Interchange Costs

Option #1 - New Interchange

Need Additional Data For Backup

Estimated cost = $35 million - 4 lane & $28 million - 2 lane

Option #2 - Gore Hill Interchange Modification

Modification would consist of adding one additional structure along with frontage road improvements between the two structures. Obliteration of the southern ramps of the existing interchange would be necessary. Traffic flow issues, such as lane configurations and signals, would need to be investigated.

Need Additional Data For Backup

Estimated cost = $17 To 20 million

Backup Data

Custer Interchange - Cost = $45 million

Quantm Data - 4 Lane - Rural Principal Arterial
MT 5299(70) - South Arterial - Great Falls

Section	Subject		Result
1.1	Start Point		TBD
1.2	End Point		TBD
1.3	Maximum Design Grade	Downhill	-4% - Rolling Terrain w/ 60 mph design speed (-7% - Mountainous)
		Uphill	+4% - Rolling Terrain w/ 60 mph design speed (+7% - Mountainous)
1.4	Maximum Sustained Grade	Downhill	N/A
		Uphill	N/A
		Sustained Distance	N/A
1.5	Formation Width (ft) in Cut		154ft
1.6	Formation Width (ft) in Fill		114ft
1.7	Minimum Vertical Radii	Crests (k value)	151 (60 mph)
		Sags (k value)	136 (60 mph)
1.8	Minimum Horizontal Radii		1200ft @ 8.0%
1.9	Road Coordination	Sight Dist	570ft - level ; 610ft - downhill ; 530ft - uphill
		Eye Level	3.5ft
		Object Level	2.0ft
1.10	Rail Curve Compensation		N/A
2.1	Haul	$/y^3/mile	~~$0.50/yd^3/mile~~
2.2	Borrow	$/y^3	$12/yd^3
2.3	Dump	$/y^3	~~$5/yd^3~~

2.4.1.A   Geotype 1 = Rock Plateau

2.4.2.A   Fill Cost $4.00/yd^3

2.4.3.A   Batter Slope   16.67% (6:1)

2.4.4.A   Strata #   2

2.4.5.A   Useable Material   Yes to both

2.4.6.A   Cut Cost $12.00/yd^3 - for Rock & $3.00/yd^3 for Dirt

2.4.7.A	Stratum Thickness	N/A
2.4.8.A	Batter Slope	33.33% (3:1)
2.4.9.A	Width of shoulder @ Interface	N/A

2.4.1.B	Geotype 2 = Floodplain Areas	
2.4.2.B	Fill Cost	$12.00/yd^3
2.4.3.B	Batter Slope	16.67% (6:1)
2.4.4.B	Strata #	1
2.4.5.B	Useable Material	Yes
2.4.6.B	Cut Cost	$3.00/yd^3
2.4.7.B	Stratum Thickness	N/A
2.4.8.B	Batter Slope	33.33% (3:1)
2.4.9.B	Width of shoulder @ Interface	N/A

2.4.1.C	Geotype 3 = Valley Floor & Ridges	
2.4.2.C	Fill Cost	$4.00/yd^3
2.4.3.C	Batter Slope	16.67% (6:1)
2.4.4.C	Strata #	1
2.4.5.C	Useable Material	Yes

2.4.6.C	Cut Cost	$3.00/yd^3
2.4.7.C	Stratum Thickness	N/A
2.4.8.C	Batter Slope	33.33% (3:1)
2.4.9.C	Width of shoulder @ Interface	N/A

3.1.1 Thru 3.1.4 - No major culverts identified but culverts will be required throughout the project

3.2.1	Retaining Walls	$400/ft^2
3.2.2	Bridges	$150/ft^2 - (84' wide bridge = $12600/ft)
3.2.3	Tunnel	$50000/ft
3.2.4	Pavement	$440/ft

Unit Price Worksheet - 4 Lane

Item	Cost	
Excavation - Unclassified	$7.00/yd^3	
Excavation - Unclassified Borrow	$12.00/yd^3	
Excavation - Muck	$15.00/yd^3	
Special Borrow	$20.00/yd^3	
Retaining Wall	$400/ft^2	
Bridge	$150/ft^2	(84' wide bridge = $12600/ft)
Haul (not paid for separately)	$0.50/yd^3/mile	(assumes average distance = 1 mile within the project limits)
Borrow	$12.00/yd^3	
Dump (not paid for separately)	$5.00/yd^3	(assume average distance = 5 miles)

Geotype 1 = Rock Plateau
Cut	$12.00/yd^3 - for Rock & $3.00/yd^3 for Dirt
Fill	$4.00/yd^3

Geotype 2 = Floodplain Areas
Cut	$3.00/yd^3	(muck excavation situation)
Fill	$12.00/yd^3	(includes a combination of borrow material, excavated material, and stabilization

Geotype 3 = Valley Floor & Ridges
Cut	$3.00/yd^3
Fill	$4.00/yd^3

Pavement - Section
Grade S Plant Mix	$20/ton
PG 70-28 Oil (5.5%)	$500/ton
Hydrated Lime (1.4%)	$150/ton
CRS-2P Seal Oil	$500/ton
Cover Material	$0.60/yd^2
Gravel	$38/yd^3

Plant Mix Cost = $20(.931)+$500(0.055)+$150(0.014) = $48/ton = $93/yd^3

Plant Mix X-Section area = ((80+86)/2)ft wide * 0.5ft thick = 41.5ft^2 = 4.61yd^2

Plant Mix Cost = 93*4.61 = $429/yd = $143/ft for an 80ft wide roadway : estimate $155.00/ft with seal & cover operations and striping

Gravel Cost = $38/yd^3 = $1.41/ft^3

Gravel X-Section area = ((114+86)/2)ft wide *2.0ft thick = 200ft^2

Gravel Cost = $1.41/ft^3 * 200ft^2 = $282/ft (cost includes some project incidental cost)

Total Section Cost = $155/ft + $282/ft = $437/ft - Use $440/ft

methods)

Quantm Data - 2 Lane - Rural Principal Arterial
MT 5299(70) - South Arterial - Great Falls

Section	Subject		Result
1.1	Start Point		TBD
1.2	End Point		TBD
1.3	Maximum Design Grade	Downhill	-4% - Rolling Terrain w/ 60 mph design speed (-7% - Mountainous)
		Uphill	+4% - Rolling Terrain w/ 60 mph design speed (+7% - Mountainous)
1.4	Maximum Sustained Grade	Downhill	N/A
		Uphill	N/A
		Sustained Distance	N/A
1.5	Formation Width (ft) in Cut		110ft
1.6	Formation Width (ft) in Fill		70ft
1.7	Minimum Vertical Radii	Crests (k value)	151 (60 mph)
		Sags (k value)	136 (60 mph)
1.8	Minimum Horizontal Radii		1200ft @ 8.0%
1.9	Road Coordination	Sight Dist	570ft - level ; 610ft - downhill ; 530ft - uphill
		Eye Level	3.5ft
		Object Level	2.0ft
1.10	Rail Curve Compensation		N/A
2.1	Haul	$/y^3/mile	~~$0.50/yd^3/mile~~
2.2	Borrow	$/y^3	$12/yd^3
2.3	Dump	$/y^3	~~$5/yd^3~~

2.4.1.A Geotype 1 = Rock Plateau

2.4.2.A Fill Cost $4.00/yd^3

2.4.3.A Batter Slope   16.67% (6:1)

2.4.4.A Strata #   2

2.4.5.A Useable Material   Yes to both

2.4.6.A Cut Cost $12.00/yd^3 - for Rock & $3.00/yd^3 for Dirt

2.4.7.A Stratum Thickness   N/A

2.4.8.A Batter Slope   33.33% (3:1)

2.4.9.A Width of shoulder @ Interface   N/A

2.4.1.B Geotype 2 = Floodplain Areas

2.4.2.B Fill Cost $12.00/yd^3

2.4.3.B Batter Slope   16.67% (6:1)

2.4.4.B Strata #   1

2.4.5.B Useable Material   Yes

2.4.6.B Cut Cost $3.00/yd^3

2.4.7.B Stratum Thickness   N/A

2.4.8.B Batter Slope   33.33% (3:1)

2.4.9.B Width of shoulder @ Interface   N/A

2.4.1.C	Geotype 3 = Valley Floor & Ridges	
2.4.2.C	Fill Cost	$4.00/yd^3
2.4.3.C	Batter Slope	16.67% (6:1)
2.4.4.C	Strata #	1
2.4.5.C	Useable Material	Yes
2.4.6.C	Cut Cost	$3.00/yd^3
2.4.7.C	Stratum Thickness	N/A
2.4.8.C	Batter Slope	33.33% (3:1)
2.4.9.C	Width of shoulder @ Interface	N/A

3.1.1 Thru 3.1.4 - No major culverts identified but culverts will be required throughout the project

3.2.1	Retaining Walls	$400/ft^2
3.2.2	Bridges	$150/ft^2 - (42' wide bridge = $6300/ft)
3.2.3	Tunnel	$50000/ft
3.2.4	Pavement	$246/ft

Environmental Costs

Joe Radonich from MDT Environmental estimated $30K to $40K for investigation per LUST site and $10K to $15K per UST site. The only site impacted by any of the proposed alignments has been the crude oil pipeline and based on $100K per acre a single crossing was $10,000.

Environmental justice parcels in the Gibson Flat area were examined by comparing run 24C1 to a run called 24BASE2. 24BASE2 was an improved land vs unimproved land with a $10k/acre value for all unimproved land and a $500k/acre value for all improved land. The alignment results when compared to 24C1 in the area in question were nearly identical.

Wetlands = $40,000/acre

Justification of Project Costs

Materials
Unclassified Excavation
> NE Bypass - $11.25/yd
> Cut Bank - West - $7.85/yd
> South Helena Interchange - $7.20/yd
>
> **Use - $5.00/yd - * This project involves a very large amount of excavation which may result in a lower unit cost.**

Special Borrow
> 10th Ave South - $24.20/yd
> Cut Bank - West - $18.30/yd
> **Use - $20.00/yd**

Unclassified Borrow
> Cut Bank - West - $9.16/yd
> South Helena Interchange - $8.24/yd
> NE Bypass - $33.22/yd
> **Use - $12.00/yd**

Crushed Aggregate Course
> Cut Bank - West - $32.70/yd
> US 2 - Havre - $51.01/yd
> Great Falls N&S - $37.93/yd
> **Use $38.00/yd**

Plant Mix Items
> Used Great Falls N&S as the basis

Right-of-Way Project Costs

Cadastral appraisal values were used a base value which was multiplied by three for more realistic R/W values. This method was spot checked in many areas and worked well. However, there are exceptions and they are listed below;

Unimproved land greater than 6 acres and east of the Missouri River was given a value of $10k/acre
All improved land with lots smaller than 0.5 acres were given a value of $1 million/acre
Infrastructure damage to the Fox Farm area was given a value of $5 million/acre
Infrastructure damage to various subdivisions in the study area was given a values from $500k/acre to $3 million/acre

Unit Price Worksheet - 2 Lane

Item	Cost	
Excavation - Unclassified	$8.00/yd^3	
Excavation - Unclassified Borrow	$12.00/yd^3	
Excavation - Muck	$15.00/yd^3	
Special Borrow	$20.00/yd^3	
Retaining Wall	$400/ft^2	
Bridge	$150/ft^2	(42' wide bridge = $6300/ft)

Haul - use 0 - MDT doesn't pay for haul	~~$0.50/yd^3/mile~~	(assumes average distance = 1 mile within the project limits)
Borrow	$12.00/yd^3	
Dump	~~$5.00/yd^3~~	(assume average distance = 5 miles)

Geotype 1 = Rock Plateau
Cut	$12.00/yd^3 - for Rock & $3.00/yd^3 for Dirt	
Fill	$4.00/yd^3	

Geotype 2 = Floodplain Areas
Cut	$3.00/yd^3	(muck excavation situation)
Fill	$12.00/yd^3	(includes special borrow material and stabilization methods)

Geotype 3 = Valley Floor & Ridges
Cut	$3.00/yd^3
Fill	$4.00/yd^3

Pavement - Section
Grade S Plant Mix	$20/ton
PG 70-28 Oil (5.5%)	$500/ton
Hydrated Lime (1.4%)	$150/ton
CRS-2P Seal Oil	$500/ton
Cover Material	$0.60/yd^2
Gravel	$38/yd^3

Plant Mix Cost = $20(.931)+$500(0.055)+$150(0.014) = $48/ton = $93/yd^3

Plant Mix X-Section area = ((40+46)/2)ft wide * 0.5ft thick = 21.5ft^2 = 2.39yd^2

Plant Mix Cost = 93*2.39 = $222/yd = $74/ft for a 40ft wide roadway : estimate $82.00/ft with seal & cover operations and striping

Gravel Cost = $38/yd^3 = $1.41/ft^3

Gravel X-Section area = ((70+46)/2)ft wide *2.0ft thick = 116ft^2

Gravel Cost = $1.41/ft^3 * 116ft^2 = $164/ft (cost includes some project incedental cost)

Total Section Cost = $82/ft + $164/ft = $246/ft - Use $246/ft