

**Appendix 3-4**  
**Pipeline Costs for J-curves**

## Pipeline Cost Estimates for J-curves

Budget Level 0 capital cost estimates for the pipeline were prepared for 18-, 20-, 24- and 28-inch diameter pipelines along the Parks Highway route from Fairbanks to Wasilla for the purposes of J-curve analysis. Separate capital estimates were developed for pipelines with maximum allowable operating pressures of 1480 and 2500 psig, thus a total of eight estimates were prepared.

The accuracy of a Budget Level 0 capital estimate is typically in the range of +/- 30 to 50%. The capital estimates were developed using a crew-up methodology and are considered to have an accuracy of +/- 30%. It is recommended that an additional contingency of up to 30% be considered for inclusion in the capital cost estimates depending upon the level for acceptance of project risk. All J-curve analyses are based on capital costs excluding additional contingency. The accuracy of a Budget Level 0 estimate is considered a mean value with a 50% probability that the value will not be exceeded.

The budget level capital estimates were generated specifically for the purpose of generating cost-of-service comparisons and care was taken to prepare all estimates on a common methodology. Part of the capital costs are independent of the pipeline diameter and were estimated separately from costs dependent on diameter. An estimate of miscellaneous and indirect costs common to all pipeline diameters are contained in Table # 0.1. All pipeline capital cost estimates are expressed in year 2006 dollars.

**Table # 0.1: Capital Costs Independent of Pipeline Diameter**

	\$mm
<b>Miscellaneous</b>	
Cathodic protection	6
SCADA & communications	5
Camps & catering	88
Medical, gravel royalty & air freight	1
Handle materials	4
Material mining and processing	4
HDD stream crossings	12
<b>Total miscellaneous</b>	<b>116</b>
<b>Indirect costs</b>	
Detailed engineering	32
Surveying	5
Permitting	7
Quality control	20
Project management	42
Purchasing	6
<b>Total indirect costs</b>	<b>113</b>

Material costs vary with the pipeline diameter, U.S. Department of Transportation pipe class and operating pressure. The U.S. DOT code 192 requires that the pipeline wall thickness be determined based on population density and the number of buildings proximate to the pipeline. Cross-country natural gas transmission pipelines through

unpopulated areas are generally designed according to DOT Class 1. DOT Class 2 criteria was assumed for 40 miles of the 319-mile route from Fairbanks to Wasilla near populated and was assigned a thicker wall pipe. The pipe wall thickness used to prepare the capital cost estimates for the J-curve analyses are shown in Table # 0.2.

**Table # 0.2: Pipe Wall Thickness according to Operating Pressure and DOT Class Location**

	18-inch	20-inch	24-inch	28-inch
<b>1,480 psig MAOP</b>				
Class 1 (inch)	0.265	0.294	0.353	0.412
Class 2 (inch)	0.318	0.353	0.423	0.494
<b>2,500 psig MAOP</b>				
Class 1 (inch)	0.447	0.497	0.596	0.695
Class 2 (inch)	0.536	0.596	0.715	0.834

The Budget Level 0 capital cost estimates for the four diameter pipeline scenarios subject to 1,480 and 2,500 psig maximum allowable operating pressures are shown in Table # 0.3 and Table # 0.4.

**Table # 0.3: Budget Level Pipeline Capital Costs, 1,480 psig MAOP**

	18-inch	20-inch	24-inch	28-inch
<b>Construction Contractor Costs</b>				
Direct	163	165	169	173
Indirect	59	59	60	60
Sub-total	222	224	229	233
Contractor mark-up (20%)	44	45	46	47
<b>Total Contractor Costs</b>	267	270	275	280
<b>Materials</b>	190	216	298	417
<b>Miscellaneous</b>				
Common to all diameters	116	116	116	116
Handle materials	4	4	7	9
<b>Total Miscellaneous</b>	120	120	123	125
<b>Indirect costs</b>	113	113	113	113
<b>Owner costs &amp; contingency</b>	0	0	0	0
<b>Total Project Costs</b>				
	689	719	809	935

**Table # 0.4: Budget Level Pipeline Capital Costs, 2,500 psig MAOP**

	18-inch	20-inch	24-inch	28-inch
<b>Construction Contractor Costs</b>				
Direct	164	167	172	175
Indirect	60	60	60	60
<b>Sub-total</b>	224	226	232	234
Contractor mark-up (20%)	45	45	46	47

<b>Total Contractor Costs</b>	269	271	279	282
<b>Materials</b>	274	333	465	622
<b>Miscellaneous</b>				
Common to all diameters	116	116	116	116
Handle materials	6	8	11	15
<b>Total Miscellaneous</b>	122	124	127	131
<b>Indirect Costs</b>	113	113	113	113
<b>Owner Costs &amp; Contingency</b>	0	0	0	0
<b>Total Project Costs</b>				
	778	841	984	1148

The schedule of capital outlay for pipeline construction is addressed in the economic analysis used to determine pipeline COS in the J-curve analyses. The capital outlays for pipeline construction, expressed in percent of total cost by year, prior to start-up are shown in Table # 0.5.

**Table # 0.5: Outlay of Pipeline Capital Costs, % per year**

	Year 1	Year 2	Year 3	Year 4	Total
<b>1,480 psig MAOP</b>					
18-inch	5	24	43	28	100
20-inch	5	24	43	28	100
24-inch	5	25	45	25	100
28-inch	4	26	48	22	100
<b>2,500 psig MAOP</b>					
18-inch	5	25	45	25	100
20-inch	4	26	46	24	100
24-inch	4	27	49	20	100
28-inch	3	28	51	18	100

### ***Pipeline Operating Costs***

Enstar's rule-of-thumb regarding the annual operating cost of their gas transmission pipelines in the Cook Inlet area is approximately \$6000 per mile. Application of this factor over the 319-mile spur line alignment used for J-curve analysis results in an annual operating costs of approximately \$2 million. Much of the spur line will be located in remote areas thereby increasing the costs over the Enstar rule-of-thumb value. The J-curve analyses are based on a \$5 million annual pipeline operating cost. This cost includes pipeline surveillance and occasional running of monitoring pigs. The pipeline operating cost has minimal impact on the COS and the rough approximation of \$5 million is sufficient for the purpose of comparative J-curve analysis.