ISLAMIC REPUBLIC OF AFGHANISTAN
AND
UNITED STATES AGENCY FOR INTERNATIONAL DEVELOPMENT

AFGHANISTAN INFRASTRUCTURE AND REHABILITATION PROGRAM
(AIRP)

VALUE ENGINEERING ANALYSIS
FINAL REPORT

SECTION 1 -SEGMENT 1 AND 2
DESIGN OF BAMYAN TO DUSHI ROAD, NH-07
STATION 0+00 TO 85+800
(FOR TASK ORDER 24)

***Prepared for*:**
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JUNE 2010

Project Number: 60157886

EXECUTIVE SUMMARY

The Ministry of Public Work (MPW) has categorized the Bamyan-Dushi Road in Afghanistan as a National Highway, requiring an asphalt paved road. This report documents the value engineering (VE) analysis by AECOM of the design documents from Louis Berger Group Inc. / Black & Veatch Joint Venture (LB- BV) for Section 1 (86km) of the proposed Bamyan-Dushi Road (164km total). AECOM conducted the VE assessment for the U.S. Agency for International Development (USAID).

The project starts at the intersection of the Kabul to Dushi part of the Ring Road in Baghlan province and ends at the intersection with the road to Maidan Shar in Bamyan. Dushi is a district in Baghlan province and Bamyan is the capital of Bamyan Province. The proposed road will mainly follow the alignment of the existing road. A variety of different topographies (flat, rolling, semi mountainous, and mountainous) can be found along the road.

For the VE analysis, all of the documents were reviewed and regular meetings were held to establish the format for the report and findings, and to share and exchange ideas. Each team developed recommendations, focusing on items associated with cost savings, design compliance and treatment, constructability, and risk management & mitigation. All recommendations were compiled and a monetary value for cost or savings was applied to the ideas where possible.

Most of the recommendations generated were suggested to improve the operation of the road, streamline construction and manufacturing, and create conformance with design standards. The recommendations that AECOM was able to place a dollar value to resulted in a savings of $2.5 million. All recommendations were grouped into categories and can be seen in the table below.

VE Recommendations Summary Table

Ideas Identi-fied	Discipline	Category*				Savings
		Value Engineering - Quantifiable	Value Engineering - Not Quantifiable	Design Criteria	Drawing Review Comments	
8	Geotechnical (G)	2	4	4	1	$2,108,066
17	Civil/Highway (C)	3	7	10	1	$108,312
10	Hydraulics (H)	7	0	2	2	$329,984
11	Bridge (B)	6	3	1	2	$394,666
12	Risk/Construction (R)	0	12	0	0	$0
58	Total	18	26	17	6	
					Maximum Total Potential (+)	$2,941,028
					-Adjustment for Overlap and Estimating Contingency (15%)	$441,154

*Some ideas qualify for more than one category

Total Savings $2,499,874

The following report details the project site, and gives a description of Value Engineering, as well as how it is applied to this project. There are also multiple appendices organized by disciplines that have examined each of the VE recommendations, listing the reason for each recommendation and the positive and negative aspects of each. A detailed risk analysis has also been performed outlining major impacts and the output for the 80% confidence level.

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I. PROJECT INFORMATION

1.0 Introduction

The purpose of this report is to document the value engineering (VE) analysis of the design documents for Section 1 of the Bamyan-Dushi road, NH-07. Section 1 consists of approximately 86 kilometers of the proposed 164-kilometer highway connecting the cities of Bamyan and Dushi, in Afghanistan. AECOM conducted the VE assessment for the U.S. Agency for International Development (USAID).

The Ministry of Public Work (MPW) has categorized the Bamyan-Dushi road as a National Highway, requiring a high level of service because of its strategic importance in providing an alternate route from Kabul going north. It will allow traffic to avoid the Salang Tunnel, which subjects all north and south bound traffic to considerable time delays during the winter months, even under the best conditions. An asphalt paved road will increase security by reducing the time to respond to local, regional, or national incidents and will also facilitate access to social services and provide new regional trade opportunities including agriculture and mining.

This section summarizes the VE sessions held at AECOM's office at 605 Third Avenue, New York City in June, 2010. The VE analysis was conducted by using a team of highly experienced senior engineers made up from various representative disciplines. Representatives of the design team headed by the Louis Berger Group Inc. / Black & Veatch Joint Venture (LB- BV) participated via teleconference with the VE Team on June 17, 2010. A record of this meeting can be found in Appendix H.

The VE tasks will be performed for two separate sections of the roadway. Section 1 considered in this report consists of Segments 1 and 2 and extends south from the vicinity of Dushi. Section 2, to be evaluated in a future VE phase, consists of Segments 3 and 4 and terminates near Bamyan. To date, the team was given the 70% Design Submittal (dated May 2010) for Section 1, which consisted of various design documents and the 70% drawings. Also provided were aerial images and reconnaissance photos, PDF / CADD design drawings (for Section 1) and the associated design calculations, reports, site inspection photos, and road videos. Additional documents were requested as found necessary from the team members, including but not limited to geotechnical information and drainage information, specifications, and cost estimate. For a detailed listing of the references provided, refer to Appendix I.

The objectives of the VE sessions were to:

1 Review the design criteria for compliance with the required standards.
2. Review the contract documents for conformance with the design standards
3 Develop recommendations of potential savings, risk mitigation and value improvements.
4. Advance value engineering recommendations on selected ideas and develop quantities and savings or costs

Over 50 ideas were generated by the VE team. Most of the ideas are in the form of suggestions to improve the overall operation of the road and streamline construction and manufacturing. Others were related to conformance with design standards or revisions to the plans. Most of the suggestions were unable to have a cost or savings calculated for them, but the suggestions that could be quantified resulted in a savings of approximately $2.5 million.

2.0 Project Details

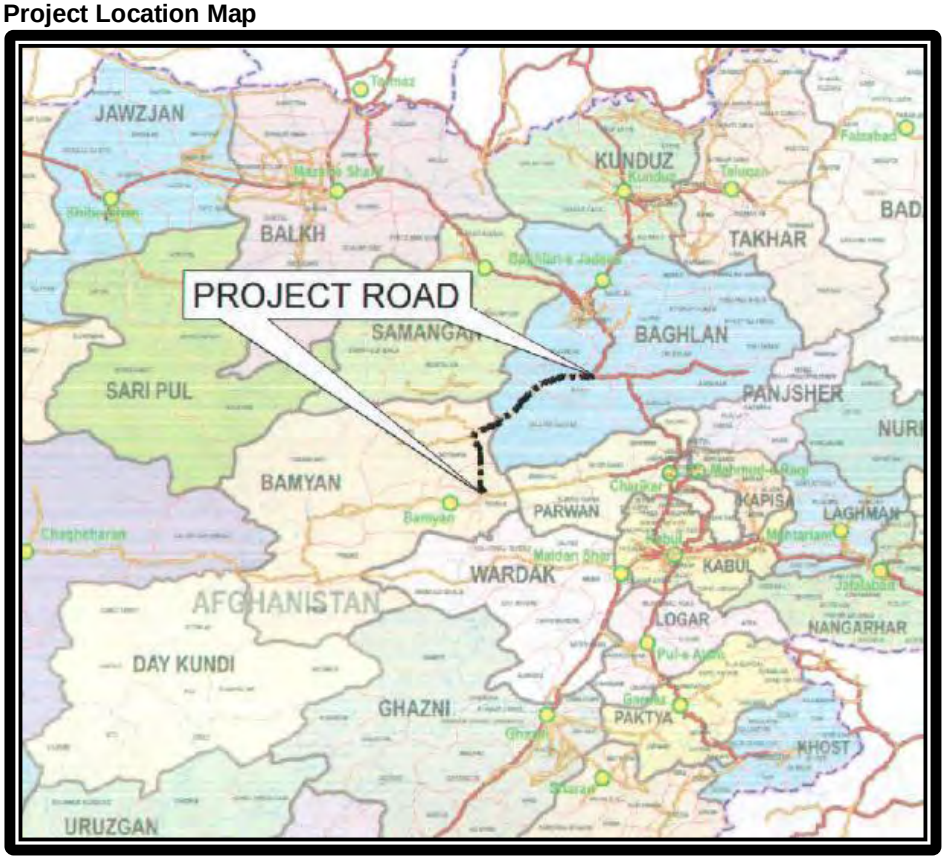
Project Schedule:
The VE study is being conducted during the Initial (70%) Engineering Design phase of the design. Construction duration for Section 1 (segment 1 & 2), is estimated to be 18 to 24 months.

Background:
Roads are instrumental to economic development and growth and are significant public assets. The Government of Islamic Republic of Afghanistan's (GoIRA) 2006 *Master Plan for Road Improvements* identified the Afghan road network as follows:

- Regional Highways - Ring Road and highways connecting Afghanistan to neighboring countries (3,242 kilometers);
- National Highways - Linking provincial capitals to Ring Road (4,884 kilometers);
- Provincial Roads - Linking district headquarters to their provincial capitals (9,656 kilometers); and
- Rural Road - Gravel or earth surfaced (17,000 kilometers).

The Ministry of Public Works (MPW) has categorized the Bamyan-Dushi Road as a National Highway requiring a high level of service because of its strategic importance in providing an alternate route for travel between the north and central provinces of Afghanistan. The current road permits traffic to avoid the Salang Tunnel, which subjects all north and south bound traffic to considerable time delays during the winter months, even under the best of conditions. However, the Bamyan-Dushi Road in its present condition is virtually impassable during the winter months, and even during summer is a very slow detour. The design of an asphaltic concrete paved road will provide a year around alternate route to the Salang Pass, as well as increase security by reducing the time to respond to local, regional, or national incidents, and facilitate access to social services and provide new regional trade opportunities, including agriculture and mining.

Project Location Map



Road Description:
The project starts at the intersection of the Kabul to Dushi part of the Ring Road in Baghlan province located about 160 Km from Kabul (Station 0+000) and ends at the intersection with road to Maidan Shar in Bamyan province along the Charikar Bamyan Road. The total length of the project road is about 164 kilometres. Dushi is a district in Baghlan province and

Bamyan is the capital of Bamyan Province. The project road will serve as a direct link between the two provinces.

The proposed road will mainly follow the alignment of the existing road.

The topography along the project highway can be described as a combination of flat to rolling to semi mountainous from Km 0 to Km 80, mountainous from Km 80 to Km 150, semi mountainous from Km 150 to end of project (per Project Assessment Report page 4). Section 1 from Km 0 to Km 85.8 follows the valley of the Surkhab River (Ref: Russian topographic maps used for watershed delineation). Many steep cuts, some in rock, are proposed throughout the project length, and protection against falling rock is needed in some areas.

Site Climate:
The climate in Bamyan is temperate to pre-alpine with mean temperature ranging from 32.4 ^{0}C in the summer to -32.12 ^{0}C during the winter. Historic climatic data were recorded at two meteorological stations (Bamyan and Baghlan).

Site Topography and Land Use:
The topography along the highway Segments 1 and 2 is flat to rolling to semi-mountainous. The elevation of Dushi-Bamyan area ranges from about 550 to 2550 m above mean sea level. Except for the valleys along Surkhab River and Dushi, most part is mountainous with intrusive rock consisting of granite, quartz diorite, diorite porphyry, diorite and gabbro, and volcanic rock consisting of rhyolite and basalt and sedimentary rocks consisting of mostly of sandstone and conglomerate. Hydrological soil type in the area is combination of type B and C as defined by the U.S. Natural Resources Conservation Service (NRCS). The area is largely dominated by rangeland and bare soil. Agriculture is practiced at all locations where the soil is suitable and water is available.

Site Hydrology:
Numerous small streams and rivulets flow to the Surkhab River. The Dushi-Bamyan Road passes alongside the Surkhab River. The Surkhab River is the main tributary of the Kunduz River which has a catchment area of 12,410 ha (KRBP). Most of the streams and rivers are dry during the autumn and winter months but carry flow during rainy season and the summer months when the snow melts. Flow fluctuations are high with flash floods during spring and summer. The watershed along Dushi-Bamyan Road is facing northeast and rises in the Kushi-i-Baba mountains. The whole area is part of the Kunduz River basin.

A total of 571 watersheds have been observed to intersect with the proposed road alignment within Sections 1 and 2. The delineated areas widely vary in size ranging from 0.002 km^2 to 9871 km^2. This large number of small watersheds owes mainly due to hilly and rolling terrain and particularly the alignment passing along the foot of the hill along the banks of the Surkhab and Bamyan Rivers.

Roadway Specifics:
The existing Dushi-Bamyan Road is a fair weather gravel road provided with major bridges and irrigation crossings. Irrigation crossings are mainly small box culverts and pipe culverts. There are no drainage culverts, other than the irrigation crossings, constructed in the first two segments.

II. VALUE ENGINEERING PROPOSALS

1.0 Introduction to Value Engineering

Value Engineering (VE) is a creative, organized effort, which analyzes the requirements of a project for the purpose of achieving the essential functions at the lowest total cost (capital, staffing, energy, and maintenance) over the life of the project. VE is a systematic, organized approach to obtain optimum value for each dollar spent. Through a group investigation, using

experienced, multi-disciplined teams, value and economy are improved through the study of alternate design concepts, materials, and methods.

This approach has been used successfully on projects of all types and magnitudes and allows the VE team to maintain a responsive turn-around while producing meaningful results. The approach also encourages owner and user participation in the study effort in order to take advantage of the VE Team members' experience and knowledge

1.1 Value Engineering Procedures

A multi-discipline team under the direction of a Project Manager was formed to analyze the project, utilizing the value engineering job plan. It was the team's objective to analyze the project to find high cost areas, opportunities to improve value and to recommend alternatives in attempt to reduce costs and streamline the construction and procurement. Other criteria were also used to assure that the proposed recommendations did not sacrifice essential facility functions and the timely completion of the project.

This section includes a description of the value engineering analysis procedure followed for the study. Each step plays an important part in achieving results and assuring eventual savings to the Owner.

The team used the following procedure:

1. Each member was provided a set of the documents for data review
2. A meeting was held to establish the format for the report and findings
3. Each team developed recommendations, focusing on items associated with:
   a. Cost Savings
   b. Design Compliance
   c. Design Treatment
   d. Constructability
   e. Risk Management & Mitigation.
4. A meeting was held to share & exchange ideas and recommendations
5. Agreed upon recommendations were further analyzed and compiled
6. Where possible, a monetary value for cost or savings was applied to the ideas.

1.2 Value Engineering Methodology

The AECOM VE Team realizes that the plans and specifications reviewed are deemed 70% complete and recognizes that several of the suggestions and recommendations made may have already been realized by the designers and are in the process of being revised.

The VE recommendations for all disciplines were developed with a focus on addressing compliance with the design standards and achieving the desired function and lowest overall cost consistent with performance. With these objectives in mind, recommendations were developed concerning more efficient methods of design and uses for materials, while recognizing the limitations of the site.

All of the VE recommendations were divided into the following 4 categories:

1. **Value Engineering Quantifiable Issues** apply to items that have a quantifiable cost or savings. The recommendations have been developed to:
   - Reduce construction costs
   - Streamline the construction and fabrication process
   - Improve roadway operation and safety
   - Comply with accepted design standards

2. **Value Engineering Non-Quantifiable Issues** apply to items that do not have a quantifiable cost or savings but are advised for the same reasons listed above.

3. **Design Criteria Issues** apply to recommendations that make the design comply with the agreed upon set of design standards. The design criteria reviewed were based on the standards outlined in the Project Assessment Report for the project. Several of these ideas were quantifiable, thus placing them into two categories.

4. **Drawing Review Comments** apply to revisions that we recommend be made to drawings. The drawings have been marked up and included in the Appendices.

Proposal numbers (i.e. C-#) were assigned based on individual discipline idea listings. Please note that several of the proposals are interconnected. Where possible, proposals have been limited to single issues so that independent judgment can be made.

Since cost is an important basis for comparison of the VE proposals, where possible, the VE Review Team based the cost on quantities and unit rates as contained in the project construction cost estimate. The estimates include the total cost to the Contractor, including the respective general requirements, overhead and profit. Sketches have been provided by the VE Review Team, where necessary to depict the respective proposed idea(s).

2.0 Geotechnical / Materials (G-#)

The Value Engineering (VE) review for the geotechnical aspects of the project were conducted using the following references:

- Subsurface Investigation Survey for Bamyan-Dushi Road/Afghanistan Final Report prepared January 10, 2010
- Project Assessment Report For Task Order 24
- 70 % Complete Plans for Segments 1 and 2
- Standard Specifications for Construction of Roads and Bridges on Federal Highway Projects FP-03
- Amendments to the Technical Specifications.

Quantifiable Value Engineering Issues:

- **G-1** refers to meeting the design criteria requirements set forth by AASHTO for scour at bridge structures and a quantifiable cost based on value engineering. This recommendation will either place the footing elevation deeper than that shown on the plans, at an additional cost, or allow the removal of the grouted rip rap within the channel of Bridge No. 1, recognizing a cost reduction. This is a quantifiable cost savings of $ 2,845.00.

- **G-6** has a potential for a large savings by changing the pavement section but keeping the same structural number. According to the plans the wearing course is 100 mm thick and the base course is 100 mm thick. A better option is to use one lift of wearing course at 50 mm thick and 2 lifts of base course at 75mm thick each. Based on the cost estimate, the wearing cost is $24.00 per square meter and the base course is $16.50 per square meter. This could result in a large savings $2,105,250.00.

Non-Quantifiable Value Engineering Issues:

- **G-3** is a general comment to the three bridges in Segments 1 and 2. This recommendation is a cost savings measure by eliminating sidewalks on the bridge since there is no sidewalk on the approaching roadways. Also it is noted that at Bridge No. 2 the new bridge is approximately 10 to 12 meters longer than the existing bridge. Consider whether the proposed bridge can match the length of the existing shorter bridge for cost savings, and analyze if the 50-year river flood could then be carried with the required minimum freeboard.

- **G-5** and **G-8** call attention to a major issue of concern that is consistent throughout the project, which uses steep slopes on the site for both Segments 1 and 2. From the cross sections, the slopes vary from 0.3 vertical to 1 horizontal to 1:1. In the Subsurface Investigation Survey (See Appendix F), the location of the slopes that are steeper than 1:1 seem to be in rock - either diorite or granite. However, it states safe slopes for diorite

are 3 horizontal to 1 vertical. It is unclear if the slopes that are 1:1 are common material or not. There is a concern on what common material refers to since there is no indication of what type of soil this material consists of. It is recommended that through the areas of common materials, borings and slope stability analysis be performed to verify the safe stability of the slopes. It is not anticipated that a 1:1 slope through the common material will be safe for the permanent condition. Another concern is how the surface of the common material slopes will be stabilized since no vegetation will grow. These items also fall under "Design Criteria Issues".

- **G-7** anticipates rock bolting will be required given the amount of rock excavation necessary. In areas that the contractor is cutting into rock slope, criteria should be set for the contractor to follow to determine which areas are to be rock bolted. Mapping through the entire area should have been performed and anticipated areas to be bolted should have been identified by stations. By mapping and identifying areas to be bolted, it can minimize claims due to rock excavation. At a minimum, and if where directed, an item should be used for these areas to come up with a cost. Because of the nature of this task, there will most likely be costs associated with this work.

Design Criteria Issues:

- **G-1** refer to "Quantifiable Value Engineering Issues" above.

- **G-2** is also related to design criteria referring to LRFD and the way bearing capacity should be specified in accordance with the AASHTO document referenced. This should add no additional cost or savings to the project.

- **G-5** and **G-8** refer to "Quantifiable Value Engineering Issues" above.

Drawing Review Comments:
- **G-4** relates to plan review comments and they are attached in the appendices.

3.0 Civil / Highway (C-#)

The Value Engineering (VE) review for the highway aspects of the project were conducted using the following references:
- Project Assessment Report For Task Order 24
- 70% Complete Plans for Segments 1 and 2
- 70% Complete Amendments to the Technical Specifications
- Standard Specifications for Construction of Roads and Bridges on Federal Highway Projects FP-03
- 2004 AASHTO A Policy on Geometric Design of Highways and Streets
- 2007 MPW Interim Road and Highway Standards.

The design appears to have sacrificed too many design standards to reduce construction costs. Therefore, the VE recommendations to bring some of these elements back to design standards will definitely increase the construction costs. However, several potential cost saving options have been identified below.

Quantifiable Value Engineering Issues:
- **C-6** calls for the elimination or reduction in height of 160m of retaining wall by lowering the profile of the road. This is an estimated quantifiable savings of $60,720.00.

- **C-7** calls for the adjustment of the horizontal alignment by adding a longer tangent section to provide better roadway geometry by eliminating curves and eliminate a superelevated section. This will also eliminate the need for 60m of retaining walls and minimize the impact to cultivated lands. This is an estimated quantifiable savings of $2,312.00.

- **C-8** calls for the realignment of tangent sections to avoid the river. This will allow for the installation of riprap to replace a significant portion of retaining wall along the river bank. This is an estimated quantifiable savings of $45,280.00.

Non-Quantifiable Value Engineering Issues:

- **C-9** and **C-10** recommends controlling the maximum superelevation rate to 6% based on the geographic region that this road situates, and the maximum profile slope at 6% (wherever feasible) since this route will also serve truck traffic. Although the MPW standards allow the use of an 8% maximum superelevation rate and 8% maximum profile slope, the recommendation will help reduce earthwork and fill, create a better roadway geometry, and improve the operation and safety of the roadway.

- **C-11** recommends investigating the necessity of adding climbing lanes for trucks where steep slopes are present.

- **C-12** recommends removing short tangents and horizontal curves to create a single curve which will remove a potentially hazardous condition.

- **C-13** recommends using longer transitions for superlevations between curves to eliminate short normal crown sections.

- **C-14** is a list of various locations where the vertical profile can be improved for better safety and operation of the roads.

- **C-15** is a list of various locations where the horizontal alignment can be improved for better geometry, eliminate areas of superelevation and to comply with standards.

- **C-16** recommends posting speed limit and “no passing zone” signs per the design speed established for the section.

- **C-17** recommends revising the length of guardwalls as per the AASHTO Roadside Design Guide.

Design Criteria Issues:

- **C-1** outlines the need for setting and adhering to a uniform design speed for the project – 50kph in populated areas and 80kph in others. This will place the design in conformance with AASHTO and MWP standards.

- **C-2 thru C-5** document various non-standard or non-conforming geometric features that can create potentially dangerous locations to the travelling public. The current design utilizes many S-curves, sub-standard curvatures, and short tangent transitions for superelevation which save construction costs but are not in conformance with the design standards. Other non-conformance elements include insufficient passing sight distance at passing zones, insufficient stopping sight distance and inadequate horizontal curve length.

- **C-13 thru C-17**, See “Non-Quantifiable Value Engineering Issues” above.

4.0 Hydraulics (H-#)

The Value Engineering (VE) review for the hydraulic aspects of the project was conducted using the following references:

- Project Assessment Report For Task Order 24
- 70% Complete Plans for Segments 1 and 2
- 70% Complete Amendments to the Technical Specifications
- Standard Specifications for Construction of Roads and Bridges on Federal Highway Projects FP-03
- LB/BV, BD_ProbableHydDataComputation, Dec. 12, 2009.

- LB/BV, BD ProbableMetDataComputation 1.1, Dec. 6, 2009.
- LB/BV, BD Hydraulic Design of Culverts, Jan. 5, 2010.
- LB/BV, Flood Data at Pul-i-Kumri, Jan 2010.
- LB/BV, Site Inspection Photos: Alignment and Bridges/Structures, April to July 2010.
- LB/BV, Dushi-Bamyan Road Videos, July 2009.
- 2007 AASHTO Highway Drainage Guidelines
- 2007 MPW Interim Road and Highway Standards.

Page 12 of The Hydrologic and Hydraulic Report states that the proposed highway alignment crosses 480 waterways, including "rivers", "washes" (intermittent streams) and irrigation canals. The portion of the project from Km 0 to Km 86 (Section 1) is stated to include three bridge crossings of the Surkhab River and 480 culvert crossings consisting of 295 reinforced concrete pipe culverts (RCPC or round pipe) and 185 reinforced concrete box culverts (RCBC) of smaller mostly intermittent watercourses. The report indicates that "washes or intermittent drains are dry most of the time of year but occasional flash floods of relatively large magnitude are to be taken into design account".

The hydraulic portion of this report raises concerns and develops recommendations regarding protection against flooding damages to the roadway for the safety of highway users and local residents and properties, as outlined below.

Recommendations concerning the safety of the roadway against flooding damages include:

Quantifiable Value Engineering Issues:

- **H-1** recommends providing a culvert or ditch design to address flows from intermittent watercourses crossing the proposed alignment where no culvert has been provided. This has an estimated cost of $306,240.00.

- **H-2** reduces the number of piers in multiple-cell reinforced concrete box culvert (RCBC) design. This has an estimated savings on $96,162.00.

- **H-3** recommends relocating irrigation canals where the highway crosses existing canals, in addition to those shown in the road cross-sections, to reduce local impacts. This has an estimated cost of $160,560.00.

- **H-4** recommends revising calculations to use a different peak flow computation method to reduce the culvert size and cost at Station 14+217. This has an estimated savings of $39,000.00.

- **H-5** recommends skewing the alignment for culvert crossings where the plan mapping shows a skewed watercourse crossing the roadway. This has an estimated cost of $12,363.00.

- **H-6** advises protection against seepage and piping failure at some culvert crossings by using anti-seep collars. This has an estimated cost of $4,000.00.

- **H-10** specifies designing box culverts (RCBC's) using AASHTO Specification M273M to reduce the concrete and reinforcement quantities. This has an estimated savings of $677,985.

Design Criteria Issues:

- **H-7** refers to designing road sections with retaining walls along the Surkhab River against overtopping and damages from the 50-year design flood. Design retaining wall foundations to resist scour.

- **H-10** refer to "Quantifiable Value Engineering Issues" above.

Drawing Review Comments:

- **H-8** calls for verifying that some of the designed culvert locations are at the correct station for capturing the large flows from each watercourse.

- **H-9** addresses noted discrepancies concerning culvert locations and missing information. Refer to plan review comments attached in Appendix C.

5.0 Bridge (B-#)

The Value Engineering (VE) review for the bridge and structure aspects of the project were conducted using the following references:

- Project Assessment Report For Task Order 24
- 70% Complete Plans for Segments 1 and 2
- 70% Complete Amendments to the Technical Specifications
- Design Calculations for Bridges 1, 2, and 3 by LB/BV dated May 2010, Revision 2.
- Standard Specifications for Construction of Roads and Bridges on Federal Highway Projects FP-03
- 2004 AASHTO Geometric Design for Highways and Streets
- 2002 AASHTO Roadside Design Guide
- 2007 MPW Interim Road and Highway Standards
- NYSDOT Bridge Detail Sheets (SI units)
- California Department of Transportation Bridge Standard Detail Sheets

There are three proposed bridges in the project: Two in Segment 1 (Bridges 1 and 2) and one in Segment 2 (Bridge 3). The bridge types are as follows:

- Bridge 1 – Cast in place reinforced concrete superstructure supported on cantilever abutments; approximately 7.8 m center to center of bearings.
- Bridge 2 – Steel plate girder superstructure with cast in place reinforced concrete deck supported on counterfort abutments; approximately 41.12 m center to center of bearings.
- Bridge 3 – Steel plate girder superstructure with cast in place reinforced concrete deck supported on counterfort abutments; approximately 38.72 m center to center of bearings.

There are also numerous cast in place reinforced concrete box culverts, ranging from 0.6 m x 0.6 m single cell to 3.5 m x 3.5 m triple cell, and stone masonry retaining walls up to 6 m in height.

The methodology used for the VE review was to compare the proposed bridges, retaining walls, and culverts with existing structures of similar length and width, configuration, and materials, designed by the AASHTO LRFD specification. From these existing designs, unit quantities, such as tons of steel reinforcement per cubic meter of concrete and cubic meters of concrete per linear meter of length were calculated and used to develop suggested design recommendations.

Although the purpose of the VE was not to check the design per se, the drawings were reviewed for conformity with the LRFD specification and standard engineering practice, regardless of the project location. Anomalies and discrepancies in the plans were noted when observed.

Quantifiable Value Engineering Issues:

- **B-2** recommends using cantilever abutments in lieu of counterfort abutments on Bridge 3. This has an estimated savings of $54,941.00.

- **B-3** calls for modifying the girder design to reduce the top flange thickness, use thinner plates for a portion of the bottom flange, and reduce the number of shear connectors for Bridge 2. This has an estimated savings of $143,907.00 .

- **B-4** calls for the use the AASHTO empirical deck design in lieu of the traditional design for Bridge 2. This has an estimated savings of $7,530.00.

- **B-7** calls for the use the AASHTO empirical deck design in lieu of the traditional design for Bridge 3. This has an estimated savings of $10,068.00.

- **B-9** calls for modifying the girder design to reduce the top flange thickness, use thinner plates for a portion of the bottom flange, and reduce the number of shear connectors for Bridge 3. This has an estimated savings of $135,018.00.

- **B-10** recommends using a rigid frame structure in lieu of a simply supported concrete slab for Bridge 1. This has an estimated savings of $43,202.00.

Non-Quantifiable Value Engineering Issues:

- **B-5** recommends eliminating one sidewalk and providing a uniform steel reinforcement pattern in the parapets for Bridge 3. A uniform reinforcement pattern would reduce the chance of placement error during construction.

- **B-6** recommends using integral abutments on Bridge 3. (However, based upon a discussion with the designers it may not be possible to obtain piles, which would be necessary for this type of structure.)

- **B-8** recommends eliminating one sidewalk and providing a uniform steel reinforcement pattern in the parapets for Bridge 2. A uniform reinforcement pattern would reduce the chance of placement error during construction.

Design Criteria Issues:

- **B-11** addresses concerns the design of the stone masonry retaining wall and guardwall.

Drawing Review Comments:

- **B-1** contains the structural Drawing Review Comments on Bridge Drawings

- **B-11** See “Design Criteria Issues” above.

The recommendations in the first three categories are based upon similar bridges that were designed using AASHTO LRFD.

The concrete and steel reinforcement quantities for the culverts could possibly be reduced using the AASHTO M273 M specification for culverts. These are discussed in **H-10**.

6.0 Estimating (E-#)

The cost estimating portion of the value engineering exercise includes applying existing project unit costs to VE recommendations as appropriate. The savings and/or additional costs calculated for the VE recommendations are solely based on the 80% Design Bill of Quantities Estimate provided by LB-BV. The provided cost estimate includes unit costs. If an item is not included in this estimate, a unit cost specific to the local conditions is not available. Where VE recommendations that cannot be tied to existing unit costs occurred, no attempt was made to develop a unit cost due to the uncertainty of resource availabilities because of the remoteness of the terrain, high transportation costs, etc.

According to LB-BV, the provided unit costs were deemed to be appropriate considering they reflect recent bid information for similar type projects in the region. However it is unclear in what capacity, if any, project requirements items are accounted for. These items include:

- Construction Survey and Staking
- Contractor Quality Control
- Contractor Sampling and Testing
- Schedules of Construction Contracts
- Public Traffic
- Soil Erosion Control

- Watering for Dust Control

The technical specifications deem these items to be considered a subsidiary obligation of the Contractor with no direct payment through a pay item. Adding these "indirect" cost items to the contract as individual pay items may serve to add value to the project allowing for a more complete and accurate comparison of bid proposals, more clearly outlining the true costs predicted by qualified bidders.

7.0 Construction(R-#)

A constructability review of the 70% plans for Segments 1 and 2 for the Bamyan to Dushi Road project in Afghanistan for USAID was performed based on a review of the plans. The process covered the following items:

- The project, as detailed in the plans and specifications, can be constructed using standard construction methods, materials and techniques.
- The plans and specifications provide the contractor with clear, concise information that can be utilized to prepare a competitive, cost-effective bid.

With the information available, a review was performed of items such as:

- Constructability
- Compatibility of plans, specifications and applicable standards
- Erosion and sediment control
- Maintenance and protection of traffic
- Site access
- Material control and acquisition
- Workforce
- Equipment

Certain items were omitted based on the background information provided by LB-BV designers on the June 17, 2010 teleconference call, such as environmental impacts, right-of-way acquisitions, local events and utilities.

Recommendations were made based on the analysis. All recommendations have been deemed Non-Quantifiable Value Engineering Ideas:

- **R-1** recommends preparing MPT and staging plans, including this as a line item in the estimate as a lump sum item and re-instating the item for the project (Section 156 of the FHA specifications). The current plans do not show how traffic will travel around the work area and how the work zone will be separated from passing traffic.

- **R-2** advises processing and re-using of blast material, if acceptable, on the project. This will save on the need to import material and improve quality.

- **R-3** states the need to define storage and staging areas for the contractor on the plans as well as in the specifications.

- **R-4** outlines that the general notes, plans and specifications should ensure the contractor submits and follows a schedule. The schedule should detail the equipment being utilized; ensuring it is of adequate size and the contractor should be required to have spare parts and qualified repair personnel on the job in order to minimize delays resulting from broken down equipment. FHA Specification Section 155 – Schedules for Construction Contracts –which covers this item to some extent has been eliminated from the project. Consider re-instating this specification and including it as a lump-sum line item in the estimate. Consider utilizing verbiage in the contract that ensures equipment malfunction is not an excusable reason for job delays.

- **R-5** recommends using a workforce that sufficient in number and skilled in the means and methods employed on the project. FHA Specification Section 155 – Schedules for Construction Contracts – has been eliminated from the project. Consider re-instating this specification and including it as a lump-sum line item in the estimate. Consider utilizing verbiage in the contract that ensures lack of a skilled work force is not an excusable reason for job delays.

- **R-6** considers including verbiage for maintenance of site similar to NYSDOT Specification 104-07.

- **R-7** recommends investigating the option of using prefabricated culverts and erecting an asphalt plant at the site.

- **R-8** details the needs to perform on-going constructability reviews on other similar projects. Identify items that affect the cost and schedule and incorporate this knowledge into new design projects. This will result in significant cost and time savings on future projects.

- **R-9** states that it is necessary to show how traffic will be maintained safely as work progresses. Keep the work area safe to the personnel working on the project as well as the travelling public.

- **R-10** recommends including natural slope protection details in the plan to avoid clogging of drainage system and subsequent flooding of roadway.

- **R-11** outlines the need to make sure the QC and REI staff (consultant and USAID) maintains focus on ensuring quality materials and workmanship are utilized on the project.

- **R-12** advises that it is necessary to establish lines of communication with local politicians and tribal leaders. Have them buy into the project and offer to hire local people on the project.

8.0 Risk

As part of subject task, AECOM performed a risk assessment of Section 1, Segments 1&2, of the Bamyan-Dushi Road Project. The purpose of this assessment was to identify the significant risks to successful completion of this portion of the project as well as provide a mitigation strategy for those risks having the most impact. In addition, AECOM performed a risk analysis for the purpose of providing an order of magnitude sense of the schedule and cost impacts resulting from the identified risks.

AECOM utilized four individuals within its organization that had in-country experience to assist in identifying risks, their impacts and possible mitigation strategies. The data gathered from these individuals was used as input to the Monte Carlo simulation which generated the risk analysis results.

The methodology for the risk assessment follows the (2009) “Practice Standard for Project Risk Management”, Project Management Institute, Pennsylvania, USA; and is consistent with the British Standard ISO 31000:2009 “Risk Management-Principles and Guidelines”.

The following assumptions were made to facilitate the risk analysis:

- The schedule for Section 1, Segments 1&2, was set at 18 months, the lower end of the 18-24 month range to remove potential float that might be built into the schedule.

- The escalation rate is constant at 10.0% for the duration of the project; this assumes a conservative forecast of the consumer price index in Afghanistan.

- Contract cost contingency is a function of three elements: the expected cost of uncertainties, the escalated cost increase due to expected delays and the fixed indirect costs produced by contract modifications.

- The current budget for Section 1, Segments 1&2, is $94,566,000. After removing the built in contingency, the Base Cost used was $86,908,000.

- The total cost of $94,566,000 was assumed to be spread linearly over the 18 month duration for Section 1, Segments 1&2.

The risks with the most impact to schedule are listed below:
- Lack of security in working areas
- Completion of ROW acquisition on time
- Limited staging and storage area for equipment and materials
- Inability to meet schedule expectations
- Disengaged labor unions or local/tribal labor groups
- Political/social instability

The risks with the most impact to cost are listed below:
- International firms are not attracted to work in Afghanistan resulting in lack of competition
- Long bureaucratic process to start operations
- Unclear definition of bid documents
- Political pressure to modify project objectives or accelerate procurement
- Bids significantly higher than expected
- Quality of construction materials not being from approved sources result in excessive rework

The following table captures the output at the 80% confidence level and provides a comparison to the base case. The 80% confidence level is the level considered by most risk managers and project owners to be appropriate:

Base		**80% Confidence Level**	
Schedule	**Cost (MM)**	**Schedule**	**Cost (MM)**
1 yr, 6 month	$86.9	2 yr, 5 month	$121.9

Comments from in-country experienced individuals and resultant mitigations indicate the predominant need to harness support of the locals and "sell" the idea of the road while carefully managing expectations of the local government". This mitigation approach, often called "Outreach", is central to the success of any project.

This risk analysis provides an order-of-magnitude sense of both schedule and cost impacts based on the risks in the attached Risk Register and the data captured in the attached Risk Data Matrix (Appendix F, Attachment F-2). The results do not appear to be outside what might be expected given the uncertainties with security, lack of contractor competition, a local population which may have mixed feelings on the need for the project, and bureaucratic processes that are not well understood outside the local government entities.

A revised risk analysis will be beneficial once additional detailed information is available to evaluate risks not identified at this stage and possible shifts in priorities. The proper mitigation strategy applied to the most important risks may significantly result in a reduction of the contingency needed for the Project. It is suggested that the Project evaluates these

mitigations in light of their more extensive in-country experience and modify the mitigations as required. AECOM is available to discuss the mitigations if requested.

Appendix A

Geotechnical

AECOM

SUMMARY OF VALUE ENGINEERING STUDY RESULTS

Project: **Design of Bamyan to Dushi Road** Discipline: **Geotechnical**

Location **Kabul, Afghanistan**

Date: **June 2010**

Client: **United States Agency for International Development**

Idea No.	Description	Category*				Savings	Cost
		Value Engineering - Quantifiable	Value Engineering - Not Quantifiable	Design Criteria	Drawing Review Comments		
G-1	Investigate for Scour - Streambed and Bridge Foundation	X		X		$ 2,816.00	
G-2	AASHTO LRFD Nomenclature Conformance			X			
G-3	Bridge Size Modifications		X				
G-4	Geotechnical Design Review Comments on Drawings				X		
G-5	Segment 1 Slope Stability Concerns		X	X			
G-6	Pavement Design Criteria and Recommendations	X				$ 2,105,250.00	
G-7	Rock Bolting Locations		X				
G-8	Segment 2 Slope Stability Concerns		X	X			
8	**Totals**	**2**	**4**	**4**	**1**	**$ 2,108,066.00**	**0**

Total Saved **$ 2,108,066.00**

*Note that Value Engineering Ideas may qualify for more than one category

	VE RECOMMENDATION	Idea No.: G-1 Segment 1&2
	Client: UNITED STATES AGENCY FOR INTERNATIONAL DEVELOPMENT Project: **DESIGN OF BAMYAN TO DUSHI ROAD** *AFGHANISTAN INFRASTRUCTURE AND REHABILITATION PROGRAM (AIRP*	

Current Design:

Bridge No. 1 Scour Depth 0.97 Meters
Bridge No. 2 Scour Depth 4.40 meters
Bridge No. 3 Scour Depth 3.68 meters

Description of VE Alternative:

In accordance with AASHTO section 2.6.4.4.2 Scour should be investigated for two conditions:

- For the design flood for scour, the streambed material in the scour prism above the total scour line shall be assumed to have been removed for design conditions. The design flood storm surge, tide, or mixed population flood shall be the more severe of the 100-year events or from an overtopping flood of lesser recurrence interval.
- For the check flood for scour, the stabilty of bridge foundation shall be investigated for scour conditions resulting from a designated flood storm surge, tide, or mixed population flood not to exceed the 500-year event or from an overtopping flood of lesser recurrence interval. Excess reserve beyond that required for stability under this condition is not necessary. The extreme event limit state shall apply.

"Spread footings on soil or erodible rock shall be located so that the bottom of footing is below scour depths determined for the check flood for scour. Spread footings on scour-resistant rock shall be designed and constructed to

All three bridges should be checked in accordance with the above requirements.

Advantages:

If the 500 year event scour is not too deep may be able to place bottom of bridge footing to this elevation and remove scour protection for Bridge No. 1.

Could use scour protection for Bridges No. 2 and 3 this would reduce cost by reducing the depth of excavation and placement of bottom of footing elevation.

Cost summary below reflects cost to remove rip rap at Bridge No. 1 only.

Disadvantages:

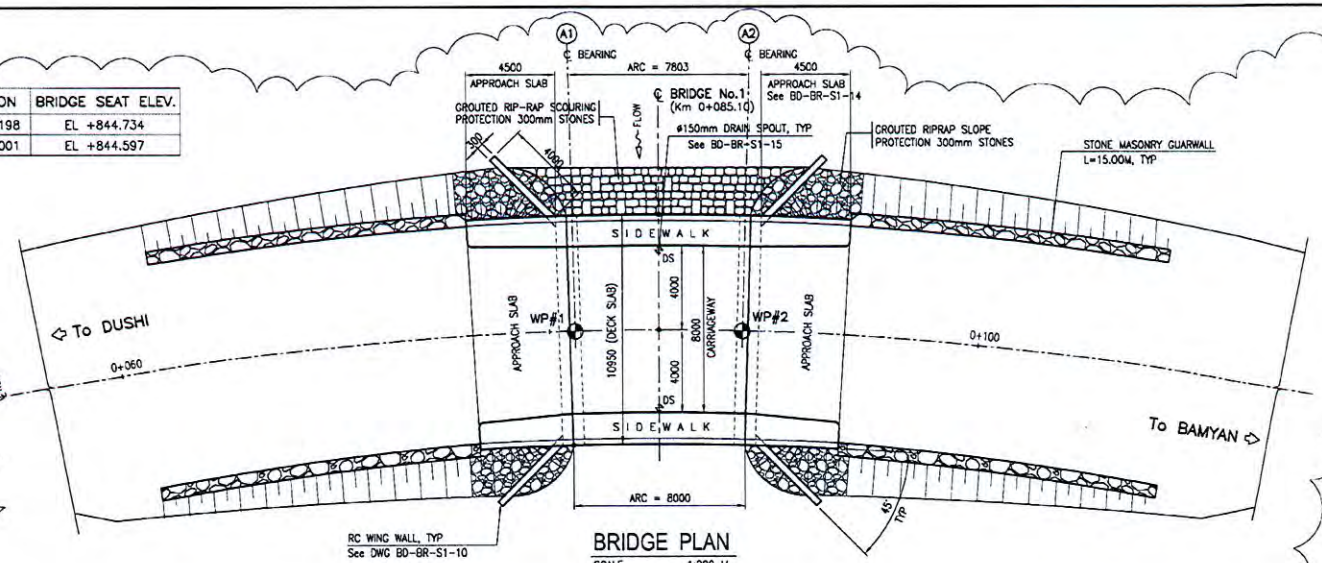
Cost Summary			
	Capital Cost	O&M Cost	Total
Original	$1,046,848.00		
Proposed	$1,044,003.00		
Savings	$2,845.00		

Discussion of VE Alternative - Idea No. :

CONTROL POINT	STATION	BRIDGE SEAT ELEV.
WP#1	0+081.198	EL +844.734
WP#2	0+089.001	EL +844.597

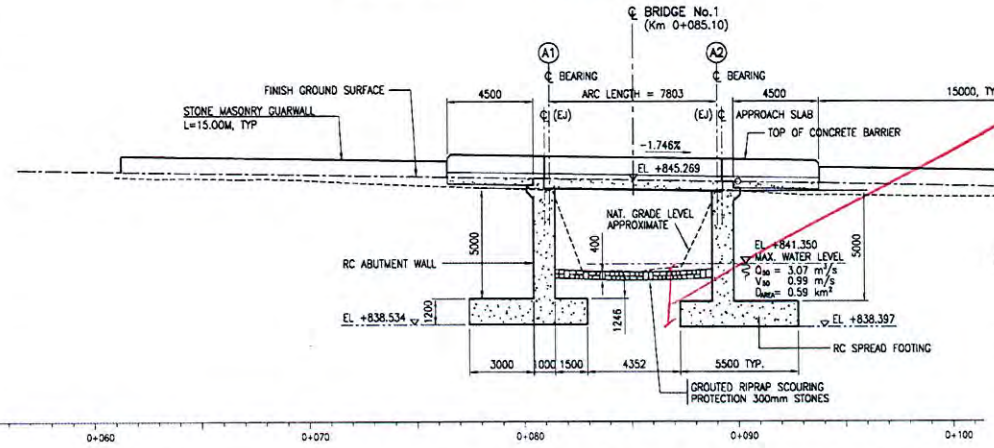
CURVE DATA :

PI STA 0+072.440
PC STA 0+002.126
RADIUS = 150.00m
Lc = 131.511m
Δ = 50°14'00"



BRIDGE PLAN

SCALE 1:200 M



IS FOOTING BELOW SCOUR?

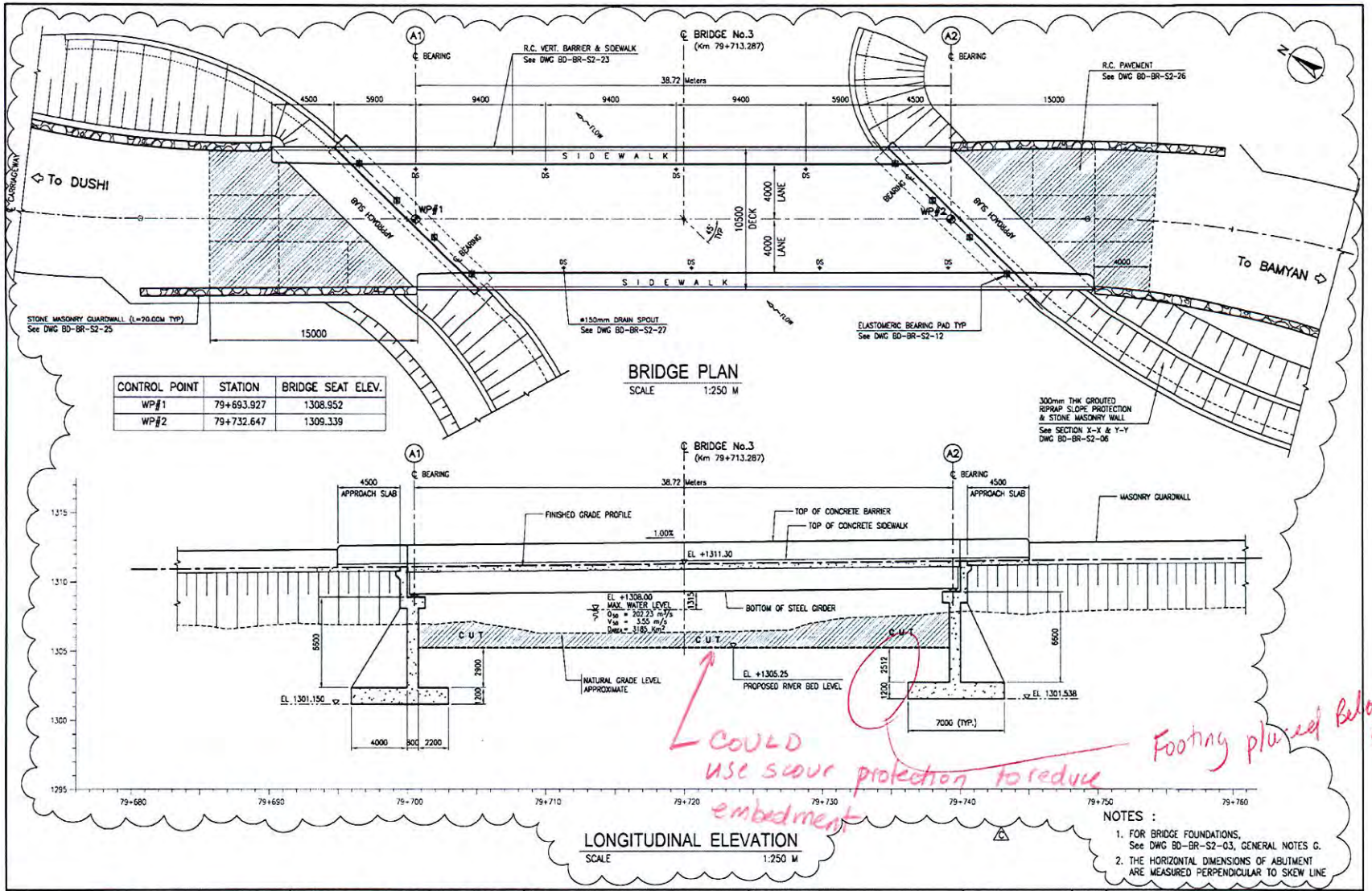
LONGITUDINAL ELEVATION

SCALE 1:200 M

NOTES :

1. FOR BRIDGE FOUNDATIONS.
   See DWG BD-BR-S1-03, GENERAL NOTES G. "FOUNDATIONS"
2. THE SUBGRADE UNDER BRIDGE FOUNDATION MUST BE OVER EXCAVATED BY A MINIMUM OF 0.50M, THE EXPOSED SUBGRADE MUST BE COMPACTED TO 95% OF THE MAXIMUM MODIFIED DENSITY, AND THE EXCAVATED MATERIAL SHOULD BE BACKFILLED IN TWO 0.25M LIFTS, AFTER COMPACTING EACH LIFT TO 95% OF THE FILL'S MAXIMUM DRY DENSITY AS OBSERVED IN ASTM D 1557
3. FOR ABUTMENT A1, DURING THE OVER-EXCAVATION OF 0.50M, IF SILT LAYERS ARE OBSERVED, SILT UNDER THE ENTIRE FOOT PRINT AREA, PLUS 1.50M IN ALL SIDES SHALL BE CUT, DISPOSED OFF, AND REPLACED BY WELL GRADED SAND AND GRAVEL, OR 20mm SIZE CRUSHED STONE. ON NO ACCOUNT, THE FOUNDATION SUBGRADE SHALL BE COMPOSED OF SILT OR CLAY.

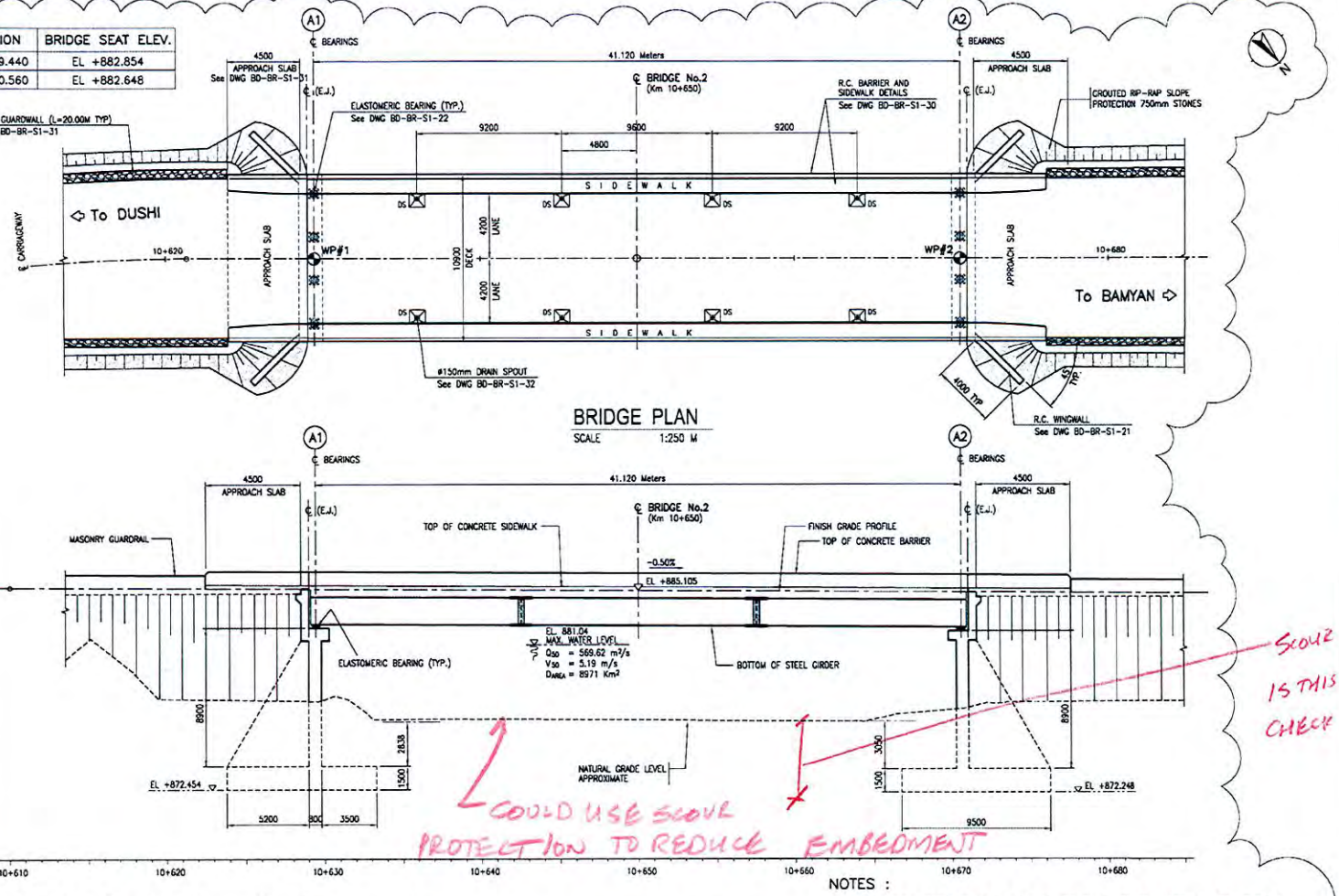
ISLAMIC REPUBLIC OF AFGHANISTAN and UNITED STATES AGENCY FOR INTERNATIONAL DEVELOPMENT	AFGHANISTAN INFRASTRUCTURE AND REHABILITATION PROGRAM (AIRP) LBG/B&V The LOUIS BERGER Group, Inc., BLACK & VEATCH SPECIAL PROJECTS CORP. JOINT VENTURE	TITLE DESIGN OF BAMYAN TO DUSHI ROAD, NH-07 (TASK ORDER 24) SEGMENT 1 LOCATION: BAGHLAN AND BAMYAN PROVINCES	SHEET CONTENTS GENERAL ARRANGEMENT BRIDGE No. 1	REVISION / DATE: RENAMED TO 29/03/10; 30% DESIGN SUBMITALL 29/03/10; MISC. CHANGES 70% DESIGN SUBMITALL 29/03/10; GEN REV 70% DESIGN SUBMITALL 21 MAY 10	NAMES & SIGNATURE: DRAWN: J. TIAMZON DESIGNED: Y. SOPANYO; CHECKED BY: RUBEN S. BORLEO Phil, PE; APPROVED BY: ABOUD AL ZAIM USA, PE	DWG NO. BD-BR-S1-07; SCALE: AS SHOWN



CONTROL POINT	STATION	BRIDGE SEAT ELEV.
WP#1	79+693.927	1308.952
WP#2	79+732.647	1309.339

ISLAMIC REPUBLIC OF AFGHANISTAN and UNITED STATES AGENCY FOR INTERNATIONAL DEVELOPMENT	AFGHANISTAN INFRASTRUCTURE AND REHABILITATION PROGRAM (AIRP) — LBG/B&V The LOUIS BERGER Group, Inc., BLACK & VEATCH SPECIAL PROJECTS CORP. JOINT VENTURE	TITLE: DESIGN OF BAMYAN TO DUSHI ROAD, NH-07 (TASK ORDER 24) SEGMENT 2 — LOCATION: BAGHLAN AND BAMYAN PROVINCES	SHEET CONTENTS: GENERAL ARRANGEMENT BRIDGE No. 3	REVISION / DATE: RENAMED TO 29/03/10; 30% DESIGN SUBMITTAL 29/03/10; MISC. CHANGED FOR DESIGN SUBMITTAL 29/03/10; GEN REV FOR DESIGN SUBMITTAL 21 MAY 10	NAMES & SIGNATURE: DRAWN: J. TIAMZON; DESIGNED: Y. SUPARNO; CHECKED BY: RUBEN S. BORLEO PhD, PE; APPROVED BY: ABOUD AL ZAIM USA, PE	DWG NO. BD-BR-S2-07; SCALE: AS SHOWN

CONTROL POINT	STATION	BRIDGE SEAT ELEV.
WP#1	10+629.440	EL +882.854
WP#2	10+670.560	EL +882.648



BRIDGE PLAN

SCALE 1:250 M

SCOUR IS 4.40
IS THIS FOR CHECK CONDITION

COULD USE SCOUR PROTECTION TO REDUCE EMBEDMENT

LONGITUDINAL ELEVATION

SCALE 1:250 M

NOTES :

1. FOR BRIDGE FOUNDATIONS, See DWG BD-BR-S1-03 GENERAL NOTES G. "FOUNDATION"
2. FOR ABUTMENT A2, THE SUBGRADE MUST BE OVER EXCAVATED BY A MINIMUM OF 0.50M. THE EXPOSED SUBGRADE MUST BE COMPACTED TO 95% OF THE MAXIMUM MODIFIED DENSITY AND THE EXCAVATED MATERIAL SHOULD BE BACKFILLED IN TWO 0.25M LIFTS AFTER COMPACTING EACH LIFT TO 95% OF THE FILL'S MAXIMUM DRY DENSITY AS OBSERVED IN ASTM D 1557.

ISLAMIC REPUBLIC OF AFGHANISTAN and UNITED STATES AGENCY FOR INTERNATIONAL DEVELOPMENT	AFGHANISTAN INFRASTRUCTURE AND REHABILITATION PROGRAM (AIRP) — LBG/B&V — The LOUIS BERGER Group, Inc., BLACK & VEATCH SPECIAL PROJECTS CORP. JOINT VENTURE	TITLE: DESIGN OF BAMYAN TO DUSHI ROAD, NH-07 (TASK ORDER 24) SEGMENT 1 — LOCATION: BAGHLAN AND BAMYAN PROVINCES	SHEET CONTENTS: GENERAL ARRANGEMENT BRIDGE No. 2	REVISION: 1 RENAMED 1 TO 1 — 2 30% DESIGN SUBMITTALL — 3 MISC. CHANGED 70% DESIGN SUBMITTALL — 4 GEN REV 70% DESIGN SUBMITTALL	DATE: 29/03/10 — 29/03/10 — 29/03/10 — 21 MAY 10	NAMES & SIGNATURE: DRAWN: J. TIAMZON — DESIGNED: Y. SUBANYO — CHECKED BY: RUBEN S. BORLEO Phil, PE — APPROVED BY: ABOUD AL ZAIM USA, PE	DWG NO.: BD-BR-S1-17 — SCALE: AS SHOWN

	VE RECOMMENDATION	**Idea No.: __G-2 __** **Segment_1&2__** **Station_____**
	Client: UNITED STATES AGENCY FOR INTERNATIONAL DEVELOPMENT Project: **DESIGN OF BAMYAN TO DUSHI ROAD** *AFGHANISTAN INFRASTRUCTURE AND REHABILITATION PROGRAM (AIRP*	

Current Design:

Bridge No. 1 Allowable Soil Bearing Capacity = 300 kn/m^2
Bridge No. 2 Allowable Soil Bearing Capacity = 400 kn/m^2
Bridge No. 3 Allowable Soil Bearing Capacity = 600 kn/m^2

Description of VE Alternative:

In accordance with AASHTO LRFD Bridge Design Specifications the term allowable bearing capacity is no longer used. The terms nominal and factored bearing resistance is now used. This is in accordance with Section 10 of AASHTO.

Advantages:

None

Disadvantages:

None

Cost Summary			
	Capital Cost	O&M Cost	Total
Original			
Proposed			
Savings			

Discussion of VE Alternative - Idea No. :

	VE RECOMMENDATION	**Idea No.: __G-3 __** **Segment_1& 2__** **Station_____**
	Client: UNITED STATES AGENCY FOR INTERNATIONAL DEVELOPMENT Project: **DESIGN OF BAMYAN TO DUSHI ROAD** *AFGHANISTAN INFRASTRUCTURE AND REHABILITATION PROGRAM (AIRP*	

Current Design:
Bridge No. 1
Bridge No. 2 Drawing BD-BR-S1-16
Bridge No. 3

Description of VE Alternative:

Can the proposed bridge No. 2 be shortened to meet the existing bridge length. This is a reduction of 10 to 12 meters of bridge.

Are sidewalks required on both sides of the bridge (Bridge No.1, 2 and 3). Each sidewalk increases the width of the bridge 1.0 meter.

Advantages:

Reduce cost of the bridge structures

Disadvantages:

Cost Summary			
	Capital Cost	O&M Cost	Total
Original			
Proposed			
Savings			

Discussion of VE Alternative - Idea No. :

	VE RECOMMENDATION	**Idea No.: __G-4 __** **Segment__1&2_** **Station_____**
	Client: UNITED STATES AGENCY FOR INTERNATIONAL DEVELOPMENT Project: **DESIGN OF BAMYAN TO DUSHI ROAD** *AFGHANISTAN INFRASTRUCTURE AND REHABILITATION PROGRAM (AIRP*	

Current Design:
Segments 1 and 2
Volume 2 of 5, Road Works

Description of VE Alternative:

Comments to above plans in pdf format.

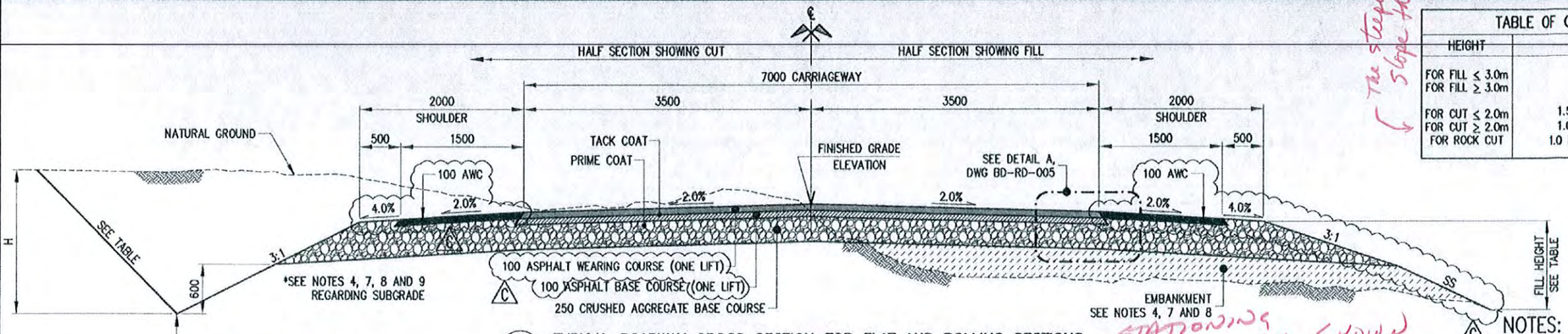
- Drawing BD-RD-004 typical sections should show stationing so that contractor knows what location these sections are built to?
- Note 8 Drawing BD-RD-004 what standard will the CBR be performed in accordance to and who will determine if CBR is required?
- The slopes specified in Table of Cut and Fill Slopes on Drawing BD-RD-004 were these cut slopes evaluated for slope stability. For common materials they are very steep for example in locations they are 1horizontal to 1 vertical and from the cross sections these could be as high as 68 meters. It would be recommended that these slopes be flattened. Also how was it determined that this is common material if there are no soil borings along this slope. It is recommended that soil borings be performed in these areas to verify material within the sloped areas.
- Drawing BD-RD-005 the fill slope does not match slope table.
- Drawing BD-RD-006 how is this drainage layer constructed behind this wall?
- Drawing BD-RD-010 between the gravel and the common earth there should be a geotextile separator.
- Drawing BD-RD-010 Detail one and detail three seem to be retaining the same amount of material however detail three has a bigger base width. Should detail three be used at both of the wall locations. Detail one shows the wall along a slope the bearing capacity of this wall should be reduced to account for the sloping ground along this area. Also have these walls been designed for service, strength and extreme events in accordance with AASHTO?
- Drawing BD-RD-047 Can not find the locations of these details in the schedules. Not clear in the schedules.

Advantages:

Disadvantages:
Could be additional cost if slopes need to be flatter due to slope stability.

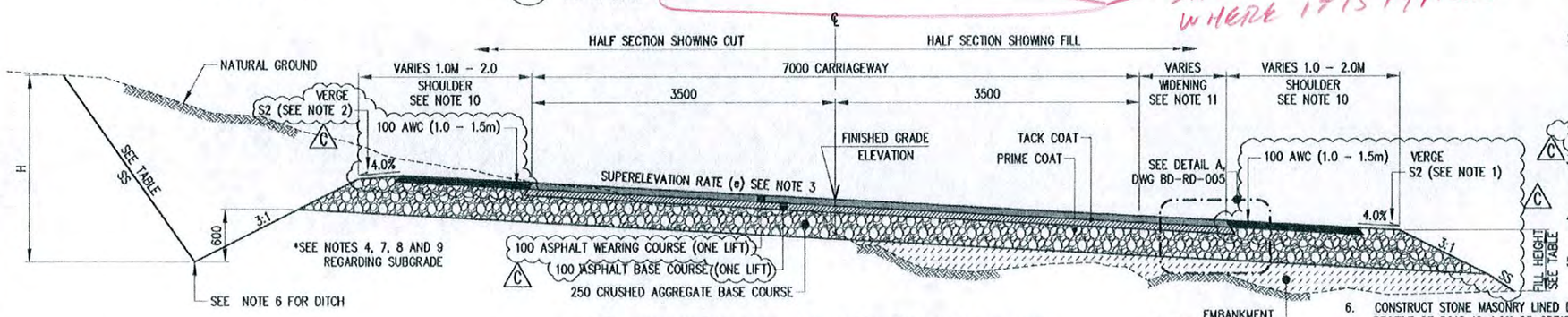
Cost Summary			
	Capital Cost	O&M Cost	Total
Original			
Proposed			
Savings			

Discussion of VE Alternative - Idea No. :

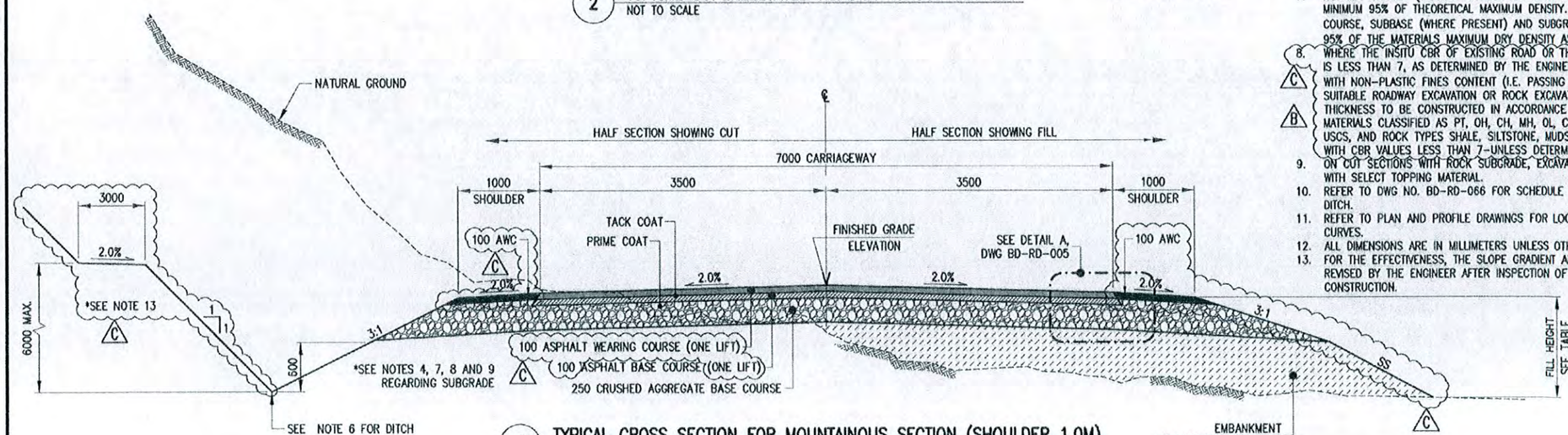


1 TYPICAL ROADWAY CROSS SECTION FOR FLAT AND ROLLING SECTIONS
NOT TO SCALE

STATIONING SHOULD BE SHOWN WHERE IT IS TYPICAL



2 TYPICAL SUPERELEVATED ROADWAY CROSS SECTION
NOT TO SCALE



3 TYPICAL CROSS SECTION FOR MOUNTAINOUS SECTION (SHOULDER 1.0M)
NOT TO SCALE

SHOULD STATIONING be shown to noted plan so contractor knows what to bid on?

The steepest slope the most critical

TABLE OF CUT AND FILL SLOPES	
HEIGHT	SLOPES
FOR FILL ≤ 3.0m	3.0 H : 1.0 V
FOR FILL ≥ 3.0m	2.0 H : 1.0 V
FOR CUT ≤ 2.0m	1.5 H : 1.0 V (COMMON MATERIALS)
FOR CUT ≥ 2.0m	1.0 H : 1.0 V (COMMON MATERIALS)
FOR ROCK CUT	1.0 H : 2.5 TO 3.0V (ROCK MATERIALS)

C

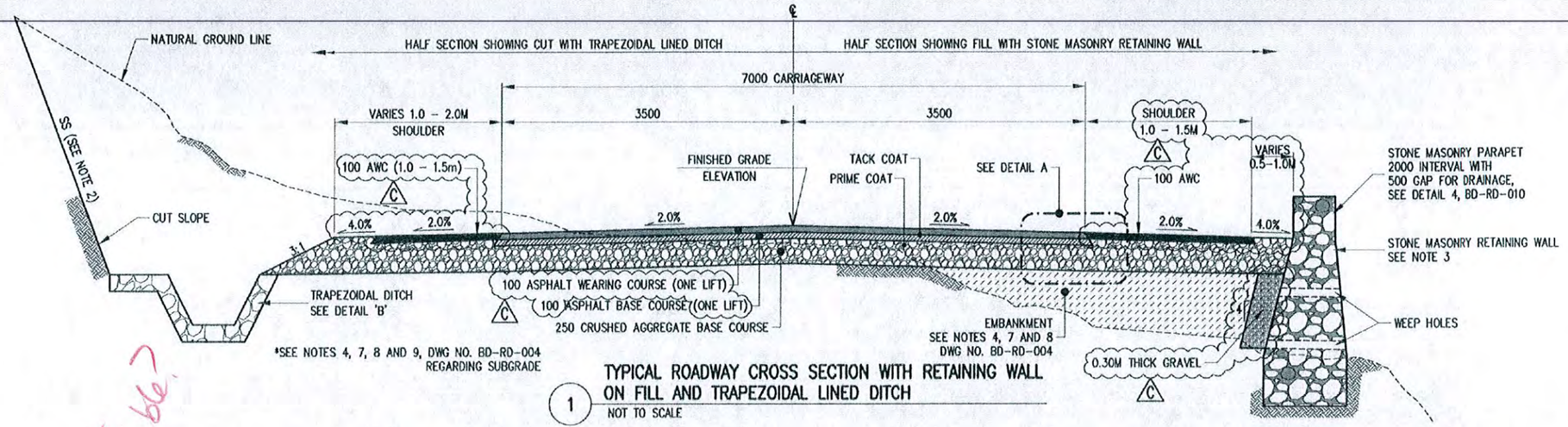
Has slope stability been performed on these materials

NOTES:

1. THE INNER SHOULDER VERGE SLOPE FOR SUPERELEVATED ROADWAY SECTION EQUALS NORMAL SLOPE OF 4% OR AT SUPERELEVATION RATE (e) IF (e) IS GREATER THAN 4%.
2. THE OUTER SHOULDER VERGE SLOPE FOR SUPERELEVATED ROADWAY SECTION EQUALS NORMAL SLOPE OF 4% IF SUPERELEVATION RATE (e) IS LESS THAN OR EQUAL TO 6%. WHERE THE SUPERELEVATION RATE (e) IS GREATER THAN 6%, SLOPE OF THE SHOULDER IS 10% MINUS (e).
2a. C THE SLOPE OF THE PAVED SHOULDER IS EQUAL TO THE SLOPE OF THE CARRIAGEWAY.
3. THE SUPERELEVATION RATE (e) IS SHOWN ON THE CONSTRUCTION DRAWING FOR EACH HORIZONTAL CURVE. SEE STANDARD DRAWINGS FOR METHOD OF APPLICATION.
4. UNSUITABLE MATERIALS SHALL BE REMOVED AS DIRECTED BY THE ENGINEER AND SHALL BE REPLACED WITH SUITABLE BACKFILL MATERIALS.
5. THE CONTRACTOR MAY SECURE APPROVAL FROM THE ENGINEER TO FLATTEN CUT SLOPES TO OBTAIN ADDITIONAL EMBANKMENT MATERIAL.
6. CONSTRUCT STONE MASONRY LINED DITCH (DETAIL B, BD-RD-005) WHERE THE LONGITUDINAL PROFILE OF ROAD IS 4.0% OR GREATER, OR AS DIRECTED BY THE ENGINEER.
7. HOT MIX ASPHALT (WEARING COURSE AND BASE COURSE) SHALL BE COMPACTED TO A MINIMUM 95% OF THEORETICAL MAXIMUM DENSITY. EMBANKMENT, CRUSHED AGGREGATE BASE COURSE, SUBBASE (WHERE PRESENT) AND SUBGRADE SHALL BE COMPACTED TO A MINIMUM 95% OF THE MATERIALS MAXIMUM DRY DENSITY AS OBSERVED IN AASHTO'S T-180.
8. C B WHERE THE INSITU CBR OF EXISTING ROAD OR THE SUBGRADE AFTER ROADWAY EXCAVATION IS LESS THAN 7, AS DETERMINED BY THE ENGINEER, PROVIDE 500MM GRANULAR MATERIAL WITH NON-PLASTIC FINES CONTENT (I.E. PASSING THE #200 SIEVE) LESS THAN 12%, OF SUITABLE ROADWAY EXCAVATION OR ROCK EXCAVATION MATERIALS AS MINIMUM SUBGRADE THICKNESS TO BE CONSTRUCTED IN ACCORDANCE WITH THE REQUIREMENTS OF SECTION 204. MATERIALS CLASSIFIED AS PT, OH, CH, MH, OL, CL, ML, SC, GC IN ACCORDANCE WITH THE USCS, AND ROCK TYPES SHALE, SILTSTONE, MUDSTONE SHALL BE CONSIDERED DELETERIOUS WITH CBR VALUES LESS THAN 7-UNLESS DETERMINED OTHERWISE BY THE ENGINEER.
9. ON CUT SECTIONS WITH ROCK SUBGRADE, EXCAVATE 150MM BELOW SUBGRADE AND REPLACE WITH SELECT TOPPING MATERIAL.
10. REFER TO DWG NO. BD-RD-066 FOR SCHEDULE OF SHOULDERS, LINED DITCH AND ROCK DITCH.
11. REFER TO PLAN AND PROFILE DRAWINGS FOR LOCATION OF WIDENING ON HORIZONTAL CURVES.
12. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE SHOWN.
13. FOR THE EFFECTIVENESS, THE SLOPE GRADIENT AND THE WIDTH OF THE BENCH MAYBE REVISED BY THE ENGINEER AFTER INSPECTION OF THE EXPOSED CUT BACK SLOPE DURING CONSTRUCTION.

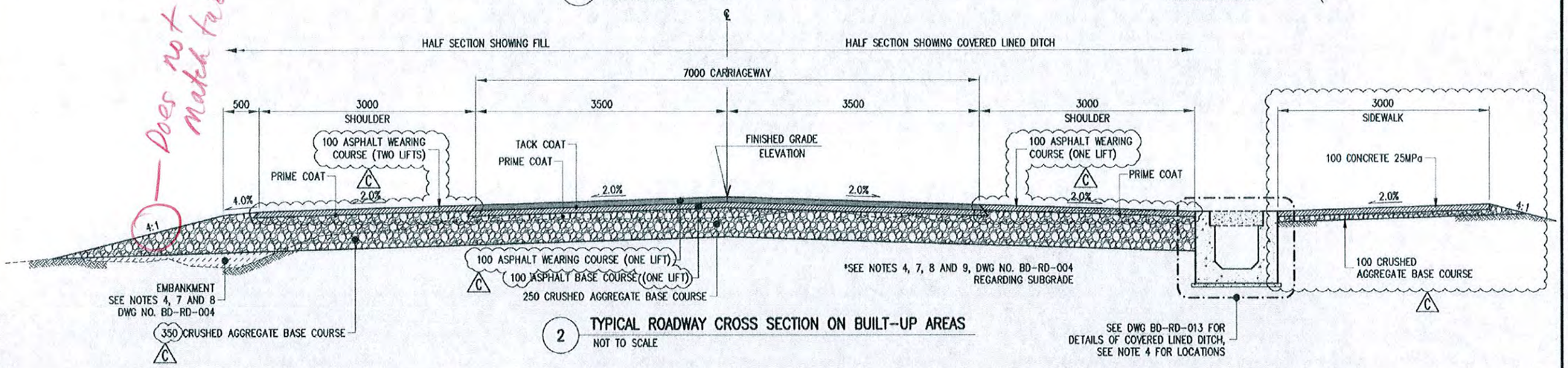
How will CBR be determined

ISLAMIC REPUBLIC OF AFGHANISTAN and UNITED STATES AGENCY FOR INTERNATIONAL DEVELOPMENT	AFGHANISTAN INFRASTRUCTURE AND REHABILITATION PROGRAM (AIRP) — The LOUIS BERGER Group, Inc., BLACK & VEATCH SPECIAL PROJECTS CORP. JOINT VENTURE	TITLE: DESIGN OF BAMYAN TO DUSHI ROAD, NH-07 (TASK ORDER 24) SEGMENT 1 — LOCATION: BAGHLAN AND BAMYAN PROVINCES	SHEET CONTENTS: TYPICAL ROADWAY CROSS SECTIONS SHEET 1 OF 3	REVISION / DATE: A RENAMED A TO A 29/03/10; A 30% DESIGN SUBMITTAL 29/03/10; A 70% DESIGN SUBMITTAL, NOTE REV 29/03/10; A 70% DESIGN SUBMITTAL, MISC REV 21/05/10	NAMES & SIGNATURE: DRAWN: A. C. CESPEDES; DESIGNED: N. THAO; CHECKED BY: J.M. TAYLOR USA, PE; APPROVED BY: ABOUD AL ZAIM USA, PE	DWG NO. BD-RD-004; SCALE: AS SHOWN

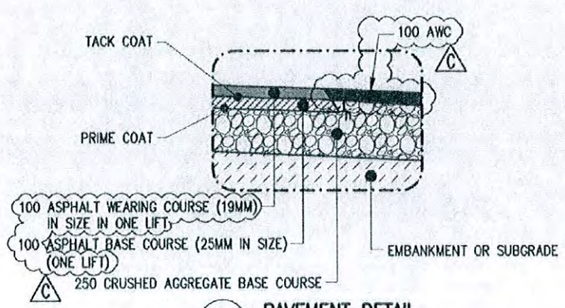


1 TYPICAL ROADWAY CROSS SECTION WITH RETAINING WALL ON FILL AND TRAPEZOIDAL LINED DITCH
NOT TO SCALE

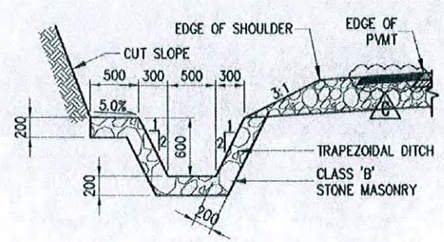
Does not match table?



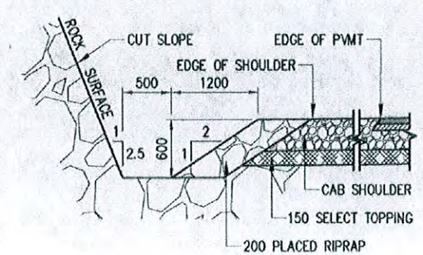
2 TYPICAL ROADWAY CROSS SECTION ON BUILT-UP AREAS
NOT TO SCALE



A PAVEMENT DETAIL
NOT TO SCALE



B TRAPEZOIDAL LINED DITCH DETAIL
NOT TO SCALE



C DITCH AT ROCKY AREA
NOT TO SCALE

NOTES:

1. STONE MASONRY SHALL BE CLASS "B".
2. REFER TO DWG NO. BD-RD-004 FOR TABLE OF CUT SLOPES.
3. REFER TO DWG NO. BD-RD-010 FOR STONE MASONRY RETAINING WALL DETAILS.
4. REFER TO DWG NOS. BD-RD-066 AND 67 FOR ACTUAL LOCATION OF STRUCTURES, SUCH AS DITCHES, RETAINING WALLS AND GUARD WALLS.
5. PROVIDE 3m ASPHALT PAVED SIDEWALK ON BUILT-UP AREAS WHERE REQUIRED AS DIRECTED BY THE ENGINEER.
6. ALL UNITS IN MILLIMETERS UNLESS OTHERWISE NOTED.

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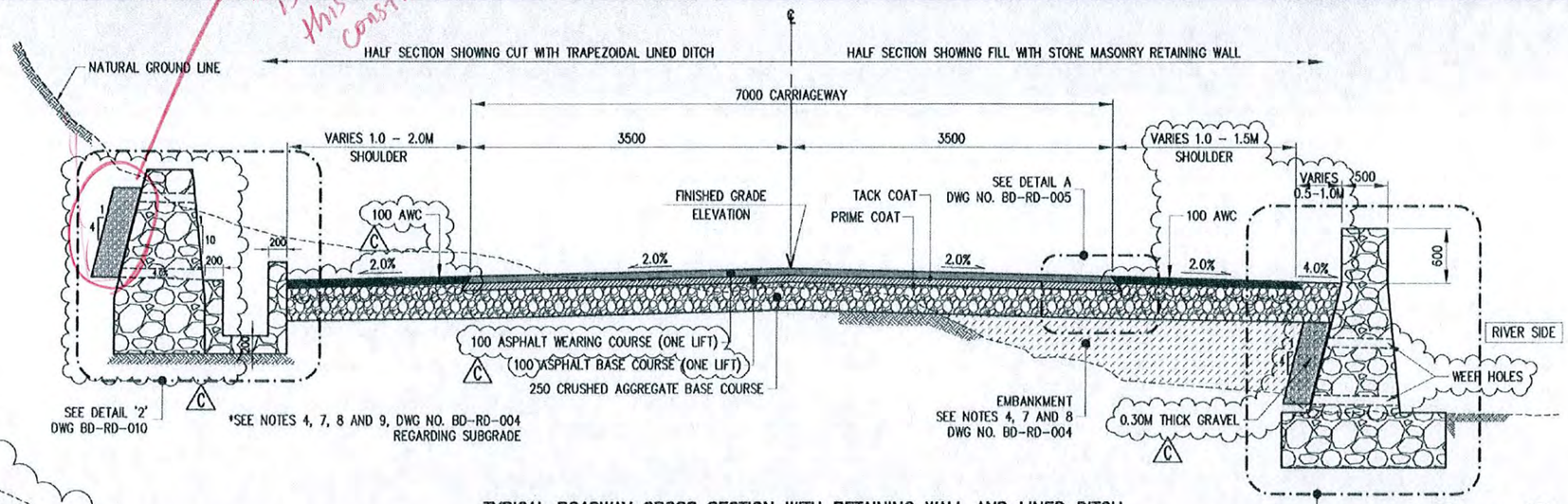
				RENAMED 1 TO 1	29/03/10	DRAWN: A. C. CESPEDES DESIGNED: N. THAO	BD-RD-005
				30% DESIGN SUBMITTAL	29/03/10	CHECKED BY: J.M. TAYLOR USA, PE	
				70% DESIGN SUBMITTAL, NOTE REV	29/03/10	APPROVED BY: ABOUD AL ZAIM USA, PE	
				70% DESIGN SUBMITTAL, MISC REV	21/05/10		SCALE: AS SHOWN

How is this constructed?

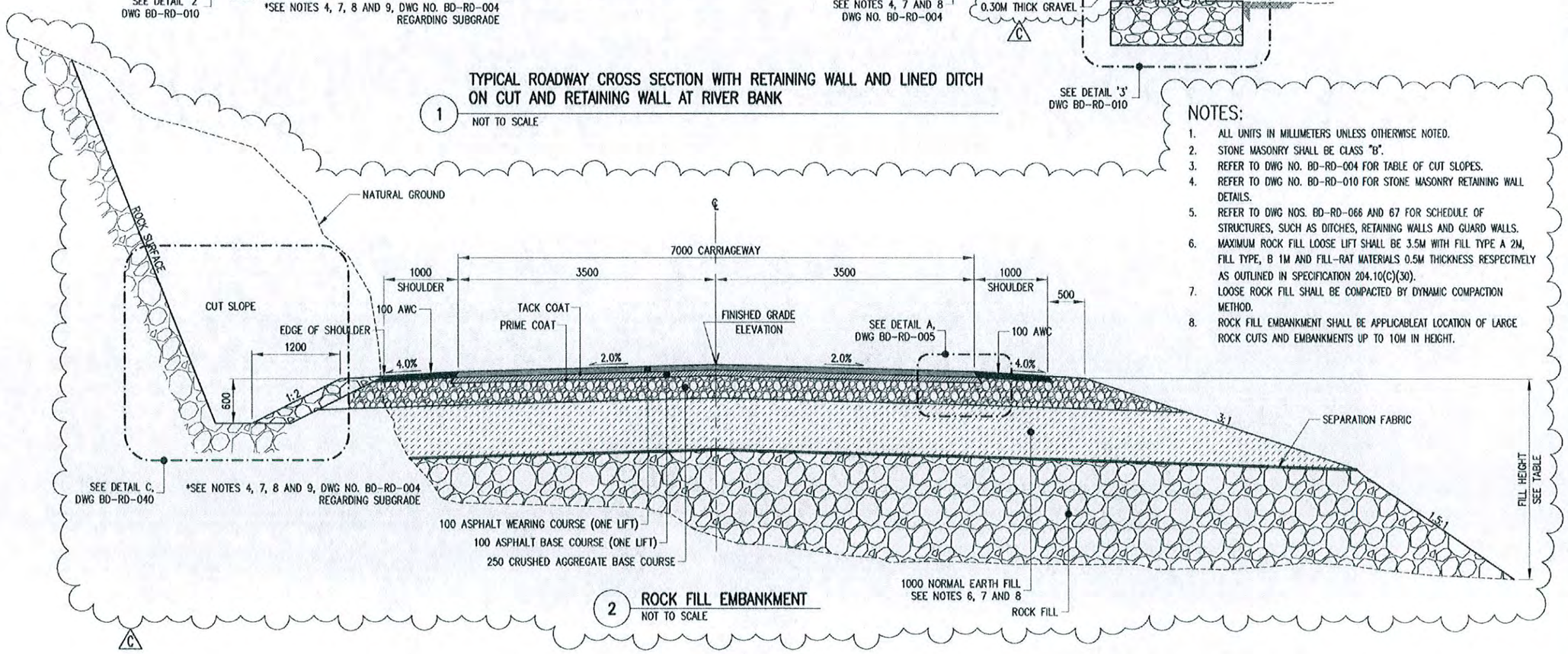


1 TYPICAL ROADWAY CROSS SECTION WITH RETAINING WALL AND LINED DITCH ON CUT AND RETAINING WALL AT RIVER BANK

NOT TO SCALE

NOTES:

1. ALL UNITS IN MILLIMETERS UNLESS OTHERWISE NOTED.
2. STONE MASONRY SHALL BE CLASS "B".
3. REFER TO DWG NO. BD-RD-004 FOR TABLE OF CUT SLOPES.
4. REFER TO DWG NO. BD-RD-010 FOR STONE MASONRY RETAINING WALL DETAILS.
5. REFER TO DWG NOS. BD-RD-066 AND 67 FOR SCHEDULE OF STRUCTURES, SUCH AS DITCHES, RETAINING WALLS AND GUARD WALLS.
6. MAXIMUM ROCK FILL LOOSE LIFT SHALL BE 3.5M WITH FILL TYPE A 2M, FILL TYPE, B 1M AND FILL-RAT MATERIALS 0.5M THICKNESS RESPECTNELY AS OUTLINED IN SPECIFICATION 204.10(C)(30).
7. LOOSE ROCK FILL SHALL BE COMPACTED BY DYNAMIC COMPACTION METHOD.
8. ROCK FILL EMBANKMENT SHALL BE APPLICABLEAT LOCATION OF LARGE ROCK CUTS AND EMBANKMENTS UP TO 10M IN HEIGHT.

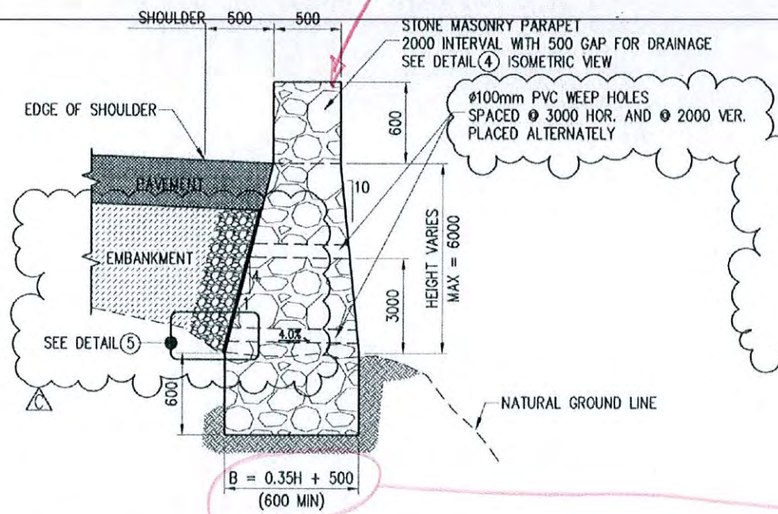


2 ROCK FILL EMBANKMENT

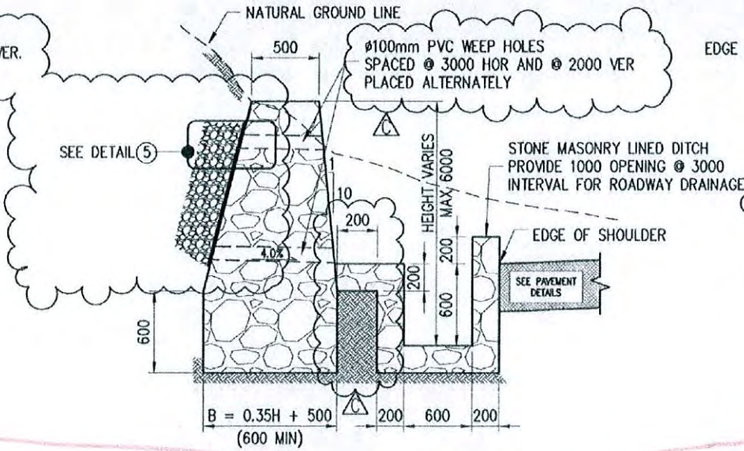
NOT TO SCALE

ISLAMIC REPUBLIC OF AFGHANISTAN and UNITED STATES AGENCY FOR INTERNATIONAL DEVELOPMENT	AFGHANISTAN INFRASTRUCTURE AND REHABILITATION PROGRAM (AIRP) LBG/B&V The LOUIS BERGER Group, Inc., BLACK & VEATCH SPECIAL PROJECTS CORP. JOINT VENTURE	TITLE	SHEET CONTENTS	REVISION	DATE	NAMES & SIGNATURE	DWG NO.
		DESIGN OF BAMYAN TO DUSHI ROAD, NH-07 (TASK ORDER 24) SEGMENT 1	TYPICAL ROADWAY CROSS SECTIONS SHEET 3 OF 3	1 RENAMED 1 TO 1	29/03/10	DRAWN: A. C. CESPEDES DESIGNED: N. THAO	BD-RD-006
				3 30% DESIGN SUBMITTAL	29/03/10	CHECKED BY: J.M. TAYLOR USA, PE	
				4 70% DESIGN SUBMITTAL, NOTE REV	29/03/10	APPROVED BY: ABOUD AL ZAIM USA, PE	
		LOCATION: BAGHLAN AND BAMYAN PROVINCES		5 70% DESIGN SUBMITTAL, MISC REV	21/05/10		SCALE: AS SHOWN

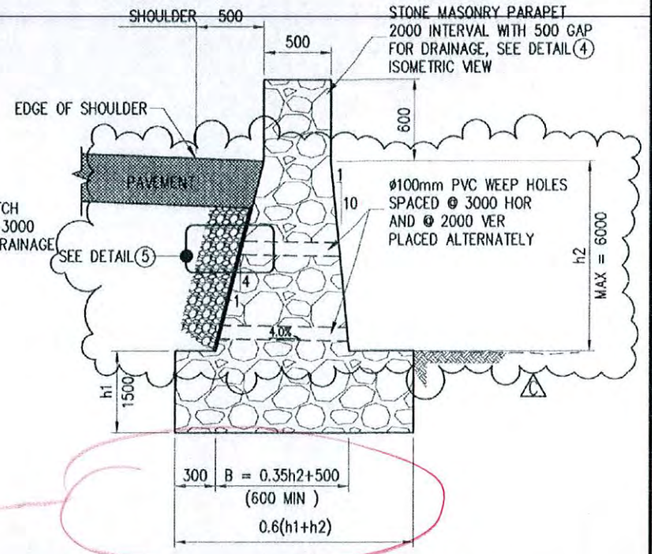
Have these walls been designed for seismic?



1 STONE MASONRY RETAINING WALL ON FILL
SCALE 1:40M

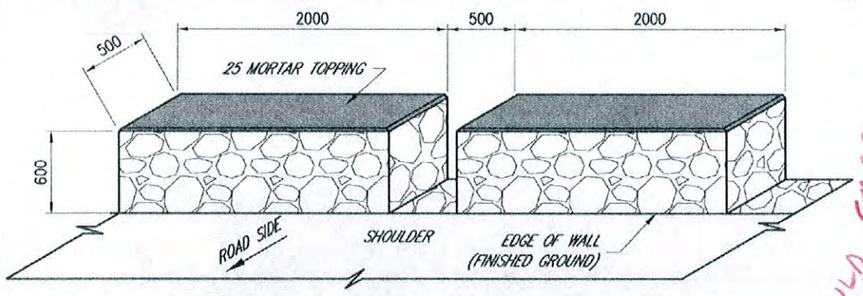


2 STONE MASONRY RETAINING WALL ON CUT
SCALE 1:40M

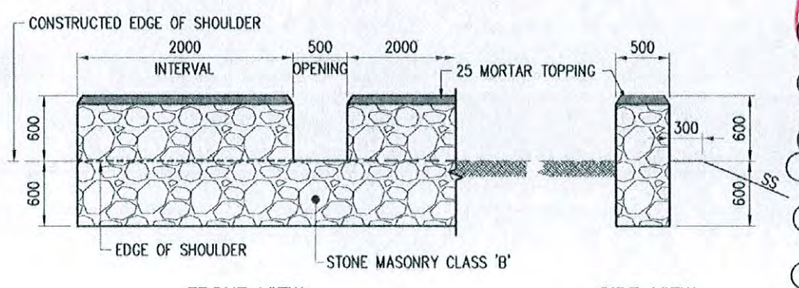


3 STONE MASONRY WALL ON RIVER BANK
SCALE 1:40M

Retaining same earth base width should be similar



ISOMETRIC VIEW



FRONT VIEW SIDE VIEW

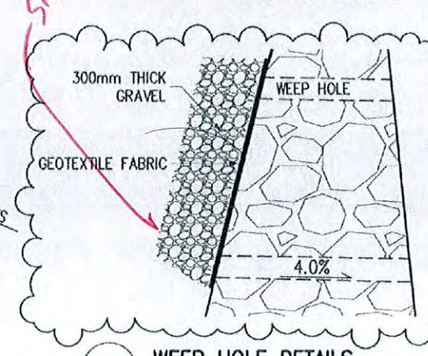
4 GUARDWALL DETAILS
NOT TO SCALE

be placed here also as seperator?

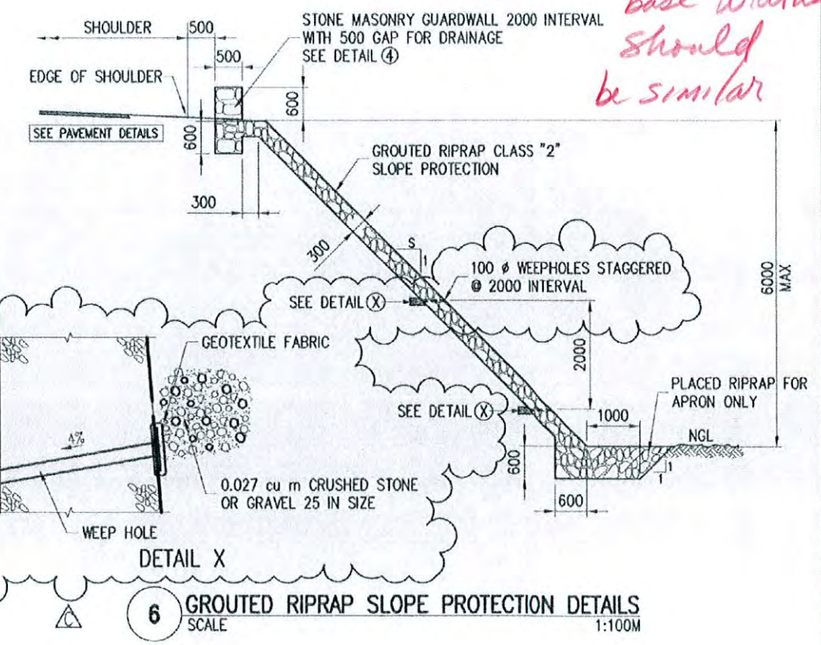
SHOULD FABRIC be placed

NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED.
2. STONE MASONRY SHALL BE CLASS "B".
3. STONE MASONRY RETAINING WALL SHALL BE CONSTRUCTED ON STABLE OR COMPACTED GROUND.
4. PLACE WEEP HOLES AT THE LOWEST POINTS FIRST WHERE FREE OUTLETS CAN BE OBTAINED.
5. REFER TO DWG NO. BD-RD-067 SCHEDULE FOR ACTUAL LOCATION OF STRUCTURES.

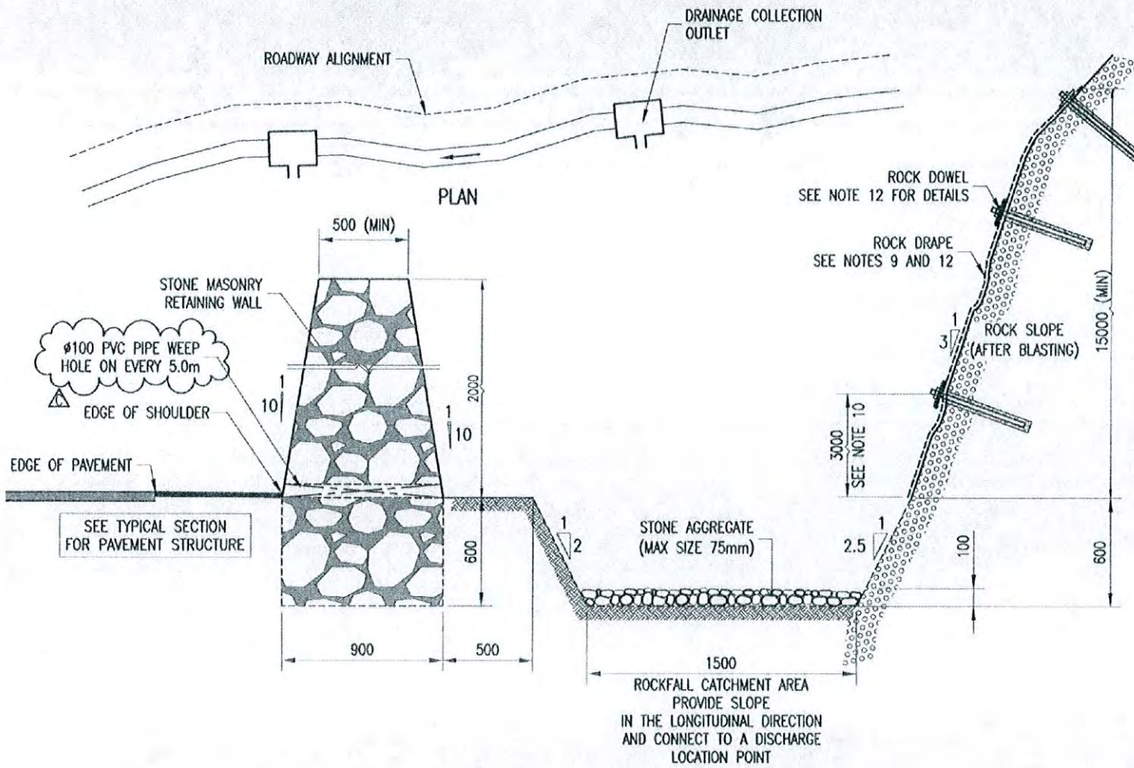


5 WEEP HOLE DETAILS
NOT TO SCALE

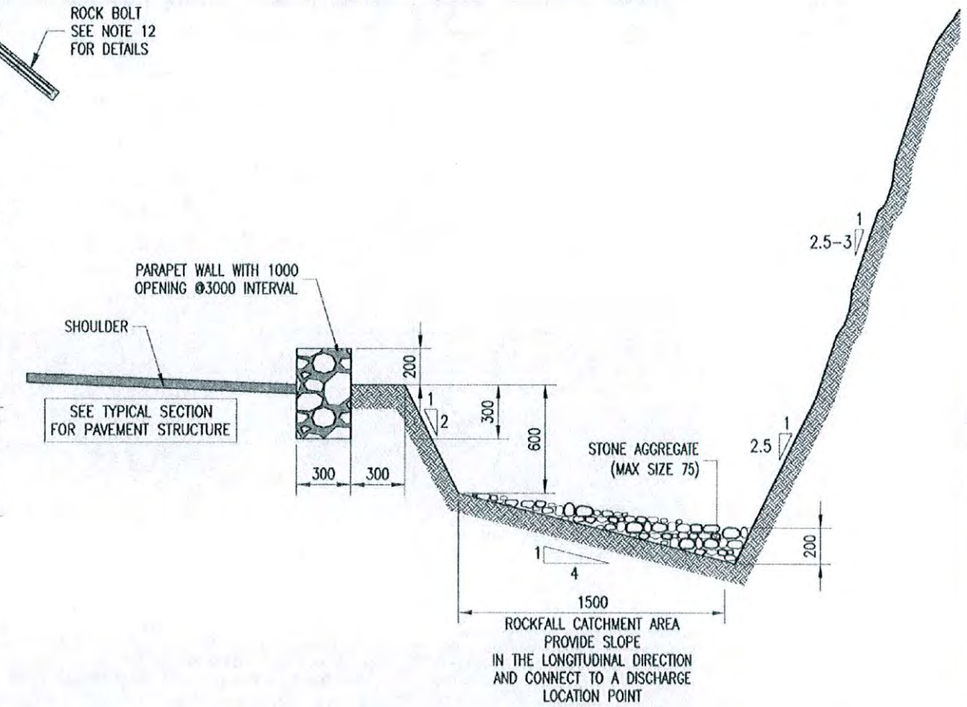


6 GROUTED RIPRAP SLOPE PROTECTION DETAILS
SCALE 1:100M

ISLAMIC REPUBLIC OF AFGHANISTAN and UNITED STATES AGENCY FOR INTERNATIONAL DEVELOPMENT	AFGHANISTAN INFRASTRUCTURE AND REHABILITATION PROGRAM (AIRP) — LBG/B&V The LOUIS BERGER Group, Inc., BLACK & VEATCH SPECIAL PROJECTS CORP. JOINT VENTURE	TITLE: DESIGN OF BAMYAN TO DUSHI ROAD, NH-07 (TASK ORDER 24) SEGMENT 1 — LOCATION: BAGHLAN AND BAMYAN PROVINCES	SHEET CONTENTS: RETAINING WALL AND SLOPE PROTECTION DETAILS	REVISION / DATE: 1 RENAMED 1 TO 1 — 29/03/10; 2 30% DESIGN SUBMITTAL — 29/03/10; 3 70% DESIGN SUBMITTAL, NO REV — 29/03/10; 4 70% DESIGN SUBMITTAL, MISC REV — 21/05/10	NAMES & SIGNATURE: DRAWN: S. SOLETE DESIGNED: N. THAO; CHECKED BY: J.M. TAYLOR USA, PE; APPROVED BY: ABOUD AL ZAIM USA, PE	DWG NO.: BD-RD-010; SCALE: AS SHOWN



1 CATCH TRENCH WITH RETAINING WALL
NOT TO SCALE



2 CATCH TRENCH WITH PARAPET WALL
NOT TO SCALE

NOTES:

1. USE ROCK BOLTS IN PLACE OF DOWELS AS NECESSARY IN AREAS WHERE LOOSE BLOCK OF ROCK IS GREATER THAN ONE CUBIC METER.
2. DOWELS – IN WATER CEMENT GROUT REINFORCING BAR WITH OUTER THREADS. 1000mm MIN OF EMBEDMENT INTO ROCK CAPABLE OF CARRYING A MINIMUM OF 10KN PULLOUT LOADS.
3. GALVANIZED STEEL CABLE – 16mm MINIMUM DIAMETER (SEE SPECIFICATION)
4. WIRE MESH – ASTM A-975-97, MINIMUM 3mm WITH OPENINGS MEASURING 80mm X 115mm (10%±), GALVANIZED. (SEE SPECIFICATION)
5. GROUT – USE NON-SHRINK WATER CEMENT GROUT. WATER-CEMENT RATIO SHALL BE 0.45
6. LOCATION OF ROCK DRAPE DRAPE SHALL BE VERIFIED AND MAY BE ADJUSTED TO SUIT ACTUAL FIELD CONDITIONS WITH APPROVAL OF THE ENGINEER.
7. USE GRADE 60 FOR REINFORCING BARS.
8. IF RESIN OR MECHANICAL ROCK BOLTS ARE USED, MANUFACTURERS RECOMMENDED DIAMETER SHALL BE USED.
9. ROCK SLOPE SHALL BE SCALED PRIOR TO PLACEMENT OF ROCK DRAPE, ROCK BOLTS OR OTHER STABILIZATION METHOD. ROCK DRAPE SHALL ONLY BE INSTALLED AFTER INSPECTION AND APPROVAL OF THE ENGINEER.
10. BOTTOM 3.0m OF THE ROCK FENCE SHALL BE LEFT OPEN FOR FREE FALL OF ROCK ONTO THE CATCH TRENCH.
11. REFER TO SCHEDULES FOR ACTUAL LOCATION OF STRUCTURES.
12. REFER TO DWG NO. BD-RD-048 FOR ROCK BOLT AND ROCK DRAPE DETAILS.
13. DIMENSION ARE IN MILLIMETERS UNLESS OTHERWISE NOTED.

CAN NOT FIND THESE LOCATIONS IN THE SCHEDULE

ISLAMIC REPUBLIC OF AFGHANISTAN and UNITED STATES AGENCY FOR INTERNATIONAL DEVELOPMENT	AFGHANISTAN INFRASTRUCTURE AND REHABILITATION PROGRAM (AIRP) LBG/B&V The LOUIS BERGER Group, Inc., BLACK & VEATCH SPECIAL PROJECTS CORP. JOINT VENTURE	TITLE DESIGN OF BAMYAN TO DUSHI ROAD, NH-07 (TASK ORDER 24) SEGMENT 1 LOCATION: BAGHLAN AND BAMYAN PROVINCES	SHEET CONTENTS CATCH TRENCH DETAILS	REVISION	DATE	NAMES & SIGNATURE	DWG NO.
				4 RENAMED 1 TO 4	29/03/10	DRAWN: A. CESPEDES DESIGNED: D. EGIN	BD-RD-047
				3 30% DESIGN SUBMITTAL	29/03/10	CHECKED BY: J.M. TAYLOR USA, PE	
				2 70% DESIGN SUBMITTAL, NO REV	29/03/10	APPROVED BY:	
				1 70% DESIGN SUBMITTAL, AS CLOUDED	21/05/10	ABOUD AL ZAIM USA, PE	SCALE: AS SHOWN

	VE RECOMMENDATION	Idea No.: __G-5 __ Segment___ Station_____
	Client: UNITED STATES AGENCY FOR INTERNATIONAL DEVELOPMENT Project: **DESIGN OF BAMYAN TO DUSHI ROAD** *AFGHANISTAN INFRASTRUCTURE AND REHABILITATION PROGRAM (AIRP*	

Current Design:
From Segment 1 Volume 2 of 5, Roadway Cross Sections
From Segment 1 Volume 2 of 5, Plan and Profile

Description of VE Alternative:

- Horizontal alignment may want to tweak in certain area to reduce the amount of rock cut. Along with the rock cut there will be need to rock bolt at certain locations depending on the potential for block failure. Below are several examples and does not reflect the entire Segment 1
    - Sta 1+173+ to 1+480 push alignment east to reduce rock cut
    - Sta 2+700 to 2+920 realign due to rock cut?
    - Sta 3+420 to 3+720, Sta 5+960 to 6+140 and Sta 6+440 to 6+780 can we realign?
        - Note these are based on the pdf drawings
- How is the surface of the common slopes stabilized without vegetation.
- It is recommended that additional soil borings be performed for the proposed roadway.
- At the following stations the slopes are very steep. From the plans and documents that were reviewed there is no plan showing areas of rock excavation and areas of common material. For common material, calculations should be provided with subsurface information to evaluate the stability of the slopes through these areas. For the rock cut areas there should be certain areas identified for rock bolting and rock draping.
    - Sta. 1+320 to 1+620 1H to 1V common
    - Sta. 1+580 to 2+200
    - Sta.2+720 to 2+920
    - Sta. 3+620 to 3+760 0.5H to 1 V
    - Sta. 5+340 to 5+360
    - Sta. 5+960 to 6+140 1H:1V
    - Sta. 6+440 to 6+780 1H:1V
    - Sta. 7+160 to 7+320 0.4H:1V
    - Sta. 7+700 to 7+860 0.7H:1V
    - Sta 8+000 to 8+120 Rock Cut 0.33H:1V
    - Sta. 11+140 to 11+400 1H:1V
    - Sta. 14+400 to 14+520
    - Sta. 14+800 to 15+140 1H:1V (68 m High)
    - Sta. 15+560 to 15+660 Rock Cut
    - Sta. 15+760 to 15+840 1H:1V
    - Sta. 15+960 to 16+560 1H:1V
    - Sta. 16+760 to 16+860 1H:1V
    - Sta. 17+500 to 17+520 1H:1V Can these sections be made flatter
    - Sta. 18+480 to 18+500 1H:1V Can these sections be made flatter
    - Sta. 18+540 to 18+940 Rock Cut

Advantages:

Reduction in cost due to reduction in rock removal due to alignment changes.

Disadvantages:

Additional cost due to flattening out of embankment slopes.

Cost Summary			
	Capital Cost	O&M Cost	Total
Original			
Proposed			
Savings			

Discussion of VE Alternative - Idea No. :

	VE RECOMMENDATION	Idea No.: __G-6 __ Segment___ Station_____
	Client: UNITED STATES AGENCY FOR INTERNATIONAL DEVELOPMENT Project: **DESIGN OF BAMYAN TO DUSHI ROAD** *AFGHANISTAN INFRASTRUCTURE AND REHABILITATION PROGRAM (AIRP*	

Current Design:
Pavement Design

Description of VE Alternative:

Provide more information for pavement design criteria along with calculations.
In the criteria it is mentioned that there is a 5% traffic growth. What is the current traffic volumes?
The structural number for the pavement proposed is approximately 5 what is the required structural number for the ten year design period mentioned?
The Amendment to the Technical Specification Section 400 discusses asphalt binder course shouldn't it refer to asphalt base course?
Section 417 Full Depth HAM Patching where will this be used.
Section 500 Rigid Pavement where is it used?

According to plans wearing course is 100 mm and 100 mm base course. The wearing course consists of a maximum 19 mm aggregate and the base course has a 25 mm max aggregate.

A better option may be to use
1- 50 mm lifts of wearing course
2 – 75 mm base course

Advantages:

This will reduce cost. Based on the cost estimate the wearing cost is $24.00 per square meter and the base course is $16.50 per square meter.

Disadvantages:

Cost Summary			
	Capital Cost	O&M Cost	Total
Original	$27,973,350.00		
Proposed	$25,868,100.00		
Savings	$2,105,250.00		

- Note cost includes base course and wearing course

Discussion of VE Alternative - Idea No. :

	VE RECOMMENDATION	Idea No.: __G-7 __ Segment___ Station_____
	Client: UNITED STATES AGENCY FOR INTERNATIONAL DEVELOPMENT Project: **DESIGN OF BAMYAN TO DUSHI ROAD** *AFGHANISTAN INFRASTRUCTURE AND REHABILITATION PROGRAM (AIRP*	

Current Design:
General comment to Segment 1 and Segment 2

Description of VE Alternative:

1. Criteria should be set for the contractor to follow to determine which areas are to be rock bolted.
2. Mapping through the entire area should have been performed and anticipated areas to be bolted should have been identified by stations.
3. If and where directed item for bolting and draping should be provided to allow the contractor to include a cost.
4. Currently from the Subsurface Investigation Survey Appendix F the rock described is diorite and granite. A plan should be developed that shows the limits of rock whether in the above survey or at another location in the contract documents that gives the contractor limits of rock to estimate his rock excavation/blasting on the project.

Advantages:

By mapping and identifying areas that may need to be bolted may limit the additional costs that may arise during construction. Because of the nature of this task there will most likely be over runs in this area either way.

Disadvantages:

Cost Summary			
	Capital Cost	O&M Cost	Total
Original			
Proposed			
Savings			

Discussion of VE Alternative - Idea No. :

	VE RECOMMENDATION	Idea No.: __G-8 __ Segment___ Station_____
	Client: UNITED STATES AGENCY FOR INTERNATIONAL DEVELOPMENT Project: **DESIGN OF BAMYAN TO DUSHI ROAD** *AFGHANISTAN INFRASTRUCTURE AND REHABILITATION PROGRAM (AIRP*	

Current Design:
From Segment 2 Volume 2 of 5, Roadway Cross Sections
From Segment 2 Volume 2 of 5, Plan and Profile

Description of VE Alternative:

- Push alignment north from Sta 51+620 to 51+720 to reduce rock cut?
- How is the surface of the common slopes stabilized without vegetation.
- It is recommended that additional soil borings be performed for the proposed roadway.
- At the following locations the slopes are very steep, and it is unclear what material the slope consists of. From the plans and documents that were reviewed there is no plan showing areas of rock excavation and areas of common material. For common material, calculations should be provided with subsurface information to evaluate the stability of the slopes through these areas. In addition the subsurface investigation report states that safe slopes for the diorite should be 1 vertical to 3 horizontal and the granite should be 3 vertical to 1 horizontal. A map should have been presented in the report that depicts limits of rock excavation. Also any of the rock cuts mentioned below are they within the diorite locations if so shouldn't they be flattened out as per report.
    - Sta. 45+420 to 45+640 1H to 1V common
    - Sta. 45+660 to 45+880 0.3 : 1 Common or rock?
    - Sta.47+740 to 47+880 1:1 Common?
    - Sta. 48+140 to 48+320 1H to 1 V common?
    - Sta. 49+080 to 49+440 1:1 Common?
    - Sta. 51+620 to 52+040 0.3H:1V Rock?
    - Sta. 52+140 to 52+200 0.3H:1V Rock?
    - Sta. 53+140 to 53+460 0.3H:1V Rock?
    - Sta. 53+480 to 53+780 1H:1V Common or rock?
    - Sta. 54+940 to 55+120 0.4H:1V Rock?
    - Sta. 56+740 to 56+780 0.4H:1V Rock?
    - Sta. 56+840 to 57+240 0.4H:1V Rock?
    - Sta. 57+700 to 57+880 0.3H:1V Rock?
    - Sta. 60+580 to 61+260 1H:1V Common?
    - Sta. 61+900 to 62+240 1H:1V Common?
    - Sta. 62+540 to 62+680 1H:1V Common?
    - Sta. 62+780 to 63+080 1H:1V Common?
    - Sta. 63+200 to 63+260 1H:1V Common?
    - Sta. 63+380 to 63+580 0.6H:1V Rock?
    - Sta. 64+640 to 65+060 1H:1V Common?
    - Sta. 69+920 to 70+060 1H:1V Common?
    - Sta. 71+700 to 71+800 0.7H:1V Common or rock?
    - Sta. 75+740 to 75+940 1H:1V Common?

- Sta. 77+280 to 77+320 0.3H:1V Rock?
- Sta. 77+540 to 77+700 1H:1V Common or rock?
- Sta. 77+720 to 77+760 0.7H:1V Common or rock?
- Sta. 78+120 to 78+160 0.3H:1V Rock?
- Sta. 78+340 to 78+420 0.3H:1V Rock?
- Sta. 79+240 to 79+340 0.3H:1V Rock?
- Sta. 79+780 to 79+940 1H:1V Common or rock?

Advantages:

Reduction in cost due to reduction in rock removal due to alignment changes.

Disadvantages:
Additional cost due to flattening out of embankment slopes.

Cost Summary			
	Capital Cost	O&M Cost	Total
Original			
Proposed			
Savings			

Discussion of VE Alternative - Idea No. :

Appendix B

Civil/Highway

AECOM

SUMMARY OF VALUE ENGINEERING STUDY RESULTS

Project: **Design of Bamyan to Dushi Road** Discipline: **Civil/Highway**

Location **Kabul, Afghanistan**

Date: **June 2010**

Client: **United States Agency for International Development**

Idea No.	Description	Category*				Savings	Cost
		Value Engineering - Quantifiable	Value Engineering - Not Quantifiable	Design Criteria	Drawing Review Comments		
C-1	Horizontal alignment			x			
C-2	Sight Distance			x			
C-3	Short Superelevation Length			x			
C-4	Insufficient transition lengths			x			
C-5	Substandard Curvature			x			
C-6	Retaining Walls	x				$60,720.00	
C-7	Tweaking Roadway Alignment	x				$2,312.00	
C-8	Roadway Alignment	x				$45,280.00	
C-9 (A-K)	Horizontal Alignment Changes		x				
C-10 (A-F)	Vertical Alignment Changes		x				
C-11	Warranted Climbing lane locations		x				
C-12	Broken back horizontal curves		x				
C-13	Short Sections of normal crowns		x	x			
C-14 (A-G)	Vertical Alignment		x	x			
C-15 (A-P)	Horizontal Alignment		x	x			
C-16	Schedule of Road signs, no passing zones			x	x		
C-17	Length of masonry gaurdwall at three bridges			X			
17	**Totals**	**3**	**7**	**10**	**1**	**$108,312.00**	**0**

Total Saved **$108,312.00**

*Note that Value Engineering Ideas may qualify for more than one category

	VE RECOMMENDATION	Idea No.: __C-1 __ Segment___ Station_____
	Client: UNITED STATES AGENCY FOR INTERNATIONAL DEVELOPMENT Project: **DESIGN OF BAMYAN TO DUSHI ROAD** *AFGHANISTAN INFRASTRUCTURE AND REHABILITATION PROGRAM (AIRP)*	

Current Design:

Design Criteria used for the horizontal alignment design of the roadway:

1. Maximum and Minimum Speed : 80kph and 40kph
2. Maximum superelevation rate: 8%
3. Maximum Longitudinal gradient:8%
4. Side slope ratio, cut in common excavation: 1.5H:1V (H<2.0m) and 1H:1V (H>2.0m)
5. Sight Distances, Stopping sight distance(80kph) :130m
6. Design Vehicle for widening of pavement width: WB-12

Description of VE Alternative:

1. The design speed shall be determined based on the functionality of the roadway and shall be set as one value. Based on the functionality and terrain of each segment of the roadway, the design speed can be different from segment to segment but each segment should have only one design speed. Based on the MPW standards, the design speed for mountainous terrain should be 50kph. Also note that the posted speed limit shall be lower than the design speed chosen for each segment of the road.

   Within a segment of the road, there are always situations that the design standard cannot be met due to site constraints and design exceptions must be granted. Since most of the design standard values are directly linked to the design speed, it is a common mistake to lower the design speed from spot to spot to meet the site conditions instead of determining the maximum safe operating speed that the design can accommodate and assessing whether design exceptions are justifiable based on the associated impacts to functionality, operation, safety, communities, environment, and construction costs. If the design exceptions are justifiable, mitigation measures must be implemented for the maximum safe operating speed, which is lower than the design speed. The mitigation measures typically include installation of signage, such as the speed limit warning signs, and positive roadside protection systems, such as guard walls. It is important to note that, in Highway Engineering, once the design speed is set, it shall not be changed.

   Based on review of the topographic maps and the MPW Interim Road and Highway Standards, the VE team recommends the design speeds be set as: 50kph for populated areas and 80kph for the others. The breakdown of these design speed limits is shown in the table below:

From	To	Design Speed	From	To	Design Speed
0+000	3+200	50kph	36+000	37+000	50kph
3+200	6+100	80kph	37+000	41+500	80kph
6+100	7+800	50kph	41+500	42+500	50kph
7+800	24+500	80kph	42+500	61+200	80kph
24+500	25+500	50kph	61+200	66+400	50kph
25+500	30+800	80kph	66+400	71+300	80kph
30+800	31+900	50kph	71+300	76+900	50kph
31+900	36+000	80kph	76+900	85+500	80kph

2. Being a low speed road and also the fact that it snows in the project limits, it is advised to reduce the maximum superelevation to 6%. A transition curve or tangent transition is required between two superelevated curves. The designer should make every effort to meet this requirement. However, site constraints may preclude providing sufficient transition in certain areas. For such locations, a design exception should be made and mitigation measures should be implemented. As mitigation measure, where there are s-curves, a maximum superelevation rate of 4% is recommended to reduce the adverse effect caused by lack of tangent transition length.

3. Based on the MPW standards and the fact that this route will be used by trucks, the maximum longitudinal gradient should be 6% wherever possible.

4. The excavation height specified for each slope seems incorrect. The 1H:1V slope does not appear to be a stable slope for common materials in a permanent condition, regardless of the excavation height.

5. The Stopping Sight Distance (SSD) for 80kph as per AASHTO is 160m. SSD for 50kph shall be included.

6. The standard drawings include a widening table for WB-15 trucks. Correction values need to be applied to get the values for WB-12 trucks. Values in the Widening Table and the plans should be revised accordingly.

Advantages:

1. Conformance to the AASHTO and MWP standards

Disadvantages:

1. Increase in project cost

Cost Summary			
	Capital Cost	O&M Cost	Total
Original			
Proposed			
Savings	N/A	N/A	N/A

	VE RECOMMENDATION	Idea No.: __C-2 __ Segment___ Station_____
	Client: UNITED STATES AGENCY FOR INTERNATIONAL DEVELOPMENT Project: **DESIGN OF BAMYAN TO DUSHI ROAD** *AFGHANISTAN INFRASTRUCTURE AND REHABILITATION PROGRAM (AIRP)*	

Current Design:
Design Criteria- Sight Distance (passing and Stopping)
Schedule of No Passing Zones (BD-SS-004)

Description of VE Alternative:
Passing Sight Distance:

Passing zones should be located preferably on a tangent roadway segment and must satisfy the passing sight distance corresponding to the selected design speed. The available sight distance of a roadway segment must be determined from the horizontal and vertical alignments, as well as other roadside features that can be obstructions to the line of sight. The selection of a passing zone must be based on the available sight distance than meets the minimum length for passing as specified in the AASHTO standards. For the design speed of 50kph, for example, the minimum value for passing sight distance is 345m. It is important to note that, if a passing zone contains a crest curve, the sight distance that the curve can provide must meet the passing sight distance value derived from the design speed for that particular roadway segment. Following stretches which have been delineated as passing zones (for right side) under the current design have crest curves with insufficient sight distance.(Note: They do not meet the passing sight distance requirements for 50kph and 80kph. See VE comments on design speed establishment.). The designer should revisit the passing sight distance requirements and accordingly establish the no passing zones for the project.

START	END	START	END	START	END	START	END	START	END
0+340	0+460	18+020	18+400	40+420	41+060	59+780	59+960	72+920	73+400
1+600	3+160	18+760	19+200	42+240	45+260	60+460	61+140	73+500	73+680
3+660	3+780	19+860	21+800	46+280	46+400	61+500	62+240	73+780	74+000
5+240	6+380	22+040	22+280	47+760	48+800	63+400	64+120	74+160	76+680
10+380	10+760	22+780	23+660	48+960	49+360	64+900	66+340	76+880	77+080
11+120	11+580	23+900	24+020	49+780	50+180	66+520	67+780	77+200	77+940
11+720	14+000	27+900	28+180	50+520	51+000	69+280	69+460	79+240	79+900
15+200	15+400	28+380	28+640	51+200	51+420	69+560	69+740	81+240	81+480
15+700	15+960	33+900	34+740	55+900	56+540	70+440	70+560	84+440	84+680
16+740	16+920	35+260	35+380	57+020	57+280	71+780	71+960		
17+160	17+880	36+220	36+480	57+840	58+180	72+180	72+760		

Stopping Sight Distance:

The following vertical curves do not meet the required stopping sight distance of 65m for 50kph:
PVI Stations 0+015, 0+905.280, 35+450, and 85+343.
It is recommended that the vertical curve lengths at these locations be increased to meet the required sight distance.

Advantages:

1. Conformance to AASHTO standards.
2. Improve safety.

Disadvantages:

1. None

Cost Summary			
	Capital Cost	O&M Cost	Total
Original			
Proposed			
Savings	N/A	N/A	N/A

	VE RECOMMENDATION	Idea No.: __C3 __ Segment___ Station_____
	Client: UNITED STATES AGENCY FOR INTERNATIONAL DEVELOPMENT Project: **DESIGN OF BAMYAN TO DUSHI ROAD** *AFGHANISTAN INFRASTRUCTURE AND REHABILITATION PROGRAM (AIRP)*	

Current Design:
Under the current design, the length of curve is too short at many locations, resulting in short superelevated sections.

Description of VE Alternative:

A short superelevated curve section is typically the result of insufficient curve length. Based on the AASHTO standards, the minimum curve length should be three times of the design speed. At the design speed of 50kph (which is 14m per second), it takes less than 2 seconds to travel through a 25m superelevated curve section; that is less than the typical 2 seconds reaction time of an ordinary driver. Many curves in the current design have a superelevated length of approximately 25m. It is meaningless to superelevate a curve for such a short distance. It is recommended that the design change to meet the minimum curve length requirement as specified by the AASHTO standards. However, it may become too costly to meet this requirement at some locations due to site constraints. In that case, a minimum of 30m of superelevation lengths is recommended.

The suggested improvements are:

Option 1: Change the radius to increase the curve length to meet the AASHTO recommended value, or to provide at least 30m long of superelevated section. This option applies to areas where the approaching roadways are designed for 80kph.

Option 2: Reduce the superelevation to 6% on curves that require a superelevation rate more than 6% to lengthen the superelevated section. The safe operating speed must be determined based on the actual radius and the 6% superelevation and, if this speed is less than the design speed, speed limit warning sign must be installed as the mitigation measure. This option applies to areas where the approaching roadways are designed for 50kph.

Below is a list of curves which have short superelevation lengths:

Curve number 17, 33, 34, 65, 70, 74, 81, 104, 109, 119, 120, 121, 135, 139, 144, 145, 154, 155, 195, 198, 210, 211, 214, 215, 224, 225, 234, 235, 252, 256, 270, 271, 272, 276, 280, 282, 283, 286, 296, 311, 321, 335, 339, 355, 361, and 366.

Advantages:

1. Conformance to AASHTO standards.
2. Improve safety.

Disadvantages:

1. Increase construction cost.

	VE RECOMMENDATION	**Idea No.: __C3 __** **Segment___ Station_____**
	Client: UNITED STATES AGENCY FOR INTERNATIONAL DEVELOPMENT Project: **DESIGN OF BAMYAN TO DUSHI ROAD** *AFGHANISTAN INFRASTRUCTURE AND REHABILITATION PROGRAM (AIRP)*	

Cost Summary			
	Capital Cost	O&M Cost	Total
Original			
Proposed			
Savings	TBD by the Designers	N/A	TBD by the Designers

	VE RECOMMENDATION	Idea No.: __C-4 __ Segment___ Station_____
	Client: UNITED STATES AGENCY FOR INTERNATIONAL DEVELOPMENT Project: **DESIGN OF BAMYAN TO DUSHI ROAD** *AFGHANISTAN INFRASTRUCTURE AND REHABILITATION PROGRAM (AIRP*	

Current Design:
Insufficient transition lengths between two curves or in cases where there are no transition lengths.

Description of VE Alternative:
The MPW Interim Road and Highway Standards require provision of transition curves for horizontal curves, which are superelevated and have radii sharper than the curvature specified in Table 6. Although a transition curve is specified, a tangent transition will serve the same purpose.

According to AASHTO standards, the maximum relative gradient (rate of application of superelevation) for 80kph and 40kph are 0.5% (1 in 200) and 0.7% (1 in 143), respectively. As shown on drawing number BD-RD-008, the current design uses 1% minimum relative gradient, which exceeds the recommended values by AASHTO for the design speeds of 40kph and 80kph. Therefore, it is suggested that the design should control this relative gradient per AASHTO standards. Based on the MPW Interim Road and Highway Standards and VE recommendations on design speed establishment, some segments of this roadway shall be designed for 50kph, which requires a transition rate of 1 in 154. Where site constraints warrant design exceptions for some critical design elements, the safe operating speeds are controlled by those non-standard design elements and the transition length can be adjusted accordingly per AASHTO standards. However, a longer transition length is always desirable. Placing entire transition length within the curve (for example, transition for S-curves layout) can result in insufficient superelevation for a significant portion of the curve and create an unsafe condition to the traveling public.

Where the required transition lengths cannot be provided due to site constraints, the superelevation should be controlled to 6% maximum to mitigate the adverse effect caused by excessive transition rate. The safe operating speed should be determined based on the radius and the actual superelevation provided, and the advisory speed limit must be posted accordingly (speed reduction to 20kph or 25kph is required at many of the locations that require design exceptions).

Below is a list of curves which have insufficient or no transition lengths for the attainment of superelevation.
Curve numbers:
6, 7, 28, 29, 32, 33, 41, 42, 57, 58, 60, 61, 68, 69, 70, 71, 87, 88, 89, 90, 92, 93, 102, 103, 104, 105, 106, 109, 110, 119, 120, 121, 128, 129, 135, 136, 144, 145, 147, 148, 154, 155, 159, 160, 162, 163, 164, 165, 166, 167, 169, 170, 171, 174, 175, 185, 186, 197, 198, 201, 203, 204, 214, 215, 227, 228, 232, 233, 270, 271, 282, 283, 284, 289, 311, 312, 314, 315, and 351.

Advantages:

1. Conformance to AASHTO and MPW design standards

Disadvantages:

1. Additional earthwork required in some areas

	VE RECOMMENDATION	**Idea No.: __C-4 __** **Segment___ Station_____**
	Client: UNITED STATES AGENCY FOR INTERNATIONAL DEVELOPMENT Project: **DESIGN OF BAMYAN TO DUSHI ROAD** *AFGHANISTAN INFRASTRUCTURE AND REHABILITATION PROGRAM (AIRP*	

Cost Summary			
	Capital Cost	O&M Cost	Total
Original			
Proposed			
Savings	N/A	N/A	N/A

	VE RECOMMENDATION	Idea No.: __C-5 __ Segment___ Station_____
	Client: UNITED STATES AGENCY FOR INTERNATIONAL DEVELOPMENT Project: **DESIGN OF BAMYAN TO DUSHI ROAD** *AFGHANISTAN INFRASTRUCTURE AND REHABILITATION PROGRAM (AIRP*	

Current Design:
Substandard curvature on horizontal curves.

Description of VE Alternative:

Below is a list of curves which have radii less than the 80m minimum radius specified in the MPW standards for 50kph design speed.
Curve numbers 4, 11, 15, 60, 62, 77, 84, 109, 119, 125, 153, 154, 162, 187, 198, 204, 229, 232, 237, 246, 251, 252, 254, 278, 279, 283, 304, 314, 316, 340, 341, 346, 347, 350, 351, 352, 355, 359, 363, and 370.
It is suggested that the radii to be increased to 80m to meet the standards.

Advantages:

1. Conformance to the MPW standards

Disadvantages:

1. Increase in project cost

Cost Summary			
	Capital Cost	O&M Cost	Total
Original			
Proposed			
Savings	N/A	N/A	N/A

	VE RECOMMENDATION	Idea No.: __C-6 __ Segment___ Station_____
	Client: UNITED STATES AGENCY FOR INTERNATIONAL DEVELOPMENT Project: **DESIGN OF BAMYAN TO DUSHI ROAD** *AFGHANISTAN INFRASTRUCTURE AND REHABILITATION PROGRAM (AIRP)*	

Current Design:

Profile from Sta. 13+000 to Sta. 13+300:

1. Profile results in installation of retaining walls along left side of the road.

Description of VE Alternative:

1. It appears that the profile in this area can be lowered to eliminate the retaining walls or at least to reduce the wall height.

Advantages:

1. Eliminate the need for 160m of retaining walls or reduce the wall height.

Disadvantages:

None.

Cost Summary			
	Capital Cost	O&M Cost	Total
Original			
Proposed			
Savings	$60,720.00	N/A	$60,720.00

	VE RECOMMENDATION	Idea No.: __C-7__ Segment___ Station_____
	Client: UNITED STATES AGENCY FOR INTERNATIONAL DEVELOPMENT Project: **DESIGN OF BAMYAN TO DUSHI ROAD** *AFGHANISTAN INFRASTRUCTURE AND REHABILITATION PROGRAM (AIRP)*	

Current Design:

Roadway alignment at Curves #270 and #272:

1. Curved alignment.
2. Short superelevated section.

Description of VE Alternative:

1. It appears that this segment of alignment can be improved with a longer tangent to eliminate Curve #271 and two flatter curves on both ends. (See the attached sketch.)

Advantages:

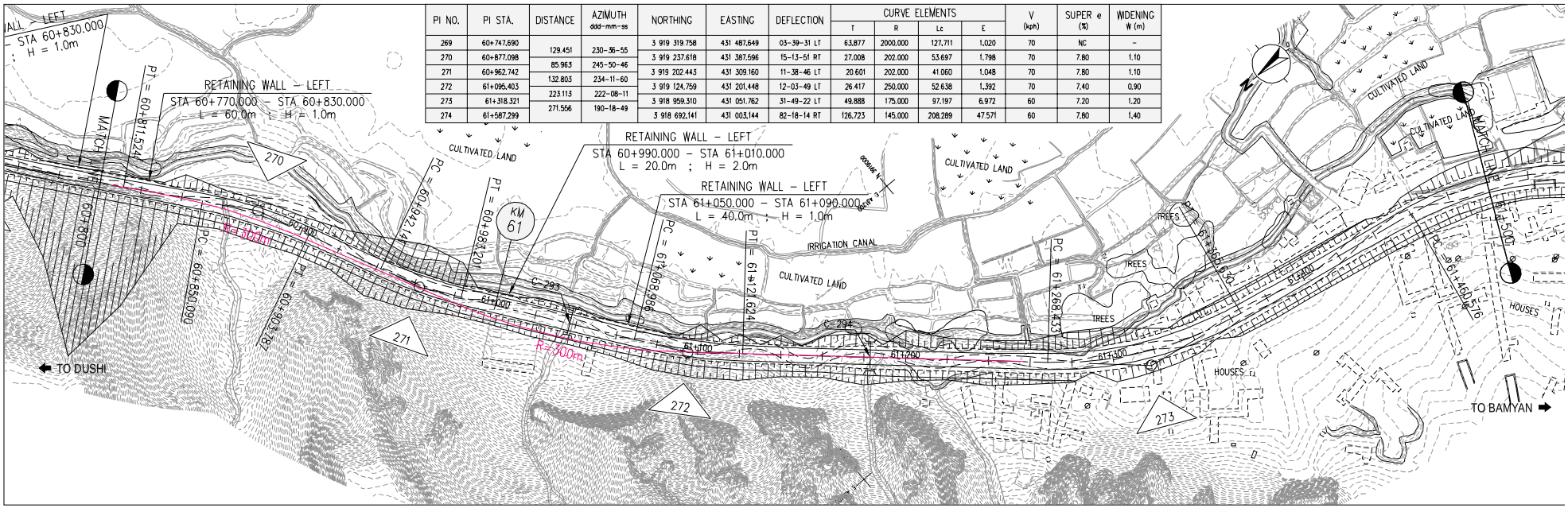
1. Provide better roadway geometry.
2. Eliminate short superelevated section.
3. Eliminate 60m of retaining walls.
4. Minimize impacts to cultivated lands on the left side of the road.

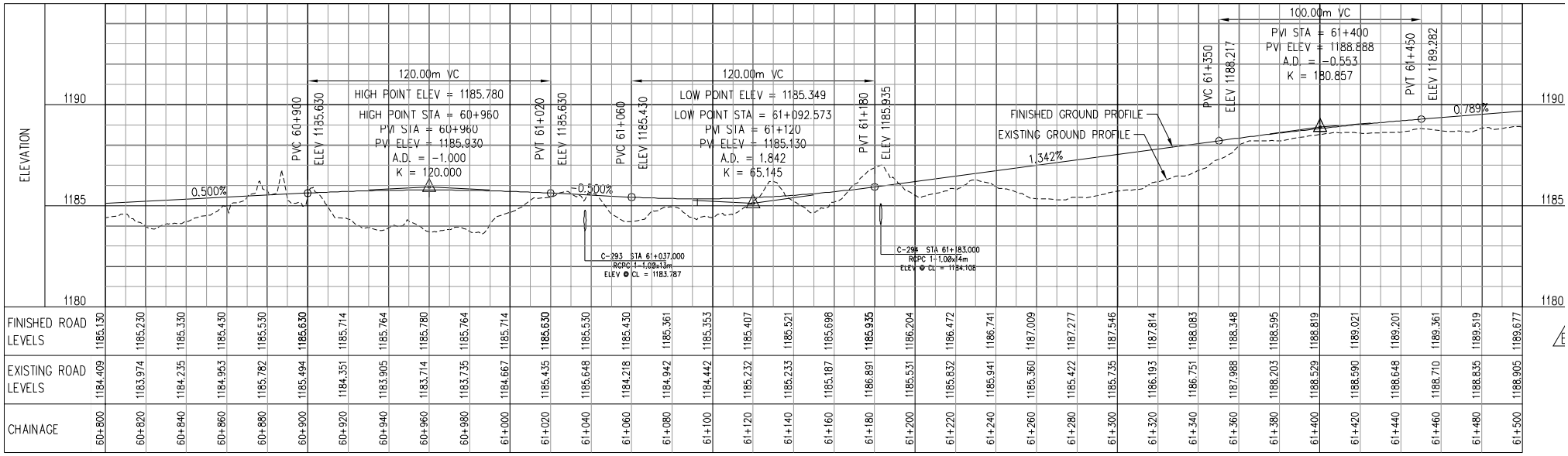
Disadvantages:

Require additional rock excavation.

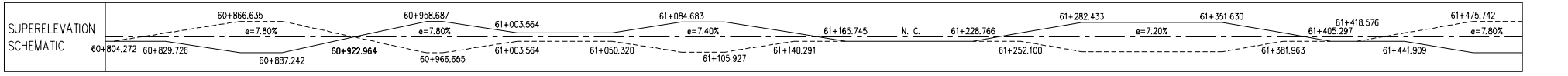
Cost Summary			
	Capital Cost	O&M Cost	Total
Original			
Proposed			
Savings	$2,312.00	N/A	$2,312.00

PI NO.	PI STA.	DISTANCE	AZIMUTH ddd-mm-ss	NORTHING	EASTING	DEFLECTION	CURVE ELEMENTS T	R	Lc	E	V (kph)	SUPER e (%)	WIDENING W (m)
269	60+747.690			3 919 319.758	431 487.649	03-39-31 LT	63.877	2000.000	127.711	1.020	70	NC	–
		129.451	230-36-55										
270	60+877.098			3 919 237.618	431 387.596	15-13-51 RT	27.008	202.000	53.697	1.798	70	7.80	1.10
		85.963	245-50-46										
271	60+962.742			3 919 202.443	431 309.160	11-38-46 LT	20.601	202.000	41.060	1.048	70	7.80	1.10
		132.803	234-11-60										
272	61+095.403			3 919 124.759	431 201.448	12-03-49 LT	26.417	250.000	52.638	1.392	70	7.40	0.90
		223.113	222-08-11										
273	61+318.321			3 918 959.310	431 051.762	31-49-22 LT	49.888	175.000	97.197	6.972	60	7.20	1.20
		271.556	190-18-49										
274	61+587.299			3 918 692.141	431 003.144	82-18-14 RT	126.723	145.000	208.289	47.571	60	7.80	1.40





CHAINAGE	FINISHED ROAD LEVELS	EXISTING ROAD LEVELS
60+800	1185.130	1184.409
60+820	1185.230	1183.974
60+840	1185.330	1184.235
60+860	1185.430	1184.953
60+880	1185.530	1185.782
60+900	1185.630	1185.494
60+920	1185.714	1184.351
60+940	1185.764	1183.905
60+960	1185.780	1183.714
60+980	1185.764	1183.735
61+000	1185.714	1184.667
61+020	1185.630	1185.435
61+040	1185.530	1185.648
61+060	1185.430	1184.218
61+080	1185.361	1184.942
61+100	1185.353	1184.442
61+120	1185.407	1185.232
61+140	1185.521	1185.233
61+160	1185.698	1185.187
61+180	1185.935	1186.891
61+200	1186.204	1185.531
61+220	1186.472	1185.832
61+240	1186.741	1185.941
61+260	1187.009	1185.360
61+280	1187.277	1185.422
61+300	1187.546	1185.735
61+320	1187.814	1186.193
61+340	1188.083	1186.751
61+360	1188.348	1187.988
61+380	1188.595	1188.203
61+400	1188.819	1188.529
61+420	1189.021	1188.590
61+440	1189.201	1188.648
61+460	1189.361	1188.710
61+480	1189.519	1188.835
61+500	1189.677	1188.905



ISLAMIC REPUBLIC OF AFGHANISTAN and UNITED STATES AGENCY FOR INTERNATIONAL DEVELOPMENT	**AFGHANISTAN INFRASTRUCTURE AND REHABILITATION PROGRAM (AIRP)** The LOUIS BERGER Group, Inc., BLACK & VEATCH SPECIAL PROJECTS CORP. JOINT VENTURE	TITLE: DESIGN OF BAMYAN TO DUSHI ROAD, NH-07 (TASK ORDER 24) SEGMENT 2	SHEET CONTENTS: **PLAN AND PROFILE STA 60+800 - STA 61+500**	REVISION / DATE	NAMES & SIGNATURE / DWG NO.
		LOCATION: BAGHLAN AND BAMYAN PROVINCES	SCALE: HOR. 1:2000 VERT. 1:200	A RENAMED 0 TO A 19/12/09	DRAWN: S. SOLETE DESIGNED: N. THAO
				A 30% DESIGN SUBMITTAL 19/12/09	CHECKED BY: R.G. BANAN Phil, PE
				B 70% DESIGN SUBMITTAL, GEN REV 29/03/10	APPROVED BY:
				C 70% DESIGN SUBMITTAL, GEN REV 21/05/10	**ABOUD AL ZAIM** USA, PE
					BD-PP-0
					SCALE: AS S

	VE RECOMMENDATION	Idea No.: __C-8 __ Segment___ Station_____
	Client: UNITED STATES AGENCY FOR INTERNATIONAL DEVELOPMENT Project: **DESIGN OF BAMYAN TO DUSHI ROAD** *AFGHANISTAN INFRASTRUCTURE AND REHABILITATION PROGRAM (AIRP)*	

Current Design:

Roadway alignment at Curve #306:

1. Roadway alignment causes reduction in river x-section at Sta. 69+040.
2. Retaining walls along river bank.

Description of VE Alternative:

1. Realign the tangent segment to avoid the river.
2. Provide a larger radius curve to allow for replacement of retaining walls with riprap along the river bank. (See the attached sketch.)

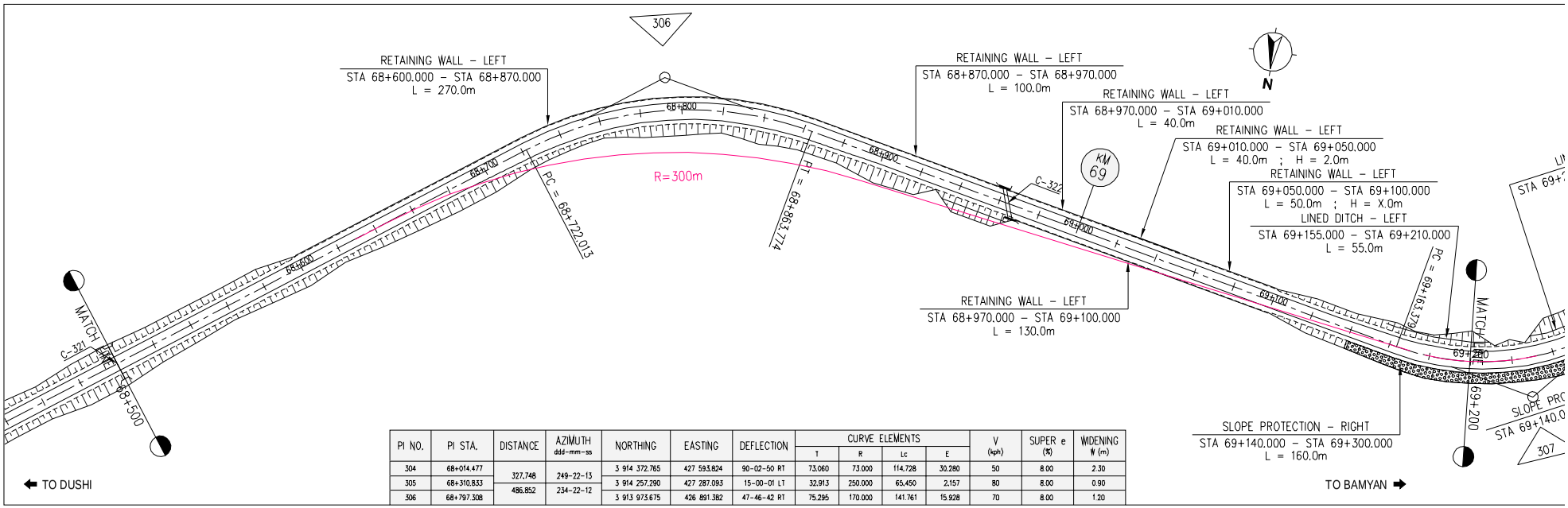
Advantages:

1. Avoid impact to river section.
2. Allow installation of riprap to replace a significant portion of the retaining wall along the river bank.

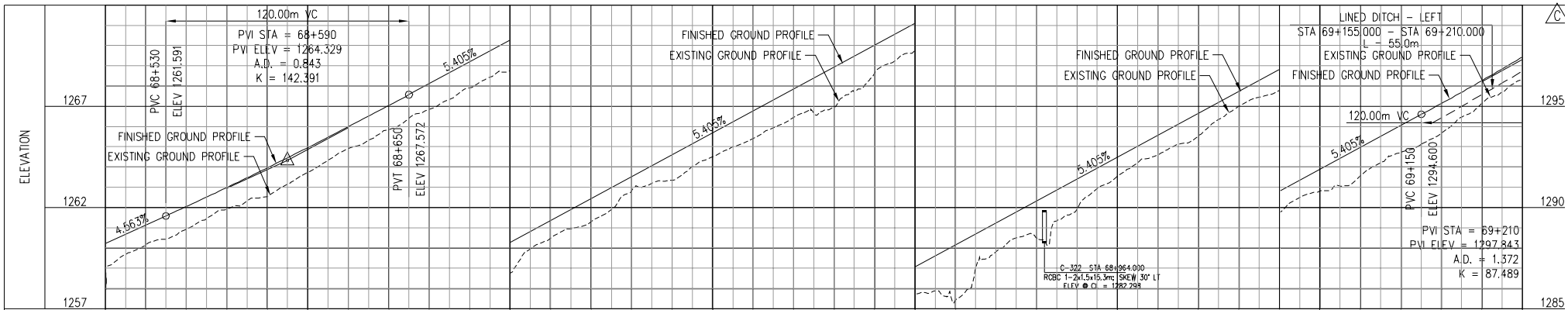
Disadvantages:

None.

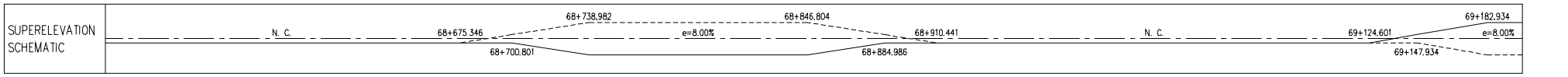
Cost Summary			
	Capital Cost	O&M Cost	Total
Original			
Proposed			
Savings	$45,280.00	N/A	$45,280.00



PI NO.	PI STA.	DISTANCE	AZIMUTH ddd-mm-ss	NORTHING	EASTING	DEFLECTION	CURVE ELEMENTS T	R	Lc	E	V (kph)	SUPER e (%)	WIDENING W (m)
304	68+014.477			3 914 372.765	427 593.824	90-02-50 RT	73.060	73.000	114.728	30.280	50	8.00	2.30
		327.748	249-22-13										
305	68+310.833			3 914 257.290	427 287.093	15-00-01 LT	32.913	250.000	65.450	2.157	80	8.00	0.90
		486.852	234-22-12										
306	68+797.308			3 913 973.675	426 891.382	47-46-42 RT	75.295	170.000	141.761	15.928	70	8.00	1.20



CHAINAGE	FINISHED ROAD LEVELS	EXISTING ROAD LEVELS
68+500	1260.222	1259.077
68+520	1261.135	1260.169
68+540	1262.051	1260.941
68+560	1262.992	1261.919
68+580	1263.960	1262.549
68+600	1264.957	1263.738
68+620	1265.982	1264.913
68+640	1267.035	1265.851
68+660	1268.113	1266.841
68+680	1269.194	1267.910
68+700	1270.275	1268.765
68+720	1271.356	1270.478
68+740	1272.437	1271.292
68+760	1273.518	1272.812
68+780	1274.599	1273.352
68+800	1275.680	1274.510
68+820	1276.762	1275.408
68+840	1277.843	1276.449
68+860	1278.924	1276.956
68+880	1280.005	1278.666
68+900	1281.086	1279.726
68+920	1282.167	1279.420
68+940	1283.248	1281.824
68+960	1284.329	1282.522
68+980	1285.410	1283.926
69+000	1286.491	1285.557
69+020	1287.572	1286.616
69+040	1288.654	1287.537
69+060	1289.735	1289.017
69+080	1290.816	1289.779
69+100	1291.897	1290.835
69+120	1292.978	1291.582
69+140	1294.059	1292.735
69+160	1295.146	1293.684
69+180	1296.273	1295.160
69+200	1297.445	1296.335



ISLAMIC REPUBLIC OF AFGHANISTAN
and
UNITED STATES AGENCY FOR INTERNATIONAL DEVELOPMENT

AFGHANISTAN INFRASTRUCTURE AND REHABILITATION PROGRAM (AIRP)
The LOUIS BERGER Group, Inc.,
BLACK & VEATCH SPECIAL PROJECTS CORP. JOINT VENTURE

TITLE: DESIGN OF BAMYAN TO DUSHI ROAD, NH-07 (TASK ORDER 24) SEGMENT 2
LOCATION: BAGHLAN AND BAMYAN PROVINCES

SHEET CONTENTS: **STA 68+500 - STA 69+200**
SCALE: HOR. 1:2000 VERT. 1:200

REVISION	DATE
3 RENAMED 2 TO 3	19/12/09
2 30% DESIGN SUBMITTAL	19/12/09
1 70% DESIGN SUBMITTAL, GEN REV	29/03/10
0 70% DESIGN SUBMITTAL, GEN REV	21/05/10

NAMES & SIGNATURE
DRAWN: S. SOLETE DESIGNED: N. THAO
CHECKED BY: R.G. BANAN Phil, PE
APPROVED BY:
ABOUD AL ZAIM USA, PE

DWG NO. **BD-PP-0**
SCALE: AS S

	VE RECOMMENDATION	**Idea No.: __C-9a __** **Segment___ Station_____**
	Client: UNITED STATES AGENCY FOR INTERNATIONAL DEVELOPMENT Project: **DESIGN OF BAMYAN TO DUSHI ROAD** *AFGHANISTAN INFRASTRUCTURE AND REHABILITATION PROGRAM (AIRP)*	

Current Design:

Roadway alignment at Sta. 1+400:

1. Roadway on a vertical curve and there is significant excavation to the hill on left.

Description of VE Alternative:

1. It appears that the horizontal alignment can be shifted approximately 10m to west and the profile can be lower to minimize earthwork.

Advantages:

1. Minimize earthwork.

Disadvantages:

None.

Cost Summary			
	Capital Cost	O&M Cost	Total
Original			
Proposed			
Savings	TBD by the designers	N/A	TBD by the designers

	VE RECOMMENDATION	Idea No.: __C-9b __ Segment___ Station_____
	Client: UNITED STATES AGENCY FOR INTERNATIONAL DEVELOPMENT Project: **DESIGN OF BAMYAN TO DUSHI ROAD** *AFGHANISTAN INFRASTRUCTURE AND REHABILITATION PROGRAM (AIRP)*	

Current Design:

Roadway alignment at Curve #63 and its profile:

1. Current alignment results in significant rock cut on the right and requires retaining walls on the left.

Description of VE Alternative:

1. It appears that the horizontal alignment can be shifted slightly to east and the profile can be lowered a bit to minimize rock cut on the right side of the road.

Advantages:

1. Minimize rock cut.

Disadvantages:

None.

Cost Summary			
	Capital Cost	O&M Cost	Total
Original			
Proposed			
Savings	TBD by the designers	N/A	TBD by the designers

	VE RECOMMENDATION	**Idea No.: __C-9c __** **Segment___ Station_____**
	Client: UNITED STATES AGENCY FOR INTERNATIONAL DEVELOPMENT Project: **DESIGN OF BAMYAN TO DUSHI ROAD** *AFGHANISTAN INFRASTRUCTURE AND REHABILITATION PROGRAM (AIRP)*	

Current Design:

Roadway alignment at Curves #185, #186, #187 and #188:

1. Curved alignment.
2. Short normal crown sections between curves.

Description of VE Alternative:

1. It appears that this curved alignment can be eliminated by a tangent alignment with a large radius curve for tie-in. (See the attached sketch.)

Advantages:

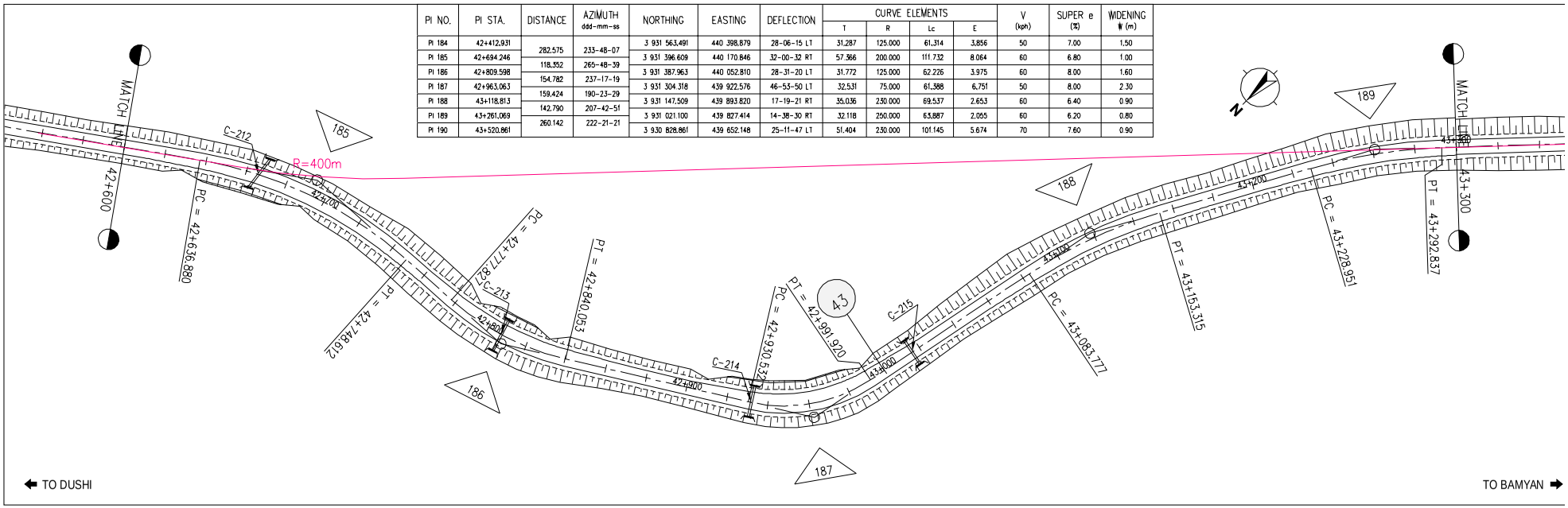
1. Provide better roadway geometry.
2. Eliminate numerous short normal crown sections.
3. There is no net increase in impact to cultivated lands.

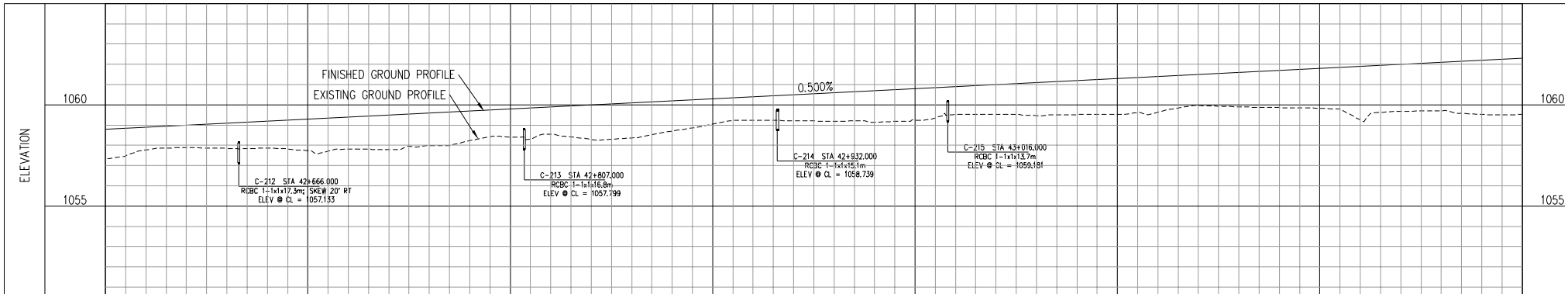
Disadvantages:

None.

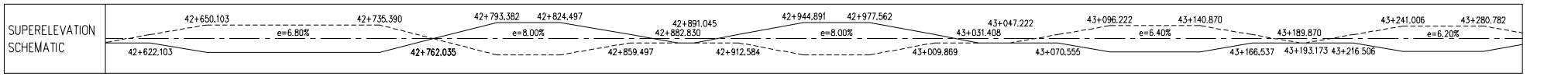
Cost Summary			
	Capital Cost	O&M Cost	Total
Original			
Proposed			
Savings	N/A	N/A	N/A

PI NO.	PI STA.	DISTANCE	AZIMUTH ddd-mm-ss	NORTHING	EASTING	DEFLECTION	CURVE ELEMENTS T	R	Lc	E	V (kph)	SUPER e (%)	WIDENING W (m)
PI 184	42+412.931			3 931 563.491	440 398.879	28-06-15 LT	31.287	125.000	61.314	3.856	50	7.00	1.50
		282.575	233-48-07										
PI 185	42+694.246			3 931 396.609	440 170.846	32-00-32 RT	57.366	200.000	111.732	8.064	60	6.80	1.00
		118.352	265-48-39										
PI 186	42+809.598			3 931 387.963	440 052.810	28-31-20 LT	31.772	125.000	62.226	3.975	60	8.00	1.60
		154.782	237-17-19										
PI 187	42+963.063			3 931 304.318	439 922.576	46-53-50 LT	32.531	75.000	61.388	6.751	50	8.00	2.30
		159.424	190-23-29										
PI 188	43+118.813			3 931 147.509	439 893.820	17-19-21 RT	35.036	230.000	69.537	2.653	60	6.40	0.90
		142.790	207-42-51										
PI 189	43+261.069			3 931 021.100	439 827.414	14-38-30 RT	32.118	250.000	63.887	2.055	60	6.20	0.80
		260.142	222-21-21										
PI 190	43+520.861			3 930 828.861	439 652.148	25-11-47 LT	51.404	230.000	101.145	5.674	70	7.60	0.90





CHAINAGE	FINISHED ROAD LEVELS	EXISTING ROAD LEVELS
42+600	1058.792	1057.352
42+620	1058.892	1057.776
42+640	1058.992	1057.881
42+660	1059.092	1057.857
42+680	1059.192	1057.859
42+700	1059.292	1057.754
42+720	1059.392	1057.810
42+740	1059.492	1057.787
42+760	1059.592	1057.996
42+780	1059.692	1058.238
42+800	1059.792	1058.395
42+820	1059.892	1058.560
42+840	1059.992	1058.296
42+860	1060.092	1058.365
42+880	1060.192	1058.709
42+900	1060.292	1059.044
42+920	1060.392	1059.230
42+940	1060.492	1059.218
42+960	1060.592	1059.193
42+980	1060.692	1059.142
43+000	1060.792	1059.247
43+020	1060.892	1059.519
43+040	1060.992	1059.528
43+060	1061.092	1059.470
43+080	1061.192	1059.518
43+100	1061.292	1059.521
43+120	1061.392	1059.641
43+140	1061.492	1059.965
43+160	1061.592	1059.898
43+180	1061.692	1059.861
43+200	1061.792	1059.826
43+220	1061.892	1059.249
43+240	1061.992	1059.677
43+260	1062.092	1059.711
43+280	1062.192	1059.527
43+300	1062.292	1059.533



ISLAMIC REPUBLIC OF AFGHANISTAN
and
UNITED STATES AGENCY FOR INTERNATIONAL DEVELOPMENT

AFGHANISTAN INFRASTRUCTURE AND REHABILITATION PROGRAM (AIRP)
The LOUIS BERGER Group, Inc., BLACK & VEATCH SPECIAL PROJECTS CORP. JOINT VENTURE

TITLE: DESIGN OF BAMYAN TO DUSHI ROAD, NH-07 (TASK ORDER 24) SEGMENT 2
LOCATION: BAGHLAN AND BAMYAN PROVINCES

SHEET CONTENTS: **PLAN AND PROFILE**
STA 42+600 - STA 43+300
SCALE: HOR. 1:2000 VERT. 1:200

REVISION	DATE
4 RENAMED 0 TO 4	19/12/09
3 30% DESIGN SUBMITTAL	19/12/09
2 70% DESIGN SUBMITTAL, GEN REV	29/03/10
1 70% DESIGN SUBMITTAL, GEN REV	21/05/10

NAMES & SIGNATURE
DRAWN: S. SOLETE DESIGNED: N. THAO
CHECKED BY: R.G. BANAN Phil, PE
APPROVED BY:
ABOUD AL ZAIM USA, PE

DWG NO. **BD-PP-0**
SCALE: AS S

	VE RECOMMENDATION	**Idea No.: __C-9d __** **Segment___ Station_____**
	Client: UNITED STATES AGENCY FOR INTERNATIONAL DEVELOPMENT Project: **DESIGN OF BAMYAN TO DUSHI ROAD** *AFGHANISTAN INFRASTRUCTURE AND REHABILITATION PROGRAM (AIRP)*	

Current Design:

Roadway alignment at Curves #216 and #217:

1. Short broken-back alignment.
2. Short normal crown section between two curves.

Description of VE Alternative:

1. Use a single curve to remove the short broken-back layout. (See the attached sketch.)
2. There is no net increase in impact to cultivated lands.

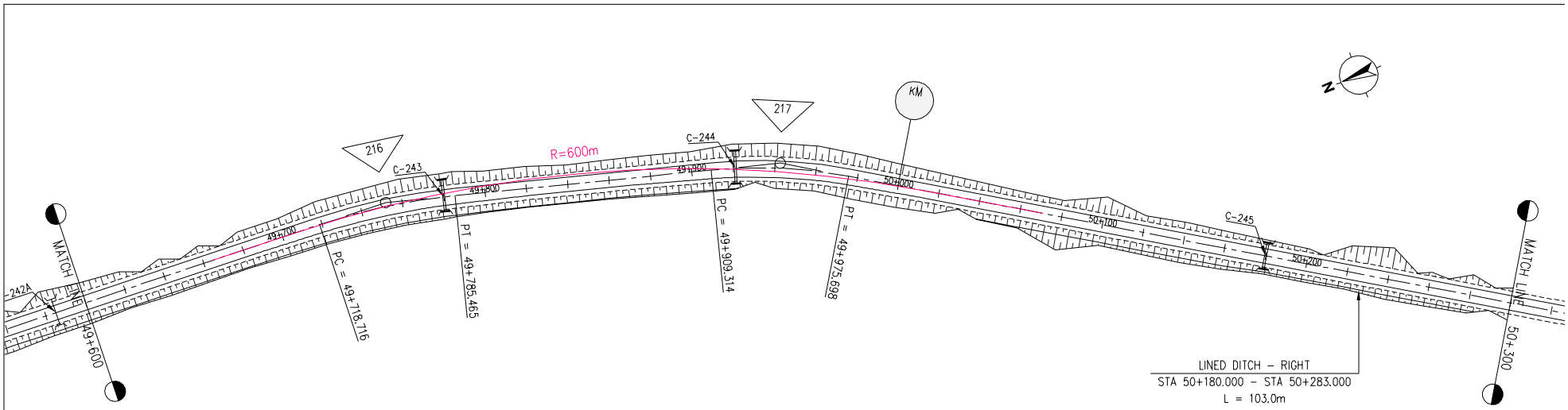
Advantages:

1. Provide better roadway geometry.
2. Eliminate adverse effect associated with short broken-back alignment, such as unexpected cross slope change (which could mislead drivers, as they come out of the first curve, thinking they are heading into a tangent segment or another curve that turns to the opposite direction.)
3. Eliminate short normal crown section.

Disadvantages:

None.

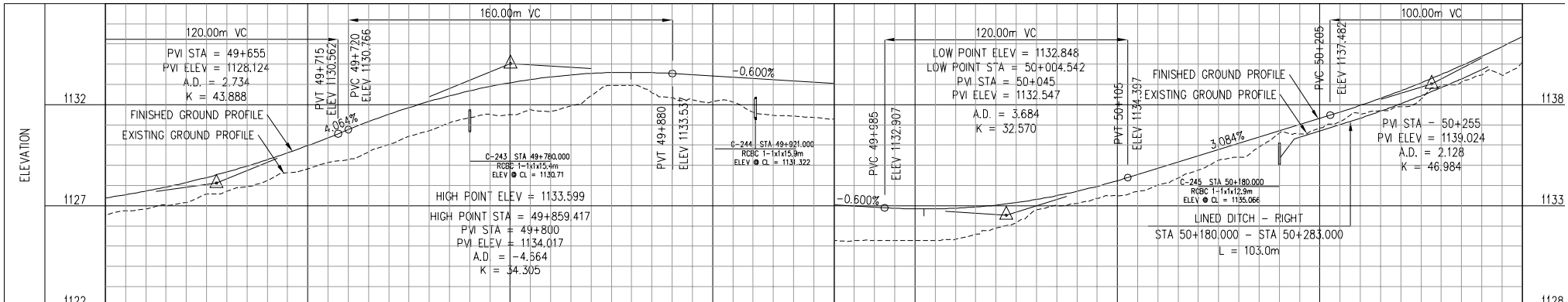
Cost Summary			
	Capital Cost	O&M Cost	Total
Original			
Proposed			
Savings	N/A	N/A	N/A



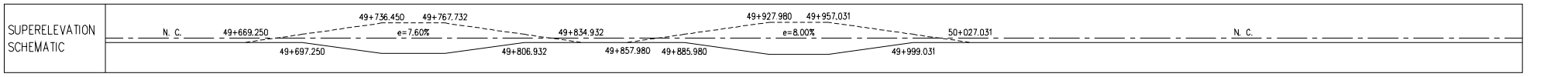
PI NO.	PI STA.	DISTANCE	AZIMUTH ddd-mm-ss	NORTHING	EASTING	DEFLECTION	CURVE ELEMENTS T	R	Lc	E	V (kph)	SUPER e (%)	WIDENING W (m)
215	49+377.028			3 927 376.469	437 128.468	09-15-36 RT	24.295	300.000	48.485	0.982	60	5.60	0.70
		375.307	183-43-56										
216	49+752.229			3 927 001.958	437 104.037	12-44-53 RT	33.513	300.000	66.749	1.866	80	7.60	0.80
		190.786	196-28-50										
217	49+942.738			3 926 819.010	437 049.913	16-32-13 RT	33.424	230.000	66.384	2.416	80	8.00	1.00
		454.381	213-01-03										
218	50+396.655			3 926 438.010	436 802.323	39-35-35 RT	32.396	90.000	62.193	5.653	50	7.80	1.90

← TO DUSHI

TO BAMYAN →



CHAINAGE	FINISHED ROAD LEVELS	EXISTING ROAD LEVELS
49+600	1127.395	1126.520
49+620	1127.730	1126.846
49+640	1128.155	1127.167
49+660	1128.672	1127.719
49+680	1129.280	1128.254
49+700	1129.978	1128.830
49+720	1130.766	1129.281
49+740	1131.520	1130.033
49+760	1132.158	1130.717
49+780	1132.679	1131.351
49+800	1133.084	1131.514
49+820	1133.372	1131.674
49+840	1133.544	1132.457
49+860	1133.599	1132.952
49+880	1133.537	1132.334
49+900	1133.417	1132.159
49+920	1133.297	1131.617
49+940	1133.177	1131.439
49+960	1133.057	1131.282
49+980	1132.937	1131.298
50+000	1132.851	1131.286
50+020	1132.885	1131.356
50+040	1133.041	1131.892
50+060	1133.320	1132.806
50+080	1133.722	1133.123
50+100	1134.247	1133.505
50+120	1134.860	1134.035
50+140	1135.477	1134.773
50+160	1136.094	1135.390
50+180	1136.711	1136.607
50+200	1137.328	1136.837
50+220	1137.969	1137.547
50+240	1138.692	1137.902
50+260	1139.500	1138.932
50+280	1140.394	1139.467
50+300	1141.373	1140.111



ISLAMIC REPUBLIC OF AFGHANISTAN
and
UNITED STATES AGENCY FOR INTERNATIONAL DEVELOPMENT

AFGHANISTAN INFRASTRUCTURE AND REHABILITATION PROGRAM (AIRP)
The LOUIS BERGER Group, Inc., BLACK & VEATCH SPECIAL PROJECTS CORP. JOINT VENTURE

TITLE: DESIGN OF BAMYAN TO DUSHI ROAD, NH-07 (TASK ORDER 24) SEGMENT 2
LOCATION: BAGHLAN AND BAMYAN PROVINCES

SHEET CONTENTS: **PLAN AND PROFILE**
STA 49+600 - STA 50+300
SCALE: HOR. 1:2000 VERT. 1:200

REVISION	DATE
4 RENAMED 2 TO 4	19/12/09
3 30% DESIGN SUBMITTAL	19/12/09
6 70% DESIGN SUBMITTAL, GEN REV	29/03/10
7 70% DESIGN SUBMITTAL, GEN REV	21/05/10

NAMES & SIGNATURE
DRAWN: S. SOLETE DESIGNED: N. THAO
CHECKED BY: R.G. BANAN Phil, PE
APPROVED BY:
ABOUD AL ZAIM USA, PE

DWG NO. **BD-PP-0**
SCALE: AS S

	VE RECOMMENDATION	**Idea No.: __C-9e __** **Segment___ Station_____**
	Client: UNITED STATES AGENCY FOR INTERNATIONAL DEVELOPMENT Project: **DESIGN OF BAMYAN TO DUSHI ROAD** *AFGHANISTAN INFRASTRUCTURE AND REHABILITATION PROGRAM (AIRP)*	

Current Design:

Roadway alignment at Curves #224 and #225:

1. Curved alignment with short superelevated roadway section at Curves #224 and #225.

Description of VE Alternative:

1. It appears that longer curve length can be provided for these two curves (through realignment) to lengthen the superelevated roadway sections. (See the attached sketch.)

Advantages:

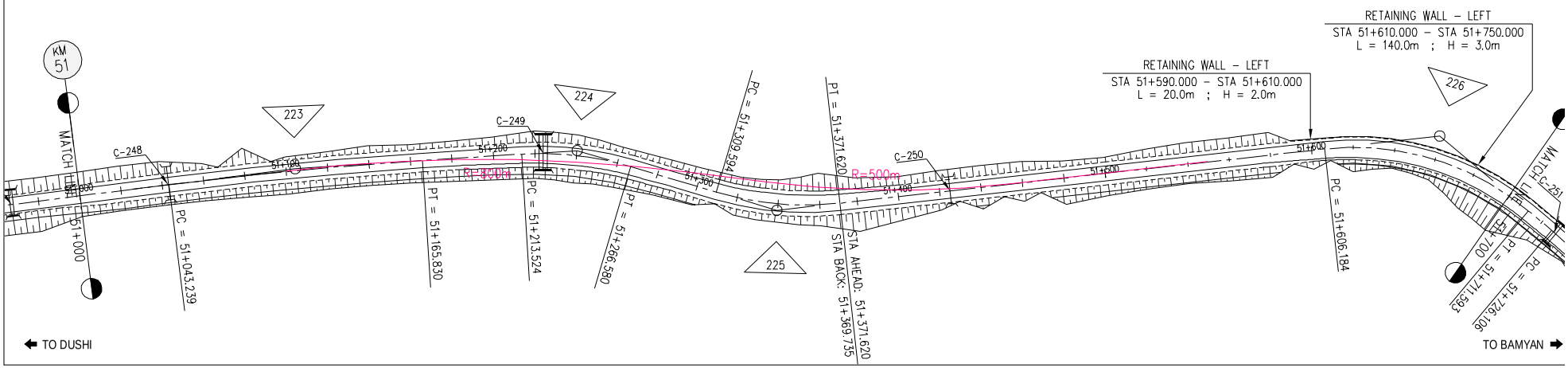
1. Provide better roadway geometry.
2. Lengthen superelevated roadway section

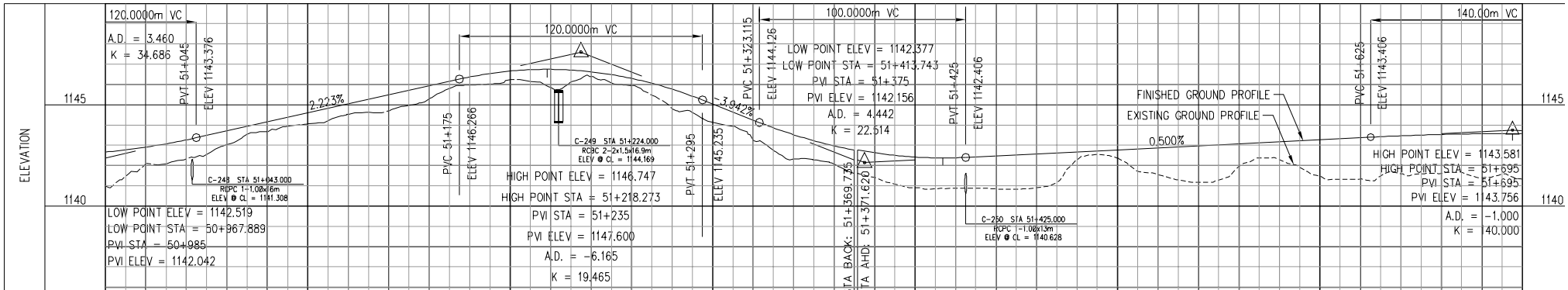
Disadvantages:

None.

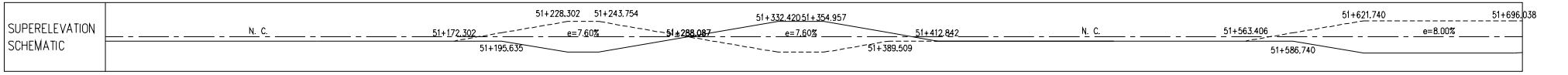
Cost Summary			
	Capital Cost	O&M Cost	Total
Original			
Proposed			
Savings	N/A	N/A	N/A

PI NO.	PI STA.	DISTANCE	AZIMUTH ddd-mm-ss	NORTHING	EASTING	DEFLECTION	CURVE ELEMENTS T	R	Lc	E	V (kph)	SUPER e (%)	WIDENING W (m)
222	50+892.812	158.092	227-32-26	3 926 171.256	436 384 .864	15-44-03 LT	31.780	230.000	63.161	2.185	60	6.40	0.90
223	51+104.554	212.142	211-48-23	3 925 990.970	436 273 .054	03-30-43 RT	61.315	2000.000	122.591	0.940	60	NC	-
224	51+240.332	135.817	215-19-06	3 925 880.150	436 194 .536	20-15-57 RT	26.808	150.000	53.056	2.377	60	7.60	1.30
225	51+340.074	100.301	235-35-03	3 925 823.460	436 111 .792	22-58-20 LT	30.480	150.000	60.141	3.065	60	7.60	1.30
226	51+661.980	320.840	212-36-43	3 925 553.204	435 938 .877	46-27-28 RT	55.796	130.000	105.409	11.468	60	8.00	1.50
227	51+756.831	101.034	259-04-10	3 925 534.046	435 839 .676	14-00-47 RT	30.725	250.000	61.144	1.881	60	6.20	0.80





CHAINAGE	FINISHED ROAD LEVELS	EXISTING ROAD LEVELS
51+000	1142.667	1140.982
51+020	1142.910	1142.060
51+040	1143.268	1142.329
51+060	1143.709	1143.036
51+080	1144.154	1143.676
51+100	1144.598	1144.055
51+120	1145.043	1144.523
51+140	1145.488	1144.701
51+160	1145.932	1145.294
51+180	1146.371	1145.970
51+200	1146.661	1146.238
51+220	1146.746	1145.846
51+240	1146.626	1146.395
51+260	1146.300	1145.959
51+280	1145.768	1144.816
51+300	1145.038	1144.141
51+320	1144.249	1143.240
51+340	1143.524	1142.321
51+360	1142.975	1142.068
STA BACK: 51+369.735	1142.630	1141.409
STA AHEAD: 51+371.620		
51+380		
51+400	1142.419	1140.905
51+420	1142.386	1140.878
51+440	1142.481	1140.852
51+460	1142.581	1140.905
51+480	1142.681	1142.298
51+500	1142.781	1142.370
51+520	1142.881	1141.560
51+540	1142.981	1141.181
51+560	1143.081	1141.978
51+580	1143.181	1142.285
51+600	1143.281	1141.467
51+620	1143.381	1141.335
51+640	1143.473	1141.602
51+660	1143.537	1141.624
51+680	1143.573	1141.405
51+700	1143.580	1141.332



ISLAMIC REPUBLIC OF AFGHANISTAN and UNITED STATES AGENCY FOR INTERNATIONAL DEVELOPMENT	**AFGHANISTAN INFRASTRUCTURE AND REHABILITATION PROGRAM (AIRP)** The LOUIS BERGER Group, Inc., BLACK & VEATCH SPECIAL PROJECTS CORP. JOINT VENTURE	TITLE: DESIGN OF BAMYAN TO DUSHI ROAD, NH-07 (TASK ORDER 24) SEGMENT 2	SHEET CONTENTS: **PLAN AND PROFILE STA 51+000 - STA 51+700**	REVISION / DATE	DWG NO.
		LOCATION: BAGHLAN AND BAMYAN PROVINCES	SCALE: HOR. 1:2000 VERT. 1:200	1 RENAMED 0 TO 1 — 19/12/09	**BD-PP-0**
				1 30% DESIGN SUBMITTAL — 19/12/09	
				2 70% DESIGN SUBMITTAL, GEN REV — 29/03/10	
				0 70% DESIGN SUBMITTAL, GEN REV — 21/10/10	

NAMES & SIGNATURE: DRAWN: S. SOLETE — DESIGNED: N. THAO; CHECKED BY: R.G. BANAN Phil, PE; APPROVED BY: **ABOUD AL ZAIM** USA, PE; SCALE: AS S

	VE RECOMMENDATION	Idea No.: __C-9f__ Segment___ Station_____
	Client: UNITED STATES AGENCY FOR INTERNATIONAL DEVELOPMENT Project: **DESIGN OF BAMYAN TO DUSHI ROAD** *AFGHANISTAN INFRASTRUCTURE AND REHABILITATION PROGRAM (AIRP)*	

Current Design:

Roadway alignment at Curves #265 and #266:

1. Curved alignment.

Description of VE Alternative:

1. It appears that this segment of alignment can be improved with single curve realignment to the east to eliminate one of the curves. (See the attached sketch.)

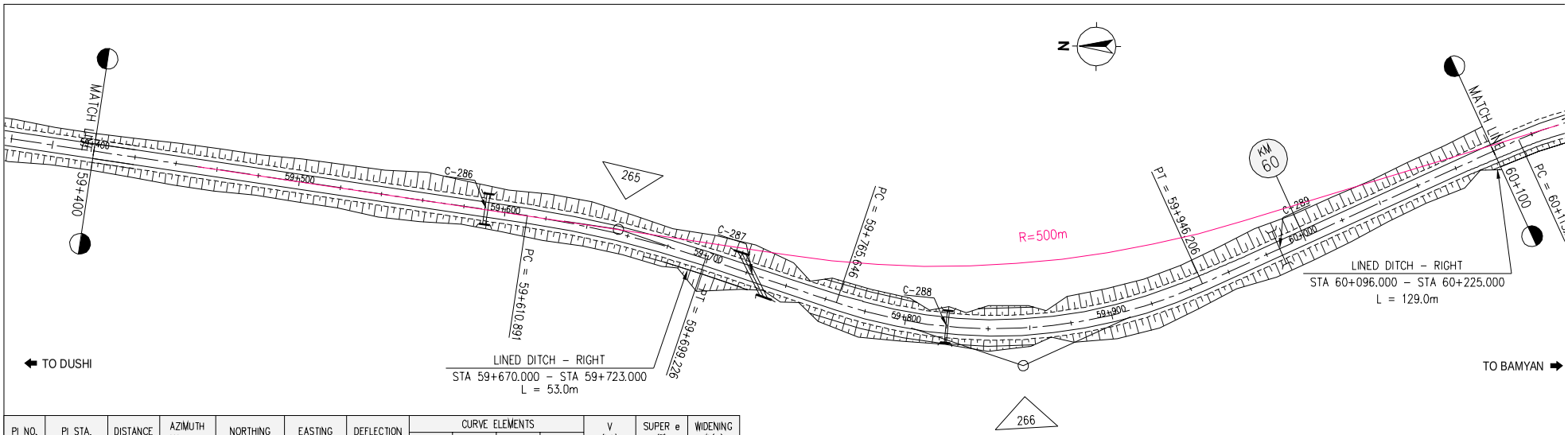
Advantages:

1. Provide better roadway geometry.

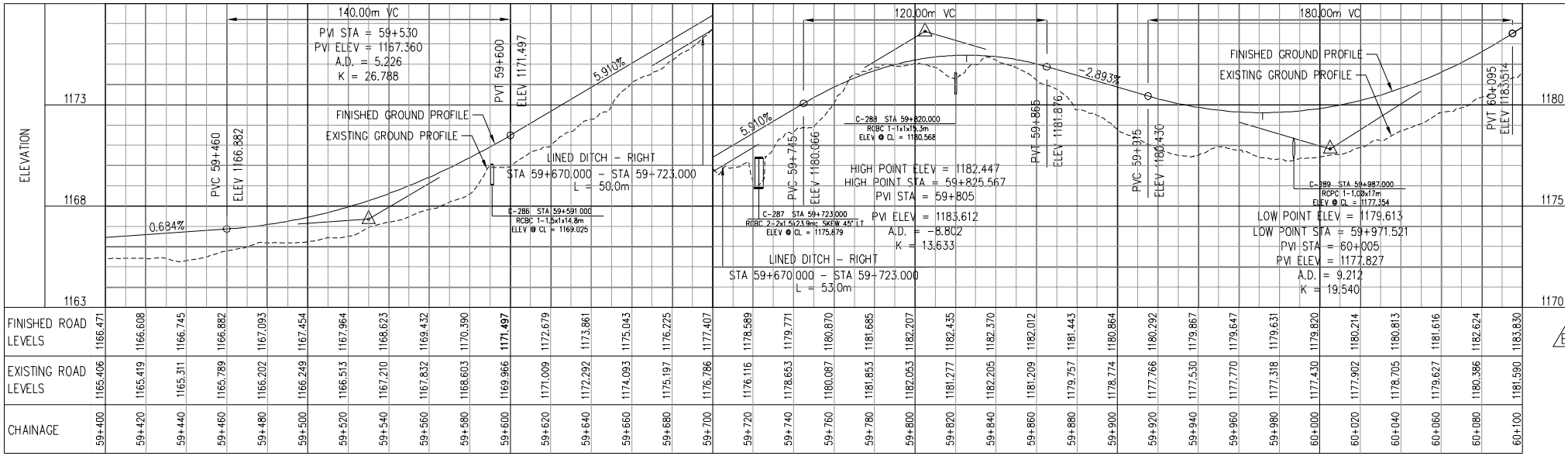
Disadvantages:

Require reconfiguration of outlet head wall of culvert C-287.

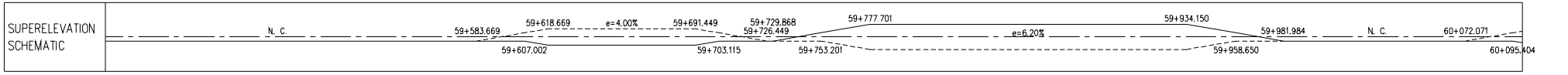
Cost Summary			
	Capital Cost	O&M Cost	Total
Original			
Proposed			
Savings	TBD by the Designers	N/A	TBD by the Designers



PI NO.	PI STA.	DISTANCE	AZIMUTH ddd-mm-ss	NORTHING	EASTING	DEFLECTION	CURVE ELEMENTS T	R	Lc	E	V (kph)	SUPER e (%)	WIDENING W (m)
263	59+237.131			3 920 681.692	431 764 .047	30-00-43 RT	30.827	115.000	60.238	4.060	60	8.00	1.60
		409.599	187-41-22										
265	59+655.174			3 920 275.777	431 709 .241	10-07-21 RT	44.283	500.000	88.335	1.957	60	4.00	–
		205.496	197-48-43										
266	59+860.440			3 920 080.131	431 646 .382	43-06-20 LT	94.794	240.000	180.560	18.043	60	6.20	0.90
		319.049	154-42-22										
267	60+170.461			3 919 791.669	431 782 .699	41-43-31 RT	57.168	150.000	109.237	10.525	60	7.60	1.30



CHAINAGE	FINISHED ROAD LEVELS	EXISTING ROAD LEVELS
59+400	1166.471	1165.406
59+420	1166.608	1165.419
59+440	1166.745	1165.311
59+460	1166.882	1165.789
59+480	1167.093	1166.202
59+500	1167.454	1166.249
59+520	1167.964	1166.513
59+540	1168.623	1167.210
59+560	1169.432	1167.832
59+580	1170.390	1168.603
59+600	1171.497	1169.966
59+620	1172.679	1171.009
59+640	1173.861	1172.292
59+660	1175.043	1174.093
59+680	1176.225	1175.197
59+700	1177.407	1176.786
59+720	1178.589	1176.116
59+740	1179.771	1178.653
59+760	1180.870	1180.087
59+780	1181.685	1181.853
59+800	1182.207	1182.053
59+820	1182.435	1181.277
59+840	1182.370	1182.205
59+860	1182.012	1181.209
59+880	1181.443	1179.757
59+900	1180.864	1178.774
59+920	1180.292	1177.766
59+940	1179.867	1177.530
59+960	1179.647	1177.770
59+980	1179.631	1177.318
60+000	1179.820	1177.430
60+020	1180.214	1177.902
60+040	1180.813	1178.705
60+060	1181.616	1179.627
60+080	1182.624	1180.386
60+100	1183.830	1181.590



ISLAMIC REPUBLIC OF AFGHANISTAN
and
UNITED STATES AGENCY FOR INTERNATIONAL DEVELOPMENT

AFGHANISTAN INFRASTRUCTURE AND REHABILITATION PROGRAM (AIRP)
The LOUIS BERGER Group, Inc., BLACK & VEATCH SPECIAL PROJECTS CORP. JOINT VENTURE

TITLE: DESIGN OF BAMYAN TO DUSHI ROAD, NH-07 (TASK ORDER 24) SEGMENT 2
LOCATION: BAGHLAN AND BAMYAN PROVINCES

SHEET CONTENTS: **PLAN AND PROFILE**
STA 59+400 - STA 60+100
SCALE: HOR. 1:2000 VERT. 1:200

REVISION	DATE
4 RENAMED 0 TO 4	19/12/09
3 30% DESIGN SUBMITTAL	19/12/09
5 70% DESIGN SUBMITTAL, GEN REV	29/03/10
6 70% DESIGN SUBMITTAL, GEN REV	21/10/10

NAMES & SIGNATURE
DRAWN: S. SOLETE DESIGNED: N. THAO
CHECKED BY: R.G. BANAN Phil, PE
APPROVED BY:
ABOUD AL ZAIM USA, PE

DWG NO. **BD-PP-0**
SCALE: AS S

	VE RECOMMENDATION	Idea No.: __C-9g__ Segment___ Station_____
	Client: UNITED STATES AGENCY FOR INTERNATIONAL DEVELOPMENT Project: **DESIGN OF BAMYAN TO DUSHI ROAD** *AFGHANISTAN INFRASTRUCTURE AND REHABILITATION PROGRAM (AIRP)*	

Current Design:

Roadway alignment at Curve #286:

1. Sharp curved alignment with impacts to cultivated lands on the left side.
2. Short superelevated roadway section at the curve.

Description of VE Alternative:

1. It appears that the sharp curve can be eliminated by a tangent alignment and a flatter curve. (See the attached sketch.)

Advantages:

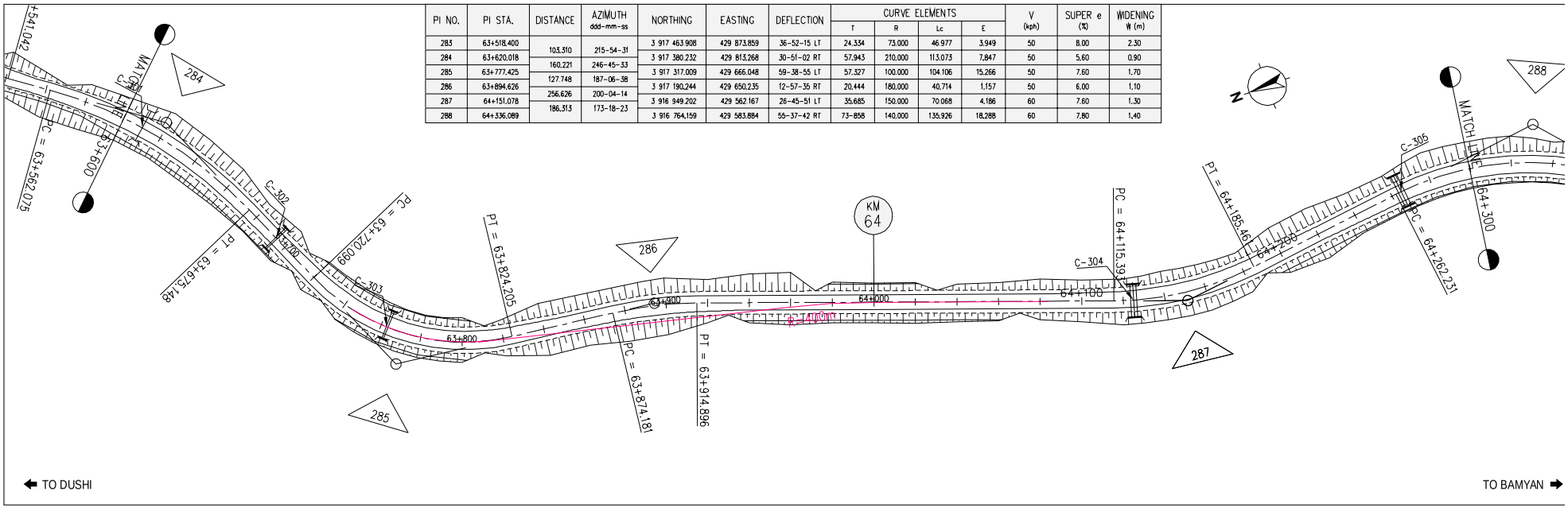
1. Provide better roadway geometry.
2. Eliminate short superelevated roadway section.
3. Save irrigation channels on the left side of the road.
4. Minimize impacts to cultivated lands.

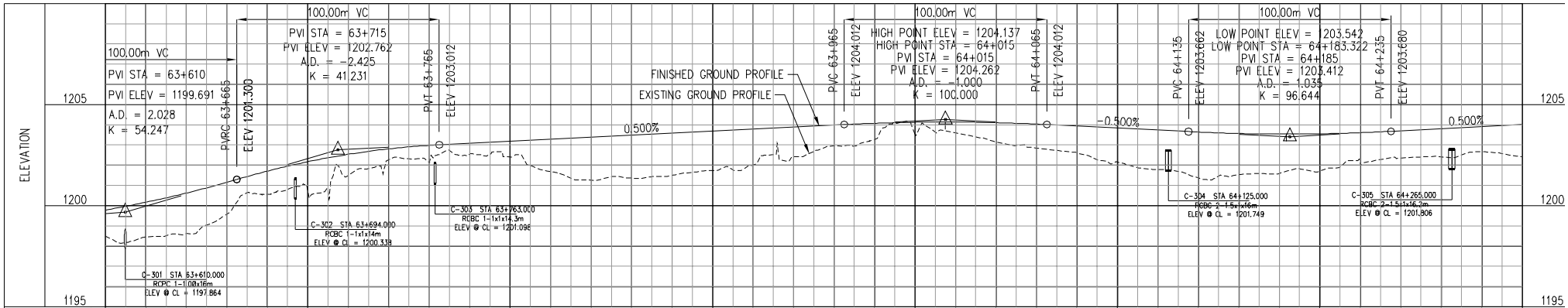
Disadvantages:

None.

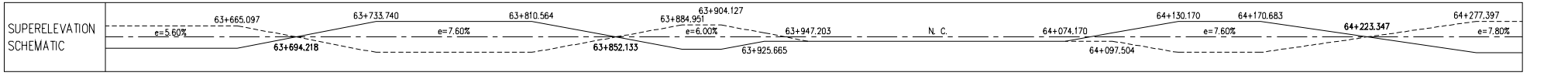
Cost Summary			
	Capital Cost	O&M Cost	Total
Original			
Proposed			
Savings	N/A	N/A	N/A

PI NO.	PI STA.	DISTANCE	AZIMUTH ddd-mm-ss	NORTHING	EASTING	DEFLECTION	CURVE ELEMENTS T	R	Lc	E	V (kph)	SUPER e (%)	WIDENING W (m)
283	63+518.400			3 917 463.908	429 873.859	36-52-15 LT	24.334	73.000	46.977	3.949	50	8.00	2.30
		103.310	215-54-31										
284	63+620.018			3 917 380.232	429 813.268	30-51-02 RT	57.943	210.000	113.073	7.847	50	5.60	0.90
		160.221	246-45-33										
285	63+777.425			3 917 317.009	429 666.048	59-38-55 LT	57.327	100.000	104.106	15.266	50	7.60	1.70
		127.748	187-06-38										
286	63+894.626			3 917 190.244	429 650.235	12-57-35 RT	20.444	180.000	40.714	1.157	50	6.00	1.10
		256.626	200-04-14										
287	64+151.078			3 916 949.202	429 562.167	26-45-51 LT	35.685	150.000	70.068	4.186	60	7.60	1.30
		186.313	173-18-23										
288	64+336.089			3 916 764.159	429 583.884	55-37-42 RT	73-858	140.000	135.926	18.288	60	7.80	1.40





CHAINAGE	FINISHED ROAD LEVELS	EXISTING ROAD LEVELS
63+600	1199.788	1198.521
63+620	1200.170	1198.455
63+640	1200.626	1198.622
63+660	1201.156	1199.575
63+680	1201.711	1200.567
63+700	1202.175	1200.753
63+720	1202.542	1201.496
63+740	1202.812	1202.277
63+760	1202.984	1202.156
63+780	1203.087	1202.551
63+800	1203.187	1202.405
63+820	1203.287	1201.693
63+840	1203.387	1201.269
63+860	1203.487	1201.365
63+880	1203.587	1201.496
63+900	1203.687	1201.736
63+920	1203.787	1202.015
63+940	1203.887	1202.430
63+960	1203.987	1202.956
63+980	1204.076	1203.278
64+000	1204.126	1203.528
64+020	1204.136	1203.618
64+040	1204.106	1203.167
64+060	1204.036	1202.861
64+080	1203.937	1202.619
64+100	1203.837	1202.161
64+120	1203.737	1201.806
64+140	1203.639	1201.382
64+160	1203.570	1201.558
64+180	1203.542	1201.615
64+200	1203.556	1201.728
64+220	1203.611	1201.991
64+240	1203.706	1202.366
64+260	1203.813	1202.431
64+280	1203.920	1202.679
64+300	1204.027	1202.433



ISLAMIC REPUBLIC OF AFGHANISTAN and UNITED STATES AGENCY FOR INTERNATIONAL DEVELOPMENT	AFGHANISTAN INFRASTRUCTURE AND REHABILITATION PROGRAM (AIRP)	TITLE	SHEET CONTENTS	REVISION	DATE	NAMES & SIGNATURE	DWG NO.
	The LOUIS BERGER Group, Inc., BLACK & VEATCH SPECIAL PROJECTS CORP. JOINT VENTURE	DESIGN OF BAMYAN TO DUSHI ROAD, NH-07 (TASK ORDER 24) SEGMENT 2	PLAN AND PROFILE STA 63+600 - STA 64+300	A RENAMED 0 TO A	19/12/09	DRAWN: S. SOLETE DESIGNED: N. THAO	BD-PP-0
				A 30% DESIGN SUBMITTAL	19/12/09	CHECKED BY: R.G. BANAN Phil, PE	
				B 70% DESIGN SUBMITTAL, GEN REV	29/03/10	APPROVED BY:	
		LOCATION: BAGHLAN AND BAMYAN PROVINCES	SCALE: HOR. 1:2000 VERT. 1:200	C 70% DESIGN SUBMITTAL, GEN REV	21/05/10	ABOUD AL ZAIM USA, PE	SCALE: AS S

	VE RECOMMENDATION	**Idea No.: __C-9h __** **Segment___ Station_____**
	Client: UNITED STATES AGENCY FOR INTERNATIONAL DEVELOPMENT Project: **DESIGN OF BAMYAN TO DUSHI ROAD** *AFGHANISTAN INFRASTRUCTURE AND REHABILITATION PROGRAM (AIRP)*	

Current Design:

Roadway alignment causes impact to houses:

1. Roadside grading at Sta. 66+200 impacts houses on the left side.

Description of VE Alternative:

1. It appears feasible to avoid impacting the existing houses by realignment (shift the roadway alignment slightly to north). The realignment will require modification to the curvature of Curve #299 and Curve #298 can be eliminated.

Advantages:

1. Save existing houses.

Disadvantages:

None.

Cost Summary			
	Capital Cost	O&M Cost	Total
Original			
Proposed			
Savings	N/A	N/A	N/A

	VE RECOMMENDATION	**Idea No.: __C-9i__ __** **Segment___ Station_____**
	Client: UNITED STATES AGENCY FOR INTERNATIONAL DEVELOPMENT Project: **DESIGN OF BAMYAN TO DUSHI ROAD** *AFGHANISTAN INFRASTRUCTURE AND REHABILITATION PROGRAM (AIRP)*	

Current Design:

Roadway alignment causes impact to houses:

1. Roadway alignment between Curve # 321 and Curve #322 causes impact to existing houses.

Description of VE Alternative:

1. It appears feasible to avoid impacting the existing houses by realignment (change the bearing angle of the tangent segment). The realignment will require modification to the curvature of Curves #321 and #322.

Advantages:

1. Save existing houses.

Disadvantages:

None.

Cost Summary			
	Capital Cost	O&M Cost	Total
Original			
Proposed			
Savings	N/A	N/A	N/A

	VE RECOMMENDATION	**Idea No.: __C-9j__ __** **Segment___ Station_____**
	Client: UNITED STATES AGENCY FOR INTERNATIONAL DEVELOPMENT Project: **DESIGN OF BAMYAN TO DUSHI ROAD** *AFGHANISTAN INFRASTRUCTURE AND REHABILITATION PROGRAM (AIRP)*	

Current Design:

Roadway alignment at Curves #360 and #361:

1. Curved alignment with retaining walls along roadside.
2. Short superelevated roadway section at Curve #361.

Description of VE Alternative:

1. It appears that these two curves can be replaced with a single curve to improve the roadway geometry. (See the attached sketch.)

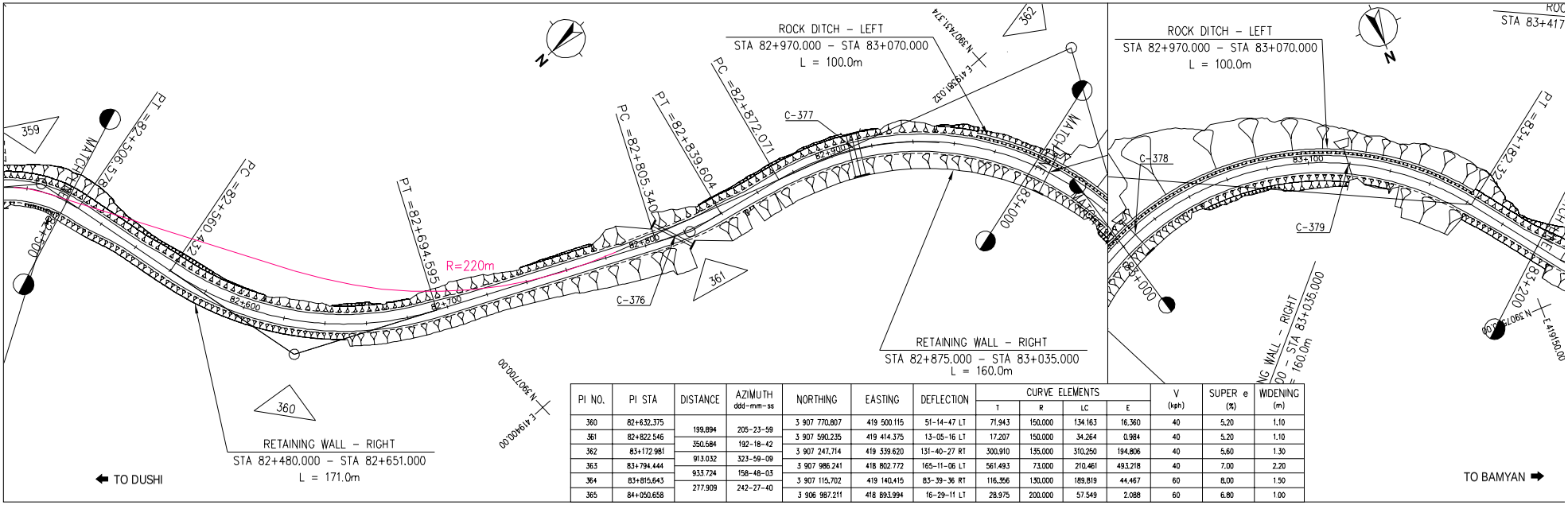
Advantages:

1. Provide better roadway geometry.
2. Eliminate short superelevated roadway section.
3. Minimize impact to cultivated land.
4. The realignment can also eliminate the need for approximately 130m of retaining walls.

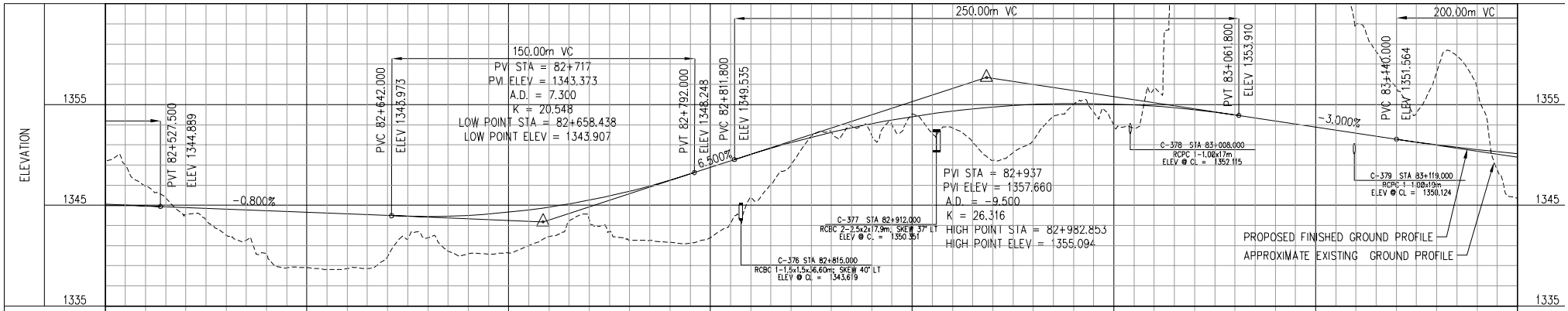
Disadvantages:

Require additional excavation. (However, the increase in excavation quantity is not significant, and the cost can be offset by the saving from retaining wall elimination.)

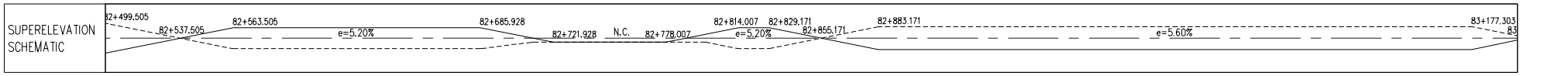
Cost Summary			
	Capital Cost	O&M Cost	Total
Original			
Proposed			
Savings	N/A	N/A	N/A



PI NO.	PI STA	DISTANCE	AZIMUTH ddd-mm-ss	NORTHING	EASTING	DEFLECTION	CURVE ELEMENTS T	R	LC	E	V (kph)	SUPER e (%)	WIDENING (m)
360	82+632.375			3 907 770.807	419 500.115	51-14-47 LT	71.943	150.000	134.163	16.360	40	5.20	1.10
361	82+822.546	199.894	205-23-59	3 907 590.235	419 414.375	13-05-16 LT	17.207	150.000	34.264	0.984	40	5.20	1.10
362	83+172.981	350.584	192-18-42	3 907 247.714	419 339.620	131-40-27 RT	300.910	135.000	310.250	194.806	40	5.60	1.30
363	83+794.444	913.032	323-59-09	3 907 986.241	418 802.772	165-11-06 LT	561.493	73.000	210.461	493.218	40	7.00	2.20
364	83+815.643	933.724	158-48-03	3 907 115.702	419 140.415	83-39-36 RT	116.356	150.000	189.819	44.467	60	8.00	1.50
365	84+050.658	277.909	242-27-40	3 906 987.211	418 893.994	16-29-11 LT	28.975	200.000	57.549	2.088	60	6.80	1.00



CHAINAGE	PROP. FINISHED GROUND ELEV.	APPR. EXISTING GROUND ELEV.
82+500	1344.964	1349.325
82+520	1344.938	1346.889
82+540	1344.789	1344.080
82+560	1344.629	1342.033
82+580	1344.469	1340.143
82+600	1344.309	1338.839
82+620	1344.149	1338.763
82+640	1343.989	1339.933
82+660	1343.908	1341.816
82+680	1344.020	1340.196
82+700	1344.328	1340.288
82+720	1344.829	1341.906
82+740	1345.526	1343.462
82+760	1346.417	1341.541
82+780	1347.503	1341.324
82+800	1348.768	1341.837
82+820	1350.055	1345.784
82+840	1351.217	1349.019
82+860	1352.227	1352.192
82+880	1353.084	1351.854
82+900	1353.790	1354.030
82+920	1354.344	1352.638
82+940	1354.745	1349.460
82+960	1354.995	1351.426
82+980	1355.093	1355.030
83+000	1355.038	1352.844
83+020	1354.832	1356.621
83+040	1354.474	1368.620
83+060	1353.963	1366.438
83+080	1353.364	1370.551
83+100	1352.764	1375.315
83+120	1352.164	1362.948
83+140	1351.564	1356.562
83+160	1351.004	1358.333
83+180	1350.524	1356.415
83+200	1350.124	1345.697



ISLAMIC REPUBLIC OF AFGHANISTAN
and
UNITED STATES AGENCY FOR INTERNATIONAL DEVELOPMENT

AFGHANISTAN INFRASTRUCTURE AND REHABILITATION PROGRAM (AIRP)
The LOUIS BERGER Group, Inc.,
BLACK & VEATCH SPECIAL PROJECTS CORP. JOINT VENTURE

TITLE: DESIGN OF BAMYAN TO DUSHI ROAD, NH-07 (TASK ORDER 24) SEGMENT 2
LOCATION: BAGHLAN AND BAMYAN PROVINCES

SHEET CONTENTS: **PLAN AND PROFILE STA 82+500 - STA 83+200**
SCALE: HOR. 1:2000 VERT. 1:200

REVISION	DATE
A INTERNAL QA REVIEW	27/02/10
B 30% DESIGN SUBMITTAL	27/03/10
C 70% DESIGN SUBMITTAL, NO REV	21/05/10

NAMES & SIGNATURE
DRAWN: R. SAFI
DESIGNED: ENG. ABDULLAH
CHECKED BY: S.A. MALIK BD, PE
APPROVED BY: **ABOUD AL ZAIM** USA, PE

DWG NO. **BD-PP-1**
SCALE: AS SH

	VE RECOMMENDATION	**Idea No.: __C-9k __** **Segment___ Station_____**
	Client: UNITED STATES AGENCY FOR INTERNATIONAL DEVELOPMENT Project: **DESIGN OF BAMYAN TO DUSHI ROAD** *AFGHANISTAN INFRASTRUCTURE AND REHABILITATION PROGRAM (AIRP)*	

Current Design:

Roadway alignment at Curve #365:

1. Curved alignment

Description of VE Alternative:

1. It appears that this curve can be eliminated by a tangent alignment. (See the attached sketch.)

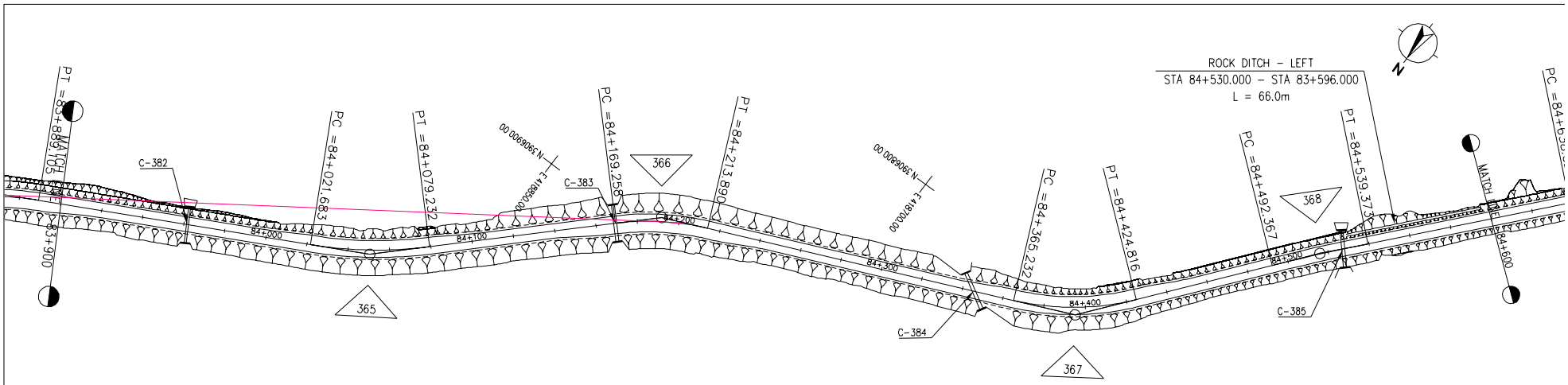
Advantages:

1. Provide better roadway geometry.
2. Minimize impact to cultivated land.

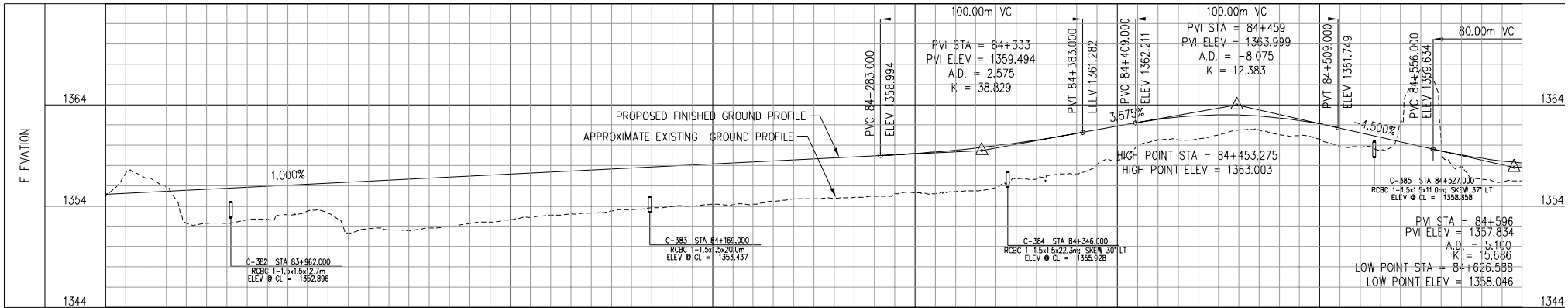
Disadvantages:

Require additional excavation. (However, the increase in excavation quantity is not significant.)

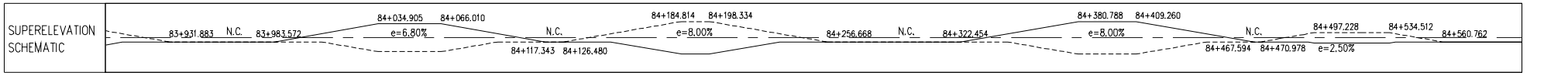
Cost Summary			
	Capital Cost	O&M Cost	Total
Original			
Proposed			
Savings	Minimal cost increase	N/A	Minimal cost increase



PI NO.	PI STA	DISTANCE	AZIMUTH ddd-mm-ss	NORTHING	EASTING	DEFLECTION	CURVE ELEMENTS T	R	LC	E	V (kph)	SUPER e (%)	WIDENING (m)
367	84+395.601	121.427	219-07-15	3 906 807.160	418 604.981	27-18-42 LT	30.370	125.000	59.585	3.636	60	8.00	1.60
368	84+515.874	149.756	221-48-51	3 906 712.955	418 528.365	02-41-36 RT	23.507	1000.000	47.006	0.276	60	2.50	-
369	84+665.622	264.656	221-11-19	3 906 601.340	418 428.520	00-37-32 LT	27.296	5000.000	54.592	0.075	60	NC	-
370	84+930.278	218.598	285-14-45	3 906 402.174	418 254.233	64-03-26 RT	45.666	73.000	81.615	13.107	50	8.00	2.30
371	85+139.158	264.789	264-38-19	3 906 459.656	418 043.328	20-36-26 LT	74.536	410.000	147.461	6.720	60	4.60	-
372	85+402.338			3 906 434.916	417 779.697	16-05-48 RT	46.663	330.000	92.710	3.283	60	5.20	0.70



CHAINAGE	PROP. FINISHED GROUND ELEV.	APPR. EXISTING GROUND ELEV.
83+900	355.164	355.036
83+920	355.364	356.753
83+940	355.564	352.376
83+960	355.764	352.304
83+980	355.964	352.748
84+000	356.164	353.513
84+020	356.364	351.357
84+040	356.564	351.675
84+060	356.764	351.847
84+080	356.964	352.285
84+100	357.164	352.659
84+120	357.364	353.147
84+140	357.564	353.329
84+160	357.764	353.681
84+180	357.964	353.978
84+200	358.164	354.205
84+220	358.364	354.188
84+240	358.564	354.722
84+260	358.764	354.805
84+280	358.964	354.990
84+300	359.201	355.334
84+320	359.540	355.456
84+340	359.982	355.843
84+360	360.527	356.683
84+380	361.176	357.206
84+400	361.890	358.514
84+420	362.556	360.546
84+440	362.932	360.654
84+460	362.985	361.519
84+480	362.714	361.070
84+500	362.121	360.590
84+520	361.254	359.852
84+540	360.354	362.450
84+560	359.459	360.585
84+580	358.738	356.681
84+600	358.271	356.519



ISLAMIC REPUBLIC OF AFGHANISTAN and UNITED STATES AGENCY FOR INTERNATIONAL DEVELOPMENT	AFGHANISTAN INFRASTRUCTURE AND REHABILITATION PROGRAM (AIRP)	TITLE	SHEET CONTENTS	REVISION	DATE	NAMES & SIGNATURE	DWG NO.
	The LOUIS BERGER Group, Inc., BLACK & VEATCH SPECIAL PROJECTS CORP. JOINT VENTURE	DESIGN OF BAMYAN TO DUSHI ROAD, NH-07 (TASK ORDER 24) SEGMENT 2	PLAN AND PROFILE STA 83+900 - STA 84+600	A INTERNAL QA REVIEW	27/02/10	DRAWN: R. SAFI DESIGNED: ENG. ABDULLAH	BD-PP-
				B 30% DESIGN SUBMITTAL	27/03/10	CHECKED BY: S.A. MALIK BD, PE	
				C 70% DESIGN SUBMITTAL, NO REV	21/05/10	APPROVED BY: ABOUD AL ZAIM USA, PE	
		LOCATION: BAGHLAN AND BAMYAN PROVINCES	SCALE: HOR. 1:2000 VERT. 1:200				SCALE: AS S

	VE RECOMMENDATION	**Idea No.: __C-10a __** **Segment___ Station_____**
	Client: UNITED STATES AGENCY FOR INTERNATIONAL DEVELOPMENT Project: **DESIGN OF BAMYAN TO DUSHI ROAD** *AFGHANISTAN INFRASTRUCTURE AND REHABILITATION PROGRAM (AIRP)*	

Current Design:

Profile at Sta. 8+900:

1. Profile results in significant fill.

Description of VE Alternative:

1. It appears that the length of the crest curve can be lengthened to lower the profile to minimize fill quantity.

Advantages:

1. Reduce fill quantity.

Disadvantages:

None.

Cost Summary			
	Capital Cost	O&M Cost	Total
Original			
Proposed			
Savings	TBD by the designers	N/A	TBD by the designers

	VE RECOMMENDATION	Idea No.: __C-10b __ Segment___ Station_____
	Client: UNITED STATES AGENCY FOR INTERNATIONAL DEVELOPMENT Project: **DESIGN OF BAMYAN TO DUSHI ROAD** *AFGHANISTAN INFRASTRUCTURE AND REHABILITATION PROGRAM (AIRP)*	

Current Design:

Profile at Sta. 14+300:

1. Profile results in slope protection and significant fill.

Description of VE Alternative:

1. It appears that the profile in this area can be lowered to flatten the -6.529%, reduce the amount of slope protection, and minimize fill quantity.

Advantages:

1. Provide flatter profile slope to improve the operation of the road.
2. Reduce slope protection quantity.
3. Reduce fill quantity.

Disadvantages:

None.

Cost Summary			
	Capital Cost	O&M Cost	Total
Original			
Proposed			
Savings	TBD by the designers	N/A	TBD by the designers

	VE RECOMMENDATION	Idea No.: __C-10c __ Segment___ Station_____
	Client: UNITED STATES AGENCY FOR INTERNATIONAL DEVELOPMENT Project: **DESIGN OF BAMYAN TO DUSHI ROAD** *AFGHANISTAN INFRASTRUCTURE AND REHABILITATION PROGRAM (AIRP)*	

Current Design:

Profile at Sta. 18+500:

1. Current profile uses a -8.000% slope.

Description of VE Alternative:

1. Since the current profile requires rock cutting in this area, doing a bit more rock cutting to obtain a flatter slope to improve the operation of the road is recommended. The recommended slope is -6.000%. (See the attached sketch.)
2. The new profile is lower in elevation than the current one in area where there is a retaining wall. Therefore, the new profile can eliminate a portion of the wall and reduce the height of the rest.

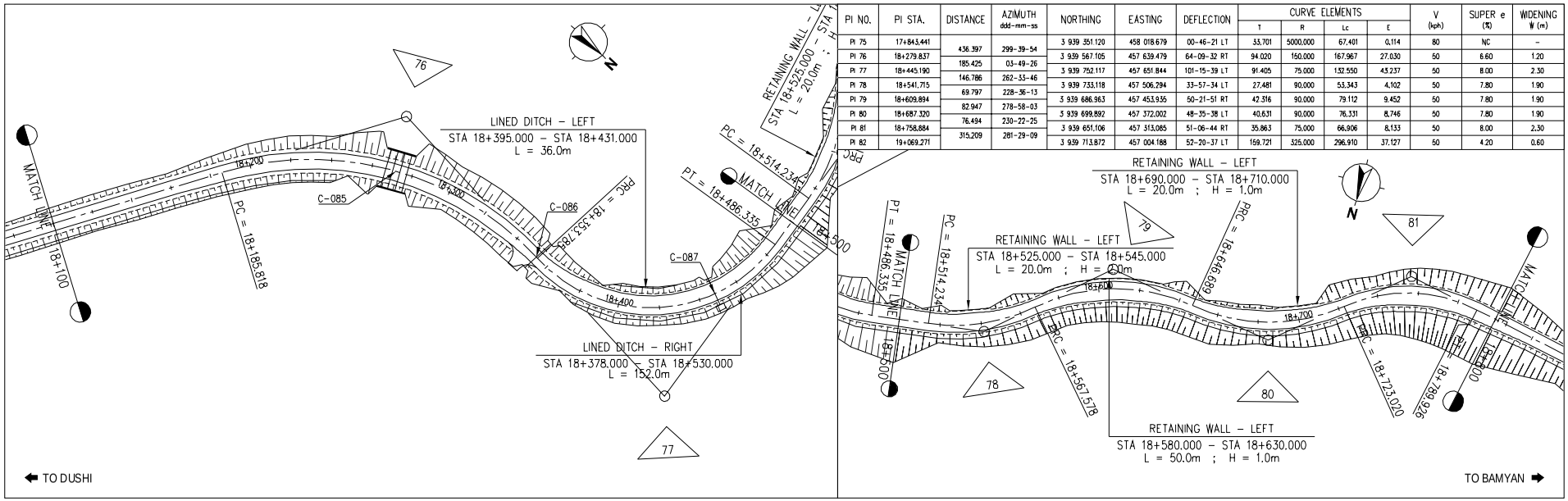
Advantages:

1. Flatten the profile slope to improve operation of the road.
2. Eliminate a portion of the retaining wall located along the left side of the road and reduce the height of the remaining portion.

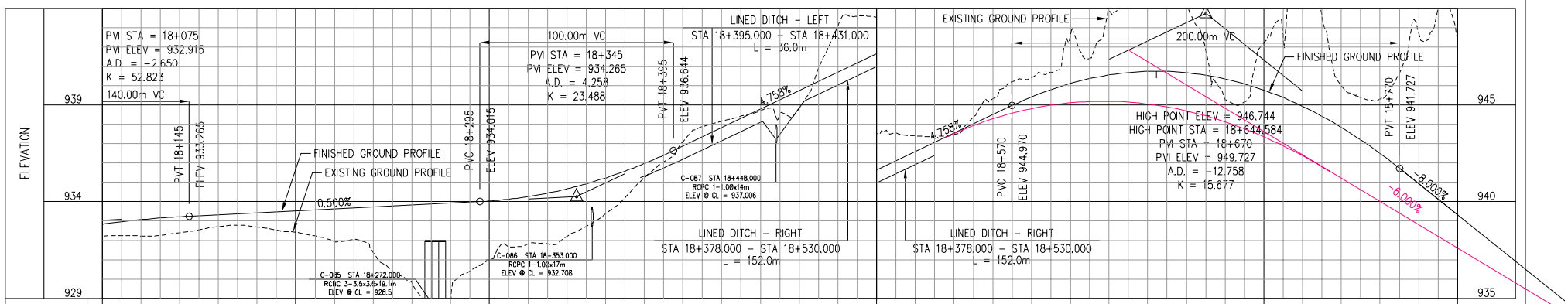
Disadvantages:

Increase rock cutting quantity.

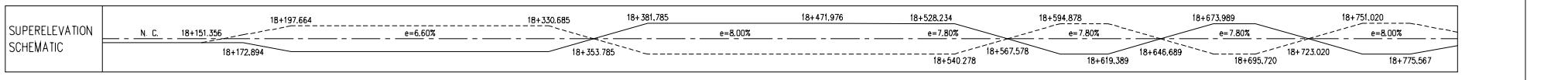
Cost Summary			
	Capital Cost	O&M Cost	Total
Original			
Proposed			
Savings	TBD by the designers	N/A	TBD by the designers



PI NO.	PI STA.	DISTANCE	AZIMUTH ddd-mm-ss	NORTHING	EASTING	DEFLECTION	CURVE ELEMENTS T	R	Lc	E	V (kph)	SUPER e (%)	WIDENING W (m)
PI 75	17+843.441	436.397	299-39-54	3 939 351.120	458 018.679	00-46-21 LT	33.701	5000.000	67.401	0.114	80	NC	–
PI 76	18+279.837	185.425	03-49-26	3 939 567.105	457 639.479	64-09-32 RT	94.020	150.000	167.967	27.030	50	6.60	1.20
PI 77	18+445.190	146.786	262-33-46	3 939 752.117	457 651.844	101-15-39 LT	91.405	75.000	132.550	45.237	50	8.00	2.30
PI 78	18+541.715	69.797	228-36-13	3 939 733.118	457 506.294	33-57-34 LT	27.481	90.000	53.343	4.102	50	7.80	1.90
PI 79	18+609.894	82.947	278-58-03	3 939 686.963	457 453.935	50-21-51 RT	42.316	90.000	79.112	9.452	50	7.80	1.90
PI 80	18+687.320	76.494	230-22-25	3 939 699.892	457 372.002	48-35-38 LT	40.631	90.000	76.331	8.746	50	7.80	1.90
PI 81	18+758.884	315.209	281-29-09	3 939 651.106	457 313.085	51-06-44 RT	35.863	75.000	66.906	8.133	50	8.00	2.30
PI 82	19+069.271			3 939 713.872	457 004.188	52-20-37 LT	159.721	325.000	296.910	37.127	50	4.20	0.60



CHAINAGE	FINISHED ROAD LEVELS	EXISTING ROAD LEVELS
18+100	932.849	932.235
18+120	933.081	932.243
18+140	933.238	932.410
18+160	933.340	932.720
18+180	933.440	932.702
18+200	933.540	932.443
18+220	933.640	931.961
18+240	933.740	931.393
18+260	933.840	929.821
18+280	933.940	928.964
18+300	934.046	931.022
18+320	934.273	931.827
18+340	934.671	932.224
18+360	935.240	933.381
18+380	935.978	935.252
18+400	936.882	937.121
18+420	937.833	938.161
18+440	938.785	938.714
18+460	939.736	938.830
18+480	940.688	943.114
18+500	941.639	943.525
18+520	942.591	943.410
18+540	943.542	943.466
18+560	944.494	945.301
18+580	945.414	946.414
18+600	946.110	948.479
18+620	946.551	949.885
18+640	946.737	951.527
18+660	946.668	950.169
18+680	946.344	945.292
18+700	945.764	948.226
18+720	944.930	951.504
18+740	943.840	945.962
18+760	942.495	945.317
18+780	940.927	948.624
18+800	939.327	948.407



ISLAMIC REPUBLIC OF AFGHANISTAN
and
UNITED STATES AGENCY FOR INTERNATIONAL DEVELOPMENT

AFGHANISTAN INFRASTRUCTURE AND REHABILITATION PROGRAM (AIRP)
The LOUIS BERGER Group, Inc.,
BLACK & VEATCH SPECIAL PROJECTS CORP. JOINT VENTURE

TITLE
DESIGN OF BAMYAN TO DUSHI ROAD, NH-07
(TASK ORDER 24)
SEGMENT 1
LOCATION: BAGHLAN AND BAMYAN PROVINCES

SHEET CONTENTS
PLAN AND PROFILE
STA 18+100 - STA 18+800
SCALE: HOR. 1:2000 VERT. 1:200

REVISION	DATE
4 RENAMED 0 TO 4	29/03/10
3 30% DESIGN SUBMITTAL	29/03/10
2 70% DESIGN SUBMITTAL, GEN REV	29/03/10
1 70% DESIGN SUBMITTAL, NO REV	21/05/10

NAMES & SIGNATURE
DRAWN: A. C. CESPEDES DESIGNED: N. THAO
CHECKED BY: J.M. TAYLOR USA, PE
APPROVED BY: **ABOUD AL ZAIM** USA, PE

DWG NO.
BD-PP-027
SCALE: AS SHOWN

	VE RECOMMENDATION	Idea No.: __C-10d __ Segment___ Station_____
	Client: UNITED STATES AGENCY FOR INTERNATIONAL DEVELOPMENT Project: **DESIGN OF BAMYAN TO DUSHI ROAD** *AFGHANISTAN INFRASTRUCTURE AND REHABILITATION PROGRAM (AIRP)*	

Current Design:

Profile at Sta. 35+300 and Sta. 35+600:

1. Profile at Sta. 35+300, there is an S-curve on the horizontal alignment where the profile slope is 5.316%.
2. Profile at Sta. 35+600, the slope is 8% and there is an S-curve ahead of this profile.

Description of VE Alternative:

1. Since there is an S-curve on the horizontal alignment, the profile slope should be as flat as possible to control the downhill speed.
2. Where the S-curve is located, the profile slope should be reduced to 4%.
3. The approaching roadway profile slope should be reduced from 8% to 6%. (See the attached sketch.)

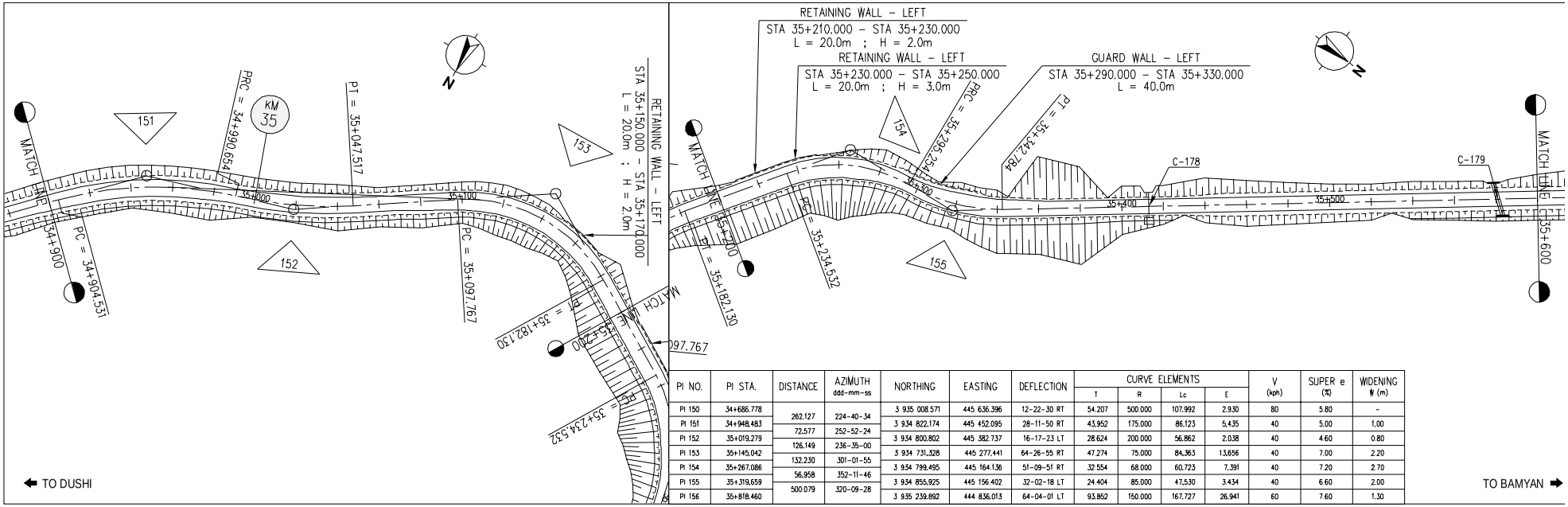
Advantages:

1. Improve operation and safety of the roadway.
2. Reduce the height of the retaining walls located along the river bank.

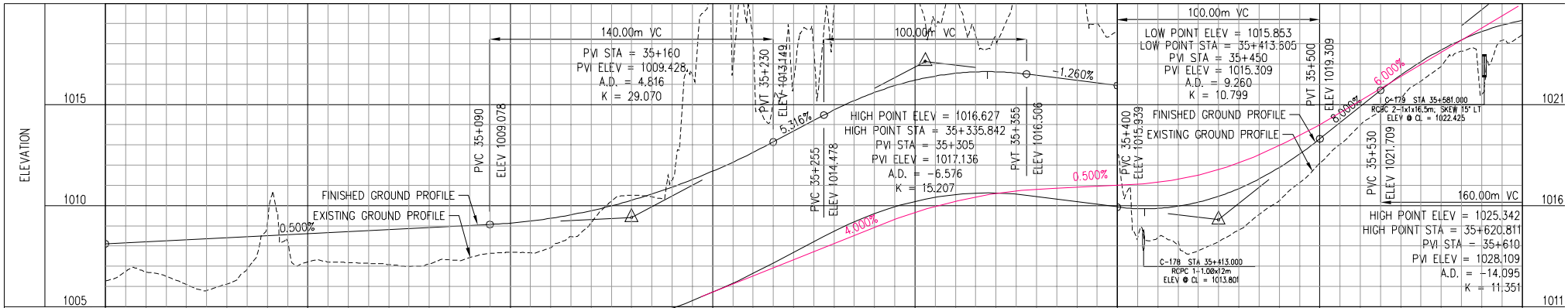
Disadvantages:

Minimal increase in earthwork quantity.

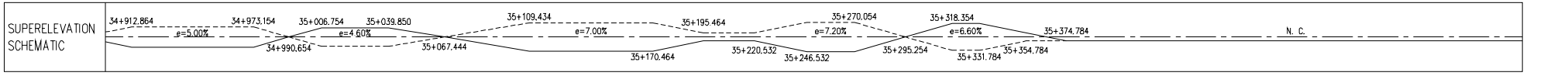
Cost Summary			
	Capital Cost	O&M Cost	Total
Original			
Proposed			
Savings	Minimal cost increase	N/A	Minimal cost increase



PI NO.	PI STA.	DISTANCE	AZIMUTH ddd-mm-ss	NORTHING	EASTING	DEFLECTION	CURVE ELEMENTS T	R	Lc	E	V (kph)	SUPER e (%)	WIDENING W (m)
PI 150	34+686.778	262.127	224-40-34	3 935 008.571	445 636.396	12-22-30 RT	54.207	500.000	107.992	2.930	80	5.80	-
PI 151	34+948.483	72.577	252-52-24	3 934 822.174	445 452.095	28-11-50 RT	43.952	175.000	86.123	5.435	40	5.00	1.00
PI 152	35+019.279	126.149	236-35-00	3 934 800.802	445 382.737	16-17-23 LT	28.624	200.000	56.862	2.038	40	4.60	0.80
PI 153	35+145.042	132.230	301-01-55	3 934 731.328	445 277.441	64-26-55 RT	47.274	75.000	84.363	13.656	40	7.00	2.20
PI 154	35+267.086	56.958	352-11-46	3 934 799.495	445 164.136	51-09-51 RT	32.554	68.000	60.723	7.391	40	7.20	2.70
PI 155	35+319.659	500.079	320-09-28	3 934 855.925	445 156.402	32-02-18 LT	24.404	85.000	47.530	3.434	40	6.60	2.00
PI 156	35+818.460			3 935 239.892	444 836.013	64-04-01 LT	93.852	150.000	167.727	26.941	60	7.60	1.30



CHAINAGE	FINISHED ROAD LEVELS	EXISTING ROAD LEVELS
34+900	1008.128	1006.289
34+920	1008.228	1006.716
34+940	1008.328	1006.124
34+960	1008.428	1006.121
34+980	1008.528	1009.016
35+000	1008.628	1007.224
35+020	1008.728	1007.196
35+040	1008.828	1007.093
35+060	1008.928	1007.124
35+080	1009.028	1007.432
35+100	1009.145	1007.695
35+120	1009.383	1007.929
35+140	1009.758	1009.155
35+160	1010.271	1010.513
35+180	1010.921	1011.269
35+200	1011.709	1020.997
35+220	1012.635	1018.184
35+240	1013.681	1016.114
35+260	1014.736	1019.897
35+280	1015.601	1035.100
35+300	1016.204	1021.901
35+320	1016.544	1020.488
35+340	1016.621	1018.256
35+360	1016.443	1022.282
35+380	1016.191	1022.769
35+400	1015.939	1018.572
35+420	1015.872	1014.413
35+440	1016.176	1013.773
35+460	1016.850	1014.802
35+480	1017.894	1016.245
35+500	1019.309	1018.097
35+520	1020.909	1019.998
35+540	1022.465	1021.401
35+560	1023.713	1022.909
35+580	1024.608	1021.522
35+600	1025.151	1024.465



ISLAMIC REPUBLIC OF AFGHANISTAN
and
UNITED STATES AGENCY FOR INTERNATIONAL DEVELOPMENT

AFGHANISTAN INFRASTRUCTURE AND REHABILITATION PROGRAM (AIRP)
The LOUIS BERGER Group, Inc., BLACK & VEATCH SPECIAL PROJECTS CORP. JOINT VENTURE

TITLE: DESIGN OF BAMYAN TO DUSHI ROAD, NH-07 (TASK ORDER 24) SEGMENT 1
LOCATION: BAGHLAN AND BAMYAN PROVINCES

SHEET CONTENTS: **PLAN AND PROFILE STA 34+900 - STA 35+600**
SCALE: HOR. 1:2000 VERT. 1:200

REVISION	DATE
4 RENAMED 0 TO 4	19/12/09
3 30% DESIGN SUBMITTAL	19/12/09
2 70% DESIGN SUBMITTAL, GEN REV	29/03/10
1 70% DESIGN SUBMITTAL, NO REV	21/05/10

NAMES & SIGNATURE
DRAWN: A. C. CESPEDES DESIGNED: N. THAO
CHECKED BY: J.M. TAYLOR USA, PE
APPROVED BY: ABOUD AL ZAIM USA, PE

DWG NO. BD-PP-4
SCALE: AS S

	VE RECOMMENDATION	Idea No.: __C-10e __ Segment___ Station_____
	Client: UNITED STATES AGENCY FOR INTERNATIONAL DEVELOPMENT Project: **DESIGN OF BAMYAN TO DUSHI ROAD** *AFGHANISTAN INFRASTRUCTURE AND REHABILITATION PROGRAM (AIRP)*	

Current Design:

Profile at Sta. 70+100:

1. The profile uses a sag curve between two crest curves.

Description of VE Alternative:

1. The 100m sag curve at Sta 70+100 can be eliminated by a tangent to improve the profile alignment.

Advantages:

1. Improve appearance of the roadway profile.

Disadvantages:

Minimal increase in earthwork quantity (fill quantity).

Cost Summary			
	Capital Cost	O&M Cost	Total
Original			
Proposed			
Savings	Minimal cost increase	N/A	Minimal cost increase

	VE RECOMMENDATION	Idea No.: __C-10f__ Segment___ Station_____
	Client: UNITED STATES AGENCY FOR INTERNATIONAL DEVELOPMENT Project: **DESIGN OF BAMYAN TO DUSHI ROAD** *AFGHANISTAN INFRASTRUCTURE AND REHABILITATION PROGRAM (AIRP)*	

Current Design:

Profile at Sta. 60+700:

1. The profile is set at low elevation, resulting large amount of rock cut.

Description of VE Alternative:

1. Raise the profile in this area by approximately 2m can significantly reduce the rock cut quantity. (See the attached sketch.)

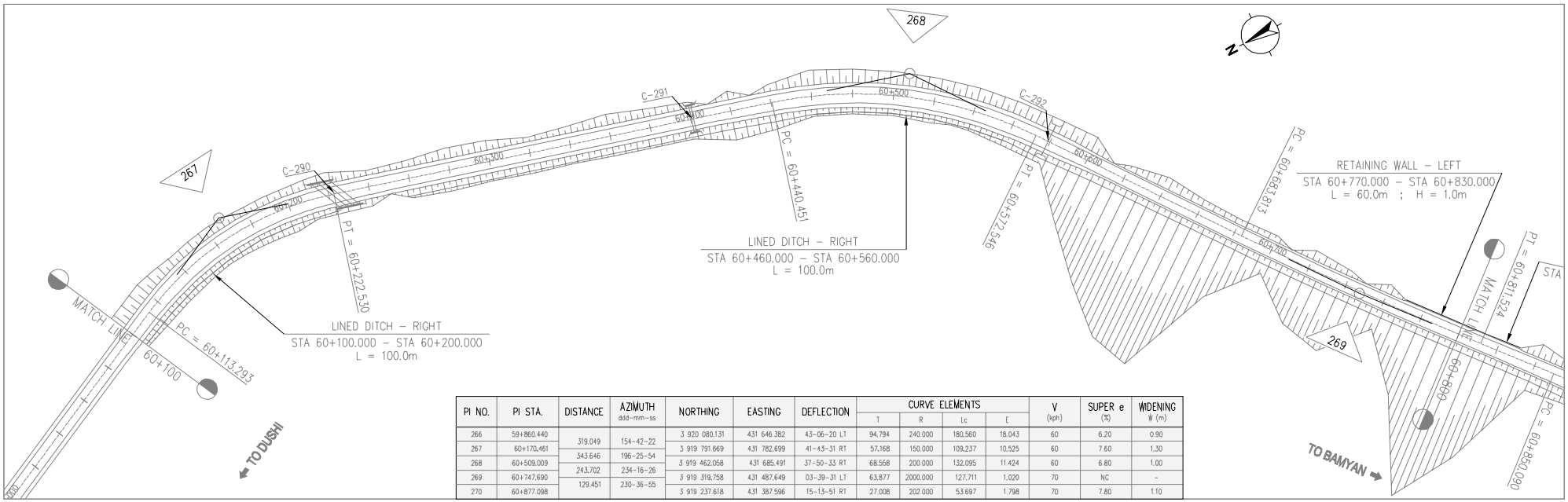
Advantages:

1. Improve 6.533% profile slope at Sta. 60+500.
2. Reduce rock cut quantity.

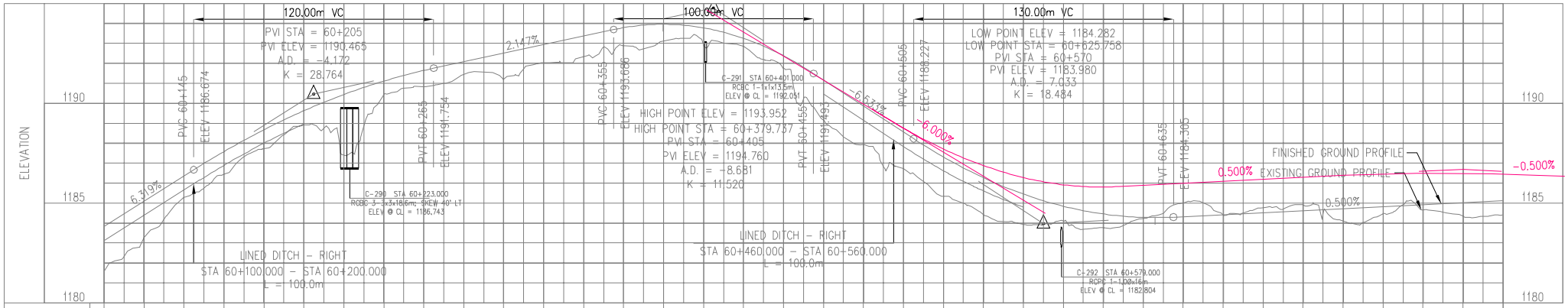
Disadvantages:

1. Require approximately 200m of additional retaining walls. (The saving from reduced quantity for rock cut may be able to offset the cost for the additional retaining walls.)

Cost Summary			
	Capital Cost	O&M Cost	Total
Original			
Proposed			
Savings	TBD by the Designers	N/A	TBD by the Designers



PI NO.	PI STA.	DISTANCE	AZIMUTH ddd-mm-ss	NORTHING	EASTING	DEFLECTION	CURVE ELEMENTS T	R	Lc	E	V (kph)	SUPER e (%)	WIDENING W (m)
266	59+860.440			3 920 080.131	431 646.382	43-06-20 LT	94.794	240.000	180.560	18.043	60	6.20	0.90
		319.049	154-42-22										
267	60+170.461			3 919 791.669	431 782.699	41-43-31 RT	57.168	150.000	109.237	10.525	60	7.60	1.30
		343.646	196-25-54										
268	60+509.009			3 919 462.058	431 685.491	37-50-33 RT	68.558	200.000	132.095	11.424	60	6.80	1.00
		243.702	234-16-26										
269	60+747.690			3 919 319.758	431 487.649	03-39-31 LT	63.877	2000.000	127.711	1.020	70	NC	-
		129.451	230-36-55										
270	60+877.098			3 919 237.618	431 387.596	15-13-51 RT	27.008	202.000	53.697	1.798	70	7.80	1.10



CHAINAGE	FINISHED ROAD LEVELS	EXISTING ROAD LEVELS
60+100	1183.830	1181.590
60+120	1185.094	1183.259
60+140	1186.358	1185.292
60+160	1187.583	1186.440
60+180	1188.673	1187.720
60+200	1189.624	1188.909
60+220	1190.436	1187.415
60+240	1191.108	1190.409
60+260	1191.642	1190.822
60+280	1192.076	1191.436
60+300	1192.505	1191.212
60+320	1192.935	1192.022
60+340	1193.364	1192.333
60+360	1193.783	1192.874
60+380	1193.952	1193.107
60+400	1193.774	1192.891
60+420	1193.248	1192.856
60+440	1192.376	1191.751
60+460	1191.167	1189.162
60+480	1189.860	1187.933
60+500	1188.553	1186.724
60+520	1187.308	1185.339
60+540	1186.272	1184.435
60+560	1185.452	1183.944
60+580	1184.848	1184.108
60+600	1184.462	1183.770
60+620	1184.291	1184.235
60+640	1184.330	1185.017
60+660	1184.430	1184.411
60+680	1184.530	1184.780
60+700	1184.630	1184.915
60+720	1184.730	1184.099
60+740	1184.830	1184.471
60+760	1184.930	1184.677
60+780	1185.030	1184.342
60+800	1185.130	1184.409

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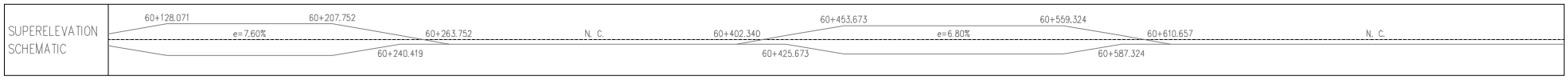


ISLAMIC REPUBLIC OF AFGHANISTAN
and
UNITED STATES AGENCY FOR INTERNATIONAL DEVELOPMENT

AFGHANISTAN INFRASTRUCTURE AND REHABILITATION PROGRAM (AIRP)

The LOUIS BERGER Group, Inc., BLACK & VEATCH SPECIAL PROJECTS CORP. JOINT VENTURE

TITLE: DESIGN OF BAMYAN TO DUSHI ROAD, NH-07 (TASK ORDER 24) SEGMENT 2

LOCATION: BAGHLAN AND BAMYAN PROVINCES

SHEET CONTENTS: **PLAN AND PROFILE** STA 60+100 - STA 60+800

SCALE: HOR. 1:2000 VERT. 1:200

REVISION	DATE
A RENAMED 0 TO A	19/12/09
A 30% DESIGN SUBMITTAL	19/12/09
B 70% DESIGN SUBMITTAL, GEN REV	29/03/10
C 70% DESIGN SUBMITTAL, GEN REV	21/05/10

NAMES & SIGNATURE
DRAWN: S. SOLETE DESIGNED: N. THAO
CHECKED BY: R.C. BANAN Phil, PE
APPROVED BY:
ABOUD AL ZAIM USA, PE

DWG NO. BD-PP-08

SCALE: AS SHOWN

	VE RECOMMENDATION	Idea No.: __C-11 __ Segment___ Station_____
	Client: UNITED STATES AGENCY FOR INTERNATIONAL DEVELOPMENT Project: **DESIGN OF BAMYAN TO DUSHI ROAD** *AFGHANISTAN INFRASTRUCTURE AND REHABILITATION PROGRAM (AIRP)*	

Current Design:
No provision for climbing lanes.

Description of VE Alternative:

Due to the lack of traffic data and traffic analysis results, the need of climbing lanes cannot be evaluated. Since the profiles of the current design use steep slope for a long run at many locations, the designers should assess the need of a climbing lane at locations where there is a potential speed reduction of more than 15kph for truck climbing a steep slope. Listed below are roadway segments where climbing lanes may be warranted:

List of roadway segments with steep slope for a long distance			
Station		Length	Grade
From	To	(m)	(%)
3+760.000	4+020.000	260.00	7.64%
5+185.000	5+490.000	305.00	7.28%
14+265.000	14+660.000	395.00	6.53%
18+780.520	18+979.070	198.55	8.03%
26+300.000	26+530.000	230.00	6.56%
28+625.000	29+020.000	395.00	7.71%
29+020.000	29+365.000	345.00	8.00%
35+450.000	35+610.000	160.00	8.00%
37+875.000	38+310.000	435.00	10.00%
38+885.000	39+350.000	465.00	8.00%
39+350.000	39+690.000	340.00	7.73%
40+940.000	41+280.000	340.00	8.00%
41+540.000	41+750.000	210.00	7.02%
54+205.000	54+465.000	260.00	8.00%
54+465.000	54+825.000	360.00	8.00%
58+515.000	58+725.000	210.00	7.76%
58+725.000	59+005.000	280.00	8.00%
69+210.000	69+410.000	200.00	6.72%
69+785.000	69+990.000	205.00	7.92%
70+465.000	70+695.000	230.00	6.54%
70+840.000	71+045.000	205.00	7.27%
71+045.000	71+360.000	315.00	6.16%
80+275.000	80+482.000	207.00	7.82%
82+717.000	82+937.000	220.00	6.49%

Advantages:

1. Improve roadway operation and safety.

Disadvantages:

1. Increase in construction costs.
2. Additional roadside impacts.

Cost Summary			
	Capital Cost	O&M Cost	Total
Original			
Proposed			
Savings	TBD be the Designers	N/A	TBD be the Designers

	VE RECOMMENDATION	Idea No.: __C-12__ Segment___ Station_____
	Client: UNITED STATES AGENCY FOR INTERNATIONAL DEVELOPMENT Project: **DESIGN OF BAMYAN TO DUSHI ROAD** *AFGHANISTAN INFRASTRUCTURE AND REHABILITATION PROGRAM (AIRP)*	

Current Design:
There are many broken back horizontal curves which have very short tangent length between them. At some locations, the short tangent portion is superelevated, resulting in excessive cross slope on the tangent alignment.

Description of VE Alternative:

Cross slope change in the tangent portion of broken back curves layout could cause confusion to motorists as they come out of the first curve, expecting a straight roadway or a curved roadway to the opposite direction ahead. The unexpected turn of the second curve to the same direction as the first curve and the cross slope changes from steep to flat and to steep again in a very short distance can create an unsafe driving condition, especially for the trucks. Carrying the steep cross slope through the short tangent can also impose unsafe condition, especially when speed is low and under wet or icy condition, which can cause vehicles sliding to the low side of the road (into the opposite direction if traveling in the lane on the high side).

Below is a list of curves which have the short broken back curves layout. It is recommended to replace these curves with a single curve to eliminate the potentially hazardous condition.

Curve numbers 36 & 37, 39 & 40, 42 & 43, 67 & 68, 114 & 115, 226 & 227, 330 & 331, 336 & 337 and 345 &346.

Advantages:

1. Eliminate adverse effect associated with short broken-back alignment, such as unexpected cross slope change (which could mislead drivers, as they come out of the first curve, thinking they are heading into a tangent segment or another curve that turns to the opposite direction.)
2. Avoid excessive cross slope on short tangent alignment between curves.

Disadvantages:

1. Additional earthwork is required at some locations.

Cost Summary			
	Capital Cost	O&M Cost	Total
Original			
Proposed			
Savings	TBD by the Designers	N/A	TBD by the Designers

	VE RECOMMENDATION	Idea No.: __C-13 __ Segment___ Station_____
	Client: UNITED STATES AGENCY FOR INTERNATIONAL DEVELOPMENT Project: **DESIGN OF BAMYAN TO DUSHI ROAD** *AFGHANISTAN INFRASTRUCTURE AND REHABILITATION PROGRAM (AIRP)*	

Current Design:
The current design creates a short normal crown section between curves at many locations. These short normal crown sections are the result of applying and distributing the required superelevation transition length strictly based on the methodology established in the design report.

Description of VE Alternative:
The superelevation transition (which is commonly called as tangent transition in highway engineering) length consists of superelevation runoff and tangent runout. The distribution methodology recommended by AASHTO has considered the best combination of utilizing superelevation and side friction to overcome the centrifugal force, comfort level, and safety due to excessive cross slope of the tangent portion within the transition length. The transition length established by AASHTO is normally considered as the minimum length required since it is derived from the maximum gradient. Therefore, utilizing a longer length is always viewed as a better design. When the transition results in a short normal crown section between curves, the transition should be lengthened to eliminate the short normal crown section because it serves no purpose. Under the design speed of 50kph (which is 14m per second), it takes less than 2 seconds to pass through a 25m long normal crown section; that is less than the typical 2 seconds reaction time of an ordinary driver.

Below is a list of curves which have a relatively short stretch of normal crown section between two superelevated curves:

Curve nos.
2, 9, 27, 66, 76, 84, 91, 98, 99, 108, 118, 122, 123, 133, 153, 157, 180, 183, 186, 187, 188, 191, 207, 221, 238, 252, 254, 255, 265, 273, 277, 278, 279, 280, 290, 296, 340, 365, 367

Advantages:

1. Better horizontal alignment

Disadvantages:

None

Cost Summary			
	Capital Cost	O&M Cost	Total
Original			
Proposed			
Savings	N/A	N/A	N/A

	VE RECOMMENDATION	Idea No.: __C-14a __ Segment___ Station_____
	Client: UNITED STATES AGENCY FOR INTERNATIONAL DEVELOPMENT Project: **DESIGN OF BAMYAN TO DUSHI ROAD** *AFGHANISTAN INFRASTRUCTURE AND REHABILITATION PROGRAM (AIRP)*	

Current Design:

Profile at Sta. 4+000:

1. Profile uses 7.641% slope and short crest curve.

Description of VE Alternative:

1. It appears that the profile slope can be reduced to 6% and the length of the crest curve can be lengthened to improve the operation of this segment of the roadway and the stopping sight distance.

Advantages:

1. Provide flatter profile slope to improve the operation of this road.
2. Improve stopping sight distance of the crest curve.

Disadvantages:

Increase in earthwork quantity.

Cost Summary			
	Capital Cost	O&M Cost	Total
Original			
Proposed			
Savings	TBD by the designers	N/A	TBD by the designers

	VE RECOMMENDATION	Idea No.: __C-14b __ Segment___ Station_____
	Client: UNITED STATES AGENCY FOR INTERNATIONAL DEVELOPMENT Project: **DESIGN OF BAMYAN TO DUSHI ROAD** *AFGHANISTAN INFRASTRUCTURE AND REHABILITATION PROGRAM (AIRP)*	

Current Design:

Profile at Sta. 17+200:

1. Current profile uses a -7.033% slope.

Description of VE Alternative:

1. It appears that the -7.033% slope can be flattened to -6.000% to improve the operation of the roadway. (See the attached sketch.)

Advantages:

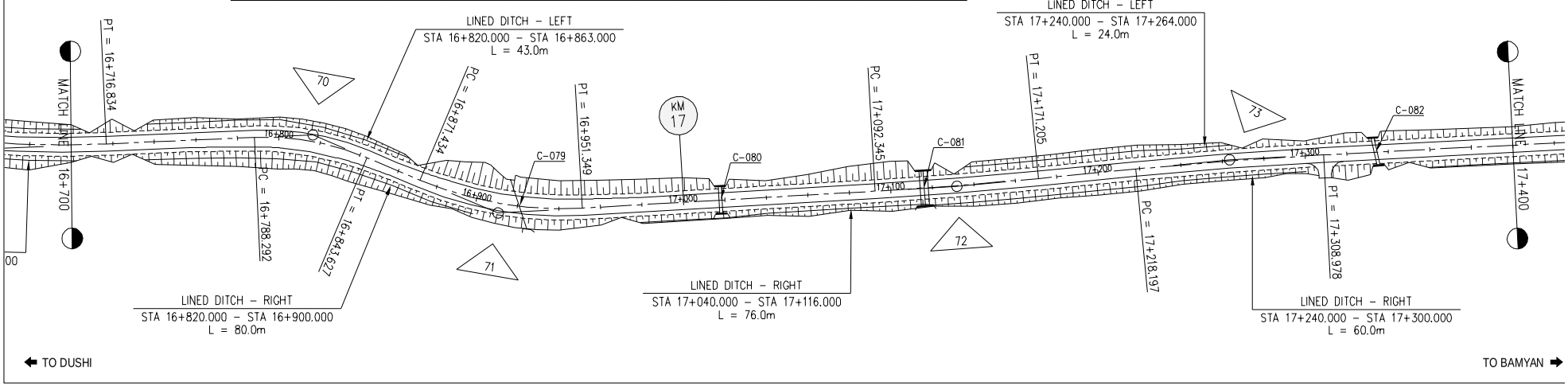
1. Flatten the profile slope to improve operation of the road.

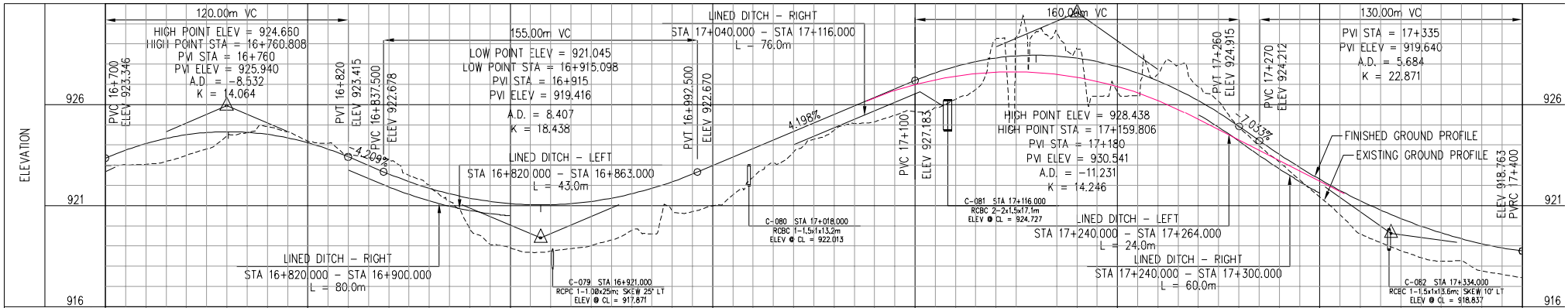
Disadvantages:

None.

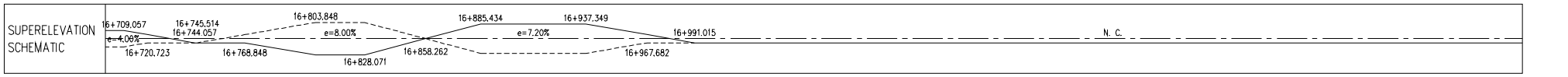
Cost Summary			
	Capital Cost	O&M Cost	Total
Original			
Proposed			
Savings	TBD by the designers	N/A	TBD by the designers

PI NO.	PI STA.	DISTANCE	AZIMUTH ddd-mm-ss	NORTHING	EASTING	DEFLECTION	CURVE ELEMENTS T	R	Lc	E	V (kph)	SUPER e (%)	WIDENING W (m)
PI 69	16+642.635			3 938 850.072	459 101.753	17-08-02 LT	75.323	500.000	149.522	5.642	60	4.00	–
		174.909	290-57-39										
PI 70	16+816.420			3 938 912.642	458 938.418	25-21-49 RT	28.128	125.000	56.335	3.126	60	8.00	1.60
		96.602	316-19-28										
PI 71	16+912.100			3 938 982.511	458 871.708	26-09-52 LT	40.667	175.000	79.915	4.663	60	7.20	1.20
		221.098	290-09-36										
PI 72	17+131.780			3 939 058.711	458 664.156	02-15-33 LT	39.435	2000.000	78.860	0.389	60	NC	–
		131.825	287-54-03										
PI 73	17+263.595			3 939 099.230	458 538.712	02-36-02 RT	45.398	2000.000	90.781	0.515	60	NC	–
		268.168	290-30-06										
PI 74	17+531.747			3 939 193.151	458 287.530	09-56-09 RT	26.077	300.000	52.023	1.131	80	7.60	0.80





CHAINAGE	FINISHED ROAD LEVELS	EXISTING ROAD LEVELS
16+700	923.346	922.978
16+720	924.068	923.051
16+740	924.506	923.488
16+760	924.660	924.435
16+780	924.529	924.912
16+800	924.114	924.198
16+820	923.415	923.529
16+840	922.575	923.301
16+860	921.869	922.027
16+880	921.379	919.875
16+900	921.107	918.927
16+920	921.052	918.754
16+940	921.213	919.033
16+960	921.592	919.780
16+980	922.188	920.760
17+000	922.985	920.994
17+020	923.824	922.422
17+040	924.664	923.659
17+060	925.504	924.744
17+080	926.343	925.156
17+100	927.183	925.651
17+120	927.882	926.268
17+140	928.301	929.259
17+160	928.438	929.611
17+180	928.295	928.742
17+200	927.871	926.625
17+220	927.167	927.519
17+240	926.181	926.876
17+260	924.915	924.879
17+280	923.530	923.150
17+300	922.298	921.413
17+320	921.241	919.610
17+340	920.360	918.779
17+360	919.652	918.265
17+380	919.120	917.778
17+400	918.763	917.443



ISLAMIC REPUBLIC OF AFGHANISTAN
and
UNITED STATES AGENCY FOR INTERNATIONAL DEVELOPMENT

AFGHANISTAN INFRASTRUCTURE AND REHABILITATION PROGRAM (AIRP)
The LOUIS BERGER Group, Inc., BLACK & VEATCH SPECIAL PROJECTS CORP. JOINT VENTURE

TITLE: DESIGN OF BAMYAN TO DUSHI ROAD, NH-07 (TASK ORDER 24) SEGMENT 1
LOCATION: BAGHLAN AND BAMYAN PROVINCES

SHEET CONTENTS: **PLAN AND PROFILE STA 16+700 - STA 17+400**
SCALE: HOR. 1:2000 VERT. 1:200

REVISION	DATE
4 RENAMED 0 TO 4	29/03/10
3 30% DESIGN SUBMITTAL	29/03/10
2 70% DESIGN SUBMITTAL, GEN REV	29/03/10
1 70% DESIGN SUBMITTAL, NO REV	21/05/10

NAMES & SIGNATURE
DRAWN: A. C. CESPEDES DESIGNED: N. THAO
CHECKED BY: J.M. TAYLOR USA, PE
APPROVED BY: **ABOUD AL ZAIM** USA, PE

DWG NO. **BD-PP-0**
SCALE: AS S

	VE RECOMMENDATION	**Idea No.: __C-14c __** **Segment___ Station_____**
	Client: UNITED STATES AGENCY FOR INTERNATIONAL DEVELOPMENT Project: **DESIGN OF BAMYAN TO DUSHI ROAD** *AFGHANISTAN INFRASTRUCTURE AND REHABILITATION PROGRAM (AIRP)*	

Current Design:

Profile at Sta. 24+600:

1. Current profile uses an 8.000% slope and the horizontal alignment consists of an S-curve.

Description of VE Alternative:

1. It is recommended to reduce the profile slope to 6.000% to minimize the adverse effect caused by an S-curve on the horizontal alignment. (See the attached sketch.)

Advantages:

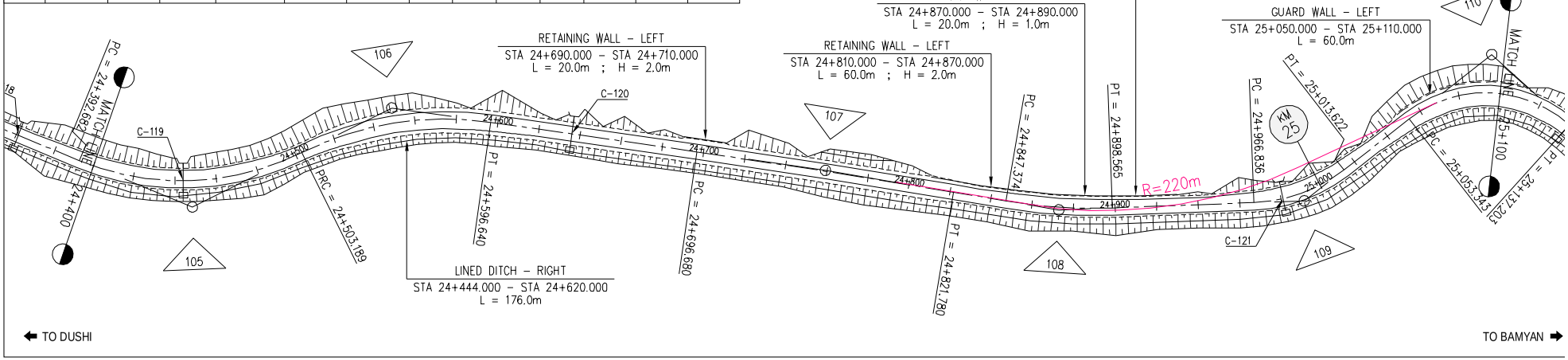
1. Flatten the profile slope to improve operation of the road.
2. Reduce the adverse effect created by an S-curve in the same area and make the road safer.

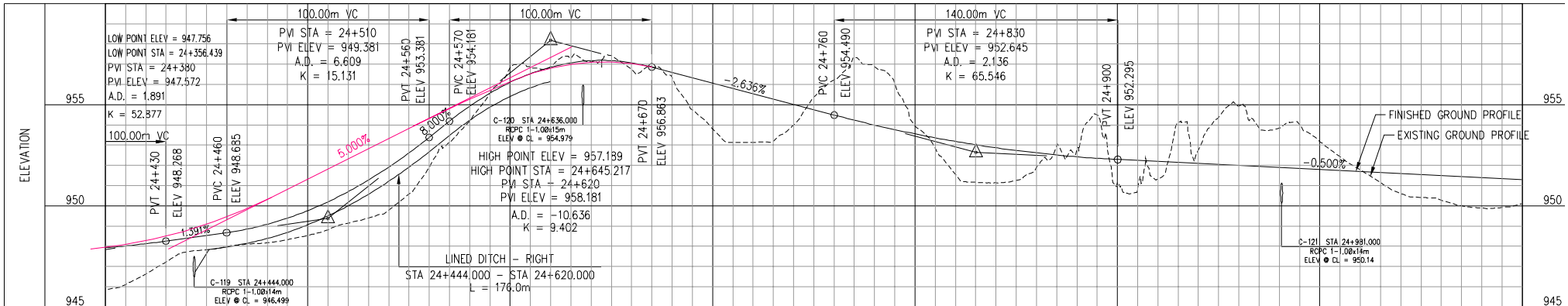
Disadvantages:

Require retaining walls on the left side of the road to minimize impact to cultivated lands (if necessary).

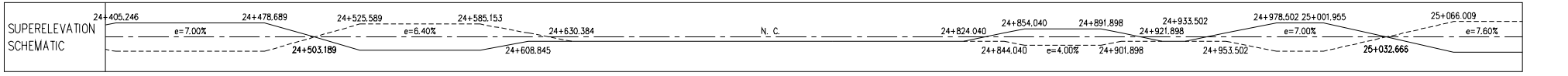
Cost Summary			
	Capital Cost	O&M Cost	Total
Original			
Proposed			
Savings	TBD by the designers	N/A	TBD by the designers

PI NO.	PI STA.	DISTANCE	AZIMUTH ddd-mm-ss	NORTHING	EASTING	DEFLECTION	CURVE ELEMENTS T	R	Lc	E	V (kph)	SUPER e (%)	WIDENING W (m)
PI 104	24+260.109			3 938 688.454	453 649.799	25-34-18 LT	34.040	150.000	66.946	3.814	60	7.60	1.30
		192.547	245-01-43										
PI 105	24+451.522			3 938 607.168	453 475.252	48-42-16 LT	58.840	130.000	110.507	12.696	50	7.00	1.40
		107.034	196-19-26										
PI 106	24+551.383			3 938 504.448	453 445.168	34-32-59 RT	48.194	155.000	93.451	7.320	50	6.40	1.20
		210.787	230-52-05										
PI 107	24+759.233			3 938 371.419	453 281.662	01-26-01 RT	62.553	5000.000	125.100	0.391	40	NC	-
		113.853	232-18-06										
PI 108	24+873.059			3 938 301.810	453 191.592	11-43-56 LT	25.685	250.000	51.191	1.316	40	4.00	0.70
		118.139	220-34-11										
PI 109	24+991.018			3 938 212.070	453 114.758	35-44-30 LT	24.182	75.000	46.786	3.802	40	7.00	2.20
		114.321	184-49-40										
PI 110	25+103.760			3 938 098.154	453 105.137	80-04-49 RT	50.418	60.000	83.860	18.371	40	7.60	2.70
		184.473	264-54-29										
PI 111	25+271.258			3 938 081.782	452 921.392	64-11-01 LT	62.710	100.000	112.022	18.036	40	6.20	1.60





CHAINAGE	FINISHED ROAD LEVELS	EXISTING ROAD LEVELS
24+400	947.936	945.872
24+420	948.138	946.637
24+440	948.407	947.720
24+460	948.685	948.015
24+480	949.096	948.189
24+500	949.770	948.550
24+520	950.709	949.154
24+540	951.913	949.796
24+560	953.381	951.923
24+580	954.928	954.185
24+600	956.102	956.824
24+620	956.851	956.864
24+640	957.175	957.117
24+660	957.073	956.744
24+680	956.599	956.323
24+700	956.072	953.811
24+720	955.545	953.145
24+740	955.018	954.009
24+760	954.490	956.222
24+780	953.994	956.873
24+800	953.558	953.955
24+820	953.184	951.547
24+840	952.870	951.139
24+860	952.617	951.901
24+880	952.426	952.788
24+900	952.295	951.169
24+920	952.195	951.338
24+940	952.095	952.796
24+960	951.995	954.917
24+980	951.895	953.850
25+000	951.795	953.177
25+020	951.695	951.772
25+040	951.595	950.605
25+060	951.495	950.278
25+080	951.395	949.897
25+100	951.295	950.115



ISLAMIC REPUBLIC OF AFGHANISTAN and UNITED STATES AGENCY FOR INTERNATIONAL DEVELOPMENT	AFGHANISTAN INFRASTRUCTURE AND REHABILITATION PROGRAM (AIRP) The LOUIS BERGER Group, Inc., BLACK & VEATCH SPECIAL PROJECTS CORP. JOINT VENTURE	TITLE: DESIGN OF BAMYAN TO DUSHI ROAD, NH-07 (TASK ORDER 24) SEGMENT 1	SHEET CONTENTS: PLAN AND PROFILE STA 24+400 - STA 25+100	REVISION / DATE	NAMES & SIGNATURE / DWG NO.
		LOCATION: BAGHLAN AND BAMYAN PROVINCES	SCALE: HOR. 1:2000 VERT. 1:200	3 RENAMED 2 TO 3 — 29/03/10 3 30% DESIGN SUBMITTAL — 29/03/10 2 70% DESIGN SUBMITTAL, GEN REV — 29/03/10 1 70% DESIGN SUBMITTAL, NO REV — 21/05/10	DRAWN: A. C. CESPEDES DESIGNED: N. THAO CHECKED BY: J.M. TAYLOR USA, PE APPROVED BY: ABOUD AL ZAIM USA, PE SCALE: AS S
					BD-PP-0

	VE RECOMMENDATION	**Idea No.: __C-14d __** **Segment___ Station_____**
	Client: UNITED STATES AGENCY FOR INTERNATIONAL DEVELOPMENT Project: **DESIGN OF BAMYAN TO DUSHI ROAD** *AFGHANISTAN INFRASTRUCTURE AND REHABILITATION PROGRAM (AIRP)*	

Current Design:

Profile at Sta. 26+500:

1. Current profile uses a 6.558% slope.

Description of VE Alternative:

1. It is recommended to reduce the profile slope to 6.000% since it will not significantly increase the earthwork. (See the attached sketch.)

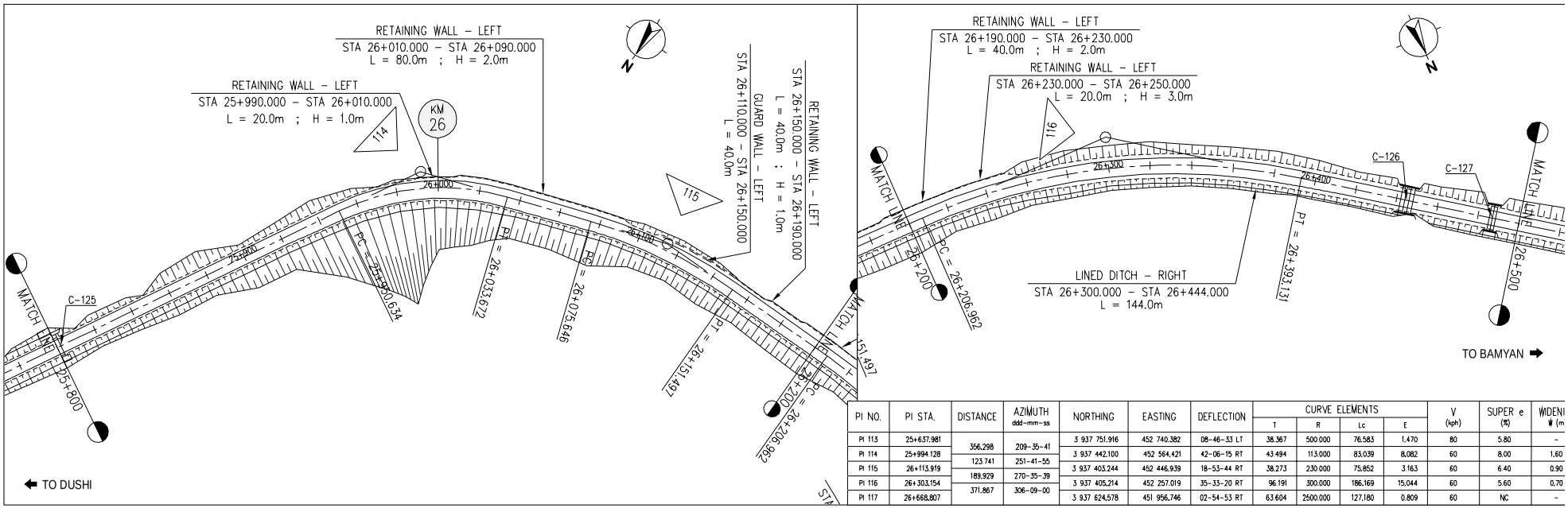
Advantages:

1. Flatten the profile slope to improve operation of the road.

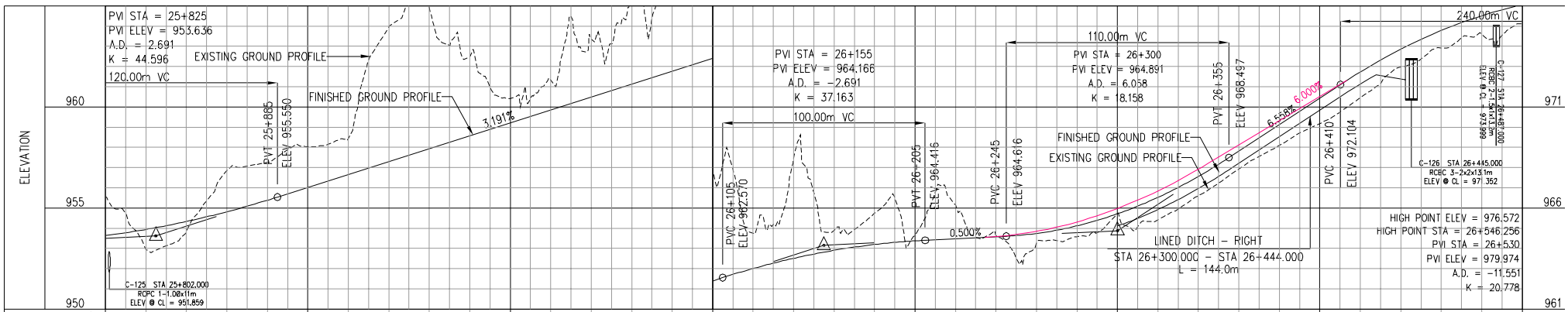
Disadvantages:

Minimal increase in earthwork.

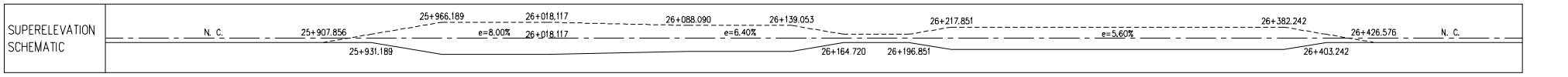
Cost Summary			
	Capital Cost	O&M Cost	Total
Original			
Proposed			
Savings	TBD by the designers	N/A	TBD by the designers



PI NO.	PI STA.	DISTANCE	AZIMUTH ddd-mm-ss	NORTHING	EASTING	DEFLECTION	CURVE ELEMENTS T	R	Lc	E	V (kph)	SUPER e (%)	WIDENI W (m
PI 113	25+637.981			3 937 751.916	452 740.382	08-46-33 LT	38.367	500.000	76.583	1.470	80	5.80	-
		356.298	209-35-41										
PI 114	25+994.128			3 937 442.100	452 564.421	42-06-15 RT	43.494	113.000	83.039	8.082	60	8.00	1.60
		123.741	251-41-55										
PI 115	26+113.919			3 937 403.244	452 446.939	18-53-44 RT	38.273	230.000	75.852	3.163	60	6.40	0.90
		189.929	270-35-39										
PI 116	26+303.154			3 937 405.214	452 257.019	35-33-20 RT	96.191	300.000	186.169	15.044	60	5.60	0.70
		371.867	306-09-00										
PI 117	26+668.807			3 937 624.578	451 956.746	02-54-53 RT	63.604	2500.000	127.180	0.809	60	NC	-



CHAINAGE	FINISHED ROAD LEVELS	EXISTING ROAD LEVELS
25+800	953.648	955.594
25+820	953.950	953.007
25+840	954.342	953.837
25+860	954.823	956.836
25+880	955.394	957.264
25+900	956.029	958.042
25+920	956.667	958.429
25+940	957.305	963.936
25+960	957.944	964.874
25+980	958.582	962.468
26+000	959.220	960.412
26+020	959.858	961.305
26+040	960.496	963.335
26+060	961.134	965.257
26+080	961.773	966.008
26+100	962.411	967.535
26+120	963.019	964.758
26+140	963.522	968.420
26+160	963.918	964.905
26+180	964.207	965.761
26+200	964.387	964.672
26+220	964.491	966.162
26+240	964.591	964.632
26+260	964.753	964.289
26+280	965.128	964.579
26+300	965.724	965.723
26+320	966.540	965.437
26+340	967.576	966.624
26+360	968.825	967.941
26+380	970.137	969.109
26+400	971.448	970.189
26+420	972.736	971.464
26+440	973.855	972.968
26+460	974.782	973.919
26+480	975.516	974.569
26+500	976.057	975.128



ISLAMIC REPUBLIC OF AFGHANISTAN and UNITED STATES AGENCY FOR INTERNATIONAL DEVELOPMENT	**AFGHANISTAN INFRASTRUCTURE AND REHABILITATION PROGRAM (AIRP)** The LOUIS BERGER Group, Inc., BLACK & VEATCH SPECIAL PROJECTS CORP. JOINT VENTURE	TITLE: DESIGN OF BAMYAN TO DUSHI ROAD, NH-07 (TASK ORDER 24) SEGMENT 1	SHEET CONTENTS: **PLAN AND PROFILE STA 25+800 - STA 26+500**	REVISION / DATE / NAMES & SIGNATURE	DWG NO.
		LOCATION: BAGHLAN AND BAMYAN PROVINCES	SCALE: HOR. 1:2000 VERT. 1:200	1 RENAMED 0 TO 1 — 29/03/10 1 30% DESIGN SUBMITTAL — 29/03/10 0 70% DESIGN SUBMITTAL, GEN REV — 29/03/10 0 70% DESIGN SUBMITTAL, NO REV — 21/05/10	DRAWN: A. C. CESPEDES DESIGNED: N. THAO CHECKED BY: J.M. TAYLOR USA, PE APPROVED BY: **ABOUD AL ZAIM** USA, PE	**BD-PP-0** SCALE: AS S

	VE RECOMMENDATION	Idea No.: __C-14e __ Segment___ Station_____
	Client: UNITED STATES AGENCY FOR INTERNATIONAL DEVELOPMENT Project: **DESIGN OF BAMYAN TO DUSHI ROAD** *AFGHANISTAN INFRASTRUCTURE AND REHABILITATION PROGRAM (AIRP)*	

Current Design:

Profile at Sta. 29+000:

1. Current profile uses a 7.715% and -8.000% slopes.

Description of VE Alternative:

1. Since the current profile requires rock cutting in this area, doing a bit more rock cutting to obtain a flatter slope to improve the operation of the road is recommended. The recommended slopes are 6.000% and -6.000%. (See the attached sketch.)

Advantages:

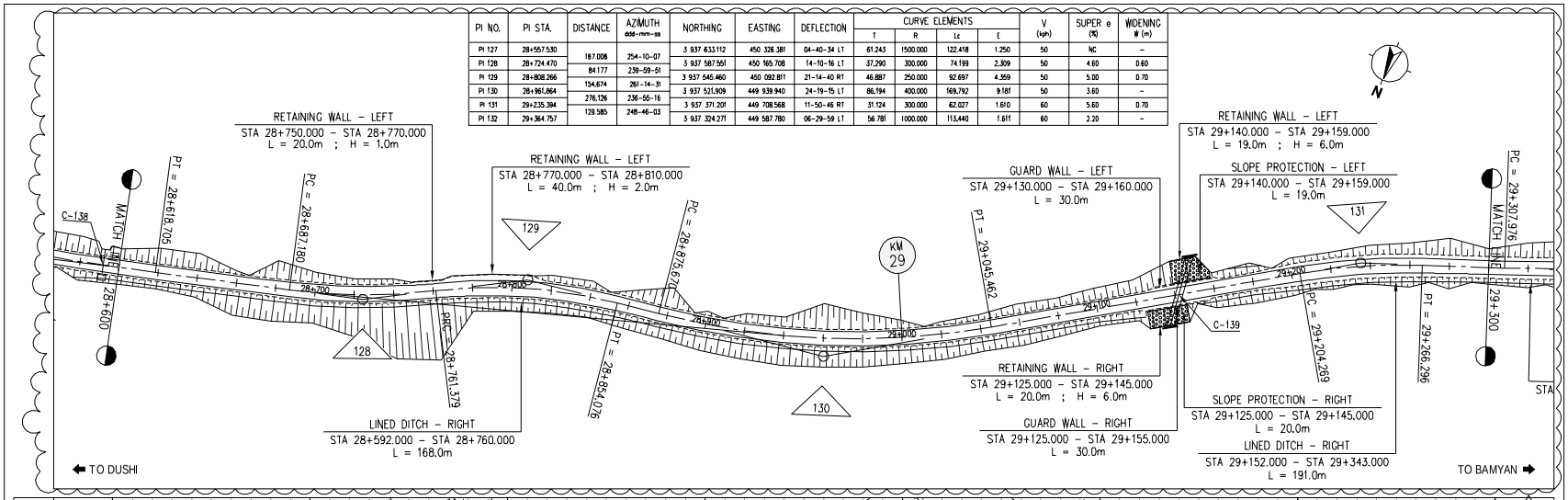
1. Flatten the profile slope to improve operation of the road.
2. Eliminate the need of retaining walls along the left side of the road.

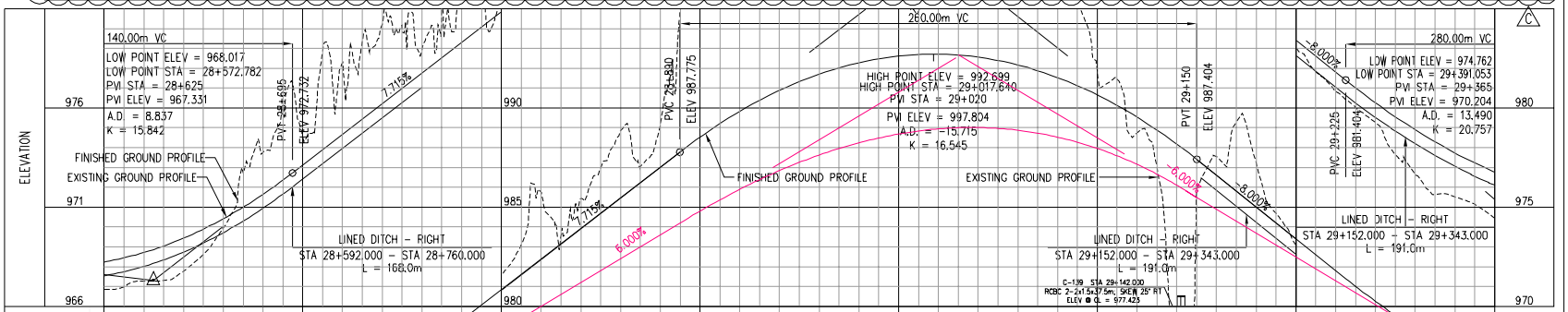
Disadvantages:

Increase rock cutting quantity.

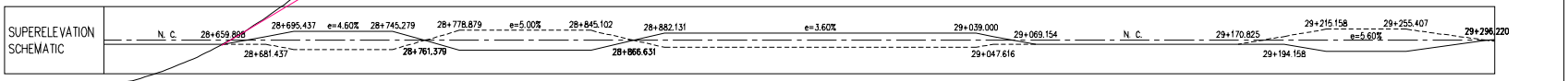
Cost Summary			
	Capital Cost	O&M Cost	Total
Original			
Proposed			
Savings	TBD by the designers	N/A	TBD by the designers

PI NO.	PI STA.	DISTANCE	AZIMUTH dddd-mmm-ss	NORTHING	EASTING	DEFLECTION	CURVE ELEMENTS T	R	Lc	E	V (kph)	SUPER e (%)	WIDENING W (m)
PI 127	28+557.530	167.008	254-10-07	3 937 633.112	450 326.381	04-40-34 LT	61.243	1500.000	122.418	1.250	50	NC	–
PI 128	28+724.470	84.177	239-59-51	3 937 587.551	450 165.708	14-10-16 LT	37.290	300.000	74.199	2.309	50	4.60	0.60
PI 129	28+808.266	154.674	261-14-31	3 937 545.460	450 092.811	21-14-40 RT	46.887	250.000	92.697	4.359	50	5.00	0.70
PI 130	28+961.864	276.126	236-55-16	3 937 521.909	449 939.940	24-19-15 LT	86.194	400.000	169.792	9.181	50	3.60	–
PI 131	29+235.394	129.585	248-46-03	3 937 371.201	449 708.568	11-50-46 RT	51.124	300.000	62.027	1.610	60	5.60	0.70
PI 132	29+364.757			3 937 324.271	449 587.780	06-29-59 LT	56.781	1000.000	113.440	1.611	60	2.20	–





CHAINAGE	FINISHED ROAD LEVELS	EXISTING ROAD LEVELS
28+600	968.251	966.868
28+620	968.721	967.284
28+640	969.443	967.782
28+660	970.418	969.929
28+680	971.645	973.772
28+700	973.117	974.588
28+720	974.660	978.259
28+740	976.203	980.189
28+760	977.746	979.908
28+780	979.289	982.872
28+800	980.832	981.586
28+820	982.375	985.771
28+840	983.918	985.441
28+860	985.461	988.858
28+880	987.004	989.055
28+900	988.517	998.340
28+920	989.818	1002.346
28+940	990.877	1004.170
28+960	991.695	1005.707
28+980	992.271	1001.453
29+000	992.605	995.316
29+020	992.697	996.552
29+040	992.548	995.764
29+060	992.157	999.921
29+080	991.524	997.446
29+100	990.649	991.738
29+120	989.532	988.743
29+140	988.174	973.839
29+160	986.604	987.541
29+180	985.004	987.136
29+200	983.404	983.086
29+220	981.804	980.843
29+240	980.259	979.260
29+260	978.669	976.668
29+280	977.133	975.531
29+300	976.759	974.464



ISLAMIC REPUBLIC OF AFGHANISTAN and UNITED STATES AGENCY FOR INTERNATIONAL DEVELOPMENT	AFGHANISTAN INFRASTRUCTURE AND REHABILITATION PROGRAM (AIRP) The LOUIS BERGER Group, Inc., BLACK & VEATCH SPECIAL PROJECTS CORP. JOINT VENTURE	TITLE	SHEET CONTENTS	REVISION	DATE	NAMES & SIGNATURE	DWG NO.
		DESIGN OF BAMYAN TO DUSHI ROAD, NH-07 (TASK ORDER 24) SEGMENT 1	PLAN AND PROFILE STA 28+600 - STA 29+300	4 RENAMED 4 TO 4	29/03/10	DRAWN: A. C. CESPEDES DESIGNED: N. THAO	BD-PP-042
				3 30% DESIGN SUBMITTAL	29/03/10	CHECKED BY: J.M. TAYLOR USA, PE	
				2 70% DESIGN SUBMITTAL, GEN REV	29/03/10	APPROVED BY:	
		LOCATION: BAGHLAN AND BAMYAN PROVINCES	SCALE: HOR. 1:2000 VERT. 1:200	1 70% DESIGN SUBMITTAL, PLAN REV	21/05/10	ABOUD AL ZAIM USA, PE	SCALE: AS SHOWN

	VE RECOMMENDATION	**Idea No.: __C-14f __** **Segment___ Station_____**
	Client: UNITED STATES AGENCY FOR INTERNATIONAL DEVELOPMENT Project: **DESIGN OF BAMYAN TO DUSHI ROAD** *AFGHANISTAN INFRASTRUCTURE AND REHABILITATION PROGRAM (AIRP)*	

Current Design:

Profile at Sta. 29+700:

1. Current profile uses a 7.5870% slope.

Description of VE Alternative:

1. It appears that the profile slope in this area can be set at 5.490%. (See the attached sketch.)

Advantages:

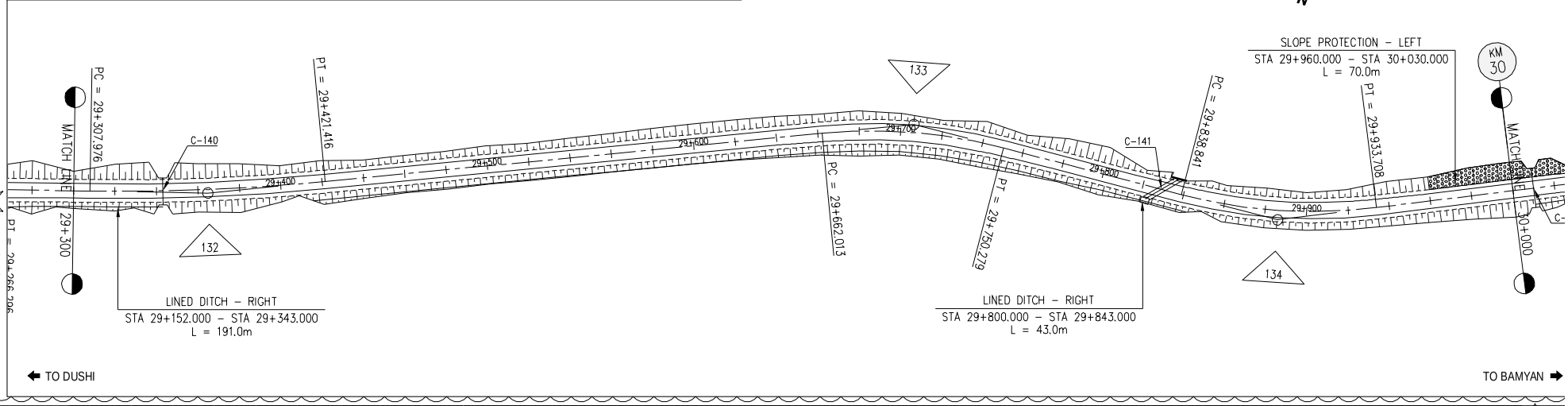
1. Flatten the profile slope to improve operation of the road.

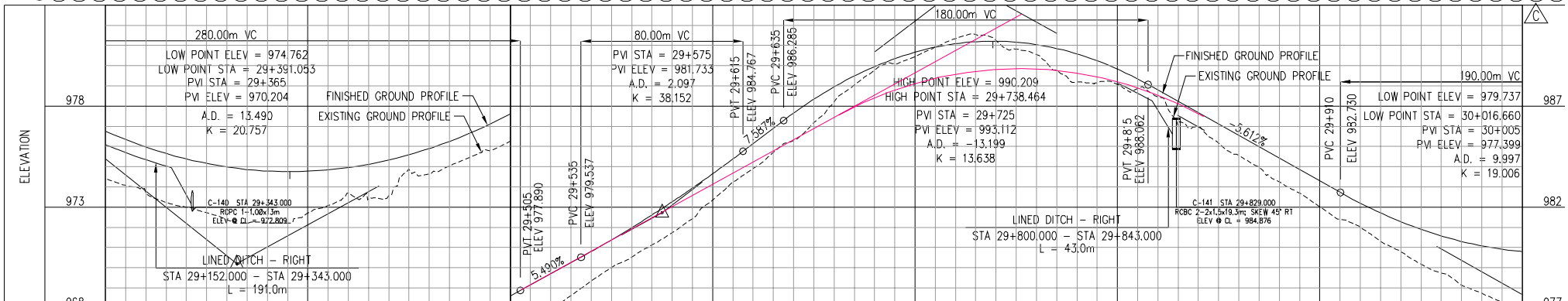
Disadvantages:

Increase earthwork. (However, the increase is minimal.)

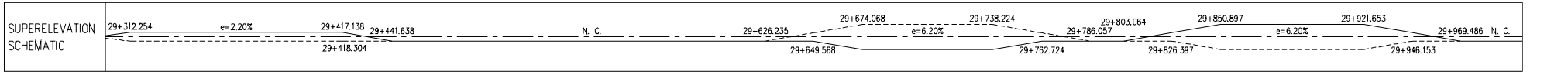
Cost Summary			
	Capital Cost	O&M Cost	Total
Original			
Proposed			
Savings	TBD by the designers	N/A	TBD by the designers

PI NO.	PI STA.	DISTANCE	AZIMUTH ddd-mm-ss	NORTHING	EASTING	DEFLECTION	CURVE ELEMENTS T	R	Lc	E	V (kph)	SUPER e (%)	WIDENING W (m)
PI 131	29+235.394	129.585	248-46-03	3 937 371.201	449 708.568	11-50-46 RT	31.124	300.000	62.027	1.610	60	5.60	0.70
PI 132	29+364.757	341.975	242-16-04	3 937 324.271	449 587.780	06-29-59 LT	56.781	1000.000	113.440	1.611	60	2.20	-
PI 133	29+706.610	181.171	262-29-49	3 937 165.136	449 285.086	20-13-45 RT	44.598	250.000	88.267	3.947	60	6.20	0.80
PI 134	29+886.852	193.824	240-45-18	3 937 141.480	449 105.467	21-44-31 LT	48.011	250.000	94.867	4.568	60	6.20	0.80
PI 135	30+079.522			3 937 046.788	448 936.347	28-49-55 RT	29.561	115.000	57.869	3.739	40	5.80	1.50





CHAINAGE	FINISHED ROAD LEVELS	EXISTING ROAD LEVELS
29+300	976.759	974.464
29+320	975.978	973.726
29+340	975.390	973.000
29+360	974.995	972.384
29+380	974.792	972.233
29+400	974.782	972.723
29+420	974.964	973.695
29+440	975.339	973.567
29+460	975.907	974.651
29+480	976.668	975.479
29+500	977.621	976.269
29+520	978.713	977.100
29+540	979.815	978.346
29+560	980.991	979.529
29+580	982.273	980.744
29+600	983.659	982.358
29+620	985.147	983.918
29+640	986.655	985.306
29+660	987.952	987.227
29+680	988.956	988.776
29+700	989.667	989.448
29+720	990.084	990.338
29+740	990.208	990.233
29+760	990.039	989.540
29+780	989.577	988.193
29+800	988.821	988.078
29+820	987.781	987.451
29+840	986.659	985.975
29+860	985.536	984.550
29+880	984.414	983.242
29+900	983.291	982.023
29+920	982.195	980.999
29+940	981.283	979.806
29+960	980.582	978.753
29+980	980.091	977.742
30+000	979.810	976.926



ISLAMIC REPUBLIC OF AFGHANISTAN
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AFGHANISTAN INFRASTRUCTURE AND REHABILITATION PROGRAM (AIRP)
The LOUIS BERGER Group, Inc., BLACK & VEATCH SPECIAL PROJECTS CORP. JOINT VENTURE

TITLE: DESIGN OF BAMYAN TO DUSHI ROAD, NH-07 (TASK ORDER 24) SEGMENT 1
LOCATION: BAGHLAN AND BAMYAN PROVINCES

SHEET CONTENTS: **PLAN AND PROFILE**
STA 29+300 - STA 30+000
SCALE: HOR. 1:2000 VERT. 1:200

REVISION	DATE
4 RENAMED 0 TO 4	29/03/10
3 30% DESIGN SUBMITTAL	29/03/10
2 70% DESIGN SUBMITTAL, GEN REV	29/03/10
1 70% DESIGN SUBMITTAL, NO REV	21/05/10

NAMES & SIGNATURE
DRAWN: A. C. CESPEDES DESIGNED: N. THAO
CHECKED BY: J.M. TAYLOR USA, PE
APPROVED BY: **ABOUD AL ZAIM** USA, PE

DWG NO. **BD-PP-0**
SCALE: AS S

	VE RECOMMENDATION	**Idea No.: __C-14g__ __** **Segment___ Station_____**
	Client: UNITED STATES AGENCY FOR INTERNATIONAL DEVELOPMENT Project: **DESIGN OF BAMYAN TO DUSHI ROAD** *AFGHANISTAN INFRASTRUCTURE AND REHABILITATION PROGRAM (AIRP)*	

Current Design:

Profile at Sta. 38+500:

1. The profile uses a 10% approaching slope, which is a bit too steep in this area where the horizontal alignment can accommodate relatively higher traveling speed.

Description of VE Alternative:

1. It appears feasible to control the slope to 7%-8%. (See the attached sketch.)

Advantages:

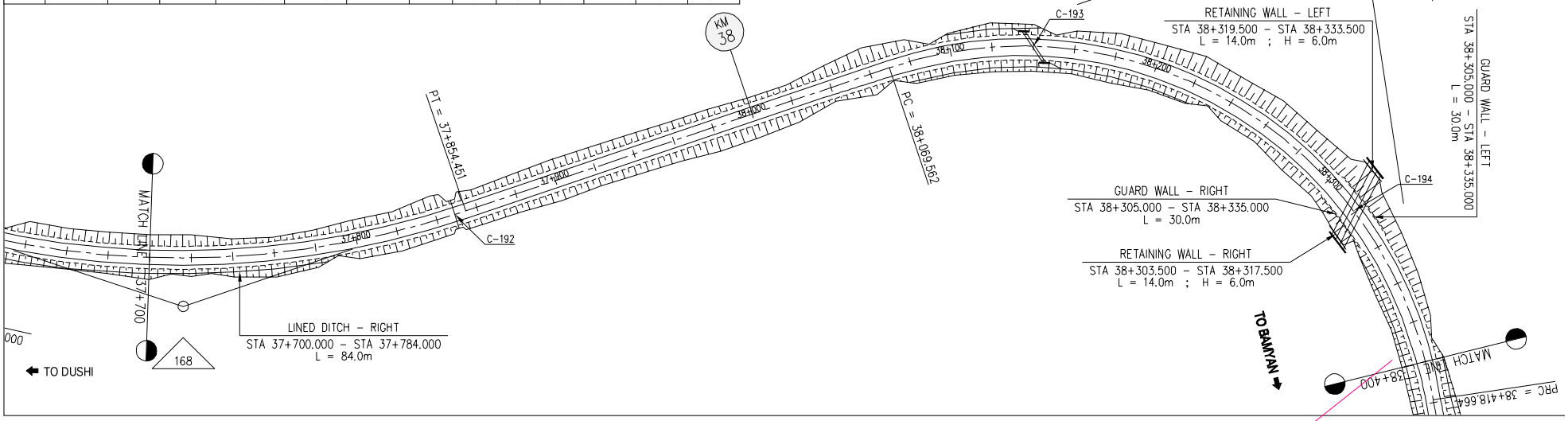
1. Meet the AASHTO and MPW design standards.
2. Improve operation of the roadway.

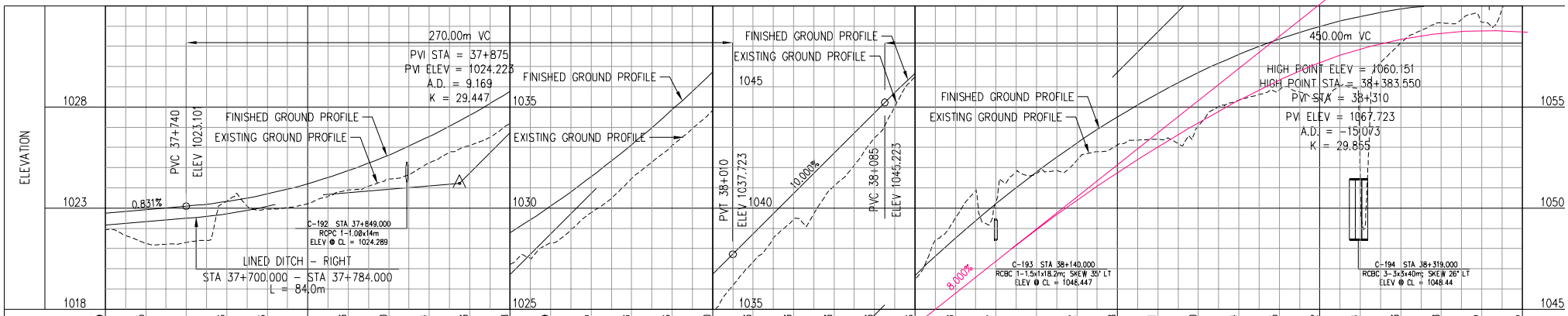
Disadvantages:

1. Minimal increase in earthwork quantity.
2. Additional grading work for irrigation channels at culvert C-193.

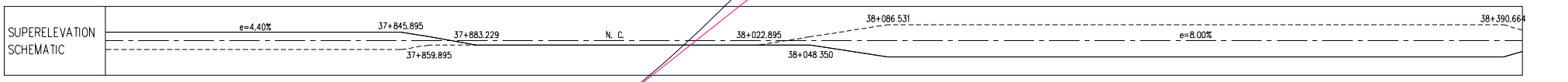
Cost Summary			
	Capital Cost	O&M Cost	Total
Original			
Proposed			
Savings	TBD by the Designers	N/A	TBD by the Designers

PI NO.	PI STA.	DISTANCE	AZIMUTH ddd-mm-ss	NORTHING	EASTING	DEFLECTION	CURVE ELEMENTS T	R	Lc	E	V (kph)	SUPER e (%)	WIDENING W (m)
PI 167	37+358.334	367.835	204-10-39	3 934 378.045	443 793.497	46-45-20 RT	45.389	105.000	85.684	9.390	50	7.60	1.70
PI 168	37+721.074	596.845	167-18-22	3 934 042.476	443 642.846	36-52-17 LT	143.339	430.000	276.716	23.262	60	4.40	-
PI 169	38+307.957	361.623	267-19-00	3 933 460.219	443 773.997	100-00-38 RT	238.395	200.000	349.103	111.179	70	8.00	1.10
PI 170	38+541.893			3 933 443.290	443 412.770	54-21-24 LT	123.228	240.000	227.688	29.787	70	7.40	0.90





CHAINAGE	FINISHED ROAD LEVELS	EXISTING ROAD LEVELS
37+700	1022.769	1021.940
37+720	1022.935	1021.268
37+740	1023.101	1021.321
37+760	1023.336	1023.349
37+780	1023.706	1022.949
37+800	1024.211	1023.225
37+820	1024.853	1023.905
37+840	1025.630	1024.440
37+860	1026.544	1025.238
37+880	1027.593	1026.102
37+900	1028.778	1027.214
37+920	1030.099	1028.282
37+940	1031.555	1029.776
37+960	1033.148	1031.483
37+980	1034.876	1033.121
38+000	1036.740	1034.859
38+020	1038.723	1037.357
38+040	1040.723	1039.435
38+060	1042.723	1041.096
38+080	1044.723	1043.482
38+100	1046.686	1046.497
38+120	1048.518	1049.512
38+140	1050.217	1050.282
38+160	1051.781	1051.713
38+180	1053.212	1052.363
38+200	1054.508	1053.117
38+220	1055.671	1053.400
38+240	1056.700	1054.068
38+260	1057.594	1055.335
38+280	1058.355	1055.846
38+300	1058.982	1055.422
38+320	1059.474	1050.583
38+340	1059.833	1058.166
38+360	1060.058	1059.150
38+380	1060.149	1059.172
38+400	1060.105	1061.054



ISLAMIC REPUBLIC OF AFGHANISTAN
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AFGHANISTAN INFRASTRUCTURE AND REHABILITATION PROGRAM (AIRP)
The LOUIS BERGER Group, Inc., BLACK & VEATCH SPECIAL PROJECTS CORP. JOINT VENTURE

TITLE: DESIGN OF BAMYAN TO DUSHI ROAD, NH-07 (TASK ORDER 24) SEGMENT 1
LOCATION: BAGHLAN AND BAMYAN PROVINCES

SHEET CONTENTS: **PLAN AND PROFILE STA 37+700 - STA 38+400**
SCALE: HOR. 1:2000 VERT. 1:200

REVISION	DATE
4 RENAMED 2 TO 4	19/12/09
3 30% DESIGN SUBMITTAL	19/12/09
2 70% DESIGN SUBMITTAL, GEN REV	29/03/10
1 70% DESIGN SUBMITTAL, NO REV	21/05/10

NAMES & SIGNATURE
DRAWN: A. C. CESPEDES DESIGNED: N. THAO
CHECKED BY: J.M. TAYLOR USA, PE
APPROVED BY: **ABOUD AL ZAIM** USA, PE

DWG NO. **BD-PP-0**
SCALE: AS S

	VE RECOMMENDATION	Idea No.: __C-15a __ Segment___ Station_____
	Client: UNITED STATES AGENCY FOR INTERNATIONAL DEVELOPMENT Project: **DESIGN OF BAMYAN TO DUSHI ROAD** *AFGHANISTAN INFRASTRUCTURE AND REHABILITATION PROGRAM (AIRP)*	

Current Design:

Sharp curvature at:

Curves #41 and Curve #42:
1. Lack of tangent transition between curves.

Curve #58:
1. Curved alignment.
2. Lack of tangent transition between curves.

Curve #93:
1. Curved alignment.
2. Lack of tangent transition between curves.
3. Impact cultivated land on the left side of the road.

Curve #109:
1. Curved alignment.
2. Short superelevated section.

Curve #129:
1. Curved alignment.
2. Lack of tangent transition between curves.
3. Retaining walls along river bank.

Curve #135:
1. Curved alignment.
2. Short superelevated section.
3. Lack of tangent transition between curves.
4. Retaining walls/guard walls along river bank.

Curve #138:
1. Roadside grading impacts houses on both sides of the road.

Curve #139:
1. Roadside grading impacts houses on the left side of the road.

Description of VE Alternative:

Curves #41 and Curve #42:
It appears that a tangent transition can be provided between the S-curves.

Curve #58:
It appears that the S-curve layout can be improved with a tangent alignment.

Curve #93:
It is recommended to use a large radius to improve the sharp curvature and provide the required tangent transition between curves. (See the attached sketch.)

Curve #109:
It is recommended to use a large radius to improve the sharp curvature and sight distance even though it requires 120m retaining walls along the river bank. (See the attached sketch.)

Curve #129:
It is recommended to use a large radius to improve the sharp curvature, provide the required tangent transition between curves, and eliminate the retaining walls located along the river bank even though this realignment will cause an increase in rock cut quantity. (See the attached sketch.)

Curve #135:
It is recommended to use a large radius to improve the sharp curvature and eliminate the retaining walls and guard walls located along the river bank even though this realignment will cause an increase in rock cut quantity. (See the attached sketch.)

Curve #138:
It is feasible to use a large radius to improve the sharp curvature and it may be able to save some houses on the left side of the road. (See the attached sketch.)

Curve #139:
Since the roadside grading impacts houses on the left side of the road, utilizing a large radius can improve the roadway geometry and it impacts the houses on the right side of the road, instead. (See the attached sketch.)

Advantages:

Curve #41 and Curve #42:
1. Meet AASHTO and MPW design standards.
2. Provide better roadway geometry.
3. Provide a tangent transition between curves.

Curve #58:
1. Meet AASHTO and MPW design standards.
2. Provide better roadway geometry.
3. Provide a tangent transition between curves.

Curve #93:
1. Meet AASHTO and MPW design standards.
2. Provide better roadway geometry.
3. Provide a tangent transition between curves.
4. Minimize impact to cultivated land.

Curve #109:
1. Provide better roadway geometry.

2. Improve sight distance.

Curve #135:
1. Meet AASHTO and MPW design standards.
2. Provide better roadway geometry.
3. Eliminate short superelevated section.
4. Provide a tangent transition between curves.
5. Improve sight distance.
6. Eliminate 40m of retaining walls and guard walls along the river bank.

Curve #138:
1. Provide better roadway geometry.
2. Save some existing houses.

Curve #139:
1. Provide better roadway geometry.
2. Eliminate short superelevated section.

Disadvantages:

Curve #41 and Curve #42: None.
Curve #58: Additional earthwork.
Curve #93: None.
Curve #109: Require 120m of retaining walls along the river bank.
Curve #135: Additional rock cut.
Curve #138: None.
Curve #139: None.

Cost Summary			
	Capital Cost	O&M Cost	Total
Original			
Proposed			
Savings	TBD by the Designers	N/A	TBD by the Designers