# South Stamford Accessibility & MNRR Bridge Replacement Feasibility Study

State Project No. 135-301
Stamford, Connecticut

# PRELIMINARY ENGINEERING REPORT

## Three-Span Bridge Alternatives

(Atlantic Street and Elm Street)

January 18, 2012


State of Connecticut
Department of Transportation

URS

500 Enterprise Drive, Suite 3B
Rocky Hill, CT 06067
Tel.: (860) 529-8882
Fax: (860) 529-3991
www.urscorp.com

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January 18, 2012

Mr. Scott Hill, P.E.
Manager of Structures
State of Connecticut
Department of Transportation
2800 Berlin Turnpike
P.O. Box 317546
Newington, CT 06131-7546

Attn: Mr. Timothy Fields, P.E.
**Re: Metro-North Railroad Bridge Replacement Feasibility Study**
**City of Stamford**
**State Project No. 135-301**
**Extra Work No. 3 – Three Span Bridge Alternate at Atlantic and Elm Streets**

Dear Mr. Hill:

We are pleased to submit the Final Letter Report for the Three Span Bridge Alternate at Atlantic and Elm Streets. Please let us know if you need additional copies; we would be glad to provide more for your use.

Should you have any questions regarding this submission or for any matter relating to this project, please feel free to contact us at (860) 529-8882.

Sincerely,

**URS Corporation AES**

Ronald Sacchi
Project Manager

Encl.
cc: URS central file (36938292)

URS Corporation
500 Enterprise Drive, Suite 3B
Rocky Hill, CT 06067-3913
Tel: 860.529.8882
Fax: 860.529.3991
www.urscorp.com

URS

# Final Letter Report

Date: January 18, 2012 File: 135-301

To: Scott Hill, P.E.
Manager of Structures
Connecticut Dept. of Transportation

Distribution:

From: Ronald Sacchi, P.E.
Project Manager
URS Corporation

Subject: ***Metro-North Railroad Bridge Replacement Feasibility Study, Stamford, CT***
***Extra Work No. 3 – Three Span Bridge Alternate at Atlantic and Elm Streets***

## Introduction

This project involves developing and preparing a preliminary engineering study for the replacement of five Metro-North Railroad (MNR) bridges in the City of Stamford. This supplemental report has been prepared to document the findings of our study of the feasibility of utilizing a three span crossing at Atlantic Street and Elm Street so that bi-directional traffic could be maintained on these streets during construction. The purpose of the study is to identify issues and potential impacts related to maintenance of traffic, design, and constructability.

## Atlantic Street

This Metro-North undergrade bridge is located at mile post 33.19 on the New Haven Line and carries five MNR Mainline Tracks over Atlantic Street. The bridge is located about 180 feet to the south of the I-95 northbound Exit 8 off-ramp, which forms a 5-leg intersection with South State Street and Atlantic Street. Immediately to the south of the railroad underpass, Atlantic Street intersects Manhattan Street at a T-intersection, with Manhattan Street approaching Atlantic Street from the east.

Located approximately 900 feet east of the Stamford Station, the Atlantic Street underpass serves as an entry point into the Stamford Central Business District (CBD) from areas south of the rail corridor. The underpass is adjacent to Station Place, which is the main access to the station and also the location of the main parking garage. Atlantic Street therefore provides the primary access between I-95 and the station.

### *Roadway*

The proposed roadway cross-section and alignment are the same as the ones used in the Preliminary Study, although the median has been eliminated because there is no center pier. Each direction of traffic will have three 11-foot lanes, 2-foot shoulders, and an 8-foot sidewalk. The northbound direction will be provided with a right-turn only lane onto South State Street. To provide for a 3 span crossing, the superstructure depth increases by approximately 1.3 feet.

The vertical alignment for Atlantic Street will include a 180-foot sag curve controlled by the bridge structure and the minimum required clearance of 14’-6”. To provide the required minimum clearance, the vertical geometry for Atlantic Street will have to be lowered by

approximately 4.0' from existing grade. This is an additional 12 inches of cut relative to the previous design. The vertical geometry has a minimum grade of 0.6% and a maximum grade of 7.3%, which is less than the design criteria of 9.0% maximum grade, but more than the 6.8% maximum grade provided in the previous design. Stopping Sight Distance provided is based on an illuminated roadway (not headlight criteria) and is greater than 305 feet, providing for a design speed greater than 40 mph.

The proposed reconstruction of Atlantic Street traverses I-95 and meets existing grade at the south edge of the North State Street intersection. The profile grade on Atlantic Street at South State was 6.8% in the previous design, and is increased to 7.3% under the 3 span alternate. South State Street will be lowered by 5 feet from existing grade, which is an additional 1 foot below the previous design. Because Atlantic Street is lowered by an additional 1 foot for the 3 span option, the proposed exit ramp flyover can be lowered slightly and still maintain the required vertical clearance.

Intersection Sight Distance for the intersection of South State Street with Atlantic Street does not meet the design criteria for a design speed of 25 mph and would require a design exception. This was also true in the previous design.

*Retaining Walls*

Similar to the previous design , the proposed exit ramp will require a new retaining wall to be constructed to the full height of I-95 along South State Street to the west of Atlantic Street (where the ramp was previously located), as well as at the proposed location of the relocated ramp. The retaining wall heights will be increased slightly for the 3 span alternate due to the lower grade of South State Street.

*Drainage*

The hydraulic grade line for the previously proposed design is approximately 1-foot below the top of frame for the catch basin at the low point beneath the Atlantic Street Bridge. This elevation corresponds to the minimum free board permitted in the CTDOT Drainage Manual. Lowering the roadway by approximately 12 inches to accommodate the 3 span alternate will violate the drainage criteria and could require a pumping plant. Because of incomplete or conflicting information on the condition of the present drainage system, further analysis will be required to quantify the issues at this location. It is known that the downstream capacity is controlled by a downstream pumping station, although it is not known how often this station is pumping at capacity. On a preliminary basis, it appears that potential flooding of the low point could be controlled by isolating the existing drainage system and pumping water out of the low point to the next downstream structure, or if the system is over capacity, pumping to another outlet. A location for the pumping station is not immediately obvious, as there is little excess land available near the structure. The pump station itself is anticipated to cost approximately $50,000, with additional costs required for alarm systems, right-of-way, emergency power, etc.

*Utilities*

Since the previous profile resulted in the replacement and/or lowering of all utilities in this section of roadway, accommodating an additional lowering of 12 inches will not cause any additional utility structures to be relocated. However, because the road is lower, it was

necessary to lengthen the vertical curves, and this is likely to increase the length of the utility relocations.

*Traffic*

The previous design required the construction of a center pier, which would effectively block the travel lanes on Atlantic Street throughout the construction period. It was therefore proposed that Atlantic Street be closed to all traffic for the duration of the construction. The proposed 3 span option places the piers back at the proposed edge of road, and allows for the existing traffic pattern of one lane in each direction to be maintained on Atlantic Street throughout the construction period. At certain times, some lane closures will be necessary to allow for the installation of temporary sheet piling, and traffic stoppages are likely to be needed for short periods during structure removal or installation.

*Constructibility*

The original plan called for the removal of the existing bridge superstructure under a single track, one stage at a time, also demolishing the abutment and piers to the point necessary to allow for new steel to be erected. The remaining old structure could then be removed following the completion of the new bridge. On reviewing the 3 span alternative, the following constructibility issues were determined:

- The east pier can be constructed without impacting the existing pier.
- The west pier can be constructed for Track 1, 2, 3, and 5 without impacting the existing pier. However, the construction the south end of the proposed westerly pier would conflict with the existing pier for Track 4. The construction will have to be staged from north to south so that this will not impact traffic.
- The proposed piers appear to conflict with the existing abutments or their foundations for Tracks 2 and 4.

With the 3 span alternative, instances where the pier conflicts with an existing abutment or pier, the old facility must be completely removed prior to the construction of the new pier. This presents some difficult constructibility issues where some of the existing structure must be removed vertically, with very little clearance to the adjacent track. Additional sheeting, shoring, and cutting of the existing blocks is likely to be necessary to accomplish this effort.

**Elm Street**

This Metro-North undergrade bridge is located at mile post 33.75 on the New Haven Line and carries seven MNR Mainline Tracks over Elm Street. Immediately north of the bridge, Elm Street intersects South State Street and the I-95 northbound on-ramp. Interstate 95 is approximately 300 feet north of the MNR tracks.

*Roadway*

The proposed roadway cross-section and alignment are the same as the one used in the Preliminary Study, although the median has been eliminated because there is no central pier. The proposed roadway section consists of two 11-foot through traffic lanes in the northbound

direction and an additional lane for right-turn only onto South State Street, along with a 2-foot shoulder. The proposed southbound lanes include two 11-foot lanes with a 2-foot shoulder. To provide for a 3 span crossing, the superstructure depth increases by approximately 5 inches.

The vertical alignment for Elm Street will include a 120-foot sag curve controlled by the bridge structure and the minimum required clearance of 14'-6". To provide the required minimum clearance, the vertical profile for Elm Street must be lowered by approximately 3.0', which is an additional 5 inches of cut relative to the previous design. The vertical geometry has a minimum grade of 0.5% and a maximum grade of 4.1%, which is lower than the maximum design criteria of 9.0%, but higher than the 2.6% maximum grade provided in the previous design. Stopping Sight Distance provided is based on an illuminated roadway (not headlight criteria) and is greater than 305 feet, which provides for a design speed greater than 40mph.

The lowering of Elm Street with the 3 span alternate causes minimal change to the vertical geometry for South State Street and I-95 NB entrance ramp from the previous design.

Intersection Sight Distance for the intersection of South State Street with Elm Street does not meet the design criteria for a design speed of 30 mph and would require a design exception. This was also true in the previous design.

*Retaining Walls*

Lowering the Elm Street roadway south of the railroad would require increasing the height and length of the retaining wall along the back of sidewalk on the MNRR property.

*Drainage*

The hydraulic grade line for the previously proposed design is 0.35' below the top of frame for the catch basin at the low point beneath the Elm Street Bridge. This elevation is less than the minimum free board permitted in the CTDOT Drainage Manual. Lowering the roadway by 5 inches to accommodate the 3 span alternate would result in the hydraulic grade line being above the catch basin frame. It is known that downstream drainage is controlled by a pump station, although it is not known how often the station is at capacity. Additional drainage studies would be required to determine the specific impacts and to resolve potential flooding issues, but it is evident that it may be necessary to isolate the existing drainage system and to install a pumping plant to take water from the low point. Depending on downstream capacity, it may be possible to pump to the next adjacent downstream structure, or another outlet may need to be identified. A location for the pump station is not immediately obvious, since the amount of available land is minimal. The pump station itself is anticipated to cost approximately $50,000, with additional costs required for alarm systems, right-of-way, emergency power, etc.

*Utilities*

Since the previous profile resulted in the replacement and/or lowering of all utilities in this section of roadway, accommodating an additional lowering of 5 inches will not cause any additional utility structures to be relocated. However, because the road is lower, it was necessary to lengthen the vertical curves, and this is likely to increase the length of the utility relocations.

*Traffic*

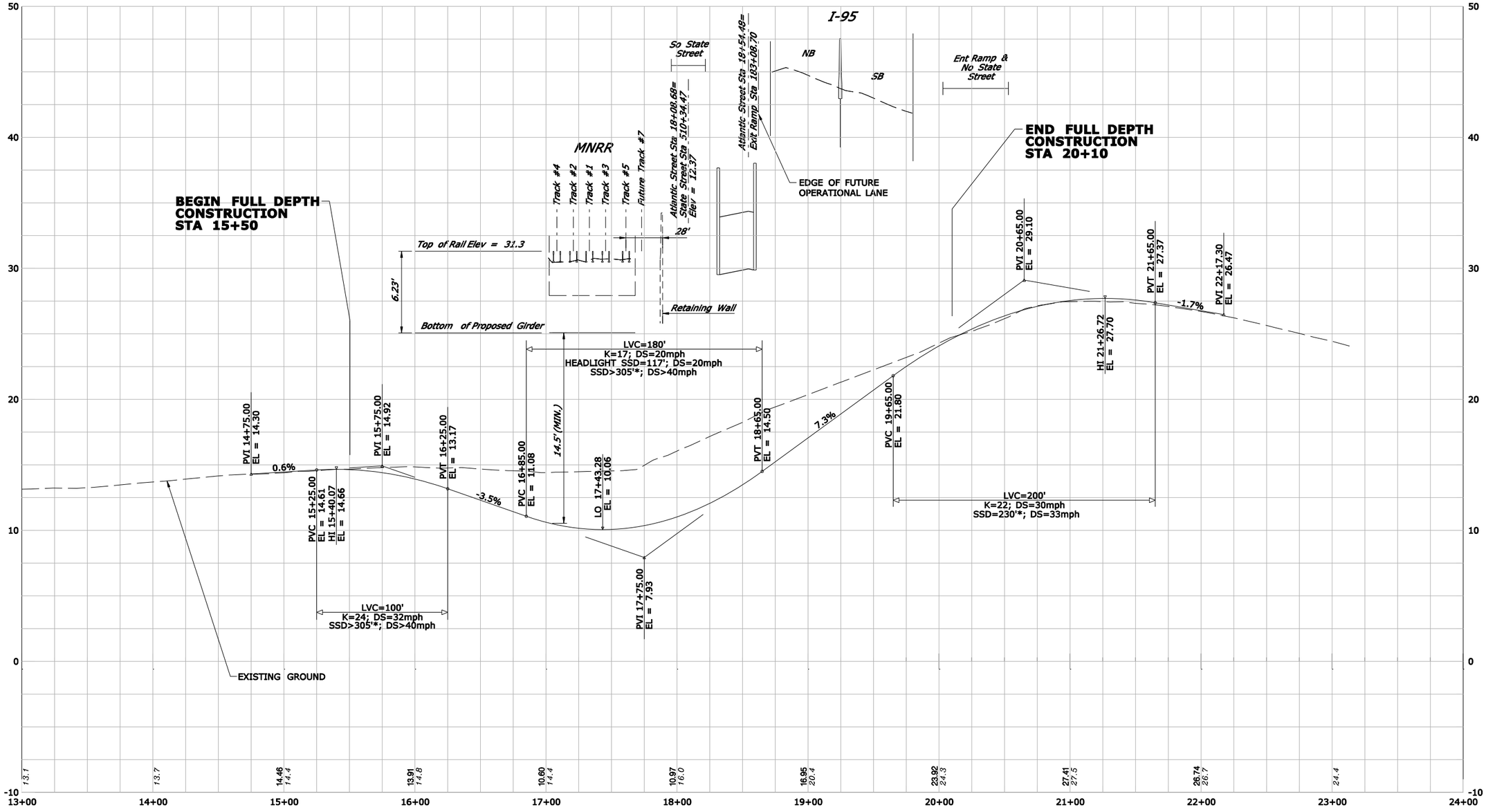
The previous design required the construction of a center pier, which would effectively block a substantial portion of Elm Street throughout the construction period. It was therefore proposed that Elm Street be reduced to a single travel lane for the duration of the construction. The proposed 3 span option places the piers back at the proposed edge of road, and allows for the existing traffic pattern of one lane in each direction to be maintained on Elm Street throughout the construction period. At certain times, some lane closures will be necessary to allow for the installation of temporary sheet piling, and traffic stoppages are likely to be needed for short periods during structure removal or installation.

*Constructibility*

The original plan called for the removal of the existing bridge superstructure under a single track, one stage at a time, also demolishing the abutment and piers to the point necessary to allow for new steel to be erected. The remaining old structure could then be removed following the completion of the new bridge. On reviewing the 3 span alternative, the following constructibility issues were determined:

- The proposed piers can be constructed without impacting the existing piers.
- Both proposed piers appear to conflict with the existing abutments or their foundations.

With the 3 span alternative, the old abutment must be completely removed prior to the construction of the new pier. This presents some difficult constructibility issues where some of the existing structure must be removed vertically, with very little clearance to the adjacent track. Additional sheeting, shoring, and cutting of the existing blocks is likely to be necessary to accomplish this effort.




* STOPPING SIGHT DISTANCE IS BASED ON ILLUMINATED ROADWAY.

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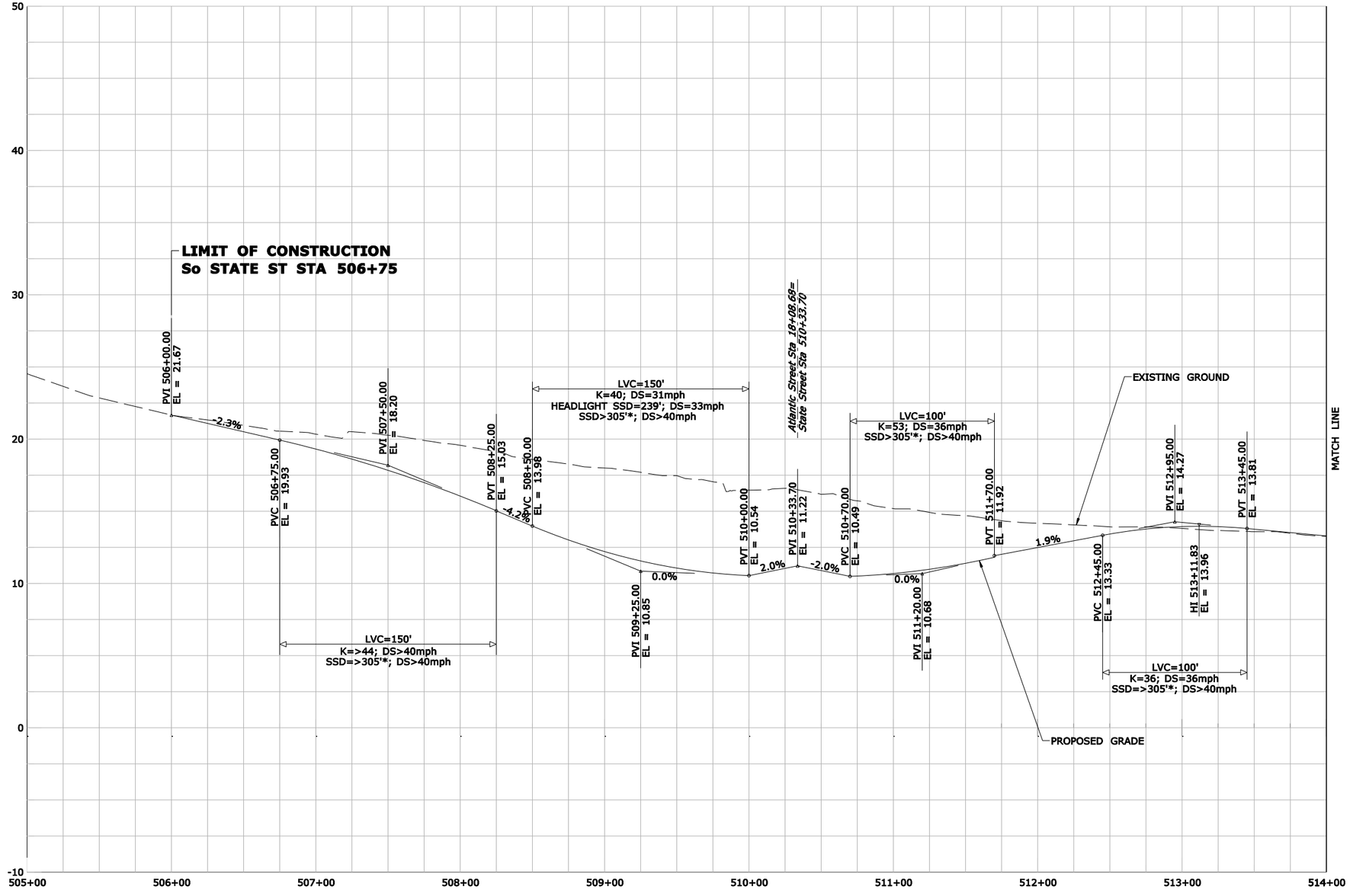
12/6/2011

SOUTH STAMFORD ACCESSIBILITY & MNRR BRIDGE REPLACEMENT FEASIBILITY STUDY

ATLANTIC STREET ALT-2
PROFILE (3 SPAN BRIDGE)

HORIZ. SCALE IN FEET
0 40 80
VERT. SCALE IN FEET
0 4 8

URS | SCALE AS NOTED | FIGURE 1.1




* STOPPING SIGHT DISTANCE IS BASED ON ILLUMINATED ROADWAY.

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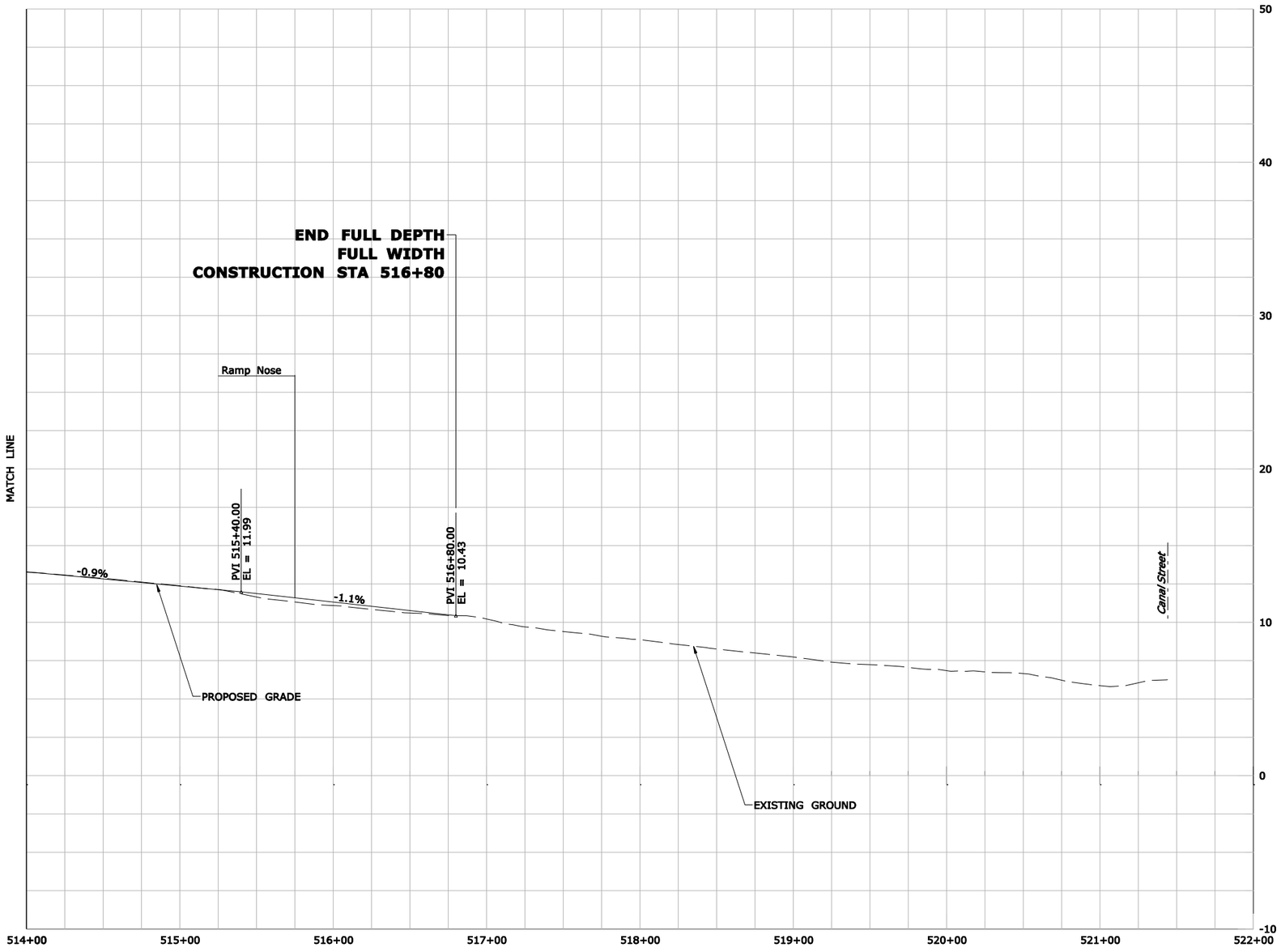
HORIZ. SCALE IN FEET
0 40 80
VERT. SCALE IN FEET
0 4 8

SHEET 1 OF 2

SOUTH STAMFORD ACCESSIBILITY & MNRR BRIDGE REPLACEMENT FEASIBILITY STUDY

So STATE STREET ALT-2
PROFILE (3 SPAN BRIDGE)

URS | SCALE AS NOTED | FIGURE 1.2a

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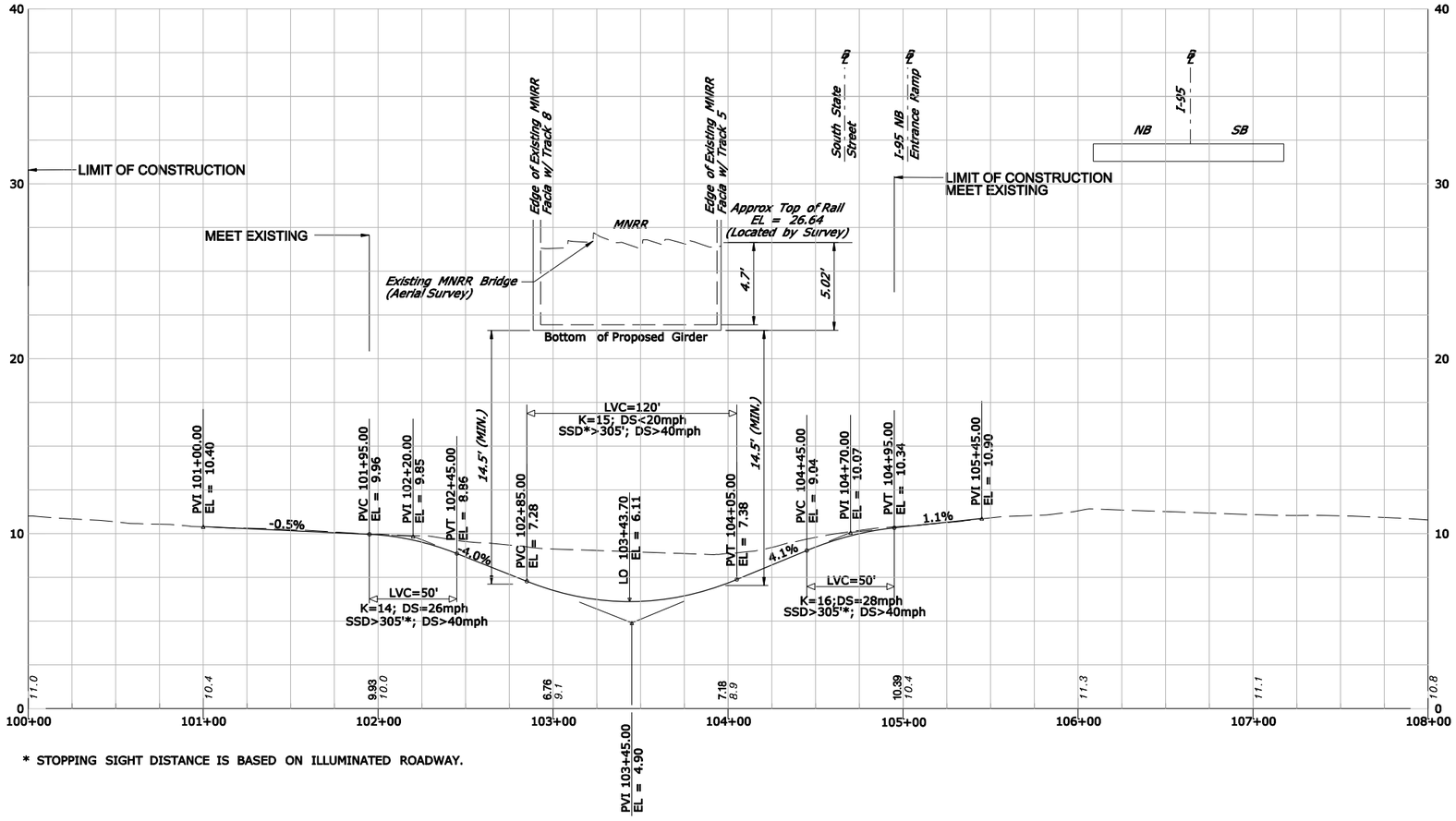
SHEET 2 OF 2

SOUTH STAMFORD ACCESSIBILITY & MNRR BRIDGE REPLACEMENT FEASIBILITY STUDY

So STATE STREET ALT-2
PROFILE (3 SPAN BRIDGE)

HORIZ. SCALE IN FEET
0 40 80
VERT. SCALE IN FEET
0 4 8

URS | SCALE AS NOTED | FIGURE 1.2b




* STOPPING SIGHT DISTANCE IS BASED ON ILLUMINATED ROADWAY.

SOUTH STAMFORD ACCESSIBILITY & MNRR BRIDGE REPLACEMENT FEASIBILITY STUDY

ELM STREET
ROADWAY PROFILE
(3 SPAN BRIDGE)

URS | SCALE 1"=80' | FIGURE 2.1

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