04TP007

CITY OF RAPID CITY

RAPID CITY, SOUTH DAKOTA 57701-2724

GROWTH MANAGEMENT DEPARTMENT

300 Sixth Street

Patsy Horton, Community Planning Coordinator
Community Planning Division
City web: www.rcgov.org

Phone: 605-394-4120
Fax: 605-394-6636
e-mail: patsy.horton@rcgov.org

MEMORANDUM

TO: Planning Commission

FROM: Patsy Horton, Community Planning Coordinator

DATE: July 1, 2004

RE: US Highway 16 Corridor Study – Executive Summary and Final Report

Attached for your review and approval is a copy of the US Highway 16 Corridor Study Executive Summary. Three public meetings were held during the development of the study and extensive public comment was received. After your review and acceptance of the Executive Summary and Final Report, the final document will be submitted to the South Dakota Department of Transportation and the Federal Highway Administration.

There have been no additional comments received during the review of the Final Draft Report. Because of the cost involved with printing the final reports, we have provided you with copies of the Executive Summary only. However, if you wish to review another copy of the full report or if you have any questions, please feel contact me.

MPO Committee Recommendation: The Executive Policy Committee recommends approval of the Final Report for the US Highway 16 Corridor Study.

US 16 Corridor Study

Rapid City, South Dakota

Executive Summary

MARCH 2004

EXECUTIVE SUMMARY

Project Overview

US Highway 16 (US 16) is the primary corridor connecting Rapid City to the Black Hills region. It serves a growing population of commercial and residential traffic, as well as seasonal tourist traffic. The limits of the study corridor are Cathedral Drive, on the north and the Reptile Gardens/Neck Yoke Road intersection on the south. In total, this covers approximately 5-½ miles of the US 16 highway corridor. Due to steady growth in and around Rapid City, and development along the US 16 study corridor, the City of Rapid City in conjunction with the South Dakota Department of Transportation (SDDOT), initiated an operational analysis and long-term access-management plan to ensure that this corridor will provide acceptable traffic operations well in the future.

Rapid City and SDDOT both recognize that change is needed along the US 16 study corridor to plan for future growth and the challenges it will bring to the transportation system. This study, conducted under the direction of these two organizations, addresses future transportation needs by developing a long-term plan for the US 16 study corridor that will promote both safety and efficiency. The current spacing and location of driveways and roadway intersections is less than acceptable for a high-speed facility under typical standards. This highway would benefit from implementation of access management standards that will not only promote safety and efficiency along the corridor, but that will also encourage and enhance the growth surrounding this vital arterial.

A major component of this project was to find a balance between the differing perspectives of both the Rapid City community and the SDDOT. Each organization has a vision for the development and functionality of this corridor into the future. The SDDOT desires to preserve the expressway concept throughout the corridor, while the City sees the corridor developing as an urban arterial. This study seeks to accommodate both perspectives by crafting solutions that would serve the community's development as well as existing and future transportation needs of the City and State. This study includes recommendations that will enhance safety and traffic operations within the corridor.

Purpose and Need

The primary function of state highway corridors is to convey traffic safely and efficiently. This can be achieved by limiting the number of conflict points that a driver on the major corridor would encounter. The secondary function is to provide access to the adjacent land uses via the local roadway network. This can be achieved through controlled spacing of intersecting roadways that connect to the local street network. Since development along US 16 generally occurred prior to the implementation of any access management strategies, the purpose of this US 16 Corridor Study is to help the City and the State improve the safety and efficiency of this corridor for the traveling public, through the implementation of good access management. Proactive management of the corridor today will protect and preserve the corridor while supporting managed development far into the future.

Alternatives Considered

Information regarding the existing conditions and future plans of the corridor was collected from both the City and the State. Once compiled, this information created a snapshot of the current traffic situation and provided insight into the development of forecasts for the future.

Fourteen of the major intersections (or access locations) along the study corridor were individually analyzed using the procedures set forth in the Highway Capacity Manual (HCM). Traffic volumes along the US 16 study corridor fluctuate during the summer months with the onset of tourist traffic, therefore seasonal versus non-seasonal conditions were taken into consideration with each analyzed intersection and each studied alternative. Current traffic counts provided a basis for investigating existing conditions along the corridor. Future peak-hour traffic volumes were developed through the use of a large-scale "manual assignment" process that involved travel-demand forecasting based on the projected future land uses provided by the City. Operational analyses were conducted first for existing conditions, to determine the current intersection performance (measured in terms of level-of-service), and then for future conditions to determine what the necessary improvements may be required. Following the operational analyses, a number of alternatives for the future year 2025 were developed for the corridor.

No-Build Alternative

A No-Build analysis was conducted to determine locations of necessary spot roadway improvements and to identify various mitigation measures for the US 16 corridor. As expected, the No-Build analysis results indicated that, at the very least, there would be a need for improvements at most of the studied intersections. Without improvements, 10 of the 14 studied intersections would fail during non-seasonal conditions and 12 of the 14 intersections would fail under seasonal conditions.

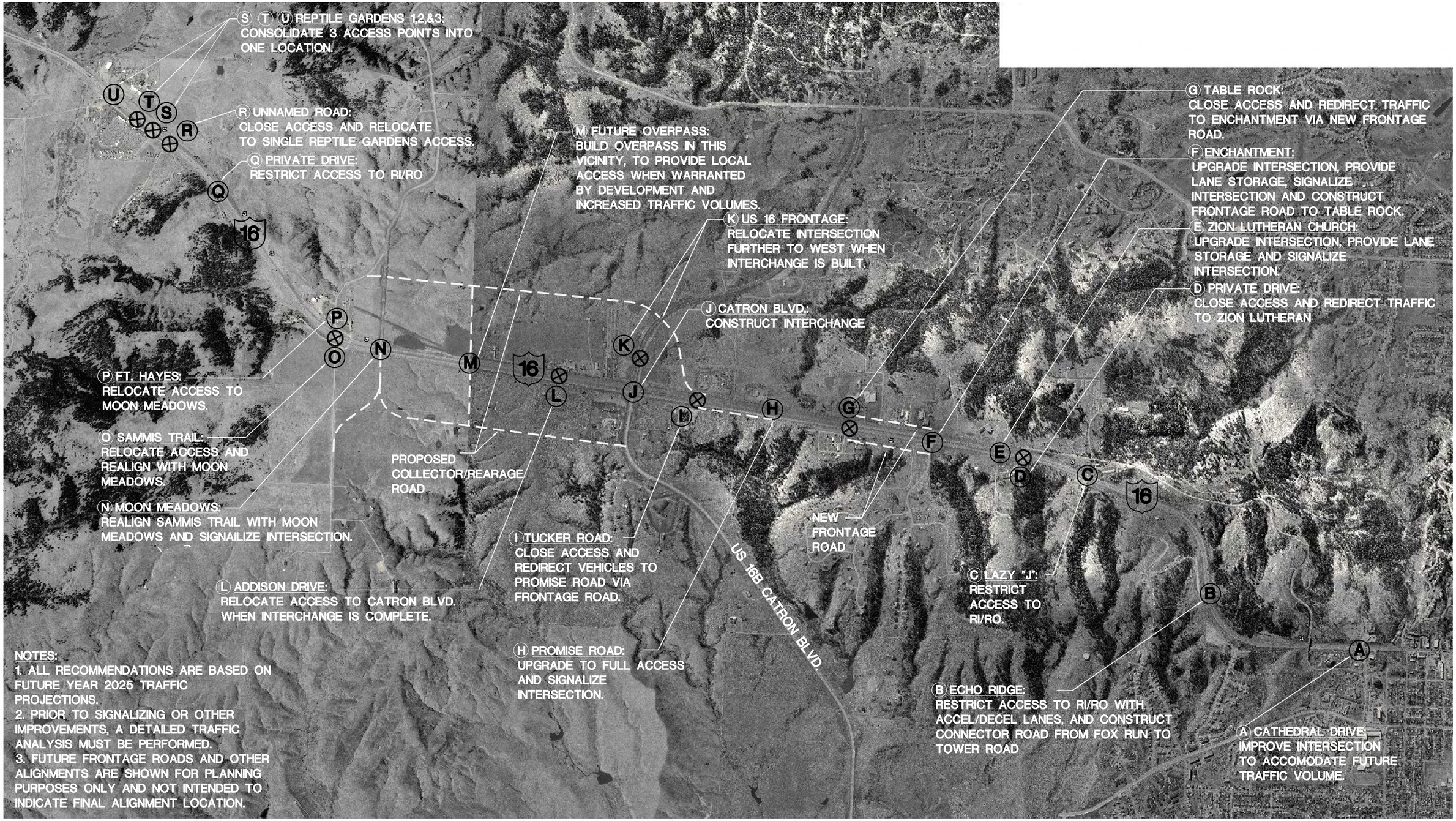
Signalized Alternative

This alternative, as the name suggests, considers what would happen if each of the studied intersections along the corridor were signalized. The primary intent behind this was to determine what the effects would be if all current access locations, with the exception of Ft. Hayes, remained open in the future. The analysis of this alternative assumed recommended geometric and intersection control mitigation, to account for both the increased traffic volumes and to allow full movement at each intersection or access location. The improvements were generally based on access and spot improvements at the intersections within the corridor that could maintain an intersection rating of LOS C or above.

Base-Case Alternative

The *Base-Case Alternative* considers the future of US 16 as a limited access facility, which would maintain efficient traffic flow through the corridor by regulating access. This alternative consists of closing a number of the studied intersections along the corridor. These intersections were selected based on factors such as safety, traffic operations, limited sight distance, future plans of the SDDOT, proximity to a future interchange, and ease of consolidation with neighboring intersections and access driveways. In addition, the Base-Case alternative recommends closure or geometric modification of several other access points such as private drives that were not included in the traffic analysis. The resulting mitigation that was selected is illustrated in Figure ES-1.

Alternatives to the *Base-Case*, specific to the *Echo Ridge*, *Enchantment Road, Table Rock Road* and *Addison Drive* intersections were also considered.



NOTES:
1. ALL RECOMMENDATIONS ARE BASED ON FUTURE YEAR 2025 TRAFFIC PROJECTIONS.
2. PRIOR TO SIGNALIZING OR OTHER IMPROVEMENTS, A DETAILED TRAFFIC ANALYSIS MUST BE PERFORMED.
3. FUTURE FRONTAGE ROADS AND OTHER ALIGNMENTS ARE SHOWN FOR PLANNING PURPOSES ONLY AND NOT INTENDED TO INDICATE FINAL ALIGNMENT LOCATION.

ALLIANCE ARCHITECTS and ENGINEERS

HDR

NORTH
NOT TO SCALE

US HIGHWAY 16
CORRIDOR STUDY
RECOMMENDED YEAR 2025 ACCESS MODIFICATIONS

Date
Mar. 2004

Figure
ES–1

Recommendations of the Base-Case Alternative

The recommended improvements for the future US 16 study corridor (as shown in Figure ES-1) are generally applicable to the projected Year 2025 traffic volumes. Prior to design and implementation, these recommended improvements will require a more detailed evaluation at such time that the land use surrounding the study corridor develops and the traffic volumes increase. The following subsections identify the key intersections along the study corridor and highlight the suggested improvements. It should be noted that the recommended improvements are provided for planning purposes only and should not be implemented until further studies are conducted.

Cathedral Drive

- To accommodate the future traffic volumes, this intersection will need geometric upgrades and the signal should be coordinated with the other signals along the US 16 study corridor.

Echo Ridge

The location of this intersection presents a challenge for both safety and adequate sight distance. To address these issues, and yet maintain highway access for the residents here, the following combination is recommended:

- Restrict direct access to US 16 by reconfiguring this intersection to accommodate right-in/right-out movements only, including the appropriate acceleration/deceleration (accel/decel) lanes on US 16.
- Provide secondary access to US 16 by connecting Fox Run and Tower Road, on the east side of the corridor.

Due to the necessity of adequate sight distance at this location and the current volume of traffic, this mitigation is necessary for existing conditions.

Zion Lutheran Intersection

- To accommodate the schools located at this intersection as well as other future traffic volumes, this intersection will need geometric upgrades on all but the southbound approaches. Upgrades shall include adequate lane storage for the minor approaches.
- Additionally, a signal should be installed that would be actuated and coordinated with the rest of the US 16 study corridor.

Enchantment Road

- To accommodate the expected density of the general commercial and residential land uses, this intersection will need geometric upgrades on all approaches. Upgrades shall include adequate lane storage for the minor approaches.
- When warranted by traffic volumes, this intersection should be signalized, actuated and coordinated with the rest of the US 16 study corridor.

- Additionally, a frontage road built on the east side of the US 16 corridor between this intersection and Table Rock Road would allow for closure of the Table Rock Road intersection.

Table Rock Road

- Due to its proximity to the other intersections, it is recommended that this intersection be closed by the Year 2025, and a frontage road be built between Table Rock Road and Enchantment Road.

Promise Road

- The location of the fire station at this intersection necessitates full access and, when warranted by traffic volumes, operation of a fully actuated signal to replace the emergency signal that is currently in place.
- The US 16 corridor should be adequately signed to make drivers aware that they are either approaching or in the vicinity of a fire station.
- To accommodate future vehicle volumes, including diverted traffic from Tucker Road, upgrades to intersection geometrics will be necessary for the north-, south- and westbound approaches.
- A connection in the form of a frontage road built between Promise Road and Tucker Road (to the south).

Tucker Road

- To accommodate the footprint for the future Catron Boulevard interchange, the Tucker Road intersection will have to be closed.
- Prior to closure of this intersection, a new frontage road connecting Tucker Road to Promise Road will need to be built on the east side of the US 16 corridor.

Catron Boulevard

Within the US 16 study corridor, the Catron Boulevard intersection serves the highest volume of traffic. If, in the future, this intersection is widened to accommodate the geometrics necessary to service the forecasted Year 2025 traffic volumes, then it can be expected that this intersection will operate at a LOS D or above. However, the SDDOT plans that by the Year 2025, and perhaps even within the next 10 years, an interchange will be built at this intersection. In this case, additional right-of-way could potentially be required to accommodate the footprint of this interchange. Therefore, this requires relocation of the US 16 Frontage Road intersection at Catron Boulevard, as well as any other existing intersection that may fall inside the necessary right-of-way. In addition, other intersections spaced closely to the interchange may need to be closed or relocated. However, an interchange at this location will significantly improve the LOS along Catron Boulevard and along the US 16 study corridor, which would allow the existing two-lane cross-section to remain.

Addison Drive

- To satisfy spacing requirements and to accommodate the potential footprint and right-of-way necessary for the future Catron Boulevard interchange, the Addison Drive intersection will have to be closed and a new access provided.

- Prior to closure of this intersection, new (rearage) roads, as depicted on City's Major Street Plan, need to be built on both the east and west sides of US 16 to provide alternate access for properties that may be affected by this closure.
- In addition to this, it is recommended that consideration be given to building a link between the east and west sides of the corridor through the construction of an overpass. The overpass would have no direct connection to US 16, but would serve as local connection between rearage roads shown on the Major Street Plan. Construction of an overpass would be contingent on the rate at which development occurs, as well as the type of development that occurs. Assuming the future developments complement each other, this may drive the need for a connection between the two sides of the corridor.

Moon Meadows

- In accordance with the City's Major Street Plan, it is recommended that Sammis Trail be realigned opposite of Moon Meadows.
- Substantial intersection upgrades will be necessary when this intersection changes from 3 to 4 legs, including signalization (with split phasing), when warranted by traffic volumes.

Ft. Hayes

- Based on the recommendation that Sammis Trail be realigned with Moon Meadows and the close proximity of Ft. Hayes to the Moon Meadows intersection, it is recommended that direct access to US 16 from Ft. Hayes be eliminated.
- The Ft. Hayes roadway should be connected to Moon Meadows, and its corresponding traffic redirected to this collector road.

Reptile Gardens and Neck Yoke Road Intersections

The existing development in this southern section of the US 16 study corridor attracts two very opposite driver types: (1) local residents who are familiar with the roads and the area, and (2) tourists who are relatively unfamiliar with the roads and the area. Therefore, this section is among the top five accident areas within the study corridor. To minimize the accidents and maximize efficiency of the corridor, it is recommended that by the Year 2025:

- All of the intersections and/or driveway accesses in the vicinity should be consolidated into one access point. This intersection should be improved to accommodate the increased traffic volumes and it should be signalized and coordinated with the rest of the study corridor. When the accesses are consolidated, a detailed study and design should be conducted to determine the best location for the single access and intersection.
- On the east side of the corridor, the existing frontage road should be maintained and improved as necessary so that it can provide adequate connectivity for all of the properties on that side of the corridor as well as Neck Yoke Road.
- On the west side of the corridor, access to the Reptile Gardens and other properties should be via the consolidated intersection only; all other access points should be closed.

In the event that traffic volumes warrant implementation of an interchange, a detailed traffic analysis should be conducted to determine the most appropriate location for this interchange.

Alternatives to the Base-Case

Based on discussions with the City, the State and the Rapid City Future Land Use Committee, a number of alternatives to the Base-Case, involving several of the studied intersections, were also considered. These alternatives are included on Figure ES-2, and described briefly below.

At the **Echo Ridge** intersection, the alternative mitigating possibilities explored ways to provide full-access, while improving safety and efficiency in this section of the study corridor. In comparison to the rest of the study corridor, this area with back-to-back curves has experienced one of the greatest numbers of accidents over the last several years. Therefore, this intersection has been identified as being one that requires special attention. The three variations considered are:

- Restrict direct access on US 16 to right-in/right-out (RI/RO) only and implement accel/decel lanes
- Restrict direct access on US 16 to right-in/right-out (RI/RO) only, implement accel/decel lanes, and build a new road connecting Fox Run to Tower Road
- Restrict direct access on US 16 to right-in/right-out (RI/RO) only, increase the accel/decel lanes, and construct an underpass with ramps

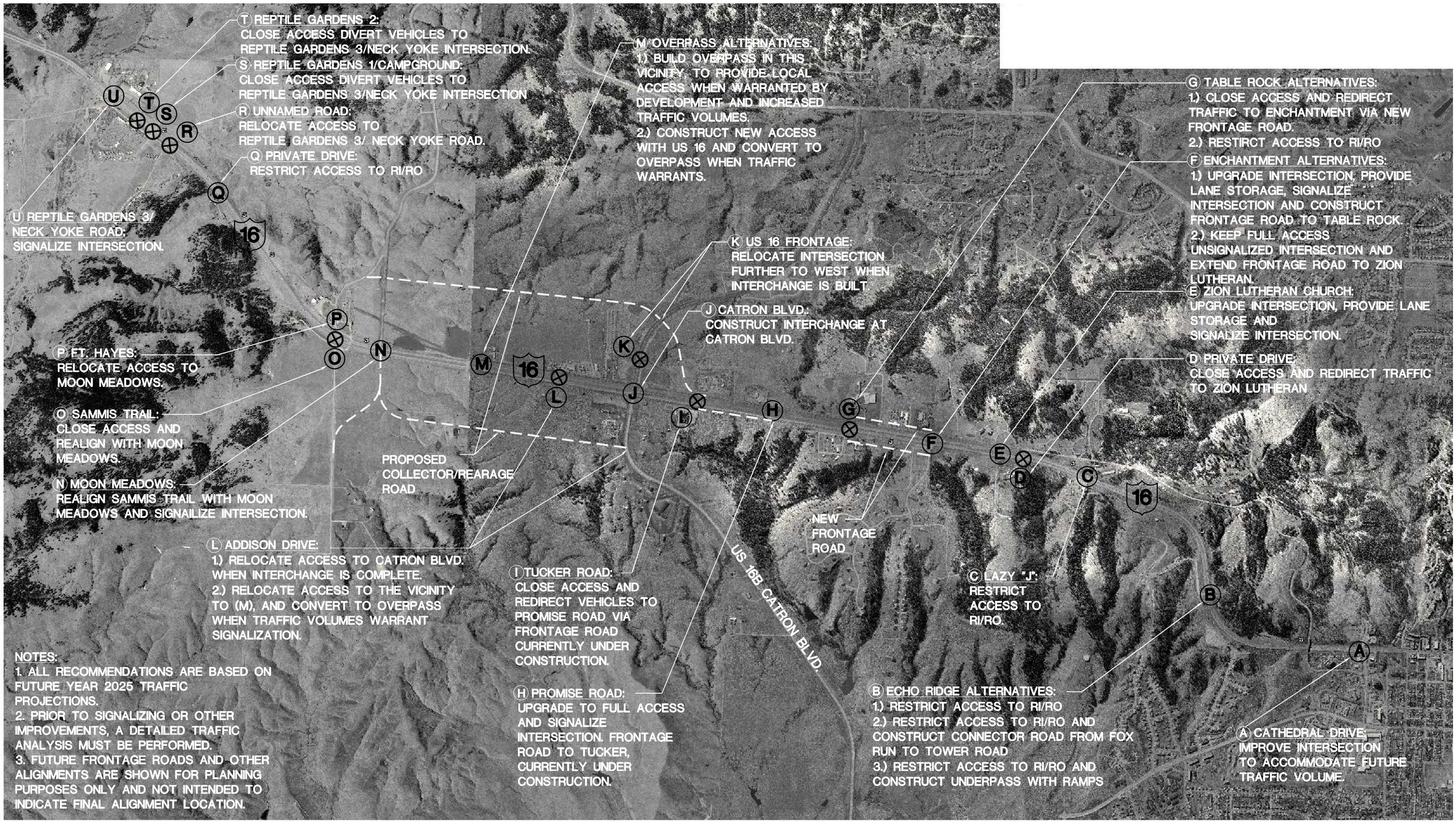
While each alternative maintains that direct access to US 16 be restricted, the second two explore ways to alleviate the problem of not being able to make a left-turn into or out of the Echo Ridge intersection.

Rather than eliminate direct access onto US 16 at **Table Rock Road**, another alternative explored the possibility of building accel/decel lanes on US 16 and providing right-in/right-out (RI/RO) only access at this intersection. This option however, would increase the number of conflict points along US 16.

When an interchange at Catron Boulevard is built, **Addison Drive** at US 16 would necessarily be eliminated due to its proximity to Catron Boulevard. As an alternative to this, it has been suggested that a new connection to US 16 be built that would provide direct access for the properties currently served by Addison Drive. A location approximately halfway between Catron Boulevard and Moon Meadows has been considered. The new intersection would be unsignalized however, and at such time that volumes along US 16 warrant signalization of the intersection, this connection should be converted to an overpass to maintain interaction between the two sides of the corridor.

Final Remarks

Based on discussions with both the City and the State, it was determined that the future US 16 corridor must be dual functioning to accommodate both corridor mobility and the rapid growth surrounding the corridor. Therefore, due to the amount of existing and expected growth along US 16 north of Catron Boulevard, it is recommended that this north section of the corridor operate like an urban arterial and be classified as Urban Developed. And south of Catron Boulevard, the US 16 study corridor should have higher speeds, and fewer access locations and be classified as Free Flow Urban. This combination of functionality allows for urban development as projected and preserves the expressway concept south of Catron Boulevard. This concept for US 16 study corridor will compliment the Southeast Connector as well as the overall system of major corridors through out Rapid City.



NOTES:
1. ALL RECOMMENDATIONS ARE BASED ON FUTURE YEAR 2025 TRAFFIC PROJECTIONS.
2. PRIOR TO SIGNALIZING OR OTHER IMPROVEMENTS, A DETAILED TRAFFIC ANALYSIS MUST BE PERFORMED.
3. FUTURE FRONTAGE ROADS AND OTHER ALIGNMENTS ARE SHOWN FOR PLANNING PURPOSES ONLY AND NOT INTENDED TO INDICATE FINAL ALIGNMENT LOCATION.

ALLIANCE ARCHITECTS and ENGINEERS

HDR

NORTH
NOT TO SCALE

US HIGHWAY 16
CORRIDOR STUDY
YEAR 2025 ACCESS MODIFICATION ALTERNATIVES

Date
Mar. 2004

Figure
ES–2