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Memo

To: I-190/Silver Street Interchange Study Advisory Team	
From: HDR Engineering	Project: I-190/Silver Street Interchange
CC: File	
Date: June 16, 2011 (revised August 26, 2011)	Job No: 137390

RE: Philadelphia Street Connection Alignments

INTRODUCTION

The purpose of this memo is to discuss alignment options for the City of Rapid City street network connecting the existing residential neighborhood to the west of I-190. Depending on the chosen interchange alternative, the current configuration with Silver Street to the west of I-190 connecting directly to North Street east of I-190 through the existing interchange may be modified to improve the interchange configuration and meet the long range goals of the City of Rapid City. This current connection would be replaced by extending Philadelphia Street to a new connection with North Street through a reconfigured interchange. In order to modify the current street network configuration, a viable access from the neighborhood to Philadelphia Street and the Interstate must be developed.

To address the access concerns, four connection options have been brought forward to be discussed in this memo. The four options are:

1. Option 1: Van Buren Street Connection (Figure 1);
2. Option 2: Boegel Street Connection (Figure 2);
3. Option 3: Silver Street Connection (Figure 3); and
4. Option 4: West Boulevard Connection (Figure 4).

A more detailed description of the connection along with advantages and disadvantages are discussed later in this document.

CONNECTION OPTION CRITERIA

Criteria used in developing and evaluating the options include:

1. Construction and ROW costs;
2. Ability to meet design criteria;
3. Constructability;
4. Adequately accommodate traffic volumes and patterns;
5. Environmental issues (including relocations, historical impacts, etc.)

CONNECTION OPTION DESCRIPTIONS

Option #1: Van Buren Street Connection

This option consists of extending Van Buren Street from the intersection of Short Street to the west to avoid existing housing. Once past the existing housing, the alignment turns south following the east edge of a drainage channel and connecting to Philadelphia Street approximately 1,100 feet west of I-190. In addition to the extension of Van Buren Street at the west end of the street, an extension of Van Buren east to West Boulevard will be required to assist with traffic flow within the development.

The alignment was selected to minimize excavation by following the side slope of a significant hill that exists between the development and Philadelphia Street. Advantages identified with this option include:

- Minimal excavation quantities due to the location of the alignment with respect to the hill;
- Alignment can be modified to eliminate the need for family relocations; and
- Meets minimum standards for separation of a major intersection to an interchange.
- Minimal to no impacts to residential structures.

Disadvantages identified with this option include:

- The extension to the west will impact the property known as "Cowboy Hill" which may be a 4(f) resource;
- The extension to West Boulevard would impact a City owned greenway, a Section 4(f) resource;
- Increase traffic along Van Buren Street altering the existing neighborhood traffic pattern;
- Possible drainage impacts since the proposed alignment follows a drainage swale;
- The profile would exceed preferred grade standards for a city street (10.0%);
- Extensive use of retaining walls needed to reduce the impact to the drainage swale;
- Provides minimal embankment material for use in constructing the interchange; and
- Possible impacts to a potential prehistoric archeological site.
- Due to the large amount of Right of Way purchase required, this would be the most expensive connection option.

Option #2: Boegel Street Connection

This option consists of extending Boegel Street from the intersection of Mallow Street to the southwest and turns south to intersect with Philadelphia Street approximately 1,100 feet west of I-190. The extension of Boegel Street does require traversing through a hill requiring significant excavation, which as a benefit may be used as embankment for the construction of the interchange.

Advantages identified with this option include:

- Excess embankment material that can be used for the construction of the interchange thus reducing the need for borrow material;
- The section of existing Boegel Street is wider and may be able to accommodate the additional traffic with minimal improvements;
- Meets minimum standards for separation of a major intersection to an interchange; and
- This option would be the least expensive.

Disadvantages identified with this option include:

- The extension would require the acquisition of four (4) residences;
- Increase traffic along Boegel Street to the southwest of Silver Street;
- The profile would exceed preferred grade standards for a city street (10.0%);
- Drifting of snow may be an issue as the alignment cuts through a hill;
- Extensive use of retaining walls to reduce the impacts could be considered and could reduce the number of impacted residences to three (3); and
- Possible impacts to a potential prehistoric archeological site.

Option #3: Silver Street Connection

This option consists of re-aligning Silver Street from the intersection of West Boulevard. At the intersection of West Boulevard, Silver Street would turn south and tie into Philadelphia Street at the existing 11th Street intersection. The extension of Silver Street does require traversing through a hill requiring significant excavation, which as a benefit may be used as embankment for the construction of the interchange. Strategic use of retaining walls could reduce the impact to private property and add/reduce the amount of excess embankment material.

Advantages identified with this option include:

- Excess embankment material can be used for the construction of the interchange;
- The vertical alignment would fall below the preferred standards with a maximum grade at 3.10%;
- Closely follows existing traffic patterns with very minimal modifications to the existing street network; and
- Connects to Philadelphia Street to create a four legged intersection with the existing roadway connection to the south.

Disadvantages identified with this option include:

- The Silver Street option would require the relocation of one (1) residence which has been previously acquired by the SDDOT;
- Use of retaining walls may be required to reduce property impacts (approximately 4,500 ft^2);
- Drifting of snow may be an issue as the alignment cuts through a hill;
- The Philadelphia Street connection separation is 300' from the proposed interchange on/off ramps. This does not meet minimum spacing requirements for Access Control at an interchange and would require an exception to the policy (current SDDOT policy is 660' from ramp to first intersection); and

- Due to the proximity to the interchange location, this connection option will work with Interchange Alternative 2a only.

Option #4: West Boulevard Connection

This option is an extension of the previously discussed Silver Street connection. Instead of starting the alignment at Silver Street and curving to the south, Silver Street would become a "T" intersection as the connection extends north to tie into West Boulevard at Boegel Street. This option would improve the traffic patterns over what currently exists by allowing West Boulevard to connect directly to Philadelphia Street and the interchange. Currently, West Boulevard becomes Boegel Street and the traffic is directed onto neighborhood streets. Additional discussions included with the Silver Street Connection also apply to this option.

Advantages identified with this option include:

- Excess embankment material can be used for the construction of the interchange;
- The vertical alignment would fall below the preferred standards with a maximum grade at 3.10%;
- The frontage road could be considered as a buffer between the interchange ramps and the neighborhood;
- Closely follows existing traffic patterns with very minimal modifications to the existing street network;
- Best follows the City of Rapid City Major Street Plan which identifies Philadelphia Street and West Boulevard North as arterial roadways; and
- Improves connection to the interchange for the development north of Silver Street.

Disadvantages identified with this option include:

- The West Boulevard option would require the relocation of up to three (3) residences. However, two of the residences are impacted by all of the interchange options except for Alternative 2a and the other residence has previously been acquired by the SDDOT;
- Use of retaining walls may be required to reduce property impacts (approximately 4,500 ft^2);
- Drifting of snow may be an issue as the alignment cuts through a hill;
- Impacts the City owned greenway, a Section 4(f) resource, on the west side of West Boulevard;
- The Philadelphia Street connection separation is 300' from the proposed interchange on/off ramps. This does not meet minimum spacing requirements for Access Control at an interchange and would require an exception to the policy (current SDDOT policy is 660' from ramp to first intersection); and
- This connection option will work with Interchange Alternative 2a only.

CONSTRUCTION AND ROW COSTS

The following are the estimates of probable costs for each of the connection options as shown in the figures.

	Option #1 Van Buren	Option #2 Boegel	Option #3 Silver	Option #4 West
Roadway Construction Costs	$ 727,000	$ 683,000	$ 563,000	$ 764,000
Structure and Wall Costs	$ 359,000	$ -	$ 269,000	$ 269,000
Right of Way and Property Acquisition Costs	$ 876,000	$ 406,000	$ 276,000	$ 333,000
Utility Relocations	$ 58,000	$ 58,000	$ 58,000	$ 58,000
Total Estimate	$ 2,020,000	$ 1,147,000	$ 1,166,000	$ 1,424,000

ENVIRONMENTAL IMPACTS AND MITIGATION

Option #1: Van Buren Street Connection

Impacts	Mitigation[1]	Description[2]	+/-[3]
Cowboy Hill (4(f))	Yes	Use of retaining walls between the roadway and Cowboy Hill would greatly reduce impacts to the property. May result in "*de minimus impact*".	+
Prehistoric Site	Yes	The horizontal alignment can be modified to avoid the site. A shift of the alignment either east or west would result in significant cost increases.	-

[1] Potential mitigation measure to minimize environmental impacts.
[2] Description of the mitigation measure.
[3] Measure of impact to the goal of the project.

Option #2: Boegel Street Connection

Impacts	Mitigation[1]	Description[2]	+/-[3]
Resident Relocation	Yes	As a part of the environmental process, identification of suitable housing similar to the current location. This would include comparable size, price, and location.	-
Prehistoric Site	Yes	The horizontal alignment would need to be modified to avoid the site. A shift of the alignment either east or west would result in significant cost increases.	-

[1] Potential mitigation measure to minimize environmental impact.
[2] Description of the mitigation measure.
[3] Measure of impact to the goal of the project.

Option #3: Silver Street Connection

Impacts	Mitigation[1]	Description[2]	+/-[3]
Resident Relocation	Yes	This property has been previously acquired by the SDDOT. Relocation remains an issue however the current resident is aware of the goal of the SDDOT and is aware of relocation in the future.	+

[1] Potential mitigation measure to minimize environmental impact.
[2] Description of the mitigation measure.
[3] Measure of impact towards the goal of the project.

Option #4: West Boulevard Connection

Impacts	Mitigation[1]	Description[2]	+/-[3]
Resident Relocation	Yes	This property has been previously acquired by the SDDOT. Relocation remains an issue; however the current resident is aware of the goal of the SDDOT and is aware of relocation in the future.	+
Impact to a Section 4(f) Resource	Yes	During previous discussions with the park board, their opinion is that the proposed improvements would not negatively impact the current purpose of the park. The parks department would be further coordinated with to receive approve of the preferred option due to impacts to a Section 4(f) resource.	+

[1] Potential mitigation measure to minimize environmental impact.
[2] Description of the mitigation measure.
[3] Measure of impact towards the goal of the project.

RECOMMENDATION OF PREFERRED CONNECTIONS

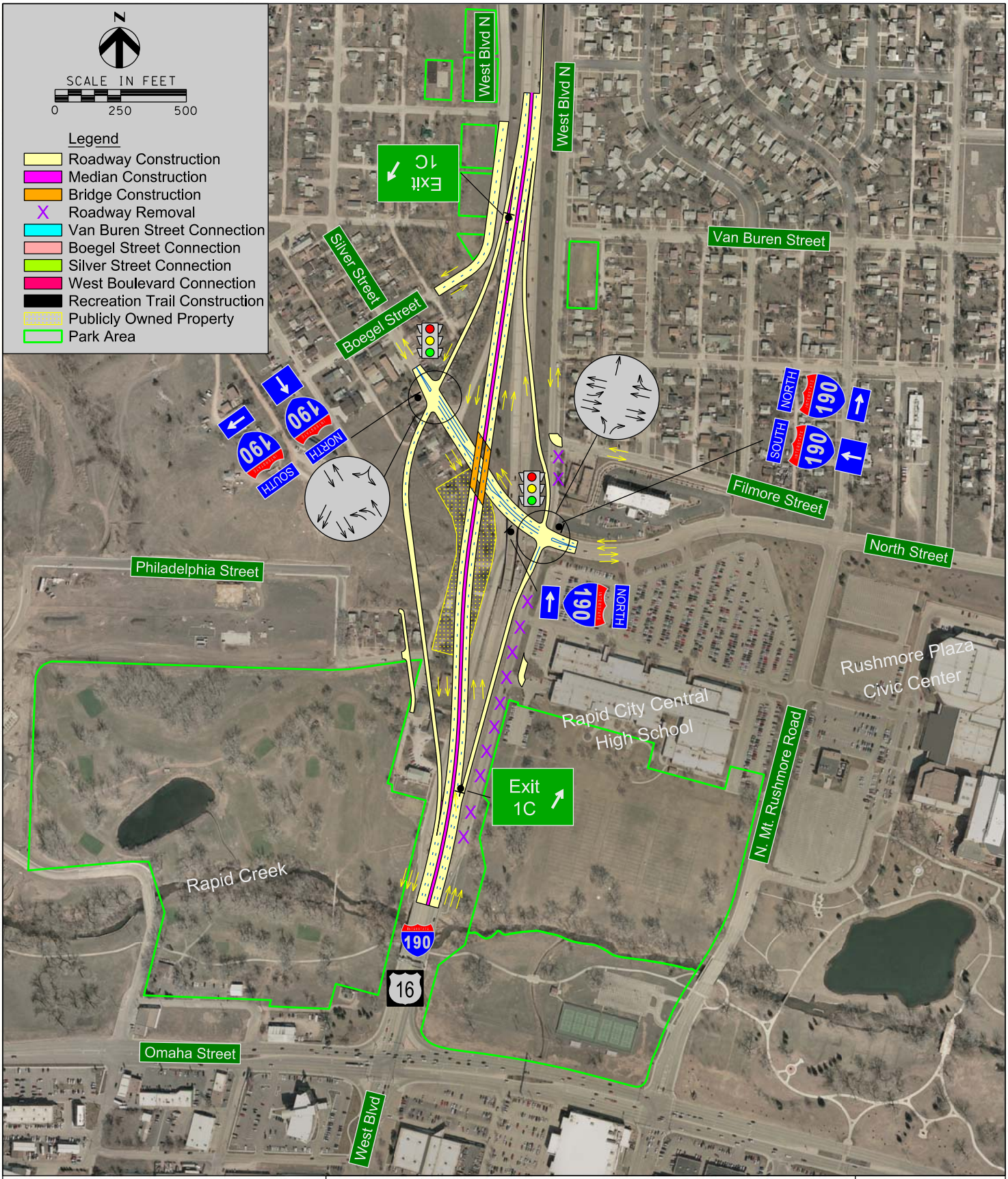
After careful consideration and review of the analysis described above and discussion from the Study Advisory Team, HDR offers the following recommendation for preferred neighborhood connection options for each of the respective I-190/Silver Street Interchange Alternatives:

Interchange Alternative 1 – No Neighborhood Connection needed.

Interchange Alternative 1a – Van Buren Street Connection. Based on the previous discussions, it is determined that the Van Buren Street connection would have the least environmental impacts and more importantly, least residential impacts.

Interchange Alternative 2a – West Boulevard Connection. This option best meets the traffic needs of the neighborhood by creating a direct link from West Boulevard North to Philadelphia Street. Although this option does impact three (3) homes, other impacts are minimized since the connection option would be constructed in an area previously developed.

Interchange Alternative 3a - Van Buren Street Connection. Based on the previous discussions, it is determined that the Van Buren Street connection would have the least environmental impacts and more importantly, least residential impacts.



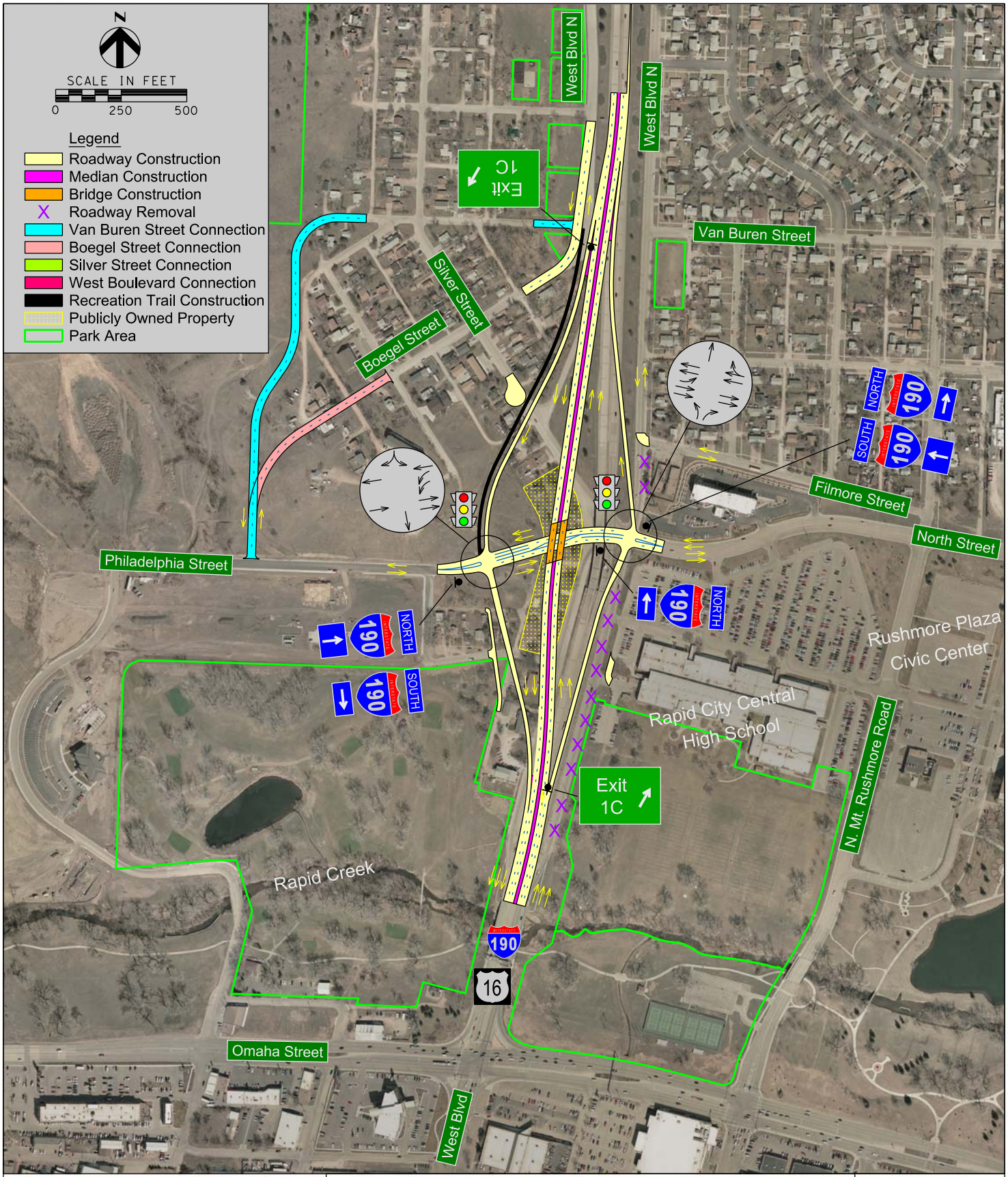
Interchange Alternative 1

Philadelphia Street Connection Options

Figure 1

Interstate 190/Silver Street Interchange Study
Rapid City, South Dakota

August 2011



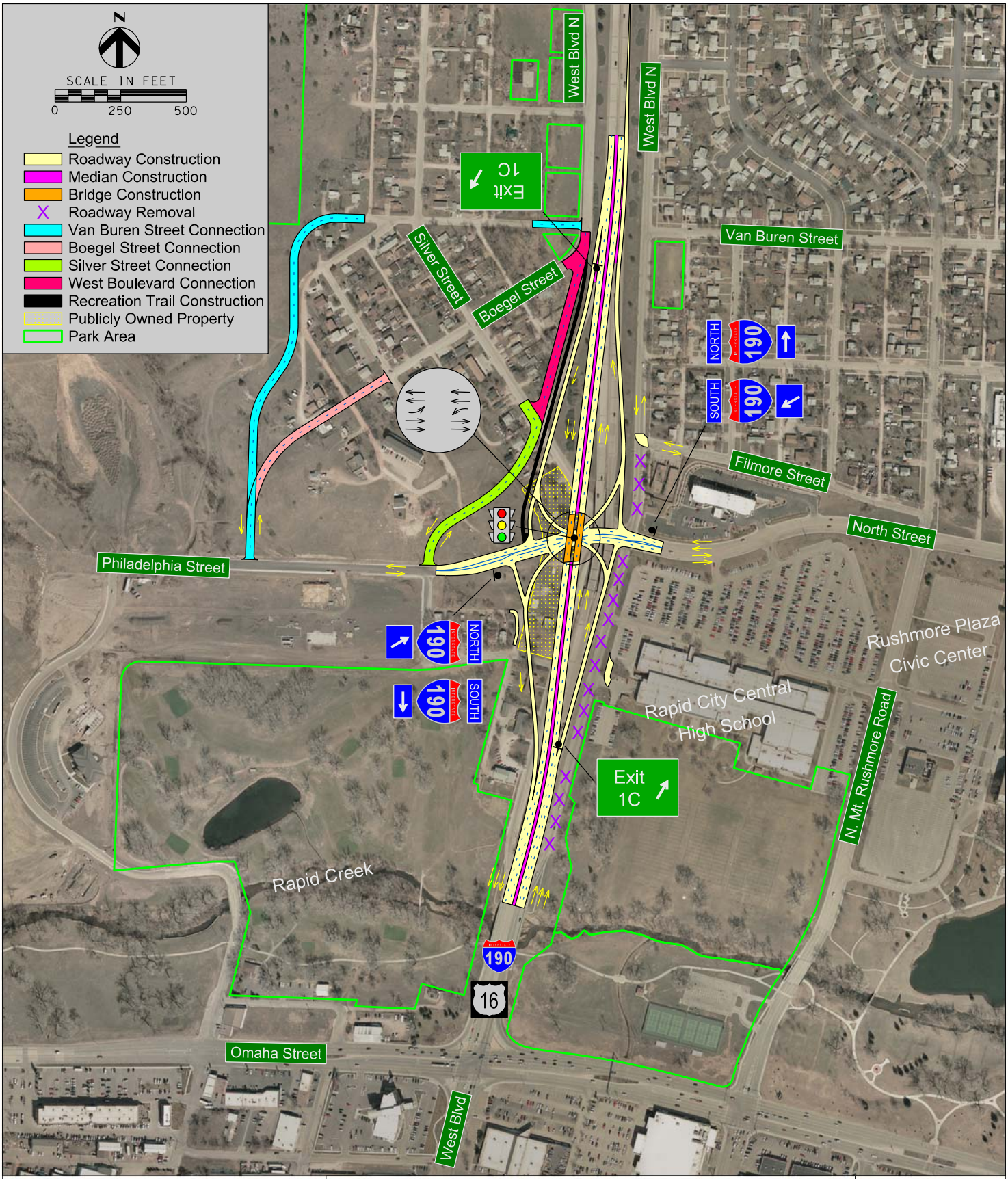
Interchange Alternative 1a

Philadelphia Street Connection Options

Figure 2

Interstate 190/Silver Street Interchange Study
Rapid City, South Dakota

August 2011



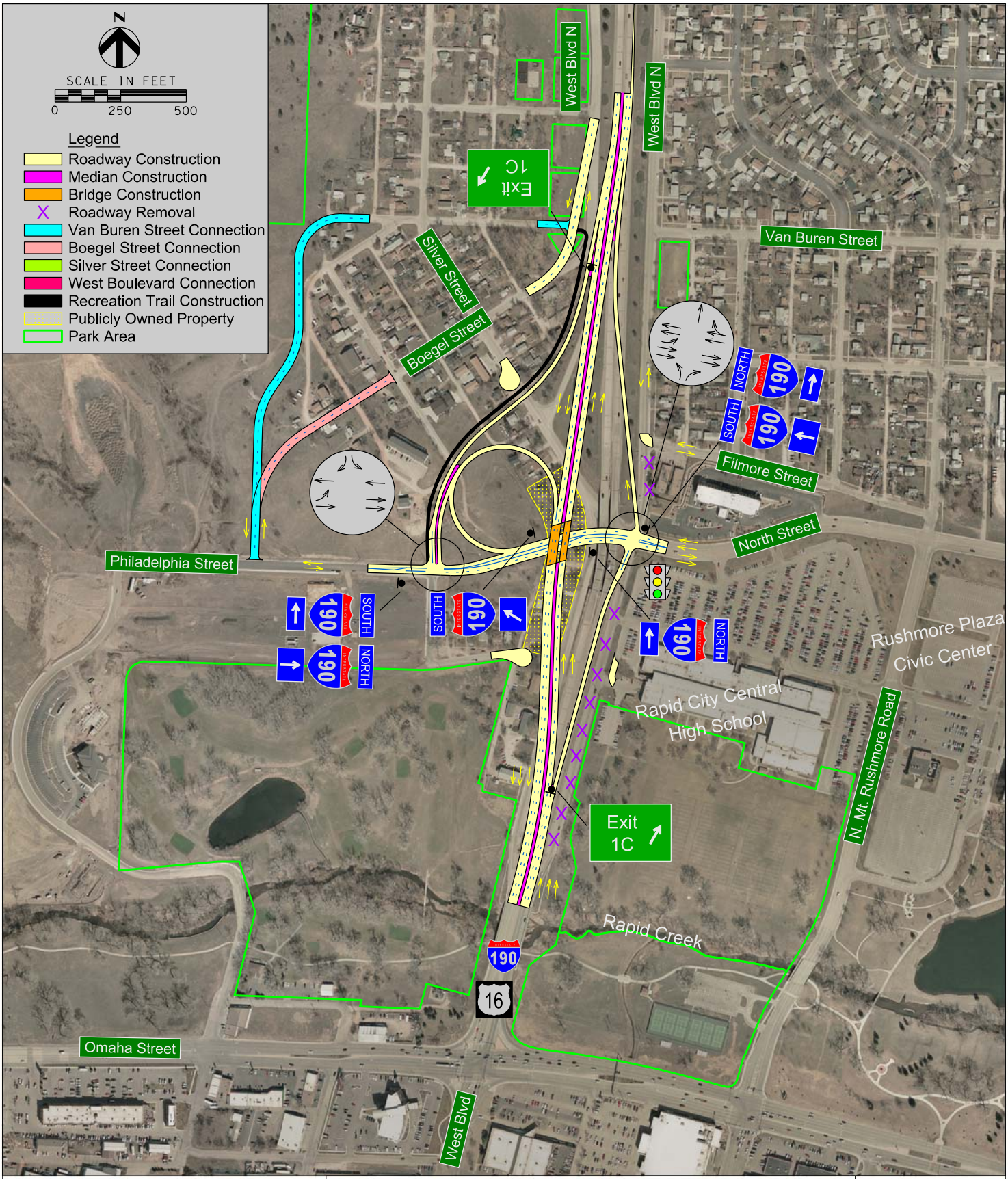
Interchange Alternative 2a

Philadelphia Street Connection Options

Figure 3

Interstate 190/Silver Street Interchange Study
Rapid City, South Dakota

August 2011



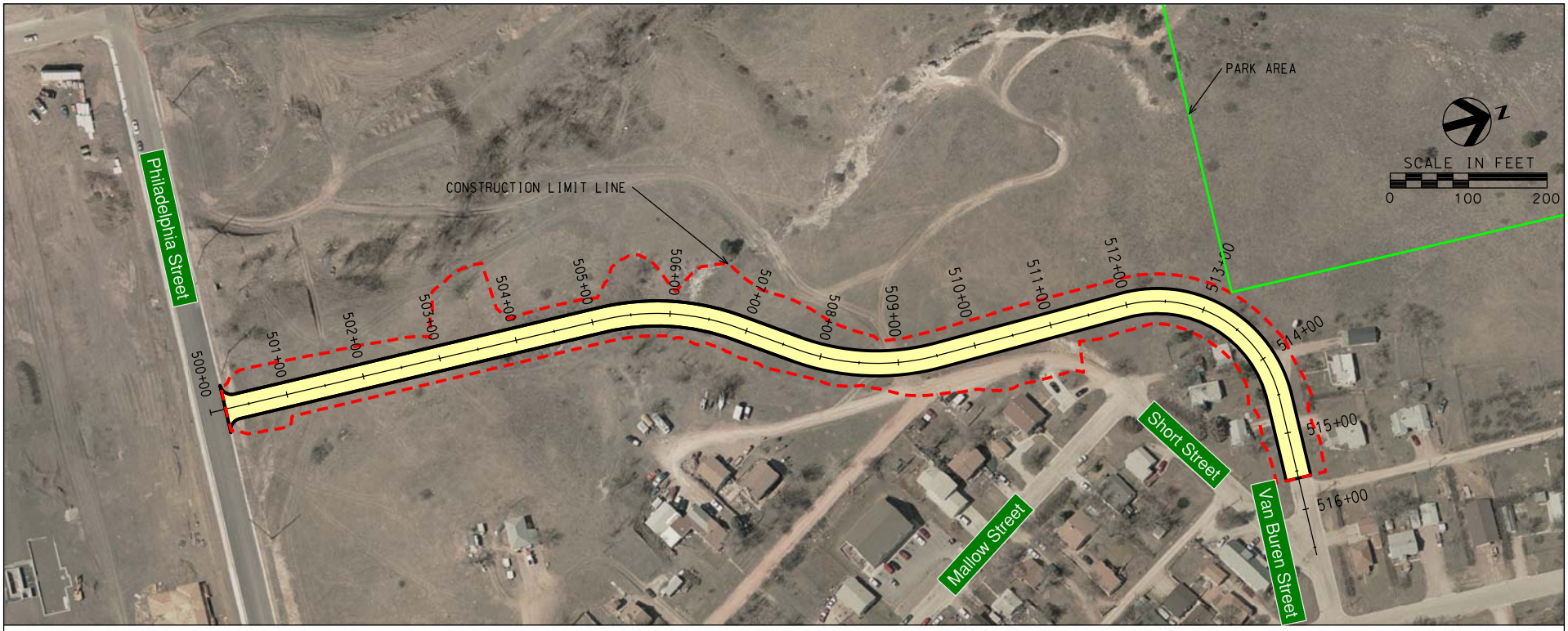
Interchange Alternative 3a

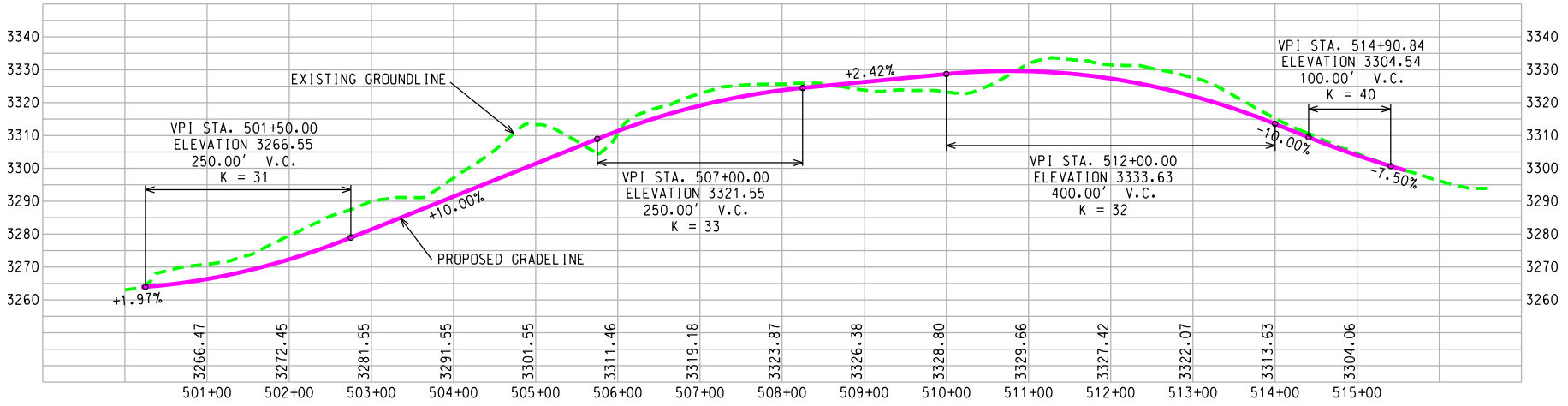
Philadelphia Street Connection Options

Figure 4

Interstate 190/Silver Street Interchange Study
Rapid City, South Dakota

August 2011





Van Buren Street Connection Option

Philadelphia Street Connection Options

Interstate 190/Silver Street Interchange Study
Rapid City, South Dakota

Figure 5

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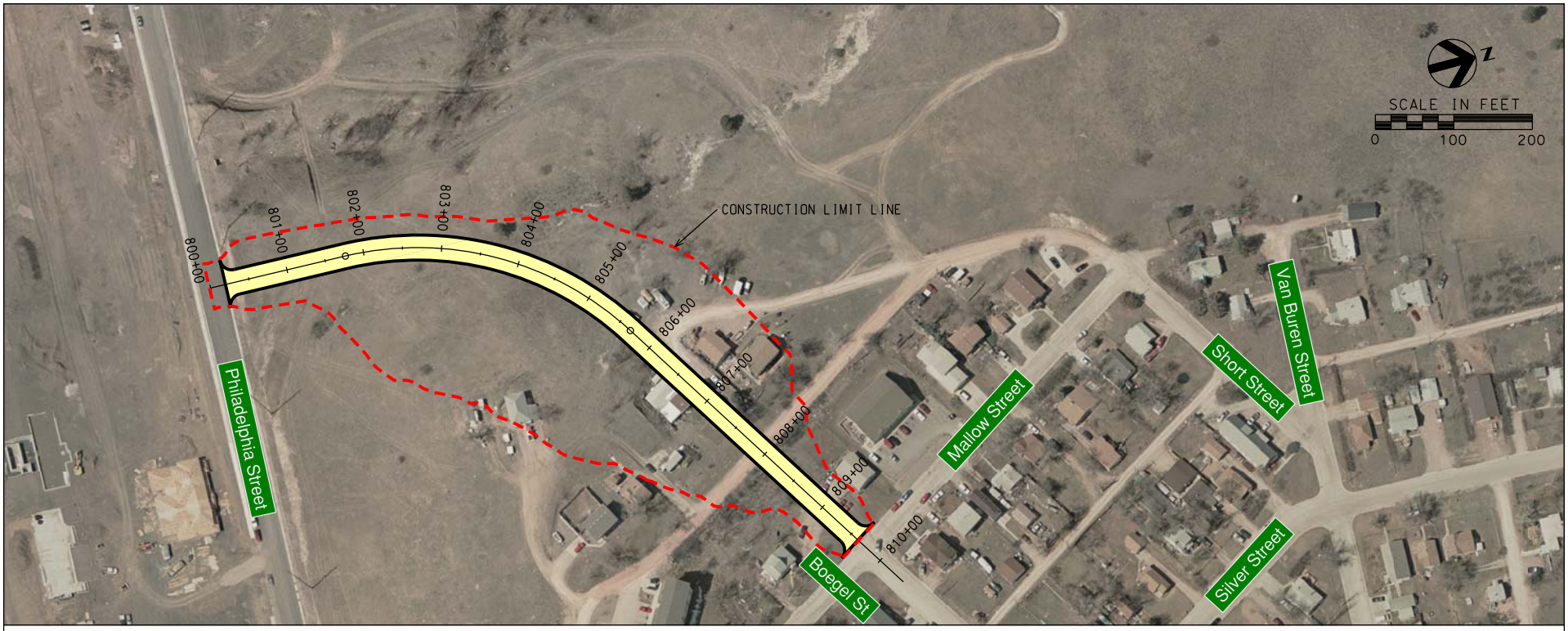

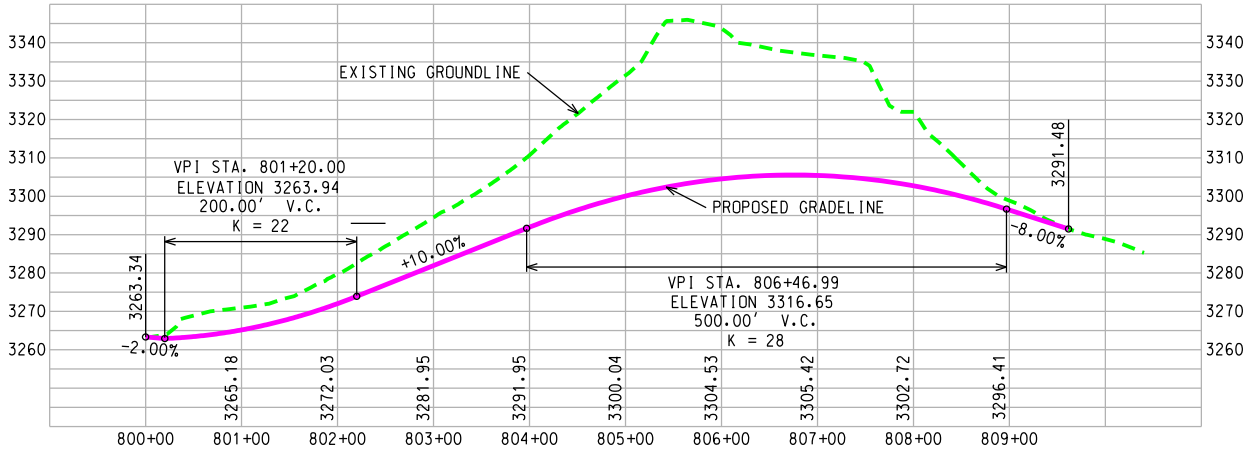

Boegel Street Connection Option

Philadelphia Street Connection Options

Interstate 190/Silver Street Interchange Study
Rapid City, South Dakota

Figure 6

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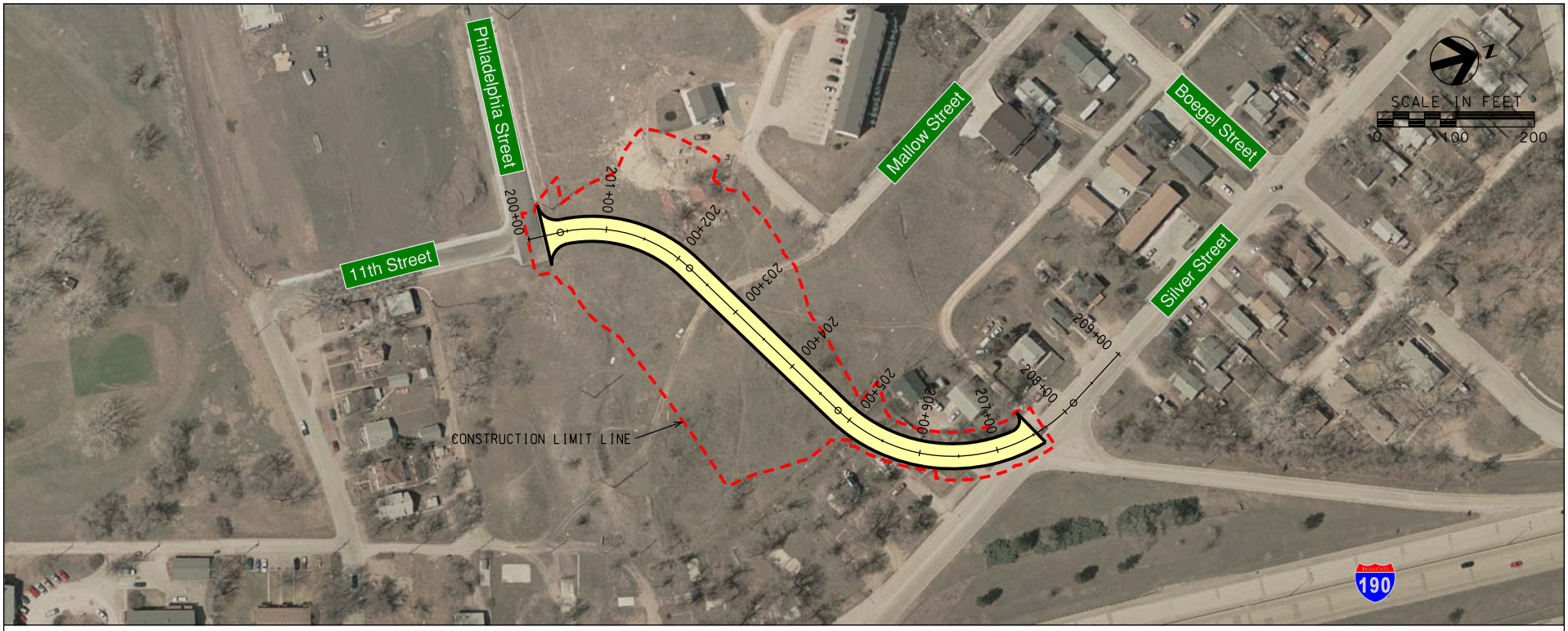

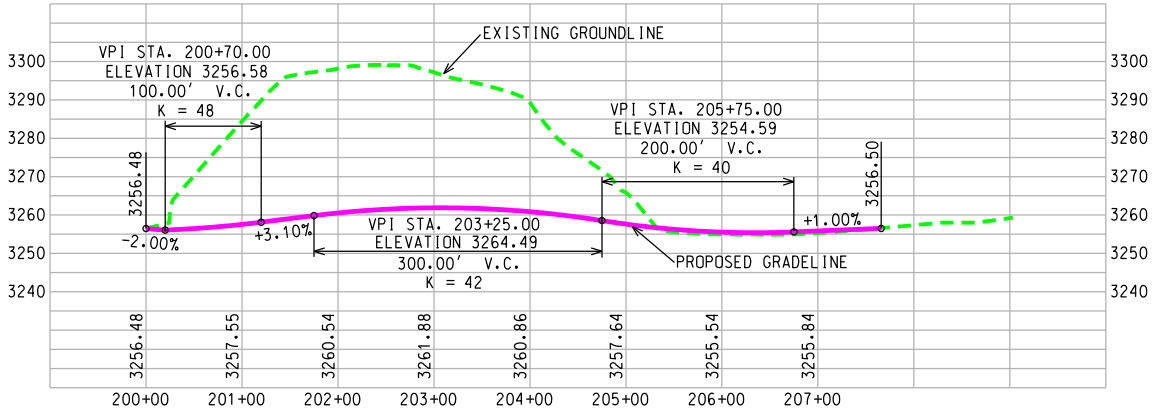

Silver Street Connection Option

Philadelphia Street Connection Options

Interstate 190/Silver Street Interchange Study
Rapid City, South Dakota

Figure 7

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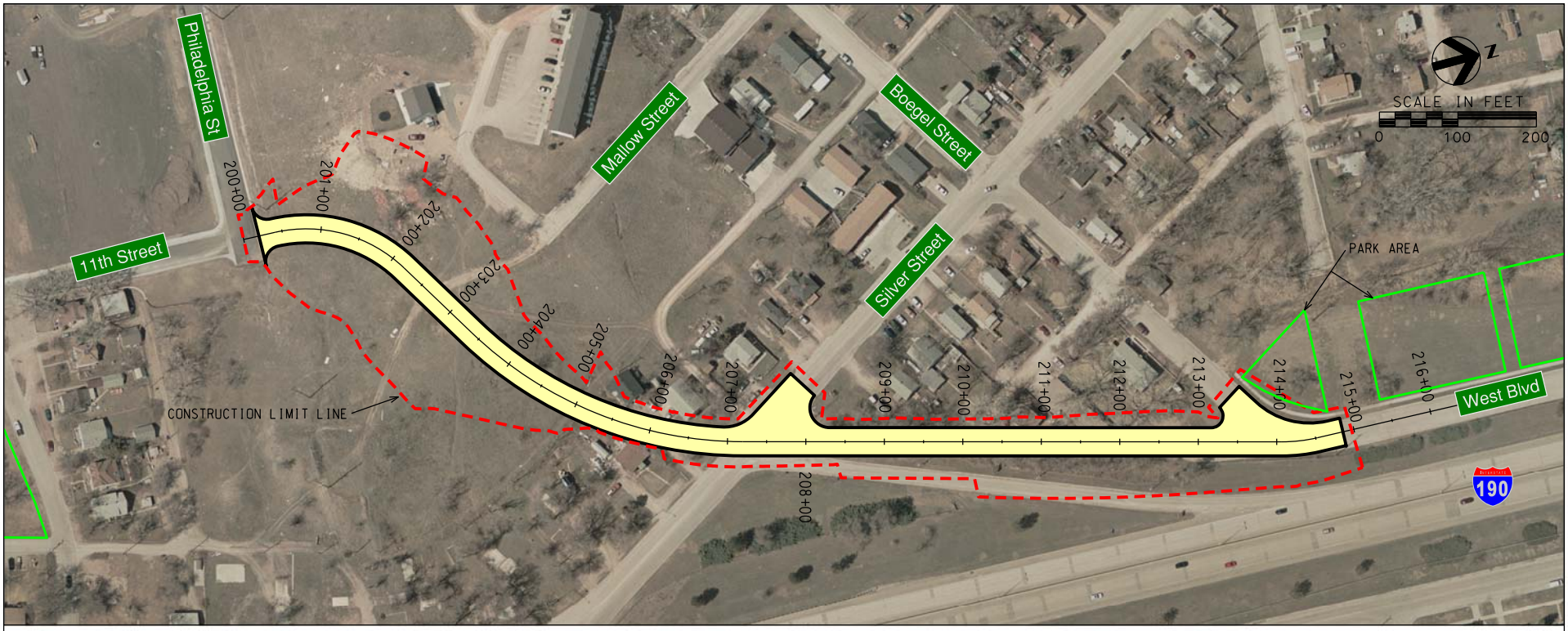

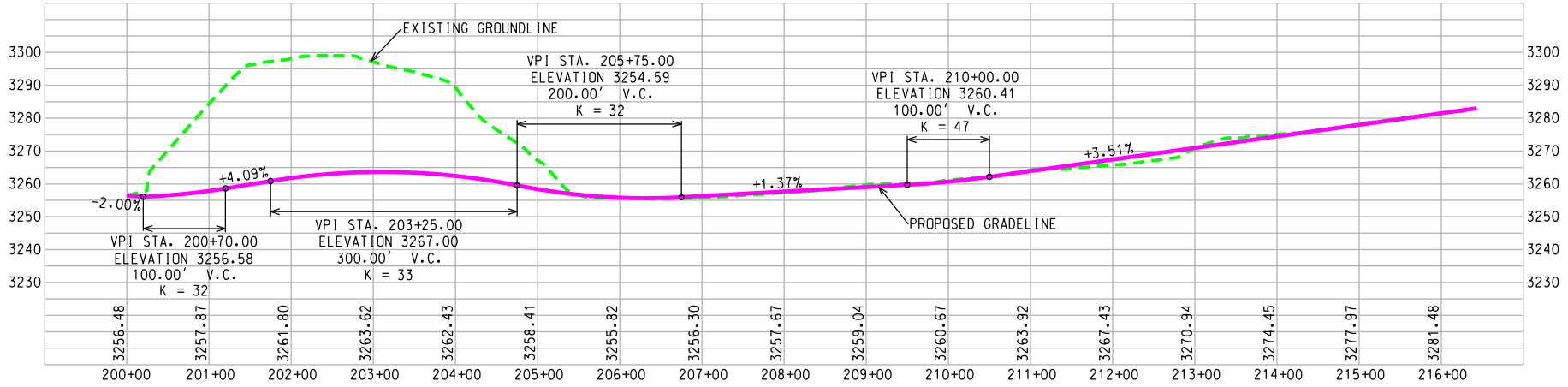

West Blvd. Connection Option

Philadelphia Street Connection Options

Interstate 190/Silver Street Interchange Study
Rapid City, South Dakota

Figure 8

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