APPENDICES

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APPENDIX A

ESTIMATED LABOR REQUIREMENTS AND ASSOCIATED COSTS CAMP, AIRPORT, AND TOWNSITE O/M

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435.60 1.069.20 13,064.00 35,912.95 254,83 1.81,81 7,464,90 5,012.45 254,83 1.81,81 7,744,90 55,012.45 291,15 2.668.05 11,414.50 131,710.05 391,15 2.591.62 11,107.80 131,770.05 391,15 2.515.59 10,781.10 131,170.05 392,37 2.515.59 10,781.10 131,170.05 392,37 2.515.59 235,400 134,44.50 392,50 3.043.00 131,010.05 30,534.00 1,065.46 1,0,780.10 391,37.20 301,39,25 1,063.46 1,0,780.10 391,37.20 304,40 1,012,77 1,080.40 135,40,00 134,40 1,012,76 2,041.05 30,254.00 134,40 1,022,71 1,068.00 135,414,50 30,301 1,012,71 2,041.07 391,41,20 301,41,20 1,012,71 2,043.00 135,414,90 301,414,90 1,012,71 2,043.00	GESCRIPTION	QUANTITY	HOURLY RATE	DAILY RATE (1)	PAYROLL BURDEN 305	OVENHEAD AND GEA 50%	SUB-TOTAL	FEE - 10%	DAILY TOTAL	WEEKLT TOTAL	MONTHLY TOTAL JD	ANHVAL TOTAL 365	
1 1.1.0 1.2.0 2.4.0.1 1.0.0 2.4.0.1 1.0.0 2.4.0.1 1.0.0 2.4.0.1 1.0.0 2.4.0.1 1.0.0 2.4.0.1 1.0.0 2.4.0.1 1.0.0 2.4.0.1 1.0.0 2.4.0.1 <th< td=""><td>Project Manager</td><td>1</td><td>20.00</td><td>220.00</td><td>66,00</td><td>110.00</td><td>396.00</td><td>39,60</td><td>435.60</td><td>3,049.20</td><td>13,068.00</td><td>158,994.00</td><td></td></th<>	Project Manager	1	20.00	220.00	66,00	110.00	396.00	39,60	435.60	3,049.20	13,068.00	158,994.00	
Troyer Ng 2 346.70 104.61 134.70 346.70 134.70 245.50 245.70 215.32 11.1 2456.05 213.13 2456.70 11.1 235.37 235.36 235.30 <td>Secretary</td> <td>1</td> <td>11.70</td> <td>128.70</td> <td>38.61</td> <td>64.35</td> <td>231,66</td> <td>23.17</td> <td>254,83</td> <td>1.763.81</td> <td>7,644.90</td> <td>53,012,95</td> <td></td>	Secretary	1	11.70	128.70	38.61	64.35	231,66	23.17	254,83	1.763.81	7,644.90	53,012,95	
Return Mat. 1 7.9.0 39.3.0 57.3.5 96.50 37.45 397.15 2.466.05 11 1 (11) 1 1.9.0 317.0 54.55 91.3 35.76 392.17 2.315.49 10. 1 (11) 1 1.9.0 317.0 54.55 91.3 35.76 392.17 2.315.49 10. 1 (11) 1 1.6.0 317.0 54.55 91.31 35.76 53.56 73.55 11. 1 (12) 1 1.6.0 317.0 54.50 35.40 31.56 73.55 11. 1 (12) 2 1.0.0 230.00 53.60 11.4.00 35.60 32.61 11.7. 1 (15) 2 10.0 230.00 53.60 11.4.00 35.60 32.61 11.7. 1 (15) 2 10.0 23.00 11.4.00 32.1.0 11.4.0.0 32.61 11.7. 1 (16) 2 11.0 11.0 11.0.0 11.0.0 24.60 11.0.0 11.0.0 11.0.0 1 (16) 2 11.0 11.0.0 11.0.0 24.60 11.0.0 11.0.0 11.0.0 11.0.0 1 (16) 2 1.1.0.0 11.0.	Total Project Mgt.	2		348.70	104.61	174.35	627.66	62.77	690.43	4.833.01	20,712.90	252,005.95	
Iteration Mer. 1 17.50 132.50 52.15 11.5 2.566.05 11.5 1 & Adata 1 16.50 11.51			_										
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	Administration Mgr.	1	17.50	192.50	57.75	96.75	346.50	34.65	361.15	2.668.05	11,434.50	139,119.75	
6 4 cert. Sign. 1 16.30 181.50 54.45 90.15 325.70 325.70 325.30 235.30 325.31 </td <td>Contracts Admin.</td> <td>-4</td> <td>17.00</td> <td>187.00</td> <td>56,10</td> <td>93.50</td> <td>336.60</td> <td>33.66</td> <td>370.26</td> <td>2,591.82</td> <td>11,207.80</td> <td>135,144.50</td> <td></td>	Contracts Admin.	-4	17.00	187.00	56,10	93.50	336.60	33.66	370.26	2,591.82	11,207.80	135,144.50	
algap. 1 ia.50 1050 5460 5260 5361 2361	Finance & Arct. Sup.	1	16.50	181.50	54,45	90.75	326.70	32.67	359.37	2,515,59	10,781.10	131,170.05	
Ubecier 1 20.00 220.00 138.00	Personnel Sup.	1	16.50	181.50	54.45	90.75	326.70	32.67	359.37	2.515.59	10,781.10	131,170.05	
disc/file 3 1,000 33.400 132.40 <td>Medical Doctor</td> <td>1</td> <td>20,00</td> <td>220,00</td> <td>66.00</td> <td>110.00</td> <td>396,00</td> <td>39.60</td> <td>435.60</td> <td>3,049,20</td> <td>13,068.00</td> <td>156,994.00</td> <td></td>	Medical Doctor	1	20,00	220,00	66.00	110.00	396,00	39.60	435.60	3,049,20	13,068.00	156,994.00	
Technician 2 13.50 331.00 100.00 131.00 110.00 530.01 613.60 613.60 613.60 613.60 613.60 613.60 613.60 613.60 613.60 613.60 613.60 613.60 613.60 613.60 613.60 730.01 2000 131.80 730.01 2001 131.80 2001 131.80 2001 131.80 2001 131.80 2001 231.80 2001 131.80 2001 131.80 2001 131.80 2001 131.80 2001 131.80 2001 131.80 2001 131.80 2011 131.80 2011 213.80 2011 213.80 2011 213.80 2011 213.80 2011 213.80 2011 213.80 2011 213.80 2011 213.80 2011 213.80 2011 213.80 2011 213.80 2011 213.80 2011 213.80 213.8	Para-Medic/EN		16.00	528.00	158.40	264.00	950.40	95.04	1,045.44	7,318.08	31, 363, 20	381.585.60	
cetta 3 15.50 \$11.50 \$11.40 \$13.10 \$14.30 \$13.10 \$10.01 \$13.00 \$10.01 \$13.00 \$10.01 \$13.00 \$10.01 \$13.00 \$10.01 \$13.00	Medical Technician	2	15.50	341-00	02.3D	00.021	613.80	61.38	675.18	4,726.26	20,255.40	246.440.70	
Order 3 11.00 163.00 131.30 65.14 11.13 5,001.13 24.04.3.00 131.35 5,001.35 131.35 5,001.35 131.35 5,001.35 131.35 5,001.35 131.35 5,001.35 131.35 5,001.35 131.35 5,001.35 131.35 5,001.35 131.35 5,001.35 131.35	Accountants	6	15.50	511,50	153.45	255.75	920,70	92,07	1,012.77	7.089.39	30,383.10	369.661.05	
Z 10.00 270.00 66.00 110.00 5.766.85 5.733.45 5.733.45 130.65 111.5 111.5 111.5 111.5 111.5 111.5 111.5 111.5 111.5 111.5 111.5 111.5 111.5 112.5	Clerk/Typist	e	11 00	361.00	108.80	181.50	653.40	65.36	218.74	5,031.18	21.562.20	262, 340, 10	
Identification 18 2.986.00 17.1 1463.00 5.786.65 5.783.45 40.55.35 17.3 CPD maintar fitz 1 17.00 37.75 96.23 346.65 37.55 31.5 31.5 31.5 31.5 31.5 CPD maintar fitz 1 17.00 36.10 35.75 95.23 346.6 31.65 31.65 31.15 31	Typist	2	10.00	220.00	66.00	110.00	396.00	39.60	435.60	3,049.20	13.068.00	158,994.00	
Type 1 11.54 122.50 52.75 56.25 36.4.6 74.65 711.13 2.668.405 11. Tarimating Her. 1 11.00 137.00 55.10 93.53 73.66 73.65 73.4.25 24.4.2 11.1.13 Tarimating Her. 1 11.00 137.00 55.10 93.53 73.66 73.6.2 219.1.8 11.1.13 Leal/Herb. Ene. 1 10.10 137.00 55.10 93.53 73.54 70.2.53 2.591.82 10.1.13 Leal/Herb. Ene. 1 10.11 156.94 47.06 73.16 73.2.92 73.5.21 2.195.42 10.1.14 Attra. Sup. 1 10.11 179.40 53.18 89.70 73.2.92 35.5.11 2.195.46 21.1.20 Attra. Sup. 1 1.179.40 53.18 10.1.20 113.50 113.50 113.50 23.5.21 2.195.46 23.5 Attra. Sup. 2 1 11.50 131.50 131.50 131.50 23.5 246.47 23.5 Attra. Sup. 2 2 2 2 2 246.47 23.5 246.47 23.5 Attr. Sup. 2 2 2	Total Administration	81		2.926.00	R72.BU	1,653.00	5.266.55	326.68	5,793.48	40,554.36	173.804.40	2.116,620.20	
TCPIanding Htt. 1 11-G1 192.50 57.53 96.25 96.25 36.64.05 31.65 31.15 31.65 31.15 Refinent 1 11.00 187.00 56.10 93.50 31.66 31.66 31.05 2.511.82 31.15 Refinent 1 12.00 187.00 56.10 93.50 31.66 31.66 31.75 2.511.82 31.15 Refinent 1 16.11 179.40 53.16 51.20 32.32 35.51 2.466.47 10.4 Refen 1 16.11 179.40 53.82 89.70 372.32 35.52 2.466.47 10.4 Refen 1 16.11 179.40 53.82 89.70 372.32 35.52 2.466.47 10.4 Refen 1 16.11 179.40 53.82 89.70 372.32 35.52 2.466.47 10.4 Refen 2 16.11 179.40 53.82 93.70 35.23 2.466.47 10.4 Refen 2 2 2 2 2 2 2 2 2 Refen 1 1 1 1 170.40 5 3 2					•								
Refiner I 17.00 137.00 56.10 91.50 316.60 310.55 2.311.87 11. Ical/Mech. Euc. 1 12.00 137.00 56.10 91.50 316.60 310.55 2.131.81 11.0 31.75 2.131.81 11.0 31.75 2.135.18 11.0 resum 1 14.31 173.00 55.10 315.61 370.25 2.135.18 10.0 31.75 1.10.57 2.135.18 10.0 resum 1 14.31 173.00 53.02 93.70 323.40 7.20 355.21 2.466.47 10.0 resum 1 16.11 179.40 53.02 311.50 315.22 2.466.47 10.0 resum 2 1 16.11 179.40 53.12 315.21 2.15 11.0 resum 2 1 1 311.60 311.50 312.20 2.15 2.15 2.15 2.15 2.15 2.15 2.15 2.15 2.	Pacility/Planning Mar.	1	17.50	192.50	57.75	96.25	346.50	59 92	381,15	2,663,05	11 416.50	139,119,75	
Isial/Metch. Ent. I 12.00 187.00 56.10 91.51 21.54 21.54 21.75 2.591 11. arren 1 16.11 15.94 (7.08 74.70 22.49 23.521 2.175.18 70.26 arren 1 16.11 15.91 179.40 53.62 83.70 37.2 23.249 35.521 2.486.47 10.4 arren 1 16.11 179.40 53.62 83.70 312.92 35.521 2.486.47 10.4 Counde Sup. 1 16.11 179.40 53.62 89.70 32.92 32.29 35.521 2.486.47 10.4 Counde Sup. 1 16.11 179.40 53.20 10.15 35.21 2.486.47 10.4 Counde Sup. 1 16.31 179.40 53.20 10.15 35.21 2.486.47 10.4 Counde Sup. 2 10.15 11.5 67.32 11.6.5 2.21 10.4 Counde Sup. 2 11.5 314.00 112.20 181.70 67.32 31.65 2.1 Counde Sup. 1 1 1 1 1 10.6 21.20 11.6 11.6 11.6	Civil Engineer	1	13.00	187.00	56.10	93.50	376.60	73.55	320.26	2.591.82	1 107.90	135,144.90	
Terrent 1 10.1 156.54 77.06 78.47 287.49 78.76 31.75.18 91. raffit. Sip. 1 16.11 179.40 53.62 89.70 372.49 355.21 2466.47 10.0 raffit. Sip. 1 16.11 179.40 53.62 89.70 372.49 355.21 2466.47 10.0 raffit. Sip. 1 16.11 179.40 53.62 89.70 372.49 355.21 2466.47 10.0 rafter Sup. 1 16.11 179.40 53.62 89.70 372.49 355.24 710.4 215.21 2466.47 10.0 rafter Sup. 2 16.50 363.00 108.50 181.20 653.44 710.2 215.21 246.47 10.0 rafter Sup. 2 11.00.0 374.00 51.82 10.1 21.2 215.21 215.61 215.21 215.61 215.21 215.61 215.21 215.61	Riectrical/Nech. Eng.	1	00°21	187.00	56.10	93.50	336.60	33.66	370.26	2,591.82	11,107.80	135,144.90	
raffir. Sup. i i6.1 179.40 53.62 69.70 327.97 35.521 2,486.47 10. Counda Sup. i i6.1 189.40 53.62 69.70 332.97 35.521 2,486.47 10. Counda Sup. i i6.1 189.40 53.62 89.70 323.97 35.521 2,486.47 10. us Sup. i i6.1 189.40 53.62 89.70 323.97 35.51 2,486.47 10. us Sup. 2 i6.10 33.60 181.50 653.40 65.340 51.02 355.21 2,486.47 10. cer/Perinter 2 11.00 131.50 181.50 653.40 673.32 706.52 5,183.42 223. ft 1 130.00 131.50 131.50 135.50 13.53.21 12.466.47 213.43 223.44 ft 1 131.00 673.40 673.40 673.42 231.42 231.46 244.4 231.46	Draftsperson	1	16.31	156.94	47.08	78.47	282.49	28.25	310.74	2,175.18	9,322,20	113.420.10	
Ground Sup. i i h, 11 179.40 53.82 89.70 32.92 355.21 2486.47 10. las Suv. i i h, 11 i h, 11 i j, 20 35.24 35.24 355.21 2486.47 10. las Suv. 2 i j, 5.00 351.00 108.90 311.50 53.40 55.34 718.74 5,031.18 211.32 cert/retineer 2 i j, 5.00 351.00 108.90 112.520 187.00 67.32 740.52 548.45 22.43 certime 2 i j, 0m 374.00 112.520 187.00 67.32 310.52 548.45 23.45 certime 1 1 10m 374.00 112.520 187.00 67.32 310.52 248.64 23.75 certime 4 1 1 1 136.60 310.52 273.64 41.1 certime 4 1 1.10.74 1.107.41 1.197.64 1130.52 273.74 27.706	Bide. Maint. Sup.	-	16.31	179.40	53.82	89.70	322.92	32.29	355.21	2,486.47	10.656.30	129,651.65	
Res Bur. I I IS.11 179.40 53.62 195.40 53.62 2466.47 10. cr 2 16.30 363.00 108.90 181.50 65.34 718.74 5.031.18 21. cr 2 16.30 374.00 112.20 181.50 65.34 716.72 5.183.64 23.5 clm 2 17.00 374.00 112.20 187.00 67.32 740.52 5.183.64 23.5 clm 2 17.00 374.00 112.20 187.00 67.13 740.52 5.183.64 23.5 clm 1 10.01 187.00 55.10 312.60 17.02 37.02 19.162 21.1 clm 1 10.01 187.00 211.20 312.60 17.02 370.26 4.10 27.1 27.1 27.1 27.1 27.1 27.1 27.1 27.1 27.1 27.1 27.1 27.1 27.1 27.1 27.1 27.1<	Roads & Grounds Sup.	1	16.31	179.40	53.82	89.70	322.92	12 24	355.21	2.486.47	10,656.30	129,651.65	
er/feitnetr 2 16.70 16.70 16.70 16.70 $5.031.16$ $5.031.16$ $5.031.16$ $5.031.16$ $5.031.16$ $5.031.16$ $5.031.16$ $5.031.16$ $5.031.16$ $5.031.16$ $5.031.16$ $5.031.16$ $5.031.16$ 52.16 51.10 117.00 374.00 112.20 187.00 671.20 67.32 740.52 $5.163.64$ 22.52 filmet Matal 1 10.01 187.00 51.10 312.60 $21.50.72$ $21.91.61$ 21.52 art Operator 4 1 11.00 232.00 $1.16.72$ $11.93.922$ $9.132.06$ 41.1 art Operator 4 1.4 $1.6.741$ $1.167.41$ $1.945.70$ 700.45 $71.92.25$ $9.132.06$ 41.1 art Operator 4 $1.126.741$ $1.945.70$ 700.45 $71.92.25$ $21.91.22$ $21.91.22$ $21.91.22$ $21.91.22$ $21.91.22$ $21.91.22$ $21.91.22$ $21.91.22$ $21.91.22$ $21.91.22$	Nethicias Sup.	-	16-31	179.40	53.82	89.70	322.92	32.29	155.2I	2.486.47	10.656.30	129,651.65	ļ
2 11.00 374.00 112.20 112.20 112.20 112.20 112.20 112.20 112.61 22.3 Ribert Martal 1 1 17.00 374.00 112.20 112.20 112.61 21.5 51.61 22.5 Ribert Martal 1 17.00 187.00 56.10 91.50 136.60 13.66 21.5 11.1 Ribert Martal 1 17.00 187.00 211.20 352.00 1.36.70 12.61.2 1.393.92 9.159.64 41.4 art Operator 4 1 11.00 211.20 352.00 1.36.05 1.30.07 37.64 41.1 art Operator 4 1.4 1.4 1.46.40 1.167.41 1.945.70 7.004.51 7.004.51 21.26 8.100.77 27.5 art Operator 4 1.1.120.66 1.167.41 1.945.70 7.004.51 7.704.96 32.934.72 23.14 art Operator 611.4 1.945.70 7.004.51 1.704.46 32.934.72 23.14 art Operator 611.1 1.945.70 7.004.51 1.704.46 32.934.72 23.14 (1) 10 bour work day (overtize 0 11/5 regot 1.104.56 7.704.56 32.934.72<	Carpentar (Painter	2	16.50	363.00	108.90	181.50	653.40	65.34	718.74	5,031.18	21.562.20	262,340.10	
Clam 2 11.00 374.00 112.20 187.00 67.32 740.52 5.183.64 22.5 Silbert Metal 1 1 17.00 187.00 56.10 91.50 136.60 370.26 3.591.82 11.1 Silbert Metal 1 1 17.00 187.00 56.10 91.50 136.60 13.66 13.7.66 11.1 Silbert Metal 4 1 1 10.01 57.7.6 11.20 135.06 11.20 37.5 11.1 11.20	Plumher	2	17.00	00.47E	112.20	187.00	623.20	67.32	740.52	5.183.64	22,215.60	270,289,80	
Silter Metal 1 11.00 187.00 56.10 91.50 136.60 13.66 170.26 2.591.82 11.1 nr. Operator 4 16.00 201.30 211.20 322.00 1.261.70 1.593.92 9.159.44 41.1 nr. Operator 4 1.4 627.76 188.32 313.66 1.100.17 371.2 (1) Low work day (overtize ê 1½ reg. rate uver 8 hours per day). 1.126.51 7.000.45 7.704.96 53.934.72 231.1 (1) 20 hour work day (overtize ê 1½ reg. rate uver 8 hours per day). 1.945.70 7.000.45 7.704.96 53.934.72 231.1	Flectrician	2	17.00	00.976	112.20	187.00	673.20	67.32	740.52	5.183.64	22,215.60	270,289.80	
nr. Operation 4 16. (n) 704,00 211,20 322.00 1.261.72 1.393.43 41.0	Welder/Sheet Netal	1	17.00	187.00	56.10	93.50	336.60	33.66	370.26	2,591.82	11,107.80	135,144.90	
4 14.11 627.76 188.32 313.69 1.706.61 113.20 112.22.96 8.100.72 37.5 (1) 20 bour work day (overtion ê 1½ reg. rate over 8 hours per day). 1,945.70 7,004.51 700.45 53,934.72 231.1 (1) 20 bour work day (overtion ê 1½ reg. rate over 8 hours per day). 1,945.70 7,004.51 700.45 53,934.72 231.1	Pentament Omerator	4	16.00	704.00	02.115	352.00	1.267.20	126.72	1,393.92	9.757.44	41,817,60	508,780.80	
(1) 10 hour work day (overtiene ê lå reg. rate over 6 hours per day). (1) 10 hour work day (overtiene ê lå reg. rate over 6 hours per day). (1) 10 hour work day (overtiene ê lå reg. rate over 6 hours per day). (1) 10 hour work day (overtiene ê lå reg. rate over 6 hours per day). (1) 10 hour work day (overtiene ê lå reg. rate over 6 hours per day).	Laborer	4	16.31	627.76	188.32	313.88	1,129.96	00.611	1,242.96	8.700.72	37,268.80	453,680.40	
(1) 10 hour work day (overtime @ 1½ reg. rate over & hours per day).	10. 1			3,891.40	1,167.41	1,945.70	7.004.51	700.45	7,704.96	53, 934. 72	231,148.80	2,812,310.40	
		our work day (o	wertime 8 lh n	eg. rate over 8	t hours per day	y).					ບ້	IRI/H&N	
Beluga Methanol Project 0 & H Fersonael-S0 Man Ca 1 Townsite 1 atter No. 0 f											ESTUMATIN	C ENGINEERING WO	ISHEET
0 6 H Personael-50 Han Ca Townaite Attention of A Personael-50 Han Ca Townaite Attention of A Personael-50 Han Ca											Beluca Mer	hanal Project	
Townaite avert No. of Jos Wo. 7400 (MERARDAY Critece OF Jos Wo. 7400 (MERARDAY CRITECE) Jos Wo. 7400 (MERARD											0 & H Perm	ormel-50 Man Can	4
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Antion Job/Join Life/Join Job/Join Tout-Join Job/Join	DESCRIPTION	QUANTITY	HOUALY RATE	CALY RATE (1)	PAYROLL BURDEN 505	DVERHEAD AND CEA 50%	2UB-TOTAL	FEE - 101	DALY TOTAL	WEEKLY TOTAL	NONTHLY TOTAL	306 305	
engle Gerrative 2 (6.01) 132.00 153.00 613	62			3,891.40	1,167.41	1,945.70	7,004.51	100.45	7,704.96	53,934.72	231,148.80	2,812,310.40	
m. Come, Yah. 1 17:00 19:00 19:00 19:00 23:00 19:05 23:01	Cater/Seusoe Cherafor	2	16.00	352.00	105.60	176.00	633.60	63.36	696,96	4.678.72	20,908.80	254, 390.40	
Num. 2 11.00 35.00 113.00 55.00 59.11 201.1 201	Telephone Com. Vech.	-	17-06	187.00	56.10	93-50	336.60	33.66	370.26	2.591.82	11.107.80	135,146.90	
Jank Obstructs 2 16.00 332.00 115.00 156.00 156.00 156.00 156.01 345.0	Clark/Tuniat	-	11.00	363.00	108-90	101.50	653.40	65.34	718.74	5,031.18	21,562.29	262.340.10	
Radiitys 30 5,1(6; (n) 1,5(3, (n) 1,5(3, (n) 1,5(3, (n) 1,5(3, (n) 1,1(3, (n) 2,1(6, (n) 1,1(3, (n)	Batter Digar Anerator	2	16-0D	352.00	105-60	176.00	633.60	63.36	696.96	4.875.72	20,508.80	254,350.40	
metriforatietien fr. 1 17.30 179.10 199.10 129.23 199.11 120.466.17 100 100 100 110 110.10 199.10 100 100 110 110.10 199.10 100 100 110 <th>Total Pacility</th> <td>8</td> <td></td> <td>5,145.40</td> <td>1,543.61</td> <td>2,572.70</td> <td>9,261.71</td> <td>926.17</td> <td>10,187.86</td> <td>71,315,16</td> <td>305,636.40</td> <td>3.719,576.20</td> <td></td>	Total Pacility	8		5,145.40	1,543.61	2,572.70	9,261.71	926.17	10,187.86	71,315,16	305,636.40	3.719,576.20	
metrifontieties I 17.30 192.50 51.55 56.55 36.65 31.13 2.666.05 11.3 Refifentieties 1 16.31 177.40 53.85 99.70 23.35 97.33 37.31 2.666.15 10. Refifentieties i 1 16.31 175.40 73.85 97.13 2.466.47 10. Refifentieties i 1 1.6.31 1.653.4 10.05 2.824.60 1.424.40 21.466.45 71. Refifentieties 1 1 1.6.31 1.653.4 2.854.60 2.824.60 1.402.40 2.466.47 10. Refifentieties 1 1.6.31 1.134.40 31.35.21 2.466.47 10. Refifentieties 1 1.6.31 1.66.40 21.32.32 2.346.45 10. Refifentieties 1 1.6.44 1.134.40 3.25.15 1.131.73.46 1.131.73.46 2.346.47 10. Refifentieties 1 1.32.30 3.26.53 <													
Telefiel 5 9 1 16.11 179.40 53.82 99.70 322.92 32.39 355.31 2.466.47 20 Refer 1 0.0.11 1779.40 33.82 99.70 172.40 137.31 2.466.47 30 Refer 1 0 1 1.450.40 470.56 773.40 172.40 173.40 21.466.47 10 Refer 0 1 1 1.450.40 236.40 246.40 1.20.56 1.466.46 11.30 Refer 1 1 1 1.451.40 237.40 237.30 1.405.46 21.30 2.466.47 10 Refer 1 1 1 1 1.401.40 237.30 2.466.47 10 Refer 1 1 1 1 1.401.40 2.466.47 10 Refer 1 1 2.313.42 2.466.47 10 2.466.47 10 Refer 1 1 2.323.43	Turrivement / Losterles ad	-	17.50	192.50	57.75	96.25	346.50	34.65	S1.18t	2,668.05	11,434.50	139,119.25	
Alternoor I 0.7.1 179.40 53.42 09.70 272.30 35.31 2.066.67 20.66 7.1 Poist 8 11.00 396.00 270.40 464.00 1.722.40 21.721.40 23. Poist 6 10.1 1.456.40 31.66 35.00 2.066.67 20.66 20.66 51. 51.00 2.066.67 20.66 51. Poist 10 1.0.1 1.456.40 31.65 35.00 2.066.67 31.60 2.066.67 31.60 2.066.67 31.60 2.066.67 31.60 2.066.67 31.60 2.066.67 31.60 2.066.67 31.60 2.066.67 31.61 66. 11.00 10.01 12.65.00 31.64 3.389.20 31.90.20 31.91.66 40.0	Mussesses and a first sector of a	-	16.11	179-40	53.82	89.70	322.92	32.29	355.21	2,486.47	10,656.30	129.651.65	•
mean s 11.00 963.00 174.46 174.36 131.46.4	Transportation and		16-31	U7"b21	53.82	89.70	322.92	32.29	355.21	2.486.47	10,656.30	129.651.65	
10 1,513 1,553,40 40,68 78,70 2,824,50 2,824,50 2,173,193 21,751,80 21,751,80 21,751,80 21,655,15 16,60 11,665,15 16,60 11,665,15 16,60 11,665,15 16,60 11,665,15 16,60 11,663,15 16,60 2,11,50 2,25,10 1,239,27 31,50 2,166,47 10,1 eff framm 1 16,31 1,864,00 31,60 32,30 1,457,30 35,51 2,135,41 10,1 eff framm 1 16,31 1,264,01 31,253,11 355,30 1,457,30 14,64,54,56 41,6 11,1 eff framm 1 16,31 31,25,31 355,31 355,31 355,31 3,35,32 9,375,45 41,6 montair 1 1,31 3,55,31 3,55,31 3,55,31 3,531,46 41,4 montair 1 1,31 3,55,31 3,55,31 3,55,31 3,531,46 41,4 montair 1 1,41 1,32,31	Marciouse Jup.		11 00	AAR OO	290.40	484.00	1.742.40	374.24	1.926.6.	13,416.48	57.499.20	699.573.60	
R. Montrater 5 16.00 1.056.01 36.60 92.60 1.303.02 3.330.00 3.733.02 3.733.02 3.753.02 5.6107.46 1.01 ed berneteer 1 1 10.0 10.0 313.00 3.353.00 3.55.00		5	14 11	07-092-1	470.80	764.70	2,824.90	282.50	3.107.40	21,751.80	93,222.00	1.134.201.00	
m. memore 12 12. 1	Taboler	2	10.21	1 056 00	316.80	528.00	1.900.80	160.08	2 (190, 88	14,636,16	62.726.40	02 121 592	
eff Fermin i (6.11 179.40 53.41 89.70 323.29 37.73 355.21 2,666.47 30 and form a i.6.00 716.00 716.00 136.10 136.12 139.53 2,797.45 2,199.74 41. and form i.e.00 716.00 716.00 31.10 353.00 1.267.20 136.19 2,199.74 41. and form i.e.01 12.00 136.19 3,55.10 1,267.20 31.15 2,199.25 21.1 and form i.e.1 17.00 137.40 5,15 5,15 36.19 12,177.72 14.054.60 21. and form i.e.1 17.00 137.50 5,15 36.50 36.5 38.15 11. from start i 1 17.00 137.50 5,15 38.25 31.15 2,156.60 11. from start i 1 10.00 35.15 36.55 31.65 31.15 2,156.60 10.0 and start i 1 10.00 35.15 32.47 32.29 31.15 2,156.60 10.0 and start i 16.1 12.40 59.40 38.47 32.29 31.2	TOULOGENE SUPERIOUS	. :	16 21	1 467 70	565.00	941,64	3.389.92	339.00	1.228.92	26,102,44	111,867.60	1.361.055.BD	
at. bit. 711.30 352.00 1,557.30 115.72 1,393.52 9,153.44 61 at. 1 1 1 0 35.00 31.56 11.66 9,159.44 61 att. 1 1 1 0 35.10 31.57.10 11.37 31.05.45 91.33 21.33 21 Attribut 1 1 1 1 0 35.10 31.64 11.37 11.05 9.331.45 21.331.45 21.331.45 21.331.45 21.331.45 21.331.45 21.331.45 21.331.45 21.331.45 21.331.45 21.331.45 21.331.45 21.311.45		-		110 40	53.82	89.70	322.92	32,29	355.21	2,486.47	10,656.30	129.651.65	
And Antale I D.0.0 17.0.0 55.10 91.50 11.60 2.591.69 2.591.69 2.591.69 2.10.05 2.591.69 2.591.69 2.11.00 2.591.69 2.11.00 2.591.69 2.11.00 2.591.69 2.11.00 2.591.69 2.11.00 2.591.69 2.11.00 2.591.69 2.11.00 2.591.60 2.11.00 2.591.60 2.11.00 2.591.60 2.11.00 2.591.60 2.11.00 2.591.60 2.11.00 2.591.60 2.11.00 2.566.00 11.1 11.1 11.1 11.1 11.1 2.11.00 2.591.60 11.1 2.591.60 11.1 2.591.60 2.591.60 2.591.60 2.591.60 2.591.60 2.591.60 2.591.60 2.591.60 2.591.60 2.11.00 2.591.60 2.591.60 2.591.60 2.591.60 2.591.60 2.591.60 2.591.60 2.591.60 2.591.60 2.591.60 2.591.60 2.591.60 2.591.60 2.591.60 2.591.60 2.591.60 2.591.60 2.591.60 2.591.60 2.10.50 2.591.60 2.10.50	Rechantcal Formun		11-11-1		711-20	352_00	1 367 20	126.72	1,293.92	9,757.44	61.817.00	508.780.60	
Mechanistic (c) 17.00 1.00 2.129.51 3.245.19 12.727.06 13.15 2.668.05 41.31 2.668.05 41.31 2.668.05 41.31 2.668.05 41.31 2.668.05 41.31 2.668.05 41.31 2.668.05 41.31 2.668.05 41.31 2.668.05 41.31 2.668.05 41.31 2.468.47 10.24 2.357.68 9.3 Ireffseruntiv 1 11 10 13.6.94 47.08 38.43 28.43 28.43 21.35.16 9.3 Ireffseruntiv 1 1 11 11.00 35.65 47.08 38.47 28.43 21.35.16 9.10 Ireffseruntiv 1 16.11 11.940 35.67 49.10 312.29 12.22.29 135.21 2.135.16 40 Methan 1 16.11 11.940 35.67 47.06 35.64 2.22.92 135.21 2.466.47 10.0 Methan 1 16.11 11.94.06 35.67 28.47	Hechanice	8			10.42	62.19	02 200	33 66	370.26	2.591.82	0101.11	00 241 211	
Instrict 65 1.096.43 6.123.3 3.223.13 1.111.4 1.13.13 2.668.02 11. Instructure 1 17.50 197.50 97.75 96.35 346.50 34.15 21.15 2,668.02 11. Instructure 1 17.00 197.00 56.10 97.30 316.60 31.41 110.74 2,135.18 9. Interfacementer 1 10.11 156.94 47.06 35.47 282.49 21.35 10.74 2,135.18 9. Noter 1 16.31 179.40 53.67 28.47 282.49 21.32 2,156.47 100.1 Noter 1 16.31 179.40 53.67 33.22 32.32 31.32.71 2,466.47 9. Noter 84.0 31.65 31.65 31.25 32.32 31.0 31.66 31.65 31.0 31.0 31.0 31.0 31.0 31.0 31.0 31.0 31.0 31.0 31.0 31.0	<u>Velder/Yachiniar</u>		17 10	187 181					14,054.80	08.387.60	221.666 DO	00 000 01 5	
Roma, Ber. Mar. 1 17.50 132.50 57.15 96.25 34.65 31.15 2,568.02 11. Iref/Security 1 17.00 137.00 56.10 93.50 33.65 31.65	Total Ingistics	59		7,096.38	10.231.2	21-242-5							
Accons. Ser. Mar. 1 17.50 37.12 31.64 31.64 2.597.82 31.1 Itelfseurity 1 11.00 187.00 56.10 93.50 316.60 31.64 2.135.16 9 eper 1 16.11 137.00 56.94 9.106 316.61 21.35 10.74 2.135.16 9 eper 1 16.11 139.40 51.87 89.70 322.92 32.39 355.31 2,466.47 10 eper 1 16.11 139.40 51.87 89.70 322.92 32.31 2,466.47 10 ok 16.61 1 16.11 139.40 51.87 89.70 322.92 315.71 2,466.47 10 ok 16.61 1 16.11 139.40 51.82 47 2 466.47 10 ok 16.61 1 16.11 139.40 51.82 47 2 466.47 10 ok 16.61 1 16.12 38.47 <				197.50	61 TE	96.36		5	31 16	2,668.05	11,434.50	57.911.9C1	
Iref/serurity 1 11.00 20.00 73.2.0 130.00 10.7.4 2.175.1.8 9. oper 1 16.11 156.94 43.08 79.47 282.49 28.7.5 110.7.4 2.175.1.8 9. unrun 1 16.11 156.94 43.08 79.47 282.49 28.7.5 110.7.4 2.175.1.8 9. unrun 1 15.11 156.94 43.08 59.70 322.92 32.32 35.21 2.486.47 10. 0. 1 16.3 387 89.70 322.92 32.32 23.7.2 2486.47 10. 0. 1 16.3 33.87 89.70 322.92 32.32 217.2 2,486.47 10. 0. 1 16.3 33.87 89.70 322.92 32.32 21.12 2,486.47 10. 0. 1 16.3 33.87 89.70 322.92 31.3 21.13 2,486.47 10. 0. 1 16.3 38.47 28.47 282.49 31.1 2,175.18 9. 0. 1 16.1 16.3 36.45 28.47 282.49 28.47 28.47 28.47 21.66<	Heusing/Com. Ser. Ner.		17.50	187_00	61.12 01 32	03 EQ	0, 10,		92 OL	2,591.82	11,107.80	115,144.90	
oper 1 16.11 2.0.17 2.0.24 2.0.24 2.175.18 3. worker 1 16.11 155.94 0.1.06 76.47 282.49 2.0.3 315.71 2.175.18 3. worker 1 16.11 179.40 5.18 9.70 32.292 32.39 315.71 2.466.47 10. dk F.s. Sign 1 16.11 179.40 5.18 89.70 32.292 32.39 315.71 2.4666.47 10. dk - Batar 1 16.11 179.40 5.18 69.70 322.92 39.34 31.32.92 31.31 2.4666.47 10. dk - Batar 1 16.11 119.40 5.8.47 282.49 38.34 31.6 31.2 desc/rate 1 16.11 15.41 282.49 38.2,41 31.2,54 2.134.05 16.738.35 71. desc/rate 1 16.41 217.64 2.134.05 16.738.35 71 10.256 2.136.05	Chief Fire/Security		00-11	156.94	01-02	07162	na arc 1		12.010	2,175.18	9,322.20	113,420.10	
Marker I IG.11 Lan-74 Vi.18 78.47 282.49 28.75 MID.A	Haugereper		14.31	10.004	4/.10	10.91	282.19			2 175 18	9.322.70	113.420.10	
Of: F.S. Sign. 1 16.11 1.19.40 53.87 89.70 32.29 32.32 15.21 2.4686.47 10. ob. z. Batar 1 16.11 1179.40 53.82 89.70 32.42 32.42 35.21 2.4686.47 10. ob. z. Batar 1 16.11 179.40 53.82 89.70 32.42 32.42 315.71 2.686.47 10. At batar 1 16.11 156.94 47.08 78.47 782.49 28.24 31.34.05 16.736.35 71. ubloc: 1 14.31 156.94 47.08 78.47 782.49 28.24 28.24 28.24 21.24 2.175.16 9. ubloc: 1 1.6.31 564.46 2.176.41 213.64 2.136.05 16.756.35 71. (1) 10 hour work day (overtise @ 14 reg. rate over 8 hours per day). 16.2176.41 213.64.05 16.756.35 71. (1) 10 hour work day (overtise @ 14 reg. rate over 8 hours per day). - 2.176.41 213.64.05 16.726.35 71. (1) 10 hour work day (overtise @ 14 reg. rate over 8 hours per day). - - 2.336.05 16.726.35 71. (1) 10 hour work day (overtise @ 14 reg. rate over 8 hours per day). <t< td=""><th>Laundry Vorter</th><td></td><td>16.31</td><td>•6-9cT</td><td>47.08</td><td>18.47</td><td>282.49</td><td>28.25</td><td>TD. TA</td><td>2 6R6 LT</td><td>10.656.30</td><td>1 129 651 65</td><td></td></t<>	Laundry Vorter		16.31	•6-9cT	47.08	18.47	282.49	28.25	TD. TA	2 6R6 LT	10.656.30	1 129 651 65	
of - Bakar 1 16. 31 119.40 33.82 89.70 322.92 32.92 315.71 Z ₁ and the state of the state o	Read Cook F.S. Sup.	1	16.31	179.40	53.82	89.70	322.92	32.29	355.21	14-201-0	01100007	100 617 65	
Ciber Hilper 1 16.41 136.94 47.06 78.47 282.49 38.95 310.74 2.175.18 9. care/Clark 1 16.41 156.94 47.06 78.47 282.49 28.95 21. car/Clark 1 1.209.12 363.73 604.46 2.176.41 21.394.05 16.756.35 71. car/Clark 1 1.209.12 363.73 604.46 2.176.41 21.34.05 16.756.35 71. car/Clark 1 1.209.12 363.73 604.46 2.176.41 21.34.05 16.756.35 71. car/Clark 1 1.209.12 363.73 604.46 2.176.41 21.34.05 16.756.35 71. car/Clark 1 1.209.12 363.73 604.46 2.176.41 21.2.42 2.394.05 16.756.35 71. car/Clark 1 1.209.12 363.73 604.46 2.176.41 21.2.42 2.34.05 16.756.35 71. car/Clark 1 1.209.12 363.73 6.04.46 2.176.41 21.2.44 2.356.35 71. car 0 1 1.2.2.44 2.176.41 2.1.2.44 2.4.44 2.4.44 car	Lead Conk - Bakar	1	16.31	179-40	53.62	89.70	322.92	32.79	12.21	2,980.4/	NF.0C0,UL	C0'TC0'67T	
Color Helper 1 16.31 136.94 47.06 78.47 282.49 38.35 310.74 2.175.18 9. Labor 1 16.31 16.31 16.47 28.45 2.176.41 21.34.05 16.758.35 71. Labor 1 1.209.12 363.73 604.46 2.176.41 21.34.05 16.758.35 71. Labor 1 1.209.12 363.73 604.46 2.176.41 21.34.05 16.758.35 71. Labor 1 1.209.12 363.73 604.46 2.176.41 21.34.05 16.758.35 71. (1) 10 hoar work day (overtize @ 14 reg. rate over 8 hours per day). 10.316.41 21.7.64 21.7.64 2.176.41 21.7.64 2.7.64 2.176.41 21.7.64 2.7.64 2.7.64 2.176.41 21.2.64 2.7.64 2.7.64 2.1.76.41 2.1.7.64 2.7.64 2.7.64 2.6.75 2.7.75 <	Cont												
Reifor: 1 16.31 136.64 47.08 78.47 282.49 28.23 3174 2.175.18 5. coar/Clark 1,209.12 163.73 604.56 2.176.41 217.64 2,394.05 16,758.35 71. coar/Clark 1,209.12 163.73 604.56 2.176.41 217.64 2,394.05 16,758.35 71. (1) 10 hoar work day (overtize @ 14 reg. rate over 8 hours per day). 9.6 0.3 9.6	fast Kirken Halmer												
coar/Clark	Witchen Halnor	1	16 31	156.94	47.05	78.47	282.49	28.25	710.74	2,175.18	9,322,20	113,420,10	
(1) 10 hour work day (overtime @ 14 reg. zate over 8 hours per day). 564,46 2,176,41 212,54 2,394,03 16,726.35 71, (1) 10 hour work day (overtime @ 14 reg. zate over 8 hours per day). 604,46 2,176,41 217,54 2,394,03 16,726.35 71, (1) 10 hour work day (overtime @ 14 reg. zate over 8 hours per day). 604,46 2,176,41 217,54 2,394,03 16,726.35 71, (2) 10 hour work day (overtime @ 14 reg. zate over 8 hours per day). 604,46 2,176,41 21,54 2,94 (2) 10 hour work day (overtime @ 14 reg. zate over 8 hours 604,46 2,176,41 2,94 (2) 10 hour work day (overtime @ 14 reg. zate over 8 hours 604,46 2,176,41 2,94 (2) 10 hour work day (overtime @ 14 reg. zate over 8 hour 604,46 2,176,41 2,94 (2) 10 hour work day (overtime @ 14 reg. zate over 8 hour 604,46 2,176,41 2,94 (2) 10 hour work day (overtime @ 14 reg. zate over 8 hour 604,46 2,176,41 2,94 (3) 10 hour work day (overtime @ 15,41,41 604,46 7,176,41 7,176 (4) 10 hour work day (overtime @ 14,41 7,176,41 7,176 (5) 10 hour work day (overtime @ 14,41 7,176 7,176 (6) 10 hour work day (overtime @ 14,41 7,176 7,176 (7) 10 ho	Fectorson // ort												
(1) 10 hour work day (overtime @ 14 reg. zate over 8 hours per day). Bel 2 6 2 7 2 7 2 7 2 7	2.0°.		•	1,209,12	362.73	604.56	2.176.41	217.54	2, 394.05	16,758.35	71,821.50		
81 10 20 20 20 20 20 20 20 20 20 20 20 20 20		day (overtime			per day).						• •		
- 03 03 03											ESTIMATO	IC ENGINEERING WOR	KSHEET
- 03 Sterring, OF											Beluga Meth	anul Project	
- 03 Statt NC. 0F - 03											9 & M Permo	ociel-50 Man Camp 4	
- 03 5 54ET NO. 07 5 208 NO. 708 NO.											Townsite		
			- 01		SHEET ND.	10			JOB ND.		PREPARED BY	ľ	DATE .
+ 202	TYPE OF ESTIMATE		+ 202			,				8	W. E. Lanz		5/16/81

4-2

M.D. Fireman/Security Capt. Fireman/Security-Off.		HOUNLY MATE DARY AATE (1)	DARY AATE (1)	BURDEN 30%	AND CAA SOS	SUB-TOTAL	FEE - 10%	DAMY TOTAL	WEEKLY TOTAL	ĝ.	ž.
a/Security Capt. n/Security-Off.			1,208.12	362.73	604.56	2,176.41	217.64	2,394.05	16,758.35	21,821.50	£2.828,E78
n/Sacurity-Off.	-	16.50	181.50	54.45	90.75	326.70	32.67	CE.922	2,515,59	10.781.15	131,170.05
	6	16.00	1,056.00	316.80	528,00	1:,900.80	190.08	2.090.88	14.636.16	62.776.60	763,171.20
Safety Englacer	-	16.50	181.50	54.45	90.75	326.70	32.67	76.92E	2.515.59	10.787.10	131,170.05
Clork/Dytat	2	91,00	242.00	72.60	121.00	435-60	43.56	A79.16	1 166 12	14 274 BA	174,893.40
Laborer	-	14.31	156.94	47.08	78-47	282.49	29.25	310.74	2,375,18	9 377 30	113,420.10
Atr Traffic Cuntrol/Radio	2	17.00	374.00	112.20	187-00	673.20	61.32	760.52	5.183-64	22.215.60	270,289.80
Total Com. Service	ন্ন	1	3-601-06	1.620.31	1 700 53	6.127.90	612-19 612-19	6 716 40	6 714 AD		2,457,942.85
						2		20-20-19-	2016270		
Grand Totel	145	14.97(2)	18.919.54	5.675.84	9.459.77	34.055.15	3.405.53	37.462.68	262.224.76	1-127.840.60	13,673,148.20
	-										
SUBBALLY		-									
Project Management	5		. 01.8AE	104.61	174.35	627.66	62.17	640.47	10 18 2	ND 217 06	163 AME DE
Administration	18		2,926.00	877.80	1,463.00	5.266.40	526.68	87-667-5	50° 217' 30	173, 804, 40	2 111 630 PH
Tanti ti tan	8		5.145.40	Γ	2.572.70	0 12 12	016.17	101 00			
	57		ac ao 01		2 2/2 10		19.075	00.101.01	01.416(1)	101.01010101	07-9/C-91/-C
Dotat Ca			BC'BC'A/	T	AT'SHCOP	12,777.08	1,277.72	14,054,80	98.383.60	421.644.00	5.130.002.01
Commuty Services.	20		30,102,6	1,020.31	1,700.53	6.121.90	612-19	6.734.09	E3.8EL.14	202.022.70	2.657.962.85
Total	211		18,919.54	5,675.84	9.459.77	34,055.15	3,405.53	37,560.68	262.224.76	1,123,820.40	13.673.148.20
										-	
		-									
			•								
			-								
(1) 10 hour work day (overtime @ 1½ reg. rate	ay (overtin	e ê 115 reg. re	ta over 8 hour	over 8 hours per day.)						່ວ [:]	CIRI/H&N
(2) Average bourly rate of pay.	rate of pay										ANUNUKANE, ALABKA
										ES LIMA I (NU	ESTINATING ENGINEERING WORKSHEET
										Beluga Methanol Project	noi Project
										O E M Person	O E M Personnel-50 Man Camp &
TVFLOFESTMANT Order of Maonfrude - Preliminary	alisicary +	- 0X + 20Z		SHEET NO. 1	0f 1			JOS NO.		NEPARD BY	CHECKED BY DATE

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Her 1 11,70 Her 1 12.50 Reservich 1 17,00 Report 1 15.50 Br 2 16.50 Br 3 15.50 Br 3 15.50 Br 3 15.50 Br 3 15.60 Br 3 16.01 Br 3 16.01 Br 1 1.00 Br 1 1.01 Br 1 Br 1		╶┼┼┼┾┿┾┾╋┽┛┽┧┾╏┨┨	64.35 14.35 96.25 96.25 90.75 90.75 90.75 10.00 10.00 110.50 110.50 10.5	231.66 627.66 346.50 336.60	71.62 77.23	254.83	1.783.81	7-644.90		
Qf. 2 fill 1 17.50 fill 1 17.00 krast(1 11.00 krast(1 16.50 m 2 16.50 m 2 16.50 m 2 16.50 m 2 16.00 m 3 15.50 kt/cm 1 1.00 kt/cm 1 2.000 fill 11.00 2. kt/cm 1 1.00 fill 1 1.00 kt/cm 1 1.4.31 ut 1 1.4.31 ut 1 1.4.31 ut 1 1.4.31 ut 1 1.4.31		╶┼┼┾┿┿┿╋┿┛┥┥╸	14.35 96.25 96.25 90.75 90.75 90.75 10.00 10.60 110.60 110.60 110.60 110.60	627.66 346.50 336.60	62.77				21,017,05	
T. I 17.50 strattda 1 17.60 strattda 1 15.50 stattda 1 16.50 1 16.50 1 1 16.50 1 1 16.50 1 1 16.50 1 1 11.00 2 stiton 1 11.00 1 11.00 2 stiton 1 17.50 1 10.00 2 stiton 1 13.50 1 11.00 2 1 17.50 2 1 17.50 2 1 17.50 1 1 17.50 1 1 15.50 1 1 15.50 1 1 15.50 1 1 15.50 1 1 15.50 1 1 1 1		┼┾┾┼┽┼╎┼┼┼┼┼	96.25 93.50 90.75 90.75 90.75 10.00 110.00 110.00 110.01 10.63.00	346.50 336.60		690.43	4.833.01	20.212.90	252.0ti6.95	
T. J 17.50 Structula 1 15.50 Structula 1 16.50 I 1 16.50 I 1 20.00 I 2 15.50 I 1 15.50 I 1 1.00 I 1 1.00 I 11.00 2. Marc 1 1.00 Bas 1 1.00 I 1.0.00 2. Marc 1 1.00 I 1.0.00 2. Marc 1 1.0.00 I 1.0.00 1 Marc 1 1.0.00 I 1.0.1.00 1 I 1.0.1.00 1 I 1.0.1.00 1 I 1.0.1.00 1	╋┥┥┙┙┙	╋┿┿┿╋┿╋	96.25 93.50 90.75 90.75 90.75 10.60 110.60 110.60 110.60 110.60	346.50 336.60					.,	
ktractich 1 17,00 ktractich 1 16,50 1 16,50 1 1 20,00 1 1 21,00 1 1 2 15,50 1 3 15,50 1 3 15,50 1 1 10,00 1 1 1,00		┿┾┼╋┼╏╢┨┨┨╆	93.50 90.75 90.75 90.75 90.75 10.00 264.00 75.75 75.75 10.00 10.00	336.60	34.65	381.15	2.668.05	02.414.11	119,110 75	
up. 1 16.50 1 16.50 1 1 20.00 1 2 1 16.50 3 16.00 1 3 15.50 2 46.0 3 11.6.00 46.1 1 2,00 46.1 1 2,00 46.1 1 2,00 46.1 1 2,00 46.1 1 2,00 46.1 1 2,00 46.1 1 2,00 47.00 1 2,00 49.1 1 17,50 49.1 1 14,31 49.1 1 16,31 49.1 1 16,31		╺┾┽╇┾╏╎╎╏╏	90.75 90.75 10.00 264.00 264.00 10.00 110.00 110.00 110.00		33.66	370-26	2,591,82	11.107.80	135.164.90	
Here 1 16.50 1 20.00 1 20.00 1 20.00 1 10.00 1 15.50 1 15.50 1 17.50 1 17.50 1 17.50 1 17.50 1 17.50 1 17.50 1 17.50 1 18.31 1 16.31 1 16.31		╺┼┽┼╎╎╎╎	90.75 110.00 264.00 170.50 255.75 255.75 181.50 110.00	326.70	32,67	159.37	2.215.59	10.781.10	111.170.01	
1 20.00 3 16.00 3 15.50 3 15.50 4 3 10.001 2 4 1 4 1 4 1 4 1 4 1 4 1 4 1 4 1 4 1 4 1 4 1 4 1 4 1 4 1 4 1 4 1 4 1	╶╆┇┫╋╋╋╋	╺╋┿╡┼┼┝╏╏┾	110,00 264,00 170,50 255,75 181,50 110,00	326.70	32.67	359.37	2, 515, 59	01-187.01	131,170,05	
3 16.00 3 15.50 3 15.50 3 15.50 4 11.00 2, 10.00 4 1 4 17.50 5 17.50 5 1.0.00 4 1 4 1 1 17.50 5 1.0.00	╶┧┨┩┥┥╞╿╷	╺┥┥┟┟╎╴┟╸╏╶┟╸	264.00 170.50 255.75 181.50 110.00	396.00	39.60	09.564	3,049,20	00.830.E1	154,994,00	
III 2 15.50 3 15.51 3 1 1 1.60 2 10.00 2 Max 1 17.50 Max 1 16.31 Max 1 16.31	╾ ┥╋╋┥ ╋	╾┼┼┼╌┠╍┠╶┨╼┾╸	170,50 255,75 181,50 110,00 1,463,00	950.40	95.04	1,045.44	7,318.08	31,363.20	361,585.60	
3 15.50 3 11.00 3 11.00 3 10.00 46.00 1 47.00 1 5 10.00 46.01 1 11.00 1 46.01 1 46.01 1 40.11 16.01 1 16.01 1 16.01	┿╋┥	╧╁┼┼┼┼┼	255,75 181,50 110,00 1,463,00	613.80	61.38	675.18	4.726.26	20,255.40	246,440.70	
1 1 1 1 1 1 2 2 1 2	╺╋┥┥┝┥┥	╶┼┼┽╎┼	181_50 110.00 1.463.00	920.70	92.07	1.012.77	60,980,7	01.082.06	369.661.05	
3 10.011 2 Mga. 1 17.50 2 Mga. 1 17.50 1 Mga. 1 17.00 1 Mga. 1 17.00 1 Mga. 1 17.00 1 Mga. 1 16.31 1 Mga. 1 16.31 1 Mga. 1 16.31 1	╺╁╞╂╌┞	╈	110.00	653.40	45.26	718.76	5,031.1B	21.562.20	262.340.10	
Maricon 18 2, Maria 1, 17.50 Eng. 1, 17.00 Eng. 1, 17.00 Eng. 1, 16.31 10.11 16.31	┥┥		00'63'1	396.00	39.60	635.60	3.049.20	13,068.00	158.994.00	
Mgr. 1 17.50 Eng. 1 17.00 Eng. 1 17.00 14.31 16.31 10.11	192.50	57.75		5.266.80	\$26.68	83-793-68	40.554.36	173,804.40	.114.620.20	
Ng. 1 17.50 Eng. 1 17.00 Eng. 1 17.00 U. 1 16.31 U. 16.31	192.50	57.75								
Eq. 1 17,00 Eq. 1 17,00 1 16.31 10.11 16.31	20 101	11 Ja	56.25	346.50	34°65	381.15	2,668.05	11,434.50	139,119.75	
Eq. 1 27.00 1 14.31 1 16.31 1 16.31 1 16.31		1 NT*0C	93.50	336.60	33-66	370.26	2,591.82	11,107.80	135,144,90	
1 14.31 1 16.31 1 16.31 1 16.31	00°-281	56.10	93.50	336.60	33.66	370,26	2,591.82	11,107.80	135,144.90	
UP. 1 16.31 1	156.94	47.08	78.47	282.49	28,25	310.74	2,175.18	9,322.20	01.024,611	
UP. 1 16.31 1 10.31 1	179.40	53.82	89.70	322,92	32.29	355-21	2,486.47	10,656.30	129,651.65	
16.31	1.79.40	53.82	85.7D	322.92	32.29	355.21	2,486.47	10,656.30	129,651.65	
	179.40	53.82	89.70	322.92	32.29	355.21	2.486.47	10,656.30	129.651.65	
	363.00	108.90	181.50	653.40	65.34	718.74	5,031.18	31,362.20	262,340,10	
Flumber 2 17.00 37	374.00	112.20	187,90	673.20	67.32	740.52	5,183.64	22,215.60	270,289.60	
Electrician , 17.00 37	374.00	112.20	187.00	673.20	67.32	740.52	5,183.64	22,215.60	270,289,80	
Welder/Sheet Matal 1 17.00 18	187.00	56.10	93,50	336.60	99°EE	370.26	2,591.82	11,107.80	135,144.90	
Equipment Operator 4 16.00 70	704-00	211.20	00.725	1,267.20	126.72	1,393.92	9,757.44	41,817.60	508,750.80	
Laborar 4 14.31 62	627.76	188.32	313,68	1,129.96	113.00	1.242.96	8,700.72	37,288,60	453,680.40	
ю.	3,891.40 1,1	1,167.41 1	1,945.70	7,004.51	700.45	7,704.96	53,934.72	231,148.80	05.010.518.	
NOTES: (1) 10 hour work day (overtime 2 14 reg. rate over	aver 8 hours per day)	er day).						÷ د	NCRORAGE, ALASKA	
								ESTIMATING	ESTIMATING ENGINEERING WORKSHEET	KSHEET
							T	Belugs Mathandl Project	ncl Project	
								0 & H Person	0 & H Personael-3,000 men caup	Đ
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DESCRIPTION	OLANTITY	HOURLY RATE	DARY RATE (1)	PAYROLL BURDEN 305	CVERHEAD AND CAA 50%	\$UB-TOTAL	FEE - 105	DAILY TOTAL	WEEKLT TOTAL 7	MONTHLY TOTAL 3D	ANBUAL SOTAL 385'	
RD.			3,891.40	1,167.41	1,945.76	7,004.53	700.45	7,704.96	53,934.72	231,148,80	2.812.310.60	
Hater/Sevage Operator	2	16.00	352,00	105.60	176.00	633.60	63.36	696.96	4.878.72	20.908.80	07 085 757	
Telephone Come. Tech.	. 1	17.00	187.00	56.10	93.50	336.60	33.66	370.26	2,591.82	11,107.80		
Clerk/Typist	3	11.00	363.00	108.90	161.50	653.40	65.34	718.74	5,031.18	21.562.20	262,340.10	
Power Flant Operator	2	16,00	352.00	105.60	176.00	633.60	63.36	696.96	4,878.72	20,908.80	254,390.40	
Total Facility	8		5.145.40	1,543.61	2,572.70	17.162.9	926.17	10,187.88	71.315.16	305,636.40	3,718,576.80	
Procurement/Logistics Hgr.	8x. 1	17.50	192.50	\$7.75	96.25	346.50	34.65	381.15	2,668.05	11,434.50	139,119.75	
Transportation Sup.	1	1 16.31	129.40	53.87	89.70	322.92	32.29	353.21	2,486.47	10.656.30	129,651.65	
Watchouse Sup.	1	16,31	179,40	12.82	89.70	322.92	32.29	355.21	2,486.47	10.656.30	129,651.65	
Clerk/Typista	8	11.00	958.00	290-40	484.00	1,742.40	174.24	1.916.64	13,416.48	57,499.20	09-572-663	
Laborer	01	16.AI	1.559.40	4Z0-80	784.70	2,824.90	282.50	3,107.40	21,751.80	93,222.00	1,134,201.00	
Equipment Operators	4	16.00	1.056.01	716 SU	528.00	1,900.80	190.08	2,090.88	14,635,16	62.726.40	763.171.20	
Drivers	12	14.31	1.643.28	565.00	941.64	3,389.92	. 339.00	3,729.92	26,102.44	111,867.60	1.361.055.80	
Mechanical Foreman	1	16.31		53.82	89.70	322.92	32.29	355.21	2.486.47	10.655.30	129.651.65	
Mechanics		06.41	704.00	211.20	00°22C	1,267.20	126.72	20.595.1	9.757.44	41.817.60	209.087.092	
Velder/Machinist		12 00	187.60	56.10	91.50	336.60	99°EE	370.26	2,591.82	11.107.80	115,144 90	
Total Logistics	<u>45</u>		7.098.38	2.129.51	1.549.19	12,777.08	1,277.72	14,054.80	98.383.60	421.644.00	00.00.001.2	
Houstog/Comm. Ser. Kgr.	1	05'21	192.50	57.75	96.25	346.50	34.65	381.15	2.668.05	11.434.50	22-211-961	
Chini Fire/Security	1	17.60	187.00	56,10	53.50	336.60	33.66	370.26	2,591.62	11,107.60	135.144.90	
Housekreper	53	14.31	8,317.82	2.425.24	4.158.91	14,971,97	1.497.25	16,469.22	115.284.54	494.076.60	011.255.30	
Loundry Worker	01	16.31	1,569.40	470.80	784.70	2,874.50	262.50	3,107.40	21,751.80	93.222.00	1.134.201.00	
fiead Cook F.S. Sup.	1	16.31	179-40	53.82	02.70	322.92	32.29	355.21	2,486.47	10,656.30	129,651,65	
Lead Cook - Baker	2	16.31	358,80	102.54	179.40	645.84	64.58	710.42	46.226.4	21.312.60	02.502.022	
Cook	¢	15.95	1.052.70	315.82	526.36	1,894.83	189,48	2,084.36	14.590.52	62.530.80	09-162-092	
Lend Kitchen Belper	-	14.57	641.08	192.32	320.56	1,153.96	115.40	35.93.1	B,885.52	38.090.80	663.316.60	
Kitchen Belper	18	16.41	2,824,92	847.45	1.412.46	5,084.86	508.48	5,593.34	39.153.38	167.800.20	2.061.509.10	
Scorekeeper/Clerk	4	11.00	484.00	145.20	242.00	871.20	87.12	958,32	6.708.24	28.749.60	169, ZR6, E0	
540. -			15,307.62	4,742.17	7,903,84	28,453.63	2,845.41	31,299,04	219,093,26	538,971.20	11.424,149.60	
NOTES: (1) 10 hour v	ork day (over	(1) 10 nour work day (overtime @ 1½ reg.	rate over 8 hou	hours per day.)						<u></u>	CIRI/H & N Anchorage, Alaska	Z 4
										ESTIMATIN	ESTIMATING ENGINE ENING WORKSHEET	IKKSHEET
										Beluga Mathanul Project	nul Project	
										O & M Person	0 4 M Personal-3,000 Man Cam	ġ,
										PREPARED EV	CHECKED BY LO	DATE
TVPE DF ESTIMATE - 03		- 61		SHEET NO.	5	•		JOB ND.			-	

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DESCRIPTION	OUANTITY	HOURLY HATE	DALLY RATE (1)	PAYROLL PAYROLL PAYROLL	OVERHEAD AND GAA 50%	SU3-TOTAL	FEE - 10%	DALY TOTAL	WEEKLY TOTAL	MONTHLY TOTAL	ABNUAL TUTAL 265	
END.			15,807.62	4.742.17	1.903.84	28.453.63	2.545.41	11. 799. 04	219,093.28	938,971.20	11.424.149.60	
Fireman/Security Capt.	1	16.50	181.50	54.45	90.75	326.70	32.67	16.925	2,515.59	10,751.10	131.170.05	
Firemen/Security-Off.	4	16.00	1,056.00	316.80	528.00	1,900.80	80.081	2,090,88	14,636.16	62,726.40	763.171.20	
Safety Engineer	1	16.50	181.50	54.45	90.75	326.70	32.67	12.925	2,515.59	19,751,10	131.170.05	
Clerk/Typist	4	11.00	484.00	145.20	242.00	871.20	57.12	958.32	6.708.24	28.749.60	149.285.80	
Laborer	ų	16.71	627.76	188.32	313.88	1,129.96	113.00	1,242.96	8,700.72	3/,288.80	453,680.40	
Air Traffic Control/ Redio	d Lo 2	17.00	00°54E	112.20	00" /81	673.20	67.37	740.52	5,183.64	22,215,60	270.289.80	
Total Come. Service	118		16,712.38	5,613.59	3,356.22	33,682,19	1,368.27	37,050.46	259.353.22	1.111.513.80	13.523.617.90	
Grand Total	£13	14.48(2)	34,230.86	10,269,12	17,115,46	61,615.44	6,161.61	67,777.05	474.439.35	05'TTE'EE0'Z	24, 738, 623.25	
Summerv												
Project Nunsgement	2		348.70	104.61	174.35	627.66	62.M	690.43	10.619.4	20-712-90	252,006,95	
Administration	18		2,926.00	877,80	1,463.00	5.266.80	\$26.68	5. 701.48	40,554.36	173,804.40	2,115,620.20	
Facilities	30		5,145.40	1,543,61	2.572.70	9 261.71	926-17	10 187 86	71.315.16	305.636.40	1.718.576.20	
Locistics	45		35.360,7	2,129.51	3,549,19	13 223 08	1,277.12	14,051.60	98.383.50	\$21.648.00	1.1.0.002.001	
Commutry Services	116		18,722.38	5,613.59	9,356.22	11.682.19	3,368.27	37,050.46	259,353.22	1.111,513.80	13.523.617.90	
Intel	213		34,230.86	10,269.12	17,115.46	61.615.44	6,161.61	67.777.05		1,033,311.50	24.738.623.25	
Project Management			Averla	ge Cost Per Re	sident	(cump population	c ton 3,000)	£2.	1,61	96.3	54.02	
Administration								1.93	13.52	57.93	204.BZ	
Facilities								3.40	23.77	101.55	1.239.53	
Logistics								4,58	32.79	140.55	1.710.00	
Commity Licylces			-					12.35	85.45	370.50	4.507.81	
Total								22.59	158.14	677.76	8.245.21	
	÷											
	-	-								ļ		
NOTES: (1) 10 hour war	rk day (overth	(1) 10 hour work day (overtime & 1½ reg. rate		over 8 hours per day.)						ت [‡]	CIRI/HE & N AHCHORAGE, ALASKA	_
(2) Average hourly rate of pay-	ourly rate of	pay.								ESTIMATIN	EST CHATTING ENGINEERING WORKSHEET	IXSHEET
										Beluga Methanol Project	and Project	
										O & M Person	J.	Camp
TYPE OF ESTIMATE - DX	colfinitary + 21	202	-	SHEET KD. 3				J 500		PREPARED BY W. R. Lanz		0ATE 5/16/81

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DESCRIPTION	QUANTITY	HOURLY RATE DA	DAILY RATE (1)	PAYAGRA. BURDEN 305	OVERHEAD AND GEA EGE	SUB-TOTAL	FEE - 10%	DAILY TOTAL	WEEKLY TOTAL	L MONTHLY TOTAL	ANNAL TOTAL	
Project Manager	T	20.00	220-00	66.00	10.00	00 205	09-61	435-60	1.049.20	13 068 00	140 AD1 AN	
Secretary	1	11.70	128.70	38.61	\$6.35	231.66	23.17	254.83	1.783.81	7-644.90	43.017.05	
Total Project MCMT	2		348,70	104.61	174.35	627.66	62.77	690.43	4,833.01	20,712,90	2.2.006.95	
Administration 203.	1	17.50	192.50	57.75	56.25	346.50	34.65	381.15	2.668.05	11,434.50	139,119.75	
Contracts Administratio	1	17.00	187.00	56.10	93,50	336.60	33.66	370.26	2.591.82	11,107.30	135.144.90	
Personnel Supervisor	1	16.50	181.50	54.45	90.75	326.70	32.67	76.92E	2.515.59	10.781.10	30.0/1.101	
Medical Doctor	1	20.00	220.00	66.00	110.00	396.00	39-60	435.60	3.049.20	13,068.00	158,994.00	
Fara-medic / RU	7	16,00	176.00	52.80	88.00	315.80	31.68	348.48	2.439.36	10,454.40	127,195.20	
Medical Technician	-	15.50	170.50	51.15	85.25	06.300	30-69	92. (EE	2,363.13	10,127.70	123,220.35	
Accountants	2	15.50	341.00	102.30	179.50	613.80	61.18	675.18	4,726.26	20,255.40	246,440.70	
Cler/typlat	2	11.00	242.00	72.60	121.00	435.60	43.56	479.16	3,354.12	14, 374.80	07"E68"921	
Typist		10.00	110.00	33.00	55.00	120.00	19.80	212.80	1.524.60	6,534.00	79,497.60	
Total Administration	11		1.620.50	546.15	910.25	3.276.90	327.69	3.604.39	25,232,13	108,137.70	1.215,675.25	
			-									
Facility/Planning Mar.	-	12.50	192,50	57.75	96.25	146.50	34.65	381.15	2,668.05	11,434.50	139,119.75	
CIVIL Engineer	-	17.00	187.00	56.10	03.50	136.60	33.66	120.26	2 541 82	11,107.80	135,144,90	
Electrical/mech. Fag.	-	2.00	187.00	56.10	93.50	336.60	11.66	120.26	7.541.87	11.107.80	135.144.90	
Draftsperson	-	16.21	A6.621	42-0H	74 A7	282.49	28.25	10.74	2,175.18	9,322.20	113,620.10	
Bida. Huintenance Sup.		16.31	179.40	53.62	89.20	322.92	12.29	155.21	2,486.47	10,656-30	129,651.65	
Roads & Grounds Sup.	-	16.31	179.40	53.82	B9.70	322.92	32.29	355.21	2,486.47	ID,656.30	129.651.65	
Utilities Sup.		15.31	179.40	1.1.1	R9. 20	322.92	32.29	355.21	2,485.47	10,656,30	129.651.55	
Carpenter/Painter	-	16.50	181.50	54.45	50.75	326.20	12.67	359.37	2,515.59	10,781.10	131,170.05	
Plumber	-	17.00	187,00	54.10	93.50	336.60	33.66	370.25	2,591.82	11,107.80	135,144.90	
Electrician		12.00	187-00	56.10	03.50	336.60	33.15	320.26	2,591.82	11,107.80	135,144.90	
Velder/Ehcet Hetal		17.00	187.00	61.42	93.50	336.60	33-11	32.075	2,591.82	11, 107.80	135,144.90	
Equipment Operator	-	16.00	176.00	52.80	88.00	116.80	31.68	348.48	2,439.36	10,454.40	127,195.20	
Laborer		1.11	156.94	10-13	78.47	282.49	28.25	10.74	2,175.18	9.322.20	113,420,10	
Ê			2, 132.08	201.12	1.168.54	4.205.24	620.67	A,627.61	32,391.87	138.822.30	1.689.004.65	
The second se						-						
NULES: (1) 10 hour work day (overtime # 15 reg.	day (overtime	1 1% rag. rate ov	aver 8 tours per day).	er day).						<u>ت</u> ₹	C I R I / H & N Anchorage, Allera	-
										ESTIMATIN	ESTRMATING ENGINEERING WORKSHEET	IXSHEET
										Beluga Met	Beluga Mathanol Project	
										O 4 M Pers	0 4 N Personnel-500 Nan Camp	¢,
			1									
1772.05 gstimals - 02 Arder of Menadeude - Proliminary - 02	11-11-10 11-11-11-10		. <u> </u>	SHEET NO.	ć			JOB NO.		PREFAGED BY	CHECKED BY DI	DATE

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CESCRIFTIDN	QUANTIEY	KOURLY RATE	DAILY RATE (1)	PAPROLL BURDEN BURDEN	OVERHEAD AND GEA \$05	sus-total	FEE - 10%	DAILY TOTAL	WEEKLY TOTAL		ANNUAL TOTAL 365	
OW.			2,670.02	801.00	1,335.01	4, \$06.03	480.60	5,286.63	37,006.41	158,598.90	1,929,619.95	
Mater/Secage Operator	1	16.00	176.00	52.80	00'RB	316.80	31.68	348.48	2,439.36	10,454.40	127,195.20	
Telephone Come. Tech.	1	17.00	187.00	\$6.10	93.50	336.60	33.66	370.26	2,591,82	11,107.80	135,144.90	
Cletk/Tvoist	2	11.00	242.00	72.60	121.00	435.60	43.56	479.16	3,354.12	14,374.80	174,893.40	
Proter Plant Operator		16,00	176.00	52.60	83.00	316,80	31.68	348.48	2,439.36	10,454.40	02.201,121	
Total Facility	R		3,451.02	1,035.30	1,725.51	6,211.83	621.18	6,833.01	47,831.07	204,990.30	2.494,048.65	
										_		
Procurement/lopistics har	gr 1	17-50	192.50	51.12	96.25	346.50	34.65	381.15	2,658.05	11,434.50	27-011,9E1	
Transnorrarion Sen.	-	16.31	179.40	53.82	89.70	322.92	32.29	355.21	2.486.47	10,656.30	129,651.65	
Varehnise Smervinn	-	16-31	179.40	53.62	DC-68	322.92	32.29	355.21	2,486.47	10,656.30	129,651.65	
	- 4	1.00	484.00	145.20	242.00	871.20	87.12	958.32	6,708.24	28,749.60	249,786.60	
	-	16.41	827.76	188.32	B3.E1E	1,129.96	113.00	1.242.96	8,700.72	37,288.80	453,680.40	
Rautet		16.00	352.00	105.60	176.00	633,60	63.36	696.96	4.878.72	20,508.80	254,390.40	
Drivara		14.31	627.76	168.32	83.EIE	1.129,96	113.00	1,242-96	8.700.72	37,288.80	453,680.40	
Machanical Forenan	-	16.31	179.40	53.82	89.70	322.92	32.29	355.21	2°*89°-47	10,656.30	129.651.65	
Mschanics	1	15.00	352.00	105.60	176.00	633-60	63,36	96-969	4,878.72	20,908.80	254,390.40	
Velder	-	17.00	187.00	56.10	93.50	136-60	13.66	370.26	2.591.62	11.107.80	135.144.90	
			1 761 27	1_008.35	1.680.61	4 050 18	ene na	A 455 20	66.5R6.4D	149.656.00	2.429.148.00	
Housing/Comm. Ser. Mgr	-	17.50	192.50	57.75	96.25	346.50	34.65	381.15	2.568.05	11.434.50	139,119.75	
Chief Fire/Security		17-00	187.00	55.10	93.50	336.60	33.66	370.26	2.591.62	11,107.80	135,144.90	
Bounekeeper	16	16.41	2.824.92	847.48	1.412.46	5,084.86	508.48	AC.593.34	39,153.38	167,800.20	2,041,569.10	
Laundry Gorker	9	16.41	941.64	282.50	470.82	1,694.96	169-50	1,864.46	13,051.22	\$5,933.80	680,527,90	1
Haad Cook TS Superviser	1	16.31	139.40	53.82	89.70	322.92	32.29	355.21	74.88,47	10,656.30	129,651.65	
Land Cook - Baker	2	16.31	358-60	107.64	179.40	645-84	64.58	710.42	4,972.94	21,312.60	259,303.30	
Cook	6	15.95	526.35	157.91	263.18	44-146	46.74	81.2%2.18	7.295.26	31,265.40	380, 385.70	
Lead Kitchen Helper	2	14.57	320.54	91-96	160.28	576.98	57.70	634.68	4.442.76	19,040.40	231,658.20	
Kitchen Helper	9	16.41	941.64	282.50	470.82	1.694.95	169.50	1,864.46	13,051.22	09-55,933.60	680.327.50	
Storekeeper/Clerk	2	11.00	242.00	72.60	121.00	435.60	43.56	479.16	3,354.12	14,374.60	174,693.40	
Eng.			6.714.79	2,014.46	17.726.6	12,686.66	1,208.66	13,295.32	93,067.24	398,859-60	4,852,791.80	
NOTES: (1) 10 Hour work day (overtime @ 14 teg.	ck day (overti	me @ 14 teg. ra	2	a per day.)						ວັ	ANCHORAGE, ALASKA	Z
										ESTIMATIN	ESTIMATING ENGINEERING WORKSHEET	DRKSHEET
										Balnes Mathanol Protect	nol Project	
										O & N Perso	0 & M Personnel-1,000 Man Carp	Carp
TYPEOFESTMATE Order of vt Prelimary		- 91 101		3HEET NO. 2 (5			CH BOT	7500	PREFARED BY M. B. Lanz	CHECKED BY	0ATE 5/16/81
ALLER VA 238RILLUL		407										

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beschiption	QUANTITY	HOURLY RATE	DAILY RATE (1)	PAYROLL BURDEN 20%	DVERKEAD AND GRA 60%	SUB-TOTAL	FEE - 10%	DALY TOTAL	WEEKLY TOTAL	9	ANNUAL TOTAL 365	
FND.			6,714-79	2,014.46	1.357.41	12,086.66	1,208.66	13,285.32	93,067.24	398,859,60	4,852,791.60	
Firemen/Security. Capt.	-	16.50	181.50	54.45	60.75	326.70	32.67	7C.02C	2,515.59	10,781.10	111,170.05	
Fireman/Sacurity Off.	5	16.00	528,00	158.40	264-00	950.40	95.04	1,045.44	7,318.08	31,363.20	381,585.60	
Safety Engineer	1.	16.50	181.50	54.45	90.75	326.70	32.67	359.37	2,515.59	10,781.10	131,170.05	
Clerk/Typist	2	11-00	242.00	U9-22	121.00	435.60	43-12	479.16	3,354,12	14,374.60	174,893.40	
Leborar	2	16.31	313.88	94.16	156.94	564,98	56-50	621.48	4,350.36	18,644.40	226,840,20	
Air Traffic Cont./Radio		17.00	167.00	26, 10	93.50	09-900	31 66	370.26	2,591.82	11,107.60	135,144.90	
Total Comm. Ser.	52		8.348.67	2.504.62	4,174.35	15,027.64	1 503 76	16,530.40	115,712.80	495,912,00	6,033,596.00	
Grand Total	108	(2) ^{14.91}	17.687.61	5,306.28	8,843,62	31,637.71	3,183.77	35,021.48	245,150.36	1,050,644.40	12,782,840.20	
Summity												
Frofert Hanasemant	2		348.70	104.61	176.35	627.66	62.77	690.43	4,833.01	20,712.90	252,006.95	
Administration	13		2,178.00	653.40	1,689,00	3,920.40	392.04	4,312.44	30,187.08	129, 373.20	1,574,040.60	
Facilities	8		3.451.02	02-360-1	1.725.51	6,211.83	81.128	6,833.01	47,831.07	204,990,30	2.494.048.65	
Lotatice	21		3,361.22	1,008.35	1.680.61	6,050,18	605.02	6,655.20	46,586.40	199,656.00	2,429,148.00	
Comminity Services	52		8.348.67	2.504.62	4.171.35	15,027.64	1,502.76	16,530.60	115,712.80	495,912,00	6.033.596.00	
	108		17.687.61	8C 9UE 5	C0 C73 B	31.837.71	3.183.77	35,021.48	245,150.36	1.050.644.40	12.782.860.20	
Project Management			Average	Cost Per See	dent	(Camp Fopultation 1,000)	ation 1,000)	69-	4.83	20.71	252.01	
Administration								4.31	30.19	129.37	1.574.04	
Pacilities								6.83	47.83	204.99	2.494.05	
Logistics								6.66	46.59	199,66	2.429.13	
Commity Services								16.53	115.71	495.91	6,033,59	
Total								35,02	245.15	1.050.64	12,782,84	
				-+								
NOTES: (1) 10 Bour	10 Bour wark day (overedme		@ 14 res. rate over 8 hours per day).	hours per day).						ں - 	CIRI/H & N AHCHORAGE ALASEA	Zs
(2) Average	Average Hourly Rate of Pay									ESTERATIN	EST MATING ENGINEERING WORKSHEET	ORKSHEET
										Beluga Mathanol Project	aol Project	
										O & M Person	O & M Personal-1,000 Kan Cam	ł
TYPE OF ESTIMATE Order of Manaltude - Preliningry	reliainary .	5		aheer no.	т В .			15/ 12/	7500	PREPARED BY	CHECKED IV	0ATE 5/16/81
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DESCRUPTION	QUANTITY	KOURLY RATE	DAILY RATE (1)	PAYROLL NURDEN 30%	DVERHEAD AND GLA BOX	SUB-TOTAL	FEE - 10%	DAILY TOTAL	WEEKLY TOTAL	MUNTHLY TOTAL	ANNUAL TOTAL	
Project Manager	-	20.00	220.00	66.00	110.00	396.00	39.60	435.60	3,049.20	13,068,00	158,994.00	
Secretary	-	11.20	128.20	38.61	64.35	231.66	23.17	254.83	1,783.81	7.644.90	93,012.95	
Total Froject Mngt.	2		348.20	104.61	174.35	627.66	62.77	690.43	4,833.01	20,712.90	252,006.95	
Administration Hgr.	1	17.50	192.50	57.75	96.25	346.50	34.65	381.15	2,668.05	11.434.50	27.911.9E1	
Contracts Adm.	-	17.00	187.00	56.10	93.50	336.60	33.66	370-26	2,591.82	11,107.80	135,144.90	
Finance & Acct. Sup.	-1	16.50	181.50	54.45	90.75	326.70	32.67	359.37	2,515.59	13,781.10	20.071.161	
Fersonnel Sup.	1	16.50	181.50	54.45	50.75	326.70	32.67	7E.93E	2.515.59	10,781.10	131.170.05	
Medical Doctor	1	20,00	220.00	66.00	110.00	396-00	39.60	435.60	3,049.20	13.068.00	158.994.00	
Fara-Medic/EH	8	16.00	352.00	105.60	175.00	633.60	63.36	696.96	4,878.72	20,908.80	254,390.40	
Medical Technician	-1	15.50	170.50	51.15	85.25	306.90	30.69	337.55	2,363.13	10,127.70	123.220.45	
Accountants	2	15.50	341.00	102.30	170.50	613-80	61,38	675.18	4,726.25	20,255.40	246.440.70	
Clerk/Typist	2	11.00	242.00	72.60	121.00	435.60	43.56	479.15	3.354.12	14.374.80	176_893 £0	
Typiat	1	10.00	110.00	33.00	55.00	198.00	19.00	217-80	1,524.60	6.534.00	79-497.00	
Total Administration	61		2.178.00	653.40	1.089.00	3,920.40	392.04	44.312.4	30.187.08	129.171.20	09 090 925 1	
Facility/Planning Net.	-	17.50	192.50	\$7.75	96.25	346.50	34,45	381.15	2.668.05	11 676 50	119 119 75	
Civil Ensincer	1	17.00	187.00	56-10	91.50	336.60	33.66.	370.26	2.541.82	11 102 80	08 771 311	
Electrical/Hech. Eng.	1	00,71	187,00	56.10	93.50	336.60	33.66	92 . 076	2,591.82	11.107.80	135,144.90	
Drsftsperson		16.31	156.94	47.08	19.67	282.49	28.25	310.74	2,175.18	9,322,20	113.420.10	
Bldg. Haintenance Sup	T	16.31	179.40	53.82	07.68	322.92	32.29	355.21	2,486.47	10.655.30	129.651.65	
Roads & Grounds Sup.	1	16.31	179.40	53.82	89.70	322.92	92.2E	355.21	2,486.47	10.656.30	129.651.65	
Utilities Supervisor	1	16.31	179.40	53.82	89.70	322.92	32.29	355.21	2,486.47	10.656.30	129.651.65	
Carpenter/24inter	I	16.50	181.50	54.45	56*05	326.70	32.67	76.926	2,515.59	10.781.10	131.170.05	
Flumber	1	17.00	187.00	56.10	93.50	336.60	33.66	370.26	2,591.82	11.107.80	135.164.90	
Electrician	1	17.00	187.00	56.10	93.50	336.60	33.66	370.26	2,591,82	11.107.80	135,144,90	
Welder/Sheet Metal	1	17.00	187.00	56.10	93.50	336.60	33,66	370.26	2,591.82	11,107,80	135,144.90	
Equipment Operator	2	16.00	00'ZSE	105.60	C0.871	633.60	63,36	695.96	4,878,72	20.908.80	254.390.40	
Laborar	2	14.31	313.68	94.16	156.94	564.98	56.50	621.48	4.350.56	18.644.40	226.840.23	
- CM3			2,670.02	00,108	1,335.01	4,806.03	480.60	5,286.63	37,006.41	158,598.90	1.929.619.95	
NOTES: (1) 10 Hour way	rk day (overth	m 6 15 Ter. To	10 Hous work day (overtime 8 Hy reg. rate pyer 8 hours per dar.)	rs per dar.)						о ^т	CIRI/H&N	N
											ARLTURAUS, ALABLA COTTAA VALO PACARCONC MOVELEET	Deveneer
										ES I MAIIN		
										Beluga Mach O & M Person	Beluga Mathanol Project O & M Personnel-1.000 Man Camp	Cent
TYPEOF ESTEMATE - 07 - 07 Order of Magnitruda - Freliminery + 203	- 01 1= nery + 202			SHEET ND. 1	0t 10			1500 T		MEPARED SY V. R. Lauz	CHECKED &Y	0ATE 5/16/81

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aescrib tion	QUANTITY	HOURLY RATE	HOURLY RATE DAILY RATE (1)	Nagen	AND GLA	SUS-TOTAL	FEE - 105	PARY TOTAL	WEEKLY TOTAL	NONTHLY TOTAL	ANRUAL TOTAL	
CH3			3,881.51	1,164.46	1,940.76	6,986.73	698.67	7,685.40	53,797.80	230,562,00	2,805,171.00	
Firesan/Security-Office	3	16.00	528.00	158.40	264.00	950.40	95.04	1.045.64	7, 318.08	31,363.20	381,585.60	
Safery Engineer	1	16.50	181.50	54.45	90.75	326,70	32.67	75.935	2,515.59	10.781.10	131,170.05	
Clerk/Typist	-	11.00	121.00	36.30	60.50	217.60	21.78	239.58	1,677.06	7.187.40	87.446.70	
Liborer	, I	14.31	156.94	47.03	78.47	282.49	28.25	310.74	2,175.18	9,322.20	113,420.10	
.Ir Traffle Control/Lad	1 ہ	1 17.00	187.00	56.10	93.50	336.60	33.66	370.26	2,591.82	11,107.50	135.144.90	
Total Comm. Service	1		5.055.95	1.516.79	2.527.98	9,100.72	910.07	10,010.79	70,075,53	300.323.70	26.929.623.6	
Grand Toral	74	15.20 ⁽²⁾	12.351.59	3.708.50	6,180.85	22,251.04	2,225.10	24,476.14	86°ZEE*1/1	734.284.20	01.162.552.3	
			Ī									
Sumoty												
Project Management	2		348.70	19"701	SE-9/1	627,66	62.77	690.43	4,833.01	20,712.90	252,006.95	
Administration	11		1,620.50	246.15	910.25	3,276.90	327.69	3,604.59	25.232.13	07.701,801	1,315,675.35	
Facilities	11		2,997.08	899.12	1,498.54	5, 394.74	539.47	12.40.2	74.952.14	178,026.30	2,165,986.65	
Lotistics	13		2,139.46	641.83	1,069.73	3,851.02	385.10 -	4,236.12	29,652.84	127,083.60	1,546,183,80	
Commity Services	10		5,055.95	1.536.79	2,527.98	9,100.72	910.07	10,010.79	70,075.53	300,325.70	3,653,938.35	
Total	76		12,361.69	3,768.50	6,160.65	22,251.04	2,225.10	24,476.14	171,332.98	734,284.20	8,933,791.10	
				_								
Project Management				Average Cost P	Per Resident	(Camp Population	tion - 500)	1.38	9.68	41.42	504.01	
Administration								7.21	50.47	216.28	2,631.35	
Facilities		-						11.87	83.05	356.05	19.155.4	
Logistics								6.47	59,32	254.17	3,092.37	
Community Services					_	-		20.02	140.15	660.65	7,307.58	
Total								45.95	342.67	1,468.57	17,867.58	
											1	
-1	10 Bour work day (overtime	ne ê liş reg. rate	ate over 8 hours	rs per day).				-		υ ⁴	C I R I / H & N Anchorates, alasea	Z
(2) Average h	Average hourly rate of pay.	pay.						ļ		ESTIMATIN	ESTIMATING ENGINEERING WORKSHEET	DRKSHEET
										Beluge Math.	Beluge Mathamol Profect	
										O & M Perso	0 & N Personnel-500 Kun Camp	8
TYPE OF ESTIMATE Order of Magnitude - Preliminary	aliminary + 201	21		SHEET NO. 3 0	0F 3					FREPARED SV	CHECKED BY	DATE S/16/31

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DESCRIPTION	QUANTITY	HOURLY RATE	DAILY RATE (1)	PAYROLL BURDEN 20%	OVERKEAD AND GAA 50%	SUB-TOTAL	FEE - 10%	DAILY TOTAL	WEEKLY TOTAL T	40MTHLY TOTAL 30	ANKUAL TOTAL 35E	
10.			2,337,08	701.12	1,165.54	4,206.74	420.67	4,627.41	32,391.87	138,822,30	1,689,004.65	
Mater/Sevage Operator	1	16.00	176.00	52.80	85.00	316.80	31.68	348.48	35.954,2	10.454.40	127,195.20	
Telephone Comm. Tech.	1	17.00	187.00	56.20	93.50	336.60	33.66	370.25	2.591.82	11.107.80	135.146.90	
Clerk/Typlst	-i	11.00	121.00	36.30	-60.50	217.80	21.78	239.58	1.677.06	7.187.40	87.446.70	
Power Plant Operator	-	16.00	176.00	52.80	68.00	316.80	31.68	348.48	36.979.36	10.454.40	127,195,20	4
Total Facility	11		2,997.08	699,12	1,498.54	5.394.74	539.47	5,934.21	41.539.47	_	2.165.986.65	
										_		
Procurement/Logistics Ma	1	17.50	192.50	57.75	96.25	346.50	34.65	381.15	2.668.05	11.436.50	110,118,75	•
Transportation Supervise	1	16.31	179.40	53,82	89.70	322.92	32.29	355.21	2 486 47	10.656.30	129,651.65	
Varehouse Scoarvisor	1	16.31	179.40	53.82	07.98	322.92	32-25	355.21	2.486.47	10,656.30	129,651.65	
Clerk/Tvoist	1	11.00	242.00	72.60	121.00	435.60	43.56	479.16	3.354.12	14,374.80	174,893.40	
1.ahrrar	6	16.31	313.88	94.16	156.94	564.98	56-50	621.48	4,350.36	18,644.40	226,840.20	
Pointement Constators	-	16,00	176.00	52,60	88.00	316.00	31.68	348.48	2.439.36	10-454-40	127.195.20	
Drivers	2	16.41	313.88	94.16	156.94	564.98	56.50	621.48	4.350,36	18.646.40	226,840.20	
Moshanins] Tareman	-	16.31	172.40	53.82	02.68	122.92	32,29	355.21	2,486.47	10.656.30	129.651.65	
Hochamles		16.00	176.00	52.80	88.00	116.80	31.68	348.48	2.439.36	10.454.40	127.195.20	
the I day fileshing at	-	17.00	187,00	56.10	93.50	336.60	33.66	370.26	2.591.82	_	135.144.90	
	:		97.021.2	641.83	1.069.73	1 851 02	385.10	4,236.12	29.652.84	127,083.60	1,546,183.60	
ESTERNICH TENOT												
United from Car. Nov.	-	17.50	192.50	51.15	96.25	346-50	34.65	381.15	2,668.05	11,434.50	\$1.911,9E1	
This Braken units	-	17-00	187.00	56,10	93.50	336.60	33.66	370.26	2,591.82	11,107.80	135,144.90	
Hunselesses		16-21	1-412.46	423.74	706.23	2,542.43	254.24	2,796.67	19,576.69	83,500.10	1,020,784.55	
Rougestern		12.71	627.76	16.33	313.88	1.129.97	113.00	1.242.97	8,700,79	37,289.10	\$0.,485,625	
LAUTORY NOTAEL		16-01	07.971	53,82	69-70	322.92	32.29	355.21	2,486.47	01.°959*01	129,651.65	
DEST VOAL TO TUP.	-	16.31	179.40	53.82	02.68	322.92	32.29	355.21	2,486.47	10,655.30	129,651,65	
PERG VOOR-DEAL		15.95	06-060	105.27	175.45	631.62	63.1 6	654.78	4,863.45	20,843.40	253,594.70	
LUDE		14.57	160.27	48.08	80.14	288.49	28.85	AC.71E	2.223.38	9.520.20	115,829.10	
Werken Uniter	, r	14.31	470,82	141.25	235.41	847.48	84.75	532.23	6,525,61	27,966.90	340,263.95	
	1	00,11	121.00	36,30	60.50	217.80	21.78	239.55	1,6/7,05	7,187.40	87,446.70	
DEVENDER CONTRACTOR			3.681.51	1,164.45	1,940.76	6,986.73	698.67	7,685.40	53,797.80	230,562.00	2,805,171.00	
	ork day (over	10 Hour work day (overtime @ 14 reg. rate over 8	rate over 8 hou	hours par day).						υ₹	CIRI/H&N Anchorage, alaska	2.
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DESCRIPTION	QUANTITY	HOUSLY BATE	DAILY RATE (1)	PAYHOLL BURDEN 305	OVERHEAD AND DAA 505	SUB-TOTAL	FEE - 10%	DAILY TOTAL	WEEKLY TOTAL T	MONTHLY TOTAL 3D	AKNUAL TOTAL 396
Protect Management											
Project Manager	1	20.00	220 00	66.00	110.00	396.00	39.60	435.60	3,049.20	13,068.00	158,994,00
Administration											
Accountant ·	1	15-50	05-071	51.15	85.25	306.90	30.69	937.5E	2,363.13	10,127.70	123,220.35
			•								
Pacilities											
Water/Sewage Operator	-	16.00	176-00	52.80	88.00	316.80	31.68	348.48	2,439.36	10,454.40	127,195.20
Power Plant Operator	•	16.00	176.00	52,80	88.00	316.80	31.68	34878	2,439.36	10,454.40	127,195.20
			352.00	105.60	176.00	633.60	61.36	636.96	4.878.72	20.908.60	254.390.40
Logistics											
Procurement logstics Mgr	1 14	17.50	192.50	57.75	96.25	346.50	34.65	301.15	2,668.05	11.434.50	139.119.75
Commuty Services		•									
Housekeper	1	16.91	156.94	47:08	78.47	282.49	28.25	310.74	2,175,18	9.322.20	113.420.10
Head Cook	1 1	16.31	179.40	53.82	89.70	322.92	32.29	355,21	2,486.47	10.656.30	129.651.65
Kitchen Helper	1	16.31	156.94	47.08	78.47	282.49	28.25	310.74	2,175.18	9.322.20	113,420.10
				147.98	246.64	887.90	88.79	976.69	6,836,83	29.300.70	356.491.85
Total	8	16.26(2)		428.4B	214.14	2,57J.9D	257.09	2,827.99	19.795.93	84.839.20	1.012.216.31
Project Management								8.71	60.98	261-36	3.179.65
Administration								6.75	47.26	202.55	2.464.41
Facilities								13.94	97.57	418,18	5.087.81
Logistics								7.62	53.36	228.69	2.782.40
Commutty Services								19.53	136.74	S86.01	7,129.84
Totel								56.35	395.91	1.696.79	20.644.36
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NDTES: (1) 10 hour work day (overtime @ 15 reg. rate over	tk day (overtie	e ê 15 reg. rat		8 hours per day)						ט	IRI/HEN
	wity rate of par									×	ANCHORAGE, ALASKA
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COOK INLET PIPE LINE COMPANY

BELUGA METHANOL PLANT PIPELINE TRANSPORTATION STUDY

GRANITE POINT TO DRIFT RIVER, ALASKA

PREPARED BY MOBIL PIPE LINE COMPANY ENGINEERING DEPARTMENT DALLAS, TEXAS

FOR

COOK INLET PIPE LINE COMPANY AUGUST, 1981

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Summary

*With 1981 investment

The objective of this report is to present the results of a pipeline transportation study to convert Cook Inlet Pipe Line Company's common carrier pipeline and tanker loading facility located at Drift River, Alaska, to multi-product service for handling shipments of methanol from a proposed 54.000 BPD capacity coal to methanol processing plant located near Granite Point, Alaska.

Cook Inlet Region, Inc. and Placer Amex, Inc. requested the study in connection with the Beluga Methanol Study (D.O.E. grant No. DE-FGO1-80RA50299). Mobil Pipe Line Company performed the study with assistance from Mobil Research and Development Corporation's Dallas Field Research Laboratory. The areas of study the report deals with are:

- Evaluation of the compatibility of crude oil and methanol in a multi-product batching type pipeline operation.
- 2) Engineering design requirements and operating procedures for the CIPL system to operate it. trude/methanol service.
- Estimation of transportation and ship loading cost (tariffs) to ship methanol through the CIPL avstem with crude on a batch basis.

The study established that it is feasible to batch in the CIPL system with modiifications and additions to existing facilities. The 1981 average cost to transport methanol would be in the range of \$0.56/bbl to \$0.79/bbl, as shown in the table below. These costs are based on the present method of determining tariffs for crude oil, the current construction and material cost, and the proposed methanol production rate of 50,000 BPD. The dismantling and restoration cost in these tariffs are \$0.08/bbl and \$0.10/bbl for the constant and declining crude volume, respectively.

Case	Case Description	Tariff \$/	bbl
		<u>1981</u>	1986*
Case I	Fuel grade methanol and constant crude production	0.56	0.62
Case I Sensitivity	Fuel grade methanol and declining crude production	0.58	0.70
Case II	<pre>1/3 chemical grade and 2/3 fuel grade methanol with constant crude production</pre>	0.66	0.70
Case II Sensitivity	1/3 chemical grade and 2/3 fuel grade methanol with declining crude production	0.68	0.79

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The 1981 \$0.56/bbl tariff of transporting fuel grade methanol is comparable to the present tariff of \$0.58/bbl of transporting crude which includes dismantling and restoration cost of \$0.12/bbl. As a result of the effects of inflation on operating, construction, and material costs, future tariffs would be higher compared to present tariffs. Since tariffs are sensitive to volume, the effect of lower volumes compared to those used in this study would also result in higher tariffs.

The future dismantling of the system and restoration of the area is also highly affected by inflation and volume throughput. Based on the volumes and the project life used in this study, the dismantling and restoration could be as low as \$0.08/bbl, or as high as \$0.10/bbl.

The cost of transporting both chemical grade and fuel grade methanol, as shown in Case II, is \$0.10/bbl higher due to the additional required facilities. For this study, an average tariff was applied to all volumes in the system. However, in view of the special handling requirements for chemical grade methanol, the added cost would usually be charged only to the chemical grade.

It must be kept in mind that the tariff estimates referred to above are all used on the cases studied, and the economic criteria and assumptions made as a basis of the study listed under Appendix "B" of this report. Any actual variations from these assumptions which would apply in the future would, of course, impact on any newly calculated tariffs at a particular time.

Mobil Pipe Line Company and/or Cook Inlet Pipe Line Company does not guarantee, whether expressed or implied, a commitment to handle methanol in the CIPL system by conducting this feasibility study. This decision is solely the right of the owners of Cook Inlet Pipe Line Company.

1.0 Introduction

Cook Inlet Pipe Line Company (CIPL) is a common carrier crude oil pipeline system located near Anchorage, Alaska.

CIPL transports crude produced from several offshore production platforms located in Cook Inlet. CIPL takes custody of the crude from producer-owned land-based terminal facilities at Granite Point and West Foreland Stations on the western shore of Cook Inlet. The crude is pumped through a 20 inch diameter pipeline to CIPL's Drift River Terminal on a common stream basis where it is stored in seven 27G,000 barrel tanks. The crude is periodically loaded into shippers' tankers, up to 70,000 DWT, through a single berth, fixed platform, offshore loading facility (See Appendix C).

Due to declining crude production from existing fields, the CIPL system is projected to have spare capacity to handle other liquid materials. However, modification and additions of existing facilities for such service is subject to the approval of the owners of CIPL. Investments would require an economic justification reflecting the risk of regulatory conditions in existence at that time.

Cook Inlet Region, Inc. and Placer Amex, Inc. (CIRI/Placer) has proposed a 54,000 barrels per day coal processing plant, located at Granite Point, for the production of methanol. CIRI/Placer requested CIPL to evaluate the technical feasibility of transporting methanol through CIPL's pipeline, and estimate tariffs based on certain assumptions and economic criteria. Mobil Pipe Line Company, acting on behalf of the CIPL system, evaluated the operational problems of batching methanol and crude in the CIPL pipeline system. Mobil Research and Development Corporation analyzed the effects of mixing Cook Inlet crude with methanol. Based on these evaluations and assumptions the tariff estimates were calculated.

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2.0 Scope of Work

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The objectives of this study are: (1) to investigate the effects of and any constraints that may be incurred as a result of batching crude oil and methanol in CIPL facilities; (2) to determine the necessary modifications of the existing CIPL pipeline, pumping equipment, storage, and tanker loading facilities in order to transport, store and load into tankers methanol and crude oil as segregated liquids; (3) to estimate the cost of the modifications and additions to the system; and (4) to calculate tariff rates for the various cases of transporting, storing and ship loading methanol and crude.

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3.0 Case Description

Four economic cases were selected on the basis of various throughput levels in the CIPL system as follows: an a special second as the

•	 18,360 TBY fuel grade methanol; 18,250 TBY crude oil Throughput volumes constant over the project life (19 years).
Case I Sensitivity: -	 Same as Case I Base except crude throughput volumes decline 912,000 barrels each year.
-	12,240 TBY fuel grade methanol 6,120 TBY chemical grade methanol 18,250 TBY crude oil Throughput volumes constant over the project life.
Case II Sensitivity:	Same as Case II Base except crude throughput decline at 912 TBY over project life.

* TBY - Thousand barrels per year

4.0 Operational Criteria

It is essential that both crude production and methanol production not be interrupted. Since methanol and crude oil will be batched as segregated fluids through a single pipeline, continuous production requires a proper balance between production storage capacity and pipeline pumping rates.

The proposed methanol plant storage was given as 15 days. There is existing producer owned crude oil tankage at Granite Point and West Foreland for 15 days and 3 days of crude production, respectively (See Appendix C) with all crude producers tankage combined into one unit for common usage.

A preliminary analysis showed that the existing producer tankage will be sufficient if methanol is batched at a rate of 332,000 BPD. This design minimizes the investment for proposed facilities required to handle methanol.

Proposed and existing tankage at Drift River Terminal has been sized to meet pipeline batch sizes based on a 10 day pipeline cycle for tanker loadings of up to 70,000 DWT capacity for crude oil or fuel grade methanol, and 35,000 DWT capacity for chemical grade methanol.

5.0 Concept of Operation

Crude and methanol will be pumped in segregrated batches from Granite Point Pump Station to Drift River Terminal through the 20" line. Between Granite Point and Drift River, crude will enter the 20" line at West Foreland Junction. Methanol production will be stored at the Beluga Plant while crude is being pumped. Crude will be stored in producer tankage located at Granite Point and West Foreland Stations during methanol pipeline shipments.

Crude oil batches will be pumped for 8 days out of a 10 day cycle. The remaining 2 days will be allotted to methanol batching. Crude oil batches from Granite Point will take place every other cycle. This is required because the low crude production rate will not be adequate to displace methanol from the Granite Point to West Foreland Junction section of the pipeline on a 10 day cycle.

Custody transfer for both methanol and crude will occur at Granite Point and crude only at West Foreland. Tank gages will be used for measurement of tanker loadings at Drift River.

All "slop" generated from methanol and crude mixing will go into proposed slop tanks at Drift River.

All interface volumes generated from chemical and fuel methanol mixing will go directly into fuel methanol tanks.

Product contamination will be minimized by launching spheres in the pipeline between batches. New sphere launching and receiving facilities and interface detection equipment will be installed at Granite Point, West Foreland Junction and Drift River for batching operations. Shipments of chemical grade methanol will be scheduled between a 3/4 to 1/4-front to rear fuel grade methanol batch buffer to minimize the contamination with crude.

At Drift River, tankage and piping for both crude and methanol will be completely segregated. Slop tanks will be installed for crude oil - methanol mixtures generated by pipeline and tanker loading operations.

Existing tankage converted to methanol service will have internal floating roofs installed. Dedicated surveillance metering systems will be installed on the incoming pipeline stream. New pipe manifold-ing will be installed for product segregation.

Blending facilities will be installed to blend crude contaminated methanol slop into the outgoing fuel grade stream. No other means of slop disposal will be provided.

Tanker loading facilities at Drift River will be modified for multiproduct service. Two 30" loading lines will have reverse flow capability to accommodate change of product service. Drain up and flushing capability will be provided for the loading pump manifold to reduce contamination. Sphere launching and receiving facilities will be installed on the two loading pipelines. Contaminated product will be returned to the slop tanks.

Wax build-up on the pipe walls will be kept to a minimum by cleaning the walls through frequent "pigging" operations. Any wax dissolved by methanol which precipitates will be kept in suspension while in terminal tankage by using tank mixers.

Water in the crude (as high as 1% by volume) which appears in the crude/ methanol interface, will be totally absorbed by the methanol. If required, chemical treatment will be considered to facilitate separation of the crude/methanol slop mixture, and also to control precipitation of wax from the methanol. However, no cost for chem-ical control of wax precipitation has been included in this study.

As mentioned previously, custody transfer will occur at Granite Point by metering and at Drift River by tank gaging. All product loss will be at shippers expense. Shipper will not receive any compensation for product loss. CIPL will deliver slightly less volume into tankers at Drift River than received at Granite Point due to normal losses.

6.0 Product Quality Control

Laboratory tests were performed on crude oil-methanol mixtures to determine any effects on either material as a result of the proposed batching operation. The full lab report text may be found in Appendix "E". A summary of this report is as follows:

- Anhydrous methanol separates readily from Cook Inlet crude after equilibration at 30°, 77° and 120°F.
- After separation, the methanol contains 6-8% by volume of dissolved oil but the oil contains no methanol.
- At 30° and 77°F, the liquids formed methanol-in-oil dispersions on shaking, but at 120°F, oil-in-methanol dispersions formed.
- Small amounts of water in the methanol caused a stable emulsion of methanol-in-oil to form. This emulsion will require the application of a chemical demulsifier to cause separation in a reasonable time.
- Methanol equilibrated with Cook Inlet oil at 30°, 77°, and 120°F did not contain any detectable heavy metals after settling.
- Diluting separated methanel 1:1 with acidified water and centrifuging in a calibrated tube is an accurate method for measuring the oil content of the methanol.
- Methanol selectively dissolves a colcrless component from parafin deposits from Cook Inlet oil. Dissolution rates are initially high but decrease to very low rates as the surface of the wax is depleted of the soluble component.
- Methanol dissolved 7.3% of a wax deposit in one hour at 77°F and 10% in one hour at 120°F. Part of the wax precipitated from the 120°F methanol when it was cooled to 77°F.
- Capacitance probes or other methods of measuring dielectric constants are good interface detectors for the methanol/oil system. The dielectric constant of methanol is 32.6 and that of oil is 2.0.

From a chemical assay of water sampled from the bottom of a crude tank at Drift River, the sodium content of water was determined to be .8% by volume.

It should be noted that the crude used in the analysis contained no water. In actual pipeline operations, crude oil could contain up to 1% water.

Combining the laboratory test results with the pipeline operations analysis the following product contamination values were predicted:

- 1500 barrels of interface (50% crude 50% methanol) will be produced per 540,000 barrel batch of methanol.
- The methanol in the interface will contain up to 8% crude by volume that will not separate from the methanol, and 1% salt water by volume absorbed from the crude.
- No methanol will be absorbed into the oil.

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 Based on the slop being blended into 540,000 barrels of fuel grade methanol, the following contamination of the total methanol was determined.

> -3 6x10 % Crude by volume -4 8x10 % Water by volume -6 8x10 % Sodium by volume

It is predicted that some of the sodium found in the water will precipitate out of the methanol/water mixture.

 Based on thorough internal cleaning of the pipe prior to methanol shipments, methanol contamination from absorbed wax is predicted
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to be 1x10 % by volume per 540,000 barrel batch.

No specific tests were made with respect to batching chemical grade methanol. If however, chemical grade batches are buffered by fuel grade batches, it can be assumed that the chemical grade can be handled with minimal contamination. Chemical grade would be cut clean, with the fuel/chemical interface going to fuel grade tankage. The only contamination that might be considered significant will be wax. However, since the fuel grade batch will be washing the walls ahead of the chemical grade batch, wax content is not expected to be a problem in chemical grade methanol (unless specifications do not allow trace amounts of wax).

Any economic penalty due to downgrading of chemical grade methanol interface to fuel grade methanol will be borne by the shipper.

It should be noted that further quantification of predicted contamination values will require more extensive testing. The laboratory tests are thought to be representative, but actual field data will be required on wax deposition before firm values can be established for wax contamination. A pipeline test loop may be required to verify contamination values.

7.0 System Modifications and Additions

The following modifications and additions will be required to convert CIPL's crude oil system to a multi-product service.

- 7.1 Beluga Methanol Plant (to be installed by CIRI/Placer)
- Install 810,000 barrels of methanol storage.
- Install a 332,000 BPD booster pump station and delivery line to supply CIPL's Granite Point methanol pump station with 75 psig suction pressure.
- Install a natural gas fuel line to CIPL's Granite Point Station.

7.2 CIPL 20" Mainline

- Hydrostatic test mainline.
- Internally inspect pipeline.
- Install sphere launcher/retriever and batch detection facilities at Granite Point, West Foreland Junction, and Drift River.
- Install pipeline surveillance metering facilities at Drift River.
- 7.3 CIPL Granite Point and West Foreland Crude Oil Production Facilities (to be performed by crude producers)
- Modify production facilities required to unitize production tankage.
- Modify booster pump station as required to supply CIPL's Granite Point and West Foreland pump stations with 82,000 BPD and 56,000 BPD, respectively.

7.4 CIPL Granite Point Pump Station

- Construct a new 332,000 BPD capacity methanol custody transfer meter system.
- Construct a new 332,000 BPD capacity, remotely controlled, 10,500 HP (3-3500 HP units), gas turbine driven methanol pump station.

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Increase capacity of crude oil pump station to 82,000 BPD.

7.5 CIPL West Foreland Station

No work required.

- 7.6 CIPL Drift River Terminal
 - Convert three (3) existing 270,000 barrel, cone roof tanks to internal floating roof tanks, and change service from crude to methanol.
 - Modify and expand terminal manifolding for segregated multiproduct service.
 - Construct two (2) new 270,000 barrel, internal floating roof tanks with manifolding for chemical grade methanol service.
- Construct two (2) 10,000 barrel slop tanks, slop gathering facilities, and slop blending facilities to handle crude/ methanol interface mixtures.
- 7.7 CIPL Drift River Tanker Loading Facility
- Install sphere launcher/retriever and batch detection facilities on both 30" loading lines.
- Modify pumping manifold for reversible flow capabilities on both 30" loading lines.
- Install crude/methanol interface collection and transfer facilities onshore and offshore.

8.0 Economic and Tariff Summary

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For purposes of this study, Cook Inlet's current method of establishing tariffs for crude shipments was assumed for estimating tariffs for methanol shipments. These estimated tariffs are based on methanol production rate of 18,360 TBY and crude oil production rate of 18,250 TBY. Additionally, it was assumed that product losses, downgrading of chemical grade methanol batch interface to fuel grade methanol, and crude oil loss by absorption into the methanol would be paid for by the shippers. The tariffs based on these assumptions are summarized in the following table:

		\$ Tariff	(\$/bb1)*
		1981	1986
Case I:	Fuel grade methanol and constant crude volume	0.56	0.62
Case I Sensitivity:	Fuel grade methanol and declining crude volume	0.58	0.70
Case II:	<pre>1/3 chemical grade and 2/3 fuel grade methanol, constant crude volume</pre>	0.66	0.70
Case II Sensitivity:	<pre>1/3 chemical grade and 2/3 fuel grade methanol, declining crude volume</pre>	0.68	0.79

*With 1981 investment

The 1981 cost to transport methanol including dismantling and restoration cost would be in the range of 0.56/b1 to 0.79/b1. In Case I, the tariff for handling a constant 18,360 TBY volume of methanol and 18,250 TBY of crude oil is 0.56/b1 in the first year increasing to 0.62/b1 by the fifth year due to the effect of inflation on operating cost. In the Case I sensitivity, the declining crude volume results in the distribution of the plant and operating cost over a smaller volume, thereby increasing the fifth year tariff to 0.70/b1 compared to 0.62/b1 in Case I.

In Case II, the additional facilities required to handle chemical grade methanol result in 1981 tariffs of \$0.66/bbl and \$0.70/bbl for the first and fifth year, respectively.

A declining crude volume would increase the fifth year tariff to \$0.79/bbl for the same reason cited in Case I. Although the cost of handling chemical grade methanol presented in this paper is distributed over the entire pipeline throughput, it is industry practice to post a higher tariff for speciality products such as chemical grade methanol to account for the additional facilities and special handling requirements.

The tariffs presented include dismantling and restoration cost which is presently \$0.12/bbl of the \$0.58/bbl posted tariff. Since the future dismantling of the system and restoration of the site escalated with inflation, the dismantling and restoration cost could be as low as \$0.08/bbl or as high as \$0.10/bbl. This cost is lower than the present charge due to the additional methanol volumes to the system.

9.0 Appendix

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A. Engineering Design Criteria and Assumptions

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- B. Economic Criteria
- C. System Schematics
- D. Project Schedule
- E. Laboratory Test Report

APPENDIX "A"

Design Criteria and Assumptions

Hydraulic Assumptions

Liquid Characteristics:	Specific Gravity @ 60°F	Viscosity CP @ 32°F	Reid Vapor Pressure PSIA @ 100°F
Methanol	0.795	$1 \\ 10.0$	4.4
Crude	0.88		8.5
Design Flow Rates: (1	000 BPD)	Methanol	Crude
Granite Point to West Fo	reland Junction	332	82
West Foreland to West Fo		N/A	56
West Foreland to Drift R		332	66
Drift River to Offshore		840	840
Design Operating Pressure	: PSIG	<u>Methanol</u>	Crude
Granite Point - Suction	je	75	75
Discharg		900	325
West Foreland - Suction	je	N/A	50
Dischary		N/A	285
Drift River - Suction		50	50

Methanol Tanker Specifications

Tankers to be used for transporting fuel grade methanol and chemical grade methanol will be in the 70,000 DWT and 35,000 DWT class, respectively.

- Methanol capacity of tanker to be 3% less than the rated vessel tonnage (long tons).
- (2) No ballast will be unloaded from methanol tankers. Tankers will have segregated ballast tanks.

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(3) Methanol tanks will be clean and ready for receiving product upon arrival at Drift River. No cleaning of product or disposition of product tank washings will be allowed at Drift River.

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APPENDIX "B"

1.

Economic Criteria and Assumptions

1.	Project Life:	19 years	
2.	Tax R ates:	Federal 46% State 9.4% Investment Tax Credit 10	0%
3.	Depreciation:	Tax - 1 1/2 year DDB/16	year SYD
		Book - Straight line	
4.	Operating Cost Inflation Factors:	Labor Materials and Supplies Ad Valorem Tax Power and Fuel Costs	97 10% 7% 11%
_		At MOT delivered the Onen	the Deduct Dt.

5. Gas fuel price: \$4/MCF delivered to Granite Point Station.

6. Tariff calculations do not include any costs associated with the following items. All costs listed below are assumed to be at shippers expense.

- Methanol and crude loss associated with normal pipeline operation.
- Downgrading of chemical grade methanol to fuel grade methanol.
- Crude oil lost by absorption into methanol.

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- Delays associated with tanker loading (Demurrage).
- Modifications and additions to crude producers' facilities.

APPENDIX "C" SYSTEM SCHEMATICS

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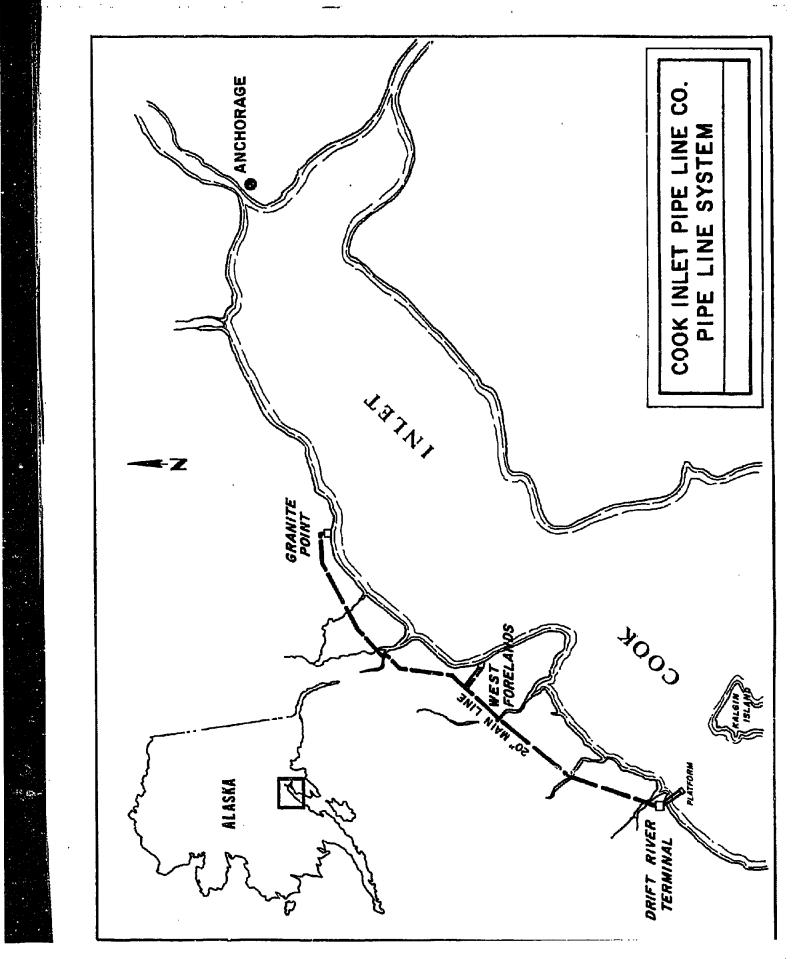
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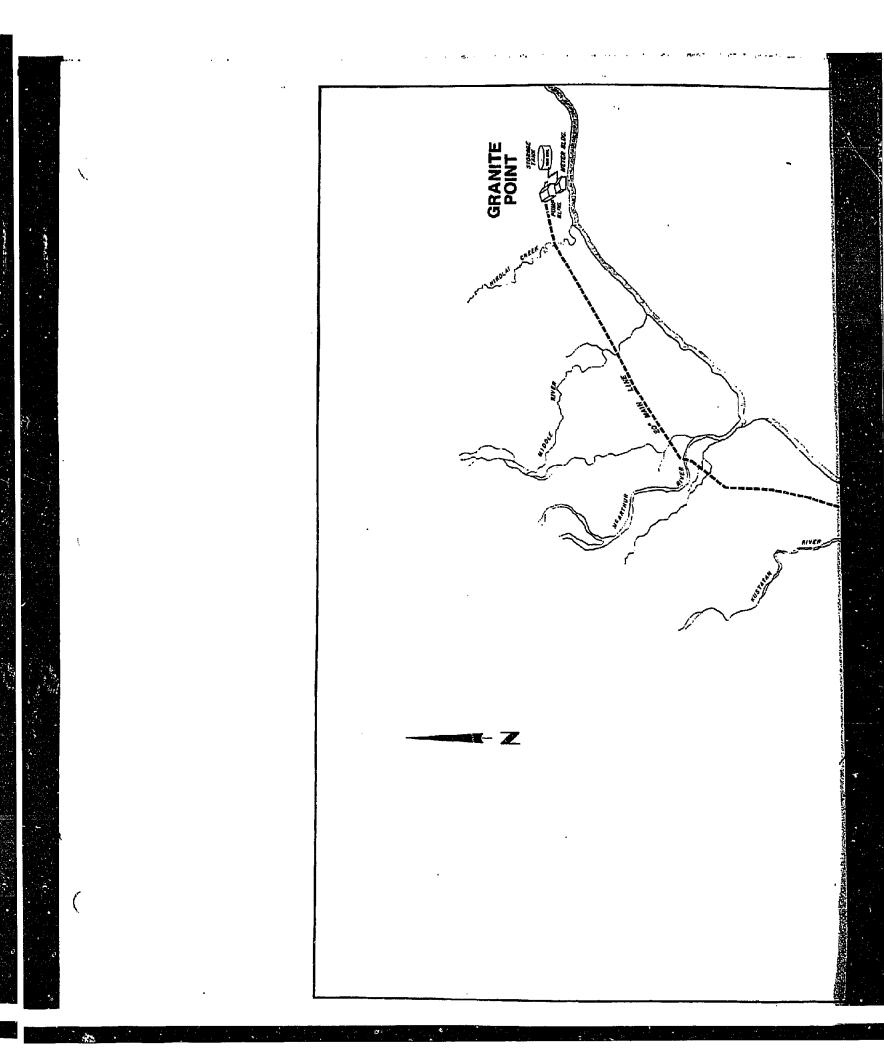
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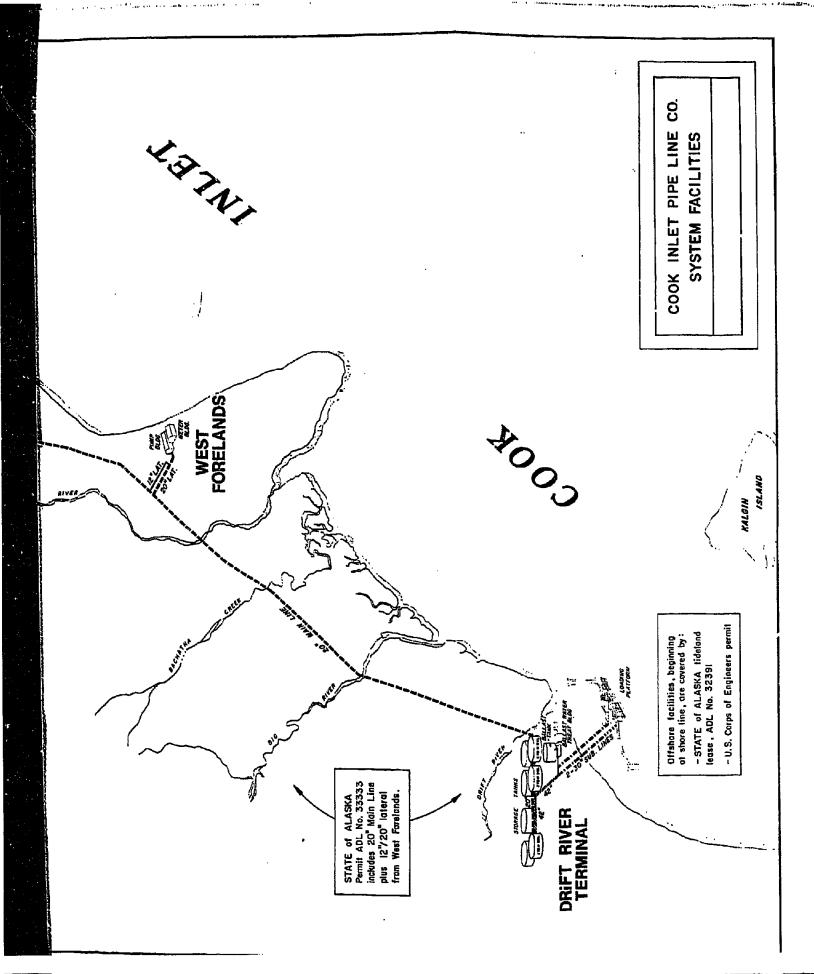


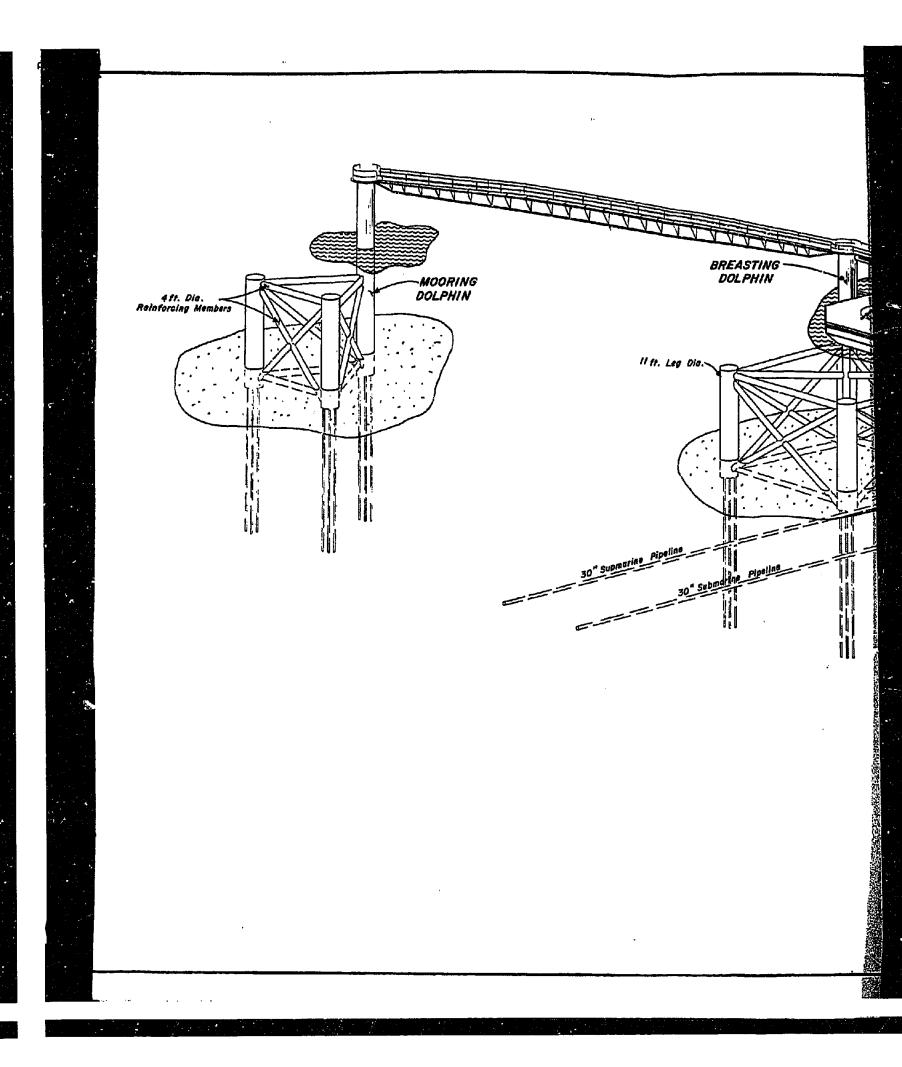
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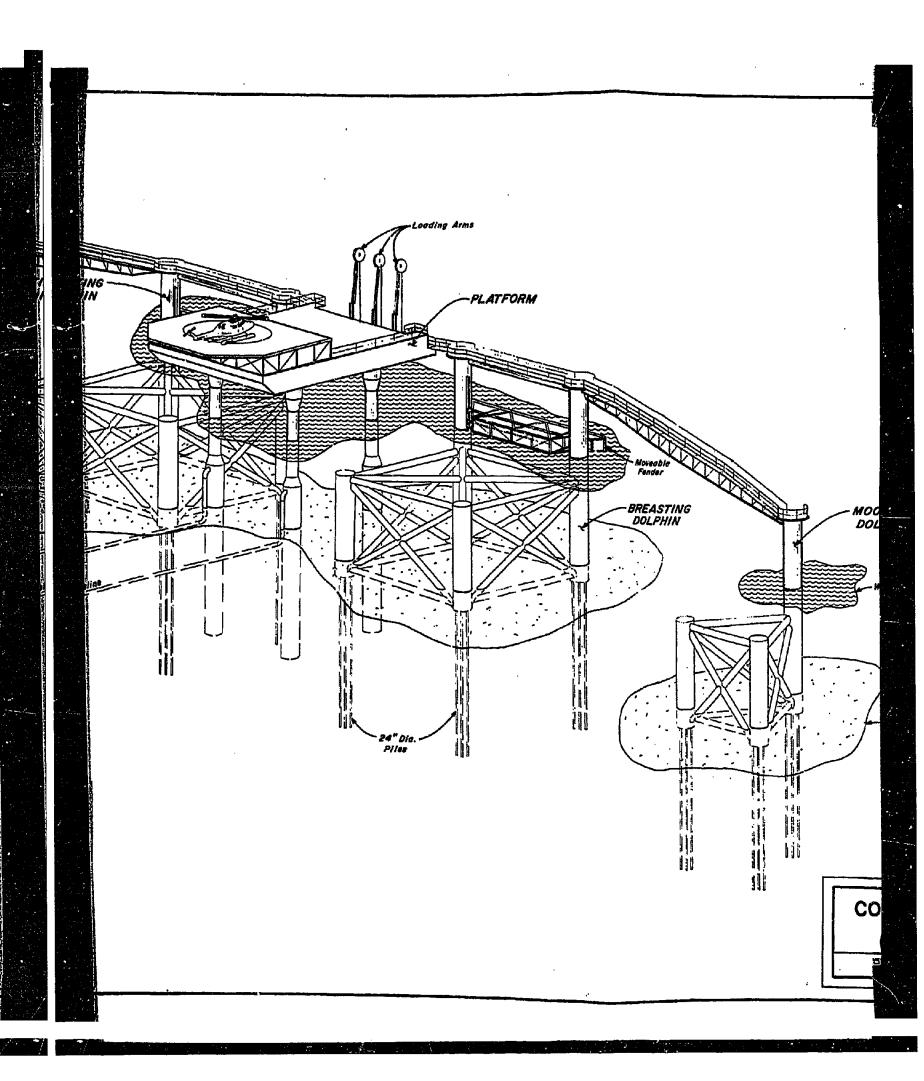
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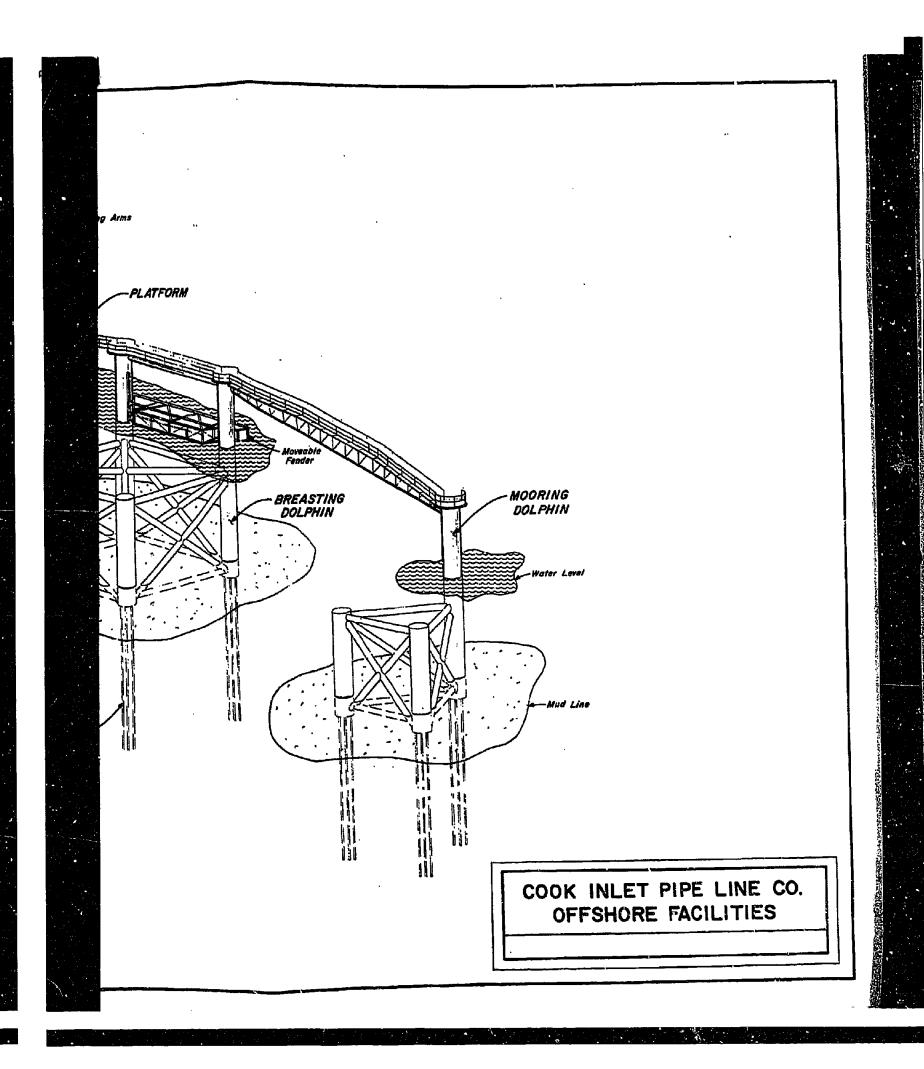
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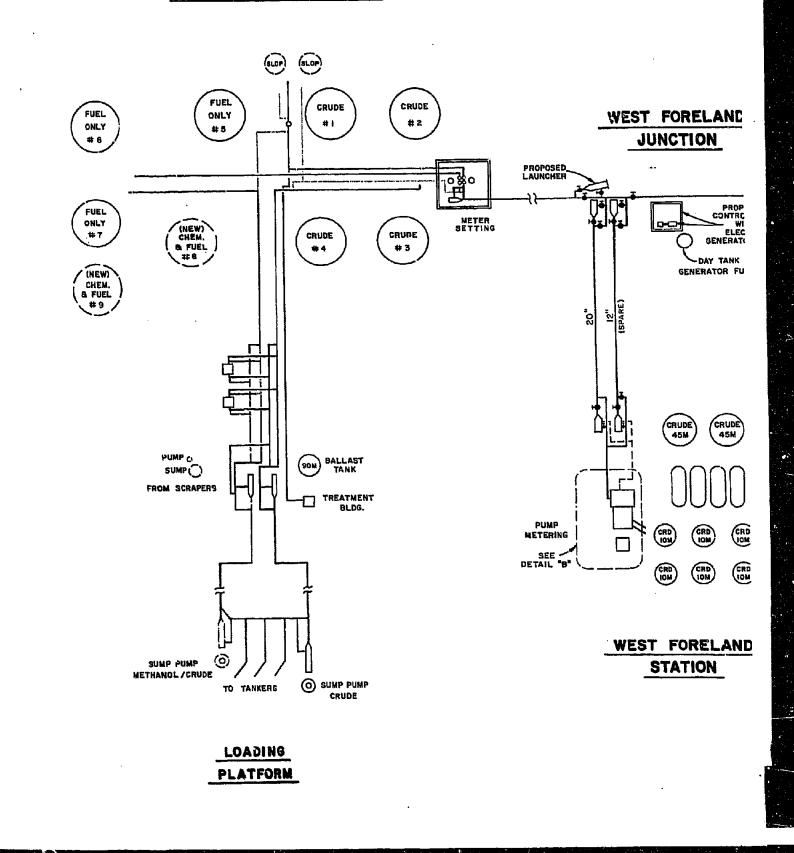




DRIFT RIVER TERMINAL

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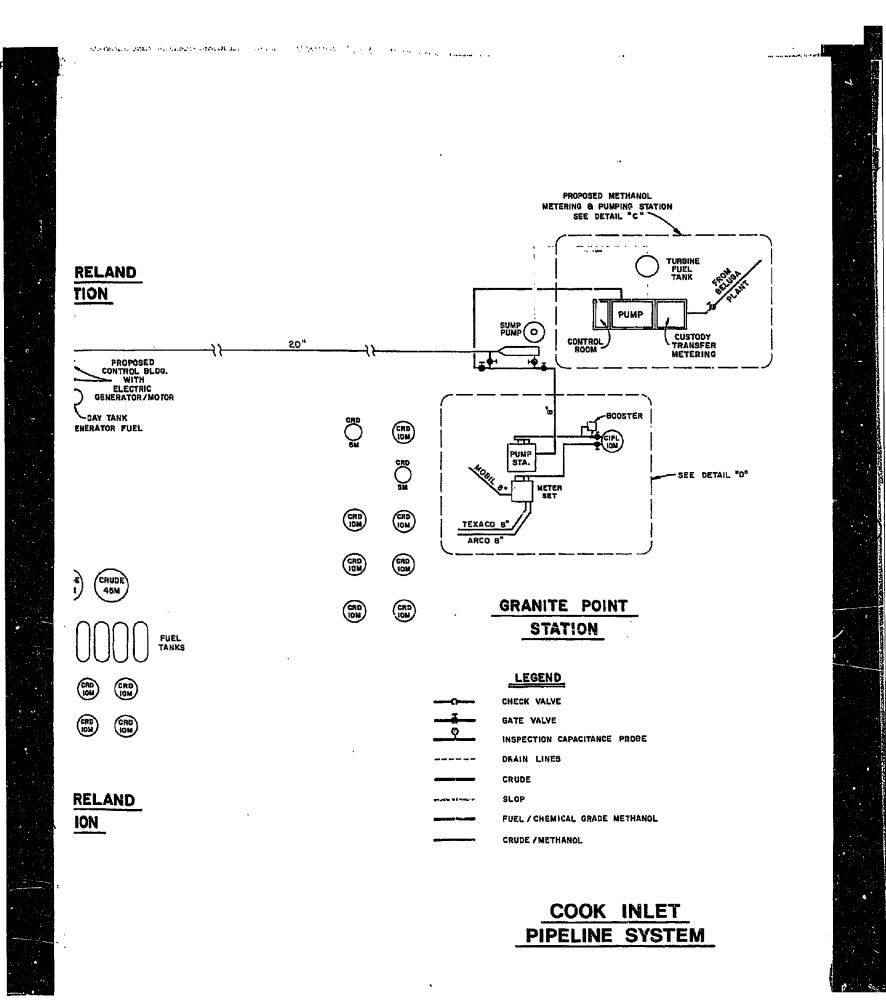
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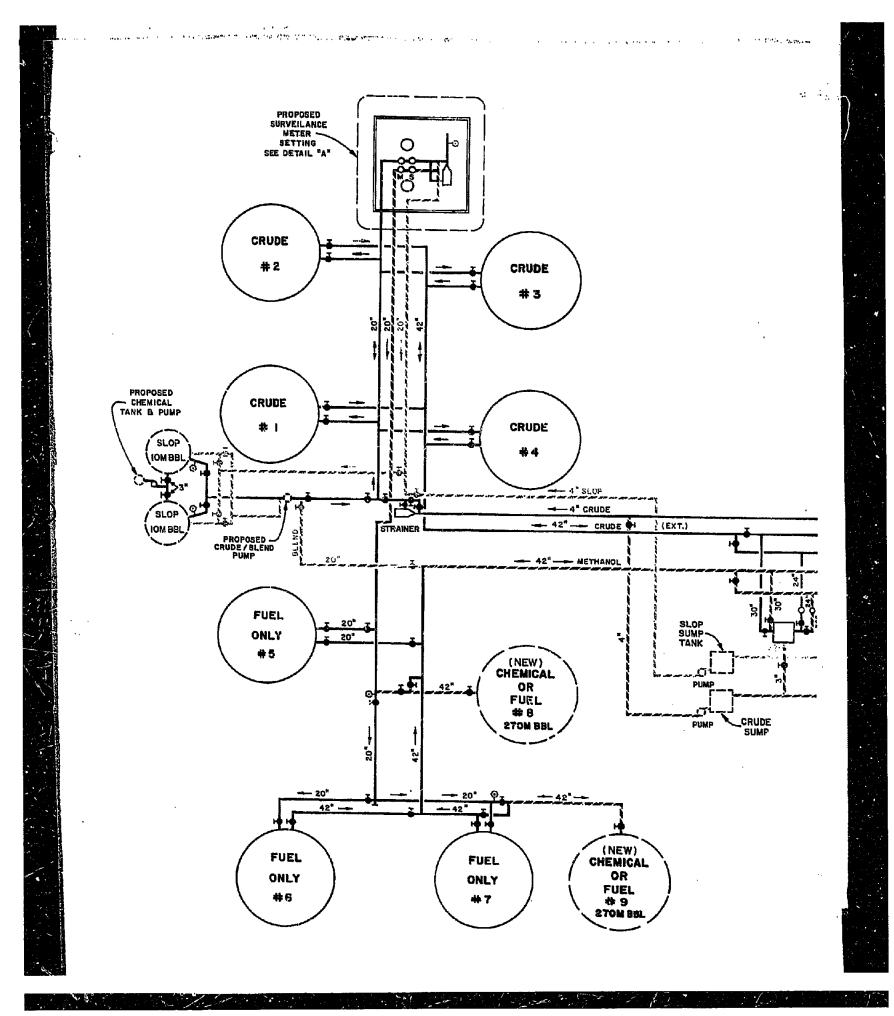


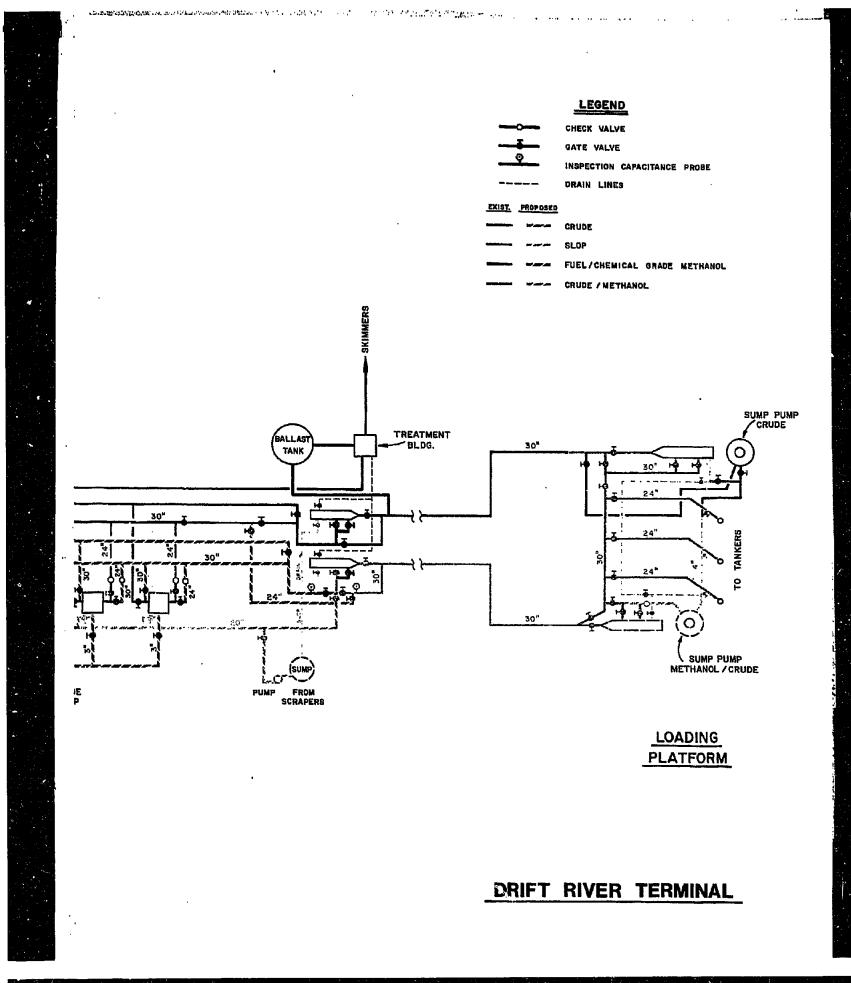
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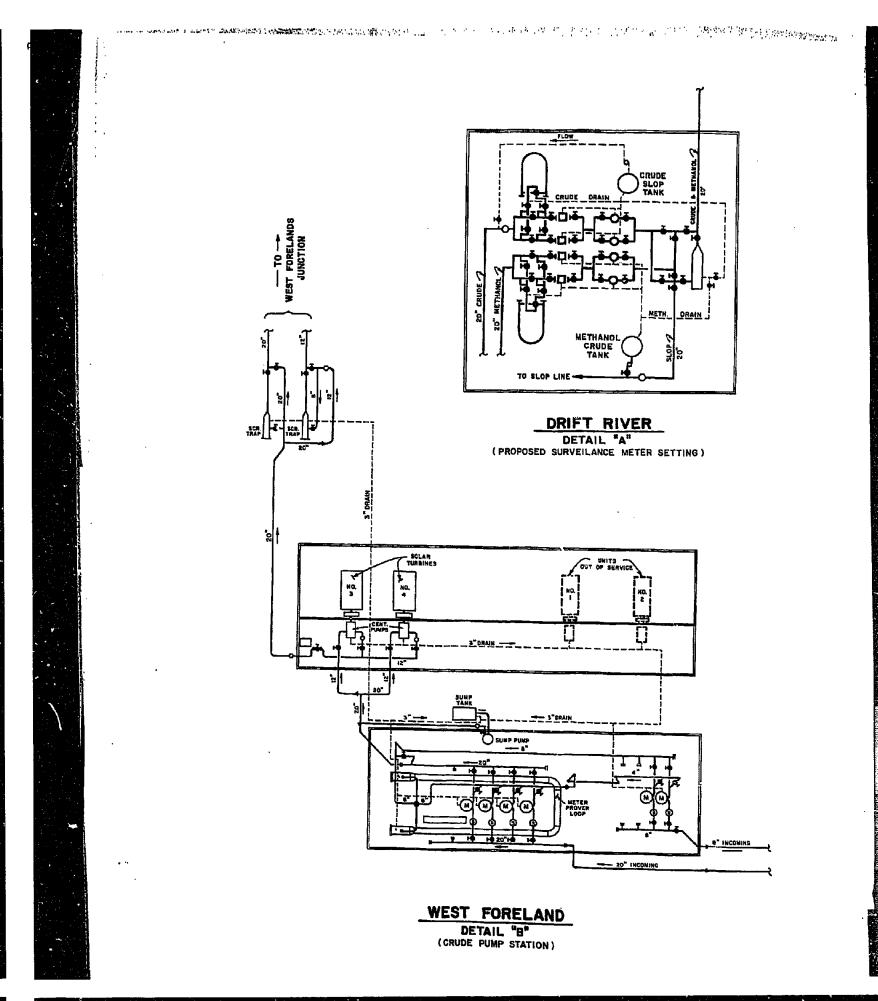
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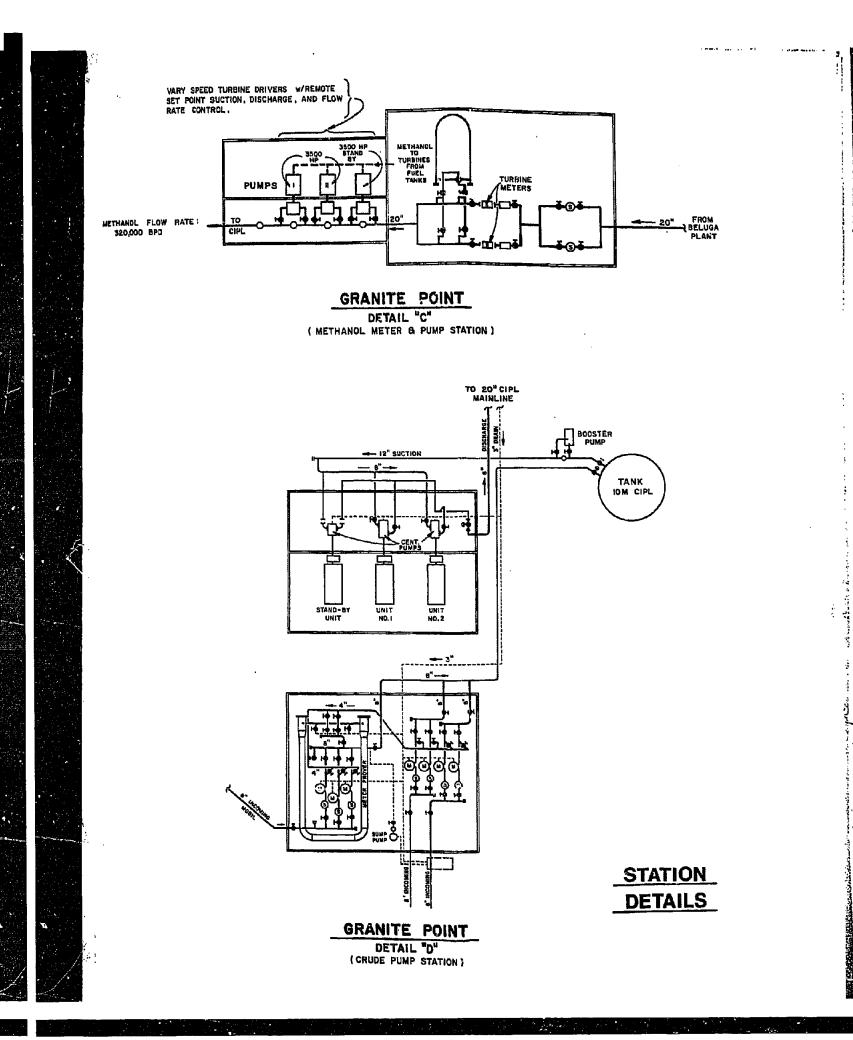








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DESIGNERS CONTRACTOR

APPENDIX "D" PROJECT SCHEDULE

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	FRONT END ENGINEERING-PERMITS												H	Ħ		\square		╘┨	╞┼		$\left \cdot \right $	
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INLET REGION.	COOK INLET REGION, INC. AND PLACER ANEX, INC.		{														5 300	DOE GRAVI (*		1-RORU	1 5029	e
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APPENDIX "E" LABORATORY TEST REPORT

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MOBIL RESEARCH AND DEVELOPMENT CORPORATION Field Research Laboratory

C.C.

DATE March 24, 1981

E. L. Jones, FRL C. L. Murphy, FRL W. C. Skinner, FRL K. M. Winston, MPL, Daltas

205-12.2-3125 <u>COOK INLET PIPE</u> <u>LINE BELUGA METHANOL</u> <u>STUDY PLACER AMEX</u>

Results of tests on the equilibrium of methanol with crude oil and on the solubility of wax in methanol are attached. In summation, the results and conclusions from the tests are as follows:

- 1. Anhydrous methanol separates readily from Cook Inlet crude after equilibration at 30, 77 and 120°F.
- 2. After separation, the methanol contains 6-8% by volume of dissolved oil but the oil contains no methanol.
- 3. At 30 and 77°F, the liquids formed methanol-in-oil dispersions on shaking, but at 120°F, oil-in-methanol dispersions formed.
- Small amounts of water in the methanol caused a stable emulsion of methanol-in-oil to form. This emulsion will require the application of a chemical demulsifier to cause separation in a reasonable time.
- Methanol equilibrated with Cook Inlet Oil at 30, 77, and 120°F did not contain any detectable heavy metals after settling.
- Diluting separated methanol 1:1 with acidified water and centrifuging in a calibrated tube is an accurate method for measuring the oil content of the methanol.
- Methanol selectively dissolves a colorless component from paraffin deposits from Cook Inlet oil. Dissolution rates are initially high but decrease to very low rates as the surface of the wax is depleted of the soluble component.

D. R. Dunn TO MPL, Dailas

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- 8. Methanol dissolved 7.3% of a wax deposit in one hour at 77°F and 10% in one hour at 120°F. Part of the wax precipitated from the 120°F methanol when it was cooled to 77°F.
- 9. Capacitance probes or other methods of measuring dielectric constant are good interface detectors for the methanol/oil system. The dielectric constant of methanol is 32.6 and of oil is 2.0.

We hope these results are sufficient to establish the feasibility of sequencing methanol and crude oil in a pipeline. Please advise if you have any questions about the crude.

Millionel B. J. Warner

9,55-ESSnavely/clm Attachment

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Cook Inlet Pipe Line Beluga Methanol Study, Placer Amex

March 5, 1981

Work by:

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S. C. Birk J. R. Featherston M. L. Mathis R. L. Morris E. S. Snavely Report by:

E. S. Snavely

Cook Inlet Pipe Line Beluga Methanol Study Placer Amex

Introduction and Background

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Placer Amex Corporation plans to produce methanol from coal in the area of Cook Iniet, Alaska, and has approached Mobil on the feasibility of transporting the methanol by Cook Inlet Pipe to tanker terminal facilities. Mobil Pipe Line requested that FRL study the equilibration and settling of methanol/Cook Inlet crude oil mixtures and the solubility of Cook Inlet paraffin deposits in methanol to aid in establishing the feasibility of pipelining methanol and in planning the pipeline terminal control, storage and separation facilities. This report gives the results of the FRL study.

Results and Conclusions

- 1. Anhydrous methanol can be interfaced with Cook Inlet crude oil in a pipeline. Methanol at the interface will contain 6-8% oil by volume but the oil will contain no dissolved methanol.
- 2. Mixtures of anhydrous methanol and Cook Inlet crude separate rapidly after equilibration at 30°, 77°, and 120°F.
- 3. Small amounts of water cause methanol to form a stable emulsion with Cook Inlet crude but these can be resolved with commercial demulsifiers applied at a concentration of about 200-400 ppm.
- 4. The oil content of methanol can be measured by diluting the methanol 1:1 by volume with acidified water and centrifuging.
- 5. Methanol equilibrated with Cook Inlet crude oil at 30°, 77° and 120°F extracts no heavy metals from the crude.
- 6. Methanol selectively dissolves a colorless component from paraffin deposits from Cook Inlet oil. Dissolution rates are initially high but decrease to very low rates as the surface of the wax is depleted of the soluble component.
- 7. Methanol dissolved 7.3% of a wax deposition in one hour at 77°F and 10% in one hour at 120°F. Fart of the dissolved wax precipitated from the 120°F methanol when it was cooled to 77°F.
- 8. Capacitance probes or other methods of measuring dielectric constant are good interface detectors for the methanol/oil system. The dielectric constant of methanol is 32.6 and of oil is 2.0. This method can also be used to measure the oil content of methanol provided a correction is made for any water which is present in the methanol. Water in methanol can be measured by the Karl Fischer titration.

Recommendations

- The pipeline terminal should be equipped with a separation facility for separating methanol/oil mixtures which will form at the methanol/ oil interface in the pipeline.
- The separation facility should have a residence time of six hours minimum and preferably 12 hours.
- 3. Commercial suppliers (Tretolite, Nalco, C-E Natco) should be requested to supply a chemical demulsifier for methanol/oil emulsions.
- 4. The separation facility should be equipped so that wax or other solids can be removed.
- 5. A continuously indicating or recording capacitance probe should be used to detect the methanol/oil interface.

Experiments and Results - Equilibration Studies

The rate of separation of methanol/oil mixtures was measured after equilibration at 30°, 77° and 120°F. Since the oil and methanol were to be subjected to various tests after separation, four replicate mixtures were made up for each temperature.

The separation measurements were made in 100cc graduated prescription bottles. Each bottle contained 50 cc of methanol and 50 cc of oil; these were put in the temperature-controlled evnironments and were shaken vigorously when the appropriate temperature was achieved. The bottles were then replaced in the temperature chambers to adjust for heat-of-mixing and then shaken again before timing for their separation rates was started. All of the samples except one separated fairly rapidly. In the 30° and 77°F, the interface appeared first near the top of the liquid level, as time passed, the interface dropped toward the original 50 cc level. Appearance of the interface at the top indicated that the liquids formed a dispersion of methanol in oil. In the 120°F test, the interface appeared near the bottom of the bottle and rose with time toward the 50 cc level. This result indicated that an oil-in-methanol-dispersion had formed which was opposite from the dispersions formed at 30° and 77°.

All of the mixtures separated rapidly at first (Figure 1) but slowed after about two hours. After four hours, the 120°F mixtures were very close to the ultimate interfaces. The ultimate interfaces were all below 50 cc indicating that more oil had dissolved in the methanol than methanol had dissolved in the oil. This was verified by analyses of the two layers as described later. Data from the settling tests are given in Table 1.

The specific gravity of methanol and Gook Inlet oil are given in Figure 2. The specific gravity of anhydrous methanol is 0.792 and Cook Inlet oil is 0.8396. Therefore, methanol is expected to rise to the top which is what was observed. An 83% solution of methanol is water has the same specific gravity as Cook Inlet oil and this mixture could not be expected to separate by gravity.

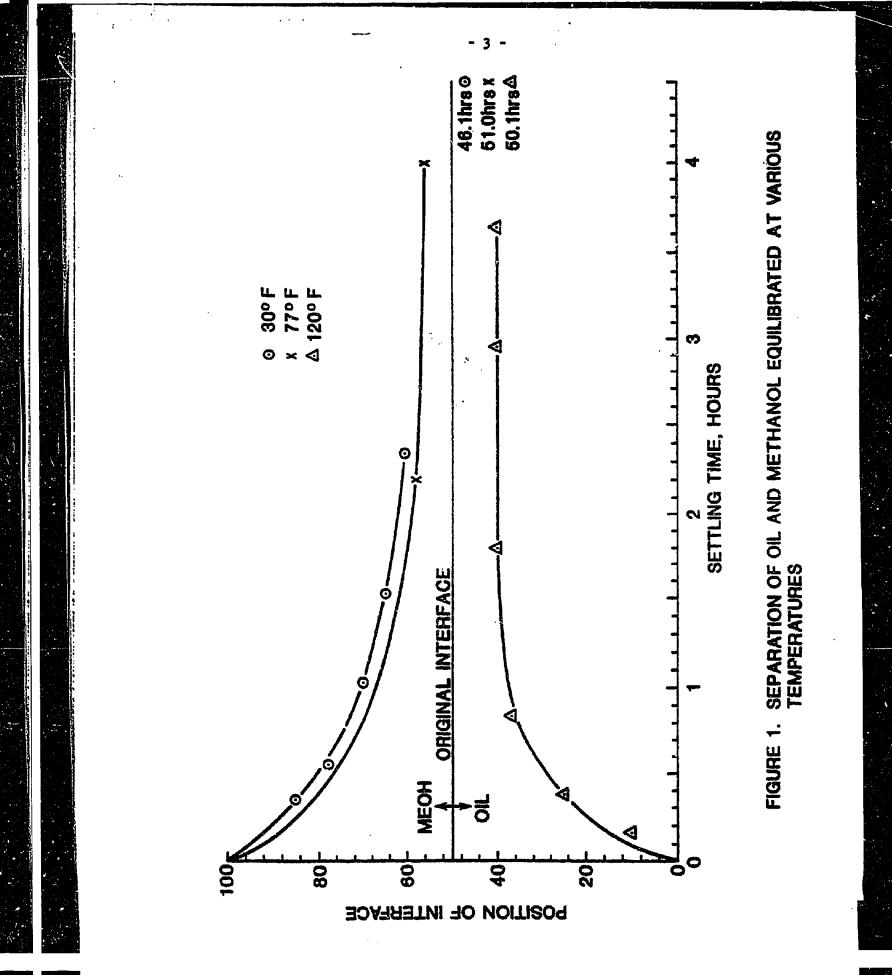


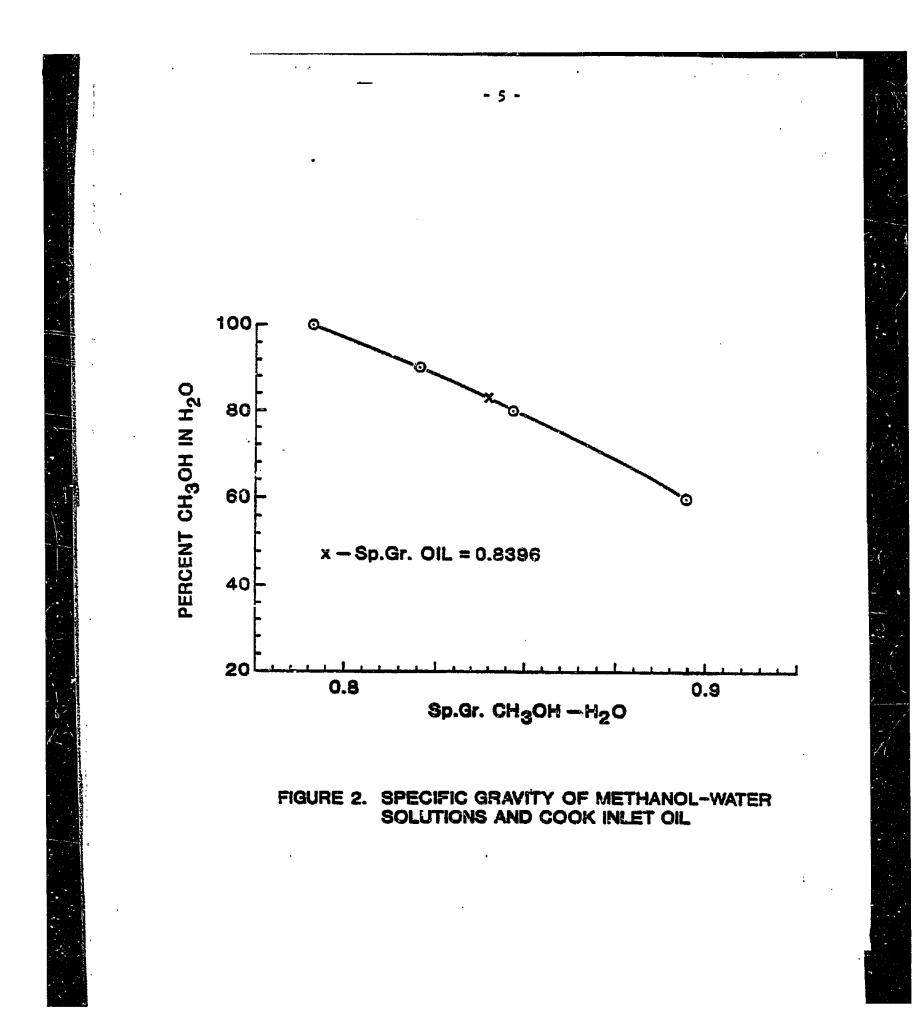
Table 1

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Time to Separate of Cook Inlet Oil and Anhydrous Methanol Equilibrated at Various Temperatures.

50 MI OII, 50 MI Methanol

•		Time		Interfac	e, Mis.	
	Temp. °F	Hours	<u>#1</u>	<u>#2</u>	<u>#3</u>	#4
	30	0.35	85	70	85	82
		0.57	78	62	70	60
		1.02	70	58	60	60
		1.52	65	55	60	55
		2.35	60	55	55	55
		46.1	47	44	45	44
	77	2.2	58	58	58	No Interface
		4.0	56	56	52	11
		4.7	55	55	52	34
		5.2	55	55	52	19
		6.0	55	55	52	
		51.0	45	45		88
	120	0.17	10	29	22	28
		0.38	25	37	33	38
		0.85	37	38	39	4C
		1.80	40	40	40	41
		2.97	40	40	40	41
		3.63	40	40	40	41
		4.20	40	40	40	41 ·
		4.97	40	40	40	41
		50.1	44	42	42	43



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One of the samples made for equilibration at 77°F would not separate (Table 1). This stable emulsion is believed to have been caused by water absorbed in the methanol from the atmosphere. Later tests in which small amounts of water were deliberately added to the methanoi, formed several stable emulsions, but not in every case. Since variable amounts of water could be absorbed by the methanol in a pipeline, it would be advisable to have an effective chemical demulsifier on hand in the event that the interface mixture forms a stable emulsion.

Oil Dissoived in Methanol

After 48 hours, the methanol layer from the equilibration tests was removed and analyzed for oil content. The separated methanol was first centrifuged to measure suspended oil; none was observed. To measure dissolved oil, 25 cc of methanol was diluted with 24 cc of distilled water and one cc of concentrated hydrochloric acid and centrifuged again. This treatement separated dissolved oil from the methanol and the separated oil was measured in the graduated centrifuge tube. It was found that the separated methanol layers contained 6.8% oil at 30° and 77°F and 8.0% at 120°F.

Methanol in Oil

The oil layers separated from the equilibration tests were analyzed for methanol by a gas chromatograph equipped with a mass spectrometer at Allied Analytical Labs, Inc. of Dallas. Methanol could not be detected in the oil indicating that the methanol content of the oil was less than 0.1%.

Metals in Methanol

The methanol separated from the equilibrium tests was analyzed for heavy metals by the following procedure: the methanol was evaporated to dryness and the residue was dissolved in 60 cc of 6M HCI and boiled for 20 minutes. The solution was then diluted to 100 cc with distilled water and analyzed at FRL by an inductively coupled plasma spectrograph. No metals were detected. The limit of detection for most metals by this method is less than one part per million.

Dielectric Constant of Methanol

The dielectric constant of anyhdrous methanol and of the methanol layers separated from the equilibration tests were measured with a capacitance bridge and capacitance cell. Results are given in Table 3. A dielectric constant below 33.03 means that oil (dielectric constant about 2.0) is dissolved in the methanol and a dielectric constant above 33.03 means that the methanol contains water (dielectric constant about 20). A capacitance probe used as an interface detector in the pipeline would increase in capacitance by 17 times as the flow changed from Cook inlet oil to anhydrous methanol.

Table 2

Methanol Dissolved In Oil and Oll Dissolved in Methanoi

Temp. °F	Hours after Equilibration	Oil in Methanol, %	Methanol In Oil, Z
. 30	46.1	6.8	0
77	51.0	6 . 8	0
120	50.1	8.0	· 0

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Trace Metals in Methanoi = 0

OII BS&W = 0

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Table 3

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Dielectric Constant of Anhydrous Methanol and Methanol-Oil Solutions for Equilibration Tests

Sample	<u>Dielectric Constant</u>	Oil Content, 2 Vol.
Anhydrous methanol	33.03	о О
30°F methanol	30.64	б.8
77°F methanol	28.60	6.8
120°F methanol	29.62	8.0
99% methanol, 1% water	33.71	0
95% methanol, 2% water	34.39	G
97% methanol, 1% water	35.07	0

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Wax Solubility in Methanol

The solubility of paraffin deposits (furnished by Cook Inlet Pipe Line) in methanol was measured by dip tests at 77°F and 120°F. Paraffin was coated onto weighed screens which were reweighed to obtain the amount of paraffin present. The coated screens were attached to arms of a mechanical device that moved the screens up and down about 2 inches at a rate of 20 cycles per minute. Five test tubes filled with methanol were placed so that the paraffin screens moved up and down beneath the surface of the methanol. A screen was removed each hour, dried by blowing with unheated air, and weighed to measure the amount of paraffin dissolved. In the 120°F test, one of the tubes was emptied each hour and refilled with fresh methanol to determine if the methanol was being saturated with dissolved paraffin.

The paraffin dissolved rapidly at first but slowed to a lower rate after one hour (Figure 3). This meant that either the methanol was becoming saturated or a component of the paraffin was dissolved and the rate slowed as the component was depleted from the paraffin coating. The test in which the methanol was changed every hour dissolved no more paraffin than would be expected for that time of exposure (Figure 3 and Table 4); therefore, it was concluded that the methanol selectively dissolved a component of the paraffin. Methanol that dissolved paraffin at 120°F formed a slight precipitate when cooled to 77°F. The methanol that dissolved paraffin at 77°F formed a voluminous white precipitate when evaporated to about half its original volume.

Table 4

Wax Solubility in Mathanol

77°F <u>Hrs.</u>	Wax Wt.	Wt. Loss	% Wax Dissolved
1	0.95	0.07	7.3
2	0.63	0.06	9.5
3	0.79	0.11	13.9
4	0,68		
5	0.85		
120°F			
T	0.82	0.0811	10
2	0.62	0.0742	12
3	0.80	0.1043	13
4	0.64	0.0908	14.1
5*	0.75	0.0961	12.8

* Methanol changed every hour.

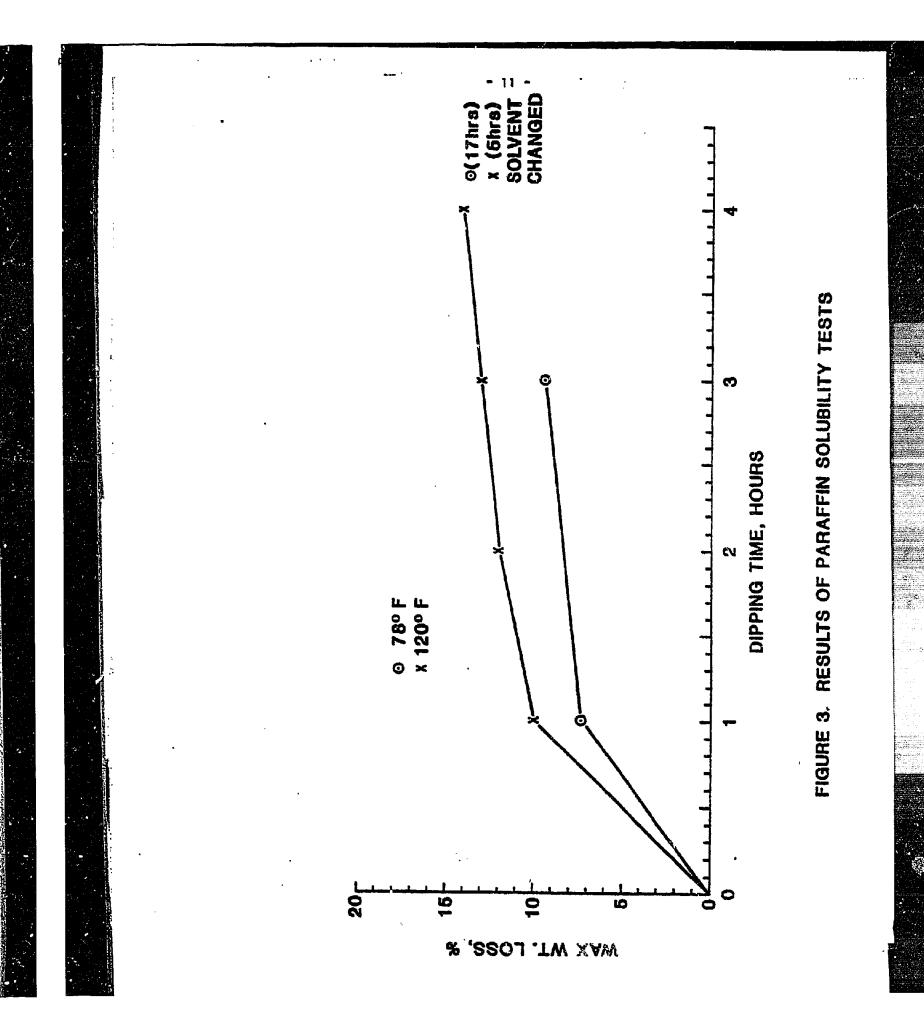
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5	Sodium _	323.04	7427	Chloride	435.17	
C	Catcium _	91.07	1825	Skurbonate	18.21	
M	Magnesium _	39.48	480	*Sulfate	0.31	14.
l,	ron _	0.07	2.07	Carbonate	0.0	0,
• 6	Barium _	0.03	2.2	Hydroxide	0.0	0.
100	20 Na prep	ակաժամամաժամասն։ 21	adamina da ang ang ang ang ang ang ang ang ang an	<mark>ու կամավեր հայ</mark> ունանանականու o s s so	գտղութորութութութութո 15	20 'f''''] Cl
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C Gravimetric Analysis

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