Construction Phase	Typical Equipment/Materials Required
	challenging topography, helicopter may be used for removal.
Restoration	• Pickup and other small trucks. • All debris is to be removed from the ROW for disposal; but brush may be piled, scattered, or chipped. Disturbed ground is back bladed to its preconstruction contours unless directed otherwise. If the work site is in an agricultural field, the soil can be decompacted by disking. Erosion controls are left in place until vegetation is established. Steep areas are stabilized with jute netting or pre-made erosion control fabric containing seed, mulch, and fertilizer. Access roads where culverts or crushed stone fords were installed will be left in place or removed as directed by the regulatory authorities in accordance with permit/certificate conditions.

5.5.1.1 Project Schedule

The projected construction schedule for the installation of the proposed facilities along the Preferred Northern Route is between the third calendar quarter of 2010 and the first calendar quarter of 2013. Construction of the new 345-kV line and the upgrade to the 115-kV lines along this corridor will occur at the same time.[21]

The projected construction schedule for the development of the 345-kV transmission line along the Noticed-Alternative Southern Route also would be between the third quarter of 2010 and the third quarter of 2013. In order to achieve this construction schedule, construction activities will occur simultaneously on both the southern corridor as well as the 115-kV northern corridor. Based upon preliminary evaluations, there would be minimal changes to the construction sequence or duration if the Noticed-Alternative Southern Route is selected.

5.6 NOTICED-ALTERNATIVE SOUTHERN ROUTE - SUMMARY COMPARISON OF UNDERGROUND AND OVERHEAD 345-kV VARIATION

As an option for placing one of the two proposed 345-kV overhead lines underground, an in-ROW underground line route alternative (UG-South 02E) was analyzed between South Agawam Switching Station and Agawam Substation (see Section 4.6.7.) Because this 345-kV underground line route option follows the same route later identified later in Section 6.2.2 and evaluated in Section 7.2.2 of this document, the full evaluation is not repeated here. The results of the impacts analysis in Section 7.2.2

[21] This is without regard to any undergrounding of the 115-kV lines which are described as alternatives in Section 6 herein. The underground alternatives are likely to cause delay in the completion of the Project.

comparing the impacts of the underground option to the overhead option are re-produced below in Table 5-29 in Section 5.6.3.

For a full analysis, the reliability of the underground variation should be compared to the reliability of the overhead lines. Furthermore, the costs of the underground 345-kV variation, inclusive of the costs estimated to construct two transition stations, must be compared with the cost of the overhead 345-kV line which would otherwise share the ROW between the South Agawam Switching Station and the Agawam Substation. Those comparisons follow.

5.6.1 345-kV Underground Line Route Variation – Reliability Comparison to Overhead Alternative

Underground cables have historically experienced fewer, but longer, failures than overhead lines. On balance, if considered on a "stand-alone" basis and without regard to the system into which they are being inserted, the underground and the overhead line alternatives here are considered to be comparable from the point of view of reliability. However, here, the system must be taken into account from the point of view of the effects on contingency analyses associated with the introduction of new cable circuits into the Greater Springfield area 345-kV system. Reliability is negatively affected by presence of new set of qualifying (extended outage) first contingencies (failure of a new 345-kV cable circuit which can take long times to repair).

5.6.2 345-kV Underground Line Route Variation – Cost Comparison to Overhead Alternative

The underground 345-kV underground variation adds costs to the Project which are not offset by the reduction in costs associated with the removal of the 345-kV overhead line in question. Table 5-28 sets forth those costs and the Net Increase in Project Cost that results from the selection of the underground line alternative.

Table 5-28: Cost Comparison of Underground and Overhead Line Route Variation from South Agawam Switching Station to Agawam Substation

Route	Segment	UG Alternatives	Net Reduction on OH Cost	Net Increase to the Project Cost
02E	South Agawam Switching Station to Agawam Substation	$135,180,000[22]	$13,467,000	$121,713,000

[22] Included in this total is the cost of the transition stations, which alone add $38.4 million.

5.6.3 345-kV Underground Line Route Variation – Impacts Comparison to Overhead Alternative

The results of the analysis of impacts and balancing factors are re-produced below in summary check mark format in Tables 5-29 and 30. The details of the analysis of the ten impact categories used in this comparison can be found in Section 7.2.2. Check marks (✓) in each table identify the more favorable route for each category. Check marks (✓) are a summarizing methodology only. They should not be understood to mean that all checks marks are of equal weight between impacts (i.e., superiority of a route over other routes may be slight in some impact cases and significant in others) or of equal significance among impacts (e.g., a check mark for noise may have more importance than a check mark for OHM).

Table 5-29: Impact Comparison of Noticed-Alternative Southern Route Underground and Overhead Line Route Variations

Impact Category	Underground 345-kV Line Route Alternative (UG-South 02E)	Noticed-Alternative Southern Route 345-kV Overhead Line
Land Use/Acquisition	✓	
Traffic	✓	✓
Noise		✓
Aesthetics/Visual	✓	
Wetlands/Water Resources		
Protected Species and Habitats		
OHM		✓
Electric and Magnetic Fields	✓	
Tree Removal		
Historic and Archaeological Resources		✓
Superior Route Balancing Impacts		✓

Table 5-30: Balancing Impacts, Costs and Reliability of Underground and Overhead Line Route Variations

Balancing Impacts, Costs and Reliability	**Underground 345-kV Line Route Alternative (UG-South 02E)**	**Noticed-Alternative Southern Route 345-kV Overhead Line**
Impacts on Balance		✓
Ability to Meet Project Need		✓
Reliability		✓
Cost		✓

Based on the balancing of impacts, costs and ability to reliably meet need, the Noticed-Alternative Southern Route overhead line alternative for the route section between South Agawam Switching Station and the Agawam Substation on the transmission line corridor is superior to the underground line variation.

5.7 COST OF PREFERRED NORTHERN AND NOTICED-ALTERNATIVE SOUTHERN ROUTES AND SUBSTATIONS

Table 5-31 shows the cost comparison for the Preferred Northern Route versus the Noticed-Southern Route.