0	1	9	55
$G_{(4)}$	48	8	5	2	33	59	34	5	1	19	107
$G_{(2)}$	29	4	0	2	23	35	23	0	1	11	64
$H_{(4)}$	57	17	7	12	21	25	20	2	1	2	82
$H_{(2)}$	47	14	6	9	18	17	14	0	1	2	64

[1] Land uses in this category include agricultural, institutional/public service, and water company lands.

TABLE ES-30
TOTAL PROPERTY IMPACT SUMMARY BY ALTERNATIVE (ALL FOUR TOWNS)

ALTERNATIVE	NUMBER OF STRUCTURES POTENTIALLY AFFECTED					ESTIMATED LAND ACQUISITION AREAS		
	TOTAL NUMBER	DWELLINGS	COMMERCIAL/ INDUSTRIAL	OUTBUILDINGS	INSTITUTIONAL / COMMUNITY SERVICE	TOTAL AREA	RESIDENTIAL LAND	NON-RESIDENTIAL LAND[1]
No Build	0	0	0	0	0	0	0	0
$W_{(4)}$	82	32	7	42	1	20.2 ha. (49.9 ac.)	12.5 ha. (30.8 ac.)	7.7 ha. (19.1 ac.)
$W_{(4)}$m	67	27	7	32	1	13.3 ha. (32.8 ac.)	7.6 ha. (18.8 ac.)	5.7 ha. (14.0 ac.)
$W_{(2)}$	44	17	3	24	0	7.8 ha. (19.3 ac.)	5.5 ha. (13.5 ac.)	2.3 ha. (5.8 ac.)
TSM	7	2	3	2	0	0.94 ha. (2.4 ac.)	0.04 ha. (0.1 ac.)	0.9 ha. (2.3 ac.)
TDM/Transit	0	0	0	0	0	0	0	0
92PD	81	31	16	34	0	274.5 ha. (678.3 ac.)	249.3 ha. (616.1 ac.)	25.2 ha. (62.2 ac.)
$E_{(4)}$	70	22	16	32	0	276.9 ha. (684.2 ac.)	251.7 ha. (622.0 ac.)	25.2 ha. (62.2 ac.)
$E_{(2)}$	33	13	0	20	0	234.6 ha. (579.6 ac.)	226.7 ha. (560.2 ac.)	7.9 ha. (19.4 ac.)
$F_{(4)}$	79	29	16	32	2	293.6 ha. (725.4 ac.)	245.0 ha. (605.4 ac.)	48.6 ha. (120.0 ac.)
$F_{(2)}$	33	16	0	15	2	252.6 ha. (624.1 ac.)	222.1 ha. (548.8 ac.)	30.5 ha. (75.3 ac.)
$G_{(4)}$	88	38	16	32	2	278.7 ha. (688.6 ac.)	230.1 ha. (568.6 ac.)	48.6 ha. (120.0 ac.)
$G_{(2)}$	42	24	0	16	2	204.9 ha. (506.3 ac.)	174.4 ha. (431.0 ac.)	30.5 ha. (75.3 ac.)
$H_{(4)}$	65	28	1	36	0	115.3 ha. (284.8 ac.)	106.3 ha. (262.6 ac.)	9.0 ha. (22.2 ac.)
$H_{(2)}$	45	20	0	25	0	90.5 ha. (223.5 ac.)	85.5ha. (211.2 ac.)	5.0 ha. (12.3 ac.)

[1] Includes land zoned for commercial, industrial, governmental, or special uses.

- Mitigation Measures: Relocation assistance would be offered to all displaced persons and businesses in accordance with the Uniform Relocation and Real Property Acquisition Policy Act of 1970, as amended, and Connecticut PA 838. In cases where a partial property acquisition is required or where a property is bisected, leaving an owner with an unusable portion of property, the state will monetarily compensate owners for any land required or left uneconomic.

ES.5.9 FARMLAND RESOURCES

In an effort to curtail the irretrievable loss of farmland, legislation was enacted on a state and federal level to restrict development within areas of prime farmlands. Under the Farmland Protection Policy Act, overall impacts of federally-funded projects to agricultural lands must be assessed using the USDA's Farmland Conversion Impact Rating Form, after the selection of a preferred alternative. Additionally, the Connecticut Department of Agriculture (CTDOA) must review any proposed capital project that would convert 10.1 ha. (25 ac.) or more of prime farmland to non-agricultural use. Several of the alternatives evaluated, herein, would require this review if selected as the preferred alternative. According to the DOA, there are currently no lands within the corridor protected under this program.

Potentially-impacted farmland areas have been assigned identification numbers and land areas have been estimated (Table ES-31).

TABLE ES-31
SUMMARY OF PRIME FARMLAND IMPACTS

ALTERNATIVE	TOTAL AREA		IMPACT AREA	
	HECTARES	ACRES	HECTARES	ACRES
No build	N/I	N/I	N/I	N/I
$W_{(4)}$	81.66	201.80	0.32	0.78
$W_{(4)}$m	81.66	201.80	0.26	0.65
$W_{(2)}$	11.66	28.80	0.18	0.45
TSM	2.19	5.40	0.12	0.30
TDM/Transit	N/I	N/I	N/I	N/I
92PD	37.32	92.20	6.32	15.61
$E_{(4)}$	37.32	92.20	6.32	15.61
$E_{(2)}$	34.08	84.20	5.93	14.65

TABLE ES-31
SUMMARY OF PRIME FARMLAND IMPACTS

$F_{(4)}$	108.07	267.02	34.49	85.23
$F_{(2)}$	108.07	267.02	30.55	75.48
$G_{(4)}$	90.83	224.42	25.58	63.19
$G_{(2)}$	90.83	224.42	21.21	52.40
$H_{(4)}$	66.05	163.2	16.73	41.35
$H_{(2)}$	39.78	98.30	7.40	18.28

N/I = No impact or negligible impact

Note: Locations and descriptions of affected farmlands are detailed in Volume 2 (Section 5.9) of the DEIS

ES.5.10 SOCIOECONOMIC ENVIRONMENT

Growth within the corridor would be generally governed by regional and state trends only; i.e., not specifically influenced by a significant change to the existing transportation system. Regional and state growth trends would, to some extent, be influenced locally by the implementation of town policies and objectives currently advocated in the existing plans of development.

The anticipated increases in traffic volumes that are expected along Routes 82 and 85 would likely affect corridor-area business. Depending on the type and location of individual business, the effects could be either positive or negative. Ease of access would be a principal factor affecting the ability of an individual business to thrive. While some types of businesses (e.g., gas stations, convenience stores) would likely benefit from the increase in motorists, others might not be able to attract customers if traffic congestion or poor access are perceived as substantial impediments to would-be patrons.

The anticipated increase in traffic and congestion along Routes 82 and 85 would likely deter further residential construction, especially where direct access from either of these routes would be required.

Municipal Service Impacts: Implementation of a full-build expressway alternative would likely result in the most growth of both residential and commercial/industrial land uses caused by the improved mobility within the corridor. The increase in accessibility and development would have impacts on the delivery of various municipal services (e.g., police, fire, emergency medical, etc.) to the four towns.

ES.5.11 HISTORIC, CULTURAL AND ARCHAEOLOGICAL RESOURCES

Historic Architectural Resources: Impacts to identified historic resources of the corridor were analyzed based on their proximity to the proposed alternatives and the degree to which the property would be impacted. Some resources would be directly impacted and demolition or removal of a structure or structures would be necessary. Other properties may be indirectly adversely affected by the closeness of the roadway project (i.e., reduction in the rural character of a house's setting). In the case of historic cemeteries, it is not unusual to discover burials outside the present-day boundaries, therefore, even if road construction takes place outside the apparent boundary, the piece of land taken should be checked for possible burials. Table ES-32 lists eligible historic sites and historic cemeteries and summarizes the type of impact anticipated with each alternative.

Section 4(f) of the Department of Transportation Act of 1966 protects historic resources that are eligible for listing on the NRHP. Eligibility was indicated on Table ES-15. A detailed evaluation of impacts to Section 4(f) resources is included in the DEIS.

- Mitigation Measures: As mitigation, buildings affected by the various alignments could be relocated within the vicinity without compromising their architectural integrity or historical character. Relatively moderate adjustments to the alignments may avoid even these impacts. Relocation would require special coordination between ConnDOT and property owners as well as recordation to appropriate standards. Modification of the location and/or design of the interchange of Alternatives 92PD, $E_{(4)}$, $F_{(4)}$ and $G_{(4)}$ with I-395/I-95 could potentially avoid impact in that area. Construction planning may minimize impacts to features such as stone walls. Mitigation, particularly with any widening of Routes 82 and 85 would include photo documentation and relocation of historic gateposts and other historic features, and accurate reconstruction of stone walls.

Archaeological Impacts: While there is evidence of archaeological resources throughout the corridor area, construction of any of the full build alternatives would adversely impact at least 25 known prehistoric sites and an estimated 100 more. Many of these sites are likely eligible for the National Register, and it is possible that a large cluster of the sites may qualify for National Register status as a thematic resource group.

These alternatives would also impact the abandoned Butlertown community (also referred to as Wolf Pit Village) in at least two areas. Although the exact village boundaries have yet to be identified, they clearly extend along Pember Road, which each full build alignment follows and eventually crosses. Impacts would be direct because the highest density of sites is along Pember Road. Butlertown contains at least 14 archaeological sites and is almost certainly eligible for the National Register; it is considered a significant historic site.

TABLE ES-32
HISTORIC/ARCHITECTURAL RESOURCE IMPACTS

			ALTERNATIVE														
SITE ID	DESCRIPTION	IMPACT*	NO BUILD	TSM	TDM/ Transit	$W_{(4)}$	$W_{(4)}m$	$W_{(2)}$	92PD	$E_{(4)}$	$E_{(2)}$	$F_{(4)}$	$F_{(2)}$	$G_{(4)}$	$G_{(2)}$	$H_{(4)}$	$H_{(2)}$
E	House, c.1800	Indirect										✘	✘	✘	✘	✘	✘
H	House, c. 1865	No impact															
I	Holmes Cemetery[1]	Direct												✘	✘		
J	House, c.1870	No impact															
K	House, c.1770	No impact															
L	House, c.1790	No impact															
M	D.W.Stanton House	No impact															
N	House, c.1800	Indirect				✘	✘	✘									
O	Barn, c.1850	Indirect				✘	✘	✘									
S	Elijah Ransom House	Indirect				✘	✘	✘									
T	Raymond Cemetery	No impact															
U	Latimer Farm	Indirect				✘	✘	✘									
V	DeWolf Cemetery	Indirect (check for outside burials)				✘	✘	✘									
W	House, 18th C	Indirect (encroach upon yard) Direct				 ✘	✘	✘									
X	Gilbert Cemetery[1]	Direct (check for outside burials)				✘	✘	✘									
BB	Chesterfield Cemetery	Direct				✘	✘	✘									

TABLE ES-32
HISTORIC/ARCHITECTURAL RESOURCE IMPACTS

SITE ID	DESCRIPTION	IMPACT*	ALTERNATIVE														
			NO BUILD	TSM	TDM/ Transit	$W_{(4)}$	$W_{(4)}m$	$W_{(2)}$	92PD	$E_{(4)}$	$E_{(2)}$	$F_{(4)}$	$F_{(2)}$	$G_{(4)}$	$G_{(2)}$	$H_{(4)}$	$H_{(2)}$
DD	House, c. 1840	Indirect Direct				 ✘	✘ 	✘ 								 ✘	✘
FF	E. F. Morgan House	Indirect Direct				 ✘	✘ 	✘ 								 ✘	✘
HH	Lake Pond Cemetery	Direct (check for outside burials)				✘	✘	✘								✘	✘
KK	Bridge, c.1850	No impact															
LL	Latimer Mill Site	No impact															
MM	Family Cemetery[1]	No impact															
NN	Waller House	Indirect							✘	✘		✘		✘			
OO	Riverhead Cemetery	No impact															
PP	House, c. 1830	No impact															
QQ	House, c. 1760	No impact															
RR	House, c. 1780	No impact															
SS	Waterford Speedbowl	No impact															
TOTAL RESOURCES IMPACTED:		Indirect Direct	0 0	0 0	0 0	5 6	8 3	8 3	1 0	1 0	0 0	2 0	1 0	2 1	1 1	1 3	3 1

✘= impacted resources
* Direct = Razing or removal of structure required / Indirect = Reduction of rural quality of setting (impact on private land/landscape features)
[1] Not eligible, but requires protection under state statute.

- Mitigation Measures: Modification of the interchange of Alignments 92PD, E, F, and G with I-395/I-95 may increase possibilities for avoidance of potential archaeological sites associated with the NHRP-eligible property on Gurley Road. Moderate adjustments to alignments in some areas may also afford the opportunity for minimization of impact. Where avoidance is not possible, mitigation measures should include excavation, retrieval of artifacts and reporting of the site, or sample of the site, or preservation in place where possible. Disturbance to sites associated with a cemetery would require a special permit from SHPO and adherance to state statutes regarding burials.

ES.5.12 SECTION 6(F) LANDS AND NON-HISTORIC 4(F) LANDS

Section 6(f) Land Impacts: Section 6(f) lands in the corridor, as defined and described in Section ES.4.12, include two small pieces of the Nehantic State Forest located between Old New London Road and Routes 82 and 85 in Salem. The full build and partial build alternatives travel to the west of, but do not contact, these lands. The widening alternatives would result of some degree of fill along Route 85 at the edge of Horse Pond. Horse Pond is included in the Nehantic State Forest parcel. However, no impact to 6(f) lands is associated with these alternatives because all work would occur within the existing ConnDOT right-of-way and, therefore, would not result in a permanent loss of recreational land.

Non-historic Section 4(f) Land Impacts: The non-historic Section 4(f) lands within the corridor, and potential impacts associated with the DEIS alternatives, are identical to the Section 6(f) lands discussed in the preceding section.

ES.5.13 VISUAL AND AESTHETIC RESOURCES

Traffic volumes within the Route 82 and 85 corridor would continue to increase under the no build condition. The combined effects of increased traffic and growth would lead to incremental degradation of the aesthetic aspects of the existing environment.

The primary aesthetic impacts of widening include removal of vegetation; removal or relocation of existing street-side features such as stone walls; cuts and fills required to accommodate the widening; and moving/demolition of selected structures. The increase in road width, combined with the removal of existing street trees, would reduce the sense of enclosure as one transits the corridor.

The 92PD alignment is among the most disruptive full build alternatives with respect to its close proximity to the Route 85 corridor from Salem Turnpike to Route 161. Several existing subdivisions would be exposed to expressway corridor views and related noise.

The E alignment avoids some of the residential areas that would be affected by 92PD and would have less visual impact. The western F and G alignments run generally along ridge areas farther from the higher concentration, residential areas and may be considered less disruptive. However, these ridge-related alignments would require severe cuts and fills and several overpasses with large grade differentials of up to 17 m. (55 ft.).

The partial build H alternatives would disrupt residential environments less than the 92PD and E alternatives. Because the alignment extends east to Route 85, the right-of-way would compromise a substantial area of moderately sloping terrain and would create an impact area from Grassy Hill Road to the Route 85 intersection point.

- Mitigation Measures: Mitigation measures associated with the widening options would generally include plantings designed to create visual diversity. Mitigation for special land use areas and individual properties may include some minor land forming and special plantings in an effort to enhance special natural or historic features or to screen views, either for the aesthetic benefit of the driver or the property owner. Landscape planting objectives would also include the correction of existing deficiencies in the landscape, e.g., cleanup of damaged and dead plant materials and installation of landscaping that may be more appropriate than what currently exists.

  Common to all the full build alternatives is the fundamentally total disruption to lands that are presently undeveloped and largely wooded to accommodate the proposed right-of-way. The resultant visual and auditory effects upon adjacent land owners may be mitigated chiefly through design sensitivity and implementation of landscape treatments. These could include land forming to create berms for screening, combined with plantings. Many of the same aesthetic design applications suggested for the full build alternatives are also appropriate for the partial build options. However, where the proposed alignment would continue south and east from Grassy Hill Road to intersect with Route 85, highway visual aesthetics would more directly impact abutters. It may be necessary to consider a combination of land forming, concentrated planting and noise barriers to mitigate adverse visual aesthetics effects.

ES.5.14 HAZARDOUS WASTE / CONTAMINATED SITES

Selection of the no build alternative would result in little, if any, impact to hazardous waste or contaminated sites given that further substantive modification of the layout of the existing roadway would not occur. Impacts associated with this alternative would be limited to the potential exposure of highway construction and/or maintenance personnel to previously undetected hazardous or regulated materials or wastes encountered during routine maintenance of the roadway.

Potential impacts associated with the proposed build alternatives may include increased construction costs or lengthened construction schedules should contaminated materials be encountered during construction. This situation is likely and should be anticipated for areas such as the Salem Four Corners and Chesterfield Four Corners intersections for the widening alternatives, and at the exit 75 interchange of I-95 for the remaining expressway alternatives, excluding the H alignment. In general, the widening alternatives and the H alternatives would present the greatest risk of encountering hazardous or contaminated material during construction. The total number of identified hazardous/contaminated sites per alternative for the build options are summarized in Table ES-33.

All materials encountered during construction that exhibit evidence of contamination would be subject to regulation under the DEP's Remediation Standard Regulations (RSRs), which typically would require removal of the contamination source and contaminated materials, analytical testing of the material, and proper disposal of the material. In areas where the groundwater table is expected to be close to the ground surface, such as at Salem Four Corners, temporary draw down of the water table may be required during excavation. Groundwater extracted at the area of contamination would require treatment and discharge under a DEP wastewater discharge permit. Should excavation prove to not be feasible, an alternate method of remediation would be required which could add substantial time and cost constraints to the project.

Based on the suite of potential factors that could influence the fate and distribution of contaminants in the subsurface environment, a more detailed investigation of the potential areas of environmental concern identified in this document would be required to sufficiently address the extent of impacts. A detailed analysis and application of mitigation/remediation strategies would be recommended for the alternative that is advanced as the preferred alternative in the FEIS.

! <u>Mitigation Measures</u>: Given the suite of potential factors that could influence the fate and distribution of contaminants in the subsurface environment, a more detailed investigation of the potential areas of environmental concern identified in this document would be required to sufficiently address the extent of impacts. Detailed analysis and application of mitigation strategies, in accordance with recommended procedures, would be applicable to only the alternative that is advanced as the recommended alternative in the FEIS. In an effort to avoid potentially-contaminated sites, further investigation would be provided by a Task 110 Corridor Land Use Evaluation following selection of a recommended action. where avoidance is not possible, mitigation of impacts to known contaminated sites could be accomplished by any one or a combination of several remediation strategies that would be employed prior to or during road construction. Examples of typical remediation strategies include excavation of contaminated materials; installation of groundwater interceptor drains, recovery wells, or treatment wells; etc. In most cases, and if at all possible, source removal would be required.

TABLE ES-33
IDENTIFIED SITES OF POTENTIAL ENVIRONMENTAL CONCERN - COMPARISON OF ALTERNATIVES

ALTERNATIVE	REGISTERED UST SITES	LUST SITES	RELEASE SITES[1]	SOLID WASTE DISPOSAL SITES	STATE SUSPECTED SITES	RCRA NOTIFIER AND TSD FACILITIES	CERCLA SITES	TOTAL SITES
No Build	0	0	0	0	0	0	0	0
$W_{(4)}$, $W_{(4)}m$, $W_{(2)}$	8	1 (suspected)	7	1	3	0	0	20
TSM	3	0	2	0	2	0	0	7
TDM/Transit	0	0	0	0	0	0	0	0
92PD	0	0	1	1	0	0	0	2
$E_{(4)}$ and $E_{(2)}$	0	0	1	1	0	0	0	2
$F_{(4)}$ and $F_{(2)}$	0	0	1	2	0	0	0	3
$G_{(4)}$ and $G_{(2)}$	0	0	1	2	0	0	0	3
$H_{(4)}$ and $H_{(2)}$	5	0	5	3	1	0	0	14

Source: New England DataMap Technology Corporation Environmental First Search

[1] Oil and chemical spills resulting from transportation accidents

UST = Underground Storage Tank
LUST = Leaking Underground Storage Tank
RCRA = Resource Conservation and Recovery Act
TSD = Hazardous Waste Treatment, Storage, or Disposal Facility
CERCLA = Comprehensive Environmental Response Compensation and Liability Act

ES.5.15 CONSTRUCTION ACTIVITY

All of the build alternatives would have short-term impacts during the construction phase that are likely to include noise, dust, sedimentation and erosion and disruption of traffic. All control measures and BMPs utilized during construction would use the latest technologies, guidelines, and specifications and adhere to all state and federal regulations and permits.

Noise resulting from construction of any of the build alternatives is expected to be a short-term impact affecting those residents living adjacent to the construction area or along the roadways traveled by the construction equipment. The noise resulting from excavation, drilling, and blasting should not exceed 90 dBA at the nearest residence or occupied building. Alternatives $W_{(4)}$, $W_{(4)}$m and $W_{(2)}$ have many residences and businesses locate within the immediate vicinity of the construction area that could be affected during construction. All methods and devices utilized to minimize impacts would be in accordance with the appropriate regulations and approval of ConnDOT.

BMPs would be utilized to ensure all reasonable measures are used to maintain water quality. The protection of surface and subsurface water quality would be extensively coordinated with ConnDOT, DPH and DEP and incorporated into the construction documents.

During the conceptual engineering and layout phases of alternative development, a general balancing of earthwork (ratio of cuts to fills) was maintained. Subsequent, more detailed design plans for a preferred alternative would attempt to further refine the balance of earthwork in order to minimize any borrowing or hauling of waste material off-site. The longest of the new expressway alternatives, Alternative $F_{(4)}$ would require the most substantial amount of excavation and grading and would likely produce the largest amount of waste material.

Short-term disruption of traffic during the construction of any of these alternatives would occur, and a detailed Maintenance and Protection of Traffic (MPT) plan would be developed as part of the design of the selected alternative to insure that traffic would be maintained at all times where possible. Sequencing of construction, detours, bypasses and crossovers are some of the measures that would be utilized to minimize any disruption to travel and would be coordinated with the appropriate state and local officials. The construction associated with Alternatives $W_{(4)}$, $W_{(4)}$m and $W_{(2)}$ would result in the greatest amount of disruption to traffic as it would be necessary for the existing roadways to remain open to traffic during most of the construction. Access to local side streets, businesses and residences along Routes 82 and 85 would also be impacted by delays and hindrance to access to these locations.

All of the expressway alternatives on a new location would generally have the least amount of disruption of traffic in the corridor. Impacts can be expected at locations where the alternatives intersect with or cross over existing interstate, state and local roadways. However, the 92PD, $E_{(4)}$, $F_{(4),}$ and $G_{(4)}$ alternatives would have substantial improvements along I- 95, including relocation, reconstruction and construction of new ramps and structures, which would disrupt traffic. Alternatives $E_{(2)}$, $F_{(2)}$ and $G_{(2)}$ would also disrupt traffic along I-95 temporarily but to a lesser extent as compared to the four-lane expressways. The partial build alternatives $H_{(4)}$ and $H_{(2)}$ would cause traffic impacts intermediate to the widening and full expressway alternatives.

ES.5.16 UTILITY SERVICE AND DEMAND

The impacts to utilities for each of the build alternatives would include, to varying degrees depending on the alternative, relocating/resetting above and below ground utilities. These impacts would be relatively minor in nature and would not pose severe problems with respect to construction of any of the alternatives. A summary of utility impacts is presented on Table ES-34.

ES.5.17 ENERGY CONSUMPTION

The energy consumption impacts associated with each alternative consider the direct consumption of energy to construct the alternative as well as the indirect consumption of energy (gasoline equivalent) by vehicles using the alternative after construction is completed.

The total energy utilization for the alternatives was estimated by adding the construction energy required to build the alternative and the energy consumption by vehicles over a service period of 20 years. The sums can then be compared to that of the no build alternative to determine if the energy savings created by a decrease in VMT for the build alternatives would compensate for the energy required to construct the alternative.

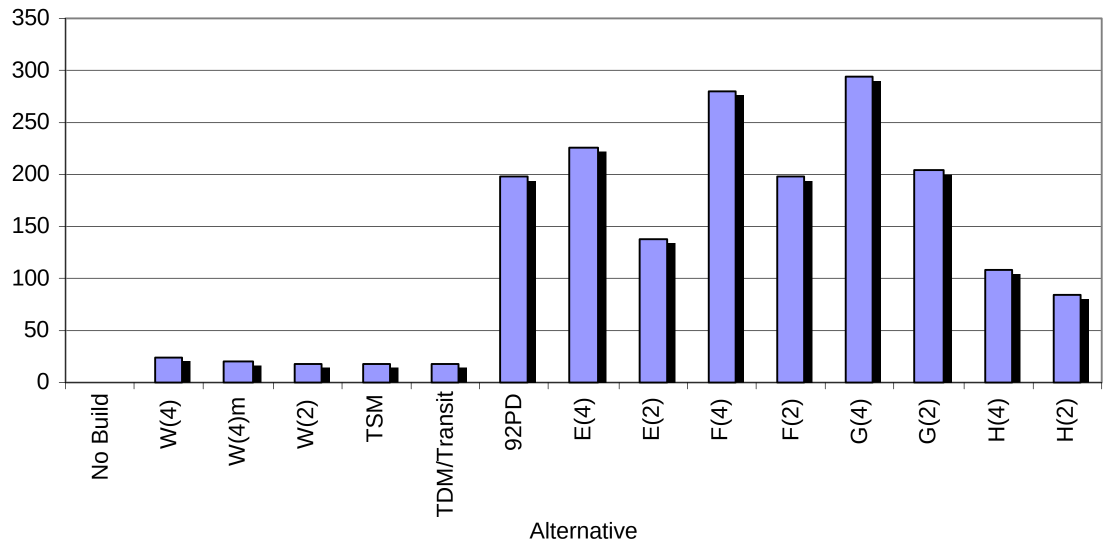
To determine the energy utilized in the construction of a given alternative, a construction energy factor (CEF) was used. The CEF relates the 1998 cost of the alternative to thenumber of kilojoules (British thermal units (BTU's)) of energy that would be consumed during construction. The cost varies between alternatives based on a number of factors such as cut/fill volumes, the length/width of the alternative, the type and number of structures, and the type of roadway project (e.g., rural freeway, rural conventional highway, rural conventional highway widening). Energy units in kilojoules were then converted to an equivalent volume measurement for gasoline. The construction energy consumption for each of the alternatives is shown in Figure ES-16.

FIGURE ES-34
POTENTIAL IMPACTS TO UTILITIES BY ALTERNATIVE

DESCRIPTION OF UTILITY	ALTERNATIVE														
	No Build	TSM	TDM/ Transit	$W_{(4)}$	$W_{(4)}$m	$W_{(2)}$	92PD	$E_{(4)}$	$E_{(2)}$	$F_{(4)}$	$F_{(2)}$	$G_{(4)}$	$G_{(2)}$	$H_{(4)}$	$H_{(2)}$
High voltage transmission lines: Northeast Utilities lines are located along I-395 in East Lyme and Waterford, and a separate set is located in Montville near Daisy Hill.							✘	✘	✘	✘	✘	✘	✘	✘	✘
Overhead electrical lines: Overhead CL&P lines are located along the entire lengths of RT 82, 85, and 161 and all local roads.		✘		✘	✘	✘	✘	✘	✘	✘	✘	✘	✘	✘	✘
Telecommunication lines: Overhead SNET lines and Eastern and Century cable lines (fiber optic and coaxial; some underground) are located along the entire lengths of RTS 82, 85, 161, and all local roads. TCG runs fiber optic cable along RT 82 and 85 for telecommunications for Millstone Nuclear Facility		✘		✘	✘	✘	✘	✘	✘	✘	✘	✘	✘	✘	✘
Sanitary sewer pipes: Waterford underground sanitary sewer lines are located near the intersection of RT 85/I-395/ Industrial Dr. and at intersection of Gurley Rd and Oil Mill Rd.; East Lyme has a line along RT 161, from 305 m. (1000 ft.) north of RT 1, south				✘	✘	✘	✘	✘		✘		✘		✘	✘
Water supply: 1main from Beckwith Pond, along RT 85 to RT 161. 3 mains from south of Lake Konomoc, along RT 85 to Cross Road. A high pressure transmission main and pump station on RT 85 between Industrial Dr. and Douglas Ln.; 1 main along RT 161, north to Westchester Rd.				✘	✘	✘				✘	✘	✘	✘	✘	✘
Gas Facilities: Yankee Gas Services has facilities along RT 85 from Industrial Drive, near I-395, and south.				✘	✘	✘								✘	✘

✘ = May require relocation and/or resetting of utility

Figure ES-16
Construction Energy Expenditures
(millions of liters of gasoline)

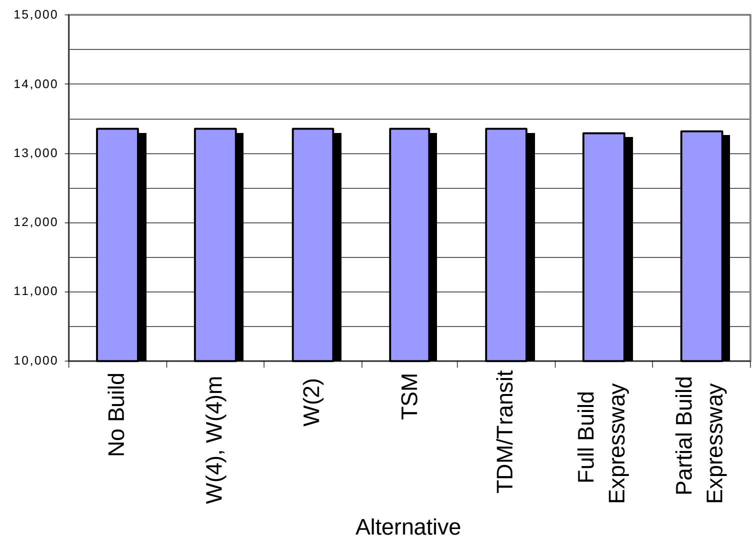


The motor vehicle energy used by each alternative is influenced by the total miles and the efficiency of travel as reflected in the average speed and the conditions of travel. For each alternative, the design year VMT by roadway class was forecast at a mesoscale level over a twenty-five town area in New London and Hartford Counties. The traffic volumes for the two- and four-lane expressway variations were assumed to be the same. Speed ranges were assigned to each of the fifteen roadway classes. Fuel consumption (liters per kilometer (gallons per mile)) by speed range and roadway type was used to determine the total liters (gallons) of gasoline consumed by each alternative.

The VMTs by speed range and road type used in the energy analysis are the same as those used in the air quality analysis. Annual fuel consumption was accumulated over the 20-year study service period, assuming that VMT by speed range and road type remained constant over the service life of the alternative. As shown in Figure ES-17, there is very little difference in vehicular energy consumption for each of the alternatives because the VMTs were collected over a large geographic area (25 towns) and the expressway alternatives would parallel the existing Route 85 with a very similar roadway length.

All of the build alternatives have total energy expenditures greater than that of the no build alternative. Therefore, vehicular energy savings of the build alternatives are not large enough to compensate for construction energy expenditures. This is primarily a result of two factors: there is very little difference in VMT between the build alternatives and the no build alternative; and the construction costs of the build alternatives are much higher than that of the no build alternative. For the build alternatives, the expressway alignments would be expected to consume the most total energy and the widening alternatives the least.

Figure ES-17
Vehicular Energy Usage Over 20 Years
(million liters of gasoline)



ES.5.18 SECONDARY AND CUMULATIVE IMPACTS

New road construction and/or improvements to existing roads may create pressure for changes in zoning that would allow higher density uses. However, the primary responsibility for future development within the study area would reside with the individual towns in the form of zoning regulations.

The major secondary and cumulative impacts anticipated are as follows:

! If the no build alternative is selected, development would continue to reflect the demand for roadside services on Routes 82 and 85 and for new housing subdivisions on currently undeveloped tracts of land.

- Under the Route 82 and 85 widening alternatives, improvement of the roadway would likely attract new commercial interests.

- The new location alternatives - both the full build and partial build - include new interchanges at Route 82 and Route 161 which may encourage commercial/ industrial growth in the surrounding area. Development may also increase on local roads that would have improved access to the highway.

- Secondary highway-induced development concentrated near the interchanges would adversely affect unfragmented forest blocks 1 and 2. Development associated with the widening alternatives may cause a minor increase in impact on unfragmented forest blocks 1 and 2.

- A number of indirect impacts to wetlands and water resources within the corridor may occur as a result of secondary development, such as, additional discharge of stormwater into adjacent watercourses from new streets or driveways, additional pollutant loadings and reduction in groundwater recharge from increased area of impervious surfaces.

- The cumulative effect of highway projects and local development may result in the alteration of flood channelization and storage. Areas of particular concern in the study area are near Salem Four Corners (Harris Brook) which would be affected by the widening alternatives, Latimer Brook which would be affected by all the build alternatives, and near the proposed Route 11/I-95/I-395 interchange (Oil Mill Brook).

- With implementation of either the Route 82/85 widening or new location build alternatives, any farmlands not required for highway right-of-way would be subjected to an increase in non-farm development pressure. The new location build alternatives would result in the greatest pressure near the new interchanges.

Mitigation measures for secondary and cumulative impact involve the management of land use and development. The future landscape and environmental health of each community would be determined by the planning and zoning decisions made today.

ES.5.19 SUMMARY OF IMPACTS

A summary of impacts by alternative is presented on Table ES-35.

TABLE ES-35
COMPARISON MATRIX: OVERVIEW OF IMPACTS BY ALTERNATIVE

PROPOSED ALTERNATIVE	WETLANDS	NUMBER OF FOREST BLOCKS	FOREST BLOCK AREA	CLASS I & II LANDS	HIGH YIELD AQUIFERS	ENDANGERED SPECIES HABITAT	PRIME FARMLAND	FLOODPLAINS	HISTORIC/ ARCHAEOLOGICAL	STRUCTURES POTENTIALLY AFFECTED	AIR QUALITY *MICROSCALE ANALYSIS/ MESOSCALE ANALYSIS	NUMBER OF NOISE RECEPTORS EXCEEDING CRITERIA[1]	POTENTIAL/KNOWN HAZARDOUS WASTE/ CONTAMINATED SITES	COST[2] (MILLIONS)
NO BUILD	None	None	None	None	None	None	None	None	None/ None	None	*No CO violations	4	None	None
$W_{(4)}$	2.07 ha. (5.12 ac.)	>200 ha. - 2 50-200 ha. - 0	2.9 ha. (7.2 ac.)	Class I - 2.99 ha. (7.39 ac.) Class II- 0.52 ha. (1.28 ac.)	3.5 ha. (8.7 ac.)	None	0.32 ha. (0.78 ac.)	1.6 ha. (3.9 ac.)	17 properties/ Yes	32 dwellings 7 commercial 42 outbuildings 1 institutional	*No CO violations/ VOC & CO < No Build NO_x < No Build	4	20	$41.0
$W_{(4)}M$	1.52 ha. (3.77 ac.)	>200 ha. - 2 50-200 ha. - 0	1.4 ha. (3.5 ac.)	Class I - 2.47 ha. (6.06 ac.) Class II- 0.44 ha. (1.09 ac.)	1.8 ha. (4.3 ac.)	None	0.26 ha. (0.65ac.)	1.1 ha. (2.7 ac.)	17 properties/ Yes	25 dwellings 7 commercial 32 outbuildings 1 institutional	*No CO violations/ VOC & CO < No Build NO_x < No Build	4	20	$33.0
$W_{(2)}$	1.37 ha. (3.37 ac.)	>200 ha. - 2 50-200 ha. - 0	1.2 ha. (3.0 ac.)	Class I - 2.42 ha. (5.96 ac.) Class II- 0.46 ha. (1.15 ac.)	1.3 ha. (3.3 ac.)	None	0.18 ha. (0.45 ac.)	1.0 ha. (2.4 ac.)	17 properties/ Yes	17 dwellings 3 commercial 24 outbuildings	*No CO violations/ VOC & CO = No Build NO_x = No Build	4	20	$31.1
TSM	0.26 ha. (0.65 ac.)	None	None	None	0.2 ha. (0.5 ac.)	None	0.12 ha. (0.3 ac.)	0.2 ha. (0.5 ac.)	2 properties/ None	2 dwellings 3 commercial 2 institutional	*No CO violations/ VOC & CO = No Build NO_x = No Build	4	8	$1.7
TDM/TRANSIT	None	None	None	None	None	None	None	None	None/ None	None	*No CO violations/ VOC & CO = No Build NO_x = No Build	4	None	$1.4[3]
92PD	14.17 ha. (35.01 ac.)	>200 ha. - 2 50-200 ha. - 2	59.2 ha. (146.2 ac.)	None	1.6 ha. (4.1 ac.)	None	6.32 ha. (15.61 ac.)	2.7 ha. (6.6 ac.)	3 properties/ Yes	31 dwellings 16 commercial 34 outbuildings	*No CO violations/ VOC & CO < No Build NO_x > No Build	7	2	$255.6
$E_{(4)}$	14.27 ha. (35.26 ac.)	>200 ha. - 2 50-200 ha. - 3	63.8 ha. (157.6 ac.)	None	1.4 ha. (3.5 ac.)	None	6.32 ha. (15.61 ac.)	2.3 ha. (5.6 ac.)	3 properties/ Yes	22 dwellings 16 commercial 32 outbuildings	*No CO violations/ VOC & CO < No Build NO_x > No Build	7	2	$255.2
$E_{(2)}$	7.89 ha. (19.50 ac.)	>200 ha. - 2 50-200 ha. - 3	47.5 ha. (117.3 ac.)	None	0.5 ha. (1.1 ac.)	None	5.93 ha. (14.65 ac.)	1.2 ha. (3.0 ac.)	2 properties/ Yes	13 dwellings 20 outbuildings	*No CO violations/ VOC & CO < No Build NO_x > No Build	7	2	$154.7
$F_{(4)}$	11.62 ha. (28.72 ac.)	>200 ha. - 2 50-200 ha. - 4	68.3 ha. (168.7 ac.)	None	1.9 ha. (4.6 ac.)	None	34.49 ha. (85.23 ac.)	1.8 ha. (4.5 ac.)	3 properties/ Yes	29 dwellings 16 commercial 32 outbuildings 2 institutional	*No CO violations/ VOC & CO < No Build NO_x > No Build	7	3	$329.7
$F_{(2)}$	6.21 ha. (15.35 ac.)	>200 ha. - 2 50-200 ha. - 4	51.6 ha. (127.5 ac.)	None	0.8 ha. (2.1 ac.)	None	30.55 ha. (75.48 ac.)	0.7 ha. (1.6 ac.)	2 properties/ Yes	16 dwellings 15 outbuildings 2 institutional	*No CO violations/ VOC & CO < No Build NO_x > No Build	7	3	$213.1
$G_{(4)}$	13.23 ha. (32.69 ac.)	>200 ha. - 2 50-200 ha. - 4	68.3 ha. (168.7 ac.)	None	2.9 ha. (7.2 ac.)	None	25.58 ha. (63.19 ac.)	2.3 ha. (5.8 ac.)	3 properties/ Yes	38 dwellings 16 commercial 32 outbuildings 2 institutional	*No CO violations/ VOC & CO < No Build NO_x > No Build	7	3	$344.8
$G_{(2)}$	7.93 ha. (19.59 ac.)	>200 ha. - 2 50-200 ha. - 4	51.6 ha. (127.5 ac.)	None	1.1 ha. (2.6 ac.)	None	21.21 ha. (52.40 ac.)	1.0 ha. (2.4 ac.)	2 properties/ Yes	24 dwellings 16 outbuildings 2 institutional	*No CO violations/ VOC & CO < No Build NO_x > No Build	7	3	$224.6
$H_{(4)}$	4.40 ha. (10.87 ac.)	>200 ha. - 2 50-200 ha. - 3	38.1 ha. (94.1 ac.)	Class I - 2.98 ha. (7.36 ac.) Class II- 0.52 ha. (1.28 ac.)	3.0 ha. (7.3 ac.)	None	16.73 ha. (41.35 ac.)	1.2 ha. (3.0 ac.)	8 properties/ Yes	28 dwellings 1 commercial 36 outbuildings	*No CO violations/ VOC & CO < No Build NO_x > No Build	8	14	$113.6
$H_{(2)}$	3.0 ha. (7.41 ac.)	>200 ha. - 2 50-200 ha. - 3	28.8 ha. (71.1 ac.)	Class I - 2.41 ha. (5.95 ac.) Class II- 0.46 ha. (1.15 ac.)	1.0 ha. (2.5 ac.)	None	7.40 ha. (18.28 ac.)	0.6 ha. (1.5 ac.)	8 properties/ Yes	20 dwellings 25 outbuildings	*No CO violations/ VOC & CO < No Build NO_x > No Build	8	14	$81.9

1 = Does not include receptors already exceeding criteria (NAC) under existing conditions
2 = Construction cost; includes estimated ROW acquisition costs
3 = Cost of implementation for Route W only