# Draft Environmental Study

I-15, Utah County Line to 10600 South
Project No. SP-15-7(167)288

Volume 2

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# Appendix A

# Traffic Volumes and Levels-of-Service

## General

The following pages contain existing and projected traffic data for the study area. This material provides detailed information used to develop Figures 1-2 to 1-5.

## Table A-1 Existing (2002) Level-of-service
## I-15 South, Alpine Interchange to 10600 South

| Section | Analysis Type | Main Line Volume | Ramp Volume | LOS |
|---|---|---|---|---|
| **Southbound** | | | | |
| **10600 S Off Ramp To On Ramp** | **Basic** | **4695** | | C |
| 10600 Sb Merge With 3 Lane Vol.(Opt. 1) | Merge | 4695 | 607 | B |
| 10600 Sb Hov As On Ramp (Opt 2.) | Merge | 4297 | 1005 | E |
| **10600 S To 12300 S Off Ramp** | **Basic** | **5302** | | **D** |
| 12300 Sb Off PM | Diverge | 5302 | 1127 | B |
| **12300 S Off To Sr-89 On** | **Basic** | **4175** | | **C** |
| Sr-89 Sb On PM | Merge | 4175 | 849 | C |
| **SR-89 On To 12300 S On** | **Basic** | **5024** | | **D** |
| 12300 Sb On PM | Merge | 5024 | 766 | D |
| **12300 S On To Bangerter Off** | **Basic** | **5790** | | **D** |
| Bangerter Sb Off PM | Diverge | 5790 | 1356 | A |
| **Bangerter Off To Bangerter On** | **Basic** | **4434** | | **D** |
| Bangerter Sb On PM | Merge | 4434 | 664 | B |
| **Bangerter Off To 14600s Off** | **Basic** | **5098** | | **D** |
| 14600 S. Sb Off PM | Diverge | 5098 | 472 | D |
| **14600 S Off To 14600 S On** | **Basic** | **4626** | 291 | **D** |
| 14600 S. Sb On PM | Merge | 4626 | 819 | C |
| **14600 S On To POM** | **Basic** | **4917** | | **D** |
| **POM To RP 287.8** | **Basic** | **4917** | | **D** |
| **RP 287.8 To Alpine** | **Basic** | **4917** | | **D** |
| Alpine Sb Off PM | Diverge | 4917 | | C |
| **Alpine Sb Alpine Sb On** | **Basic** | **4098** | | **C** |
| **Northbound** | | | | |
| **Alpine Nb Off To Alpine On** | **Basic** | **5580** | | **D** |
| Alpine Nb On AM | Merge | 4720 | 923 | C |
| **Alpine To RP 287.8** | **Basic** | **5643** | | **D** |
| **RP 287.8 To POM** | **Basic** | **5643** | | **E** |
| **POM To 14600 S Nb Off** | **Basic** | **5643** | | **D** |
| 14600 S Nb Off AM | Diverge | 5643 | 374 | C |
| **14600 S Nb Off To 14600s Nb On** | **Basic** | **5269** | | **D** |
| 14600 Nb On AM | Merge | 5269 | 443 | C |
| **14600 S Nb Off To Bangerter Nb Off** | **Basic** | **5712** | | **D** |
| Bangerter Nb Off AM | Diverge | 5712 | 1090 | A |
| **Bangerter Nb Off To Bangerter Nb On** | **Basic** | **4622** | | **C** |
| Bangerter Nb On AM | Merge | 4622 | 587 | B |
| **Bangerter Nb On To 12300 N Off** | **Basic** | **5209** | | **D** |
| 12300 Nb Off AM | Diverge | 5209 | 324 | C |
| **12300 Nb Off 12300 Nb On** | **Basic** | **4885** | | **D** |
| 12300 South On Ramp To Weave Point | Type A Weave | | 1469 | F |
| 12300 S To I-15 | Type A Weave | | 1315 | F |
| 12300 S To Sr-89 | Type A Weave | | 154 | F |
| I-15 To SR-89 | Type A Weave | | 492 | F |
| **12300 Nb On To Sr-89 Off** | **Basic** | **6454** | | **C** |
| **Sr-89 To 10600 S Off Ramp** | **Basic** | **5708** | | **D** |
| 10600 Nb Off AM | Diverge | 5708 | 338 | D |
| **10600 South Off To 10600 S On** | **Basic** | **5370** | | **D** |

Source: InterPlan Company, 2002 Note: POM is Point of the Mountain. AM is morning peak and PM is afternoon peak. RP is Reference Post.

"Analysis type" refers to the analysis module of the Highway Capacity Manual and Software (Version 2000).

**Table A-2 2002 No Build (Plus 12300 South Project Less 11800 South)**
**I-15 South, Alpine Interchange to 10600 South**

| Section | Analysis Type | Main Line Volume | Ramp Volume | LOS |
|---|---|---|---|---|
| **Southbound** | | | | |
| **10600 S Off Ramp To On Ramp** | **Basic** | **4695** | | **C** |
| 10600 Sb Merge With 3 Lane Vol.(Opt. 1) | Merge | 4695 | 1032 | B |
| 10600 Sb Hov As On Ramp (Opt 2.) | Merge | 4722 | 1005 | F |
| **10600 S To 12300 S Off Ramp** | **Basic** | **5727** | | **D** |
| 12300 Sb Off PM | Diverge | 5727 | 1127 | A |
| **12300 S Off Ramp To 12300 S On Ramp** | **Basic** | **4600** | | **C** |
| 12300 Sb On PM | Merge | 4600 | 1190 | D |
| **12300 S On To Bangerter Off** | **Basic** | **5790** | | **D** |
| Bangerter Sb Off PM | Diverge | 5790 | 1356 | A |
| **Bangerter Off To Bangerter On** | **Basic** | **4434** | | **D** |
| Bangerter Sb On PM | Merge | 4434 | 664 | B |
| **Bangerter Off To 14600s Off** | **Basic** | **5098** | | **D** |
| 14600 S. Sb Off PM | Diverge | 5098 | 472 | D |
| **14600 S Off To 14600 S On** | **Basic** | **4626** | | **D** |
| 14600 S. Sb On PM | Merge | 4626 | 291 | C |
| **14600 S On To POM** | **Basic** | **4917** | | **D** |
| **POM To RP 287.8** | **Basic** | **4917** | | **D** |
| **RP 287.8 To Alpine** | **Basic** | **4917** | | **D** |
| Alpine Sb Off PM | Diverge | 4917 | 819 | C |
| **Alpine Sb Alpine Sb On** | **Basic** | **4098** | | **C** |
| **Northbound** | | | | |
| **Alpine Nb Off To Alpine On** | **Basic** | **5580** | | **D** |
| Alpine Nb On AM | Merge | 4720 | 923 | C |
| **Alpine To RP 287.8** | **Basic** | **5643** | | **D** |
| **RP 287.8 To POM** | **Basic** | **5643** | | **E** |
| **POM To 14600 S Nb Off** | **Basic** | **5643** | | **D** |
| 14600 S Nb Off AM | Diverge | 5643 | 374 | C |
| **14600 S Nb Off To 14600s Nb On** | **Basic** | **5269** | | **D** |
| 14600 Nb On AM | Merge | 5269 | 443 | C |
| **14600 S Nb Off To Bangerter Nb Off** | **Basic** | **5712** | | **D** |
| Bangerter Nb Off AM | Diverge | 5712 | 1090 | A |
| **Bangerter Nb Off To Bangerter Nb On** | **Basic** | **4622** | | **C** |
| Bangerter Nb On AM | Merge | 4622 | 587 | B |
| **Bangerter Nb On To 12300 N Off** | **Basic** | **5209** | | **D** |
| 12300 Nb Off AM | Diverge | 5209 | 570 | A |
| **12300 Nb Off 12300 Nb On** | **Basic** | **4639** | | **C** |
| 12300 Nb On AM | Diverge | 4639 | 1315 | C |
| **12300 On To 10600 S Off** | **Basic** | **5954** | | **E** |
| 10600 Nb Off AM | Diverge | 5954 | 584 | D |
| **10600 South Off To 10600 S On** | **Basic** | **5370** | | **D** |

Source: InterPlan Company, 2002 Note: POM is Point of the Mountain. AM is morning peak and PM is afternoon peak. RP is Reference Post.

**Table A-3 2010 No-Build (30% Growth)**
**I-15 South, Alpine Interchange to 10600 South**

| Section | Analysis Type | Main Line Volume | Ramp Volume | LOS |
|---|---|---|---|---|
| **Southbound** | | | | |
| **10600 S Off Ramp To On Ramp** | **Basic** | **6425** | | **D** |
| 10600 Sb Merge With 3 Lane Vol.(Opt. 1) | Merge | 6425 | 1325 | F |
| 10600 Sb Hov As On Ramp (Opt 2.) | Merge | 6350 | 1400 | F |
| **10600 S To 12300 S Off Ramp** | **Basic** | **7750** | | **F** |
| 12300 Sb Off PM | Diverge | 7750 | 1750 | F |
| **12300 S Off Ramp To 12300 S On Ramp** | **Basic** | **6000** | | **E** |
| 12300 Sb On PM | Merge | 6000 | 1650 | F |
| **12300 S On To Bangerter Off** | **Basic** | **7650** | | **F** |
| Bangerter Sb Off PM | Diverge | 7650 | 1775 | F |
| **Bangerter Off To Bangerter On** | **Basic** | **5875** | | **E** |
| Bangerter Sb On PM | Merge | 5875 | 1025 | F |
| **Bangerter On To 14600s Off** | **Basic** | **6900** | | **F** |
| 14600 S. Sb Off PM | Diverge | 6900 | 875 | F |
| **14600 S Off To 14600 S On** | **Basic** | **6025** | | **E** |
| 14600 S. Sb On PM | Merge | 6025 | 625 | F |
| **14600 S On To POM** | **Basic** | **6650** | | **F** |
| **POM To RP 287.8** | **Basic** | **6650** | | **F** |
| **RP 287.8 To Alpine** | **Basic** | **6650** | | **F** |
| Alpine Sb Off PM | Diverge | 6650 | 1075 | F |
| **Alpine Sb Alpine Sb On** | **Basic** | **5575** | | **D** |
| **Northbound** | | | | |
| **Alpine Nb Off To Alpine On** | **Basic** | **6125** | | **E** |
| Alpine Nb On Amm | Merge | 6125 | 1200 | F |
| **Alpine To RP 287.8** | **Basic** | **7325** | | **F** |
| **RP 287.8 To POM** | **Basic** | **7325** | | **F** |
| **POM To 14600 S Nb Off** | **Basic** | **7325** | | **F** |
| 14600 S Nb Off AM | Diverge | 7325 | 800 | F |
| **14600 S Nb Off To 14600s Nb On** | **Basic** | **6525** | | **D** |
| 14600 Nb On AM | Merge | 6525 | 900 | F |
| **14600 S Nb Off To Bangerter Nb Off** | **Basic** | **7425** | | **F** |
| Bangerter Nb Off AM | Diverge | 7425 | 1450 | F |
| **Bangerter Nb Off To Bangerter Nb On** | **Basic** | **5975** | | **F** |
| Bangerter Nb On AM | Merge | 5975 | 800 | F |
| **Bangerter Nb On To 12300 N Off** | **Basic** | **6775** | | **F** |
| 12300 Nb Off AM | Diverge | 6775 | 850 | F |
| **12300 Nb Off 12300 Nb On** | **Basic** | **5925** | | **E** |
| 12300 Nb On AM | Merge | 5925 | 1875 | F |
| **12300 On To 10600 S Off** | **Basic** | **7800** | | **F** |
| 10600 Nb Off AM | Diverge | 7800 | 775 | F |
| **10600 South Off To 10600 S On** | **Basic** | **7025** | | **D** |

Source: InterPlan Company, 2002 Note: POM is Point of the Mountain. AM is morning peak and PM is afternoon peak. RP is Reference Post.

**Table A-4 2015 (40%) No-Build**
**I-15 South, Alpine Interchange to 10600 South**

| Section | Analysis Type | Maine Line Volume | Ramp Volume | LOS |
|---|---|---|---|---|
| **Southbound** | | | | |
| **10600 S Off Ramp To On Ramp** | **Basic** | **6900** | | **D** |
| 10600 Sb Merge With 3 Lane Vol.(Opt. 1) | Merge | 6900 | 1425 | F |
| 10600 Sb Hov As On Ramp (Opt 2.) | Merge | 6825 | 1500 | F |
| **10600 S To 12300 S Off Ramp** | **Basic** | **8325** | | **F** |
| 12300 Sb Off PM | Diverge | 8325 | 1875 | F |
| **12300 S Off Ramp To 12300 S On Ramp** | **Basic** | **6450** | | **E** |
| 12300 Sb On PM | Merge | 6450 | 1775 | F |
| **12300 S On To Bangerter Off** | **Basic** | **8225** | | **F** |
| Bangerter Sb Off PM | Diverge | 8225 | 1900 | F |
| **Bangerter Off To Bangerter On** | **Basic** | **6325** | | **E** |
| Bangerter Sb On PM | Merge | 6325 | 1075 | F |
| **Bangerter Off To 14600s Off** | **Basic** | **7400** | | **F** |
| 14600 S. Sb Off PM | Diverge | 7400 | 925 | F |
| **14600 S Off To 14600 S On** | **Basic** | **6475** | | **F** |
| 14600 S. Sb On PM | Merge | 6475 | **700** | **F** |
| **14600 S On To POM** | **Basic** | **7175** | | **F** |
| POM To RP 287.8 | Basic | 7175 | | **F** |
| **RP 287.8 To Alpine** | **Basic** | **7175** | | **F** |
| Alpine Sb Off PM | Diverge | 7175 | 1150 | **F** |
| **Alpine Sb Alpine Sb On** | **Basic** | **6025** | | **E** |
| **Northbound** | | | | |
| **Alpine Nb Off To Alpine On** | **Basic** | **6575** | | **E** |
| Alpine Nb On AM | Merge | 6575 | 1300 | F |
| **Alpine To RP 287.8** | **Basic** | **7875** | | **F** |
| **RP 287.8 to POM** | **Basic** | **7875** | | **F** |
| **POM To 14600 S Nb Off** | **Basic** | **7875** | | **F** |
| 14600 S Nb Off AM | Diverge | 7875 | 875 | F |
| **14600 S Nb Off To 14600s Nb On** | **Basic** | **7000** | | **F** |
| 14600 Nb On AM | Merge | 7000 | 950 | F |
| **14600 S Nb Off To Bangerter Nb Off** | **Basic** | **7950** | | **F** |
| Bangerter Nb Off AM | Diverge | 7950 | 1525 | F |
| **Bangerter Nb Off To Bangerter Nb On** | **Basic** | **6425** | | **E** |
| Bangerter Nb On AM | Merge | 6425 | 875 | F |
| **Bangerter Nb On To 12300 N Off** | **Basic** | **7300** | | **F** |
| 12300 Nb Off AM | Diverge | 7300 | 1000 | F |
| **12300 Nb Off 12300 Nb On** | **Basic** | **6300** | | **F** |
| 12300 Nb On AM | Merge | 6300 | 2000 | F |
| **12300 On To 10600 S Off** | **Basic** | **8300** | | **F** |
| 10600 Nb Off AM | Diverge | 8300 | 850 | F |
| **10600 South Off To 10600 S On** | **Basic** | **7450** | | **D** |

Source: InterPlan Company, 2002 Note: POM is Point of the Mountain. AM is morning peak and PM is afternoon peak. RP is Reference Post.

# Appendix B

# Detailed Alternatives Information

## General

The following pages present detailed information regarding alternatives evaluated as part of the environmental study. This appendix provides the following information:

- A detailed discussion of features, advantages, and disadvantages for each Build alternative
- Typical sections for each Build alternative
- Cost estimates for each Build alternative
- An evaluation table comparing the alternatives

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**Dedicated Reversible Lanes (3-2-3) Alternative**

The lane arrangement for the Dedicated Reversible Lanes (3-2-3) Alternative has 3 permanent lanes in each direction and two reversible lanes in the median. The directional split in the PM is 54/46, which does not show much difference in the number of vehicles for each direction. As time passes, the directional split historically tends to move closer to 50/50, making efficient use of reversible lanes less likely. Typical sections and cost estimates for the Dedicated Reversible Lanes (3-2-3) Alternative are provided at the end of this section.

The features of this alternative are:

- Similar to the existing 6-lane configuration on I-15 and also provides two new dedicated reversible lanes in the peak travel direction in the median.
- The dedicated lanes have barrier along both sides except for those sections where traffic must be moved back to the appropriate side of the roadway to avoid obstacles in the median, such as elevation differences between northbound and southbound roadways at 12300 South and bridge piers in the median at Bangerter Highway Interchange.
- Requires pavement widening beyond the outside shoulder.
- Requires reconstruction of most outside shoulders to accommodate traffic control during construction.
- Requires retaining wall or stepped-pavement type barrier from the Alpine Interchange to the horizontal curve north of 14600 South.
- Uses precast barrier to allow flexibility for lane configurations.
- Modifications required to Bangerter Highway Interchange:
  - Requires vertical realignment of the southbound exit ramp because the cross slope breakover criteria along the edges of the gore cannot be met.
  - Requires reconstruction of a portion of the southbound entrance ramp because the pavement widening on I-15 forces the ramp further to the west.
- Modifications required to 10600 South Interchange:
  - Requires reconstruction of a portion of the northbound entrance ramp because the pavement widening on I-15 forces the ramp further to the east.
  - Requires reconstruction of a portion of the southbound entrance ramp because the pavement widening on I-15 forces the ramp further to the west.
  - Requires a new southbound auxiliary lane north of 10600 South.
  - Requires a new northbound auxiliary lane north of 10600 South.

The advantages of the Dedicated Reversible Lanes (3-2-3) Alternative are:

- Provides additional capacity in peak travel direction.

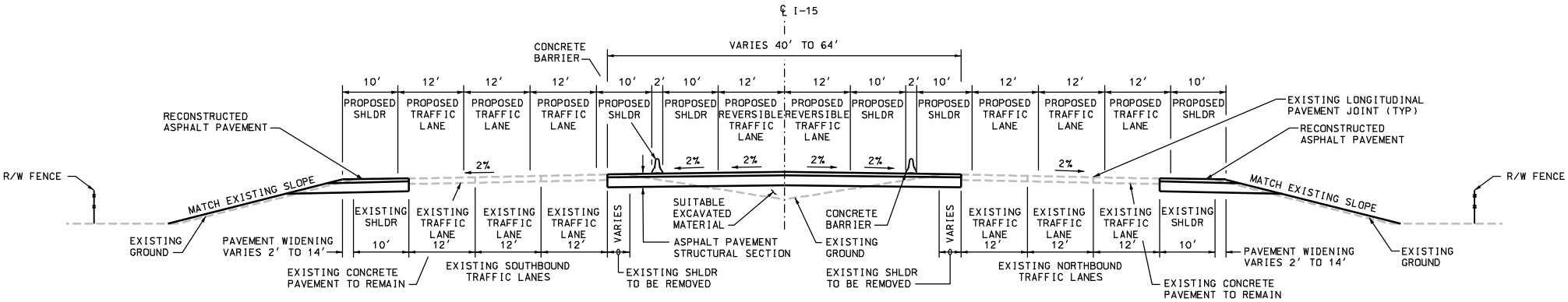
- A reversible lane could be used as a HOV lane.
- Precast barrier could be used during the construction phase and moved into its permanent position after construction.

The disadvantages of the Dedicated Reversible Lanes (3-2-3) Alternative are:

- The level-of-service for the off-peak travel direction would drop below Level-of-Service D within eight years of project construction.
- Additional pavement widening and construction cost is similar to a traditional 10-Lane Section.
- The typical section for this alternative does not fit under the existing Bangerter Highway bridge structure because there is a pier in the center of the median.
- The typical section for this alternative does not easily fit the typical section being constructed at the 12300 South Interchange and would require additional costs to move the reversible lanes to one side of the centerline or modify the 12300 South typical section.
- Requires the use of retaining walls to support the dedicated reversible lanes from 14600 South to the Utah County Line due to the existing elevation differential between the northbound and southbound roadways.
- Requires an on going expense for barriers controlling traffic flow into the reversible lanes to be moved twice daily. There would be 6 locations where traffic flow must be controlled by some type of barrier due to the constraints listed above. Due to the limited space, moveable barrier may have to be used at these locations to effect the twice-daily shift in travel direction.
- Snow removal would be complicated and must occur where the moveable barrier is being placed prior to a barrier shift. The location where the barrier was located would also have to be plowed prior to opening that lane for traffic.
- Number of points to enter or exit the reversible lanes would be limited to those areas where traffic would be brought back into a five-lane roadway section at 12300 South and Bangerter Highway.
- Requires new right-of-way or narrower shoulders and/or lanes to fit past Bangerter Interchange gore areas.
- Directional split of traffic may not warrant reversible lanes.
- Reduces inside shoulder width for general-purpose lanes from 12’ for a 10-lane section to 10’ for the Dedicated Reversible Lanes (3-2-3) Alternative.
- Complicates snow removal from between fixed barriers.
- Traps vehicles when an accident occurs in front of them, requiring them to wait until accident is cleared.
- Requires the purchase of a Transfer and Transport machine (TTM).

- The TTM used to move the barrier would have to cross three lanes of traffic four times per day to return to its storage location.
- The moveable barrier shift is dependent on the equipment functioning when needed.

# DEDICATED REVERSIBLE LANES (3-2-3) ALTERNATIVE




ALPINE EXIT TO 10600 SOUTH



Figure B-1
Sheet 1 of 1

# I-15
# Utah County Line to 10600 South
# Dedicated Reversible Lanes (3-2-3) Alternative
# Utah County Portion (Alpine Exit to Utah County Line)

SUMMARY
ESTIMATE OF PROBABLE COST

| Item No. | Item Description | Quantity | Units | Unit Price | Total Cost |
|---|---|---|---|---|---|
| 1 | Roadway Excavation | 19,506 | CUYD | $4.71 | $91,875 |
| 2 | Borrow | 23,400 | CUYD | $6.74 | $157,716 |
| 3 | Roadway and Shoulder Pavement | 51,392 | SQYD | $27.06 | $1,390,445 |
| 4 | Reduced Pavement Section | 0 | SQYD | $8.56 | $0 |
| 5 | Concrete Pavement | 4,200 | SQYD | $40.72 | $171,024 |
| 6 | Constant Slope Concrete Barrier | 0 | FT | $45.72 | $0 |
| 7 | Stepped Pavement Type Concrete Barrier | 9,500 | FT | $103.14 | $979,787 |
| 8 | Concrete Barrier | 18,800 | FT | $24.85 | $467,180 |
| 9 | Concrete Barrier and Moment Slab | 0 | FT | $118.00 | $0 |
| 10 | Moveable Barrier | 900 | FT | $230.00 | $207,000 |
| 11 | Overhead Sign Structure Widening | 0 | EACH | $150,000.00 | $0 |
| 12 | Bridge Rehabilitation | 0 | EACH | varies | $0 |
| 13 | Bridge Widening | 0 | SQFT | $75.00 | $0 |
| 14 | Retaining Wall | 0 | SQFT | $30.00 | $0 |
| 15 | Noise Barrier | 1 | LS | $400,000.00 | $400,000 |
| 16 | Drainage (10% of Items 1 - 15) | 1 | LS | 10% | $386,503 |
| 17 | Temporary Erosion Control (10% of item 16) | 1 | LS | 10% | $38,650 |
| 18 | Pavement Marking (5% of Items 2-5) | 1 | LS | 5% | $78,073 |
| 19 | Maintenance of Traffic During Construction (10% of Items 1 - 15) | 1 | LS | 10% | $386,503 |
| 20 | Items Not Estimated (10% of Items 1 - 15) | 1 | LS | 10% | $386,503 |
| 21 | Mobilization (2% of Items 1-20) | 1 | LS | 2% | $102,825 |
| 22 | Design and Construction Engineering (15% of items 1-20) | 1 | LS | 15% | $771,189 |
| | | | | | |
| 23 | Transfer and Transport Machine (TTM) to Shift Moveable Barrier | 0 | EACH | $1,000,000 | $0 |
| 24 | Pres. Value of Annual Cost for 15yrs to Shift Moveable Barrier & Maintain TTM | 0 | LS | $2,000,000 | $0 |
| | | | | | |
| 25 | Inflation - 1 year at 3% (3% of items 1-24) | 1 | LS | 3% | $180,458 |
| | | | | | |
| 26 | Contingency (10% of Items 1-25) | 1 | LS | 10% | $619,573 |
| | | | | | |
| | *Total* | | | | $6,815,304 |
| | **Total (Use)** | | | | **$7,000,000** |

# I-15
# Utah County Line to 10600 South
# Dedicated Reversible Lanes (3-2-3) Alternative
# Salt Lake County Portion (Utah County Line to 10600 South)

SUMMARY
ESTIMATE OF PROBABLE COST

| Item No. | Item Description | Quantity | Units | Unit Price | Total Cost |
|---|---|---|---|---|---|
| 1 | Roadway Excavation | 147,746 | CUYD | $4.71 | $695,882 |
| 2 | Crack and Seat with Pavement Overlay | 28,400 | SQYD | $11.18 | $317,388 |
| 3 | Roadway and Shoulder Pavement | 325,323 | SQYD | $27.06 | $8,801,824 |
| 4 | Reduced Pavement Section | 0 | SQYD | $8.56 | $0 |
| 5 | Concrete Pavement | 15,800 | SQYD | $52.59 | $830,883 |
| 6 | Constant Slope Concrete Barrier | 2,289 | FT | $45.72 | $104,630 |
| 7 | Stepped Pavement Type Concrete Barrier | 17,100 | FT | $170.12 | $2,909,086 |
| 8 | Concrete Barrier* | 82,800 | FT | $24.85 | $2,057,580 |
| 9 | Concrete Barrier and Moment Slab | 4,500 | FT | $118.00 | $531,000 |
| 10 | Moveable Barrier | 4,200 | FT | $230.00 | $966,000 |
| 11 | Overhead Sign Structure Widening | 1 | EACH | $150,000.00 | $150,000 |
| 12 | Bridge Rehabilitation** | 2 | EACH | varies** | $668,643 |
| 13 | Bridge Widening | 18,700 | SQFT | varies*** | $1,409,716 |
| 14 | Retaining Wall | 38,081 | SQFT | $30.00 | $1,142,419 |
| 15 | Noise Barrier | 1 | LS | $1,400,000.00 | $1,400,000 |
| 16 | Drainage (10% of Items 1 - 15) | 1 | LS | 10% | $2,198,505 |
| 17 | Temporary Erosion Control (10% of item 16) | 1 | LS | 10% | $219,851 |
| 18 | Pavement Marking (5% of Items 2-5) | 1 | LS | 5% | $481,635 |
| 19 | Maintenance of Traffic During Construction (10% of Items 1 - 15) | 1 | LS | 10% | $2,198,505 |
| 20 | Items Not Estimated (10% of Items 1 - 15) | 1 | LS | 10% | $2,198,505 |
| 21 | Mobilization (2% of Items 1-20) | 1 | LS | 2% | $585,641 |
| 22 | Design and Construction Engineering (15% of items 1-20) | 1 | LS | 15% | $4,392,308 |
| | | | | | |
| 23 | Transfer and Transport Machine (TTM) to Shift Moveable Barrier | 1 | EACH | $1,000,000 | $1,000,000 |
| 24 | Pres. Value of Annual Cost for 15yrs to Shift Moveable Barrier & Maintain TTM | 1 | LS | $2,000,000 | $2,000,000 |
| | | | | | |
| 25 | Inflation - 1 year at 3% (3% of items 1-24) | 1 | LS | 3% | $1,117,800 |
| | | | | | |
| 26 | Contingency (10% of Items 1-25) | 1 | LS | 10% | $3,837,780 |
| | | | | | |
| | *Total* | | | | $42,215,582 |
| | **Total (Use)** | | | | **$43,000,000** |

* Assuming that 1 mile (5,280') of UDOT furnished concrete barrier is available

** 14600 Structure (F-207): $394,526
** 11400 Structure (F-56): $274,117

*** $75/sqft used for 14600 South and 11400 South Structures; $200/sqft used for 10000 South Structure

**Dedicated Reversible Lane (4-1-4) Alternative**

The lane arrangement for the Dedicated Reversible Lane (4-1-4) Alternative was set at 4 permanent lanes in each direction in order to handle off-peak traffic. The directional split in the PM is 54/46, which does not show much difference in the number of vehicles for each direction. As time passes, the directional split historically tends to move closer to 50/50, making efficient use of reversible lanes less likely. Typical sections and cost estimates for the Dedicated Reversible Lane (4-1-4) Alternative are provided at the end of this section.

The features of this alternative are:

- Similar to the 8-Lane Alternative and also provides one new reversible lane in the peak travel direction in the median.
- The dedicated lane has barrier along both sides except for those sections where traffic must be moved back to the appropriate side of the roadway to avoid obstacles in the median, such as elevation differences between northbound and southbound roadways at 12300 South and bridge piers in the median at Bangerter Highway Interchange.
- Requires pavement widening beyond outside shoulder.
- Requires reconstruction of most outside shoulders to accommodate traffic control during construction.
- Requires retaining wall or stepped-pavement type barrier from the Alpine Interchange to the horizontal curve north of 14600 South.
- Uses precast barrier to allow flexibility for lane configurations.
- Modifications required to Bangerter Highway Interchange:
  - Requires vertical realignment of the southbound exit ramp because the cross slope breakover criteria along the edges of the gore cannot be met.
  - Requires reconstruction of a portion of the southbound entrance ramp because the pavement widening on I-15 forces the ramp further to the west.
- Modifications required to 10600 South Interchange:
  - Requires reconstruction of a portion of the northbound entrance ramp because the pavement widening on I-15 forces the ramp further to the east.
  - Requires reconstruction of a portion of the southbound entrance ramp because the pavement widening on I-15 forces the ramp further to the west.
  - Requires a new southbound auxiliary lane north of 10600 South.
  - Requires a new northbound auxiliary lane north of 10600 South.

The advantages of the Dedicated Reversible Lane (4-1-4) Alternative are:

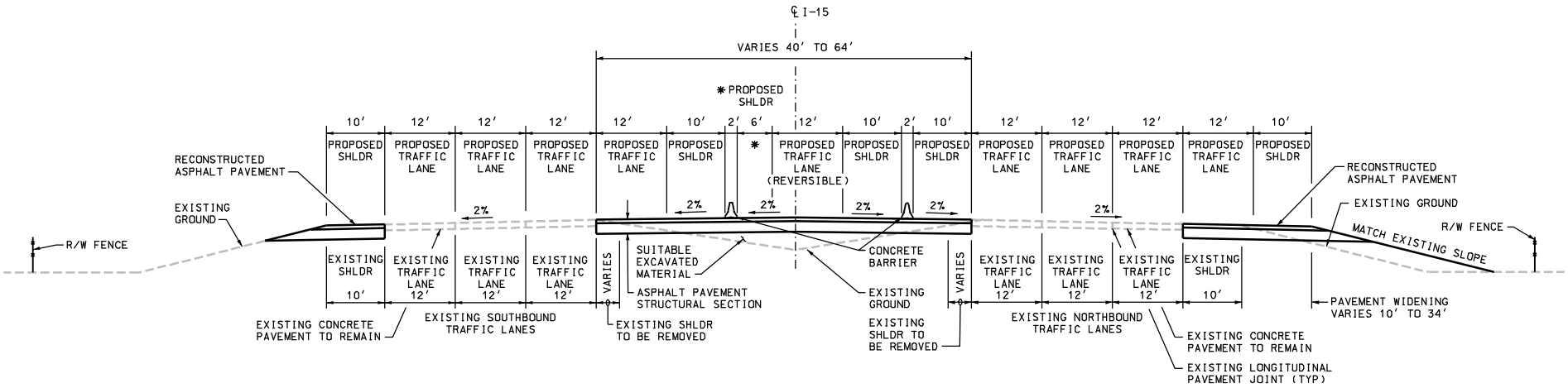
- Provides additional capacity in peak travel direction.
- Reversible lane could be used as a HOV lane.
- Precast barrier could be used during the construction phase and moved into its permanent position after construction.

The disadvantages of the Dedicated Reversible Lane (4-1-4) Alternative are:

- Additional pavement widening and construction cost is similar to a traditional 10-Lane Section.
- Complicated by Bangerter Highway bridge columns.
- Complicated by proposed elevation differential in the median at the horizontal curve at 12300 South
- Requires the use of retaining walls to support the dedicated reversible lanes from 14600 South to the Utah County Line due to the existing elevation differential between the northbound and southbound roadways.
- Requires an on going expense for barriers controlling traffic flow into the reversible lanes to be moved twice daily. There would be 6 locations where traffic flow must be controlled by some type of barrier due to the constraints listed above. Due to the limited space, moveable barrier may have to be used at these locations to effect the twice-daily shift in travel direction.
- Snow removal would be complicated and must occur where the moveable barrier is being placed prior to a barrier shift. The location where the barrier was located would also have to be plowed prior to opening that lane for traffic.
- Number of points to enter or exit the reversible lanes would be limited to those areas where traffic would be brought back into a five-lane roadway section at 12300 South and Bangerter Highway.
- Requires new right-of-way or narrower shoulders and/or lanes to fit past Bangerter Interchange gore areas.
- Directional split of traffic may not warrant reversible lanes.
- Reduces inside shoulder for general-purpose lanes from 12’ for a 10-lane section to 10’ for the Dedicated Reversible Lane Alternative.
- Complicates snow removal from between fixed barriers.
- Traps vehicles when an accident occurs in front of them, requiring them to wait until accident is cleared.
- Requires the purchase of a Transfer and Transport machine (TTM).

- The TTM used to move the barrier would have to cross four lanes of traffic four times per day to return to its storage location.
- The moveable barrier shift is dependent on the equipment functioning when needed.

# DEDICATED REVERSIBLE LANE (4-1-4) ALTERNATIVE




ALPINE EXIT TO 10600 SOUTH



Figure B-2
Sheet 1 of 1

# I-15
# Utah County Line to 10600 South
# Dedicated Reversible Lane (4-1-4) Alternative
# Utah County Portion (Alpine Exit to Utah County Line)

SUMMARY
ESTIMATE OF PROBABLE COST

| Item No. | Item Description | Quantity | Units | Unit Price | Total Cost |
|---|---|---|---|---|---|
| 1 | Roadway Excavation | 21,900 | CUYD | $4.71 | $103,149 |
| 2 | Borrow | 23,400 | CUYD | $6.74 | $157,716 |
| 3 | Roadway and Shoulder Pavement | 57,700 | SQYD | $27.06 | $1,561,112 |
| 4 | Reduced Pavement Section | 0 | SQYD | $8.56 | $0 |
| 5 | Concrete Pavement | 4,200 | SQYD | $40.72 | $171,024 |
| 6 | Constant Slope Concrete Barrier | 0 | FT | $45.72 | $0 |
| 7 | Stepped Pavement Type Concrete Barrier | 9,500 | FT | $103.14 | $979,787 |
| 8 | Concrete Barrier | 18,800 | FT | $24.85 | $467,180 |
| 9 | Concrete Barrier and Moment Slab | 0 | FT | $118.00 | $0 |
| 10 | Moveable Barrier | 900 | FT | $230.00 | $207,000 |
| 11 | Overhead Sign Structure Widening | 0 | EACH | $150,000.00 | $0 |
| 12 | Bridge Rehabilitation | 0 | EACH | varies | $0 |
| 13 | Bridge Widening | 0 | SQFT | $75.00 | $0 |
| 14 | Retaining Wall | 0 | SQFT | $30.00 | $0 |
| 15 | Noise Barrier | 1 | LS | $400,000.00 | $400,000 |
| 16 | Drainage (10% of Items 1 - 15) | 1 | LS | 10% | $404,697 |
| 17 | Temporary Erosion Control (10% of item 16) | 1 | LS | 10% | $40,470 |
| 18 | Pavement Marking (5% of Items 2-5) | 1 | LS | 5% | $86,607 |
| 19 | Maintenance of Traffic During Construction (10% of Items 1 - 15) | 1 | LS | 10% | $404,697 |
| 20 | Items Not Estimated (10% of Items 1 - 15) | 1 | LS | 10% | $404,697 |
| 21 | Mobilization (2% of Items 1-20) | 1 | LS | 2% | $107,763 |
| 22 | Design and Construction Engineering (15% of items 1-20) | 1 | LS | 15% | $808,220 |
| | | | | | |
| 23 | Transfer and Transport Machine (TTM) to Shift Moveable Barrier | 0 | EACH | $1,000,000 | $0 |
| 24 | Pres. Value of Annual Cost for 15yrs to Shift Moveable Barrier & Maintain TTM | 0 | LS | $2,000,000 | $0 |
| | | | | | |
| 25 | Inflation - 1 year at 3% (3% of items 1-24) | 1 | LS | 3% | $189,124 |
| | | | | | |
| 26 | Contingency (10% of Items 1-25) | 1 | LS | 10% | $649,324 |
| | | | | | |
| | *Total* | | | | $7,142,567 |
| | **Total (Use)** | | | | **$8,000,000** |

# I-15
# Utah County Line to 10600 South
# Dedicated Reversible Lane (4-1-4) Alternative
# Salt Lake County Portion (Utah County Line to 10600 South)

SUMMARY
ESTIMATE OF PROBABLE COST

| Item No. | Item Description | Quantity | Units | Unit Price | Total Cost |
|---|---|---|---|---|---|
| 1 | Roadway Excavation | 161,400 | CUYD | $4.71 | $760,194 |
| 2 | Crack and Seat with Pavement Overlay | 28,400 | SQYD | $11.18 | $317,388 |
| 3 | Roadway and Shoulder Pavement | 355,400 | SQYD | $27.06 | $9,615,587 |
| 4 | Reduced Pavement Section | 0 | SQYD | $8.56 | $0 |
| 5 | Concrete Pavement | 15,800 | SQYD | $52.59 | $830,883 |
| 6 | Constant Slope Concrete Barrier | 2,500 | FT | $45.72 | $114,300 |
| 7 | Stepped Pavement Type Concrete Barrier | 17,100 | FT | $170.12 | $2,909,086 |
| 8 | Concrete Barrier* | 82,800 | FT | $24.85 | $2,057,580 |
| 9 | Concrete Barrier and Moment Slab | 4,500 | FT | $118.00 | $531,000 |
| 10 | Moveable Barrier | 4,200 | FT | $230.00 | $966,000 |
| 11 | Overhead Sign Structure Widening | 1 | EACH | $150,000.00 | $150,000 |
| 12 | Bridge Rehabilitation** | 2 | EACH | varies** | $668,643 |
| 13 | Bridge Widening | 18,700 | SQFT | varies*** | $1,540,000 |
| 14 | Retaining Wall | 41,600 | SQFT | $30.00 | $1,248,000 |
| 15 | Noise Barrier | 1 | LS | $1,400,000.00 | $1,400,000 |
| 16 | Drainage (10% of Items 1 - 15) | 1 | LS | 10% | $2,310,866 |
| 17 | Temporary Erosion Control (10% of item 16) | 1 | LS | 10% | $231,087 |
| 18 | Pavement Marking (5% of Items 2-5) | 1 | LS | 5% | $522,323 |
| 19 | Maintenance of Traffic During Construction (10% of Items 1 - 15) | 1 | LS | 10% | $2,310,866 |
| 20 | Items Not Estimated (10% of Items 1 - 15) | 1 | LS | 10% | $2,310,866 |
| 21 | Mobilization (2% of Items 1-20) | 1 | LS | 2% | $615,893 |
| 22 | Design and Construction Engineering (15% of items 1-20) | 1 | LS | 15% | $4,619,200 |
| | | | | | |
| 23 | Transfer and Transport Machine (TTM) to Shift Moveable Barrier | 1 | EACH | $1,000,000 | $1,000,000 |
| 24 | Pres. Value of Annual Cost for 15yrs to Shift Moveable Barrier & Maintain TTM | 1 | LS | $2,000,000 | $2,000,000 |
| | | | | | |
| 25 | Inflation - 1 year at 3% (3% of items 1-24) | 1 | LS | 3% | $1,170,893 |
| | | | | | |
| 26 | Contingency (10% of Items 1-25) | 1 | LS | 10% | $4,020,066 |
| | | | | | |
| | *Total* | | | | $44,220,722 |
| | **Total (Use)** | | | | **$45,000,000** |

* Assuming that 1 mile (5,280') of UDOT furnished concrete barrier is available

** 14600 Structure (F-207): $394,526
** 11400 Structure (F-56): $274,117

*** $75/sqft used for 14600 South and 11400 South Structures; $200/sqft used for 10000 South Structure

**Moveable Barrier Reversible Lanes (5-3, 3-5) Alternative**

The lane arrangement for the Moveable Barrier Reversible Lane (5-3, 3-5) Alternative has 3 lanes in the non-peak direction and 5 lanes in the peak direction. The directional split in the PM is 54/46, which does not show much difference in the number of vehicles for each direction. As time passes, the directional split historically tends to move closer to 50/50, making efficient use of reversible lanes less likely. Typical sections and cost estimates for the Moveable Barrier Reversible Lane (5-3, 3-5) Alternative are provided at the end of this section.

The features of the Moveable Barrier Reversible Lane (5-3, 3-5) Alternative are:

- Similar to the 8-Lane Alternative with two of the new lanes in the median acting as reversible lanes in the peak travel direction by using moveable barrier.
- The area from the Alpine Interchange to south of the Bangerter Interchange would act as a contraflow lane because of the elevation differential in the median.
- Requires reconstruction of most outside shoulders to accommodate traffic control during construction.
- Requires retaining wall or stepped pavement type barrier at the horizontal curve north of 14600 South.
- Modifications required to Bangerter Highway Interchange:
  - Requires vertical realignment of the southbound exit ramp because the cross slope breakover criteria along the edges of the gore cannot be met.
  - Requires reconstruction of a portion of the southbound entrance ramp because the pavement widening on I-15 forces the ramp further to the west.
- Modifications required to 10600 South Interchange:
  - Requires reconstruction of a portion of the northbound entrance ramp because the pavement widening on I-15 forces the ramp further to the east.
  - Requires reconstruction of a portion of the southbound entrance ramp because the pavement widening on I-15 forces the ramp further to the west.
  - Requires a new southbound auxiliary lane north of 10600 South.
  - Requires a new northbound auxiliary lane north of 10600 South.

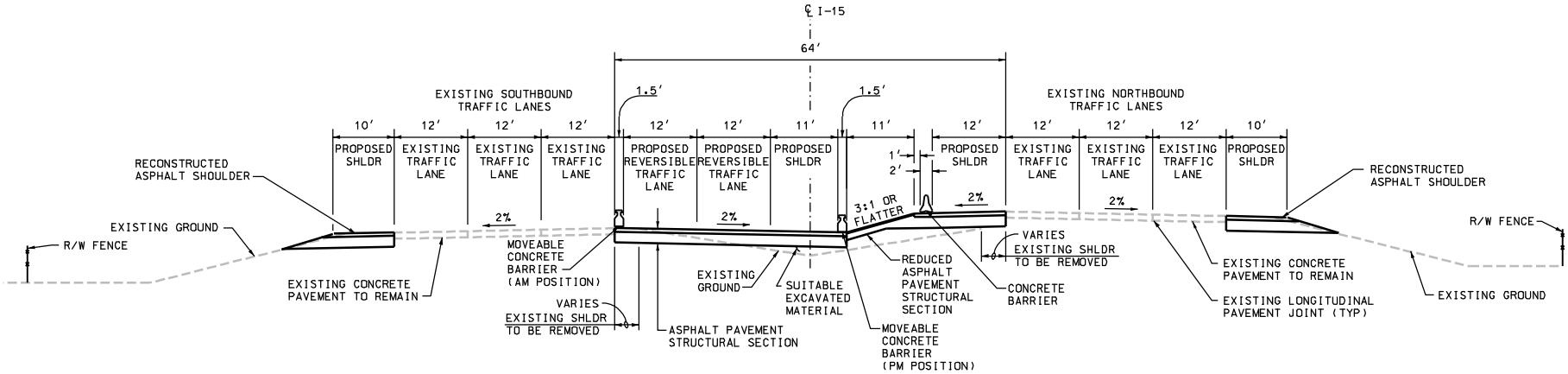
The advantages of the Moveable Barrier Reversible Lane (5-3, 3-5) Alternative are:

- Provides additional capacity in peak travel direction.
- Provides similar level-of-service as a traditional 10-lane section within an 8-lane section area of pavement.
- Additional lane could be striped as an HOV lane.
- Moveable barrier could be used during the construction phase and moved into its permanent position after construction.

The disadvantages of the Moveable Barrier Reversible Lane (5-3, 3-5) Alternative are:

- The level-of-service for the off-peak travel direction would drop below LOS D within eight years of project construction.
- The typical section for this alternative does not easily fit under the existing Bangerter Highway bridge structure because there is a pier in the center of the median. A special configuration of barrier could be used around the pier but this configuration would place the pier between two travel lanes.
- Complicated by proposed elevation differential in the median at the horizontal curve at 12300 South and the existing elevation differential from 14600 South to the Utah County Line.
- Requires the purchase of a Transfer and Transport Machine (TTM).
- Requires an ongoing expense for shifting the moveable barrier twice daily.
- Requires new right-of-way or narrower shoulders and/or lanes to fit past Bangerter Interchange gore areas.
- Directional split of traffic may not warrant reversible lanes.
- Depressed median may no longer be feasible. Pavement drainage would run across all travel lanes to the outside of the roadway, which is not recommended by AASHTO.
- Existing longitudinal pavement joint lines may not line up with proposed striping.
- The TTM used to move the barrier would have to cross four lanes of traffic four times per day to return to its storage location.
- Snow removal would be complicated and must occur where the barrier is being placed prior to a barrier shift. The location where the barrier was located would also have to be plowed prior to opening that lane for traffic.
- The barrier shift is dependent on the equipment functioning when needed.

# MOVEABLE BARRIER REVERSIBLE LANES (5-3, 3-5) ALTERNATIVE

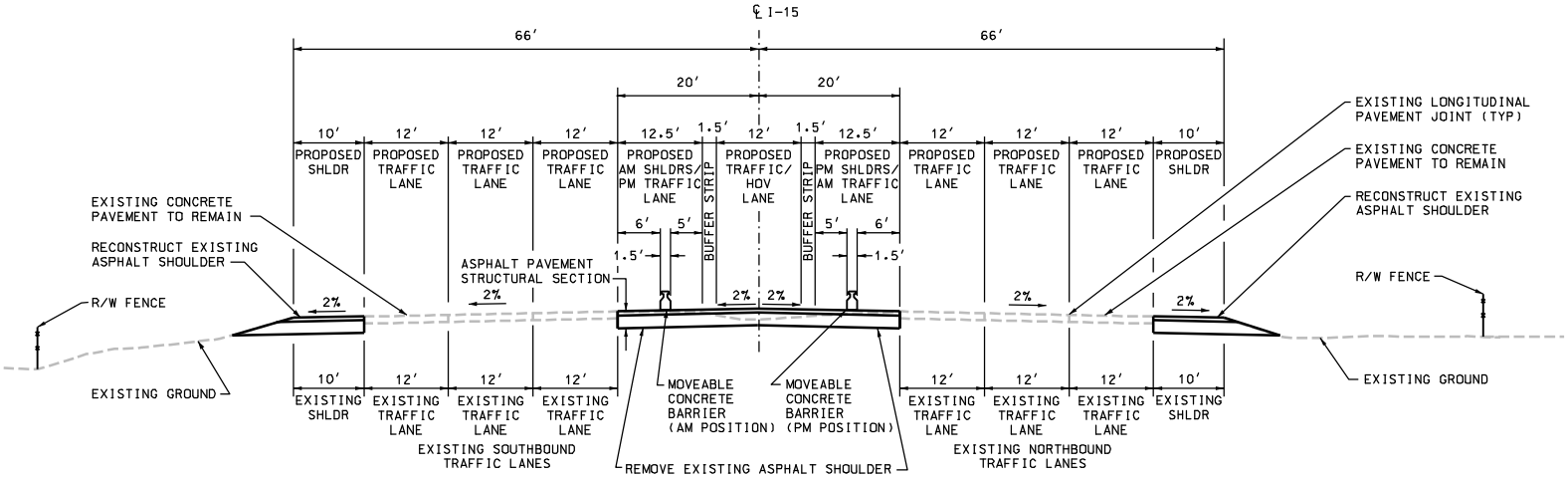



ALPINE TO BANGERTER HIGHWAY

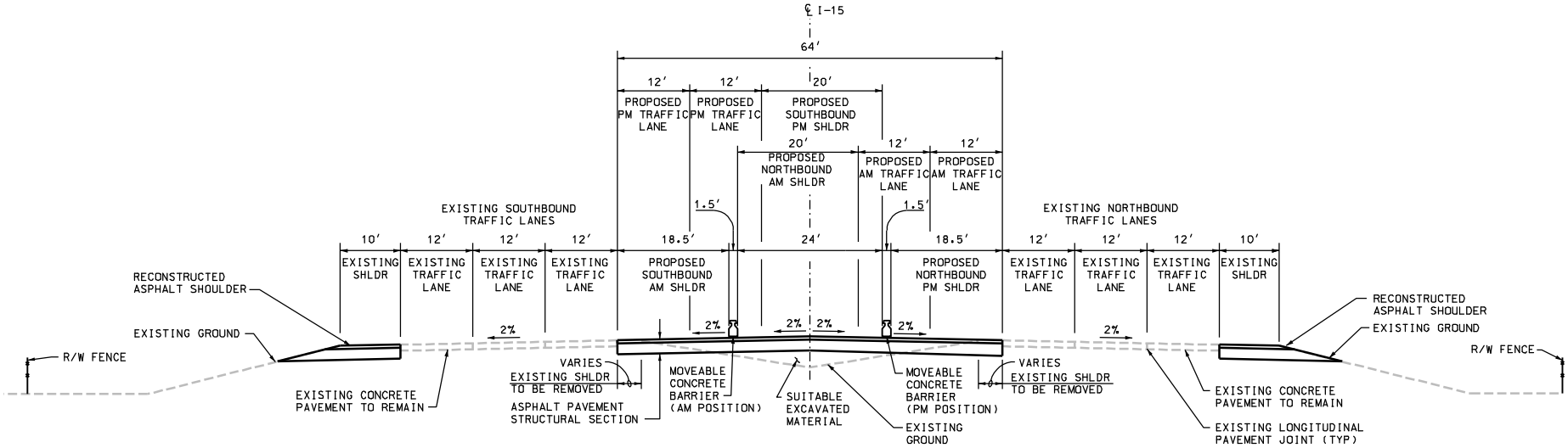


Figure B-3
Sheet 1 of 2

# MOVEABLE BARRIER REVERSIBLE LANES (5-3, 3-5) ALTERNATIVE




BANGERTER HIGHWAY TO 12700 SOUTH (APPROXIMATE SOUTHERN EXTENT OF 12300 SOUTH PROJECT)




11900 SOUTH (APPROXIMATE NORTHERN EXTENT OF 12300 SOUTH PROJECT) TO 10600 SOUTH



Figure B-3
Sheet 2 of 2

# I-15
# Utah County Line to 10600 South
# Moveable Barrier Reversible Lanes (5-3, 3-5) Alternative
# Utah County Portion (Alpine Exit to Utah County Line)

SUMMARY
ESTIMATE OF PROBABLE COST

| Item No. | Item Description | Quantity | Units | Unit Price | Total Cost |
|---|---|---|---|---|---|
| 1 | Roadway Excavation | 14,700 | CUYD | $4.71 | $69,237 |
| 2 | Crack and Seat with Pavement Overlay | 0 | CUYD | $11.18 | $0 |
| 3 | Roadway and Shoulder Pavement | 27,200 | SQYD | $27.06 | $735,914 |
| 4 | Reduced Pavement Section | 14,700 | SQYD | $8.56 | $125,841 |
| 5 | Concrete Pavement | 4,200 | SQYD | $40.72 | $171,024 |
| 6 | Constant Slope Concrete Barrier | 0 | FT | $45.72 | $0 |
| 7 | Stepped Pavement Type Concrete Barrier | 0 | FT | $103.14 | $0 |
| 8 | Concrete Barrier | 18,800 | FT | $24.85 | $467,180 |
| 9 | Concrete Barrier and Moment Slab | 0 | FT | $118.00 | $0 |
| 10 | Moveable Barrier | 9,400 | FT | $230.00 | $2,162,000 |
| 11 | Overhead Sign Structure Widening | 0 | EACH | $150,000.00 | $0 |
| 12 | Bridge Rehabilitation | 0 | EACH | varies | $0 |
| 13 | Bridge Widening | 0 | SQFT | $75.00 | $0 |
| 14 | Retaining Wall | 0 | SQFT | $30.00 | $0 |
| 15 | Noise Barrier | 1 | LS | $400,000.00 | $400,000 |
| 16 | Drainage (10% of Items 1 - 15) | 1 | LS | 10% | $413,120 |
| 17 | Temporary Erosion Control (10% of item 16) | 1 | LS | 10% | $41,312 |
| 18 | Pavement Marking (5% of Items 2-5) | 1 | LS | 5% | $51,639 |
| 19 | Maintenance of Traffic During Construction (10% of Items 1 - 15) | 1 | LS | 10% | $413,120 |
| 20 | Items Not Estimated (10% of Items 1 - 15) | 1 | LS | 10% | $413,120 |
| 21 | Mobilization (2% of Items 1-20) | 1 | LS | 2% | $109,270 |
| 22 | Design and Construction Engineering (15% of items 1-20) | 1 | LS | 15% | $819,526 |
| | | | | | |
| 23 | Transfer and Transport Machine (TTM) to Shift Moveable Barrier | 0 | EACH | $1,000,000 | $0 |
| 24 | Pres. Value of Annual Cost for 15yrs to Shift Moveable Barrier & Maintain TTM | 1 | LS | 600,000 | $600,000 |
| | | | | | |
| 25 | Inflation - 1 year at 3% (3% of items 1-24) | 1 | LS | 3% | $209,769 |
| | | | | | |
| 26 | Contingency (10% of Items 1-25) | 1 | LS | 10% | $720,207 |
| | | | | | |
| | *Total* | | | | $7,922,278 |
| | **Total (Use)** | | | | **$8,000,000** |

# I-15
# Utah County Line to 10600 South
# Moveable Barrier Reversible Lanes (5-3, 3-5) Alternative
# Salt Lake County Portion (Utah County Line to 10600 South)

SUMMARY
ESTIMATE OF PROBABLE COST

| Item No. | Item Description | Quantity | Units | Unit Price | Total Cost |
|---|---|---|---|---|---|
| 1 | Roadway Excavation | 130,800 | CUYD | $4.71 | $616,068 |
| 2 | Crack and Seat with Pavement Overlay | 0 | SQYD | $11.18 | $0 |
| 3 | Roadway and Shoulder Pavement | 240,100 | SQYD | $27.06 | $6,496,068 |
| 4 | Reduced Pavement Section | 24,500 | SQYD | $8.56 | $209,735 |
| 5 | Concrete Pavement | 15,800 | SQYD | $52.59 | $830,883 |
| 6 | Constant Slope Concrete Barrier | 2,500 | FT | $45.72 | $114,300 |
| 7 | Stepped Pavement Type Concrete Barrier | 800 | FT | $170.12 | $136,098 |
| 8 | Concrete Barrier* | 76,300 | FT | $24.85 | $1,896,055 |
| 9 | Concrete Barrier and Moment Slab | 2,100 | FT | $118.00 | $247,800 |
| 10 | Moveable Barrier | 35,500 | FT | $230.00 | $8,165,000 |
| 11 | Overhead Sign Structure Widening | 1 | EACH | $150,000.00 | $150,000 |
| 12 | Bridge Rehabilitation** | 2 | EACH | varies** | $668,643 |
| 13 | Bridge Widening | 17,700 | SQFT | varies*** | $1,465,000 |
| 14 | Retaining Wall | 20,100 | SQFT | $30.00 | $603,000 |
| 15 | Noise Barrier | 1 | LS | $1,400,000.00 | $1,400,000 |
| 16 | Drainage (10% of Items 1 - 15) | 1 | LS | 10% | $2,299,865 |
| 17 | Temporary Erosion Control (10% of item 16) | 1 | LS | 10% | $229,986 |
| 18 | Pavement Marking (5% of Items 2-5) | 1 | LS | 5% | $376,834 |
| 19 | Maintenance of Traffic During Construction (10% of Items 1 - 15) | 1 | LS | 10% | $2,299,865 |
| 20 | Items Not Estimated (10% of Items 1 - 15) | 1 | LS | 10% | $2,299,865 |
| 21 | Mobilization (2% of Items 1-20) | 1 | LS | 2% | $610,101 |
| 22 | Design and Construction Engineering (15% of items 1-20) | 1 | LS | 15% | $4,575,760 |
| | | | | | |
| 23 | Transfer and Transport Machine (TTM) to Shift Moveable Barrier | 1 | EACH | $1,000,000 | $1,000,000 |
| 24 | Pres. Value of Annual Cost for 15yrs to Shift Moveable Barrier & Maintain TTM | 1 | LS | $2,000,000 | $2,000,000 |
| | | | | | |
| 25 | Inflation - 1 year at 3% (3% of items 1-24) | 1 | LS | 3% | $1,160,728 |
| | | | | | |
| 26 | Contingency (10% of Items 1-25) | 1 | LS | 10% | $3,985,165 |
| | | | | | |
| | *Total* | | | | $43,836,818 |
| | **Total (Use)** | | | | **$44,000,000** |

* Assuming that 1 mile (5,280') of UDOT furnished concrete barrier is available

** 14600 Structure (F-207): $394,526
** 11400 Structure (F-56): $274,117

*** $75/sqft used for 14600 South and 11400 South Structures; $200/sqft used for 10000 South Structure

**Moveable Barrier Reversible Lane Alternative (5-4, 4-5)**

The lane arrangement for the Moveable Barrier Reversible Lane (5-4, 4-5) Alternative was set to have 4 lanes in the non-peak direction in order to handle off-peak traffic. The directional split in the PM is 54/46, which does not show much difference in the number of vehicles for each direction. As time passes, the directional split historically tends to move closer to 50/50, making efficient use of reversible lanes less likely. Typical sections and cost estimates for the Moveable Barrier Reversible Lane (5-4, 4-5) Alternative are provided at the end of this section.

The features of the Moveable Barrier Reversible Lane (5-4, 4-5) Alternative are:

- Similar to 8-Lane Alternative and also provides one new reversible lane in peak travel direction by using moveable barrier in the median.
- The area from the Alpine Interchange to south of the Bangerter Interchange would act as a contraflow lane because of the elevation differential in the median.
- Requires pavement widening beyond outside shoulder.
- Requires reconstruction of most outside shoulders to accommodate traffic control during construction.
- Requires retaining wall or stepped pavement type barrier at the horizontal curve north of 14600 South.
- Requires three separate sections of moveable barrier to clear obstacles in the median, such as elevation differences between northbound and southbound roadways at 12300 South and bridge piers in the median at Bangerter. At the obstacles, the reversible lane would be shifted away from the median to become a fifth lane around the obstacles.
- Modifications required to Bangerter Highway Interchange:
  - Requires vertical realignment of the southbound exit ramp because the cross slope breakover criteria along the edges of the gore cannot be met.
  - Requires reconstruction of a portion of the southbound entrance ramp because the pavement widening on I-15 forces the ramp further to the west.
- Modifications required to 10600 South Interchange:
  - Requires reconstruction of a portion of the northbound entrance ramp because the pavement widening on I-15 forces the ramp further to the east.
  - Requires reconstruction of a portion of the southbound entrance ramp because the pavement widening on I-15 forces the ramp further to the west.
  - Requires a new southbound auxiliary lane north of 10600 South.
  - Requires a new northbound auxiliary lane north of 10600 South.

The advantages of the Moveable Barrier Reversible Lane (5-4, 4-5) Alternative are:

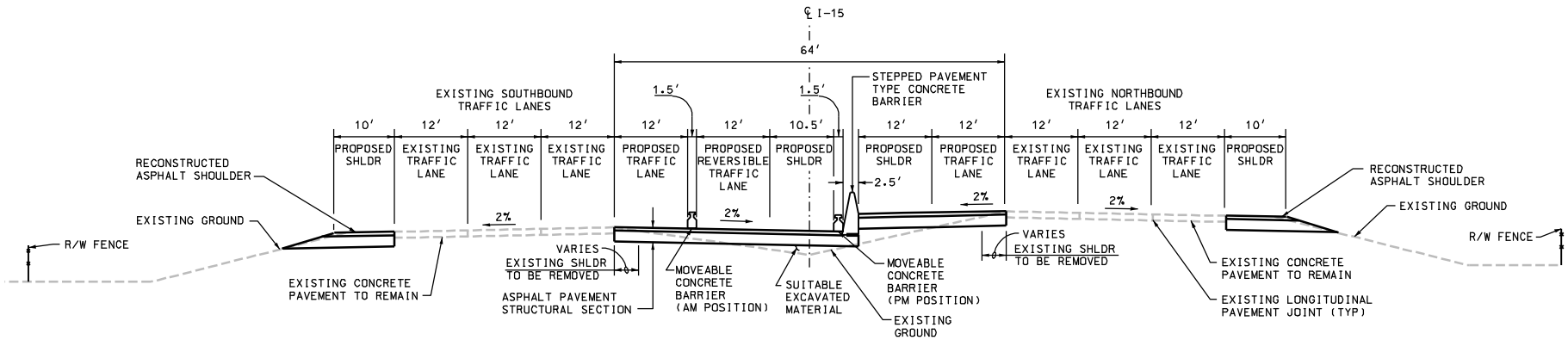
- Provides additional capacity in peak travel direction.

- Provides similar level-of-service as a traditional 10-lane section within a 9-lane section area of pavement.
- Additional lane could be striped as a HOV lane.
- Moveable barrier could be used during the construction phase and moved into its permanent position after construction.

The disadvantages of the Moveable Barrier Reversible Lane (5-4, 4-5) Alternative are:

- The typical section for this alternative does not easily fit under the existing Bangerter Highway bridge structure because there is a pier in the center of the median. A special configuration of barrier could be used around the pier but this configuration would place the pier between two travel lanes.
- Complicated by proposed elevation differential in the median at the horizontal curve at 12300 South and the existing elevation differential from 14600 South to the Utah County Line.
- Requires the purchase of a Transfer and Transport Machine (TTM).
- Requires an ongoing expense for shifting the moveable barrier twice daily.
- Requires new right-of-way or narrower shoulders and/or lanes to fit past Bangerter Interchange gore areas.
- Directional split of traffic may not warrant reversible lanes.
- Depressed median may no longer be feasible. Pavement drainage would run across all travel lanes to the outside of the roadway, which is not recommended by AASHTO.
- Existing longitudinal pavement joint lines may not line up with proposed striping.
- The TTM used to move the barrier would have to cross four lanes of traffic four times per day to return to its storage location.
- Snow removal would be complicated and must occur where the barrier is being placed prior to a barrier shift. The location where the barrier was located would also have to be plowed prior to opening that lane for traffic.
- The barrier shift is dependent on the equipment functioning when needed.

# MOVEABLE BARRIER REVERSIBLE LANES (5-4, 4-5) ALTERNATIVE

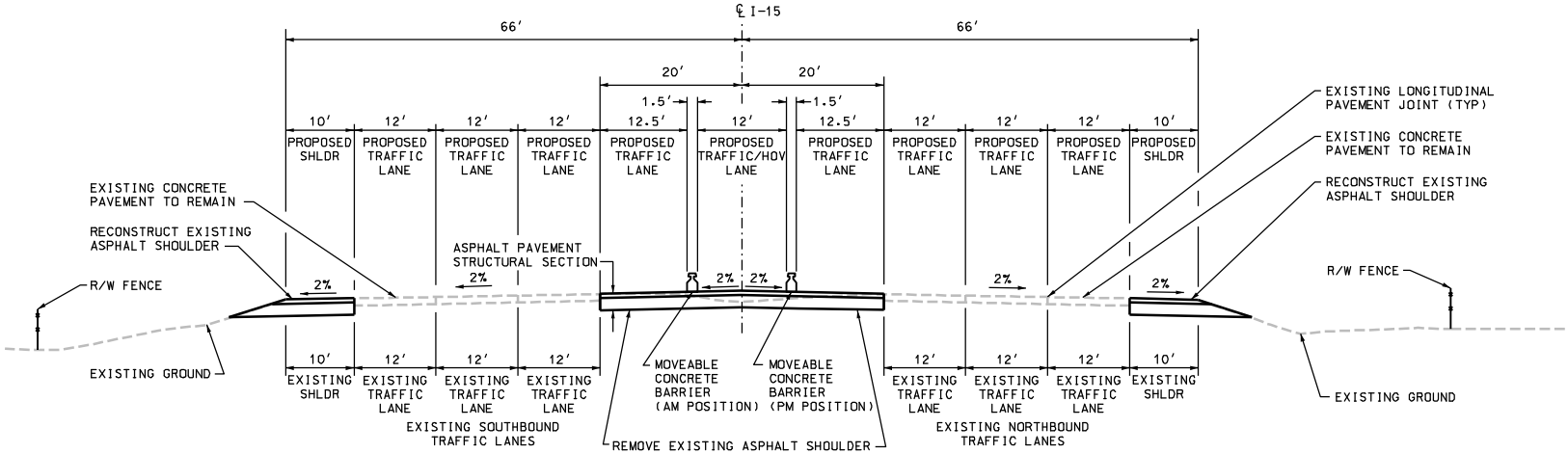



ALPINE TO BANGERTER HIGHWAY

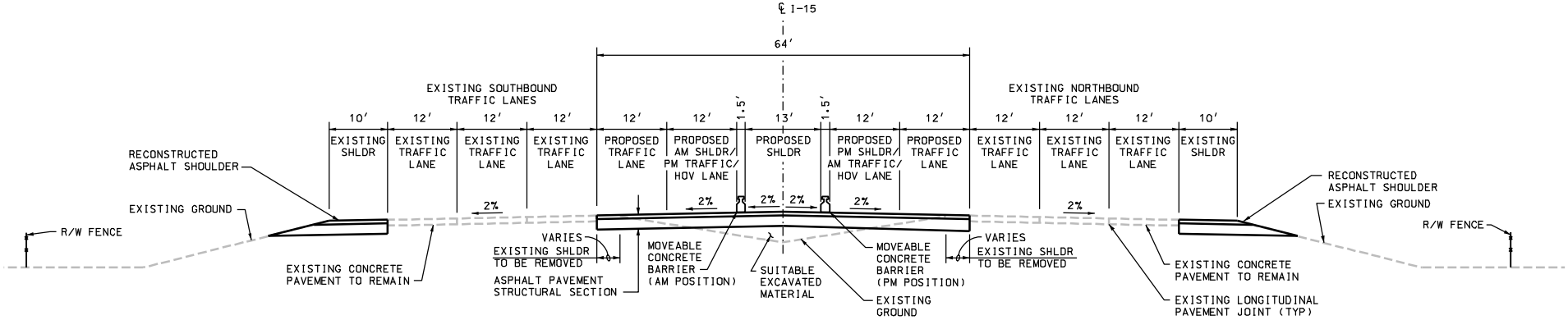


Figure B-4
Sheet 1 of 2

# MOVEABLE BARRIER REVERSIBLE LANE (5-4, 4-5) ALTERNATIVE




BANGERTER HIGHWAY TO 12700 SOUTH (APPROXIMATE SOUTHERN EXTENT OF 12300 SOUTH PROJECT)




11900 SOUTH (APPROXIMATE NORTHERN EXTENT OF 12300 SOUTH PROJECT) TO 10600 SOUTH



Figure B-4
Sheet 2 of 2

# I-15
# Utah County Line to 10600 South
# Moveable Barrier Reversible Lane (5-4, 4-5) Alternative
# Utah County Portion (Alpine Exit to Utah County Line)

SUMMARY
ESTIMATE OF PROBABLE COST

| Item No. | Item Description | Quantity | Units | Unit Price | Total Cost |
|---|---|---|---|---|---|
| 1 | Roadway Excavation | 14,700 | CUYD | $4.71 | $69,237 |
| 2 | Crack and Seat with Pavement Overlay | 0 | CUYD | $11.18 | $0 |
| 3 | Roadway and Shoulder Pavement | 39,900 | SQYD | $27.06 | $1,079,521 |
| 4 | Reduced Pavement Section | 0 | SQYD | $8.56 | $0 |
| 5 | Concrete Pavement | 4,200 | SQYD | $40.72 | $171,024 |
| 6 | Constant Slope Concrete Barrier | 0 | FT | $45.72 | $0 |
| 7 | Stepped Pavement Type Concrete Barrier | 9,500 | FT | $103.14 | $979,787 |
| 8 | Concrete Barrier | 9,400 | FT | $24.85 | $233,590 |
| 9 | Concrete Barrier and Moment Slab | 0 | FT | $118.00 | $0 |
| 10 | Moveable Barrier | 9,400 | FT | $230.00 | $2,162,000 |
| 11 | Overhead Sign Structure Widening | 0 | EACH | $150,000.00 | $0 |
| 12 | Bridge Rehabilitation | 0 | EACH | varies | $0 |
| 13 | Bridge Widening | 0 | SQFT | $75.00 | $0 |
| 14 | Retaining Wall | 0 | SQFT | $30.00 | $0 |
| 15 | Noise Barrier | 1 | LS | $400,000.00 | $400,000 |
| 16 | Drainage (10% of Items 1 - 15) | 1 | LS | 10% | $509,516 |
| 17 | Temporary Erosion Control (10% of item 16) | 1 | LS | 10% | $50,952 |
| 18 | Pavement Marking (5% of Items 2-5) | 1 | LS | 5% | $62,527 |
| 19 | Maintenance of Traffic During Construction (10% of Items 1 - 15) | 1 | LS | 10% | $509,516 |
| 20 | Items Not Estimated (10% of Items 1 - 15) | 1 | LS | 10% | $509,516 |
| 21 | Mobilization (2% of Items 1-20) | 1 | LS | 2% | $134,744 |
| 22 | Design and Construction Engineering (15% of items 1-20) | 1 | LS | 15% | $1,010,578 |
| | | | | | |
| 23 | Transfer and Transport Machine (TTM) to Shift Moveable Barrier | 0 | EACH | $1,000,000 | $0 |
| 24 | Pres. Value of Annual Cost for 15yrs to Shift Moveable Barrier & Maintain TTM | 1 | LS | $600,000 | $600,000 |
| | | | | | |
| 25 | Inflation - 1 year at 3% (3% of items 1-24) | 1 | LS | 3% | $254,475 |
| | | | | | |
| 26 | Contingency (10% of Items 1-25) | 1 | LS | 10% | $873,698 |
| | | | | | |
| | *Total* | | | | $9,610,682 |
| | **Total (Use)** | | | | **$10,000,000** |

# I-15
# Utah County Line to 10600 South
# Moveable Barrier Reversible Lane (5-4, 4-5) Alternative
# Salt Lake County Portion (Utah County Line to 10600 South)

SUMMARY
ESTIMATE OF PROBABLE COST

| Item No. | Item Description | Quantity | Units | Unit Price | Total Cost |
|---|---|---|---|---|---|
| 1 | Roadway Excavation | 131,100 | CUYD | $4.71 | $617,481 |
| 2 | Crack and Seat with Pavement Overlay | 0 | SQYD | $11.18 | $0 |
| 3 | Roadway and Shoulder Pavement | 261,744 | SQYD | $27.06 | $7,081,661 |
| 4 | Reduced Pavement Section | 0 | SQYD | $8.56 | $0 |
| 5 | Concrete Pavement | 15,800 | SQYD | $52.59 | $830,883 |
| 6 | Constant Slope Concrete Barrier | 2,500 | FT | $45.72 | $114,300 |
| 7 | Stepped Pavement Type Concrete Barrier | 17,100 | FT | $170.12 | $2,909,086 |
| 8 | Concrete Barrier* | 40,900 | FT | $24.85 | $1,016,365 |
| 9 | Concrete Barrier and Moment Slab | 2,100 | FT | $118.00 | $247,800 |
| 10 | Moveable Barrier | 35,500 | FT | $230.00 | $8,165,000 |
| 11 | Overhead Sign Structure Widening | 1 | EACH | $150,000.00 | $150,000 |
| 12 | Bridge Rehabilitation** | 2 | EACH | varies** | $668,643 |
| 13 | Bridge Widening | 17,700 | SQFT | varies*** | $1,465,000 |
| 14 | Retaining Wall | 20,100 | SQFT | $30.00 | $603,000 |
| 15 | Noise Barrier | 1 | LS | $1,400,000.00 | $1,400,000 |
| 16 | Drainage (10% of Items 1 - 15) | 1 | LS | 10% | $2,526,922 |
| 17 | Temporary Erosion Control (10% of item 16) | 1 | LS | 10% | $252,692 |
| 18 | Pavement Marking (5% of Items 2-5) | 1 | LS | 5% | $395,627 |
| 19 | Maintenance of Traffic During Construction (10% of Items 1 - 15) | 1 | LS | 10% | $2,526,922 |
| 20 | Items Not Estimated (10% of Items 1 - 15) | 1 | LS | 10% | $2,526,922 |
| 21 | Mobilization (2% of Items 1-20) | 1 | LS | 2% | $669,966 |
| 22 | Design and Construction Engineering (15% of items 1-20) | 1 | LS | 15% | $5,024,746 |
| | | | | | |
| 23 | Transfer and Transport Machine (TTM) to Shift Moveable Barrier | 1 | EACH | $1,000,000 | $1,000,000 |
| 24 | Pres. Value of Annual Cost for 15yrs to Shift Moveable Barrier & Maintain TTM | 1 | LS | $2,000,000 | $2,000,000 |
| | | | | | |
| 25 | Inflation - 1 year at 3% (3% of items 1-24) | 1 | LS | 3% | $1,265,790 |
| | | | | | |
| 26 | Contingency (10% of Items 1-25) | 1 | LS | 10% | $4,345,881 |
| | | | | | |
| | *Total* | | | | $47,804,686 |
| | **Total (Use)** | | | | **$48,000,000** |

* Assuming that 1 mile (5,280') of UDOT furnished concrete barrier is available

** 14600 Structure (F-207): $394,526
** 11400 Structure (F-56): $274,117

*** $75/sqft used for 14600 South and 11400 South Structures; $200/sqft used for 10000 South Structure

**Eight General-Purpose Lanes Alternative**

The Eight General-Purpose Lanes Alternative provides one additional lane in each direction throughout the project. It was also used as the basis for the other alternatives, except the reversible lane alternatives. Typical sections and cost estimates for the Eight General-Purpose Lanes Alternative are provided at the end of this section.

The features of this alternative are:

- Provides a 7' inside shoulders from south of 14600 South to the 12300 South Project where the existing median is only 40 feet wide.
- Provides 14' extra pavement in the median throughout the rest of the project where the exiting median is 64 feet wide.
  - 12300 South Project to 10600 South- extra pavement is full depth
  - Utah County line to 14600 South- extra pavement is reduced depth
- Requires reconstruction of most outside shoulders to accommodate traffic control during construction.
- Requires approximately 800' of retaining wall or stepped pavement type barrier at the horizontal curve north of 14600 South.
- Stays within the existing Right-of-way

The advantages of the Eight General-Purpose Lanes Alternative are:

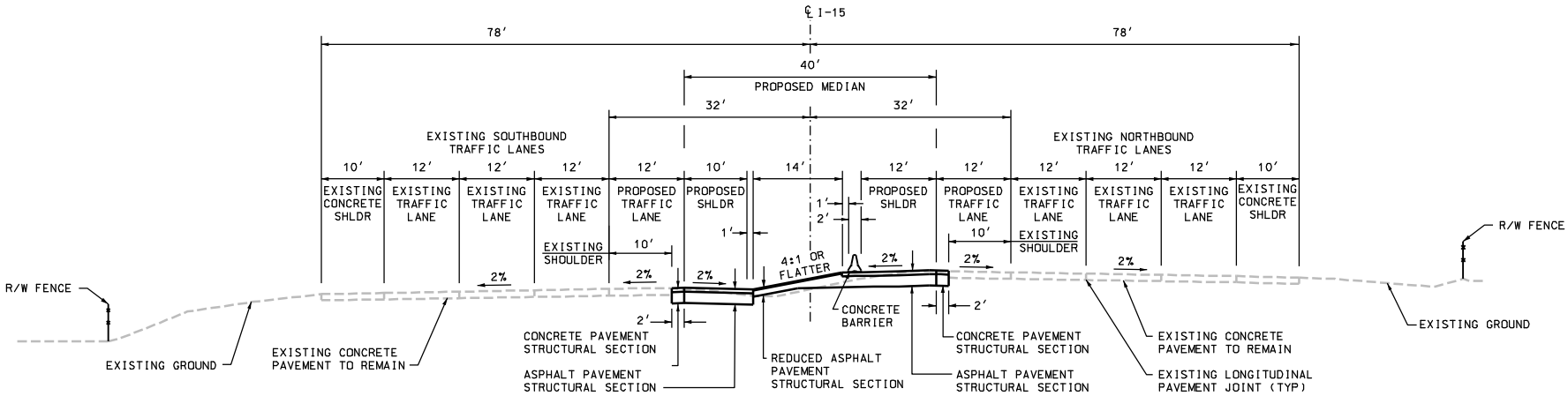
- Minimal environmental impacts since all widening is done in the existing median.
- Does not impact ramps at the 14600 South Interchange, the Bangerter Highway Interchange, the 12300 South Interchange or the 10600 South Interchange.
- Existing longitudinal pavement joint lines do not conflict with proposed striping. (Existing travel lanes would remain in the same location since all the new lanes are to be added in the median.)
- Depressed median collects median pavement drainage, which permits less water to run across adjacent travel lanes.
- No additional Right-of-way would be required.

The disadvantages of the Eight General-Purpose Lanes Alternative are:

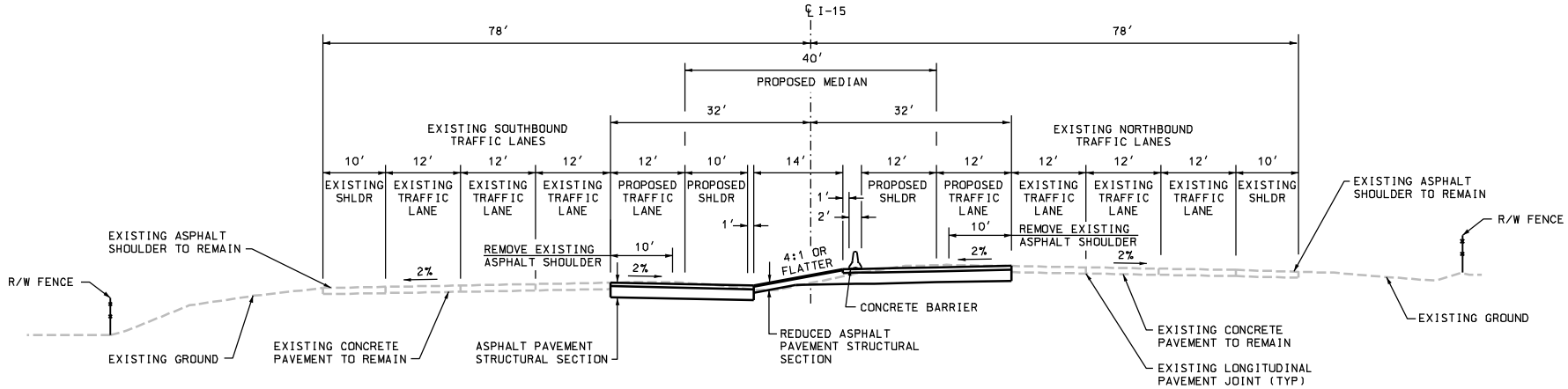
- Capacity could be exceeded within 8-10 years.
- Doesn't fully utilize the full 10-lane section (4,600' long) to be constructed by the 12300 South Project.

- The 7’ inside shoulders from south of 14600 South to the 12300 South Project would require a design exception because AASHTO recommends that shoulders should be 12’ wide next to a median barrier.

# EIGHT GENERAL-PURPOSE LANES ALTERNATIVE




## ALPINE EXIT TO UTAH COUNTY LINE

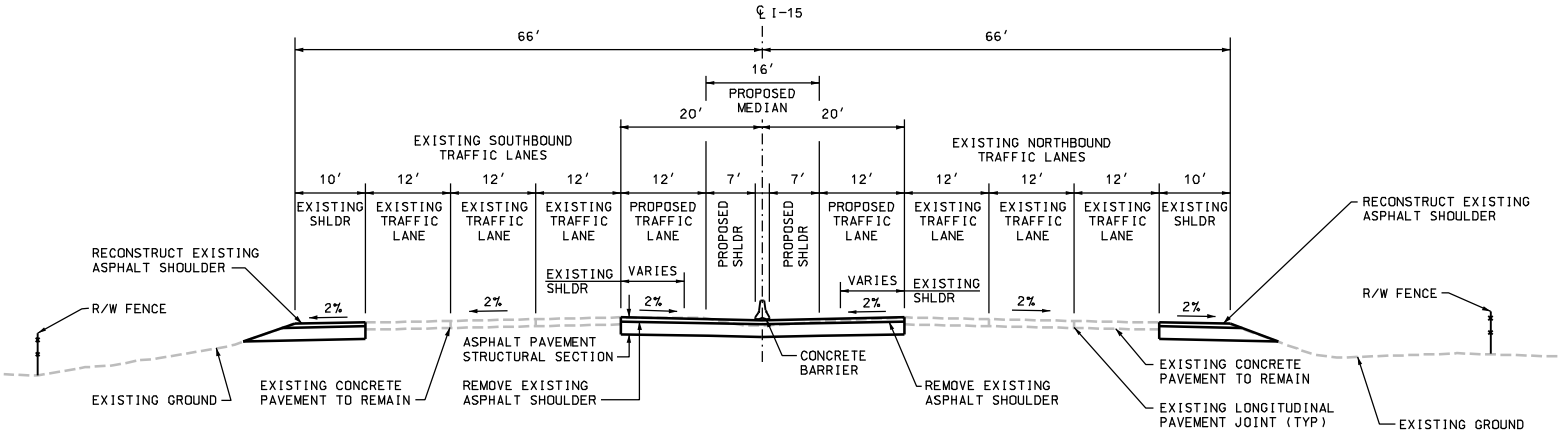



## UTAH COUNTY LINE TO BANGERTER HIGHWAY

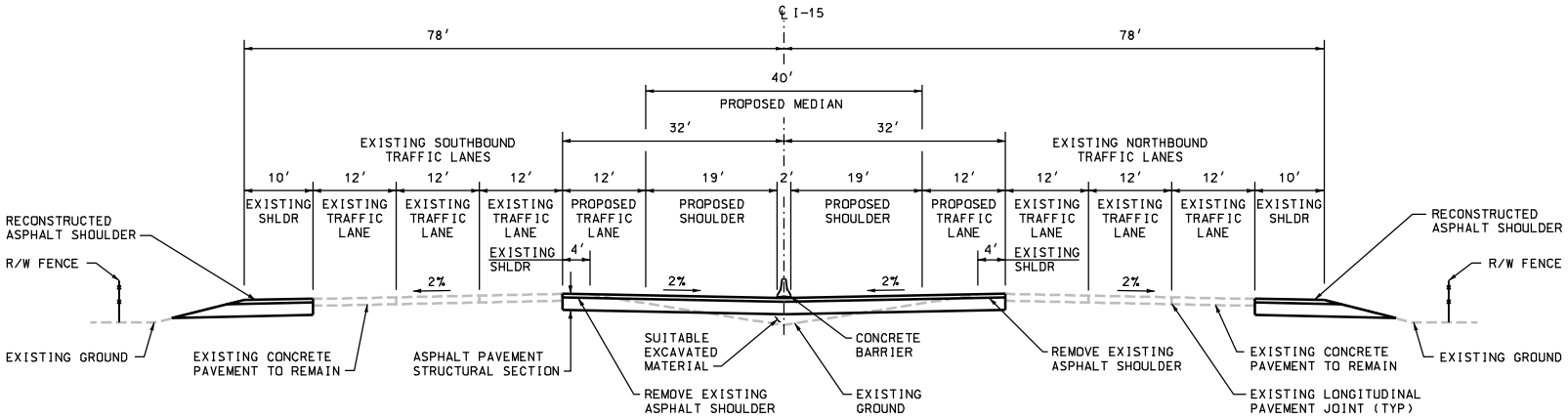


Figure B-5
Sheet 1 of 2

# EIGHT GENERAL-PURPOSE LANES ALTERNATIVE




BANGERTER HIGHWAY TO 12700 SOUTH (APPROXIMATE SOUTHERN EXTENT OF 12300 SOUTH PROJECT)




11900 SOUTH (APPROXIMATE NORTHERN EXTENT OF 12300 SOUTH PROJECT) TO 10600 SOUTH



Figure B-5
Sheet 2 of 2

# I-15
# Utah County Line to 10600 South
# Eight General-Purpose Lanes Alternative
# Utah County Portion (Alpine Exit to Utah County Line)

SUMMARY
ESTIMATE OF PROBABLE COST

| Item No. | Item Description | Quantity | Units | Unit Price | Total Cost |
|---|---|---|---|---|---|
| 1 | Roadway Excavation | 14,700 | CUYD | $4.71 | $69,237 |
| 2 | Borrow | 0 | CUYD | $6.74 | $0 |
| 3 | Roadway and Shoulder Pavement | 27,200 | SQYD | $27.06 | $735,914 |
| 4 | Reduced Pavement Section | 14,700 | SQYD | $8.56 | $125,841 |
| 5 | Concrete Pavement | 4,200 | SQYD | $40.72 | $171,024 |
| 6 | Constant Slope Concrete Barrier | 0 | FT | $45.72 | $0 |
| 7 | Stepped Pavement Type Concrete Barrier | 0 | FT | $94.98 | $0 |
| 8 | Concrete Barrier | 18,800 | FT | $24.85 | $467,180 |
| 9 | Concrete Barrier and Moment Slab | 0 | FT | $118.00 | $0 |
| 10 | Moveable Barrier | 0 | FT | $230.00 | $0 |
| 11 | Overhead Sign Structure Widening | 0 | EACH | $150,000.00 | $0 |
| 12 | Bridge Rehabilitation | 0 | EACH | varies | $0 |
| 13 | Bridge Widening | 0 | SQFT | $75.00 | $0 |
| 14 | Retaining Wall | 0 | SQFT | $30.00 | $0 |
| 15 | Noise Barrier | 1 | LS | $400,000.00 | $400,000 |
| 16 | Drainage (10% of Items 1 - 15) | 1 | LS | 10% | $196,920 |
| 17 | Temporary Erosion Control (10% of item 16) | 1 | LS | 10% | $19,692 |
| 18 | Pavement Marking (5% of Items 3-5) | 1 | LS | 5% | $51,639 |
| 19 | Maintenance of Traffic During Construction (10% of Items 1 - 15) | 1 | LS | 10% | $196,920 |
| 20 | Items Not Estimated (10% of Items 1 - 15) | 1 | LS | 10% | $196,920 |
| 21 | Mobilization (2% of Items 1-20) | 1 | LS | 2% | $52,626 |
| 22 | Design and Construction Engineering (15% of items 1-20) | 1 | LS | 15% | $394,693 |
| | | | | | |
| 23 | Inflation - 1 year at 3% (3% of items 1-22) | 1 | LS | 3% | $92,358 |
| | | | | | |
| 24 | Contingency (10% of Items 1-23) | 1 | LS | 10% | $317,096 |
| | | | | | |
| | *Total* | | | | $3,488,059 |
| | **Total (Use)** | | | | **$4,000,000** |

# I-15
# Utah County Line to 10600 South
# Eight General-Purpose Lanes Alternative
# Salt Lake County Portion (Utah County Line to 10600 South)

SUMMARY
ESTIMATE OF PROBABLE COST

| Item No. | Item Description | Quantity | Units | Unit Price | Total Cost |
|---|---|---|---|---|---|
| 1 | Roadway Excavation | 120,200 | CUYD | $4.71 | $566,142 |
| 2 | Borrow | 0 | CUYD | $6.74 | $0 |
| 3 | Roadway and Shoulder Pavement | 240,100 | SQYD | $27.06 | $6,496,068 |
| 4 | Reduced Pavement Section | 24,500 | SQYD | $8.56 | $209,735 |
| 5 | Concrete Pavement | 0 | SQYD | $40.72 | $0 |
| 6 | Constant Slope Concrete Barrier | 0 | FT | $45.72 | $0 |
| 7 | Stepped Pavement Type Concrete Barrier | 800 | FT | $94.98 | $75,980 |
| 8 | Concrete Barrier* | 65,600 | FT | $24.85 | $1,630,160 |
| 9 | Concrete Barrier and Moment Slab | 0 | FT | $118.00 | $0 |
| 10 | Moveable Barrier | 0 | FT | $230.00 | $0 |
| 11 | Overhead Sign Structure Widening | 1 | EACH | $150,000.00 | $150,000 |
| 12 | Bridge Rehabilitation** | 2 | EACH | varies** | $668,643 |
| 13 | Bridge Widening | 11,800 | SQFT | $75.00 | $885,000 |
| 14 | Retaining Wall | 0 | SQFT | $30.00 | $0 |
| 15 | Noise Barrier | 1 | LS | $1,400,000.00 | $1,400,000 |
| 16 | Drainage (10% of Items 1 - 15) | 1 | LS | 10% | $1,208,173 |
| 17 | Temporary Erosion Control (10% of item 16) | 1 | LS | 10% | $120,817 |
| 18 | Pavement Marking (5% of Items 3-5) | 1 | LS | 5% | $335,290 |
| 19 | Maintenance of Traffic During Construction (10% of Items 1 - 15) | 1 | LS | 10% | $1,208,173 |
| 20 | Items Not Estimated (10% of Items 1 - 15) | 1 | LS | 10% | $1,208,173 |
| 21 | Mobilization (2% of Items 1-20) | 1 | LS | 2% | $323,247 |
| 22 | Design and Construction Engineering (15% of items 1-20) | 1 | LS | 15% | $2,424,353 |
| | | | | | |
| 23 | Inflation - 1 year at 3% (3% of items 1-22) | 1 | LS | 3% | $567,299 |
| | | | | | |
| 24 | Contingency (10% of Items 1-23) | 1 | LS | 10% | $1,947,725 |
| | | | | | |
| | *Total* | | | | $21,424,977 |
| | **Total (Use)** | | | | **$22,000,000** |

* Assuming that 1 mile (5,280') of UDOT furnished concrete barrier is available

** 14600 Structure (F-207): $394,526
** 11400 Structure (F-56): $274,117

**Six General-Purpose and Two High Occupancy Vehicle (HOV) Lanes Alternative**

Similar to the Eight General-Purpose Lanes Alternative, however the additional lane in each direction would function as a High Occupancy Vehicle (HOV) lane. Typical sections and cost estimates for the Six General-Purpose and Two High Occupancy Vehicle (HOV) Lanes Alternative are provided at the end of this section.

The features of the Six General-Purpose and Two High Occupancy Vehicle (HOV) Lanes Alternative are:

- Provides a 7' inside shoulders from south of 14600 South to the 12300 South Project where the existing median is 40 feet wide.
- Provides 14' extra pavement in the median throughout the rest of the project where the existing median is 64 feet wide.
  - 12300 South Project to 10600 South- extra pavement is full depth
  - Utah County line to 14600 South- extra pavement is reduced depth
- Requires reconstruction of most outside shoulders to accommodate traffic control during construction.
- Requires approximately 800' of retaining wall or stepped pavement type barrier at the horizontal curve north of 14600 South.
- Stays within the existing Right-of-way.

The advantages of the Six General-Purpose and Two High Occupancy Vehicle (HOV) Lanes Alternative are:

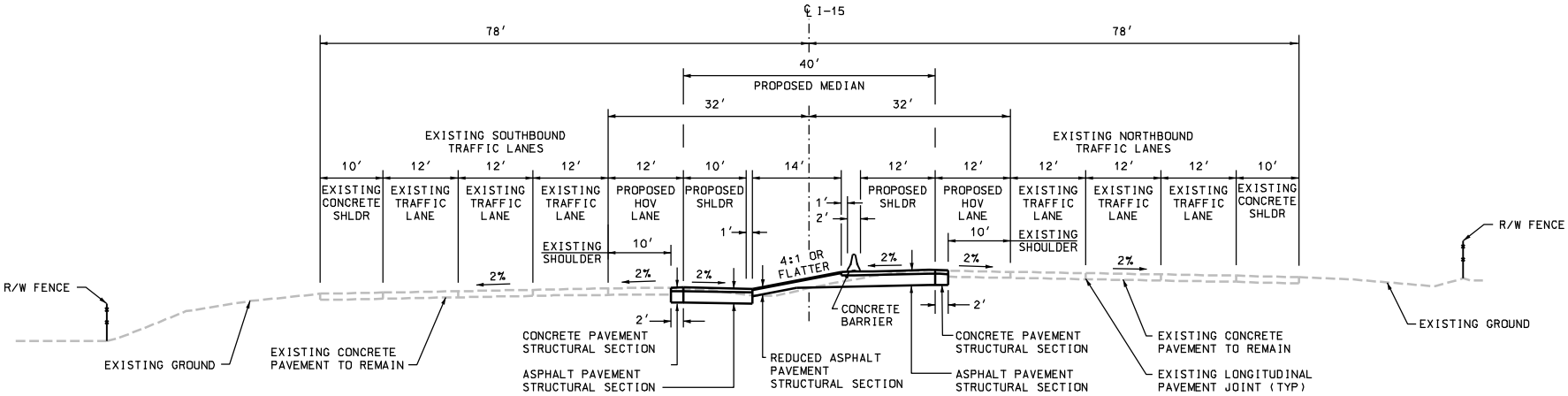
- Minimal environmental impacts since all widening is done in the existing median.
- Does not impact ramps at the 14600 South Interchange, the Bangerter Highway Interchange and the 10600 South Interchange.
- Existing longitudinal pavement joint lines do not conflict with proposed striping. (Existing travel lanes would remain in the same location since all the new lanes are to be added in the median.)
- Depressed median collects median pavement drainage, which permits less water to run across adjacent travel lanes.
- Extends HOV lanes southward to the Alpine Exit.
- No additional Right-of-way would be required.

The disadvantages of the Six General-Purpose and Two High Occupancy Vehicle (HOV) Lanes Alternative are:

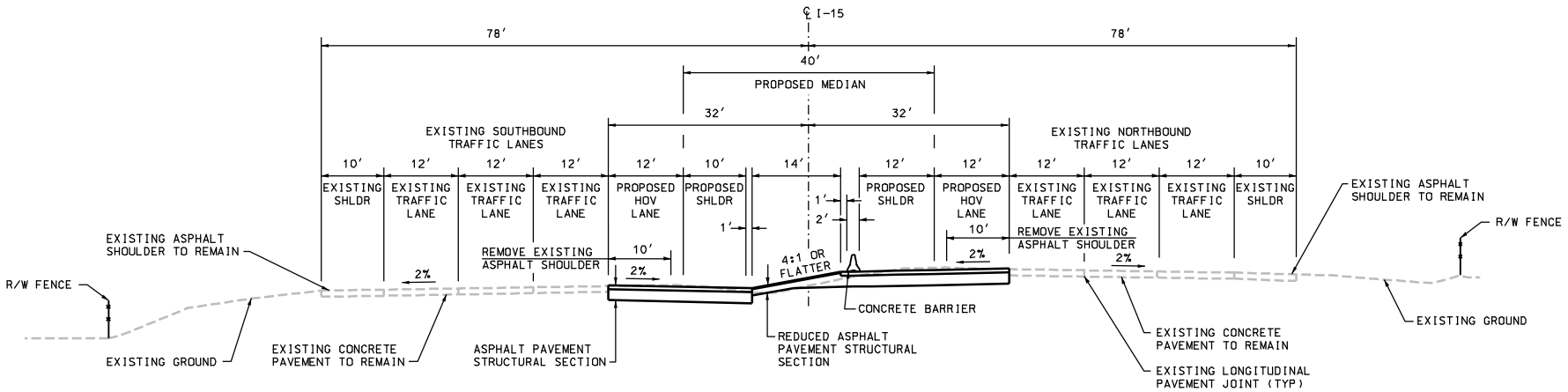
- The level-of-service would drop below LOS D by 2010.

- Doesn't fully utilize the full 10-lane section (4,600' long) to be constructed by the 12300 South Project.
- The 7' inside shoulders from south of 14600 South to the 12300 South Project would require a design exception because AASHTO recommends that shoulders should be 12' wide next to a median barrier.

# SIX GENERAL-PURPOSE LANES AND TWO HIGH OCCUPANCY VEHICLE (HOV) LANES ALTERNATIVE




ALPINE EXIT TO UTAH COUNTY LINE

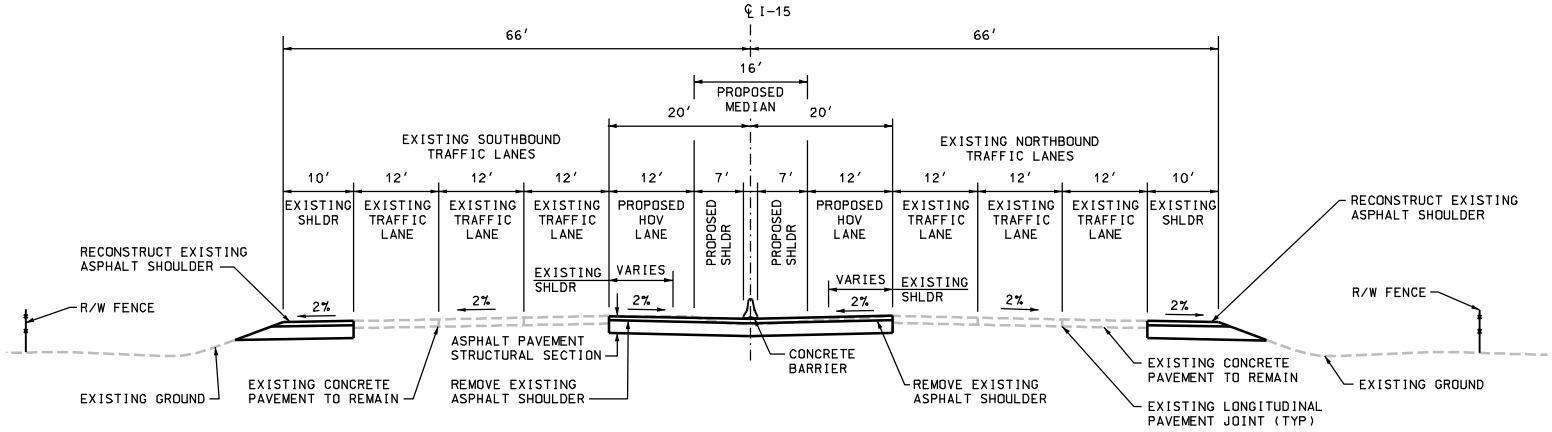



UTAH COUNTY LINE TO BANGERTER HIGHWAY

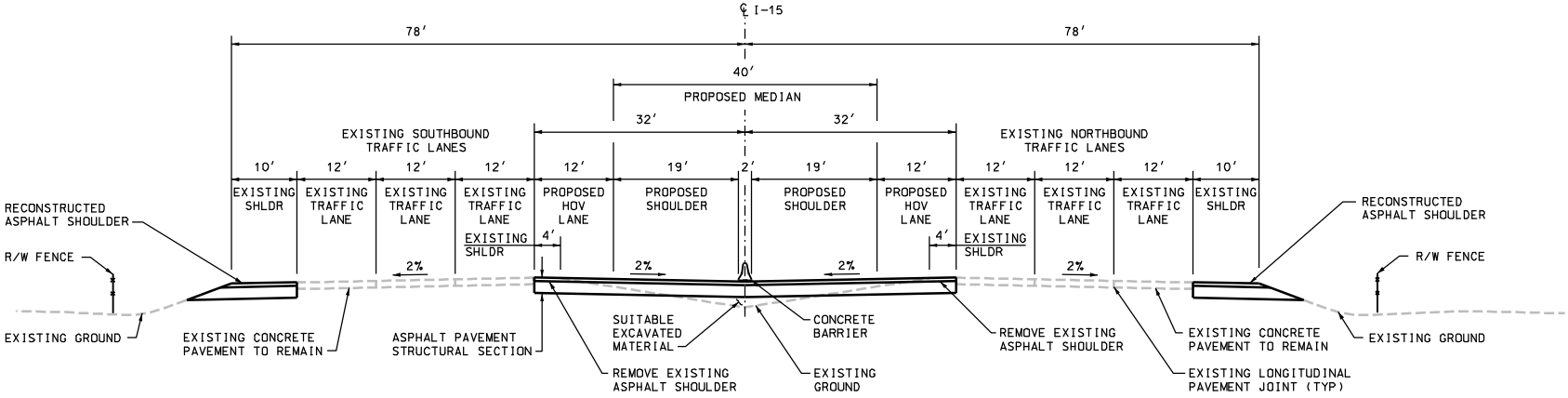


Figure B-6
Sheet 1 of 2

# SIX GENERAL-PURPOSE LANES AND TWO HIGH OCCUPANCY VEHICLE (HOV) LANES ALTERNATIVE




BANGERTER HIGHWAY TO 12700 SOUTH (APPROXIMATE SOUTHERN EXTENT OF 12300 SOUTH PROJECT)




11900 SOUTH (APPROXIMATE NORTHERN EXTENT OF 12300 SOUTH PROJECT) TO 10600 SOUTH



Figure B-6
Sheet 2 of 2

# I-15
# Utah County Line to 10600 South
# Six General-Purpose Lanes and Two HOV Lanes Alternative
# Utah County Portion (Alpine Exit to Utah County Line)

SUMMARY
ESTIMATE OF PROBABLE COST

| Item No. | Item Description | Quantity | Units | Unit Price | Total Cost |
|---|---|---|---|---|---|
| 1 | Roadway Excavation | 14,700 | CUYD | $4.71 | $69,237 |
| 2 | Borrow | 0 | CUYD | $6.74 | $0 |
| 3 | Roadway and Shoulder Pavement | 27,200 | SQYD | $27.06 | $735,914 |
| 4 | Reduced Pavement Section | 14,700 | SQYD | $8.56 | $125,841 |
| 5 | Concrete Pavement | 4,200 | SQYD | $40.72 | $171,024 |
| 6 | Constant Slope Concrete Barrier | 0 | FT | $45.72 | $0 |
| 7 | Stepped Pavement Type Concrete Barrier | 0 | FT | $94.98 | $0 |
| 8 | Concrete Barrier | 18,800 | FT | $24.85 | $467,180 |
| 9 | Concrete Barrier and Moment Slab | 0 | FT | $118.00 | $0 |
| 10 | Moveable Barrier | 0 | FT | $230.00 | $0 |
| 11 | Overhead Sign Structure Widening | 0 | EACH | $150,000.00 | $0 |
| 12 | Bridge Rehabilitation | 0 | EACH | varies | $0 |
| 13 | Bridge Widening | 0 | SQFT | $75.00 | $0 |
| 14 | Retaining Wall | 0 | SQFT | $30.00 | $0 |
| 15 | Noise Barrier | 1 | LS | $400,000.00 | $400,000 |
| 16 | Drainage (10% of Items 1 - 15) | 1 | LS | 10% | $196,920 |
| 17 | Temporary Erosion Control (10% of item 16) | 1 | LS | 10% | $19,692 |
| 18 | Pavement Marking (5% of Items 3-5) | 1 | LS | 5% | $51,639 |
| 19 | Maintenance of Traffic During Construction (10% of Items 1 - 15) | 1 | LS | 10% | $196,920 |
| 20 | Items Not Estimated (10% of Items 1 - 15) | 1 | LS | 10% | $196,920 |
| 21 | Mobilization (2% of Items 1-20) | 1 | LS | 2% | $52,626 |
| 22 | Design and Construction Engineering (15% of items 1-20) | 1 | LS | 15% | $394,693 |
| | | | | | |
| 23 | Inflation - 1 year at 3% (3% of items 1-22) | 1 | LS | 3% | $92,358 |
| | | | | | |
| 24 | Contingency (10% of Items 1-23) | 1 | LS | 10% | $317,096 |
| | | | | | |
| | *Total* | | | | $3,488,059 |
| | **Total (Use)** | | | | **$4,000,000** |

# I-15
# Utah County Line to 10600 South
# Six General-Purpose Lanes and Two HOV Lanes Alternative
# Salt Lake County Portion (Utah County Line to 10600 South)

SUMMARY
ESTIMATE OF PROBABLE COST

| Item No. | Item Description | Quantity | Units | Unit Price | Total Cost |
|---|---|---|---|---|---|
| 1 | Roadway Excavation | 120,200 | CUYD | $4.71 | $566,142 |
| 2 | Borrow | 0 | CUYD | $6.74 | $0 |
| 3 | Roadway and Shoulder Pavement | 240,100 | SQYD | $27.06 | $6,496,068 |
| 4 | Reduced Pavement Section | 24,500 | SQYD | $8.56 | $209,735 |
| 5 | Concrete Pavement | 0 | SQYD | $40.72 | $0 |
| 6 | Constant Slope Concrete Barrier | 0 | FT | $45.72 | $0 |
| 7 | Stepped Pavement Type Concrete Barrier | 800 | FT | $94.98 | $75,980 |
| 8 | Concrete Barrier* | 65,600 | FT | $24.85 | $1,630,160 |
| 9 | Concrete Barrier and Moment Slab | 0 | FT | $118.00 | $0 |
| 10 | Moveable Barrier | 0 | FT | $230.00 | $0 |
| 11 | Overhead Sign Structure Widening | 1 | EACH | $150,000.00 | $150,000 |
| 12 | Bridge Rehabilitation** | 2 | EACH | varies** | $668,643 |
| 13 | Bridge Widening | 11,800 | SQFT | $75.00 | $885,000 |
| 14 | Retaining Wall | 0 | SQFT | $30.00 | $0 |
| 15 | Noise Barrier | 1 | LS | $1,400,000.00 | $1,400,000 |
| 16 | Drainage (10% of Items 1 - 15) | 1 | LS | 10% | $1,208,173 |
| 17 | Temporary Erosion Control (10% of item 16) | 1 | LS | 10% | $120,817 |
| 18 | Pavement Marking (5% of Items 3-5) | 1 | LS | 5% | $335,290 |
| 19 | Maintenance of Traffic During Construction (10% of Items 1 - 15) | 1 | LS | 10% | $1,208,173 |
| 20 | Items Not Estimated (10% of Items 1 - 15) | 1 | LS | 10% | $1,208,173 |
| 21 | Mobilization (2% of Items 1-20) | 1 | LS | 2% | $323,247 |
| 22 | Design and Construction Engineering (15% of items 1-20) | 1 | LS | 15% | $2,424,353 |
| | | | | | |
| 23 | Inflation - 1 year at 3% (3% of items 1-22) | 1 | LS | 3% | $567,299 |
| | | | | | |
| 24 | Contingency (10% of Items 1-23) | 1 | LS | 10% | $1,947,725 |
| | | | | | |
| | *Total* | | | | $21,424,977 |
| | **Total (Use)** | | | | **$22,000,000** |

* Assuming that 1 mile (5,280') of UDOT furnished concrete barrier is available

** 14600 Structure (F-207): $394,526
** 11400 Structure (F-56): $274,117

**Eight General-Purpose Lanes and Auxiliary Lanes Alternative**

Similar to the Eight General-Purpose Lanes Alternative with auxiliary lanes between the interchanges. Typical sections and cost estimates for the Eight General-Purpose Lanes and Auxiliary Lanes Alternative are provided at the end of this section.

The features of the Eight General-Purpose Lanes and Auxiliary Lanes Alternative are:

- Provides an additional general-purpose lane in each direction and also provides an additional lane (auxiliary lane) on the outside of the general-purpose lanes that connects the on-ramps from one interchange to the off-ramps of the next interchange. These auxiliary lanes are provided between the 10600 South and 12300 South interchanges and also between the 12300 South and Bangerter Highway Interchanges.
- Requires reconstruction of most outside shoulders to accommodate traffic control during construction.
- Requires approximately 800' of retaining wall or stepped pavement type barrier at the horizontal curve north of 14600 South.
- Provides a 7' inside shoulders from south of 14600 South to the 12300 South Project where the existing median is 40 feet wide.

The advantages of the Eight General-Purpose Lanes and Auxiliary Lanes Alternative are:

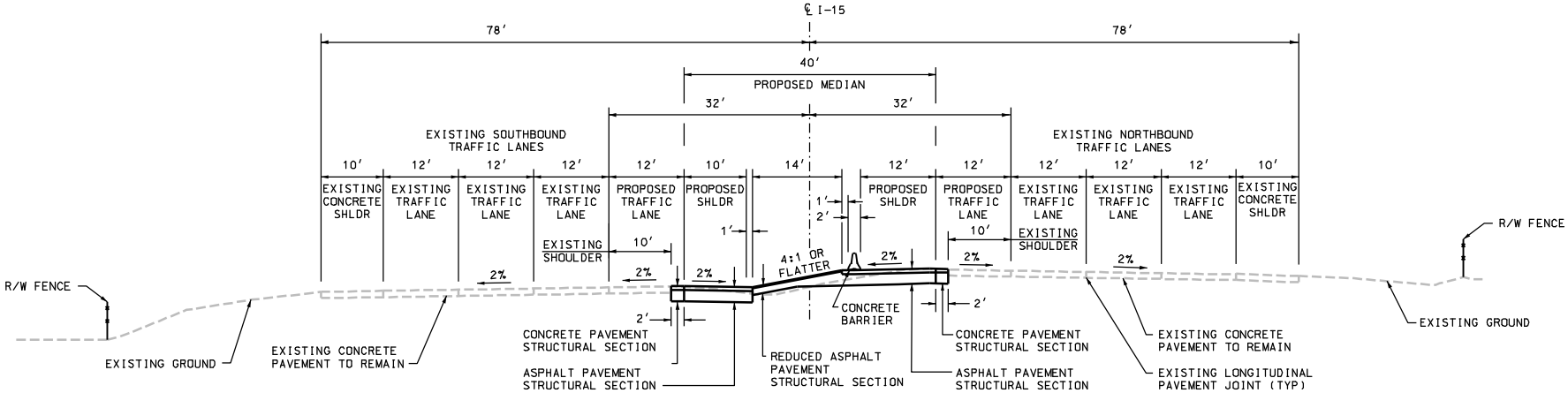
- Does not impact ramps at the 14600 South Interchange, the Bangerter Highway Interchange, the 12300 South Interchange or the 10600 South Interchange.
- Existing longitudinal pavement joint lines do not conflict with proposed striping. (Existing travel lanes would remain in the same location since all the new lanes are to be added in the median.)
- Depressed median collects median pavement drainage, which permits less water to run across adjacent travel lanes.

The disadvantages of the Eight General-Purpose Lanes and Auxiliary Lanes Alternative are:

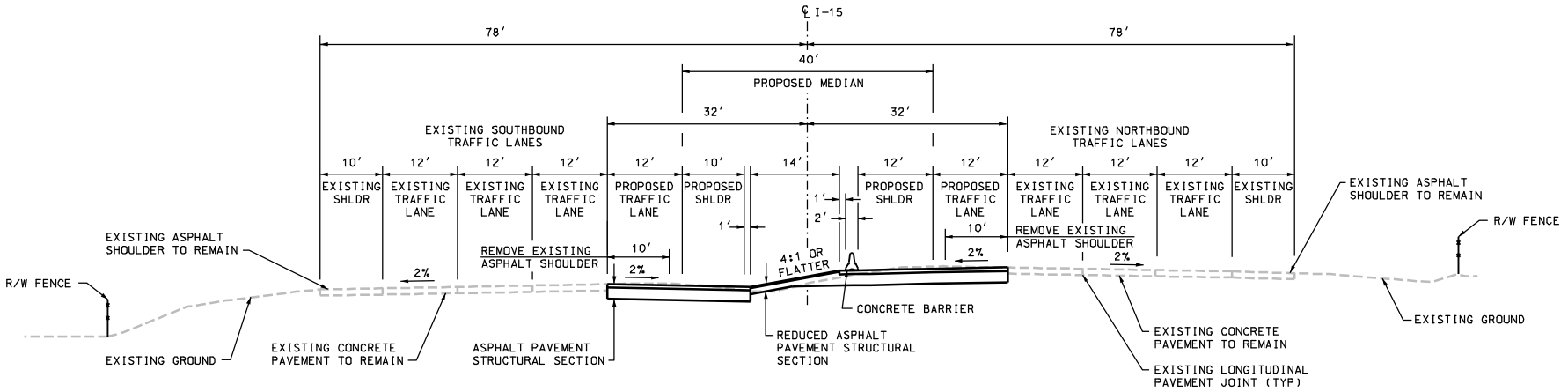
- The alternative does not carry 10 lanes under the 10600 South structure.
- The alternative does not carry 10 lanes under the Bangerter Highway structure.
- Doesn't fully utilize the full 10-lane section (4,600' long) to be constructed by the 12300 South Project.

- The 7’ inside shoulders from south of 14600 South to the 12300 South Project would require a design exception because AASHTO recommends that shoulders should be 12’ wide next to a median barrier.

# EIGHT GENERAL-PURPOSE LANES AND AUXILIARY LANES (10600 SOUTH TO BANGERTER) ALTERNATIVE




ALPINE EXIT TO UTAH COUNTY LINE

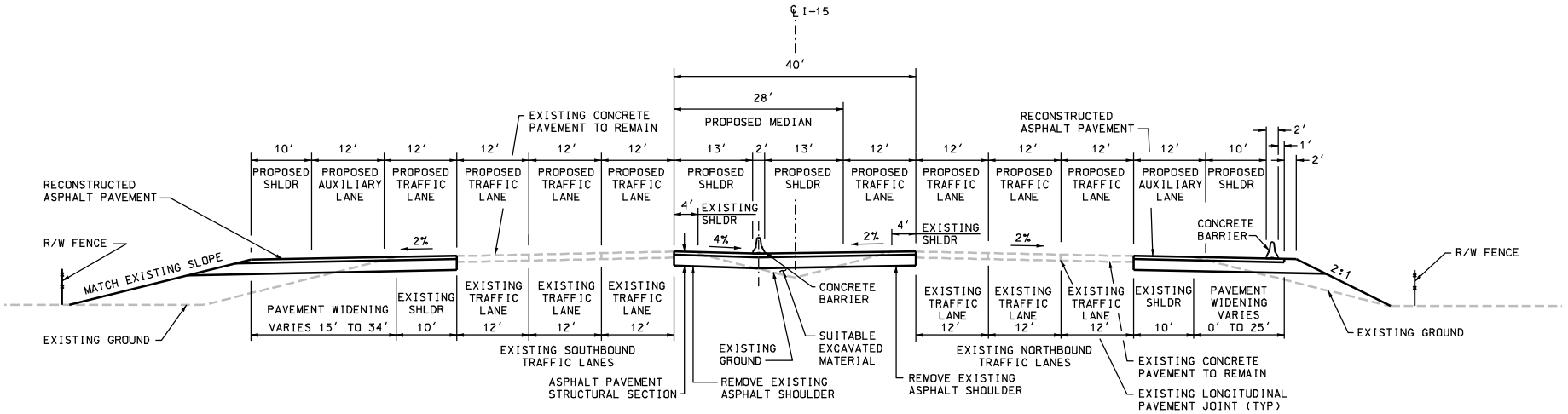



UTAH COUNTY LINE TO BANGERTER HIGHWAY

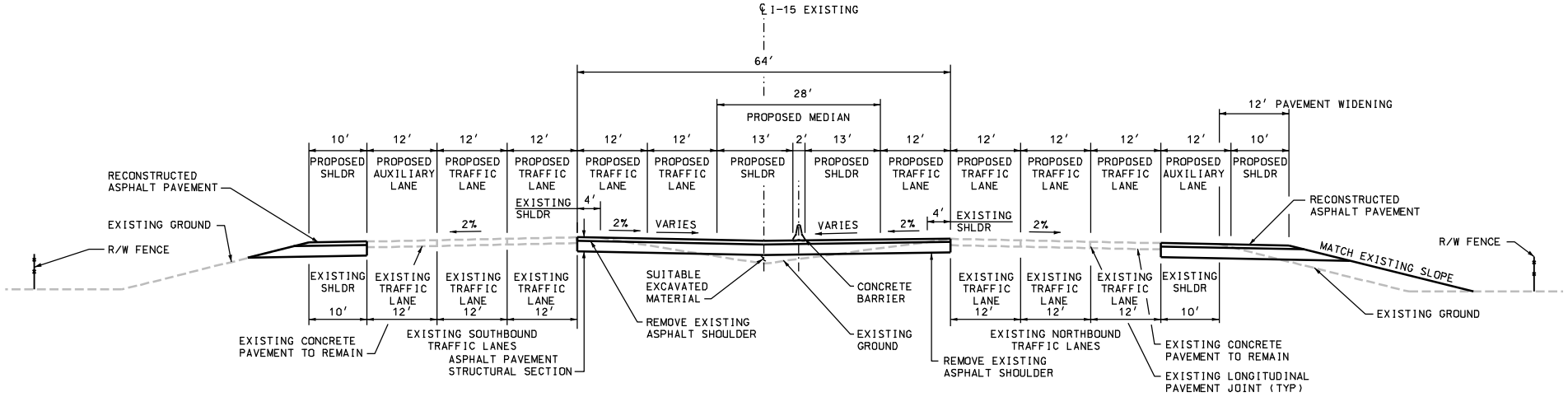


Figure B-7
Sheet 1 of 2

# EIGHT GENERAL-PURPOSE LANES AND AUXILIARY LANES (10600 SOUTH TO BANGERTER) ALTERNATIVE




BANGERTER HIGHWAY TO 12700 SOUTH (APPROXIMATE SOUTHERN EXTENT OF 12300 SOUTH PROJECT)




11900 SOUTH (APPROXIMATE NORTHERN EXTENT OF 12300 SOUTH PROJECT) TO 10600 SOUTH



Figure B-7
Sheet 2 of 2

# I-15
# Utah County Line to 10600 South
# Eight General-Purpose Lanes and
# Auxiliary Lanes - 10600 South to Bangerter Highway Alternative
# Utah County Portion (Alpine Exit to Utah County Line)

SUMMARY
ESTIMATE OF PROBABLE COST

| Item No. | Item Description | Quantity | Units | Unit Price | Total Cost |
|---|---|---|---|---|---|
| 1 | Roadway Excavation | 14,700 | CUYD | $4.71 | $69,237 |
| 2 | Borrow | 0 | CUYD | $6.74 | $0 |
| 3 | Roadway and Shoulder Pavement | 27,200 | SQYD | $27.06 | $735,914 |
| 4 | Reduced Pavement Section | 14,700 | SQYD | $8.56 | $125,841 |
| 5 | Concrete Pavement | 4,200 | SQYD | $40.72 | $171,024 |
| 6 | Constant Slope Concrete Barrier | 0 | FT | $45.72 | $0 |
| 7 | Stepped Pavement Type Concrete Barrier | 0 | FT | $94.98 | $0 |
| 8 | Concrete Barrier | 18,800 | FT | $24.85 | $467,180 |
| 9 | Concrete Barrier and Moment Slab | 0 | FT | $118.00 | $0 |
| 10 | Moveable Barrier | 0 | FT | $230.00 | $0 |
| 11 | Overhead Sign Structure Widening | 0 | EACH | $150,000.00 | $0 |
| 12 | Bridge Rehabilitation | 0 | EACH | varies | $0 |
| 13 | Bridge Widening | 0 | SQFT | $75.00 | $0 |
| 14 | Retaining Wall | 0 | SQFT | $30.00 | $0 |
| 15 | Noise Barrier | 1 | LS | $400,000.00 | $400,000 |
| 16 | Drainage (10% of Items 1 - 15) | 1 | LS | 10% | $196,920 |
| 17 | Temporary Erosion Control (10% of item 16) | 1 | LS | 10% | $19,692 |
| 18 | Pavement Marking (5% of Items 3-5) | 1 | LS | 5% | $51,639 |
| 19 | Maintenance of Traffic During Construction (10% of Items 1 - 15) | 1 | LS | 10% | $196,920 |
| 20 | Items Not Estimated (10% of Items 1 - 15) | 1 | LS | 10% | $196,920 |
| 21 | Mobilization (2% of Items 1-20) | 1 | LS | 2% | $52,626 |
| 22 | Design and Construction Engineering (15% of items 1-20) | 1 | LS | 15% | $394,693 |
| | | | | | |
| 23 | Inflation - 1 year at 3% (3% of items 1-22) | 1 | LS | 3% | $92,358 |
| | | | | | |
| 24 | Contingency (10% of Items 1-23) | 1 | LS | 10% | $317,096 |
| | | | | | |
| | *Total* | | | | $3,488,059 |
| | **Total (Use)** | | | | **$4,000,000** |

# I-15
# Utah County Line to 10600 South
# Eight General-Purpose Lanes and
# Auxiliary Lanes - 10600 South to Bangerter Highway Alternative
# Salt Lake County Portion (Utah County Line to 10600 South)

SUMMARY
ESTIMATE OF PROBABLE COST

| Item No. | Item Description | Quantity | Units | Unit Price | Total Cost |
|---|---|---|---|---|---|
| 1 | Roadway Excavation | 128,000 | CUYD | $4.71 | $602,880 |
| 2 | Borrow | 0 | CUYD | $6.74 | $0 |
| 3 | Roadway and Shoulder Pavement | 266,100 | SQYD | $27.06 | $7,199,515 |
| 4 | Reduced Pavement Section | 24,500 | SQYD | $8.56 | $209,735 |
| 5 | Concrete Pavement | 0 | SQYD | $52.59 | $0 |
| 6 | Constant Slope Concrete Barrier | 0 | FT | $45.72 | $0 |
| 7 | Stepped Pavement Type Concrete Barrier | 800 | FT | $94.98 | $75,980 |
| 8 | Concrete Barrier* | 65,600 | FT | $24.85 | $1,630,160 |
| 9 | Concrete Barrier and Moment Slab | 2,400 | FT | $118.00 | $283,200 |
| 10 | Moveable Barrier | 0 | FT | $230.00 | $0 |
| 11 | Overhead Sign Structure Widening | 1 | EACH | $150,000.00 | $150,000 |
| 12 | Bridge Rehabilitation** | 2 | EACH | varies** | $668,643 |
| 13 | Bridge Widening | 15,600 | SQFT | varies*** | $1,170,000 |
| 14 | Retaining Wall | 13,100 | SQFT | $30.00 | $393,000 |
| 15 | Noise Barrier | 1 | LS | $1,400,000.00 | $1,400,000 |
| 16 | Drainage (10% of Items 1 - 15) | 1 | LS | 10% | $1,378,311 |
| 17 | Temporary Erosion Control (10% of item 16) | 1 | LS | 10% | $137,831 |
| 18 | Pavement Marking (5% of Items 3-5) | 1 | LS | 5% | $370,462 |
| 19 | Maintenance of Traffic During Construction (10% of Items 1 - 15) | 1 | LS | 10% | $1,378,311 |
| 20 | Items Not Estimated (10% of Items 1 - 15) | 1 | LS | 10% | $1,378,311 |
| 21 | Mobilization (2% of Items 1-20) | 1 | LS | 2% | $368,527 |
| 22 | Design and Construction Engineering (15% of items 1-20) | 1 | LS | 15% | $2,763,951 |
| | | | | | |
| 23 | Inflation - 1 year at 3% (3% of items 1-22) | 1 | LS | 3% | $646,765 |
| | | | | | |
| 24 | Contingency (10% of Items 1-23) | 1 | LS | 10% | $2,220,558 |
| | | | | | |
| | *Total* | | | | $24,426,142 |
| | **Total (Use)** | | | | **$25,000,000** |

* Assuming that 1 mile (5,280') of UDOT furnished concrete barrier is available

** 14600 Structure (F-207): $394,526
** 11400 Structure (F-56): $274,117

*** $75/sqft used for 14600 South and 11400 South Structures

**Eight/Ten Lanes (8 Lanes, Bangerter to Alpine; 10 Lanes Bangerter to 10600 South) Alternative**

Similar to the Eight General-Purpose Lanes Alternative, except one additional lane is added each direction from Bangerter to 10600 South Interchange. Typical sections and cost estimates for the Eight/Ten Lanes (8 Lanes, Bangerter to Alpine; 10 Lanes Bangerter to 10600 South) Alternative are provided at the end of this section.

The features of this alternative are:

- Similar to the 8-Lane Alternative from the Alpine Interchange to the Bangerter Highway Interchange.
- Provides 10-lane section (5 lanes northbound and 5 lanes southbound) from Bangerter Highway to 10600 South Interchange.
- From Bangerter Highway Interchange to 12300 South Project, requires pavement widening beyond the existing outside shoulders and short retaining walls to accommodate the third and fourth new lanes along with a new auxiliary lane. (Most of the widening in this area is done to the west).
- From 12300 South project to 10600 South, requires pavement widening beyond the existing outside shoulders and short retaining walls to accommodate the fourth new lane and a new auxiliary lane south of 10600 South Interchange.
- Additional bridge widening required at 11400 South.
- Stays within existing right of way.
- Requires reconstruction of most outside shoulders to accommodate traffic control during construction.
- Requires approximately 800’ of retaining wall or stepped pavement type barrier at the horizontal curve north of 14600 South.
- Modifications required to Bangerter Highway Interchange:
  - Requires vertical realignment of the southbound exit ramp because the cross slope breakover criteria along the edges of the gore cannot be met.
  - Requires reconstruction of a portion of the southbound entrance ramp because the pavement widening on I-15 forces the ramp further to the west.
- Modifications required to 10600 South Interchange:
  - Requires reconstruction of a portion of the northbound entrance ramp because the pavement widening on I-15 forces the ramp further to the east.
  - Requires reconstruction of a portion of the southbound entrance ramp because the pavement widening on I-15 forces the ramp further to the west.
  - Requires a new southbound auxiliary lane north of 10600 South.
  - Requires a new northbound auxiliary lane north of 10600 South.

- Requires retaining walls to protect the Jordan and Salt Lake City Canal box culvert openings.
- Uses precast barrier to allow flexibility for lane configurations.

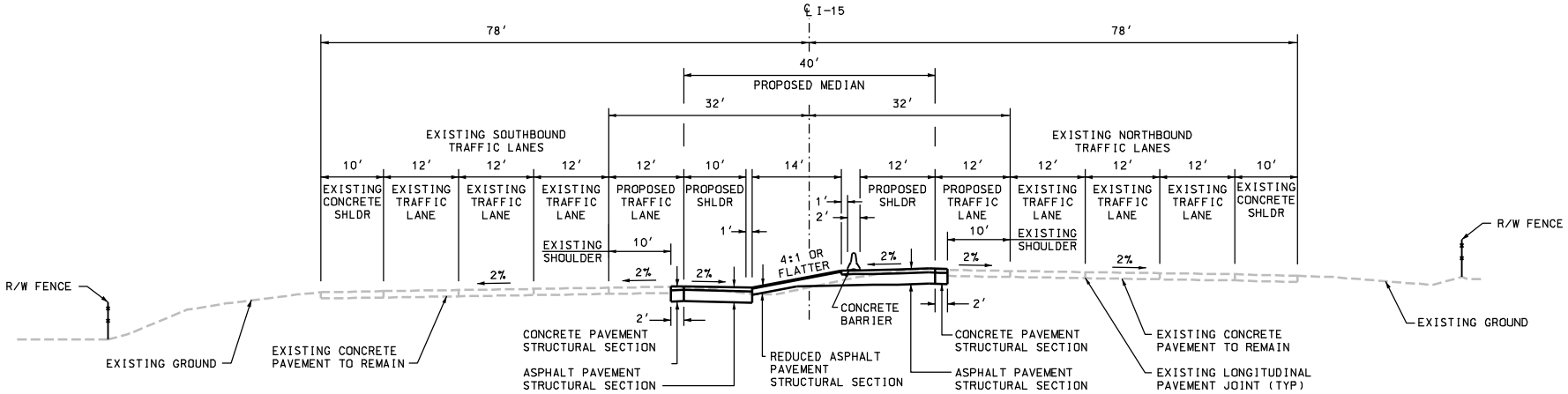
The advantages of the Eight/Ten Lanes (8 Lanes, Bangerter to Alpine; 10 Lanes, to Bangerter to 10600 South) Alternative are:

- Provides full capacity of I-15 from 10600 South to Bangerter Highway, a major route to provide access to the southwest portion of Salt Lake County.
- Provides a continuation of the reconstructed I-15 10-lane typical section north of the 10600 South Interchange to the Bangerter Highway.
- Provides a longer design life.
- Allows extension of HOV lanes.
- Fully utilizes the 10-lane section (4,600' long) to be constructed by 12300 South Project.
- Uses depressed median to collect median pavement drainage, which reduces water running across adjacent travel lanes.
- Uses precast barrier during the construction phase that could be placed in a permanent position after construction.

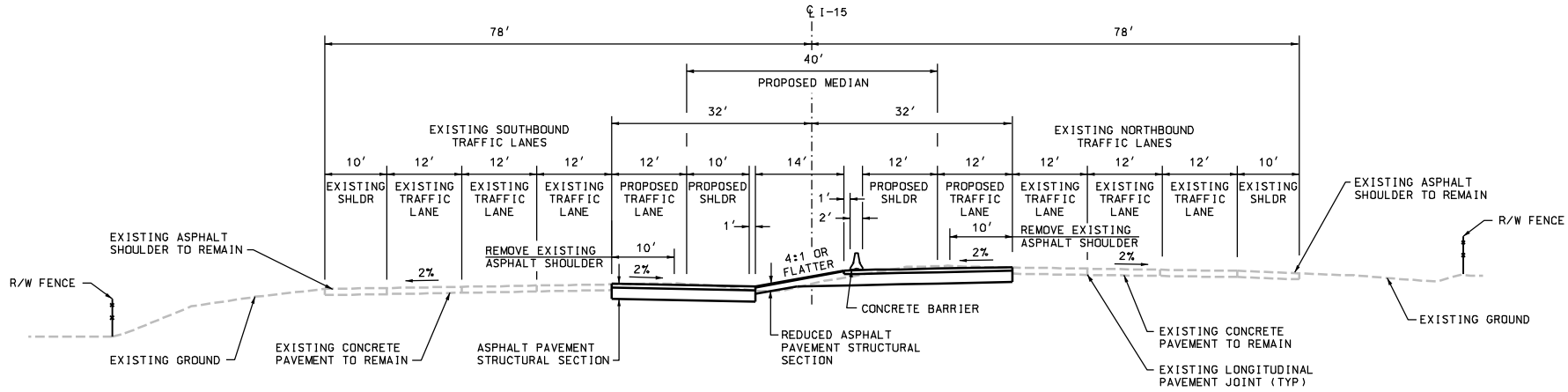
The disadvantages of the Eight/Ten Lanes (8 Lanes, Bangerter to Alpine; 10 Lanes, Bangerter to 10600 South) Alternative are:

- 5 southbound lanes (not including inside shoulder) from 12300 South Project to the lane drop at the Bangerter Highway Interchange and 4 southbound lanes from the Bangerter Highway Interchange to the horizontal curve north of 14600 South would be drained across the pavement to the west. (This condition could be eliminated if a 7' inside shoulder is used and the additional lanes are symmetric about the I-15 centerline.)
- Vertical clearance is reduced by 2" to 3" on the east side of the east 11400 South bridge structure. Currently, the minimum vertical clearance is 15'-9".

# EIGHT/TEN LANES
# (8 LANES, ALPINE TO BANGERTER; 10 LANES, BANGERTER TO 10600 SOUTH) ALTERNATIVE




ALPINE EXIT TO UTAH COUNTY LINE

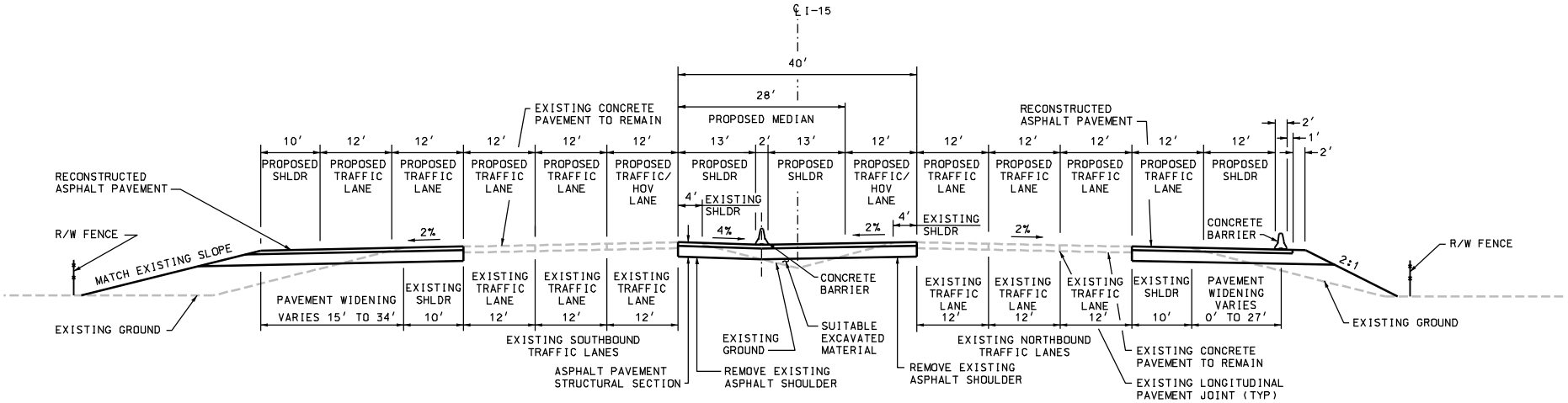



UTAH COUNTY LINE TO BANGERTER HIGHWAY

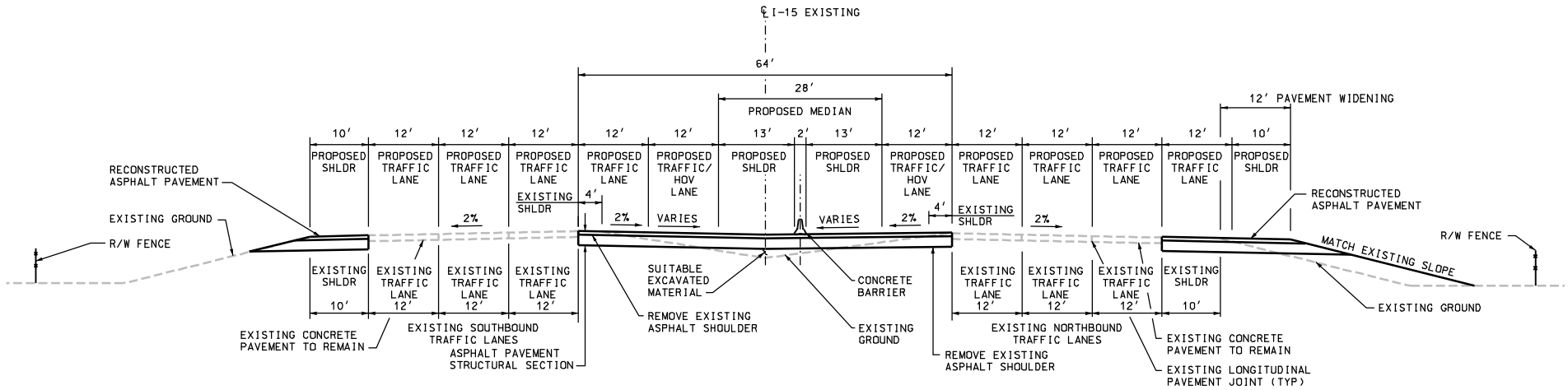


Figure B-8
Sheet 1 of 2

# EIGHT/TEN LANES
# (8 LANES, ALPINE TO BANGERTER; 10 LANES, BANGERTER TO 10600 SOUTH) ALTERNATIVE




BANGERTER HIGHWAY TO 12700 SOUTH (APPROXIMATE SOUTHERN EXTENT OF 12300 SOUTH PROJECT)




11900 SOUTH (APPROXIMATE NORTHERN EXTENT OF 12300 SOUTH PROJECT) TO 10600 SOUTH



Figure B-8
Sheet 2 of 2

# I-15
# Utah County Line to 10600 South
# Eight/Ten Lanes Alternative
# (8 Lanes, Bangerter Hwy to Alpine Interchange; 10 Lanes, Bangerter Hwy to 10600 South
# Utah County Portion (Alpine Exit to Utah County Line)

SUMMARY
ESTIMATE OF PROBABLE COST

| Item No. | Item Description | Quantity | Units | Unit Price | Total Cost |
|---|---|---|---|---|---|
| 1 | Roadway Excavation | 14,700 | CUYD | $4.71 | $69,237 |
| 2 | Crack and Seat with Pavement Overlay | 0 | CUYD | $11.18 | $0 |
| 3 | Roadway and Shoulder Pavement | 27,200 | SQYD | $27.06 | $735,914 |
| 4 | Reduced Pavement Section | 14,700 | SQYD | $8.56 | $125,841 |
| 5 | Concrete Pavement | 4,200 | SQYD | $40.72 | $171,024 |
| 6 | Constant Slope Concrete Barrier | 0 | FT | $45.72 | $0 |
| 7 | Stepped Pavement Type Concrete Barrier | 0 | FT | $94.98 | $0 |
| 8 | Concrete Barrier | 18,800 | FT | $24.85 | $467,180 |
| 9 | Concrete Barrier and Moment Slab | 0 | FT | $118.00 | $0 |
| 10 | Moveable Barrier | 0 | FT | $230.00 | $0 |
| 11 | Overhead Sign Structure Widening | 0 | EACH | $150,000.00 | $0 |
| 12 | Bridge Rehabilitation | 0 | EACH | varies | $0 |
| 13 | Bridge Widening | 0 | SQFT | $75.00 | $0 |
| 14 | Retaining Wall | 0 | SQFT | $30.00 | $0 |
| 15 | Noise Barrier | 1 | LS | $400,000.00 | $400,000 |
| 16 | Drainage (10% of Items 1 - 15) | 1 | LS | 10% | $196,920 |
| 17 | Temporary Erosion Control (10% of item 16) | 1 | LS | 10% | $19,692 |
| 18 | Pavement Marking (5% of Items 2-5) | 1 | LS | 5% | $51,639 |
| 19 | Maintenance of Traffic During Construction (10% of Items 1 - 15) | 1 | LS | 10% | $196,920 |
| 20 | Items Not Estimated (10% of Items 1 - 15) | 1 | LS | 10% | $196,920 |
| 21 | Mobilization (2% of Items 1-20) | 1 | LS | 2% | $52,626 |
| 22 | Design and Construction Engineering (15% of items 1-20) | 1 | LS | 15% | $394,693 |
| | | | | | |
| 23 | Inflation - 1 year at 3% (3% of items 1-22) | 1 | LS | 3% | $92,358 |
| | | | | | |
| 24 | Contingency (10% of Items 1-23) | 1 | LS | 10% | $317,096 |
| | | | | | |
| | *Total* | | | | $3,488,059 |
| | **Total (Use)** | | | | **$4,000,000** |

# I-15
# Utah County Line to 10600 South
# Eight/Ten Lanes Alternative
# (8 Lanes, Bangerter Hwy to Alpine Interchange; 10 Lanes, Bangerter Hwy to 10600 South)
# Salt Lake County Portion (Utah County Line to 10600 South)

SUMMARY
ESTIMATE OF PROBABLE COST

| Item No. | Item Description | Quantity | Units | Unit Price | Total Cost |
|---|---|---|---|---|---|
| 1 | Roadway Excavation | 144,600 | CUYD | $4.71 | $681,066 |
| 2 | Crack and Seat with Pavement Overlay | 28,400 | SQYD | $11.18 | $317,388 |
| 3 | Roadway and Shoulder Pavement | 292,200 | SQYD | $27.06 | $7,905,668 |
| 4 | Reduced Pavement Section | 24,500 | SQYD | $8.56 | $209,735 |
| 5 | Concrete Pavement | 15,800 | SQYD | $52.59 | $830,883 |
| 6 | Constant Slope Concrete Barrier | 2,500 | FT | $45.72 | $114,300 |
| 7 | Stepped Pavement Type Concrete Barrier | 800 | FT | $94.98 | $75,980 |
| 8 | Concrete Barrier* | 76,300 | FT | $24.85 | $1,896,055 |
| 9 | Concrete Barrier and Moment Slab | 4,500 | FT | $118.00 | $531,000 |
| 10 | Moveable Barrier | 0 | FT | $230.00 | $0 |
| 11 | Overhead Sign Structure Widening | 1 | EACH | $150,000.00 | $150,000 |
| 12 | Bridge Rehabilitation** | 2 | EACH | varies** | $668,643 |
| 13 | Bridge Widening | 16,700 | SQFT | varies*** | $1,390,000 |
| 14 | Retaining Wall | 41,600 | SQFT | $30.00 | $1,248,000 |
| 15 | Noise Barrier | 1 | LS | $1,400,000.00 | $1,400,000 |
| 16 | Drainage (10% of Items 1 - 15) | 1 | LS | 10% | $1,741,872 |
| 17 | Temporary Erosion Control (10% of item 16) | 1 | LS | 10% | $174,187 |
| 18 | Pavement Marking (5% of Items 2-5) | 1 | LS | 5% | $463,184 |
| 19 | Maintenance of Traffic During Construction (10% of Items 1 - 15) | 1 | LS | 10% | $1,741,872 |
| 20 | Items Not Estimated (10% of Items 1 - 15) | 1 | LS | 10% | $1,741,872 |
| 21 | Mobilization (2% of Items 1-20) | 1 | LS | 2% | $465,634 |
| 22 | Design and Construction Engineering (15% of items 1-20) | 1 | LS | 15% | $3,492,256 |
| | | | | | |
| 23 | Inflation - 1 year at 3% (3% of items 1-22) | 1 | LS | 3% | $817,188 |
| | | | | | |
| 24 | Contingency (10% of Items 1-23) | 1 | LS | 10% | $2,805,678 |
| | | | | | |
| | *Total* | | | | $30,862,461 |
| | **Total (Use)** | | | | **$31,000,000** |

* Assuming that 1 mile (5,280') of UDOT furnished concrete barrier is available

** 14600 Structure (F-207): $394,526
** 11400 Structure (F-56): $274,117

*** $75/sqft used for 14600 South and 11400 South Structures; $200/sqft for 10000 South Structure

**Eight/Ten Lanes with Climbing Lanes Alternative**

Similar to the Eight/Ten Lanes (8 Lanes, Bangerter to Alpine; 10 Lanes, Bangerter to 10600 South) Alternative with the addition of a southbound climbing lane from the southbound Bangerter Highway Interchange on-ramp to the Utah County line and a northbound climbing lane from the Alpine Interchange to the downgrade over the Point of the Mountain. Typical sections and cost estimates for the Eight/Ten Lanes with Climbing Lanes Alternative are provided at the end of this section.

The features of this alternative are:

- From Bangerter Highway Interchange to 12300 South Project, requires pavement widening beyond the existing outside shoulders and short retaining walls to accommodate the third and fourth new lanes along with a new auxiliary lane. (Most of the widening in this area is done to the west).
- From 12300 South project to 10600 South, requires pavement widening beyond the existing outside shoulders and short retaining walls to accommodate the fourth new lane and a new auxiliary lane south of 10600 South Interchange.
- Additional bridge widening required at 11400 and 14600 South.
- Stays within existing right of way.
- Requires reconstruction of most outside shoulders to accommodate traffic control during construction.
- From the Utah County Line to the Bangerter Interchange, requires pavement widening to the west.
- Requires reconfiguration of 14600 South Interchange southbound gore areas and reconstruction of portions of southbound ramps.
- Requires approximately 800’ of retaining wall or stepped pavement type barrier at the horizontal curve north of 14600 South.
- Modifications required to Bangerter Highway Interchange:
  - Requires vertical realignment of the southbound exit ramp because the cross slope breakover criteria along the edges of the gore cannot be met.
  - Requires reconstruction of a portion of the southbound entrance ramp because the pavement widening on I-15 forces the ramp further to the west.
- Modifications required to 10600 South Interchange:
  - Requires reconstruction of a portion of the northbound entrance ramp because the pavement widening on I-15 forces the ramp further to the east.
  - Requires reconstruction of a portion of the southbound entrance ramp because the pavement widening on I-15 forces the ramp further to the west.
  - Requires a new southbound auxiliary lane north of 10600 South.
  - Requires a new northbound auxiliary lane north of 10600 South.

- Requires retaining walls to protect the Jordan and Salt Lake City Canal box culvert openings.
- Uses precast barrier to allow flexibility for lane configurations.

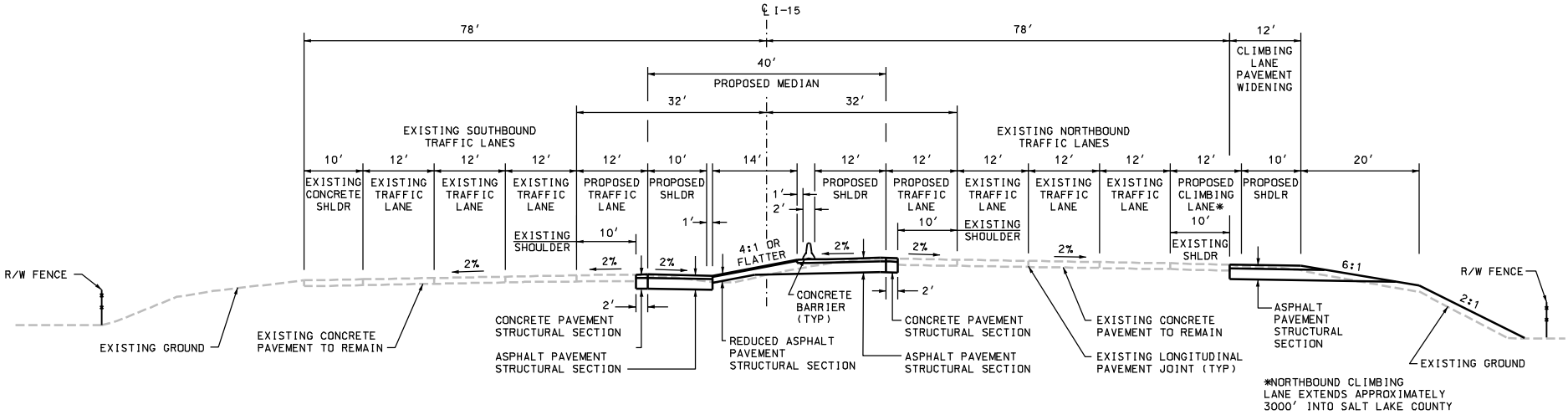
The advantages of the Eight/Ten Lanes with Climbing Lanes Alternative are:

- Similar to the Eight/Ten Lanes (8 Lanes, Bangerter to Alpine; 10 Lanes, Bangerter to 10600 South) Alternative with the addition of better LOS over the Point of the Mountain.
- Provides full capacity of I-15 from 10600 South to Bangerter Highway, a major route to provide access to the southwest portion of Salt Lake County.
- Provides a continuation of the reconstructed I-15 10-lane typical section north of the 10600 South Interchange to the Bangerter Highway.
- Provides a longer design life.
- Allows extension of HOV lanes.
- Fully utilizes the 10-lane section (4,600' long) to be constructed by 12300 South Project.
- Uses depressed medians to collect median pavement drainage, which reduces water running across adjacent travel lanes.
- Uses precast barrier during the construction phase that could be placed in a permanent position after construction.

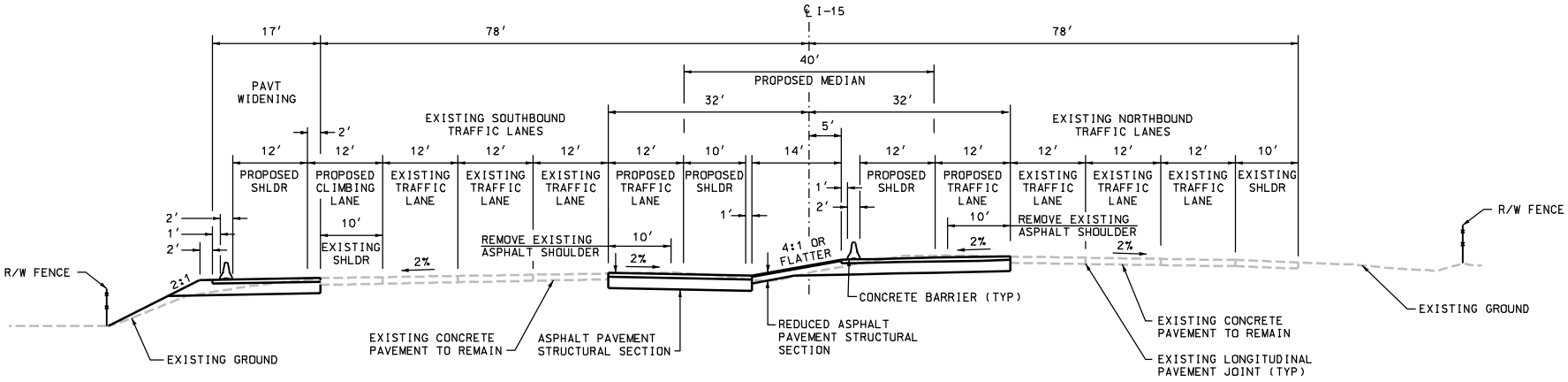
The disadvantages of the Eight/Ten Lanes with Climbing Lanes Alternative are:

- Similar to the Eight/Ten Lanes (8 Lanes, Bangerter to Alpine; 10 Lanes, Bangerter to 10600 South) Alternative disadvantages.
- 5 southbound lanes (not including inside shoulder) from 12300 South Project to the lane drop at the Bangerter Highway Interchange and 4 southbound lanes from the Bangerter Highway Interchange to the horizontal curve north of 14600 South would be drained across the pavement to the west. (This condition could be eliminated if a 7' inside shoulder is used and the additional lanes are symmetric about the I-15 centerline.)
- Vertical clearance is reduced by 2" to 3" on the east side of the east 11400 South bridge structure. Currently, the minimum vertical clearance is 15'-9".
- Additional Right-of-way could be required.

# EIGHT/TEN LANES WITH CLIMBING LANES ALTERNATIVE




## ALPINE EXIT TO UTAH COUNTY LINE

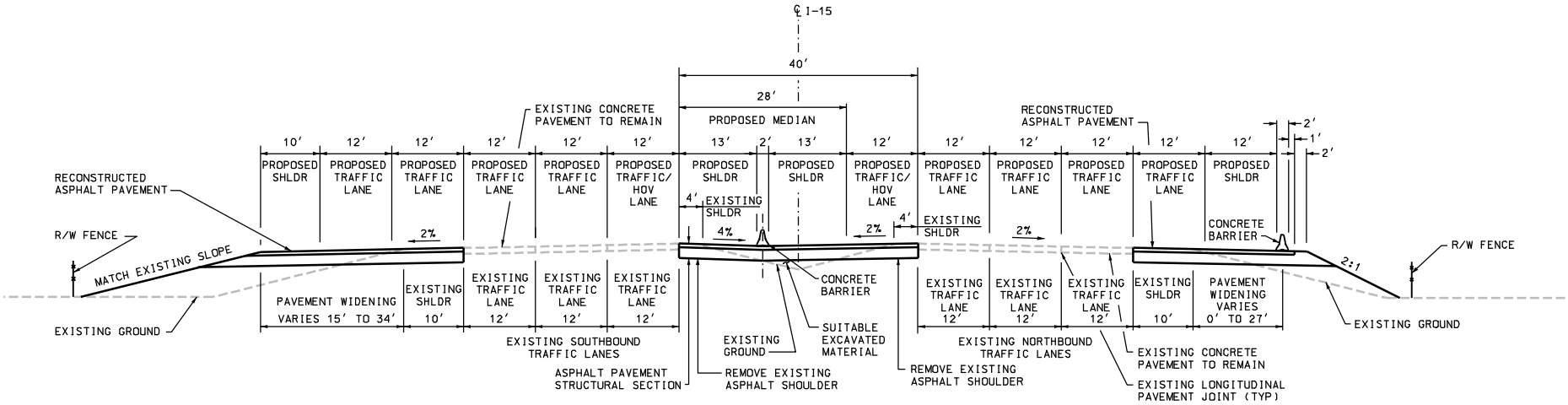



## UTAH COUNTY LINE TO 14600 SOUTH

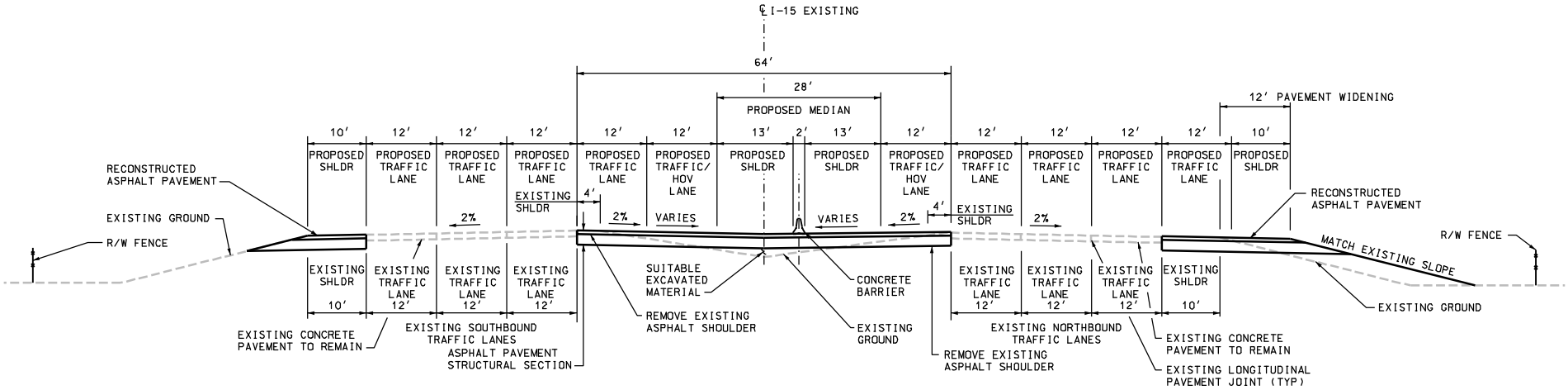


Figure B-9
Sheet 1 of 2

# EIGHT/TEN LANES WITH CLIMBING LANES ALTERNATIVE




BANGERTER HIGHWAY TO 12700 SOUTH (APPROXIMATE SOUTHERN EXTENT OF 12300 SOUTH PROJECT)




11900 SOUTH (APPROXIMATE NORTHERN EXTENT OF 12300 SOUTH PROJECT) TO 10600 SOUTH



Figure B-9
Sheet 2 of 2

# I-15
# Utah County Line to 10600 South
# Eight/Ten Lanes with Climbing Lanes Alternative
# Utah County Portion (Alpine Exit to Utah County Line)

SUMMARY
ESTIMATE OF PROBABLE COST

| Item No. | Item Description | Quantity | Units | Unit Price | Total Cost |
|---|---|---|---|---|---|
| 1 | Roadway Excavation | 19,400 | CUYD | $4.71 | $91,374 |
| 2 | Borrow | 23,400 | CUYD | $6.74 | $157,716 |
| 3 | Roadway and Shoulder Pavement | 39,400 | SQYD | $27.06 | $1,065,994 |
| 4 | Reduced Pavement Section | 14,700 | SQYD | $8.56 | $125,841 |
| 5 | Concrete Pavement | 4,200 | SQYD | $40.72 | $171,024 |
| 6 | Constant Slope Concrete Barrier | 0 | FT | $45.72 | $0 |
| 7 | Stepped Pavement Type Concrete Barrier | 0 | FT | $94.98 | $0 |
| 8 | Concrete Barrier | 18,800 | FT | $24.85 | $467,180 |
| 9 | Concrete Barrier and Moment Slab | 0 | FT | $118.00 | $0 |
| 10 | Moveable Barrier | 0 | FT | $230.00 | $0 |
| 11 | Overhead Sign Structure Widening | 0 | EACH | $150,000.00 | $0 |
| 12 | Bridge Rehabilitation | 0 | EACH | varies | $0 |
| 13 | Bridge Widening | 0 | SQFT | $75.00 | $0 |
| 14 | Retaining Wall | 0 | SQFT | $30.00 | $0 |
| 15 | Noise Barrier | 1 | LS | $400,000.00 | $400,000 |
| 16 | Drainage (10% of Items 1 - 15) | 1 | LS | 10% | $247,913 |
| 17 | Temporary Erosion Control (10% of item 16) | 1 | LS | 10% | $24,791 |
| 18 | Pavement Marking (5% of Items 3-5) | 1 | LS | 5% | $68,143 |
| 19 | Maintenance of Traffic During Construction (10% of Items 1 - 15) | 1 | LS | 10% | $247,913 |
| 20 | Items Not Estimated (10% of Items 1 - 15) | 1 | LS | 10% | $247,913 |
| 21 | Mobilization (2% of Items 1-20) | 1 | LS | 2% | $66,316 |
| 22 | Design and Construction Engineering (15% of items 1-20) | 1 | LS | 15% | $497,370 |
| | | | | | |
| 23 | Inflation - 1 year at 3% (3% of items 1-22) | 1 | LS | 3% | $116,385 |
| | | | | | |
| 24 | Contingency (10% of Items 1-23) | 1 | LS | 10% | $399,587 |
| | | | | | |
| | *Total* | | | | $4,395,459 |
| | **Total (Use)** | | | | **$5,000,000** |

# I-15
# Utah County Line to 10600 South
# Eight/Ten Lanes with Climbing Lanes Alternative
# Salt Lake County Portion (Utah County Line to 10600 South)

SUMMARY
ESTIMATE OF PROBABLE COST

| Item No. | Item Description | Quantity | Units | Unit Price | Total Cost |
|---|---|---|---|---|---|
| 1 | Roadway Excavation | 160,200 | CUYD | $4.71 | $754,542 |
| 2 | Crack and Seat with Pavement Overlay | 28,400 | CUYD | $11.18 | $317,388 |
| 3 | Roadway and Shoulder Pavement | 349,000 | SQYD | $27.06 | $9,442,431 |
| 4 | Reduced Pavement Section | 24,500 | SQYD | $8.56 | $209,735 |
| 5 | Concrete Pavement | 15,800 | SQYD | $52.59 | $830,883 |
| 6 | Constant Slope Concrete Barrier | 2,500 | FT | $45.72 | $114,300 |
| 7 | Stepped Pavement Type Concrete Barrier | 800 | FT | $94.98 | $75,980 |
| 8 | Concrete Barrier* | 76,300 | FT | $24.85 | $1,896,055 |
| 9 | Concrete Barrier and Moment Slab | 4,700 | FT | $118.00 | $554,600 |
| 10 | Moveable Barrier | 0 | FT | $230.00 | $0 |
| 11 | Overhead Sign Structure Widening | 1 | EACH | $150,000.00 | $150,000 |
| 12 | Bridge Rehabilitation** | 2 | EACH | varies** | $668,643 |
| 13 | Bridge Widening | 19,250 | SQFT | varies*** | $1,581,250 |
| 14 | Retaining Wall | 76,100 | SQFT | $30.00 | $2,283,000 |
| 15 | Noise Barrier | 1 | LS | $1,400,000.00 | $1,400,000 |
| 16 | Drainage (10% of Items 1 - 15) | 1 | LS | 10% | $2,027,881 |
| 17 | Temporary Erosion Control (10% of item 16) | 1 | LS | 10% | $202,788 |
| 18 | Pavement Marking (5% of Items 2-5) | 1 | LS | 5% | $540,022 |
| 19 | Maintenance of Traffic During Construction (10% of Items 1 - 15) | 1 | LS | 10% | $2,027,881 |
| 20 | Items Not Estimated (10% of Items 1 - 15) | 1 | LS | 10% | $2,027,881 |
| 21 | Mobilization (2% of Items 1-20) | 1 | LS | 2% | $542,105 |
| 22 | Design and Construction Engineering (15% of items 1-20) | 1 | LS | 15% | $4,065,789 |
| | | | | | |
| 23 | Inflation - 1 year at 3% (3% of items 1-22) | 1 | LS | 3% | $951,395 |
| | | | | | |
| 24 | Contingency (10% of Items 1-23) | 1 | LS | 10% | $3,266,455 |
| | | | | | |
| | *Total* | | | | $35,931,002 |
| | **Total (Use)** | | | | **$36,000,000** |

* Assuming that 1 mile (5,280') of UDOT furnished concrete barrier is available

** 14600 Structure (F-207): $394,526
** 11400 Structure (F-56): $274,117

*** $75/sqft used for 14600 South and 11400 South Structures; $200/sqft for 10000 South Structure

**Eight/Ten Lanes with Enhanced Bangerter Highway Interchange Alternative**

Similar to the 8-10 Lane Alternative with additional auxiliary lanes at the Bangerter Highway Interchange. Typical sections and cost estimates for the Eight/Ten Lanes with Enhanced Bangerter Highway Interchange Alternative are provided at the end of this section.

The features of the Eight/Ten Lanes with Enhanced Bangerter Highway Interchange Alternative are:

- Provides 10-lane section (5 lanes northbound and 5 lanes southbound) from Bangerter Highway to 10600 South Interchange.
- From Bangerter Highway Interchange to 12300 South Project, requires pavement widening beyond the existing outside shoulders and short retaining walls to accommodate the third and fourth new lanes along with the new auxiliary lane. (Most of the widening in this area is done to the west).
- From 12300 South project to 10600 South, requires pavement widening beyond the existing outside shoulders and short retaining walls to accommodate the fourth new lane and a new auxiliary lane south of 10600 South Interchange.
- Additional bridge widening required at 11400 South.
- Requires reconstruction of most outside shoulders to accommodate traffic control during construction.
- Requires approximately 800' of retaining wall or stepped pavement type barrier at the horizontal curve north of 14600 South.
- Requires more modifications to the Bangerter Highway Interchange in comparison to the 8-10 lane alternative.
- Modifications required to 10600 South Interchange:
  - Requires reconstruction of a portion of the northbound entrance ramp because the pavement widening on I-15 forces the ramp further to the east.
  - Requires reconstruction of a portion of the southbound entrance ramp because the pavement widening on I-15 forces the ramp further to the west.
  - Requires a new southbound auxiliary lane north of 10600 South.
  - Requires a new northbound auxiliary lane north of 10600 South.
- Requires retaining walls to protect the Jordan and Salt Lake City Canal box culvert openings.
- Uses precast barrier to allow flexibility for lane configurations.

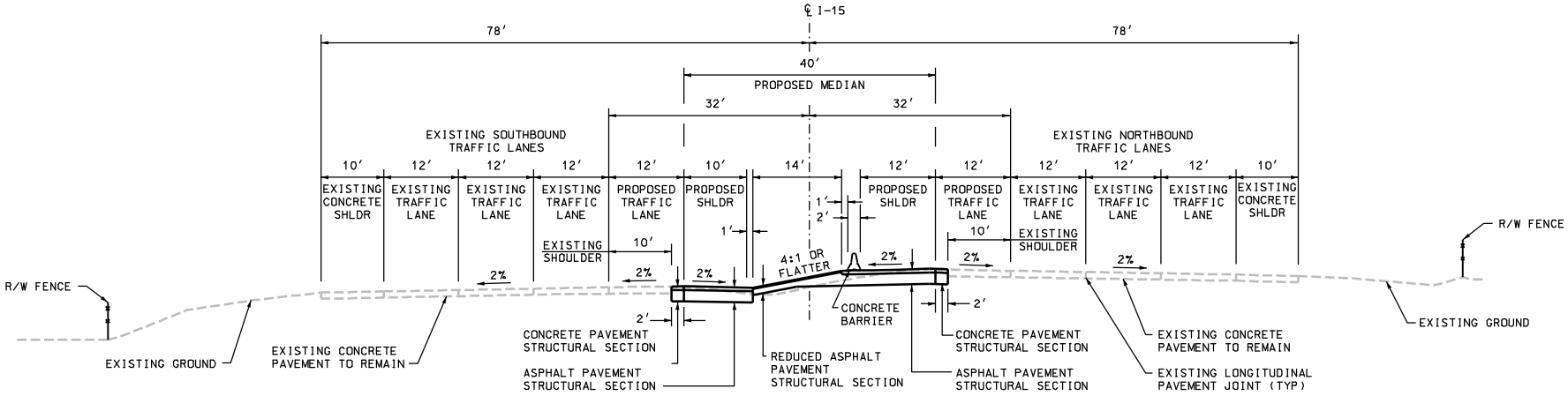
The advantages of the Eight/Ten Lanes with Enhanced Bangerter Highway Interchange Alternative are:

- Provides full capacity of I-15 from 10600 South to Bangerter Highway, a major route to provide access to the southwest portion of Salt Lake County.
- Provides a continuation of the reconstructed I-15 10 lane typical section north of the 10600 South Interchange to the Bangerter Highway.
- Uses additional 2 lanes as HOV lanes.
- Fully utilizes the 10-lane section (4,600' long) to be constructed by 12300 South Project.
- Uses depressed medians to collect median pavement drainage, which reduces water running across adjacent travel lanes.
- Uses precast barrier during the construction phase that could be moved into a permanent position after construction.

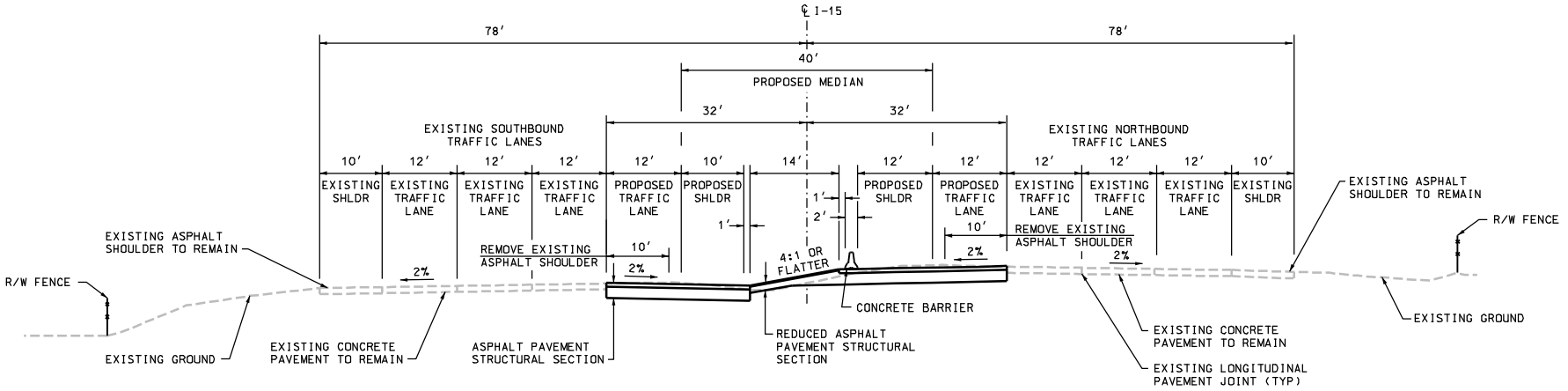
The disadvantages of the Eight/Ten Lanes with Enhanced Bangerter Highway Interchange Alternative are:

- 5 southbound lanes (not including inside shoulder) from 12300 South Project to Bangerter Highway Interchange and 4 southbound lanes from the Bangerter Highway Interchange to the horizontal curve north of 14600 South would be drained across the pavement to the west. (This condition could be eliminated if a 7' inside shoulder is used and the additional lanes are symmetric about the I-15 centerline.)
- Vertical clearance is reduced by 2" to 3" on the east side of the east 11400 South bridge structure. Currently, the minimum vertical clearance is 15'-9".
- Additional Right-of-way could be required.

# EIGHT/TEN LANES WITH ENHANCED BANGERTER HIGHWAY INTERCHANGE ALTERNATIVE




ALPINE EXIT TO UTAH COUNTY LINE

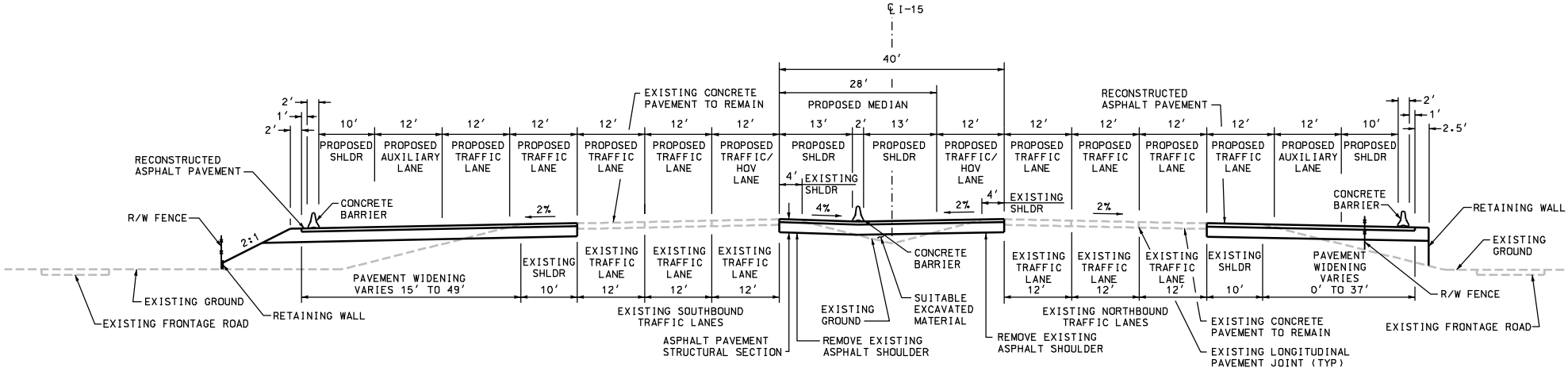



UTAH COUNTY LINE TO APPROXIMATELY 3000′ SOUTH OF BANGERTER HIGHWAY

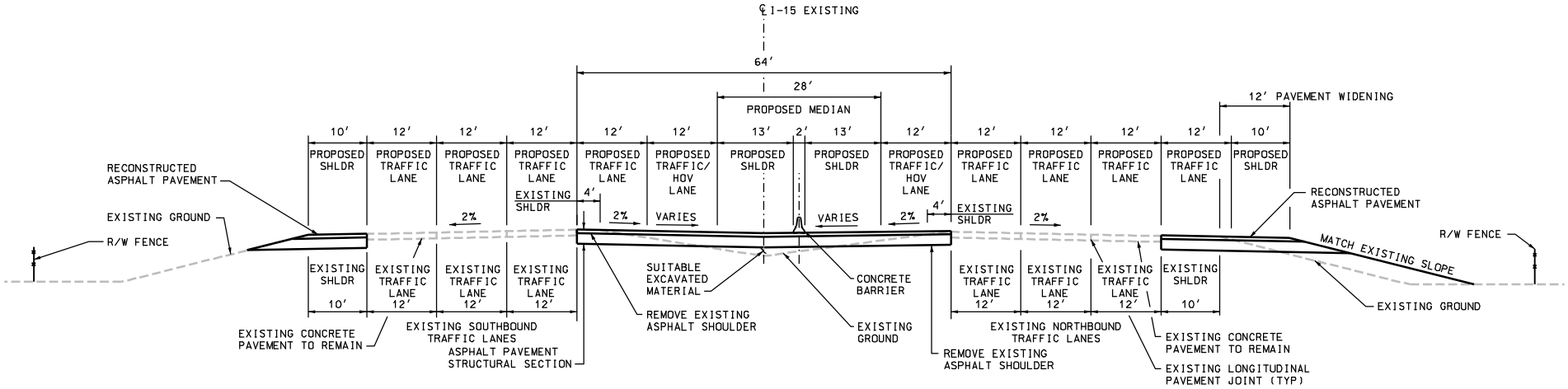


Figure B-10
Sheet 1 of 2

# EIGHT/TEN LANES WITH ENHANCED BANGERTER HIGHWAY INTERCHANGE ALTERNATIVE




APPROXIMATELY 3000' SOUTH OF BANGERTER HIGHWAY TO 12700 SOUTH (APPROXIMATE SOUTHERN EXTENT OF 12300 SOUTH PROJECT)




11900 SOUTH (APPROXIMATE NORTHERN EXTENT OF 12300 SOUTH PROJECT) TO 10600 SOUTH



Figure B-10
Sheet 2 of 2

# I-15
# Utah County Line to 10600 South
# Eight/Ten Lanes with Enhanced Bangerter Highway Interchange Alternative
# Utah County Portion (Alpine Exit to Utah County Line)

SUMMARY
ESTIMATE OF PROBABLE COST

| Item No. | Item Description | Quantity | Units | Unit Price | Total Cost |
|---|---|---|---|---|---|
| 1 | Roadway Excavation | 14,700 | CUYD | $4.71 | $69,237 |
| 2 | Crack and Seat with Pavement Overlay | 0 | CUYD | $11.18 | $0 |
| 3 | Roadway and Shoulder Pavement | 27,200 | SQYD | $27.06 | $735,914 |
| 4 | Reduced Pavement Section | 14,700 | SQYD | $8.56 | $125,841 |
| 5 | Concrete Pavement | 4,200 | SQYD | $40.72 | $171,024 |
| 6 | Constant Slope Concrete Barrier | 0 | FT | $45.72 | $0 |
| 7 | Stepped Pavement Type Concrete Barrier | 0 | FT | $94.98 | $0 |
| 8 | Concrete Barrier | 18,800 | FT | $24.85 | $467,180 |
| 9 | Concrete Barrier and Moment Slab | 0 | FT | $118.00 | $0 |
| 10 | Moveable Barrier | 0 | FT | $230.00 | $0 |
| 11 | Overhead Sign Structure Widening | 0 | EACH | $150,000.00 | $0 |
| 12 | Bridge Rehabilitation | 0 | EACH | varies | $0 |
| 13 | Bridge Widening | 0 | SQFT | $75.00 | $0 |
| 14 | Retaining Wall | 0 | SQFT | $30.00 | $0 |
| 15 | Noise Barrier | 1 | LS | $400,000.00 | $400,000 |
| 16 | Drainage (10% of Items 1 - 15) | 1 | LS | 10% | $196,920 |
| 17 | Temporary Erosion Control (10% of item 16) | 1 | LS | 10% | $19,692 |
| 18 | Pavement Marking (5% of Items 2-5) | 1 | LS | 5% | $51,639 |
| 19 | Maintenance of Traffic During Construction (10% of Items 1 - 15) | 1 | LS | 10% | $196,920 |
| 20 | Items Not Estimated (10% of Items 1 - 15) | 1 | LS | 10% | $196,920 |
| 21 | Mobilization (2% of Items 1-20) | 1 | LS | 2% | $52,626 |
| 22 | Design and Construction Engineering (15% of items 1-20) | 1 | LS | 15% | $394,693 |
| | | | | | |
| 23 | Inflation - 1 year at 3% (3% of items 1-22) | 1 | LS | 3% | $92,358 |
| | | | | | |
| 24 | Contingency (10% of Items 1-23) | 1 | LS | 10% | $317,096 |
| | | | | | |
| | *Total* | | | | $3,488,059 |
| | **Total (Use)** | | | | **$4,000,000** |

# I-15
# Utah County Line to 10600 South
# Eight/Ten Lanes with Enhanced Bangerter Highway Interchange Alternative
# Salt Lake County Portion (Utah County Line to 10600 South)

SUMMARY
ESTIMATE OF PROBABLE COST

| Item No. | Item Description | Quantity | Units | Unit Price | Total Cost |
|---|---|---|---|---|---|
| 1 | Roadway Excavation | 161,821 | CUYD | $4.71 | $762,179 |
| 2 | Crack and Seat with Pavement Overlay | 28,400 | CUYD | $11.18 | $317,388 |
| 3 | Roadway and Shoulder Pavement | 328,200 | SQYD | $27.06 | $8,879,673 |
| 4 | Reduced Pavement Section | 24,500 | SQYD | $8.56 | $209,735 |
| 5 | Concrete Pavement | 15,800 | SQYD | $52.59 | $830,883 |
| 6 | Constant Slope Concrete Barrier | 2,500 | FT | $45.72 | $114,300 |
| 7 | Stepped Pavement Type Concrete Barrier | 800 | FT | $94.98 | $75,980 |
| 8 | Concrete Barrier | 76,300 | FT | $24.85 | $1,896,055 |
| 9 | Concrete Barrier and Moment Slab | 9,600 | FT | $118.00 | $1,132,800 |
| 10 | Moveable Barrier | 0 | FT | $230.00 | $0 |
| 11 | Overhead Sign Structure Widening | 1 | EACH | $150,000.00 | $150,000 |
| 12 | Bridge Rehabilitation | 2 | EACH | varies** | $668,643 |
| 13 | Bridge Widening | 16,700 | SQFT | varies*** | $1,390,000 |
| 14 | Retaining Wall | 70,900 | SQFT | $30.00 | $2,127,000 |
| 15 | Noise Barrier | 1 | LS | $1,400,000.00 | $1,400,000 |
| 16 | Drainage (10% of Items 1 - 15) | 1 | LS | 10% | $1,995,464 |
| 17 | Temporary Erosion Control (10% of item 16) | 1 | LS | 10% | $199,546 |
| 18 | Pavement Marking (5% of Items 2-5) | 1 | LS | 5% | $511,884 |
| 19 | Maintenance of Traffic During Construction (10% of Items 1 - 15) | 1 | LS | 10% | $1,995,464 |
| 20 | Items Not Estimated (10% of Items 1 - 15) | 1 | LS | 10% | $1,995,464 |
| 21 | Mobilization (2% of Items 1-20) | 1 | LS | 2% | $533,049 |
| 22 | Design and Construction Engineering (15% of items 1-20) | 1 | LS | 15% | $3,997,868 |
| | | | | | |
| 23 | Inflation - 1 year at 3% (3% of items 1-22) | 1 | LS | 3% | $935,501 |
| | | | | | |
| 24 | Contingency (10% of Items 1-23) | 1 | LS | 10% | $3,211,887 |
| | | | | | |
| | *Total* | | | | $35,330,762 |
| | **Total (Use)** | | | | **$36,000,000** |

* Assuming that 1 mile (5,280') of UDOT furnished concrete barrier is available

** 14600 Structure (F-207): $394,526
** 11400 Structure (F-56): $274,117

*** $75/sqft used for 14600 South and 11400 South Structures; $200/sqft for 10000 South Structure

**Nine/Ten Lanes with Enhanced Bangerter Highway Interchange Alternative**

Similar to the 8-10 Lane Alternative with a southbound climbing lane and additional auxiliary lanes at the Bangerter Highway Interchange. Typical sections and cost estimates for the Nine/Ten Lanes with Enhanced Bangerter Highway Interchange Alternative are provided at the end of this section.

The features of the Nine/Ten Lanes with Enhanced Bangerter Highway Interchange Alternative are:

- Provides 10-lane section (5 lanes northbound and 5 lanes southbound) from Bangerter Highway to 10600 South Interchange.
- Requires reconfiguration of 14600 South Interchange southbound gore areas and reconstruction of portions of southbound ramps.
- From Bangerter Highway Interchange to 12300 South Project, requires pavement widening beyond the existing outside shoulders and short retaining walls to accommodate the third and fourth new lanes along with the new auxiliary lane. (Most of the widening in this area is done to the west).
- From 12300 South project to 10600 South, requires pavement widening beyond the existing outside shoulders and short retaining walls to accommodate the fourth new lane and a new auxiliary lane south of 10600 South Interchange.
- Additional bridge widening required at 11400 and 14600 South.
- Requires reconstruction of most outside shoulders to accommodate traffic control during construction.
- Requires approximately 800’ of retaining wall or stepped pavement type barrier at the horizontal curve north of 14600 South.
- Requires more modifications to the Bangerter Highway Interchange in comparison to the 8-10 lane alternative.
- Modifications required to 10600 South Interchange:
  - Requires reconstruction of a portion of the northbound entrance ramp because the pavement widening on I-15 forces the ramp further to the east.
  - Requires reconstruction of a portion of the southbound entrance ramp because the pavement widening on I-15 forces the ramp further to the west.
  - Requires a new southbound auxiliary lane north of 10600 South.
  - Requires a new northbound auxiliary lane north of 10600 South.
- Requires retaining walls to protect the Jordan and Salt Lake City Canal box culvert openings.
- Uses precast barrier to allow flexibility for lane configurations.

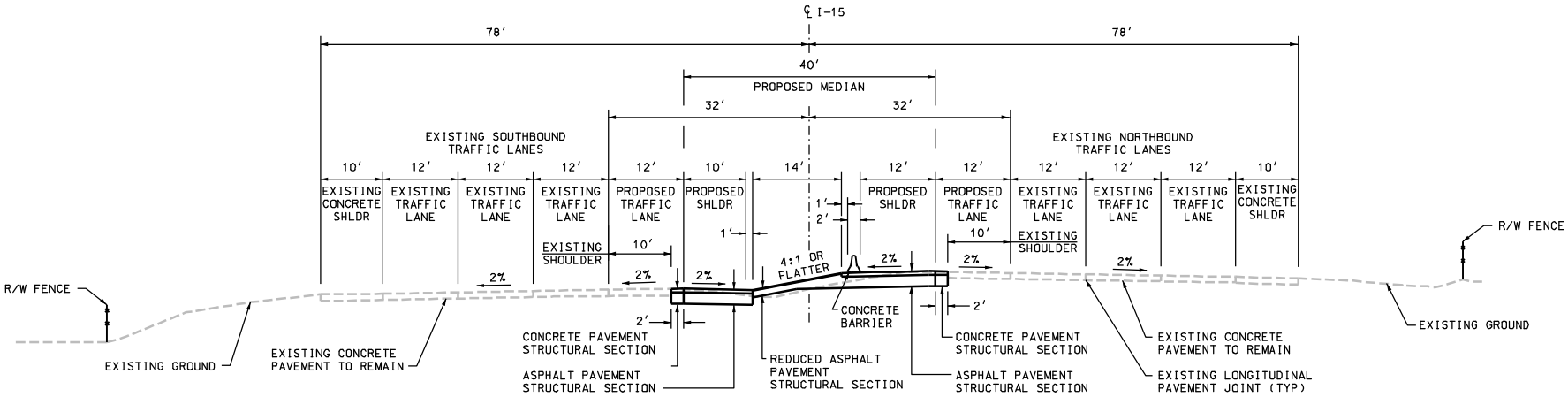
The advantages of the Nine/Ten Lanes with Enhanced Bangerter Highway Interchange Alternative are:

- Provides full capacity of I-15 from 10600 South to Bangerter Highway, a major route to provide access to the southwest portion of Salt Lake County.
- Provides a continuation of the reconstructed I-15 10-lane typical section north of the 10600 South Interchange to the Bangerter Highway.
- Provides future flexibility to improve capacity in the nine-lane area by introducing a contraflow lane.
- Provides a climbing lane in the southbound direction.
- Uses additional 2 lanes as HOV lanes.
- Provides a longer design life.
- Fully utilizes the 10-lane section (4,600' long) to be constructed by 12300 South Project.
- Uses depressed medians to collect median pavement drainage, which reduces water running across adjacent travel lanes.
- Uses precast barrier during the construction phase that could be moved into a permanent position after construction.

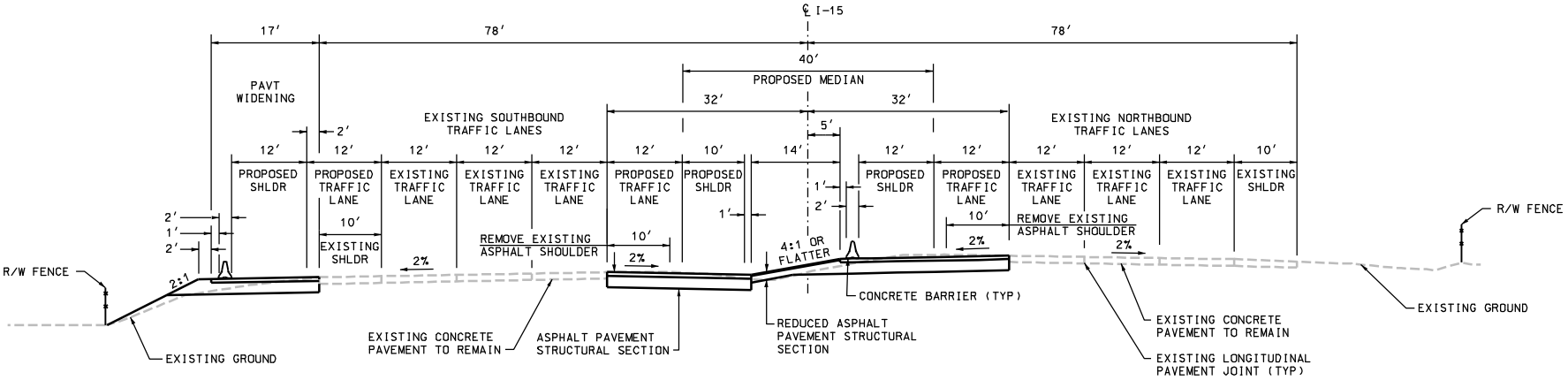
The disadvantages of the Nine/Ten Lanes with Enhanced Bangerter Highway Interchange Alternative are:

- 5 southbound lanes (not including inside shoulder) from 12300 South Project to Bangerter Highway Interchange and 4 southbound lanes from the Bangerter Highway Interchange to the horizontal curve north of 14600 South would be drained across the pavement to the west. (This condition could be eliminated if a 7' inside shoulder is used and the additional lanes are symmetric about the I-15 centerline.)
- Vertical clearance is reduced by 2" to 3" on the east side of the east 11400 South bridge structure. Currently, the minimum vertical clearance is 15'-9".
- Additional Right-of-way could be required.

# NINE/TEN LANES WITH ENHANCED BANGERTER HIGHWAY INTERCHANGE ALTERNATIVE




## ALPINE EXIT TO UTAH COUNTY LINE

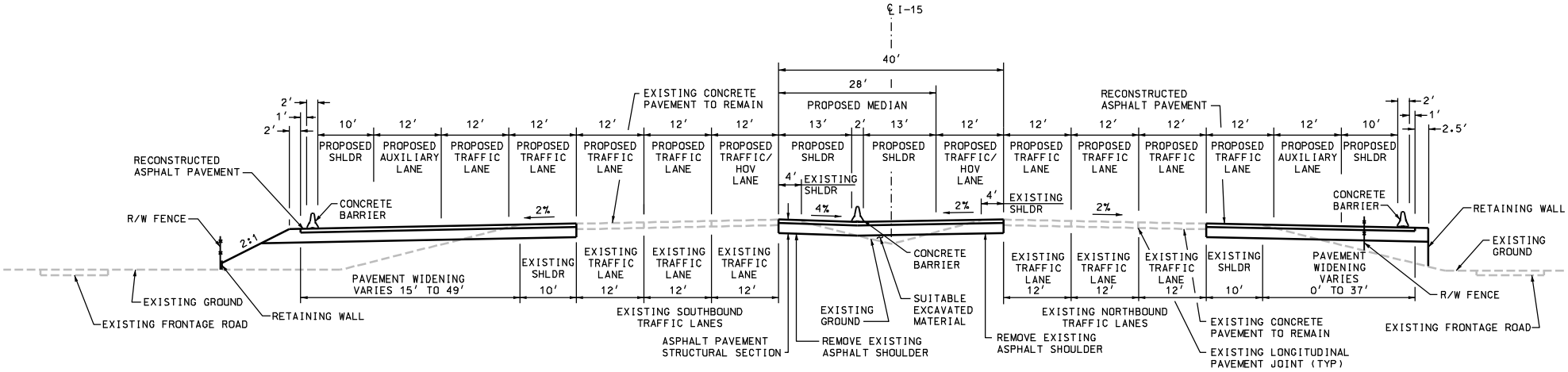



## UTAH COUNTY LINE TO APPROXIMATELY 3000′ SOUTH OF BANGERTER HIGHWAY

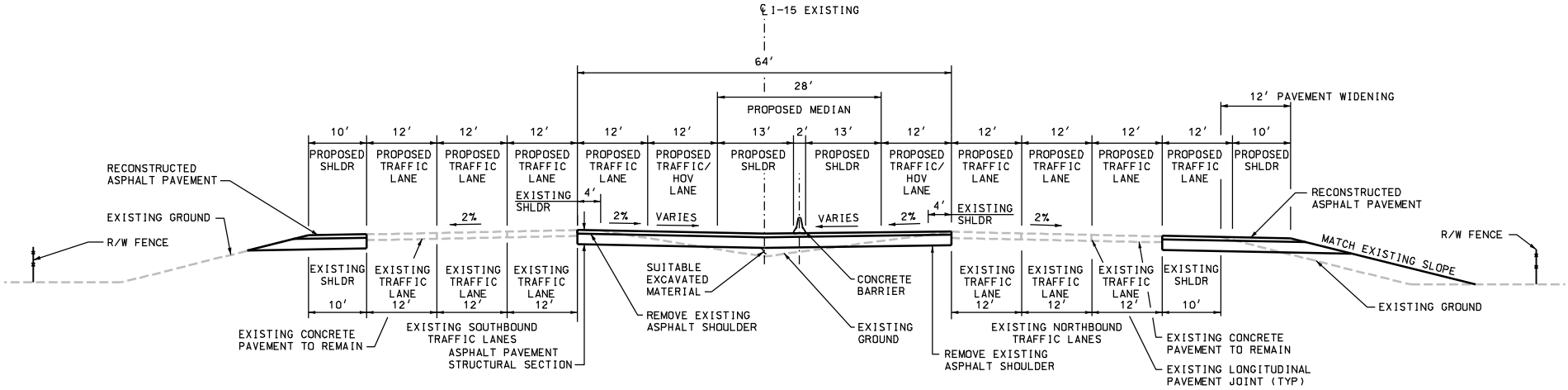


Figure B-11
Sheet 1 of 2

# NINE/TEN LANES WITH ENHANCED BANGERTER HIGHWAY INTERCHANGE ALTERNATIVE




APPROXIMATELY 3000′ SOUTH OF BANGERTER HIGHWAY TO 12700 SOUTH (APPROXIMATE SOUTHERN EXTENT OF 12300 SOUTH PROJECT)




11900 SOUTH (APPROXIMATE NORTHERN EXTENT OF 12300 SOUTH PROJECT) TO 10600 SOUTH



Figure B-11
Sheet 2 of 2

# I-15
# Utah County Line to 10600 South
# Nine/Ten Lanes with Enhanced Bangerter Highway Interchange Alternative
# Utah County Portion (Alpine Exit to Utah County Line)

SUMMARY
ESTIMATE OF PROBABLE COST

| Item No. | Item Description | Quantity | Units | Unit Price | Total Cost |
|---|---|---|---|---|---|
| 1 | Roadway Excavation | 14,700 | CUYD | $4.71 | $69,237 |
| 2 | Borrow | 0 | CUYD | $6.74 | $0 |
| 3 | Roadway and Shoulder Pavement | 27,200 | SQYD | $27.06 | $735,914 |
| 4 | Reduced Pavement Section | 14,700 | SQYD | $8.56 | $125,841 |
| 5 | Concrete Pavement | 4,200 | SQYD | $40.72 | $171,024 |
| 6 | Constant Slope Concrete Barrier | 0 | FT | $45.72 | $0 |
| 7 | Stepped Pavement Type Concrete Barrier | 0 | FT | $94.98 | $0 |
| 8 | Concrete Barrier | 18,800 | FT | $24.85 | $467,180 |
| 9 | Concrete Barrier and Moment Slab | 0 | FT | $118.00 | $0 |
| 10 | Moveable Barrier | 0 | FT | $230.00 | $0 |
| 11 | Overhead Sign Structure Widening | 0 | EACH | $150,000.00 | $0 |
| 12 | Bridge Rehabilitation | 0 | EACH | varies | $0 |
| 13 | Bridge Widening | 0 | SQFT | $75.00 | $0 |
| 14 | Retaining Wall | 0 | SQFT | $30.00 | $0 |
| 15 | Noise Barrier | 1 | LS | $400,000.00 | $400,000 |
| 16 | Drainage (10% of Items 1 - 15) | 1 | LS | 10% | $196,920 |
| 17 | Temporary Erosion Control (10% of item 16) | 1 | LS | 10% | $19,692 |
| 18 | Pavement Marking (5% of Items 3-5) | 1 | LS | 5% | $51,639 |
| 19 | Maintenance of Traffic During Construction (10% of Items 1 - 15) | 1 | LS | 10% | $196,920 |
| 20 | Items Not Estimated (10% of Items 1 - 15) | 1 | LS | 10% | $196,920 |
| 21 | Mobilization (2% of Items 1-20) | 1 | LS | 2% | $52,626 |
| 22 | Design and Construction Engineering (15% of items 1-20) | 1 | LS | 15% | $394,693 |
| | | | | | |
| 23 | Inflation - 1 year at 3% (3% of items 1-22) | 1 | LS | 3% | $92,358 |
| | | | | | |
| 24 | Contingency (10% of Items 1-23) | 1 | LS | 10% | $317,096 |
| | | | | | |
| | *Total* | | | | $3,488,059 |
| | **Total (Use)** | | | | **$4,000,000** |

# I-15
# Utah County Line to 10600 South
# Nine/Ten Lanes with Enhanced Bangerter Highway Interchange Alternative
# Salt Lake County Portion (Utah County Line to 10600 South)

SUMMARY
ESTIMATE OF PROBABLE COST

| Item No. | Item Description | Quantity | Units | Unit Price | Total Cost |
|---|---|---|---|---|---|
| 1 | Roadway Excavation | 177,421 | CUYD | $4.71 | $835,655 |
| 2 | Crack and Seat with Pavement Overlay | 28,400 | CUYD | $11.18 | $317,388 |
| 3 | Roadway and Shoulder Pavement | 376,800 | SQYD | $27.06 | $10,194,578 |
| 4 | Reduced Pavement Section | 24,500 | SQYD | $8.56 | $209,735 |
| 5 | Concrete Pavement | 15,800 | SQYD | $52.59 | $830,883 |
| 6 | Constant Slope Concrete Barrier | 2,500 | FT | $45.72 | $114,300 |
| 7 | Stepped Pavement Type Concrete Barrier | 800 | FT | $94.98 | $75,980 |
| 8 | Concrete Barrier* | 76,300 | FT | $24.85 | $1,896,055 |
| 9 | Concrete Barrier and Moment Slab | 9,800 | FT | $118.00 | $1,156,400 |
| 10 | Moveable Barrier | 0 | FT | $230.00 | $0 |
| 11 | Overhead Sign Structure Widening | 1 | EACH | $150,000.00 | $150,000 |
| 12 | Bridge Rehabilitation** | 2 | EACH | varies** | $668,643 |
| 13 | Bridge Widening | 19,250 | SQFT | varies*** | $1,581,250 |
| 14 | Retaining Wall | 105,400 | SQFT | $30.00 | $3,162,000 |
| 15 | Noise Barrier | 1 | LS | $1,400,000.00 | $1,400,000 |
| 16 | Drainage (10% of Items 1 - 15) | 1 | LS | 10% | $2,259,287 |
| 17 | Temporary Erosion Control (10% of item 16) | 1 | LS | 10% | $225,929 |
| 18 | Pavement Marking (5% of Items 2-5) | 1 | LS | 5% | $577,629 |
| 19 | Maintenance of Traffic During Construction (10% of Items 1 - 15) | 1 | LS | 10% | $2,259,287 |
| 20 | Items Not Estimated (10% of Items 1 - 15) | 1 | LS | 10% | $2,259,287 |
| 21 | Mobilization (2% of Items 1-20) | 1 | LS | 2% | $603,486 |
| 22 | Design and Construction Engineering (15% of items 1-20) | 1 | LS | 15% | $4,526,143 |
| | | | | | |
| 23 | Inflation - 1 year at 3% (3% of items 1-22) | 1 | LS | 3% | $1,059,117 |
| | | | | | |
| 24 | Contingency (10% of Items 1-23) | 1 | LS | 10% | $3,636,303 |
| | | | | | |
| | *Total* | | | | $39,999,334 |
| | **Total (Use)** | | | | **$40,000,000** |

* Assuming that 1 mile (5,280') of UDOT furnished concrete barrier is available

** 14600 Structure (F-207): $394,526
** 11400 Structure (F-56): $274,117

*** $75/sqft used for 14600 South and 11400 South Structures; $200/sqft for 10000 South Structure

**Nine/Ten/Eight Lanes Alternative**

Similar to the 9-10 Lanes with Enhanced Bangerter Highway Interchange, except only eight lanes are provided under the 10600 South Interchange. Typical sections and cost estimates for the Nine/Ten/Eight Lanes Alternative are provided at the end of this section.

The features of the Nine/Ten/Eight Lanes Alternative are:

- Provides climbing northbound and southbound climbing lane lanes to Point of the Mountain
- Provides 10-lane section (5 lanes northbound and 5 lanes southbound) from Bangerter Highway to south of the 10600 South Interchange.
- From the Utah County Line to the Bangerter Interchange, requires pavement widening to the west.
- Requires reconfiguration of 14600 South Interchange southbound gore areas and reconstruction of portions of southbound ramps.
- From Bangerter Highway Interchange to 12300 South Project, requires pavement widening beyond the existing outside shoulders.
- From 12300 South project to south of 10600 South, requires pavement widening beyond the existing outside shoulders.
- Additional bridge widening required at 11400 and 14600 South.
- Requires reconstruction of most outside shoulders to accommodate traffic control during construction.
- Requires approximately 800’ of retaining wall or stepped pavement type barrier at the horizontal curve north of 14600 South.
- Requires more modifications to the Bangerter Highway Interchange in comparison to the 8-10 lane alternative.
- Requires no modifications to 10600 South Interchange.
- Requires retaining walls to protect the Jordan and Salt Lake City Canal box culvert openings.
- Uses precast barrier to allow flexibility for lane configurations.

The advantages of the Nine/Ten/Eight Lanes Alternative are:

- Provides full capacity of I-15 from south of 10600 South to Bangerter Highway, a major route to provide access to the southwest portion of Salt Lake County.
- Provides future flexibility to improve capacity in the nine-lane area by introducing a contraflow lane.
- Provides a climbing lane in the north bound and southbound directions.

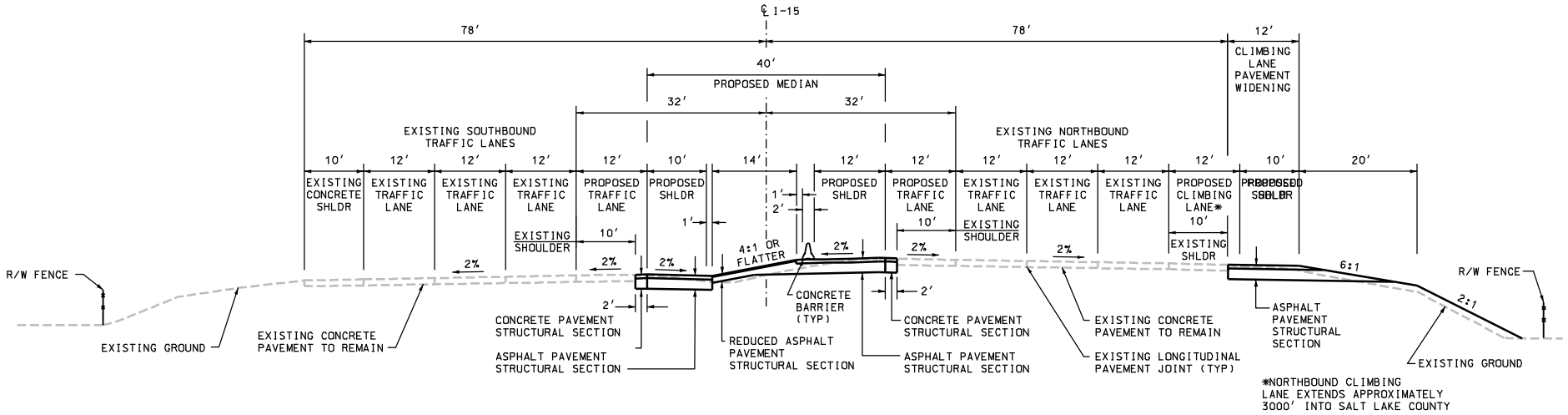
- Can use additional 2 lanes as HOV lanes.
- Provides a longer design life.
- Fully utilizes the 10-lane section (4,600' long) to be constructed by 12300 South Project.
- Uses depressed medians to collect median pavement drainage, which reduces water running across adjacent travel lanes.
- Uses precast barrier during the construction phase that could be moved into a permanent position after construction.

The disadvantages of the Nine/Ten/Eight Lanes Alternative are:

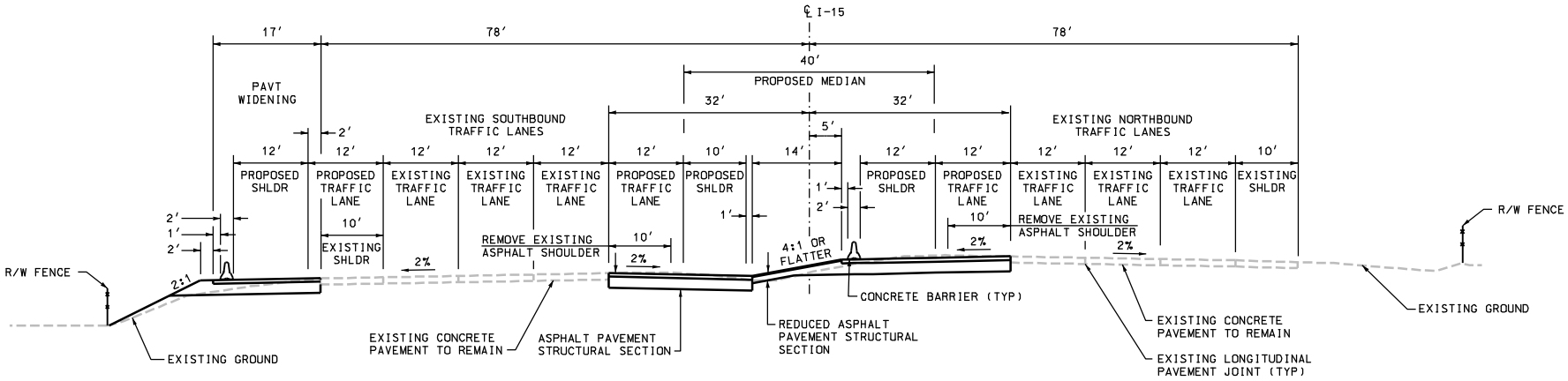
- 5 southbound lanes (not including inside shoulder) from 12300 South Project to Bangerter Highway Interchange and 4 southbound lanes from the Bangerter Highway Interchange to the horizontal curve north of 14600 South would be drained across the pavement to the west. (This condition could be eliminated if a 7' inside shoulder is used and the additional lanes are symmetric about the I-15 centerline.)
- Vertical clearance is reduced by 2" to 3" on the east side of the east 11400 South bridge structure. Currently, the minimum vertical clearance is 15'-9".
- The alternative does not provide 10 lanes under the 10600 South structure.
- Additional Right-of-way could be required.

# NINE/TEN/EIGHT LANES ALTERNATIVE

(9 Lanes, Alpine Int. to 14600 South Int.; 10 Lanes, 14600 South Int. to 10600 South Int.; 8 Lanes Under 10600 South)




ALPINE EXIT TO UTAH COUNTY LINE



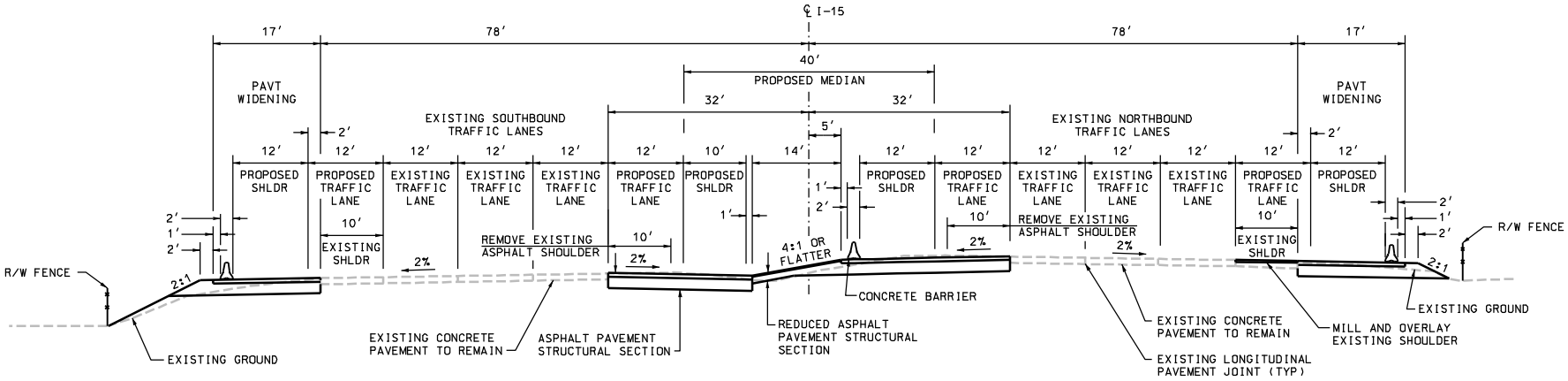

UTAH COUNTY LINE TO 14600 SOUTH



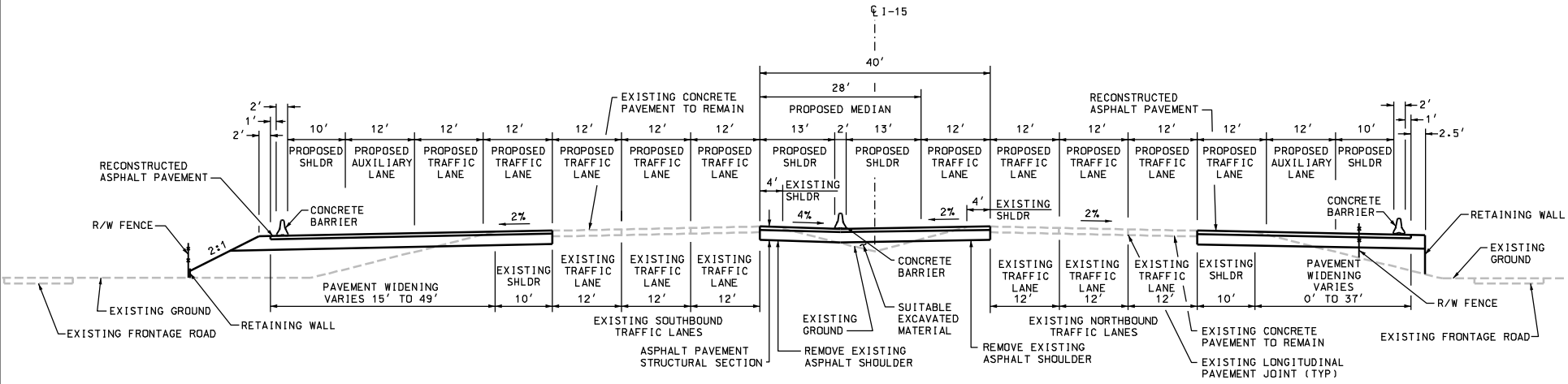
Figure B-12
Sheet 1 of 3

# NINE/TEN/EIGHT LANES ALTERNATIVE

(9 Lanes, Alpine Int. to 14600 South Int.; 10 Lanes, 14600 South Int. to 10600 South Int.; 8 Lanes Under 10600 South)




14600 SOUTH TO APPROXIMATELY 3000′ SOUTH OF BANGERTER HIGHWAY



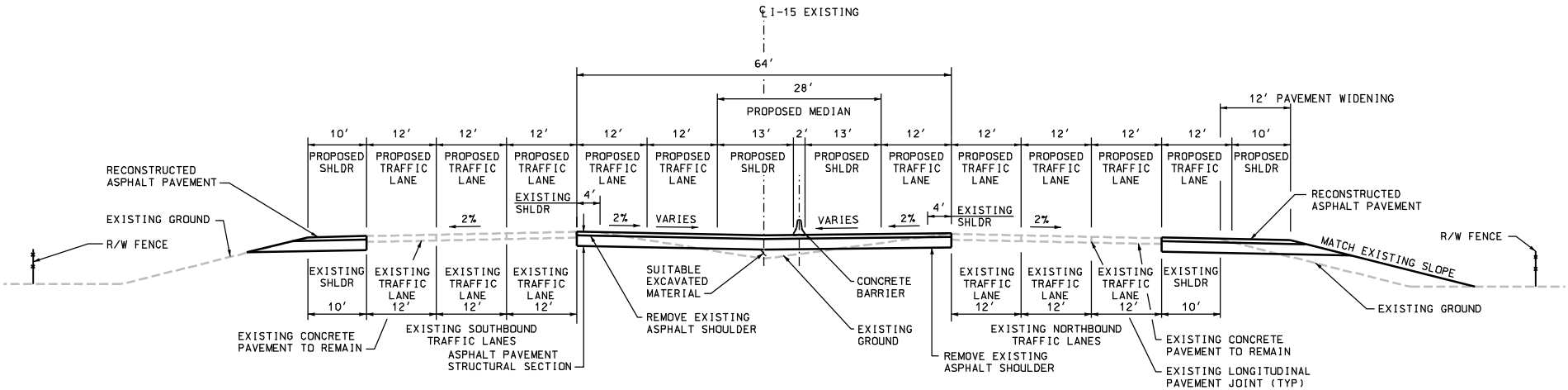

APPROXIMATELY 3000′ SOUTH OF BANGERTER HIGHWAY TO 12700 SOUTH (APPROXIMATE SOUTHERN EXTENT OF 12300 SOUTH PROJECT)



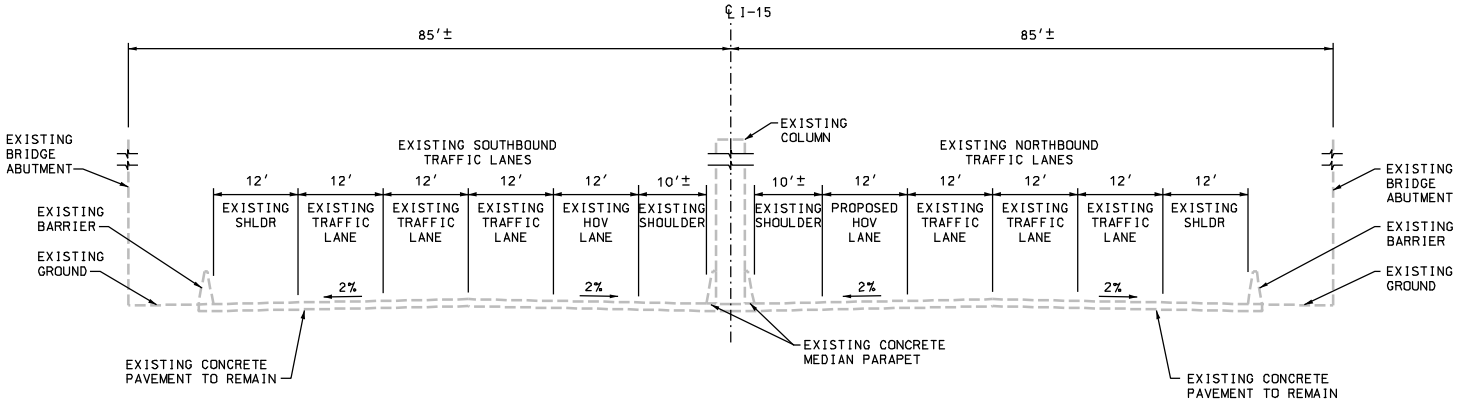
Figure B-12
Sheet 2 of 3

# NINE/TEN/EIGHT LANES ALTERNATIVE

(9 Lanes, Alpine Int. to 14600 South Int.; 10 Lanes, 14600 South Int. to 10600 South Int.; 8 Lanes Under 10600 South)




11900 SOUTH (APPROXIMATE NORTHERN EXTENT OF 12300 SOUTH PROJECT) TO 10600 SOUTH




UNDER 10600 SOUTH BRIDGE



Figure B-12
Sheet 3 of 3

# I-15
# Utah County Line to 10600 South
# Nine/Ten/Eight Lanes Alternative
# (9 Lanes, Alpine Int. to 14600 South Int.; 10 Lanes, 14600 South Int. to 10600 South Int.; 8 Lanes Under 10600 South)
# Utah County Portion (Alpine Exit to Utah County Line)

SUMMARY
ESTIMATE OF PROBABLE COST

| Item No. | Item Description | Quantity | Units | Unit Price | Total Cost |
|---|---|---|---|---|---|
| 1 | Roadway Excavation | 19,400 | CUYD | $4.71 | $91,374 |
| 2 | Borrow | 23,400 | CUYD | $6.74 | $157,716 |
| 3 | Roadway and Shoulder Pavement | 39,400 | SQYD | $27.06 | $1,065,994 |
| 4 | Reduced Pavement Section | 14,700 | SQYD | $8.56 | $125,841 |
| 5 | Concrete Pavement | 4,200 | SQYD | $40.72 | $171,024 |
| 6 | Rotomill and Pavement Overlay | 0 | SQYD | $5.14 | $0 |
| 7 | Stepped Pavement Type Concrete Barrier | 0 | FT | $94.98 | $0 |
| 8 | Concrete Barrier | 18,800 | FT | $24.85 | $467,180 |
| 9 | Concrete Barrier with Mounted N/A Fence | 241 | FT | $27.60 | $6,652 |
| 10 | Ramp Lighting | 0 | EACH | $50,000.00 | $0 |
| 11 | Overhead Sign Structure Widening | 0 | EACH | $150,000.00 | $0 |
| 12 | Bridge Rehabilitation | 0 | EACH | varies | $0 |
| 13 | Bridge Widening | 0 | SQFT | $75.00 | $0 |
| 14 | Retaining Wall | 0 | SQFT | $30.00 | $0 |
| 15 | Noise Barrier | 1 | LS | $400,000.00 | $400,000 |
| 16 | Drainage (10% of Items 1 - 15) | 1 | LS | 10% | $248,578 |
| 17 | Temporary Erosion Control (10% of item 16) | 1 | LS | 10% | $24,858 |
| 18 | Pavement Marking (5% of Items 3-6) | 1 | LS | 5% | $68,143 |
| 19 | Maintenance of Traffic During Construction (10% of Items 1 - 15) | 1 | LS | 10% | $248,578 |
| 20 | Items Not Estimated (10% of Items 1 - 15) | 1 | LS | 10% | $248,578 |
| 21 | Mobilization (2% of Items 1-20) | 1 | LS | 2% | $66,490 |
| 22 | Design and Construction Engineering (15% of items 1-20) | 1 | LS | 15% | $498,677 |
| | | | | | |
| 23 | Inflation - 1 year at 3% (3% of items 1-22) | 1 | LS | 3% | $116,690 |
| | | | | | |
| 24 | Contingency (10% of Items 1-23) | 1 | LS | 10% | $400,637 |
| | | | | | |
| | *Total* | | | | $4,407,010 |
| | **Total (Use)** | | | | **$5,000,000** |

# I-15
# Utah County Line to 10600 South
# Nine/Ten/Eight Lanes Alternative
# (9 Lanes, Alpine Int. to 14600 South Int.; 10 Lanes, 14600 South Int. to 10600 South Int.; 8 Lanes Under 10600 South)
# Salt Lake County Portion (Utah County Line to 10600 South)

SUMMARY
ESTIMATE OF PROBABLE COST

| Item No. | Item Description | Quantity | Units | Unit Price | Total Cost |
|---|---|---|---|---|---|
| 1 | Roadway Excavation | 241,500 | CUYD | $4.71 | $1,137,465 |
| 2 | Borrow | 0 | CUYD | $6.74 | $0 |
| 3 | Roadway and Shoulder Pavement | 399,700 | SQYD | $27.06 | $10,814,153 |
| 4 | Reduced Pavement Section | 24,500 | SQYD | $8.56 | $209,735 |
| 5 | Crack and Seat with Pavement Overlay | 28,400 | SQYD | $11.18 | $317,388 |
| 6 | Rotomill and Pavement Overlay | 4,700 | SQYD | $5.14 | $24,171 |
| 7 | Stepped Pavement Type Concrete Barrier | 800 | FT | $94.98 | $75,980 |
| 8 | Concrete Barrier* | 73,700 | FT | $24.85 | $1,831,445 |
| 9 | Concrete Barrier with Mounted N/A Fence | 12,000 | FT | $27.60 | $331,200 |
| 10 | Ramp Lighting | 2 | EACH | $50,000.00 | $100,000 |
| 11 | Overhead Sign Structure Widening | 1 | EACH | $150,000.00 | $150,000 |
| 12 | Bridge Rehabilitation** | 2 | EACH | varies** | $668,643 |
| 13 | Bridge Widening | 18,100 | SQFT | $75.00 | $1,357,500 |
| 14 | Retaining Wall | 5,900 | SQFT | $30.00 | $177,000 |
| 15 | Noise Barrier | 1 | LS | $1,400,000.00 | $1,400,000 |
| 16 | Drainage (10% of Items 1 - 15) | 1 | LS | 10% | $1,859,468 |
| 17 | Temporary Erosion Control (10% of item 16) | 1 | LS | 10% | $185,947 |
| 18 | Pavement Marking (5% of Items 3-6) | 1 | LS | 5% | $568,272 |
| 19 | Maintenance of Traffic During Construction (10% of Items 1 - 15) | 1 | LS | 10% | $1,859,468 |
| 20 | Items Not Estimated (10% of Items 1 - 15) | 1 | LS | 10% | $1,859,468 |
| 21 | Mobilization (2% of Items 1-20) | 1 | LS | 2% | $498,546 |
| 22 | Design and Construction Engineering (15% of items 1-20) | 1 | LS | 15% | $3,739,096 |
| | | | | | |
| 23 | Inflation - 1 year at 3% (3% of items 1-22) | 1 | LS | 3% | $874,948 |
| | | | | | |
| 24 | Contingency (10% of Items 1-23) | 1 | LS | 10% | $3,003,990 |
| | | | | | |
| | *Total* | | | | $33,043,885 |
| | **Total (Use)** | | | | **$34,000,000** |

* Assuming that 1 mile (5,280') of UDOT furnished concrete barrier is available

** 14600 Structure (F-207): $394,526
** 11400 Structure (F-56): $274,117

**Nine/Eight/Ten/Eight Lanes Alternative**

Similar to the Nine/Ten/Eight Lanes Alternative, except only eight lanes are provided under the Bangerter and 10600 South Interchanges. Typical sections and cost estimates for the Nine/Eight/Ten/Eight Lanes Alternative are provided at the end of this section.

The features of the Nine/Eight/Ten/Eight Lanes Alternative are:

- Provides climbing northbound and southbound climbing lane lanes to Point of the Mountain
- Provides 10-lane section (5 lanes northbound and 5 lanes southbound) from the northern side of the Bangerter Highway to south side of the 10600 South Interchange.
- From the Utah County Line to the Bangerter Interchange, requires pavement widening to the west.
- Requires reconfiguration of 14600 South Interchange southbound gore areas and reconstruction of portions of southbound ramps.
- From Bangerter Highway Interchange to 12300 South Project, requires pavement widening beyond the existing outside shoulders and short retaining walls to accommodate the new lanes along with the new auxiliary lane. (Most of the widening in this area is done to the west).
- From 12300 South project to south of 10600 South, requires pavement widening beyond the existing outside shoulders.
- Stays within existing right of way.
- Additional bridge widening required at 11400 South and 14600 South.
- Requires reconstruction of most outside shoulders to accommodate traffic control during construction.
- Requires approximately 800’ of retaining wall or stepped pavement type barrier at the horizontal curve north of 14600 South.
- Requires the same modifications to the Bangerter Highway Interchange as the 8-10 lane alternative.
- Requires no modifications to 10600 South Interchange:
- Requires retaining walls to protect the Jordan and Salt Lake City Canal box culvert openings.
- Uses precast barrier to allow flexibility for lane configurations.

The advantages of the Nine/Eight/Ten/Eight Lanes Alternative are:

- Provides full capacity of I-15 from south of 10600 South to Bangerter Highway, a major route to provide access to the southwest portion of Salt Lake County.

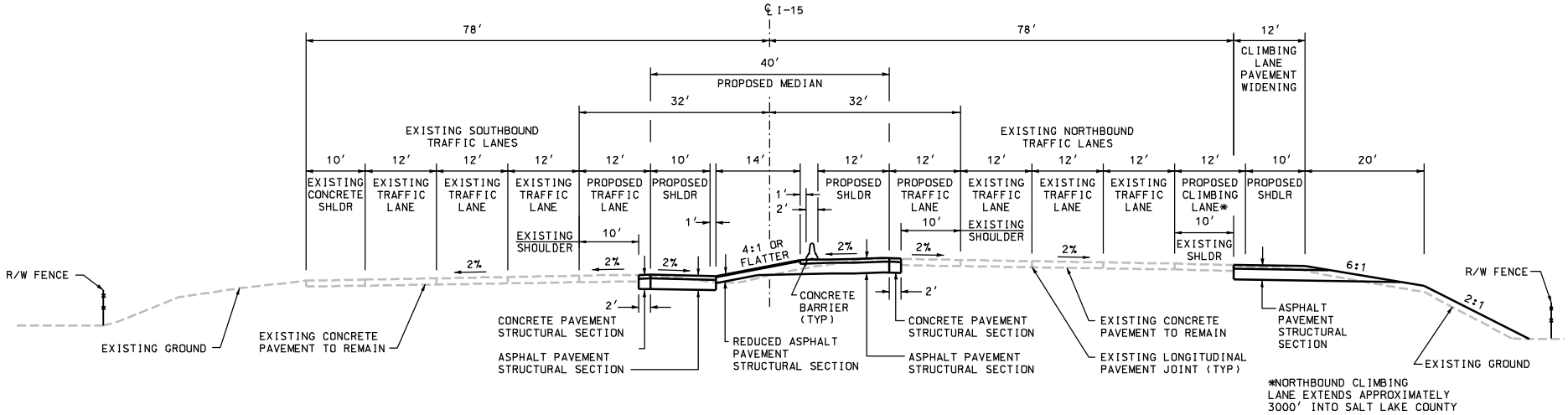
- Provides future flexibility to improve capacity in the nine-lane area by introducing a contraflow lane.
- Provides a climbing lane in the northbound and southbound directions.
- Can use additional 2 lanes as HOV lanes.
- Provides a longer design life.
- Fully utilizes the 10-lane section (4,600' long) to be constructed by 12300 South Project.
- Uses depressed medians to collect median pavement drainage, which reduces water running across adjacent travel lanes.
- Uses precast barrier during the construction phase that could be moved into a permanent position after construction.
- Fits within the existing Right-of-way.

The disadvantages of the Nine/Eight/Ten Lanes Alternative are:

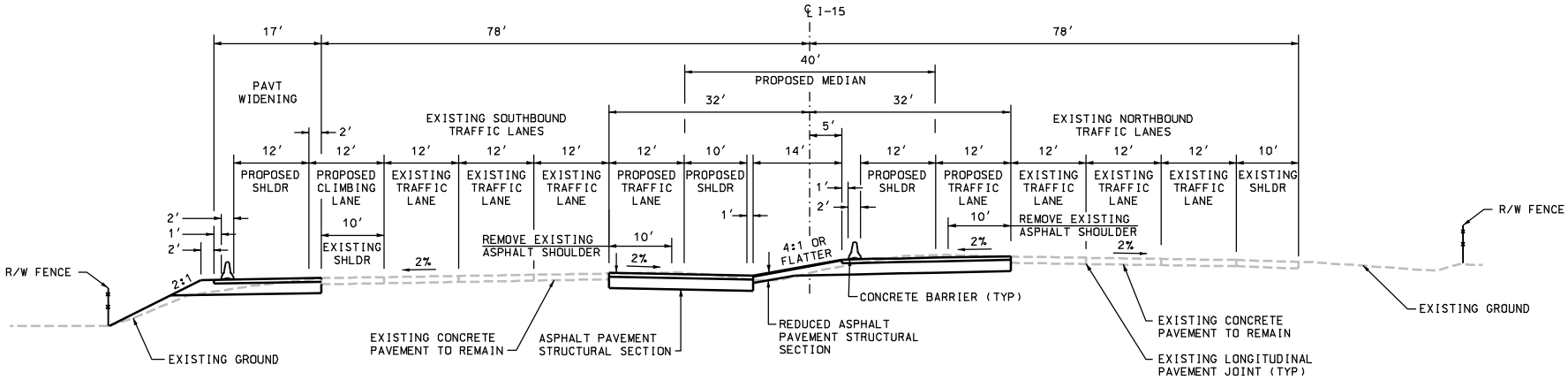
- 5 southbound lanes (not including inside shoulder) from 12300 South Project to Bangerter Highway Interchange and 4 southbound lanes from the Bangerter Highway Interchange to the horizontal curve north of 14600 South would be drained across the pavement to the west. (This condition could be eliminated if a 7' inside shoulder is used and the additional lanes are symmetric about the I-15 centerline.)
- Vertical clearance is reduced by 2" to 3" on the east side of the east 11400 South bridge structure. Currently, the minimum vertical clearance is 15'-9".
- The alternative does not provide 10 lanes under the 10600 South structure.
- The alternative does not provide 10 lanes under the Bangerter Highway structure.

# NINE/EIGHT/TEN/EIGHT LANES ALTERNATIVE

(9 Lanes, Alpine Int. to Bangerter Highway Int.; 8 Lanes Under Bangerter Highway;
10 Lanes, Bangerter Highway Int. to 10600 South Int.; 8 Lanes Under 10600 South)




ALPINE EXIT TO UTAH COUNTY LINE



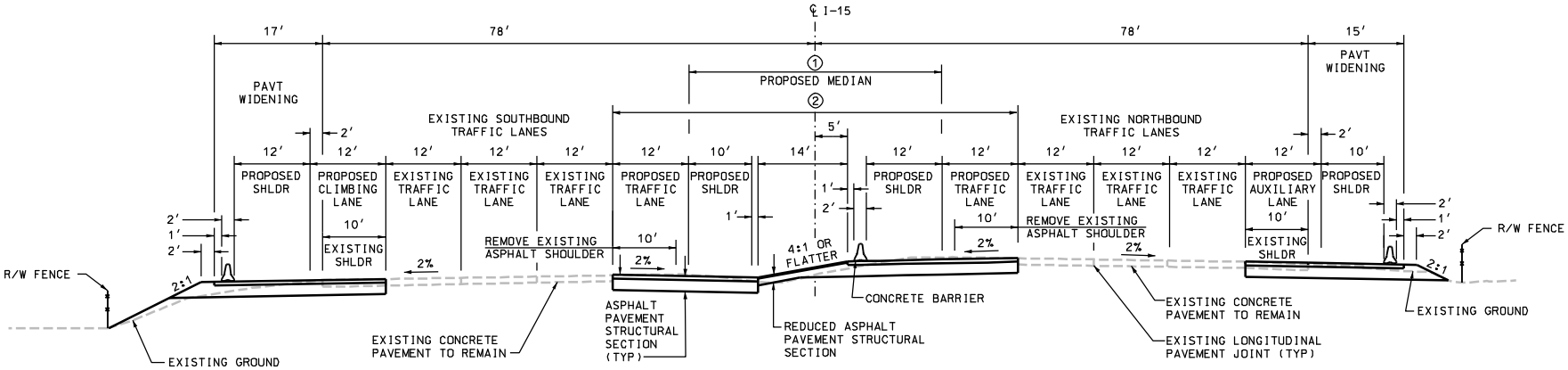

UTAH COUNTY LINE TO 14600 SOUTH



Figure B-13
Sheet 1 of 4

# NINE/EIGHT/TEN/EIGHT LANES ALTERNATIVE

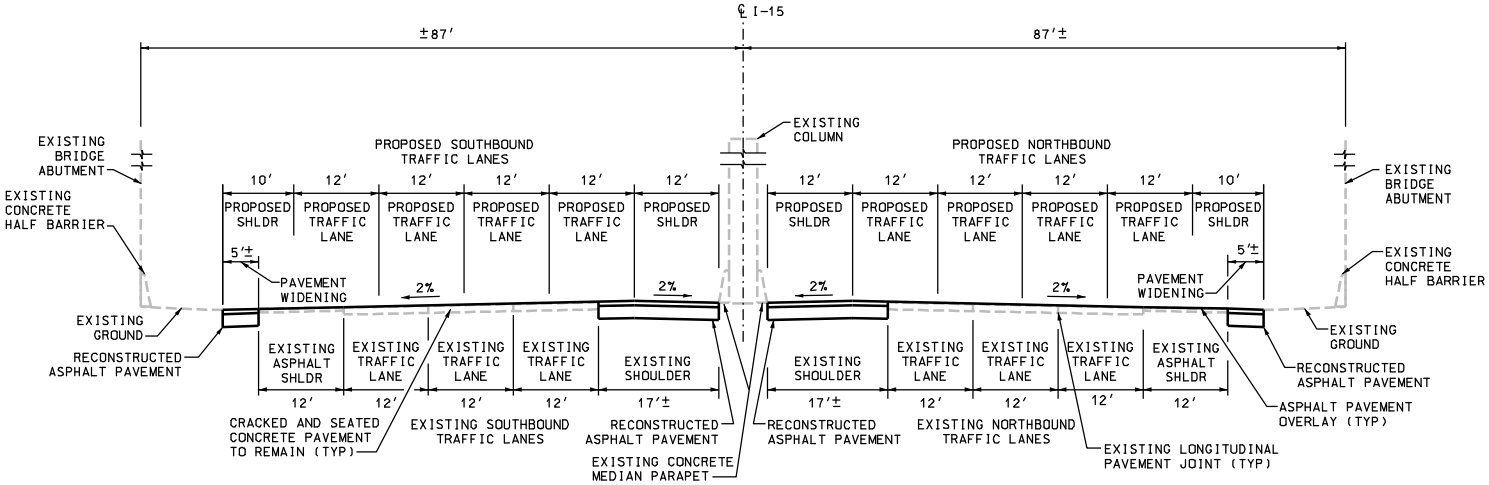
(9 Lanes, Alpine Int. to Bangerter Highway Int.; 8 Lanes Under Bangerter Highway;
10 Lanes, Bangerter Highway Int. to 10600 South Int.; 8 Lanes Under 10600 South)




## 14600 SOUTH TO BANGERTER HIGHWAY

SHEET NOTES:

1. PROPOSED MEDIAN WIDTH TRANSITIONS FROM 40′ TO 28′.
2. EXISTING MEDIAN WIDTH TRANSITIONS FROM 64′ TO 40′.



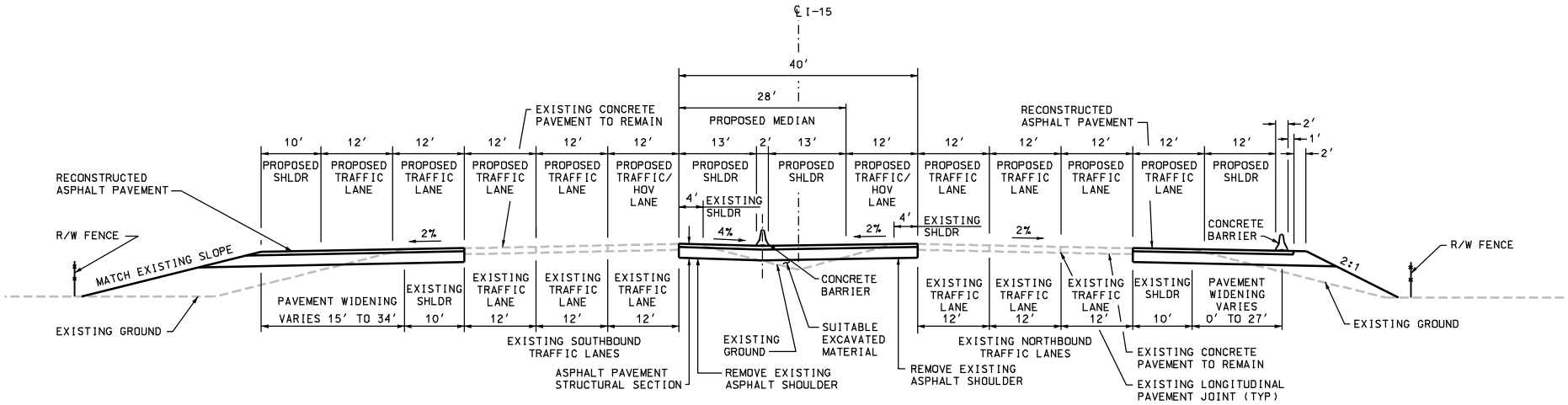

## UNDER BANGERTER HIGHWAY BRIDGE



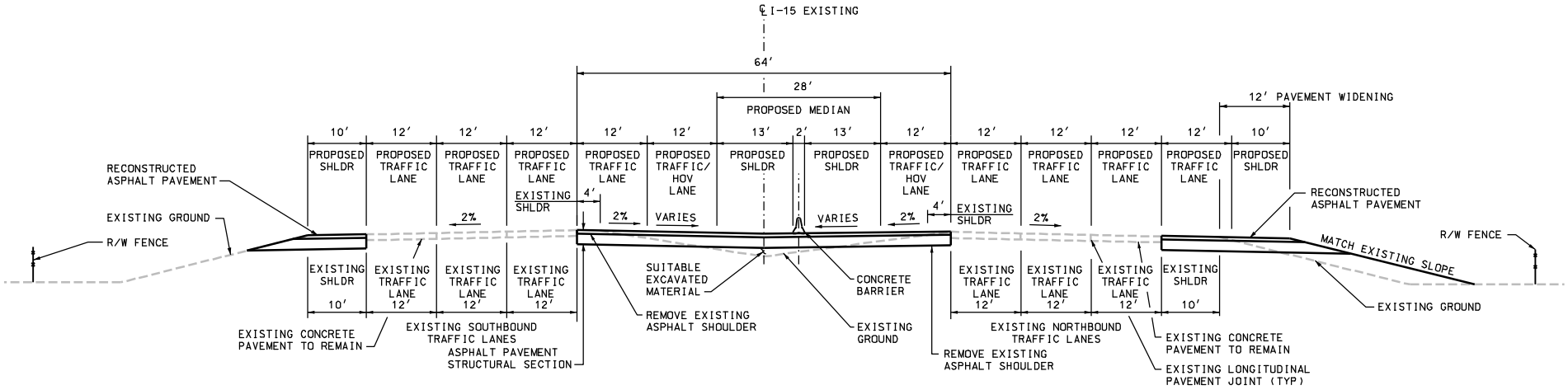
Figure B-13
Sheet 2 of 4

# NINE/EIGHT/TEN/EIGHT LANES ALTERNATIVE

(9 Lanes, Alpine Int. to Bangerter Highway Int.; 8 Lanes Under Bangerter Highway;
10 Lanes, Bangerter Highway Int. to 10600 South Int.; 8 Lanes Under 10600 South)




BANGERTER HIGHWAY TO 12700 SOUTH (APPROXIMATE SOUTHERN EXTENT OF 12300 SOUTH PROJECT)



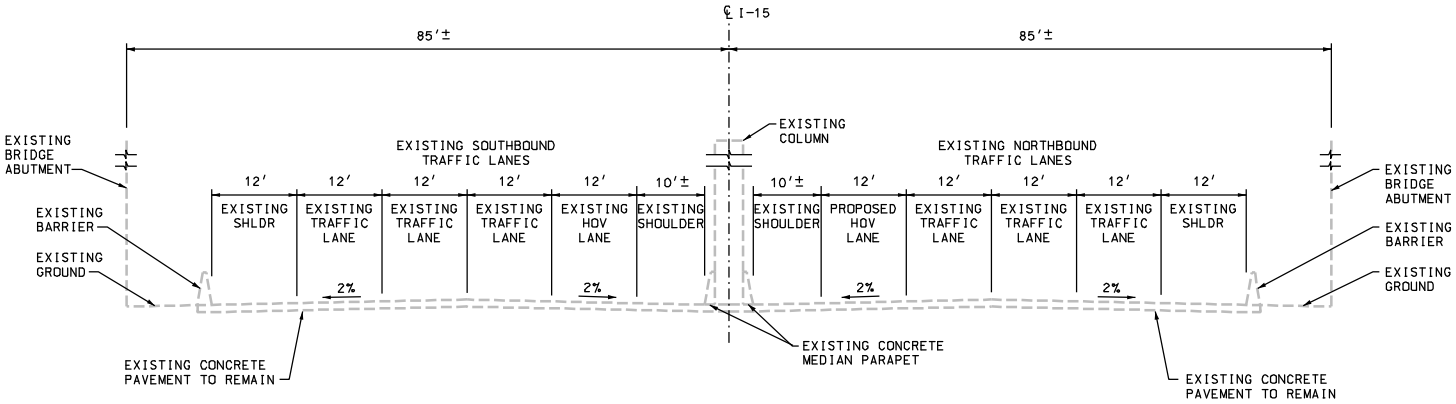

11900 SOUTH (APPROXIMATE NORTHERN EXTENT OF 12300 SOUTH PROJECT) TO 10600 SOUTH



Figure B-13
Sheet 3 of 4

# NINE/EIGHT/TEN/EIGHT LANES ALTERNATIVE

(9 Lanes, Alpine Int. to Bangerter Highway Int.; 8 Lanes Under Bangerter Highway;
10 Lanes, Bangerter Highway Int. to 10600 South Int.; 8 Lanes Under 10600 South)




UNDER 10600 SOUTH BRIDGE



Figure B-13
Sheet 4 of 4

# I-15
# Utah County Line to 10600 South
# Nine/Eight/Ten/Eight Alternative
# (9 Lanes, Alpine Int. to Bangerter Highway Int.; 8 Lanes Under Bangerter Highway; 10 Lanes, Bangerter Highway Int. to 10600 South Int.; 8 Lanes Under 10600 South)
# Utah County Portion (Alpine Exit to Utah County Line)

SUMMARY
ESTIMATE OF PROBABLE COST

| Item No. | Item Description | Quantity | Units | Unit Price | Total Cost |
|---|---|---|---|---|---|
| 1 | Roadway Excavation | 19,400 | CUYD | $4.71 | $91,374 |
| 2 | Borrow | 23,400 | CUYD | $6.74 | $157,716 |
| 3 | Roadway and Shoulder Pavement | 39,400 | SQYD | $27.06 | $1,065,994 |
| 4 | Reduced Pavement Section | 14,700 | SQYD | $8.56 | $125,841 |
| 5 | Crack and Seat with Pavement Overlay | 0 | SQYD | $11.18 | $0 |
| 6 | Concrete Pavement | 4,200 | SQYD | $40.72 | $171,024 |
| 7 | Stepped Pavement Type Concrete Barrier | 0 | FT | $94.98 | $0 |
| 8 | Concrete Barrier | 18,800 | FT | $24.85 | $467,180 |
| 9 | Conrete Barrier and Moment Slab | 0 | FT | $118.00 | $0 |
| 10 | Ramp Lighting | 0 | EACH | $50,000.00 | $0 |
| 11 | Overhead Sign Structure Widening | 0 | EACH | $150,000.00 | $0 |
| 12 | Bridge Rehabilitation | 0 | EACH | varies | $0 |
| 13 | Bridge Widening | 0 | SQFT | $75.00 | $0 |
| 14 | Retaining Wall | 0 | SQFT | $30.00 | $0 |
| 15 | Noise Barrier | 1 | LS | $400,000.00 | $400,000 |
| 16 | Drainage (10% of Items 1 - 15) | 1 | LS | 10% | $247,913 |
| 17 | Temporary Erosion Control (10% of item 16) | 1 | LS | 10% | $24,791 |
| 18 | Pavement Marking (5% of Items 3-6) | 1 | LS | 5% | $68,143 |
| 19 | Maintenance of Traffic During Construction (10% of Items 1 - 15) | 1 | LS | 10% | $247,913 |
| 20 | Items Not Estimated (10% of Items 1 - 15) | 1 | LS | 10% | $247,913 |
| 21 | Mobilization (2% of Items 1-20) | 1 | LS | 2% | $66,316 |
| 22 | Design and Construction Engineering (15% of items 1-20) | 1 | LS | 15% | $497,370 |
| | | | | | |
| 23 | Inflation - 1 year at 3% (3% of items 1-22) | 1 | LS | 3% | $116,385 |
| | | | | | |
| 24 | Contingency (10% of Items 1-23) | 1 | LS | 10% | $399,587 |
| | | | | | |
| | *Total* | | | | $4,395,459 |
| | **Total (Use)** | | | | **$5,000,000** |

# I-15
# Utah County Line to 10600 South
# Nine/Eight/Ten/Eight Alternative
# (9 Lanes, Alpine Int. to Bangerter Highway Int.; 8 Lanes Under Bangerter Highway; 10 Lanes, Bangerter Highway Int. to 10600 South Int.; 8 Lanes Under 10600 South)
# Salt Lake County Portion (Utah County Line to 10600 South)

SUMMARY
ESTIMATE OF PROBABLE COST

| Item No. | Item Description | Quantity | Units | Unit Price | Total Cost |
|---|---|---|---|---|---|
| 1 | Roadway Excavation | 250,800 | CUYD | $4.71 | $1,181,268 |
| 2 | Borrow | 0 | CUYD | $6.74 | $0 |
| 3 | Roadway and Shoulder Pavement | 364,000 | SQYD | $27.06 | $9,848,266 |
| 4 | Reduced Pavement Section | 24,500 | SQYD | $8.56 | $209,735 |
| 5 | Crack and Seat with Pavement Overlay | 32,900 | SQYD | $11.18 | $367,679 |
| 6 | Rotomill and Pavement Overlay | 9,600 | SQYD | $5.14 | $49,371 |
| 7 | Stepped Pavement Type Concrete Barrier | 800 | FT | $94.98 | $75,980 |
| 8 | Concrete Barrier* | 57,600 | FT | $24.85 | $1,431,360 |
| 9 | Conrete Barrier and Moment Slab | 1,100 | FT | $118.00 | $129,800 |
| 10 | Ramp Lighting | 0 | EACH | $50,000.00 | $0 |
| 11 | Overhead Sign Structure Widening | 1 | EACH | $150,000.00 | $150,000 |
| 12 | Bridge Rehabilitation** | 2 | EACH | varies** | $668,643 |
| 13 | Bridge Widening | 18,100 | SQFT | $75.00 | $1,357,500 |
| 14 | Retaining Wall | 50,900 | SQFT | $30.00 | $1,527,000 |
| 15 | Noise Barrier | 1 | LS | $1,400,000.00 | $1,400,000 |
| 16 | Drainage (10% of Items 1 - 15) | 1 | LS | 10% | $1,839,660 |
| 17 | Temporary Erosion Control (10% of item 16) | 1 | LS | 10% | $183,966 |
| 18 | Pavement Marking (5% of Items 3-6) | 1 | LS | 5% | $523,753 |
| 19 | Maintenance of Traffic During Construction (10% of Items 1 - 15) | 1 | LS | 10% | $1,839,660 |
| 20 | Items Not Estimated (10% of Items 1 - 15) | 1 | LS | 10% | $1,839,660 |
| 21 | Mobilization (2% of Items 1-20) | 1 | LS | 2% | $492,466 |
| 22 | Design and Construction Engineering (15% of items 1-20) | 1 | LS | 15% | $3,693,495 |
| | | | | | |
| 23 | Inflation - 1 year at 3% (3% of items 1-22) | 1 | LS | 3% | $864,278 |
| | | | | | |
| 24 | Contingency (10% of Items 1-23) | 1 | LS | 10% | $2,967,354 |
| | | | | | |
| | *Total* | | | | $32,640,894 |
| | **Total (Use)** | | | | **$33,000,000** |

* Assuming that 1 mile (5,280') of UDOT furnished concrete barrier is available

** 14600 Structure (F-207): $394,526
** 11400 Structure (F-56): $274,117

**Ten General-Purpose Lane Alternative**

The Ten General-Purpose Lanes Alternative provides two additional lanes in each direction to the Point of the Mountain and nine lanes to the Alpine Interchange. Typical sections and cost estimates for the Ten General-Purpose Lane Alternative are provided at the end of this section.

The features of the Ten General-Purpose Lane Alternative are:

- Provides 10-lane section (5 lanes northbound and 5 lanes southbound) from the Point of the Mountain to the 10600 South Interchange. Five lanes would be provided northbound and four southbound from the Alpine Interchange to the Point of the Mountain.
- From Utah County Line to Bangerter Interchange, requires pavement widening in the median, to the east, and to the west.
- Widening to the east and west would require reconfiguration of 14600 South Interchange gore areas and reconstruction of portions of the ramps.
- From the Bangerter Highway Interchange to the 12300 South Project, requires pavement widening beyond the existing outside shoulders and short retaining walls to accommodate the third and fourth new lanes along with a new auxiliary lane. (Most of the widening in this area is done to the west).
- From the 12300 South Project to 10600 South, requires pavement widening beyond the existing outside shoulders and short retaining walls to accommodate the fourth new lane and a new auxiliary lane south of 10600 South Interchange.
- Additional bridge widening required at 11400 and 14600 South.
- Requires reconstruction of most outside shoulders to accommodate traffic control during construction.
- Requires approximately 800’ of retaining wall or stepped pavement type barrier at the horizontal curve north of 14600 South.
- Requires more modifications to the Bangerter Highway Interchange in comparison to the 8/10 lane alternatives.
- Modifications required to 10600 South Interchange:
  - Requires reconstruction of a portion of the northbound entrance ramp because the pavement widening on I-15 forces the ramp further to the east.
  - Requires reconstruction of a portion of the southbound entrance ramp because the pavement widening on I-15 forces the ramp further to the west.
  - Requires a new southbound auxiliary lane north of 10600 South.
  - Requires a new northbound auxiliary lane north of 10600 South.
- Requires retaining walls to protect the Jordan and Salt Lake City Canal box culvert openings.

- Uses precast barrier to allow flexibility for future lane configurations.

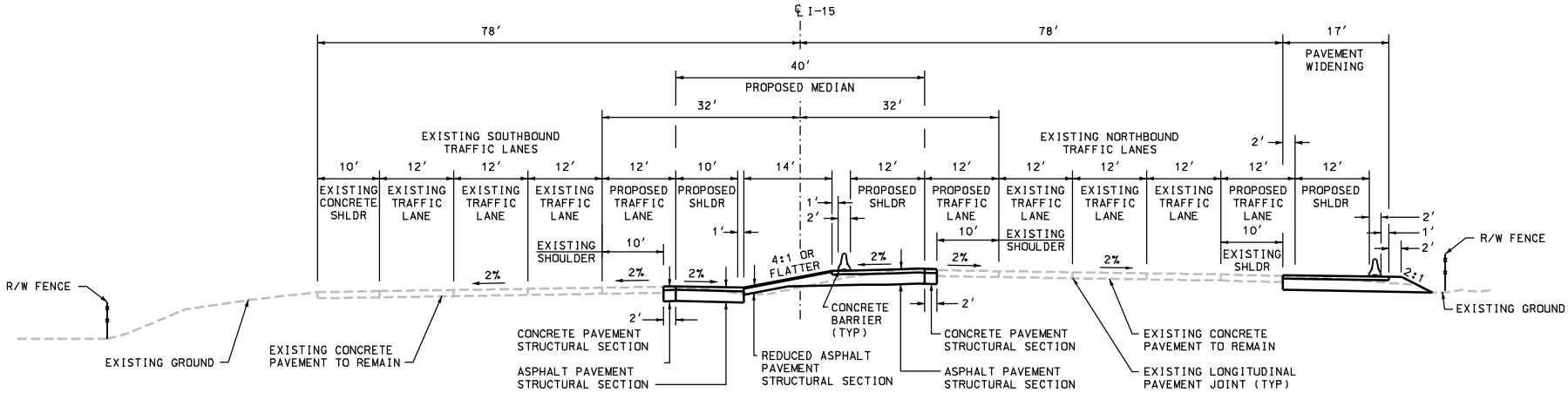
The advantages of the Ten General-Purpose Lane Alternative are:

- Provides full capacity of I-15 from 10600 South to Bangerter Highway, a major route to provide access to the southwest portion of Salt Lake County.
- Provides a continuation of the reconstructed I-15 10-lane typical section north of the 10600 South Interchange to the County Line.
- Provides a longer design life.
- Possible to use additional 2 lanes as HOV lanes.
- Fully utilizes the 10-Lane section (4,600' long) to be constructed by 12300 South Project.
- Depressed median collects median pavement drainage, which reduces water running across adjacent travel lanes.
- Uses precast barrier during the construction phase that could be moved into a permanent position after construction.

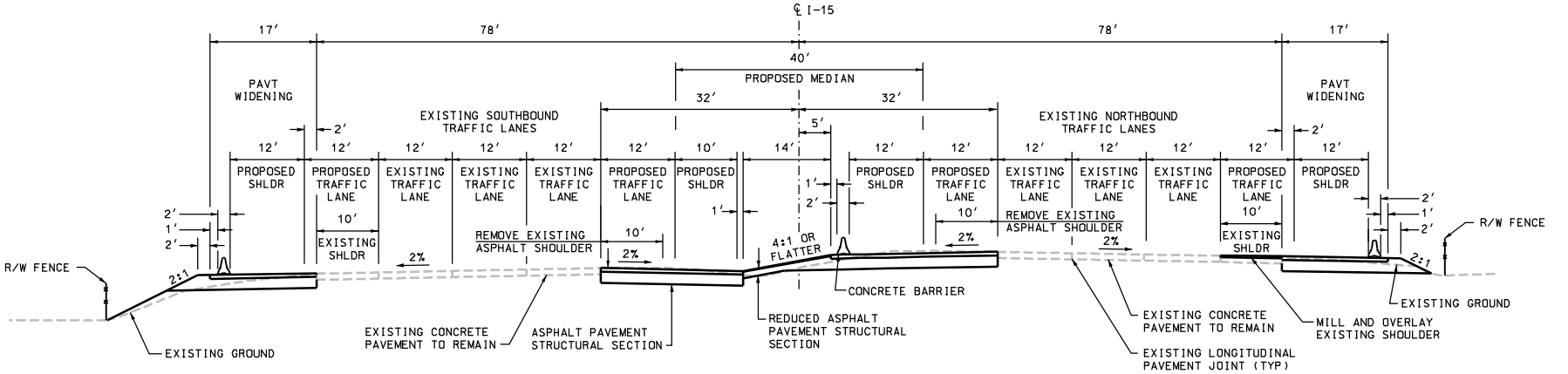
The disadvantages of the Ten Lane Alternative are:

- 5 southbound lanes (not including inside shoulder) from 12300 South Project to Bangerter Highway Interchange and 5 southbound lanes from the Bangerter Highway Interchange to the horizontal curve north of 14600 South would be drained across the pavement to the west. (This condition could be eliminated if a 7' inside shoulder is used and the additional lanes are symmetric about the I-15 centerline.)
- Vertical clearance would be reduced by 2" to 3" on the east side of the 11400 South bridge structure. Currently, the minimum vertical clearance is 15'-9".
- Vertical clearance would be reduced by 7" on the east side of the east 14600 South bridge structure.
- Additional Right-of-way would be required.

# TEN GENERAL-PURPOSE LANES ALTERNATIVE




ALPINE EXIT TO UTAH COUNTY LINE

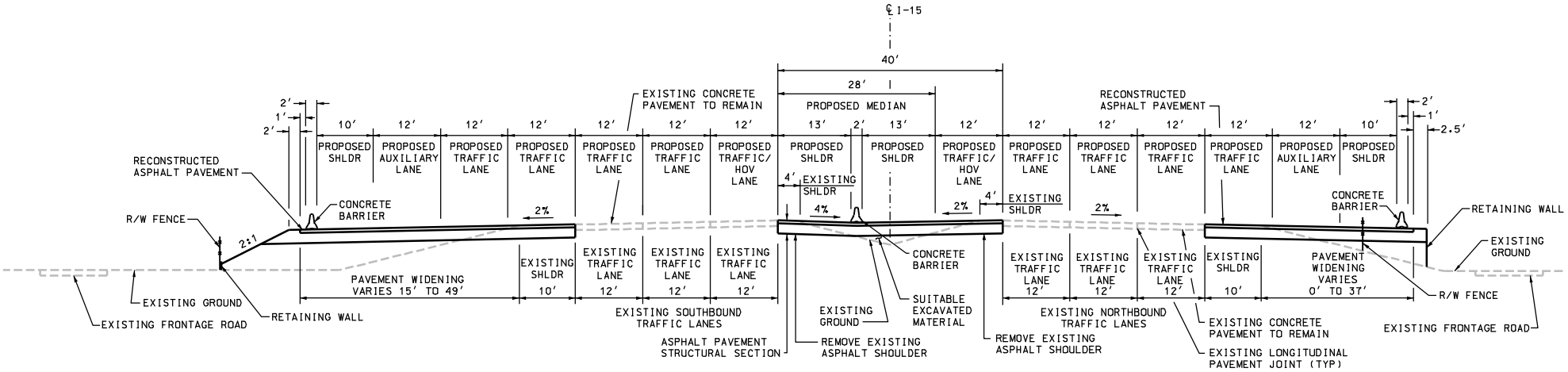



UTAH COUNTY LINE TO APPROXIMATELY 3000′ SOUTH OF BANGERTER HIGHWAY

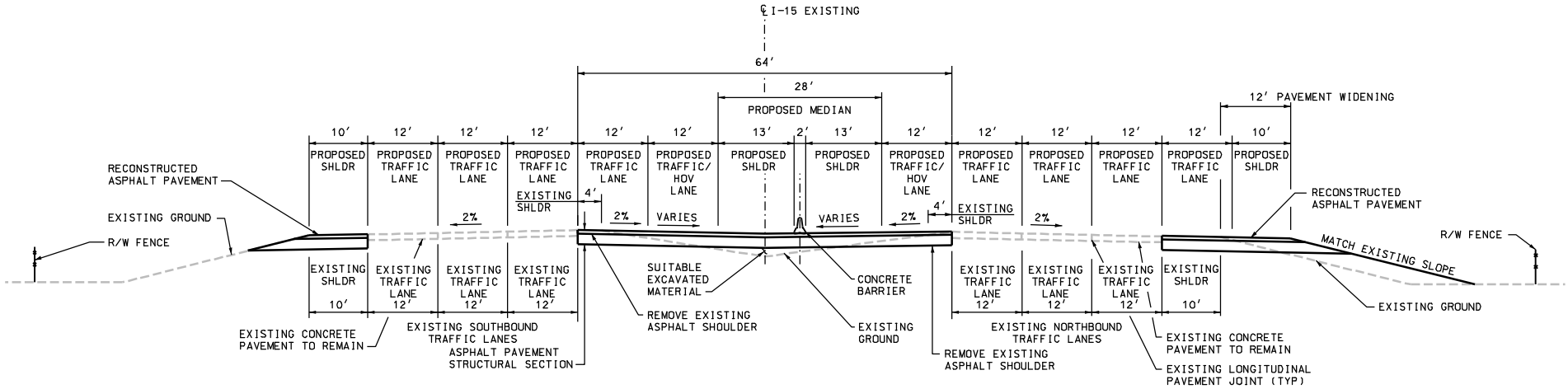


Figure B-14
Sheet 1 of 2

# TEN GENERAL-PURPOSE LANES ALTERNATIVE




APPROXIMATELY 3000′ SOUTH OF BANGERTER HIGHWAY TO 12700 SOUTH (APPROXIMATE SOUTHERN EXTENT OF 12300 SOUTH PROJECT)




11900 SOUTH (APPROXIMATE NORTHERN EXTENT OF 12300 SOUTH PROJECT) TO 10600 SOUTH



Figure B-14
Sheet 2 of 2

# I-15
# Utah County Line to 10600 South
# Ten General-Purpose Lanes Alternative
# Utah County Portion (Alpine Exit to Utah County Line)

SUMMARY
ESTIMATE OF PROBABLE COST

| Item No. | Item Description | Quantity | Units | Unit Price | Total Cost |
|---|---|---|---|---|---|
| 1 | Roadway Excavation | 19,400 | CUYD | $4.71 | $91,374 |
| 2 | Borrow | 23,400 | CUYD | $6.74 | $157,716 |
| 3 | Roadway and Shoulder Pavement | 39,400 | SQYD | $27.06 | $1,065,994 |
| 4 | Reduced Pavement Section | 14,700 | SQYD | $8.56 | $125,841 |
| 5 | Concrete Pavement | 4,200 | SQYD | $40.72 | $171,024 |
| 6 | Constant Slope Concrete Barrier | 0 | FT | $45.72 | $0 |
| 7 | Stepped Pavement Type Concrete Barrier | 0 | FT | $94.98 | $0 |
| 8 | Concrete Barrier | 19,300 | FT | $24.85 | $479,605 |
| 9 | Concrete Barrier and Moment Slab | 0 | FT | $118.00 | $0 |
| 10 | Moveable Barrier | 0 | FT | $230.00 | $0 |
| 11 | Overhead Sign Structure Widening | 0 | EACH | $150,000.00 | $0 |
| 12 | Bridge Rehabilitation | 0 | EACH | varies | $0 |
| 13 | Bridge Widening | 0 | SQFT | $75.00 | $0 |
| 14 | Retaining Wall | 0 | SQFT | $30.00 | $0 |
| 15 | Noise Barrier | 1 | LS | $400,000.00 | $400,000 |
| 16 | Drainage (10% of Items 1 - 15) | 1 | LS | 10% | $249,155 |
| 17 | Temporary Erosion Control (10% of item 16) | 1 | LS | 10% | $24,916 |
| 18 | Pavement Marking (5% of Items 3-5) | 1 | LS | 5% | $68,143 |
| 19 | Maintenance of Traffic During Construction (10% of Items 1 - 15) | 1 | LS | 10% | $249,155 |
| 20 | Items Not Estimated (10% of Items 1 - 15) | 1 | LS | 10% | $249,155 |
| 21 | Mobilization (2% of Items 1-20) | 1 | LS | 2% | $66,642 |
| 22 | Design and Construction Engineering (15% of items 1-20) | 1 | LS | 15% | $499,812 |
| | | | | | |
| 23 | Inflation - 1 year at 3% (3% of items 1-22) | 1 | LS | 3% | $116,956 |
| | | | | | |
| 24 | Contingency (10% of Items 1-23) | 1 | LS | 10% | $401,549 |
| | | | | | |
| | *Total* | | | | $4,417,036 |
| | **Total (Use)** | | | | **$5,000,000** |

# I-15
# Utah County Line to 10600 South
# Ten General-Purpose Lanes Alternative
# Salt Lake County Portion (Utah County Line to 10600 South)

SUMMARY
ESTIMATE OF PROBABLE COST

| Item No. | Item Description | Quantity | Units | Unit Price | Total Cost |
|---|---|---|---|---|---|
| 1 | Roadway Excavation | 193,721 | CUYD | $4.71 | $912,428 |
| 2 | Rotomill and Pavement Overlay | 10,900 | CUYD | $5.14 | $56,057 |
| 3 | Roadway and Shoulder Pavement | 417,200 | SQYD | $27.06 | $11,287,628 |
| 4 | Reduced Pavement Section | 24,500 | SQYD | $8.56 | $209,735 |
| 5 | Concrete Pavement | 15,800 | SQYD | $52.59 | $830,883 |
| 6 | Crack and Seat with Pavement Overlay | 28,400 | SQYD | $11.18 | $317,512 |
| 7 | Constant Slope Concrete Barrier | 2,500 | FT | $45.72 | $114,300 |
| 8 | Stepped Pavement Type Concrete Barrier | 800 | FT | $94.98 | $75,980 |
| 9 | Concrete Barrier* | 76,300 | FT | $24.85 | $1,896,055 |
| 10 | Concrete Barrier and Moment Slab | 9,800 | FT | $118.00 | $1,156,400 |
| 11 | Overhead Sign Structure Widening | 1 | EACH | $150,000.00 | $150,000 |
| 12 | Bridge Rehabilitation** | 2 | EACH | varies** | $668,643 |
| 13 | Bridge Widening | 21,800 | SQFT | varies*** | $1,963,750 |
| 14 | Retaining Wall | 108,700 | SQFT | $30.00 | $3,261,000 |
| 15 | Noise Barrier | 1 | LS | $1,400,000.00 | $1,400,000 |
| 16 | Drainage (10% of Items 1 - 15) | 1 | LS | 10% | $2,430,037 |
| 17 | Temporary Erosion Control (10% of item 16) | 1 | LS | 10% | $243,004 |
| 18 | Pavement Marking (5% of items 2 - 6) | 1 | LS | 5% | $635,091 |
| 19 | Maintenance of Traffic During Construction (10% of Items 1 - 15) | 1 | LS | 10% | $2,430,037 |
| 20 | Items Not Estimated (10% of Items 1 - 15) | 1 | LS | 10% | $2,430,037 |
| 21 | Mobilization (2% of Items 1-20) | 1 | LS | 2% | $649,371 |
| 22 | Design and Construction Engineering (15% of items 1-20) | 1 | LS | 15% | $4,870,286 |
| | | | | | |
| 23 | Inflation - 1 year at 3% (3% of items 1-22) | 1 | LS | 3% | $1,139,647 |
| | | | | | |
| 24 | Contingency (10% of Items 1-23) | 1 | LS | 10% | $3,912,788 |
| | | | | | |
| | *Total* | | | | $43,040,668 |
| | **Total (Use)** | | | | **$44,000,000** |

* Assuming that 1 mile (5,280') of UDOT furnished concrete barrier is available

** 14600 Structure (F-207): $394,526
** 11400 Structure (F-56): $274,117

*** $75/sqft used for 14600 South and 11400 South Structures; $200/sqft for 10000 South Structure

## Alternatives Comparison

The second level of evaluation included a comparison of how each alternative satisfied the following criteria. If the alternative provided a good solution for a particular criterion, a score of 5 was given to the alternative. If the alternative provided an acceptable solution for the criterion, a score of 3 was given to the alternative. If the alternative provided a poor solution to a criterion, a score of 1 was given to the alternative. Scores of 4 or 2 could be given to an alternative if the solution provided by the alternative was between good and acceptable or acceptable and poor.

A weighting factor, *w*, was assigned to each evaluation criteria in order to indicate the relative importance of each evaluation criteria. The weighting factors represent a possible guide that should not be interpreted to represent exact accuracy. However, the relative ranking of each alternative is based on detailed analysis and still yields the advancement of a single alternative regardless of the alternative weighting factors. A description of each evaluation criterion and its weighting factor follows.

### Immediate Traffic Congestion Relief (w-10)

The purpose of this project is to provide immediate traffic congestion relief in the vicinity of the 10600 South Interchange for PM Peak travel. The alternative considered as the proposed action alternative should be able to be implemented quickly. Table 2-14 lists the criteria used in assigning a score to an alternative for immediate traffic congestion relief.

**Table 2-14 Immediate Traffic Congestion Relief Criteria**

| LOS | Score |
|---|---|
| LOS C or better in 2004 | 5 |
| LOS D in 2004 | 3 |
| LOS E in 2004 | 1 |
| LOS C or better in 2005 | 4 |
| LOS D in 2005 | 2 |
| LOS E in 2005 | 0 |
| LOS F | 0 |

Source: Stanley Consultants, Inc.

**Mid-term Traffic Relief (w=10)**

The design life selected for the I-15, Utah County Line to 10600 South, Project is 10 to 15 years. The alternative considered as the proposed action alternative must provide an adequate level-of-service at the end of the design life. Level-of-service for 2015 traffic volumes was evaluated for each alternative considered for the proposed action alternative and used to assign a score for the alternative evaluation. Table 2-15 lists the criteria used in assigning a score to an alternative for mid-term traffic relief.

**Table 1.15 Mid-term Traffic Relief Criteria**

| LOS for 2015 Traffic Volumes | Score |
|---|---|
| LOS C or better | 5 |
| LOS D | 3 |
| LOS E | 1 |
| LOS F | 0 |

Source: Stanley Consultants, Inc.

**Long-term Flexibility (w=8)**

Long-term flexibility is considered to be the ability of an alternative to be reconfigured, altered or enlarged to meet future traffic demands. For example, if the directional split for AM Peak or PM Peak traffic changes so that it moves further away from a 50/50 split and an additional lane is needed in the peak direction, the use of moveable barrier to create a contraflow lane could be implemented without reconstruction of the existing pavement section. Table 2-16 lists the criteria used in assigning a score to an alternative for long-term flexibility.

**Table 2-16 Long-term Flexibility Criteria**

| Criteria | Score |
|---|---|
| The configuration can be changed with minimal adjustments or alterations. | 5 |
| The configuration can be changed with some minor adjustments or alterations. | 3 |
| The configuration can be changed but requires major adjustments or alterations. | 1 |
| The configuration can be changed but requires complete reconstruction. | 0 |

Source: Stanley Consultants, Inc.

**Operation Costs (w=10)**

All of the alternatives have operational costs such as pavement maintenance, snow plowing, catch basin cleaning, etc. In addition to these costs, some of the alternatives evaluated would have increased costs such as the moveable barrier alternative. For this alternative, the barrier must be moved twice a day in order for the alternative to function properly. Such operations would require a large increase in operational costs. Table 2-17 lists the criteria used in assigning a score to an alternative for operational costs.

**Table 2-17 Operation Cost Criteria**

| Criteria | Score |
|---|---|
| Requires only normal maintenance costs | 5 |
| Requires some minor operational costs in addition to normal maintenance costs | 3 |
| Requires major operational costs in addition to normal maintenance costs | 1 |

Source: Stanley Consultants, Inc.

**Construction Costs (w=6)**

The project budget for the I-15, Utah County Line to 10600 South, Project has been set at $35 million, including design engineering and construction engineering costs. While construction costs should not be considered a major factor in the selection of an alternative, if the construction costs greatly exceeds the project budget, the likelihood of being able to construct that alternative is severely reduced. Table 2-18 lists the criteria used in assigning a score to an alternative for construction costs.

**Table 2-18 Construction Cost Criteria**

| Criteria | Score |
|---|---|
| Cost estimate is less than or equal to project budget | 5 |
| Cost estimate exceeds the budget but is within $2 million | 4 |
| Cost estimate exceeds the budget but is within $5 million | 3 |
| Cost estimate exceeds the budget but is within $9 million | 2 |
| Cost estimate exceeds the budget more than $9 million | 1 |

Source: Stanley Consultants, Inc.

**Comparison Matrix**

The results of the evaluation, based on the above scoring criteria, are shown in Table 2-19 below.

**Table 2-19 Alternatives Comparison**

| Alternative | Immed. Traffic Relief | Mid-term Traffic Relief | Long-term Flexibility | Operation Cost | Cost | Weighted Score |
|---|---|---|---|---|---|---|
| Evaluation Weighting Factor | 10 | 10 | 8 | 10 | 6 | |
| No-Build | 1 | 1 | 0 | 5 | 5 | 100 |
| Traffic Demand Management | 1 | 1 | 5 | 3 | 5 | 120 |
| Ramp Metering | 1 | 1 | 0 | 5 | 5 | 120 |
| Commuter Rail Transit | 1 | 1 | 5 | 1 | 1 | 76 |
| Light Rail Transit | 1 | 1 | 5 | 1 | 1 | 76 |
| TDM/Transit/Ramp Metering | 1 | 1 | 5 | 1 | 1 | 76 |
| Mountain View Corridor | 1 | 1 | 5 | 5 | 1 | 116 |
| Dedicated Reversible Lanes (3-2-3) | 4 | 0 | 3 | 3 | 1 | 106 |
| Dedicated Reversible Lanes (4-1-4) | 5 | 5 | 3 | 3 | 1 | 160 |
| Moveable Barrier Rev. Lanes (5-3, 3-5) | 4 | 0 | 5 | 1 | 2 | 102 |
| Moveable Barrier Rev. Lanes (5-4, 4-5) | 4 | 5 | 5 | 1 | 1 | 146 |
| 8 General-Purpose Lanes (1) | 5 | 3 | 3 | 5 | 5 | 184 |
| 6 General-Purpose Lanes/2 HOV Lanes (1) | 5 | 3 | 3 | 5 | 5 | 184 |
| 8 General-Purpose Lanes w/ Aux. Lanes (1) | 5 | 3 | 3 | 5 | 4 | 158 |
| 8/10 Lanes (1) | 4 | 1 | 3 | 5 | 4 | 156 |
| 9/10 Lanes (1) | 4 | 3 | 4 | 5 | 3 | 170 |
| 9/10/8 Lanes | 4 | 3 | 4 | 5 | 5 | 182 |
| 9/8/10/8 Lanes(1) | 5 | 3 | 4 | 5 | 5 | 192 |
| 10 General-Purpose Lanes (includes 2 HOV Lanes) (1) | 5 | 3 | 5 | 5 | 1 | 176 |

(1) Includes 14600 South to Bangerter Highway Northbound Auxiliary Lane.

Source: Stanley Consultants, Inc.

The weighted scores for the alternatives range from 76 for Commuter Rail Transit and Light Rail Transit to 192 for the Nine/Eight/Ten/Eight Lanes Alternative. Based on this evaluation, the Nine/Eight/Ten/Eight Lanes Alternative will be carried forward as the Proposed Action Alternative for further evaluation of its impacts.