Appendix 1: Operating Plan Methodology

OPERATING PLAN METHODOLOGY

Operating plans were developed for each transit alternative to provide input to the ridership estimation process. This appendix describes the operating assumptions and methodology used to develop these operating plans.

Rail Segments

In order to calculate trip times for the three rail alternatives, SYSTRA employed its RAILSIM™ Train Performance Calculator (TPC), which is widely used for rail systems planning, analysis and design. The TPC, part of the RAILSIM™ Suite, is the ideal tool for travel time predictions, train control attainable speed and safe braking distance analysis, alternative rail alignment analysis, and rolling stock evaluation.

Operating Assumptions

The following assumptions were made with regards to track speeds, physical characteristics, and train operations of the three rail alternatives:

1. Track charts were available from the Maine Department of Transportation for the segment from Brewer to Ellsworth, which was used in the TPC model for Alternatives 1 and 5. Since Alternatives 4 consists primarily of new track, a new track stationing system was developed by SYSTRA.
2. Grade data for the segment from Brewer to Ellsworth in Alternatives 1 and 5 was provided by the Maine DOT track charts. Grade data for all other segments within Alternatives 1 and 5 was created by SYSTRA.
3. Curve data for all segments within the three alternatives was created by SYSTRA. Since no freight traffic is envisioned for Alternative 4, higher curve speeds were permitted for this alternative.
4. Speed restrictions were calculated by SYSTRA for all segments within the three rail alternatives. Speed restrictions correlate with curve data. Maximum authorized speeds (MAS) for all alternatives was 79 mph, except for segment 1 in Alternative 5, which was 25 mph due to street operations. Traffic signal pre-emption was assumed for the street-running segment 1 of Alternative 5, meaning that no delays for the light rail vehicle waiting at vehicular intersections for traffic lights were reflected in the model.
5. Curve speed restrictions were rounded down by 5 mph. However, curve speed restrictions were not rounded down for the street-running segment 1 of Alternative 5, since the MAS was already relatively low at 25 mph and rounding down by 5 mph would be significant as a percentage of the operating speed of 25 mph.
6. Trip times were calculated allowing 30-second platform dwells. Dwell times at stations are reflected in the running times.

Vehicles

The trip time analysis for Alternative 1 entailed diesel-powered, commuter rail rolling stock with a maximum speed of 79 mph. Train composition is envisioned to include one rebuilt GP40-2 with separate, head-end power generator, one Bombardier single-level coach car, and one Bombardier cab control car. Passenger loading was user-defined to be 25 persons per vehicle for the TPC model, although the coach car has a seating capacity of 113 and the cab car of 104.

The rolling stock for Alternatives 4 and 5 was a Diesel Multiple Unit (DMU) upgraded to a maximum speed of 79 mph. Train composition included two Concept I Articulated DMUs, manufactured by Siemens for NJ TRANSIT's South New Jersey Light Rail System (SNJLRT). Passenger loading was user-defined to be 25 persons per vehicle for the TPC model, although the vehicle seating capacity is 80.

Trip Time Results

The following table summarizes the trip times for each rail alternative.

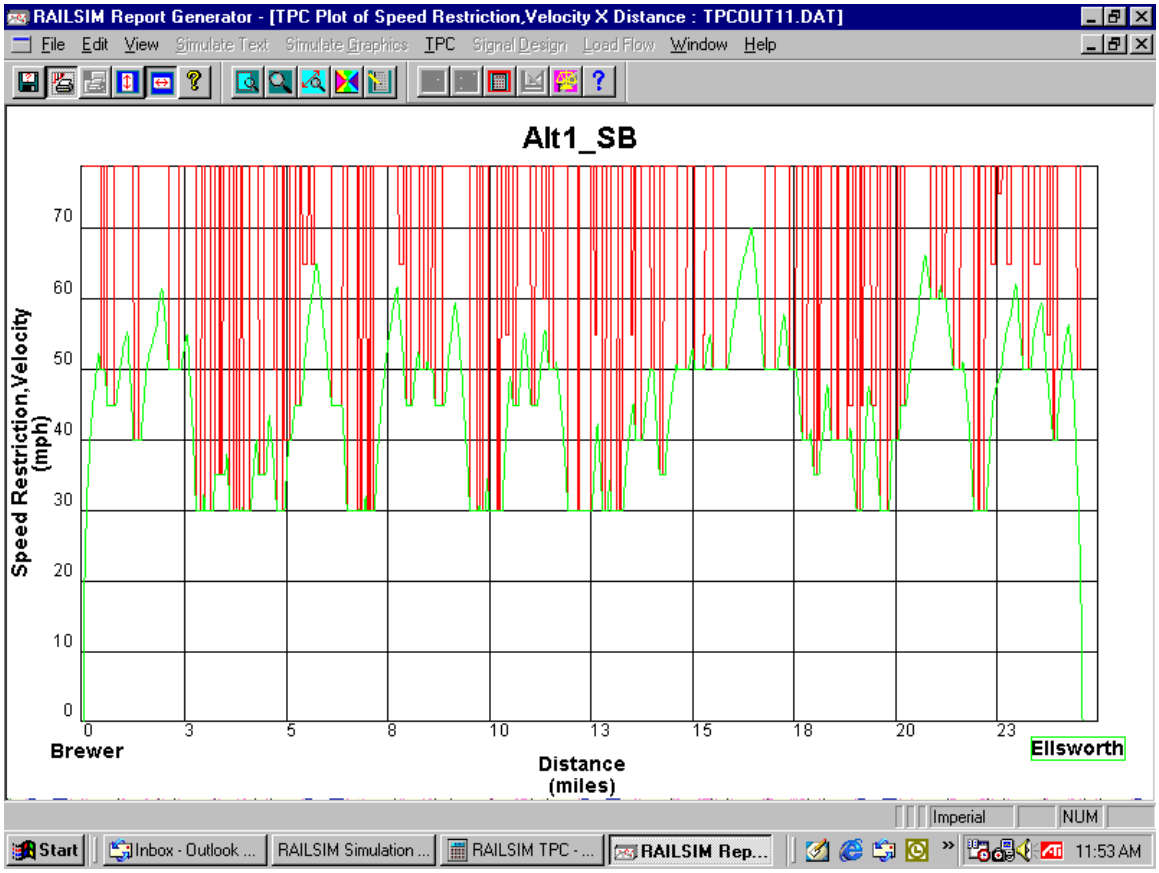
Table A-1: Rail Alternative Trip Time Results

	Run Time (hh:mm:sec)		
SOUTHBOUND	**Alternative 1**	**Alternative 4**	**Alternative 5**
BGR IMF	NA	0:00:00	0:00:00
Waterfront	NA	0:05:23	0:06:57
Brewer	0:00:00	0:12:26	0:13:26
Ellsworth	0:35:24	0:37:30	0:48:54
BHB IMF	NA	0:46:17	0:57:40
NORTHBOUND	**Alternative 1**	**Alternative 4**	**Alternative 5**
BHB IMF	NA	0:00:00	0:00:00
Ellsworth	0:00:00	0:08:28	0:08:27
Brewer	0:35:23	0:33:38	0:43:53
Waterfront	NA	0:40:36	0:50:37
BGR IMF	NA	0:46:30	0:57:58

Velocity Profiles

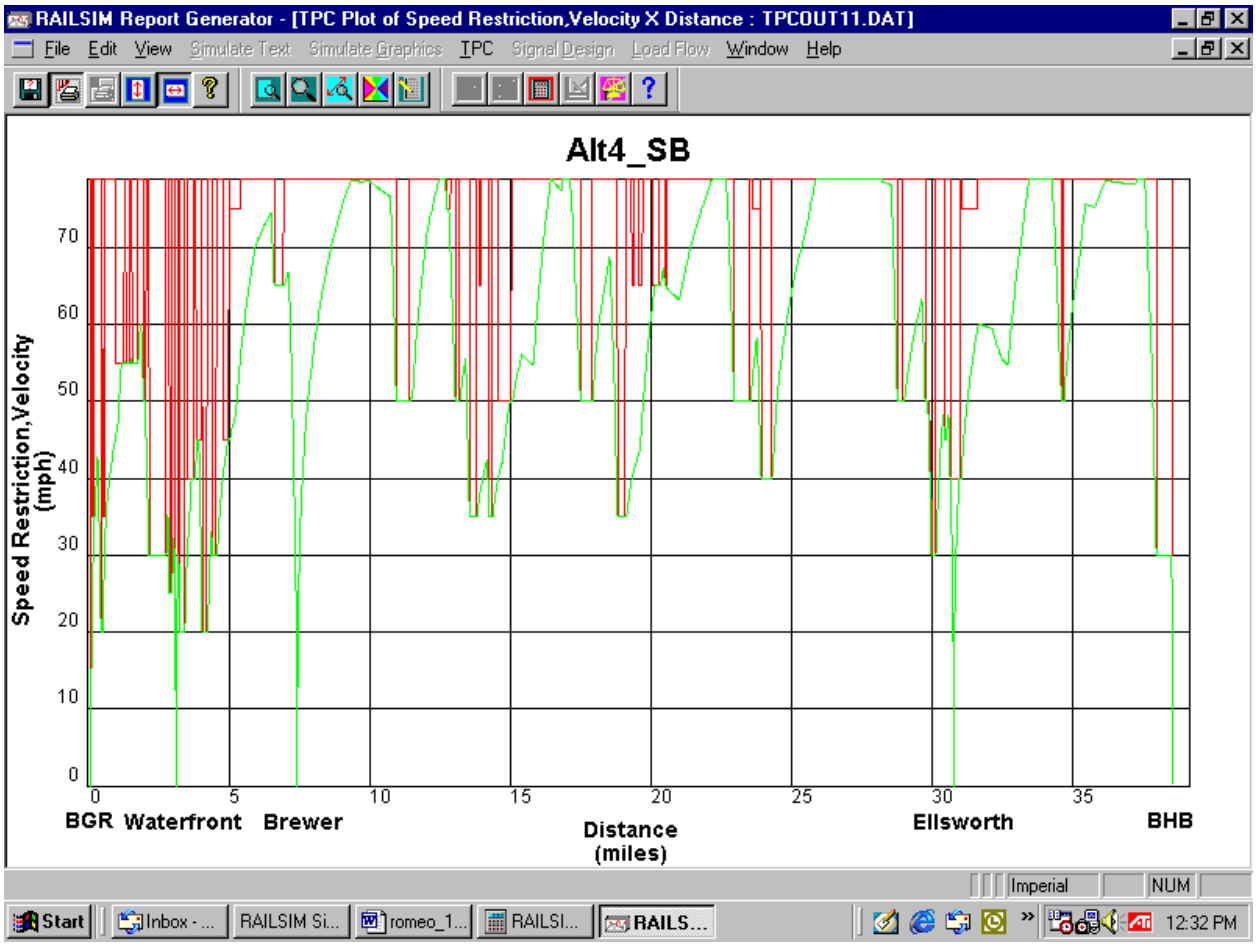
The following graphs of velocity/speed limit versus distance illustrate velocity profile for southbound trains. (Note: In the graph, the red lines represent speed restrictions along the alignment due to curves in the track. The green line represents the train speed along the line).

Alternative 1



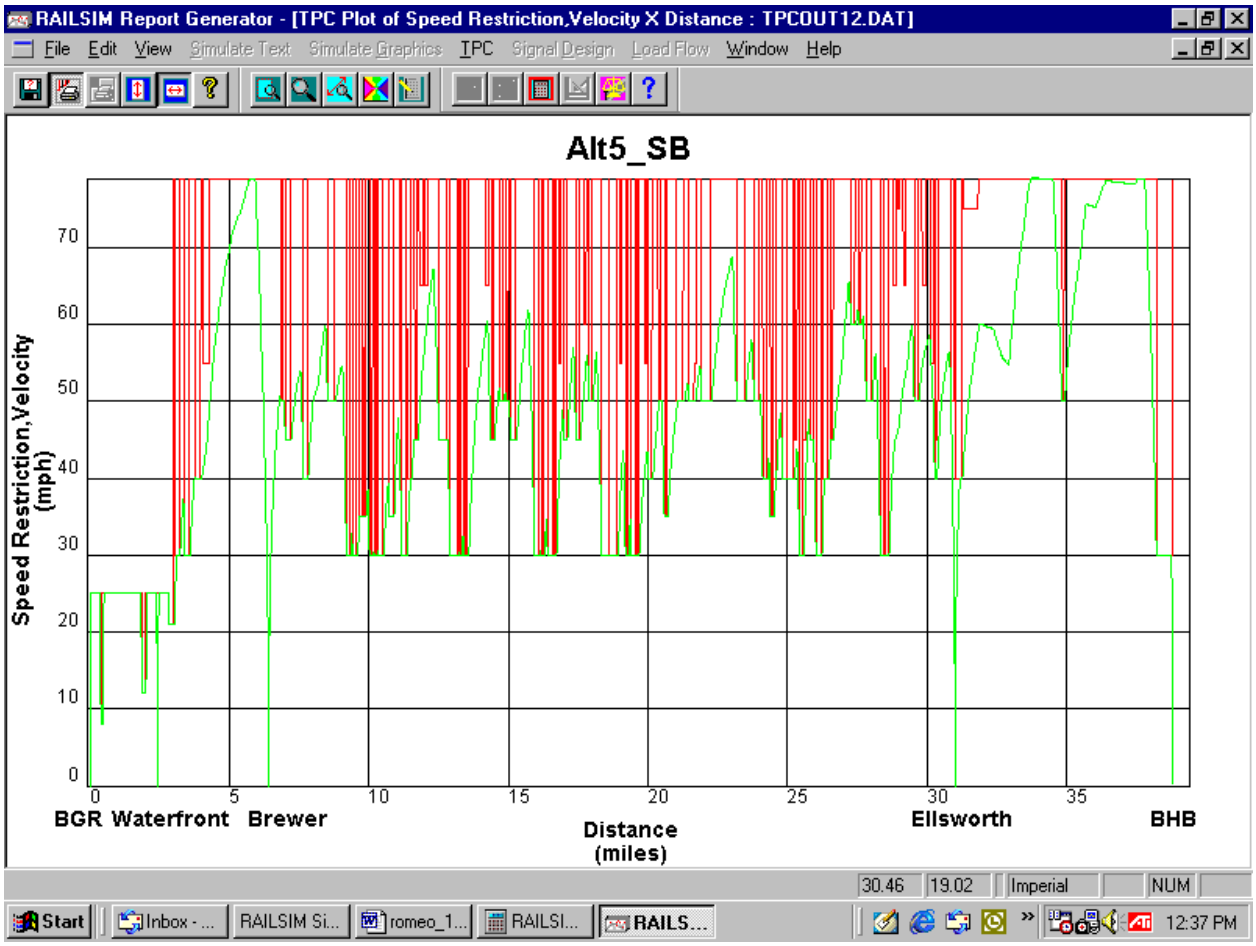
Due to several curves present along the Brewer to Ellsworth track segment, train operating speeds rarely reach the MAS of 79 MPH, thus constraining total trip time. The train reaches 70 mph only once between mileposts 15 and 18, and it is restricted to 30 - 40 mph between mileposts 3 and 5 and around mileposts 7, 10 and 13.

Alternative 4



As illustrated by the above velocity chart, the train reaches its MAS of 79 mph on seven separate occasions (approximately at mileposts 9, 13, 17, 22, 26-28, 34 and 36-37). However, it is also evident that due to the grades along this alignment, the train must acclimate to top speeds. Unlike Alternative 1, curve speeds between Brewer and Ellsworth have been maximized in order to provide a faster trip time. There is no freight operation along this corridor, which also contributes to a faster trip time.

Alternative 5



As illustrated in the above velocity chart, the same speed restrictions under Alternative 1 are also in place for Alternative 5 between Brewer and Ellsworth. In addition, there is a speed restriction of 25 mph between milepost 0 and 3 due to street operation. Furthermore, there are more severe speed restrictions of 8 mph and 12 mph due to curves within this street-running section. Similar to Alternative 4, track grades between Ellsworth and BHB IMF impede the full velocity of the train.

Bus Segments

Operating Assumptions

The following assumptions were used in developing operating plans for the bus alternatives:

1. Buses will dwell at each station for one minute to reflect time required for boarding and acceleration/deceleration. At each endpoint layover time is assumed to be five minutes. The dwell times at stations are reflected in the running times.
2. Under Alternative 2, there are 8 traffic signals located along the route between Ellsworth and Mount Desert Island. To account for delays in travel time caused by red traffic signals along the route, it was assumed that buses would stop at half of the traffic signals. The resulting delay caused by red traffic signals was assumed to be 45 seconds in duration per red signal. Assuming that buses would stop at four traffic lights for a duration of 45 seconds per traffic signal, a delay totaling 3 minutes was built into the operating schedule for the segment between Ellsworth and Mount Desert Island. (45 * 4 = 180 seconds or 3 minutes in delay). An additional two minutes (rounded up from 1.5 minutes) was added to this total to take into account that the buses may need to wait 3 or more cycles to clear the traffic signal on Route 1A in Ellsworth during peak travel times. Under Alternative 3, the majority of these traffic signals are by-passed because of the busway facility between Ellsworth and Trenton. However, it is assumed that the bus will stop at two traffic signals, one in Trenton and one at the junction of Route 3/Route 102 at the head of Mount Desert Island. Assuming that buses would stop at two traffic lights for a duration of 45 seconds per traffic signal, a delay totaling 2 minutes (rounded up from 1.5 minutes) was built into the operating schedule for the segment between Trenton and Mount Desert Island.

Vehicles

In order to make the bus alternatives attractive to potential riders this service will use motor coach buses. Motor coach buses are over-the-road buses with luggage storage and are more plush than transit buses. Bicycle racks can be fitted onto these buses for added convenience to potential riders. These coaches generally have a seating capacity of 40 passengers. It is assumed that conventional diesel bus equipment will be used to operate the service. However, alternate fuel technology such as Compressed Natural Gas (CNG) or propane propulsion systems could be used, if preferred.