SECTION 2.0

RAILROAD SYSTEM

2.1 GENERAL

The railroad is dedicated solely to the support of the methanol production complex, its functions being the transport of coal to the plant, ash and sludge from plant to the mines, and commodities between the barge dock, the plant and the mines. Facilities are included for loading and unloading coal and ash, servicing of locomotives, and repair and maintenance operations.

The system comprises a twenty-two-mile long, single-track network with turnabout loops at either end, sidings at both mines and sidings and yard tracks at the plant. There is one emergency passing siding between the two mines, one siding between the plant and the Chuitna mine, and a four-mile-long, single-track extension to the barge dock which provides for rail movement to the plant, construction camp and mines of equipment, materials and supplies arriving by barges.

The railroad design is based on two studies. The first study, conducted by Davy McKee, consists of basic engineering design and cost estimates. To obtain the benefit of their sub-arctic railroad experience, R. A. Fisk and Associates, Ltd., was commissioned to make a second study. Two additional subcontractors were engaged to provide specific sub-arctic earth moving and bridge building cost estimating data. The railroad capital cost estimate involves input from all the participants.

2.2 ROUTE

The railroad alignment is shown on Drawing 5530-104-C-001. It originates at the plant and runs in a generally northwest direction following the natural ridge line. The average grade along the route is 1.5%, with a maximum grade of 2%. There are nine bridges along the route.

The single track between the dock and the plant is shown on Drawing 5530-104-C-039. In the high bluff area the single track is set on cut benches, climbing from dock to bluff level at a maximum grade of 2%.

The railroad corridor from plant to mines contains a standard gauge track on timber ties, supported by crushed stone. A 40-foot wide service road with drainage ditches parallels the track except at river crossings, where the road deviates to locations where convenient crossings of the river can be made with use of culverts. The road is crowned to provide lateral drainage to the drainage ditches which channel all runoff water into a series of settling ponds.

2.3 TRAIN OPERATIONS

- Coal Trains:

  There are two coal trains, each of which makes three round trips per day, five days a week. Each train consists of three 3500 HP locomotives, 60 coal cars, 11 ash cars, and 12 sludge cars. Forty-two coal cars are loaded at the Capps mine and the remaining 18 coal cars are loaded at the Chuitna mine. At Chuitna 11 empty ash cars, and 12 empty sludge cars are attached. The train proceeds downhill from the Chuitna mine to the plant where all sixty coal cars are unloaded. Once unloading is complete the locomotives are fueled and sanded. After the first locomotive is serviced, it is detached and used to push the empty ash and sludge cars onto the ash and sludge loading sidings. The empty cars are detached and replaced by loaded cars which the locomotive pulls back onto the main loop and reattaches to the train. The full ash and sludge cars are dropped off at the disposal siding at the Chuitna mine and the locomotives and empty coal cars proceed to the Capps mine where the cycle begins again.

- Ash and Sludge Trains:

  There are two trains, operating only on weekends, hauling ash and sludge from the plant to the Chuitna mine. Each of these trains consists of 11 ash cars and 12 sludge cars, and each makes three round trips per day, two days per week.

- Commodity Train:

  There is one commodity train. It makes two trips per week to each mine, and one trip per week to the barge dock. The train consists of one 3500 HP locomotive, three box cars, three flat cars, and five tank cars. The trip begins at the central warehouse at the plant where the cars are loaded with commodities. The loaded cars are dropped off at the Chuitna mine and the locomotive continues on to the Capps mine to pick up an identical string of cars which are loaded with refuse. This train is hauled back to the central warehouse at the plant where the refuse is unloaded in the outdoor storage area. The train makes one such round trip on one day. On the following day the Capps mine receives commodities and Chuitna unloads its refuse. On the third day this train is used to haul commodities from the dock to the central warehouse or for emergency shipments to the mines or other points.

A complete list of the required railroad rolling stock is given in the following tabulation:

TABLE 2-1

ROLLING STOCK

	No. of Cars				
	Train #1	Train #2	Plant	Mine	Spares
DIESEL-ELECT. LOCOMOTIVE (3500 HP)	3	3	-	-	1
BOTTOM DUMP COAL CARS	60	60	-	-	18
SIDE DUMP ASH CARS	11	11	11	-	6
SIDE DUMP SLUDGE CARS	12	12	16	-	6
DIESEL-ELECT. LOCOMOTIVE (3500 HP)	1	-	-	-	-
FLAT CARS	3	-	3	-	1
BOX CARS	3	-	3	-	1
TANK CARS (DIESEL)	4	-	4	-	1
TANK CARS (GASOLINE)	1	-	1	-	-

2.4 TRAIN CONTROL SYSTEM

All train movements on the main tracks, sidings and yard tracks are controlled by a dispatcher in the control tower in the unloadloop at the plant. The dispatcher monitors trains on the track model board and uses a control panel to activate switches to the loops, sidings, and main track. Safety circuits in the equipment reject any unsafe control commands, such as allowing two opposing trains on the same track. There is also radio communication between the dispatcher, locomotive engineers, the mine operators and the plant operators.

2.5 LOADING AND UNLOADING

- Coal Loading:

  There are two coal loading facilities, one at each mine. Each system has an overtrack surge bin, hydraulic cutoff gate and traveling and telescoping chute. The operator controls the chute and the cutoff gate while the engineer indexes the cars forward to load them evenly. When the last car is loaded, the operator moves the chute clear and the train moves on.

- Coal Unloading:

  This facility, located in the loop at the plant, consists of a 500-foot-long trestle enclosed by a metal building. As the coal cars enter the building the car doors are activated by a "live" electrical contact. The doors open and the coal is dumped into a hopper. As the train proceeds at 3 to 5 mph each car dumps its coal. The car doors are closed by a similar contact at the far end of the building. By switching "live" contacts the operator can fill one end of the hopper with Capps coal and the other end with Chuitna coal.

- Ash Loadout:

  There are three 1400 ton overtrack ash storage silos located over a siding adjacent to the loop. The empty ash cars are positioned under the silos and a car puller system is attached. The ash is conditioned with water in a mixer and discharged onto conveyors which fill the cars. The cars are indexed forward automatically until all of the empties are filled. The system shuts down automatically and the full cars remain in place until the locomotive comes to retrieve them.

- Sludge Loadout:

  The filter building is located on a siding inside of the loop at the plant. Since the filters are continuously discharging sludge, a continuous supply of empty cars is required. The locomotive brings 12 empties, and four spares are kept in the loading line for emergency storage. The empty cars are indexed forward automatically by a car puller and loaded inside of the filter building. The train schedule is such that 12 cars will be filled and detached by the time the locomotive returns.

- Ash Loading Siding:

  The locomotive pushes the empty ash cars through the bypass siding onto the end of the ash loading siding. The cars are attached to the positioner system which pulls them down a 0.5% grade to the ash loadout station. The operator manually positions the lead car under the load-out point and then switches the positioner to automatic control. The operator observes the loading as the cars are indexed forward. When all the cars are loaded, the system automatically shuts off. The positioner is disconnected and the cars are retrieved by the locomotive.

- Sludge Loading Siding:

  The operation of this car positioner system is essentially the same as for the ash loading siding. The only difference is that the filters continuously discharge sludge so a continuous line of empty cars is required. When the locomotive returns with 12 empty cars, they are attached at the end of the loading line. The locomotive then moves to the head of the loading line and picks up 12 full cars. There are four spare empty cars in the middle of the loading line to supply reserve storage capacity.

2.6 CAR POSITIONER DESIGN CONDITIONS

Two car positioner systems are required; one at the ash loading siding and the other at the sludge loading siding.

- Ash Siding --

  1. The car positioner will haul 11 full side dump ash cars.

  2. The hopper cars will be identical and hold 85 tons of conditioned ash. The car weight and dimensions will be given later. Each car truck has antifriction roller bearings.

3. The loadout track is straight with a 0.5% grade. The cars may be pulled uphill.

4. The loadout system is rated at 750 net tons per hour.

5. Presently the system is intermittently used but future conditions may require continuous operation.

- Sludge Siding --

  1. The car positioner hauls 16 full and 12 empty side dump sludge cars.

  2. The hopper cars are identical and hold 44 tons of scrubber sludge. Each car truck has antifriction roller bearings.

  3. The loadout track is straight with a 0.5% grade. The cars may be pulled uphill.

  4. The loadout system is rated at 119 net tons per hour.

  5. The positioner system will be operating continuously.

2.7 LOCOMOTIVE SERVICING

The servicing facility is located in the coal unloading loop at the plant. Six trains per day with 3 locomotives each arrive for servicing, which includes sanding, fueling, lubrication and inspection. The facility is operated by two men and is capable of servicing one locomotive at a time.

o Fueling:

Diesel fuel is imported to Cook Inlet and is brought to the facility by tank truck or railroad car. The fuel is then loaded into a 45,000 gallon underground storage tank (approximately one week's storage). A locomotive is fueled from this tank by means of flexible hose and a "loading arm" which extends out to the tanks on the underside of the locomotive. Each locomotive is refilled at least once every three days.

o Sanding:

The locomotives are sanded after every round trip because of the steep grades and weather conditions. Sand is assumed to be available from local sand banks. The sand is loaded into trucks for transport to the facility where it is dumped into a temporary storage pile (five-day storage). In between train arrivals, one operator loads this sand with a front end loader into an above grade hopper. The sand moves by conveyor from the hopper to a 6-ton-per-hour rotary sand dryer. The discharge from the dryer is transported pneumatically to two overtrack hoppers of 1000 cubic feet capacity each; one over each locomotive sandbox. The operator connects the flexible hose and the sandboxes are filled by gravity. Elevated platforms are provided to help the operator reach the filler inlet on the locomotive.

The locomotives also receive spot lubrication and an inspection.

- Inspection and Lubrication:

After each trip, the operator will inspect each locomotive for wheel, spring and truck wear. Also, the air brake system will be inspected at this time. Any defects requiring repair will be handled at the railroad maintenance facility with the defective locomotive being replaced by the spare locomotive.

Lubrication of trucks and wheels will be carried out on a scheduled basis with any additional greasing done as required. Grease is dispersed from a small storage tank with hose reels.

2.8 LOCOMOTIVE SERVICE DATA

Train Schedule:

2 Coal Trains, with Ash and Sludge Return to Chuitna	3 RT/day each, 5 days/week
2 Ash and Sludge Trains	3 RT/day each, 2 days/week (Weekends)
1 Commodity Train	3 RT/day, 5 days/week

Service Schedule:

Fueling -	2 times/week minimum
Sanding -	After each round trip
Inspection -	After each round trip
Water & Lubrication -	As required

Locomotive Capacities:

Diesel Fuel -	3200 gallons
Cooling Water -	255 gallons
Sand -	56 cubic feet
Lube Oil -	243 gallons

Locomotive Consumption:

Diesel Fuel -	1060 gallons/day
Sand -	90 cubic feet/day

Storage Facility Capacities:

Bank Sand -	2700 cubic feet
Dried Sand -	2000 cubic feet
Diesel Fuel -	45000 gallons

Sand Drying Capacity:	3000 cubic feet/day

2.9 ROLLING STOCK MAINTENANCE AND REPAIR

The maintenance facility is located on the yard tracks northeast of the plant. It has five tracks housed in a heated metal building. One track is a "run through" track for inspection, washing and air brake testing. Two tracks are for locomotive repair. Of these two, one is for heavy repair and engine overhaul and the other is for wheel, truck and traction motor repair. Two tracks are for railcar repair with one of these for wheelset changes and minor truck repair and the other for major truck or car body repair. There are overhead cranes to service each of the heavy repair tracks and jib cranes to service the other repair tracks. The cars are moved through the building by means of either a car puller or a trackmobile and placed on the holding tracks for pickup by the locomotive.

A portion of the fleet is rotated out of service each week for scheduled maintenance. There are various offices and shops in the building to support the maintenance work.

2.10 THAW SHED

Provision is made for this future facility to be located ahead of the unloading station in the loop at the plant. It will be a metal building long enough to hold five cars. The bottom third of the coal cars will be heated by infra-red heaters located on either side of and between the rails. The first five cars will have a five-minute "soak time" after which the train will proceed at 1/2 MPH.

2.11 SUMMARY OF DAVY McKEE STUDY

1. The principal purpose of the Phase I Feasibility Study is to accomplish, within a limited time frame, the resolution of all basic questions of conceptual design and to establish realistic project cost estimates. Therefore, no attempt has been made, nor has it been considered necessary, to reconcile various alternatives or to optimize the entire railroad system. This can be done only in Phase II upon development of further detailed mapping and more extensive geotechnical data.

2. Some trade-off studies have been made, however, and are included in Volume V of this report. They are as follows:

   - (Base Case) Rail system with Diesel-Electric Locomotives.
   - Rail system with Electric Locomotives.
   - An all-conveyor system for transport of coal from mines to process plant.

- o Conveyor system from Capps to Chuitna West, Diesel-Electric Train from Chuitna West to plant.

- o Rail system with Diesel-Electric Locomotives from Capps to Chuitna West or B.H.W. Area, then to plant.

- o Rail system with Diesel-Electric Locomotives from plant to B.H.W., conveyor from Capps to B.H.W., future conveyor from Chuitna East to B.H.W.

3. There will be need for further work in Phase II as follows:

- o A detailed study of hydrology and environmental considerations with respect to bridges vs fills-with-culverts for stream crossings.

- o Determine final route and profile of railroad and roadways, on the basis of detailed alignment surveys, soils studies, availability of suitable roadbed gravel, etc.

- o Study the ratios of capital costs to operating costs for various arrangements of rolling stock, train schedules, etc. to find most economical solutions.

- o Review and refine the study on use of Diesel-Electric vs Electric Locomotives, and investigate in greater depth the substitution of conveyors for sections of the railroad.

- o Examine rail and tie alternates, i.e., welded rail vs tie plates, and wooden vs precast concrete ties.

- Investigate the economics of limiting rolling stock maintenance and repair capability at the plant site - e.g., by barging equipment to Anchorage for major repairs.

4. The following tabulation of railroad system costs are included in the Cost Estimates in Volume V of this feasibility report. (Note that the Fisk estimates have been used for earthwork and site preparation.)

TABLE 2.2

BASE ESTIMATE FOR RAILROAD

MAIN LINE - PLANT TO CAPPS

		M$	Estimate Source Davy McKee	Fisk
o	Grading and Drainage	52,246 (1)	X	X
o	Access Road			X
o	Trackwork	18,598 (2)	X	
o	Bridges (Complete, Excl. Unloading Trestle)	16,976	X	
o	Equipment and Rolling Stock	23,331	X	
o	Piping	63	X	
o	Foundations (Excl. Bridges)	3,970	X	
o	Buildings	8,614 (3)	X	
o	Structural Steel (Excl. Bridges)	1,887	X	
o	Electrical and Instrumentation	972	X	
o	Painting	23	X	
o	Miscellaneous Labor	999	X	
	TOTAL	$127,679		

(1) Includes miscellaneous sitework for railwaste treatment facility.
(2) Excludes loop at Capps Mine and spur to Chuinta Mine. Includes plant, main line, and extension to dock.
(3) Fisk Report makes no estimates for these items.

2.12 ENGINEERING DESIGN DATA

Design data pertinent to the railroad is detailed in the drawings listed below, and in the Equipment List on Page 2/17.

DRAWINGS RELATING TO THE RAILROAD SYSTEM

DRAWING NO.	TITLE
5530-104-C-001	Proposed Railroad Alignment
5530-104-C-002	Railroad Profile
5530-104-C-003	Proposed Railroad Bridge Profile
5530-104-C-004	Proposed Railroad Cross Sections
5530-104-C-005	Proposed Railroad Cross Sections
5530-104-C-006	Proposed Railroad Cross Sections
5530-104-C-037	Menthanol Plant Plot Plan
5530-104-C-039	Proposed Transporter Road and Dock Facility Plan
5530-104-P-001	Railroad System Repair and Maintenance
5530-104-P-002	Locomotive Sanding and Fueling Facilities

2.13 FISK REPORT

Further detail, general comment and estimates of capital and operating costs are provided in the report from R. A. Fisk & Associates Ltd. which is appended at the end of this section following page 3/18.

(It will be noted that Fisk establishes Mile 0 at the plant site loop switch, while Davy McKee used the Capps Mine coal lease boundary as Mile 0.)

RAILROAD - AREA 104

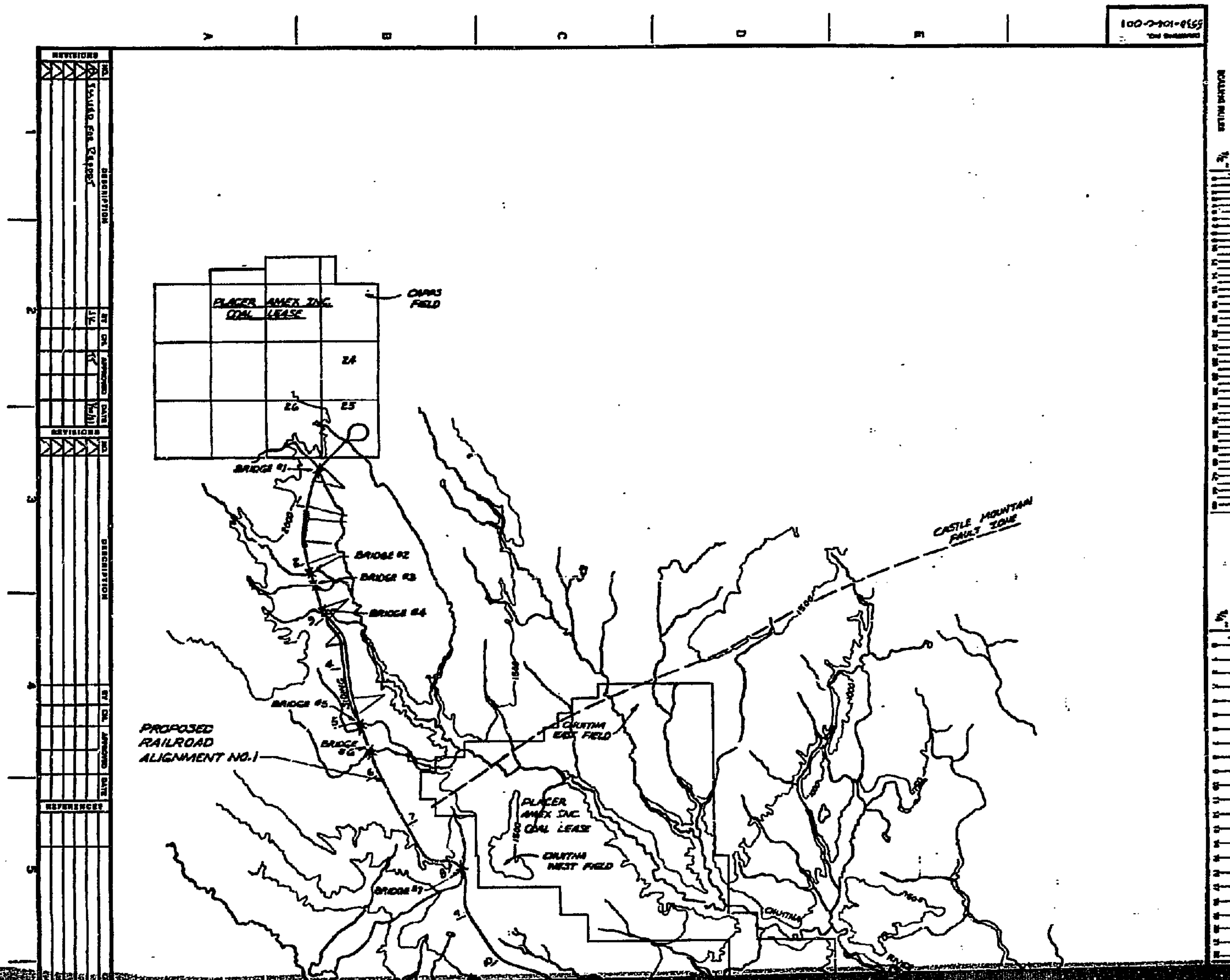
EQUIPMENT LIST

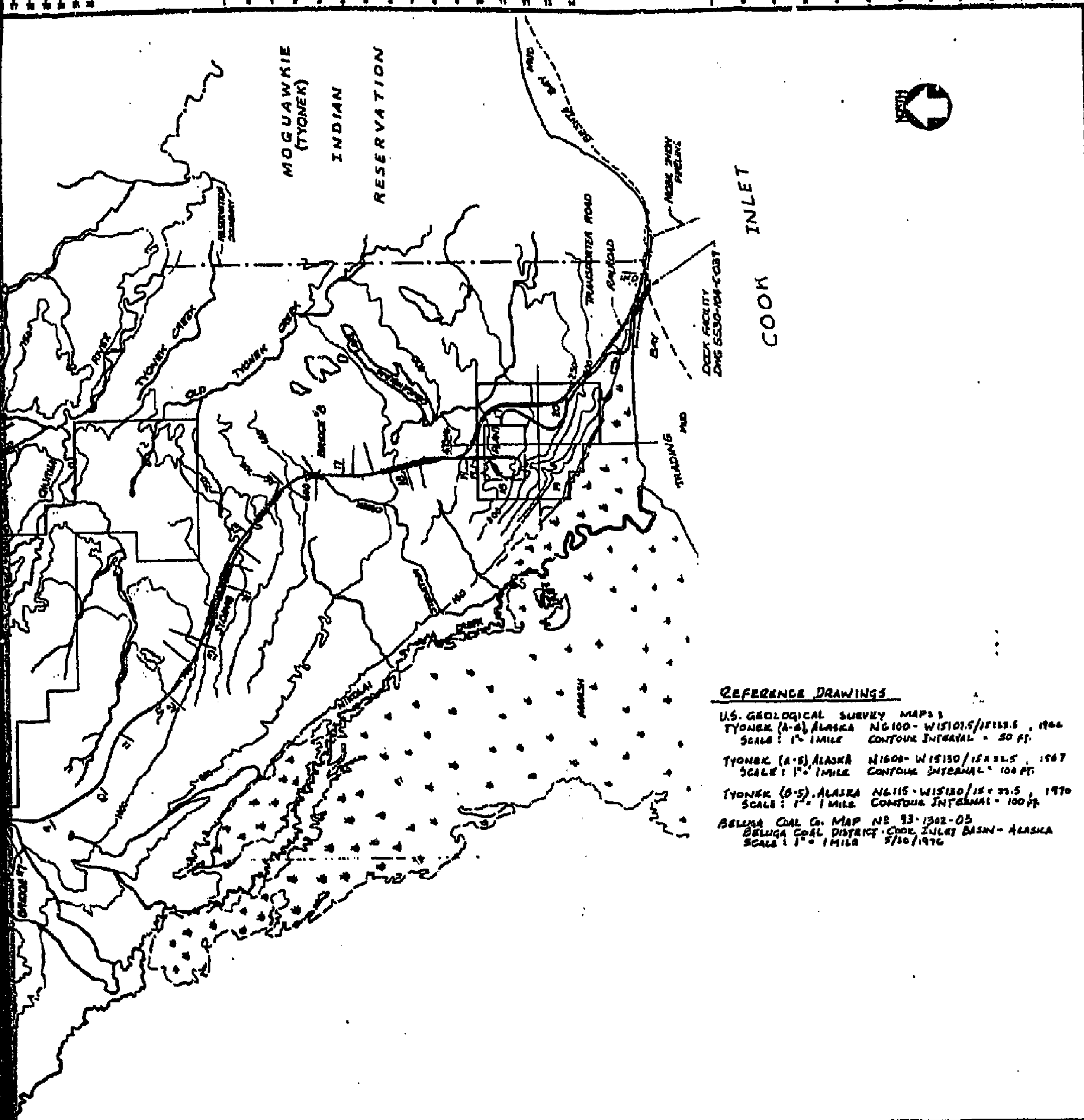
ITEM	NO. REQUIRED	DESCRIPTION
104-3901	7 + 1	Locomotives T - Diesel-Electric S - 71'-2"L x 10'-4"W x 15'-8"H D - 3500 HP
104-3902	10 + 3	Buses T - Diesel-Buses C - 47 Passengers
104-3903	120 + 18	Rail Cars T - Bottom Dump C - 100 Ton S - 53'-5"L x 10'-8"W x 13'-4"H
104-3904	73 + 12	Rail Cars T - Side Dump C - 85 Ton S - 50'-0"L x 10'-8"W x 13'-4"H
104-3905	6 + 1	Rail Cars T - Flat C - 70 Ton S - 63'-9"L x 10'-8"W x 12'-3"H
104-3906	6 + 1	Rail Cars T - Box C - 70 Ton S - 56'-8"L x 10'-8"W x 15'-2"H
104-3907	8 + 1	Rail Cars T - Tank - Diesel C - 20,000 Gal. Noninsulated S - 56'-3"L x 10'-8"W x 15'-0"H

RAILROAD - AREA 104

EQUIPMENT LIST

ITEM	NO. REQUIRED	DESCRIPTION
104-3908 Rail Cars	2	T - Tank - Gasoline C - 20,000 Gal. Noninsulated S - 56'-3"L x 10'-8"W x 15'-0"H


PLACER AMEX INC. COAL LEASE
CHRIS FIELD
24
25
26
BRIDGE #1
BRIDGE #2
BRIDGE #3
BRIDGE #4
BRIDGE #5
BRIDGE #6
BRIDGE #7
PROPOSED RAILROAD ALIGNMENT NO.1
CASTLE MOUNTAIN FAULT ZONE
CHUITNA EAST FIELD
PLACER AMEX INC. COAL LEASE
CHUITNA WEST FIELD
CHUITNA
1500
2000
DRAWING NO. 5530-104-C-001
SCALING RULES
REVISIONS
NO.
DESCRIPTION
BY
CHK.
APPROVED
DATE
Issued for Report
REFERENCES



REFERENCE DRAWINGS

U.S. GEOLOGICAL SURVEY MAPS:
TYONEK (A-4), ALASKA N6100-W15107.5/15x33.6, 1966
SCALE: 1" = 1 MILE CONTOUR INTERVAL = 50 FT.

TYONEK (A-5), ALASKA N1600-W15130/15x22.5, 1967
SCALE: 1" = 1 MILE CONTOUR INTERVAL = 100 FT.

TYONEK (B-5), ALASKA N6115-W15130/15x22.5, 1970
SCALE: 1" = 1 MILE CONTOUR INTERVAL = 100 FT.

BELUGA COAL CO. MAP NO. 93-1302-05
BELUGA COAL DISTRICT - COOK INLET BASIN - ALASKA
SCALE: 1" = 1 MILE 5/10/1976

CLIENT: CIRI/PLACER
BELUGA METHANOL PROJECT
COOK INLET, ALASKA

Davy McKee
ENGINEERS AND CONSTRUCTORS

TITLE: PROPOSED RAILROAD ALIGNMENT

SCALE: 1" = 1 MILE

5530-104-C-001

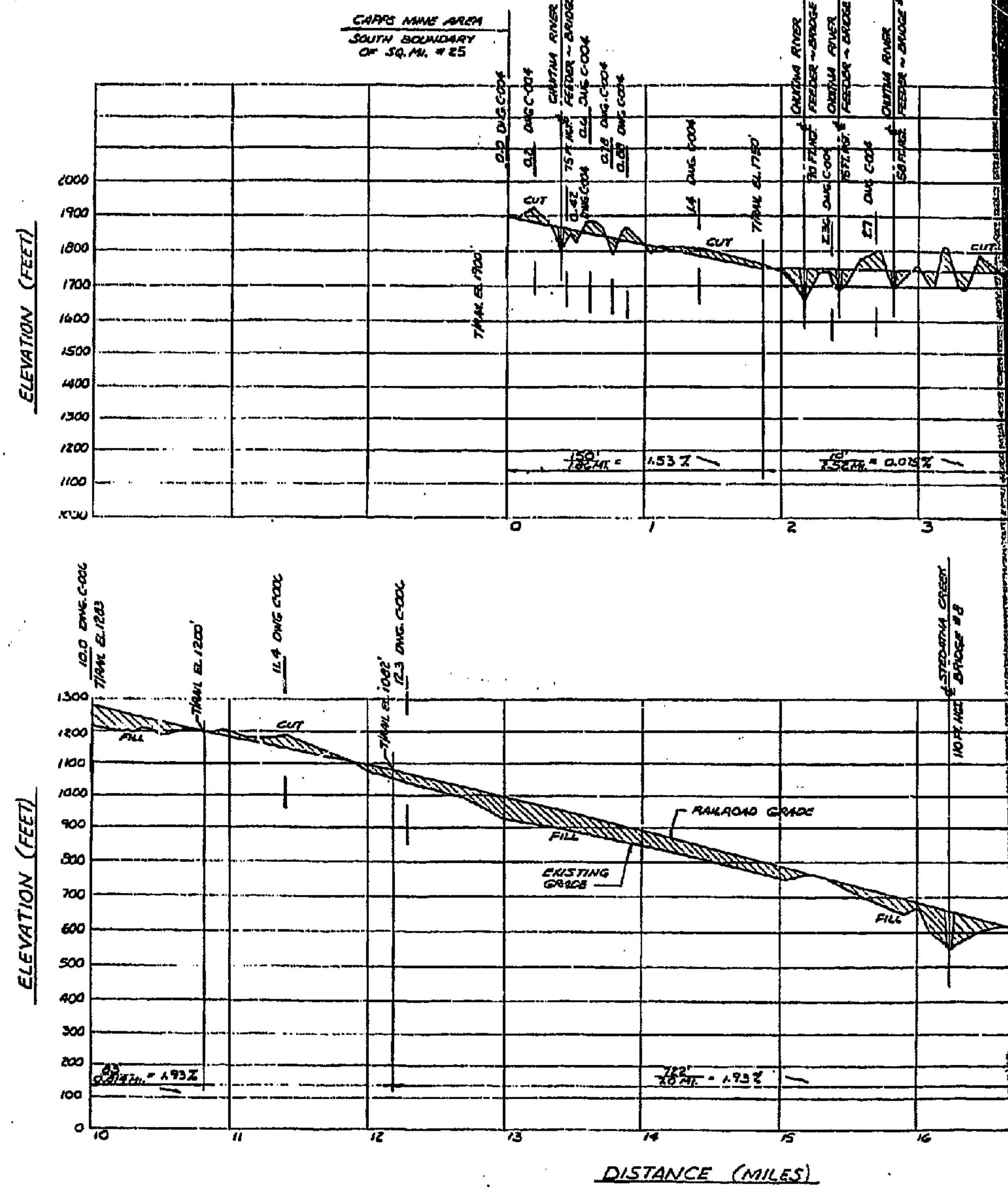
REVISION: 0

	BY	DATE
DESIGNED		
DRAWN	TSK	
CHECKED		
APPROVED 1		
APPROVED 2		
APPROVED 3		

DATE TO	A	B	C	0	1	2	3	4	5	6	7
CLIENT											
FIELD											
ESTIMATING											
FINAL REPORT											

SCALING RULES 1/8" 1/4"

DRAWING NO. 5530-104-E002



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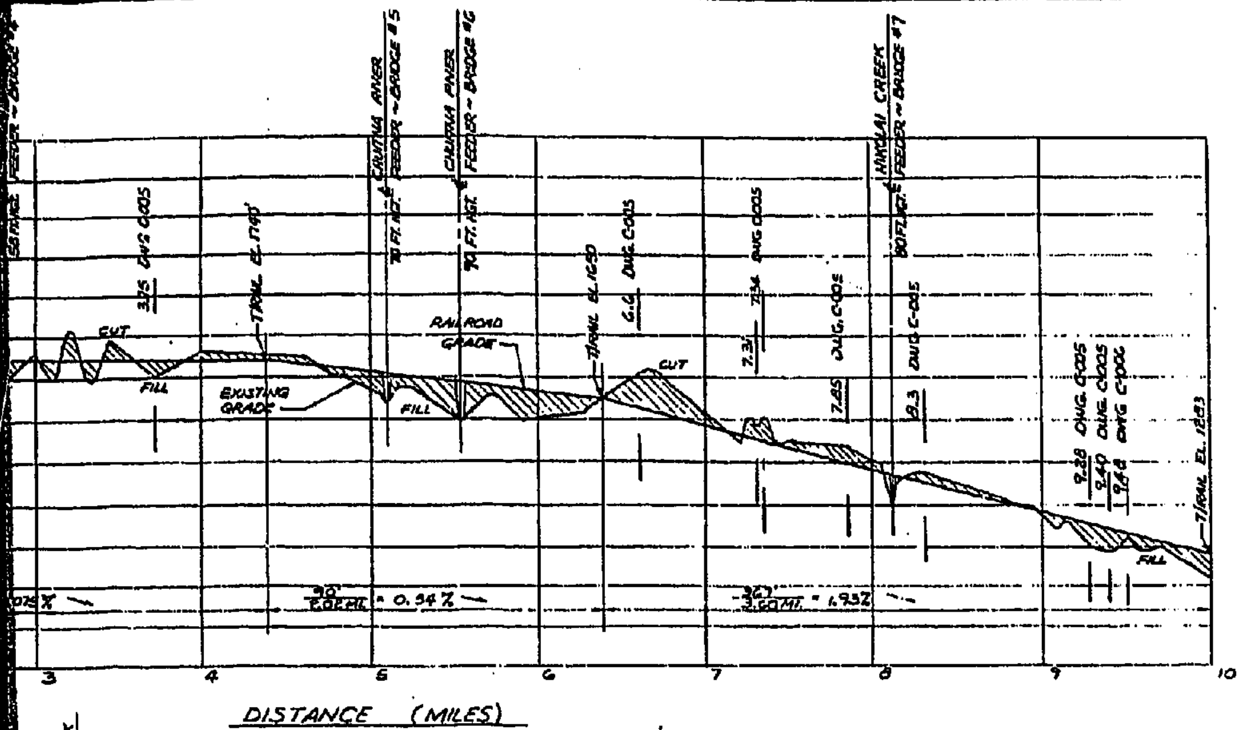

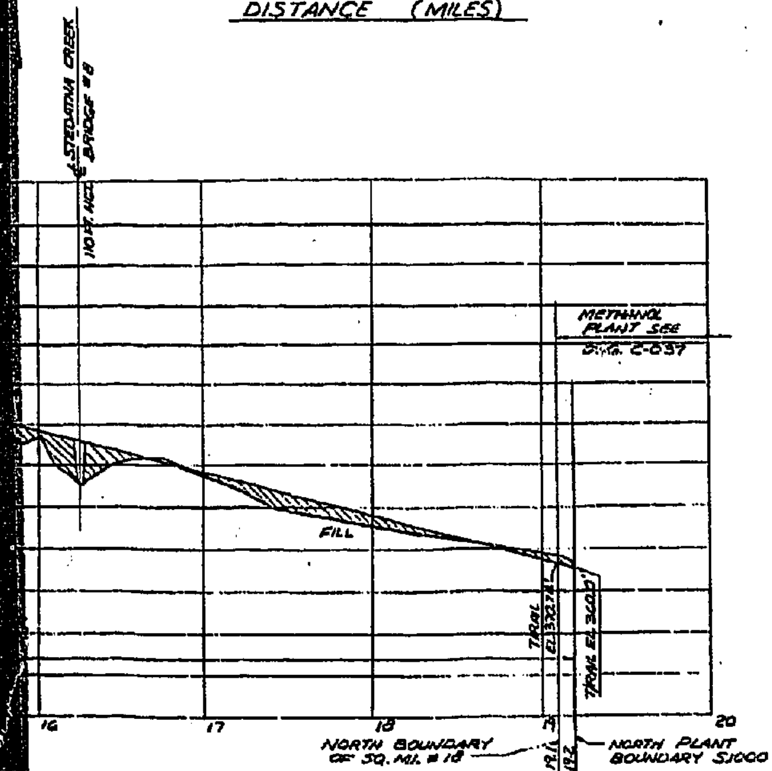

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CLIENT: C.I.R.I./PLACER
BELUGA METHANOL PROJECT
COOK INLET, ALASKA

Davy McKee
ENGINEERS AND CONSTRUCTORS

TITLE: RAILROAD PROFILE

SCALE: HORIZ.: 1" = ¼ MILE; VERT.: 1" = 200 FT.

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DATE TO: CLIENT; FIELD; ESTIMATING; Final Report

5530-104-C-002

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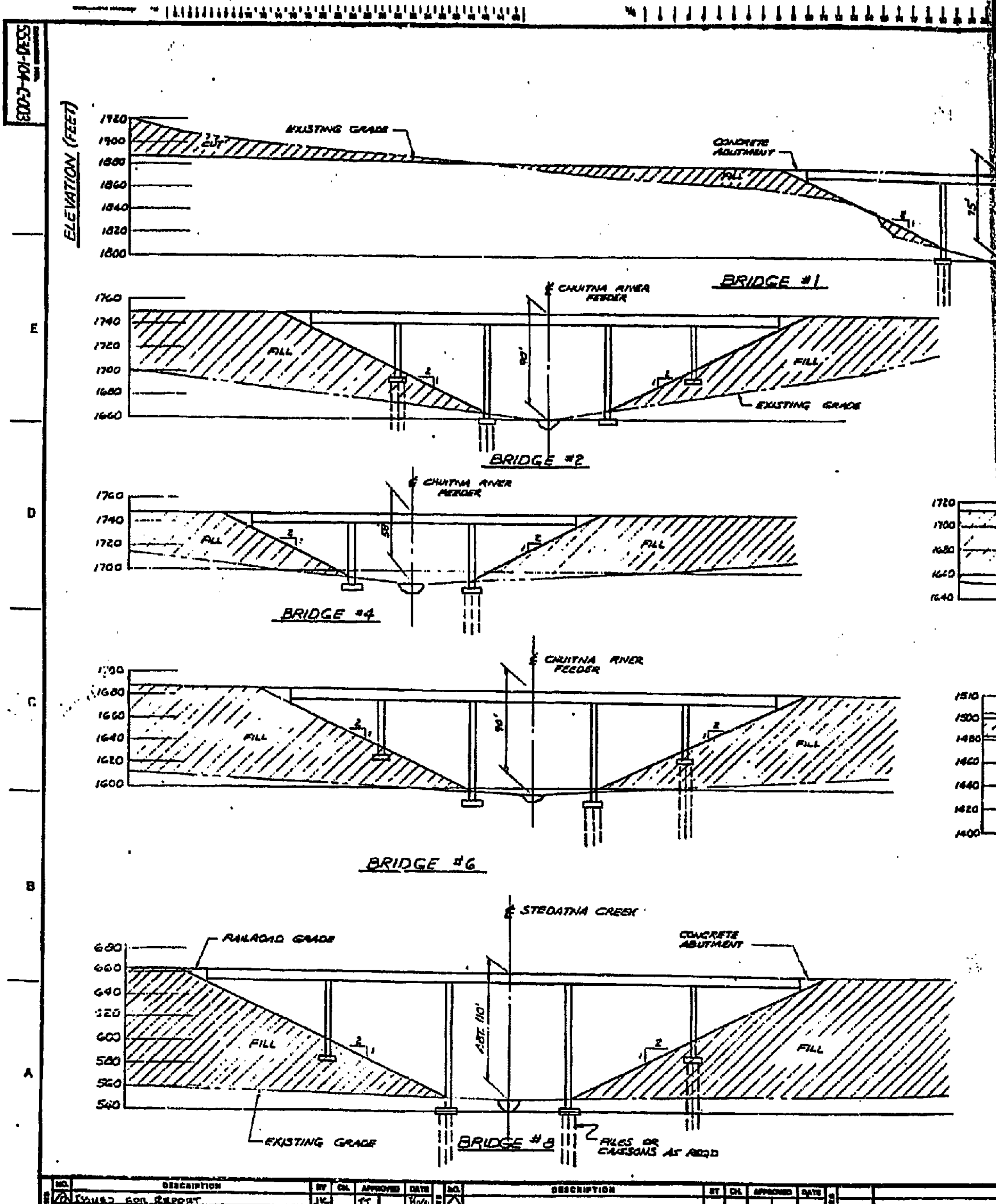
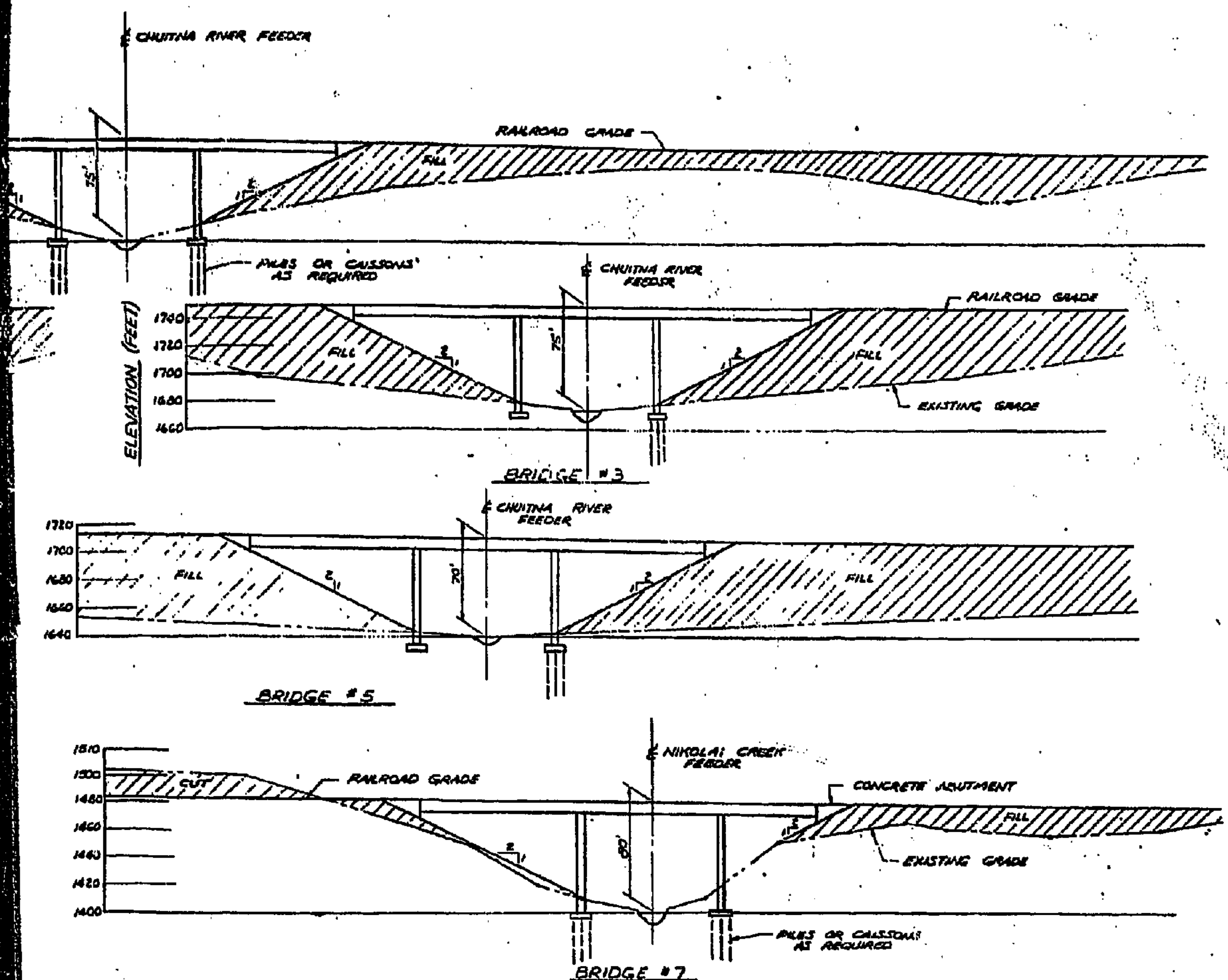


5530-104-C003
ELEVATION (FEET)
EXISTING GRADE
CUT
CONCRETE ABUTMENT
FILL
BRIDGE #1
CHUITNA RIVER FEEDER
BRIDGE #2
BRIDGE #4
BRIDGE #6
STEDATNA CREEK
RAILROAD GRADE
ABT. 110'
BRIDGE #8
PILES OR CAISSONS AS REQ'D



NOTES:
1. WIDTH AND DEPTH OF RIVERS AND CREEKS ARE ASSUMED

REFERENCE DRAWINGS:

ALIGNMENT NO.7	PLAN	DWG.	5530-104-C-001
ALIGNMENT NO.7	PROFILE	DWG.	5530-104-C-002

CLIENT: C.I.R.I. / PLACER
BELUGA METHANOL PROJECT
COOK INLET, ALASKA

Davy McKee
ENGINEERS AND CONSTRUCTORS

DESIGNED	BY JSK	
DRAWN	JSK	
CHECKED		
APPROVED		
APPROVED		
APPROVED		

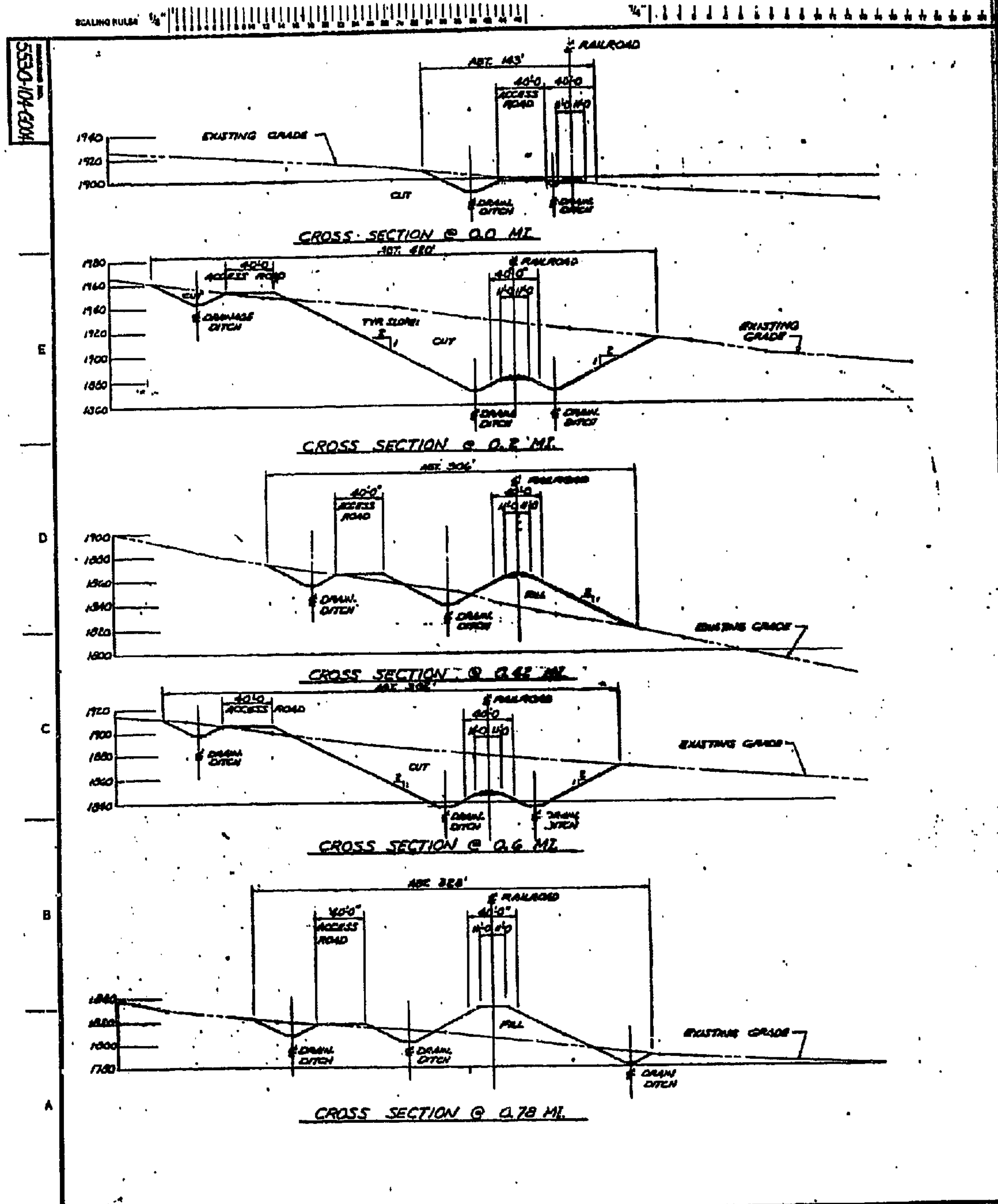
ISSUED TO: CLIENT, FIELD, ESTIMATG, FINAL REPORT

TITLE: PROPOSED RAILROAD
BRIDGE PROFILES

SCALE 1" = 60 FT.

5530-104-C-003

REVISION 0



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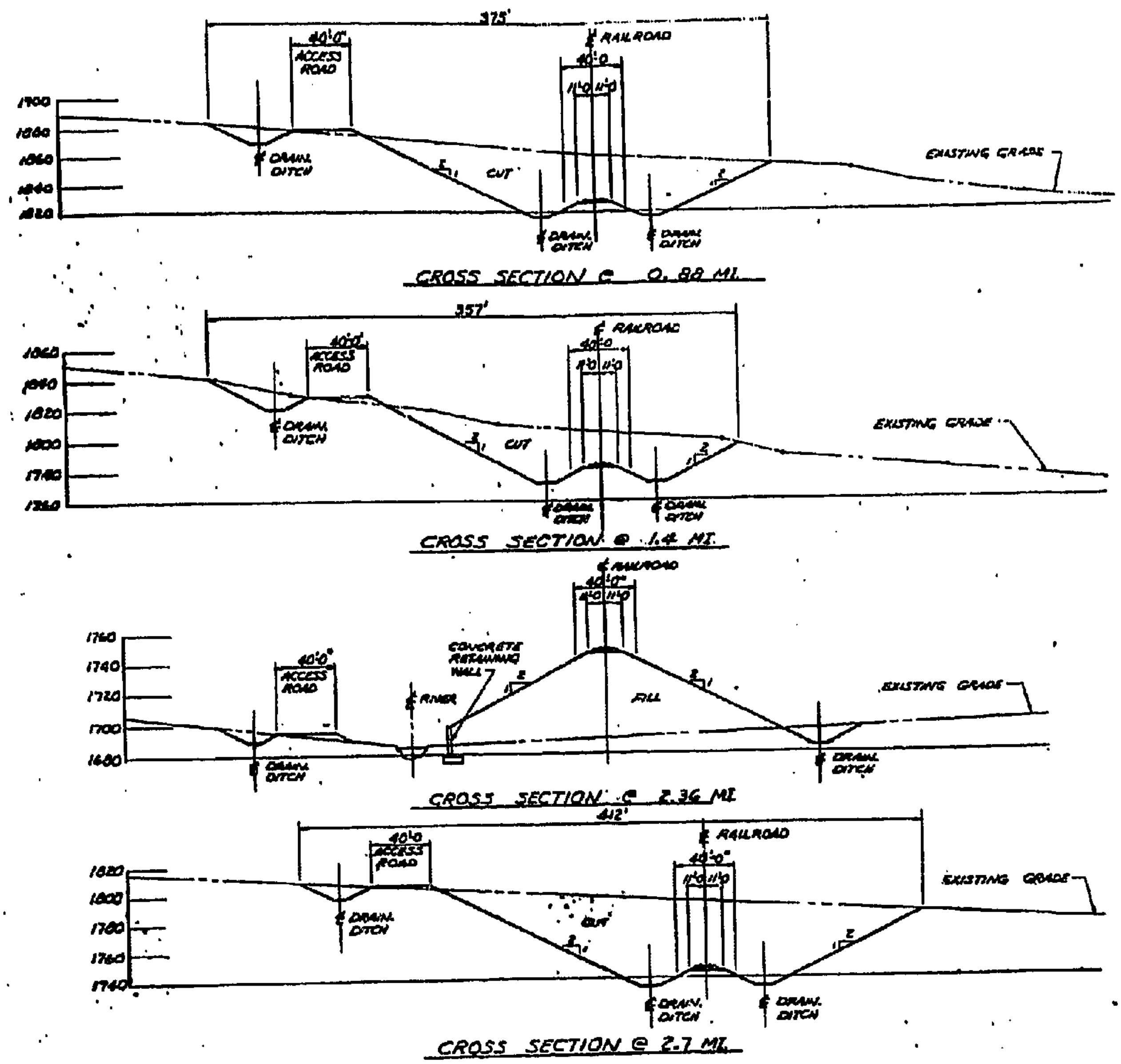
A	ISSUED FOR REPORT				



ALIGNMENT NO. 1 PLAN DWG. 5530-104-C-001
ALIGNMENT NO. 1 PROFILE DWG. 5530-104-C-002
ALIGNMENT NO. 1 BRIDGE PROFILES DWG. 5530-104-C-003

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CLIENT: C.I.R.I. / PLACER
BELUGA METHANOL PROJECT
COOK INLET, ALASKA

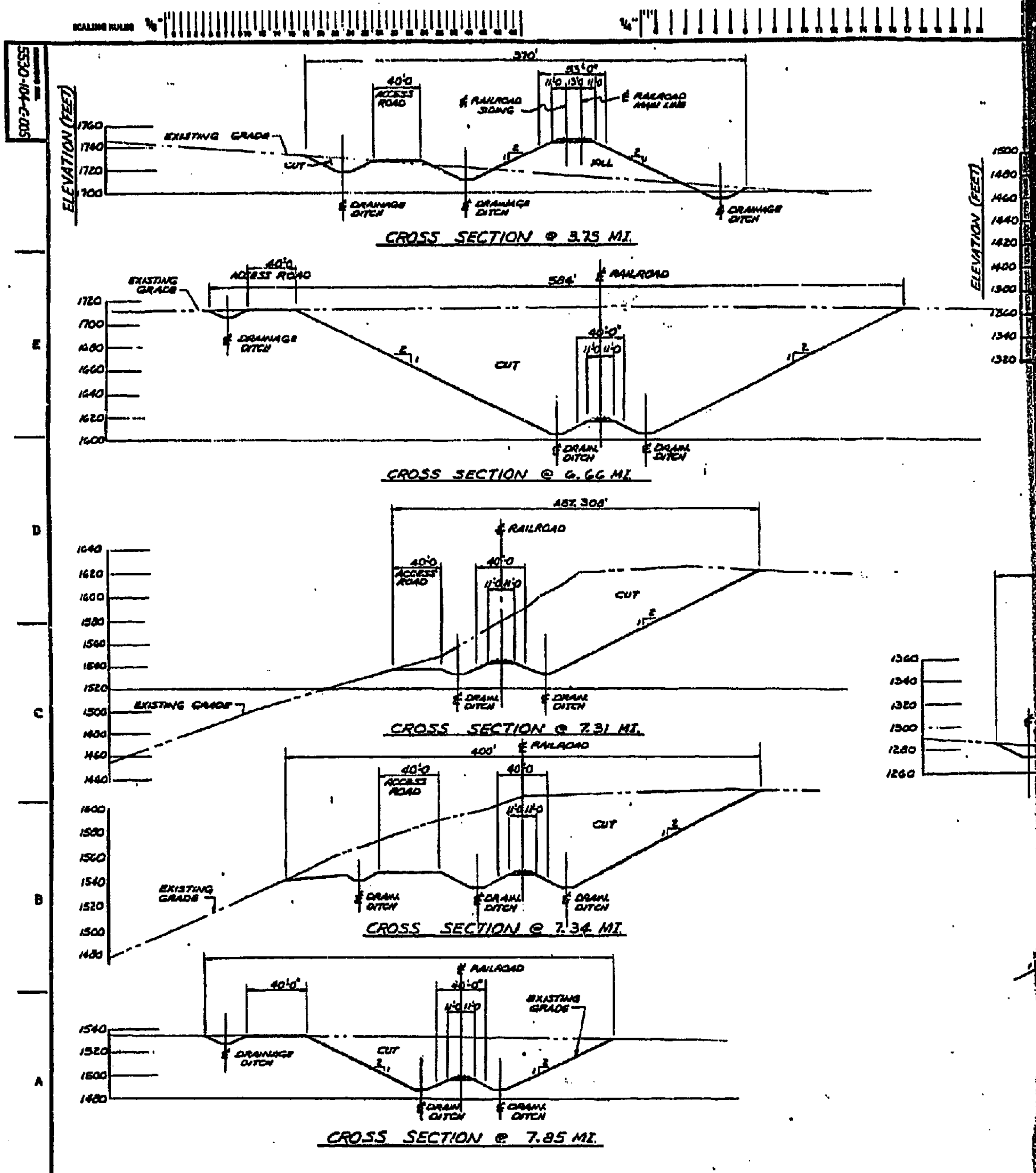
TITLE: PROPOSED RAILROAD CROSS SECTIONS

SCALE: 1" = 150 FT.

Davy McKee
ENGINEERS AND CONSTRUCTORS

5530-104-C-004

REVISION 0



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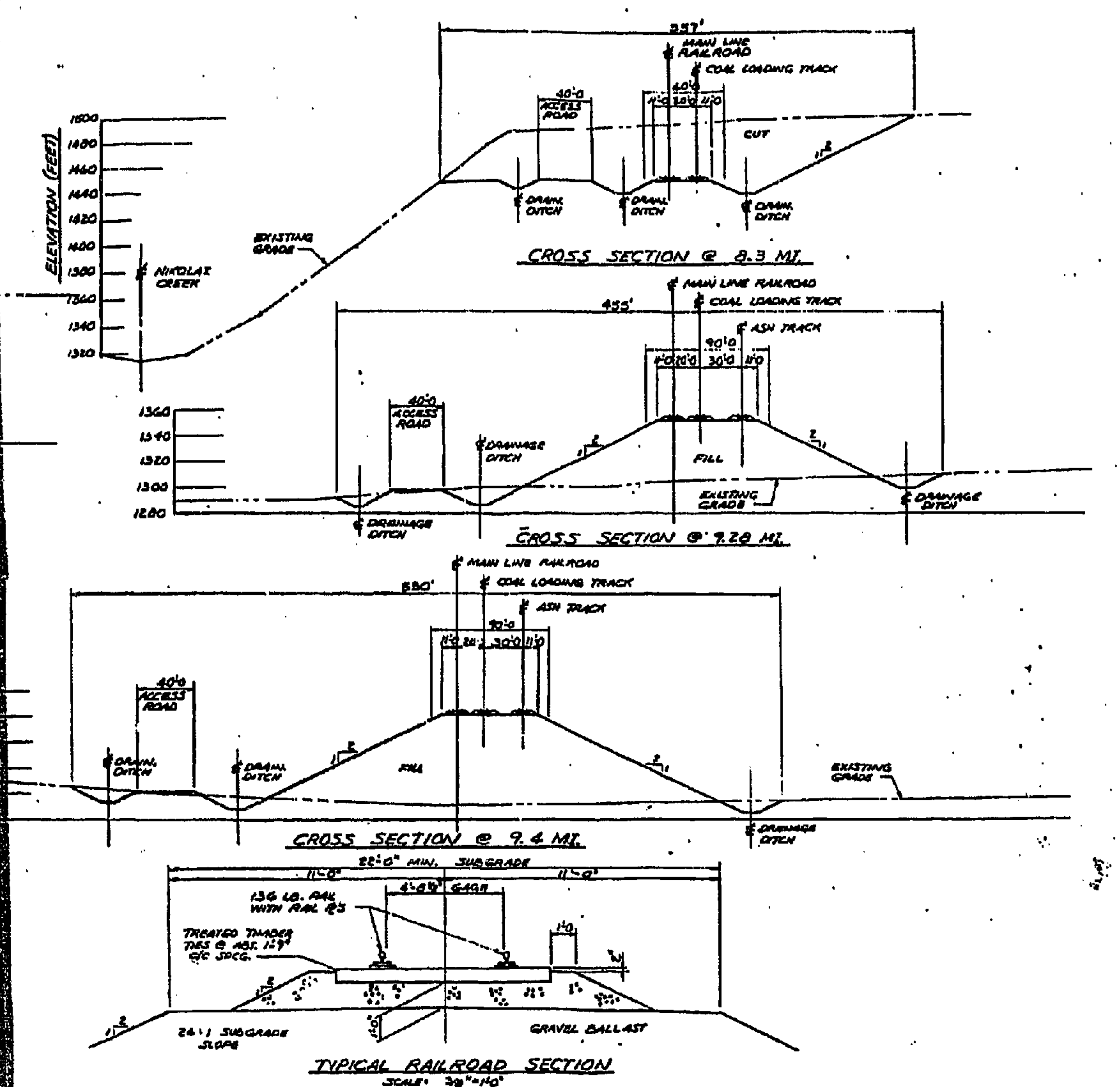
	ISSUED FOR REPORT										



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CLIENT: C.I.R.I. / PLACER BELUGA METHANOL PROJECT COOK INLET, ALASKA

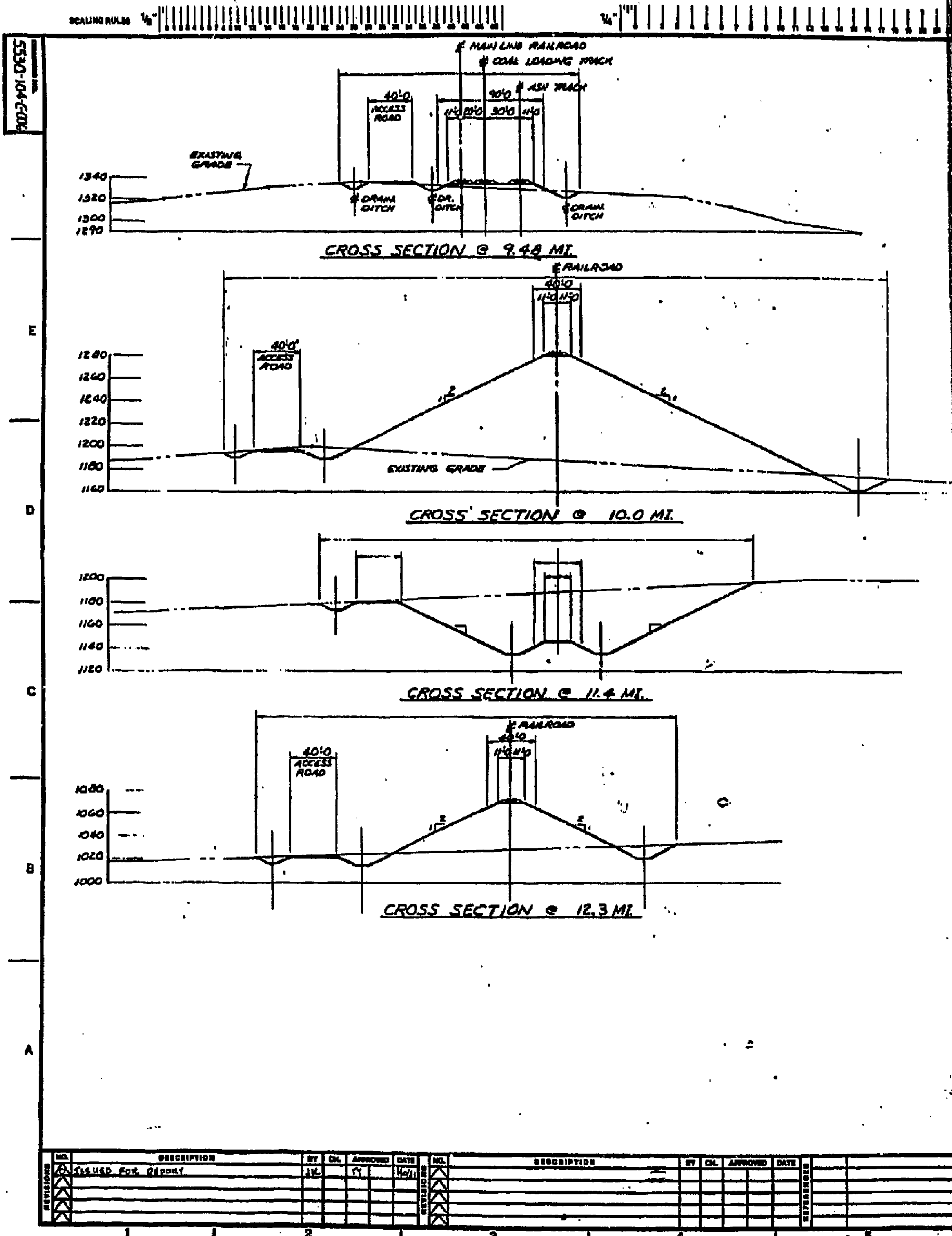
Davy McKee
ENGINEERS AND CONSTRUCTORS

TITLE: PROPOSED RAILROAD CROSS SECTIONS

SCALE: 1" = 50 FT. U.N.

5530-104-C-005

REVISION: 0



SCALING RULES
5530-104-C-202
℄ MAIN LINE RAILROAD
℄ COAL LOADING TRACK
℄ ASH TRACK
40'-0
ACCESS ROAD
90'0
11'0 20'0 30'0 11'0
EXISTING GRADE
℄ DRAIN DITCH
℄ DR. DITCH
1340
1320
1300
1290
CROSS SECTION @ 9.48 MI.
℄ RAILROAD
40'0
11'0 11'0
40'0"
ACCESS ROAD
1280
1260
1240
1220
1200
1180
1160
EXISTING GRADE
CROSS SECTION @ 10.0 MI.
1200
1180
1160
1140
1120
CROSS SECTION @ 11.4 MI.
℄ RAILROAD
40'0
11'0 11'0
40'0
ACCESS ROAD
1080
1060
1040
1020
1000
CROSS SECTION @ 12.3 MI.
E
D
C
B
A
REVISIONS
NO.
DESCRIPTION
BY
CH.
APPROVED
DATE
ISSUED FOR REPORT
REFERENCES
1
2
3
4
5

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CLIENT: C.I.R.I. / PLACER
BELUGA METHANOL PROJECT
COOK INLET, ALASKA

Davy McKee
ENGINEERS AND CONSTRUCTORS

TITLE: PROPOSED RAILROAD

CROSS SECTIONS

SCALE 1" = 50 FT. E/R NO.

5530-104-C-006

REVISION 0

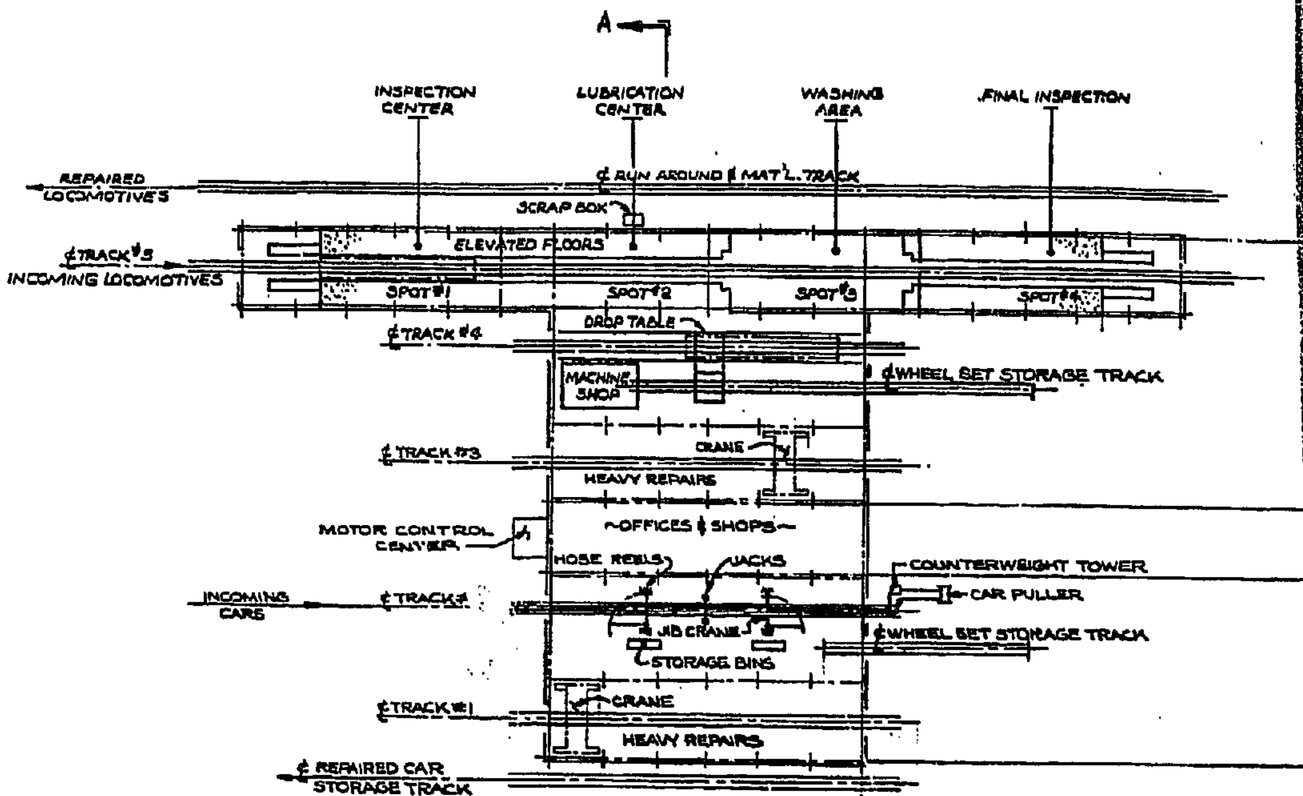
	BY	DATE
DESIGNED	JSK	
DRAWN	JSK	
CHECKED		
APPROVED 1		
APPROVED 2		
APPROVED 3		

ISSUED TO	A	B	C	0	1	2	3	4	5	6	7
CLIENT											
FIELD											
ESTIMATE											
ENG. REPORT											

6 7 8 9 10

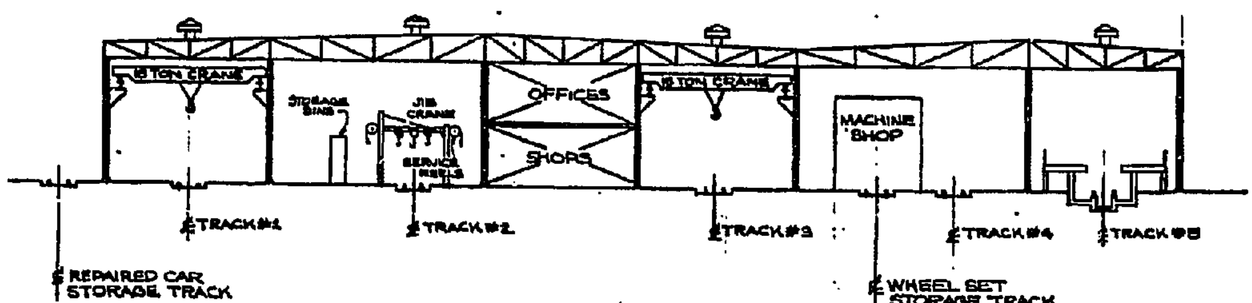
F E D C B A

5530 104-P-001



PLAN - LOCOMOTIVE & RAIL CAR REPAIR/MAINTENANCE SHOP

A



SECTION A-A
SCALE 1"=20'-0"

NO.	DESCRIPTION	BY	CH.	APPROVED	DATE
A	PRELIMINARY ISSUE				2-??
A	OFFICE PLANS & SECTION ADDED				2-27
A	ISSUED FOR REPORT	KB	CAK		7/78

REVISIONS

NO.	DESCRIPTION	BY	CH.	APPROVED	DATE

REFERENCES

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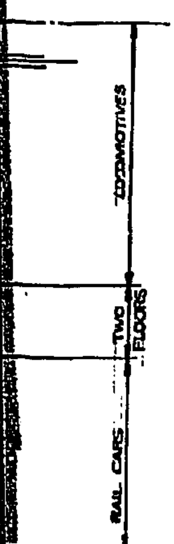


EQUIPMENT REQUIRED:

LOCOMOTIVES

1- 15 TON CRANE W/5 TON AUX.
1- WASHING FACILITY
1- DROP TABLE
2- FORK LIFTS

RAIL CARS

1- 15 TON CRANE W/5 TON AUX.
1- SET OF BUILT-IN JACKS
2- JIB CRANES
6- $1\frac{1}{2}$ TON HOISTS
STORAGE BINS AS REQUIRED
2- RETARDERS
1- CAR POSITIONER

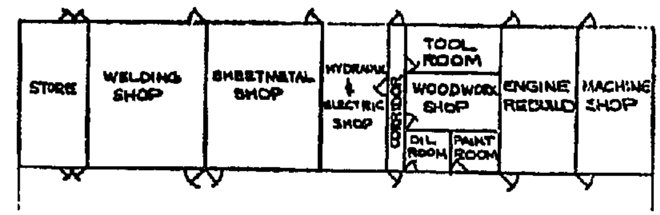
SERVICE FACILITIES:

LOCOMOTIVES

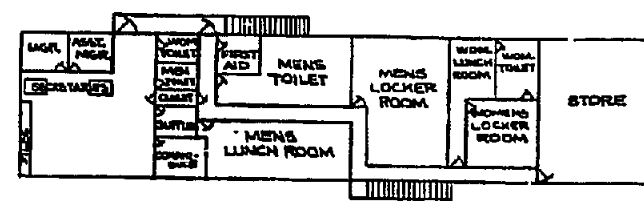
INSPECTION PIT - 4'-0" BELOW T/RAILS
PIT DRAINAGE
DEPRESSED FLOOR - 2'-6" BELOW T/RAILS
ELEVATED FLOOR - 5'-0" ABOVE T/RAILS
RAMPS TO ELEVATED FLOORS (FORK LIFTS)
LUBRICATING OIL SUPPLY
LUBRICATING OIL DRAINAGE
OIL FILTER DISPOSAL
WATER SUPPLY SYSTEM
COMPRESSED AIR
GENERAL WASHING SYSTEM
ELECTRICAL CLEANING SOLVENT
OXYGEN-ACETYLENE SYSTEM
LOCOMOTIVE TOILET SERVICING
DE-ICING
HEATING & VENTILATING
WATER TREATMENT
COMMUNICATIONS
FIRE PROTECTION

RAIL CARS

HOSE REELS:
- AIR
- SOLVENT
- OXYGEN-ACETYLENE
- ELECTRIC WELDER
- ROLLER BEARING GREASE
- WASTE DISPOSAL
- FIRE PROTECTION



FIRST FLOOR
OFFICES & SHOPS
SCALE 1" = 20'-0"



SECOND FLOOR
OFFICES & SHOPS
SCALE 1" = 20'-0"

CLIENT: CIRI/PLACER
BELUGA METHANOL PROJECT
COOK INLET, ALASKA

Davy McKee
ENGINEERS AND CONSTRUCTORS

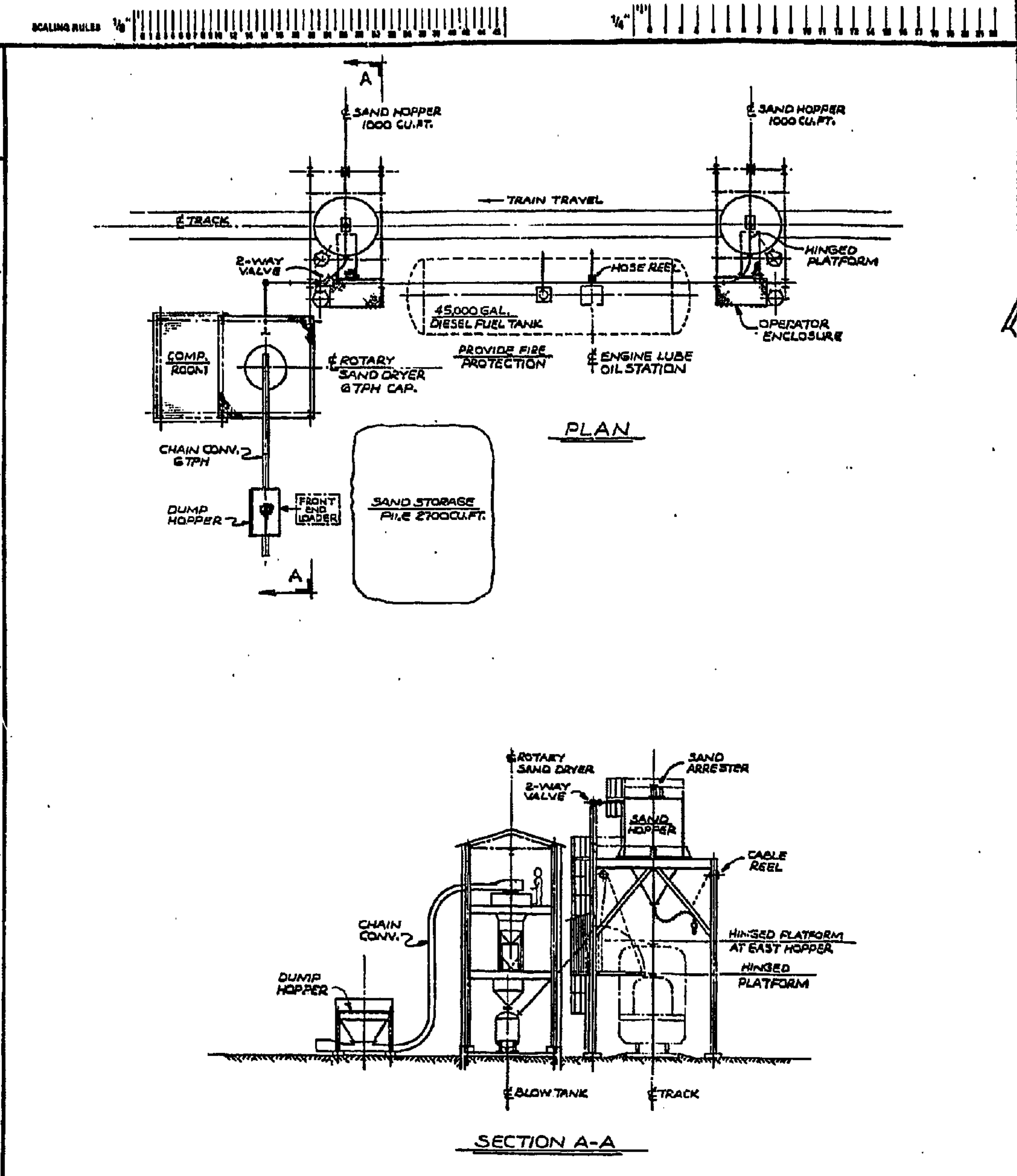
	BY	DATE
DESIGNED		
DRAWN	RVK	1/81
CHECKED		
APPROVED 1		
APPROVED 2		
APPROVED 3		

TITLE: RAILROAD SYSTEM
REPAIR & MAINTENANCE

SCALE 1" = 40'-0" PC-5530

5530
104-P-001
REVISION 0

5530
1201-D-011



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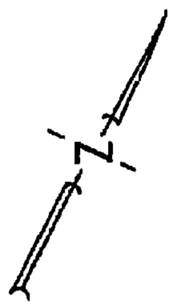

CLIENT: CIRI/PLACER
BELUGA METHANOL PROJECT
COOK INLET, ALASKA

Davy McKee
ENGINEERS AND CONSTRUCTORS

TITLE: COAL RECEIVING, STORAGE & RECLAIM
LOCOMOTIVE SANDING AND
FUELING FACILITIES

SCALE: 1" = 10'-0"   PC-5530

	BY	DATE
DESIGNED		
DRAWN	[illegible]	5-26-81
CHECKED		
APPROVED 1		
APPROVED 2		
APPROVED 3		

DATE ISSUED	A	B	C	D	1	2	3	4	5	6	7
CLIENT											
FIELD											

5530
104-P-002

REVISION: 0

REPORT AND COST ESTIMATE

RAIL LINE TO SERVE BELUGA METHANOL PLANT
COOK INLET, ALASKA

FOR

CIRI/PLACER AMEX INC.

R.A. Fisk & Associates Ltd.
Victoria, B.C.
June 30, 1981

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APPENDICES

A Route Map - 18-28-8A-001
Profile - 18-28-8A-002
Typical Sections - 18-28-8A-003
B Detailed Route Description
C Green Construction Letter Report - Earthwork
D Peratrovich & Nottingham - Letter Report - Bridges

1. INTRODUCTION

By letter agreement dated 12 May 1981, Cook Inlet Region, Inc. and Placer Amex Inc. commissioned a consulting assignment relative to a proposed rail line to transport coal between the Beluga coal field and a proposed methanol plant near Granite Point, some 50 miles west of Anchorage.

Specifically, the scope of the assignment is set out in the agreement as follows:

"You shall furnish services necessary to perform work comprising analysis, evaluation, reporting and consulting with respect to the routing and construction of a proposed heavy-duty, standard gauge railroad line of approximately 30 miles between the Beluga Coalfield, Alaska, and the proposed methanol plant of the Project. This work is to include review of a preliminary routing and a visit to the site. Supplemental information such as maps, data of surface geology, reports and photographs will be provided by CIRI/Placer. This information together with the assistance of a local (Alaska) engineering and construction firm selected by CIRI/Placer will enable cost of construction to be made by R.A. Fisk & Associates and a qualified engineering/construction firm. Such cost of construction will comprise capital cost estimates for grading the right-of-way, erection of structures, and laying of track."

2. BACKGROUND

A heavy-duty railroad line, capable of transporting approximately 42,000 NT of coal daily a distance of some 21 miles is required to support the proposed Beluga methanol plant. The engineering firm of Davy McKee has, in the course of performing preliminary plant design, established the parameters for construction and operation of this rail line, including:

- proposed alignment, profile and typical design cross sections;
- proposed bridge structures;
- sidings, loading and unloading loops, ash loading and equipment maintenance tracks;
- train consists and scheduling.

The nature and source of the mapping on which this work was based is unknown to us. There has been no detailed geotechnical terrain analysis or soil testing.

The current assignment is to include a review of the work done to date, and a cost estimate for construction of the railroad.

3. DATA

Data supplied by Placer Amex has included:

- USGS Sheet Tyonek (A-5) at 1 inch = 1 mi and C.I. 100 ft, upon which is marked a tentative route;
- Set of Davy McKee plans, profiles, cross sections, bridges, etc. relative to the proposed railroad, known as Alignment 7;
- Set of aerial photographs together with map showing flight lines (loan basis);
- Report - Preliminary Geologic Map of the Congahbuna area Cook Inlet Region, Alaska;
- Report - Reconnaissance Engineering Geology of the Beluga Coal Resource Area, south-central Alaska;
- Pertinent topographic maps at 1 inch = 400 ft with 10 ft contour interval, as available.

4. SCOPE

The scope of this study is limited by the short study time available, which naturally has a significant bearing on the completeness of the work and the accuracy of the results.

Of necessity, the data supplied by the client has been accepted as presented, with no independent checks. The work done to date has been reviewed and found generally reasonable. Quantity calculations have been made using generally accepted methods and some rather conservative assumptions as to earthwork design and construction procedures, in the absence of geotechnical data.

Some modification has been made to the geometric design, but further refinements are unwarranted until more detailed information is available. Structural estimates are based on conjectural layouts. Trackwork estimates are straightforward, and can be made with greater certainty than the other elements.

5. STUDY METHOD

A two day visit was made to Alaska to visit the site and to talk with other engineers in Anchorage who could contribute to the study.

A helicopter reconnaissance of the area was made, including landings at several locations to gain some appreciation of the local geography and terrain.

Discussions were held with Green Construction relative to basic assumptions, construction methods and unit costs for estimating. Green Construction later submitted a report setting out the various unit estimating prices, and these are used in the estimate.

Discussions were also held with Peratrovich and Nottingham, consultants primarily in structural engineering, relative to bridge construction. An agreement was later concluded, whereby this firm undertook to supply cost estimate guidelines based on their past experience with Alaskan railway bridges. This information was used in the structural estimate.

Both the foregoing letter reports are included as Appendices to this report (C and D).

Because the plant location is likely to remain fixed, whereas coal fields may be mined out and trackage relocated; also, branch lines may be built off the original route; we have designated Mile 0 as the loop switch at the plant site. Thus our mileage increases in the northward direction.

The location was projected on 1 inch = 400 ft mapping with a 10 ft contour interval, based essentially upon the route formerly projected (defined as Alignment 7), but with some attempt to improve on gradients in locations where trains have to stop and start. The route selected is at a maximum gradient of 2% (compensated for curvature) and has maximum curvature of 4°. A more detailed route description is provided in Appendix B.

A centreline profile was drawn and cross sections taken from the contour plans at irregular intervals. Maximum interval in uniform terrain is 1000 ft; other intervals are controlled by breaks in the ground, bridge structures and the ends of curves.

Volumes of earthwork were computed using the method of Average End Areas. The cross sections were entered into the computer with the grade line elevation and the typical design section for each station. (Typical sections are in Appendix A.) The computer then calculated the areas and volumes for all cuts and fills. The area of the cross section is calculated from the coordinates, the areas at adjacent sections are averaged and multiplied by the difference between sections to give volumes.

Lump sum figures for mobilization and demobilization and for clearing, have been supplied by Green Construction after viewing the site.

Two separate approaches have been used in computing the earthwork estimate, resulting in a range of conjectured costs.

Case 1

This is the worst case assumption, and is the same as outlined in the Green Construction letter (Appendix C):

- that there is no suitable material for subgrade construction in the north half of the line
- that there is sufficient usable and rippable material in the tuff deposits located at about the mid-point, and that this material would be used to build the fills for two thirds of the line;
- that the unusable cut material in the north half would be wasted;
- that there will be suitable gravel deposits found in the south one third of the line so that the average haul distance will be approximately 1 mile.

Case 2

If the foregoing assumptions appear to be too pessimistic after soil investigations are carried out, alternative assumptions somewhat along the following lines may prove realistic:

- that 75% of the cut material in the north half will be usable;

- that all of the cut material in the south half will be usable;

- that there will be suitable gravel deposits found in the south one third of the line so that the average haul distance will be approximately 1 mi.

In either case, the following additional allowances were made:

- 4 ft of organic and topsoil material will be stripped and wasted;

- volume of fill is increased by 10% for shrinkage;

- a constant of 10,000 cu yd/mi is added to allow for culvert excavation, interceptor and offtake ditches.

For sub ballast (granular pit run), it was assumed that this would be produced from the Chakachatna deposits and truck spread on the grade in a uniform layer compacted to 12 inches thick. This would require 5300 cu yd/mi.

For top ballast (crushed stone) it was assumed that suitable 1-1/2 inch minus material could also be produced from the Chakachatna deposits. A volume of 4370 cu yd/mi will be required.

The 40 ft access road, while not part of the railroad, is obviously intended to lie in the same general corridor and is also obviously intended to follow the ground line more closely than is possible for the railroad grade. While we do not have any design parameters for this road, we have included an allowance of $360,000/mi on the basis of:

Stripping	$ 67,000
Minimal Grading	158,000
Gravel Base 12 inches	105,000
Drainage	30,000
	$360,000

It is assumed generally that gullies in excess of 50 ft in depth will be bridged, and that those of lesser depth will be drained with culverts. With more detailed examination, it may be found possible to substitute culvert and fill construction for some of the bridges, thereby reducing cost.

No hydrological work has been done, therefore, a nominal allowance of one 60 inch diameter metal culvert has been assumed for each drainage channel, to extend between slope stakes plus 20% for skew and end allowance.

To estimate the bridges, the consulting structural engineers established a simple span steel girder bridge with average pier height of 60 to 70 ft, based on the conjectural bridge drawings supplied to us. Using past experience with Alaskan railway bridges, a cost per foot was established. Repetition, if all bridges are of the same type, would save some cost, therefore, a range of bridge cost estimates is given, between $4000 and $5000 per foot.

During this review, a brief examination was made of a possible alternative route from Mile 15± northerly to Capp's Mine Area. This alternative would diverge from the accepted route at Mile 14.55 to cross the Chuitna River and climb to the mine area, avoiding the deeply incised gullies on the west side of the river. It was considered that savings in bridges and in distance might make this route worthwhile. Since these savings were not sufficient to offset higher grading costs and less favourable grades and curvature on the alternative route, it is not presented as an option at this time. However, the overall costs were close enough to warrant further examination before finalizing the route.

6. DESIGN CRITERIA

The volume and nature of the traffic dictates a high standard of construction, in order to support the loadings.

The required reliability of service dictates that relatively low maintenance requirements should be observed.

6.1 Track geometry

- Maximum main line curvature is 4°.
- Maximum gradient is 2%, and all gradients are compensated for curvature at 0.04% per degree of curve.
- Minimum track centres are 15 feet, increased to allow for curvature where applicable.
- Main line siding turnouts are #11
- Secondary turnouts are #9
- Shop turnouts are #7.
- Recommended maximum curvature for loops (AREA) is 7° 30' (radius 764').

6.2 Earthwork

This is the costliest portion of the work, and the one for which we have the least data on which to base our design. Of necessity, therefore, conservative assumptions have been used. The silty grey till material which appears to underlie most of the study area closely resembles a soil type we are familiar with which may stand almost vertically in the natural state with low moisture content, yet lose strength and become fluid when wet.

The typical sections used are illustrated on Dwg. 18-28-8A-003 (Appendix A). When more is known about the projected behaviour of the soil, the section can be varied to suit, but 2:1 slopes will be a minimum requirement. For this preliminary estimating purpose, 2:1 slopes have been assumed throughout. It is not anticipated that rock will be encountered - if it should be, the volumes to be moved will be much lower, but the price much higher.

Generous side ditch allowances have been made for three reasons:

- to provide adequate storage for snow;
- to provide adequate storage for sloughed material;
- to permit access and working capability for bulldozers and/or front end loaders for snow removal or ditch maintenance.

Because of the steep gradients, special treatment will be required to reduce water velocity in ditches and minimize erosion.

6.3 Bridges and Culverts

These will be designed to Cooper E-80 loading, consistent with the axle loads to be used in this service.

6.4 Track

a) Rail - 136# rail throughout. Carbon rail on tangents. Premium rail on curves, to reduce wear and consequently maintenance.

b) Ties - #1 treated timber ties - 8 ft-6 inches long. Spaced at 20-1/2 inch centres.

c) Tie Plates - 7-1/2 inch x 14 inch Double Shoulder.

d) Rail Anchors - Improved Fair or equivalent 6220/mile.

e) Joints - 36 inch standard 6 hole splice bars, 1-1/8 inch diameter track bolts, square nuts and spring washers.

f) Spikes - standard 5/8 inch square x 6 inch long cut track spikes.

g) Turnouts - 136# #11 turnouts with rail bound manganese frogs, Samson switch points for main line switches.

h) Ballast - 12 inches beneath the bottom of the tie of 1-1/2 inch maximum size graded crushed rock or gravel, minimum 75% particles with two fractured faces, and 98% with one fractured face, to standard section Appendix A.

i) Sub ballast - minimum of 12 inch granular pit run between the bottom of the crushed ballast and the top of the subgrade. The actual depth required will be designed when the bearing value of the subgrade in place is known. The nominal 12 inches is used for this estimate.

j) Alternative - continuous welded rail (CWR).

There are significant advantages in using CWR, whereby rail life is extended and joint maintenance eliminated. Although this location may not lend itself conveniently to the welding and installation of long strings technology is available to do this. The whole success in using CWR, however, is based upon successfully and completely restraining the rail. It would take some in-depth study to assess the probability of being able to achieve this on these gradients and with the probable temperature variations.

6.5 Signals

No signal system is required for this simple operation.

6.6 Communication

A reliable radio communication system will be required with train movements controlled from a central dispatcher.

7. Estimate

As previously described, a range of costs is presented for some of the items. Two columns are therefore shown below, representing the upper and lower boundaries of the range.

Main Line - Includes only the direct main route between the upper and lower loop switches.

Secondary tracks - Includes Capp's Loop, Receiving Loop, three sidings, ash track at Chuitna, Wye at lower loop, and ash loading tracks at lower loop.

Shop tracks - Include only those tracks shown serving the repair and maintenance facility at the plant site. Shop buildings are <u>not</u> included.

1. Grading and drainage - includes mobilization and demobilization, clearing, stripping, installation of culverts, excavation of cuts and formation of embankments, all ditching, and distribution and compaction of 12" granular sub-ballast.

2. Track - includes all labour and material to fully install all trackage and turnouts ready for use.

3. Bridges - includes all main line bridge structures.

4. Unloading trestle - at unloading loop.

5. Access Road - a provisional allowance for a 40' roadway 21 miles long.

6. Engineering - 6% of sub-total.

PRELIMINARY COST ESTIMATE

		Lower		Upper
1.	**Grading & Drainage**			
	a. Main Line	25,570,000		39,354,000
	b. Secondary Tracks	3,067,000		3,457,000
	c. Shop Tracks	1,487,000		1,487,000
2.	**Track**			
	a. Main Line	10,739,000		10,739,000
	b. Secondary Tracks	4,316,000		4,316,000
	c. Shop Tracks	976,000		976,000
3.	**Bridges**	16,660,000		21,200,000
4.	**Unloading Trestle**	2,350,000		2,350,000
5.	**Access Road**	7,564,000		7,564,000
	SUB TOTAL	72,729,000		91,443,000
6.	**Engineering**	4,364,000		5,487,000
		77,093,000		96,930,000
	say	77 million	say	97 million
				1981 dollars

8. FURTHER ENGINEERING REQUIREMENTS

Geotechnical Study

Terrain analysis to identify types of materials to be excavated in cuts, foundation conditions for fills, sources of borrow, potential areas of instability, etc.

Confirmation of terrain analysis by field observation, test drilling and laboratory analysis.

Detailed foundation drilling at bridge sites.

Field Location

The line is run on the ground, quantities recalculated based on field rather than map measurements, adjustments made to achieve most economical design and/or to avoid problem areas. Interceptor and offtake ditches are designed.

Hydrology

Expected runoff in drainage channels must be studied in order to size and locate drainage structures.

Bridges

A detailed drilling program is required at each bridge site upon which to base most economical bridge design. This design is a specialty in itself.

Environmental Studies

Environmental concerns will doubtless have to be addressed, and this should be done at an early date in order that allowances can be made in the physical design for any necessary changes. Frequently these changes can be accommodated at reasonable cost when identified at an early stage.

9. REVIEW OF PROPOSED OPERATIONAL PLAN

A brief review of the operating data displayed on Plan 5530-201-P-009 was made, for the purpose of better understanding the operation, and also to confirm the overall feasibility. So far as can be determined from available data, the information set out on this plan appears to be reasonable.

Braking the downhill loaded movements will be more critical than pulling the lighter movements uphill. Dynamic braking will be used to the greatest extent possible to assist the air brake system. It is estimated that about one half the required braking force will be available from dynamic braking, except as the train approaches zero velocity, when all braking effort comes from the air brake system.

The amount of energy that is dissipated in heat may make it attractive to look at electric locomotives, if you have not already done so. Such a system would permit much of this energy to be re-used. However, first cost is high for the volume of traffic.

Because it is vital to have the trains well under control approaching the plant site, we have tried to reduce gradients to the greatest extent possible without unduly increasing construction costs. There is however very limited scope in this terrain.

The location of the unloading loop is such that heavy grading is required and most of the loop is on steep gradients. Commonly, such loops are built on as nearly level ground as possible. There is better ground available here, but presumably it is required for the plant proper. Further investigation would be warranted.

The planned sidings appear to be 2 miles long, which seems to be unnecessarily long. Six thousand feet would appear to be sufficient for these trains, and this is the figure we have used in the estimate. Other than this, we have accepted the secondary trackage as given, at this stage.

The two additional intermediate sidings may not often be required, if the operation cycles smoothly. Subject to further review, it may be desirable to do the grading, but withhold laying the track until the need is demonstrated.

It is noted that AREA recommends maximum curvature for unit train loops as 7° 30' (minimum radius 764'). With sharper curves, difficulty may be experienced with coupling, excessive rail wear and "string lining" (pulling empty cars off the track on the inside of the curve). The loops presently laid out have radii of 600' and 650', but these have not been altered at this time. However, this could be reviewed at the detailed design stage.

While coal is commonly carried in 100-ton capacity cars, it has been the writer's experience, shared by many North American railroads, that unit trains of these cars are very hard on track and structures. The repetitive effect of heavy axle loads have been shown to reduce rail and tie life and increase the frequency of maintenance cycles.

Many reports have been written on this subject. One that was recently written by Mr. Robert H. Ahlf, of the Illinois Central Gulf Railroad, contains an analysis of the subject and demonstrates that it is actually more economical to operate 80-ton cars than 100-ton cars.

It is recommended that this matter be carefully reviewed before making purchase commitments.

10. SUMMARY AND CONCLUSIONS

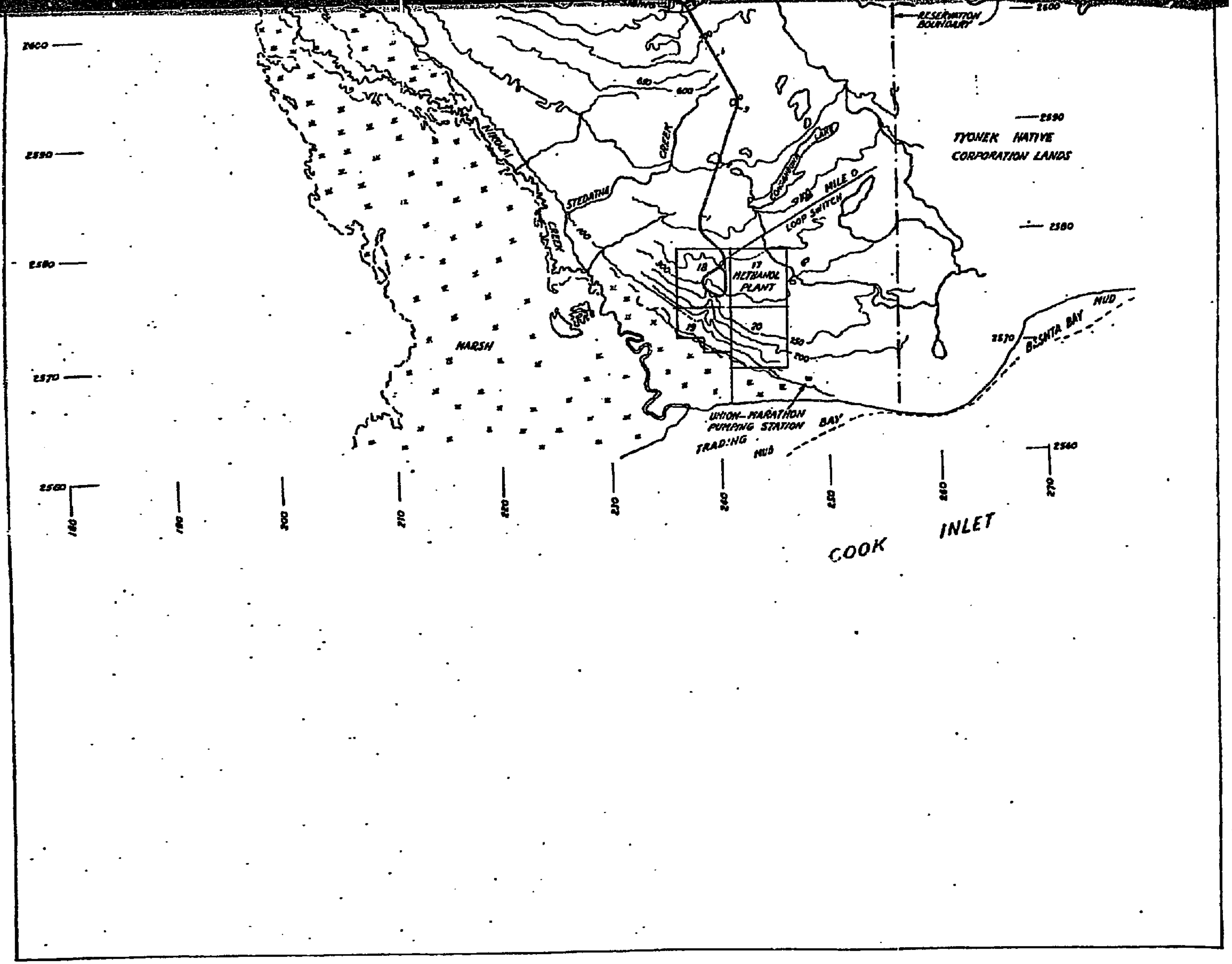
The preliminary rail planning which preceded this assignment has yielded reasonable results. With some minor variations, Alignment 7 is acceptable, and the geometrics of the secondary trackage is generally satisfactory.

With limited knowledge of the soil characteristics, and in the time available, it has been necessary for the purpose of this study to assume a band of possible construction conditions, ranging from what might be termed normal balanced earthwork design, to a "worst case" situation where the fills for the entire northerly half of the line would have to be built from materials hauled a considerable distance. When detailed soils information becomes available, including laboratory analysis of soil samples, refinements can be made to both the alignment and the estimate, to yield a more definitive cost projection. Until such geotechnical data is available, the tolerance in the present estimates cannot be accurately reconciled.

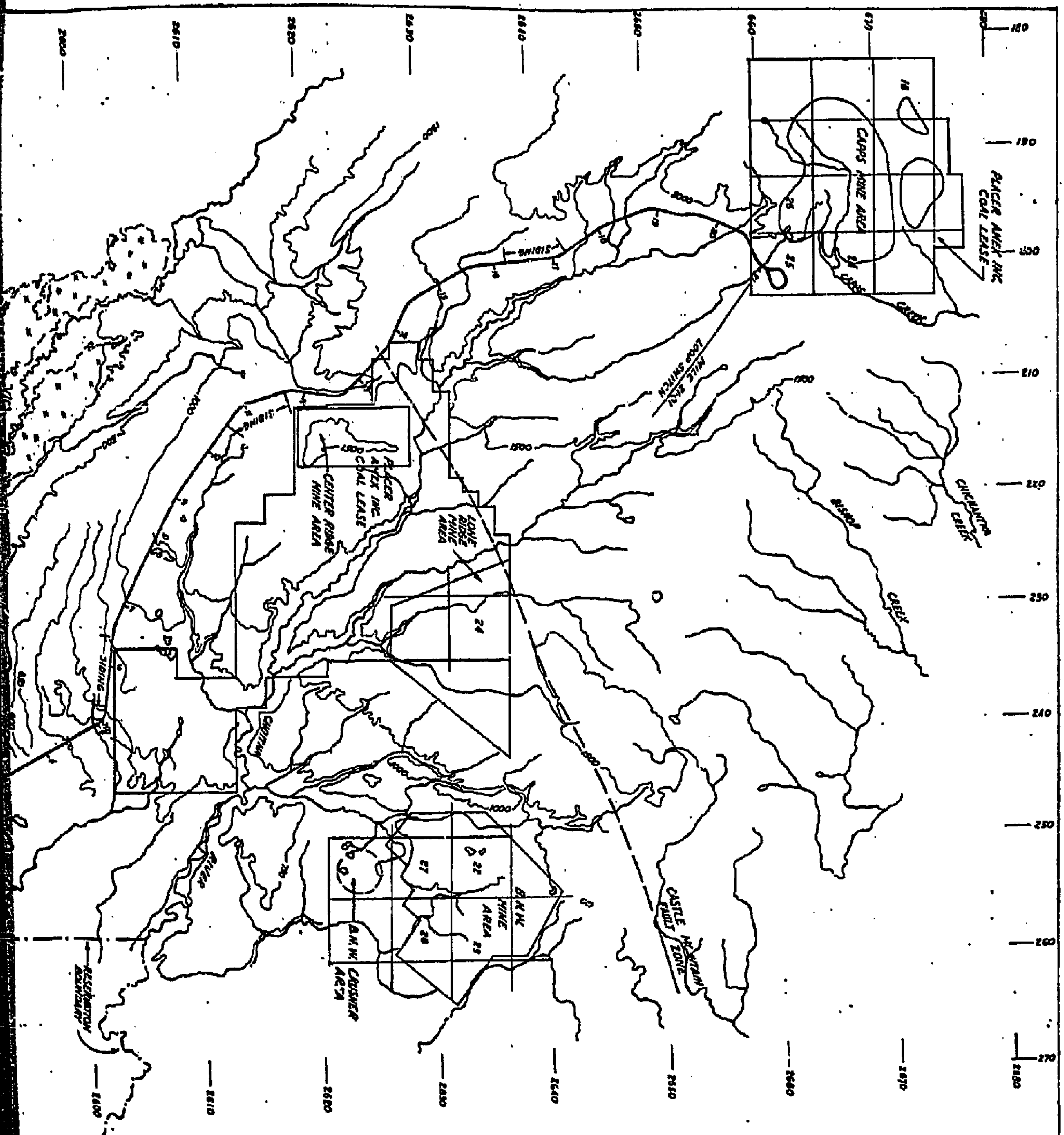
On this basis, it is conjectured that this rail line, complete with secondary trackage and shop trackage, can be built at a cost within the range of $77 million to $97 million.

APPENDIX A

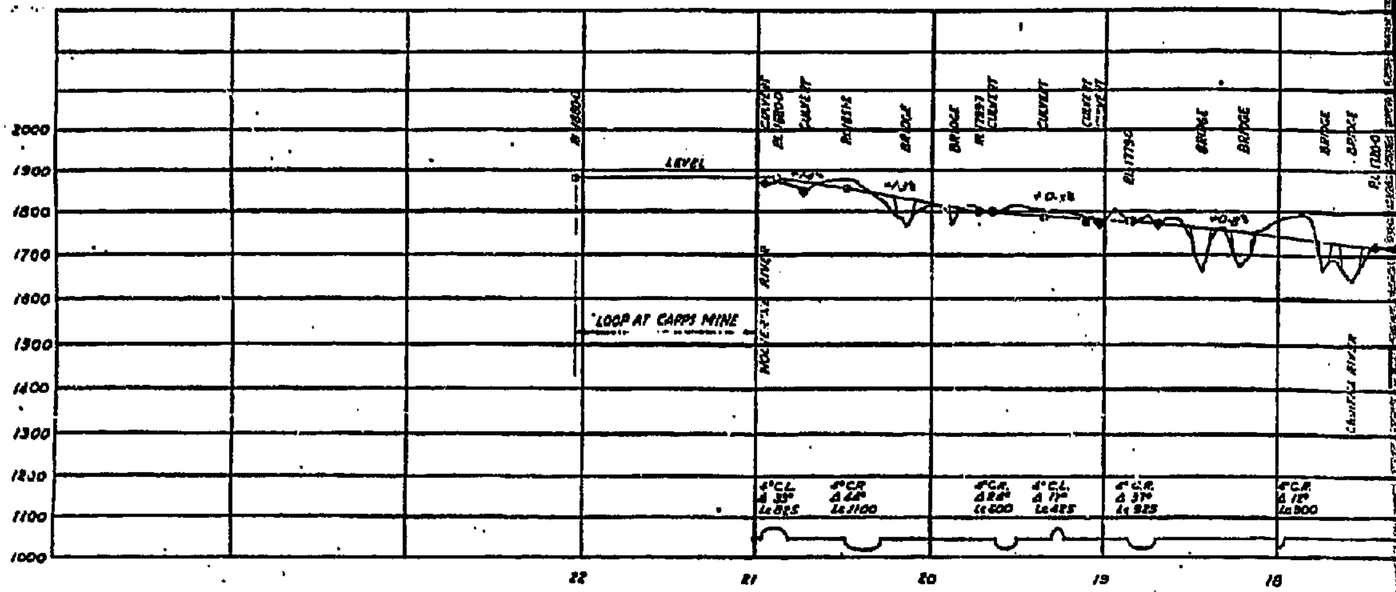
DRAWINGS

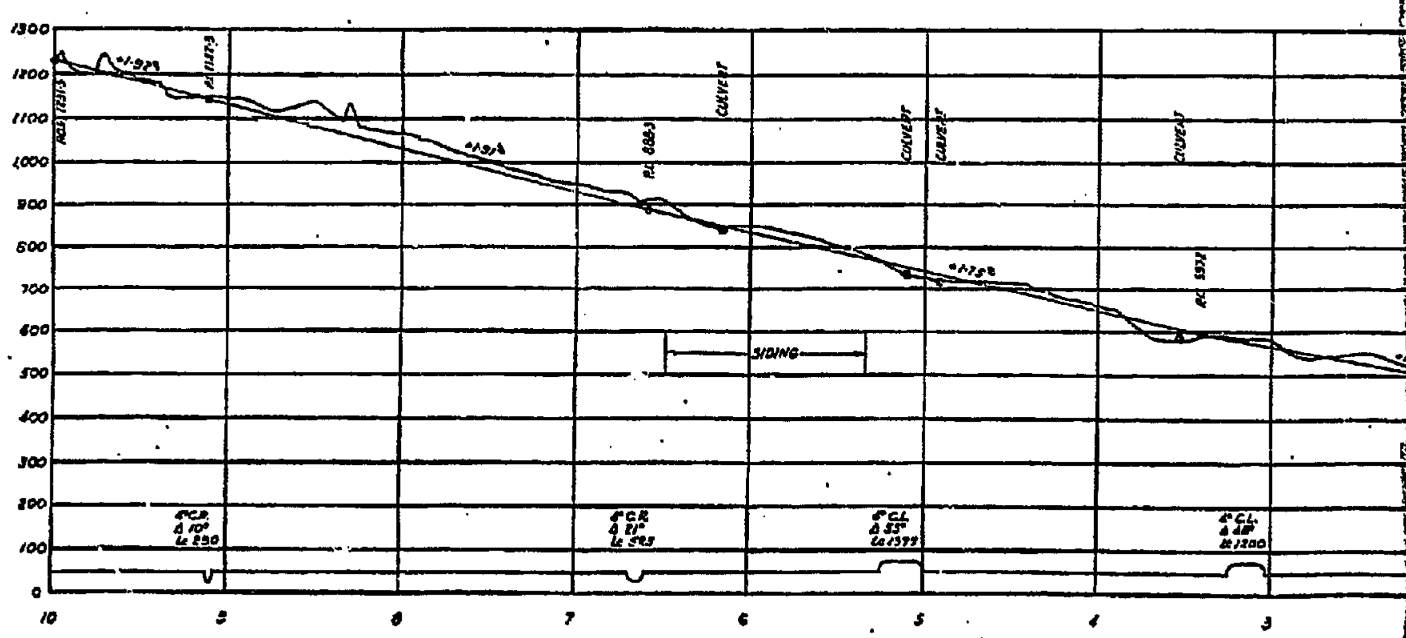


TYONEK NATIVE CORPORATION LANDS
RESERVATION BOUNDARY
NIKOLAI CREEK
STEDATNA CREEK
MARSH
METHANOL PLANT
LOOP SWITCH
MILE 0
UNION-MARATHON PUMPING STATION
TRADING BAY
MUD
BESHTA BAY
COOK INLET



	R.A. FISK & ASSOCIATES LTD. VICTORIA B.C.
	BELUGA METHANOL PROJECT RAILWAY LINE — ROUTE MAP
REVISIONS / DATE	DRAWN BY: D.R.F. CHECKED BY: R.A.F. DATE: July 6, 1981
	SCALE: 1"=1 MILE
	DRAWING No: 18-28-8A 001


LEVEL
LOOP AT CAPPS MINE
BRIDGE
CULVERT
22
21
20
19
18


SIDING
CULVERT
10
9
8
7
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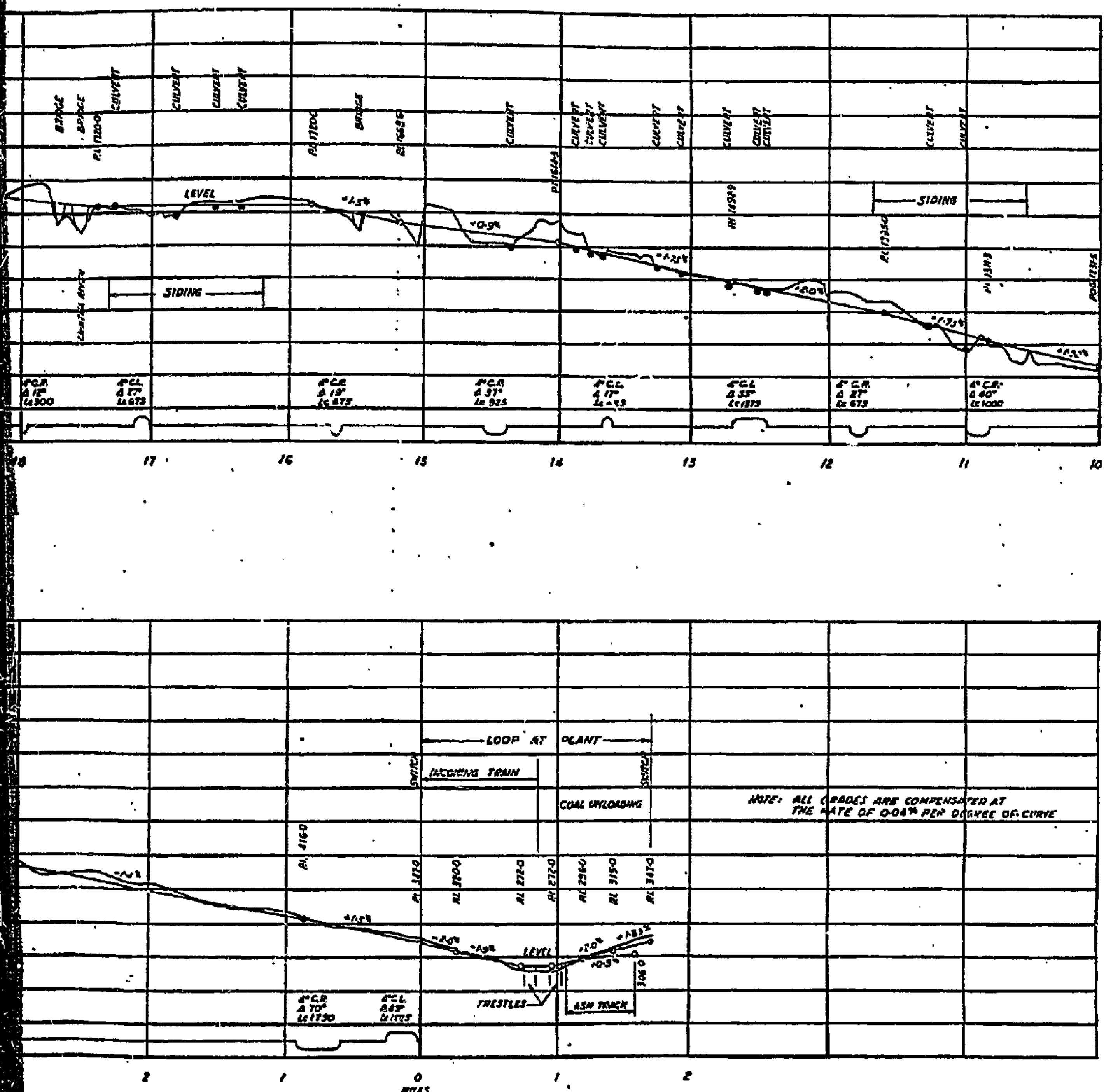
5
4
3

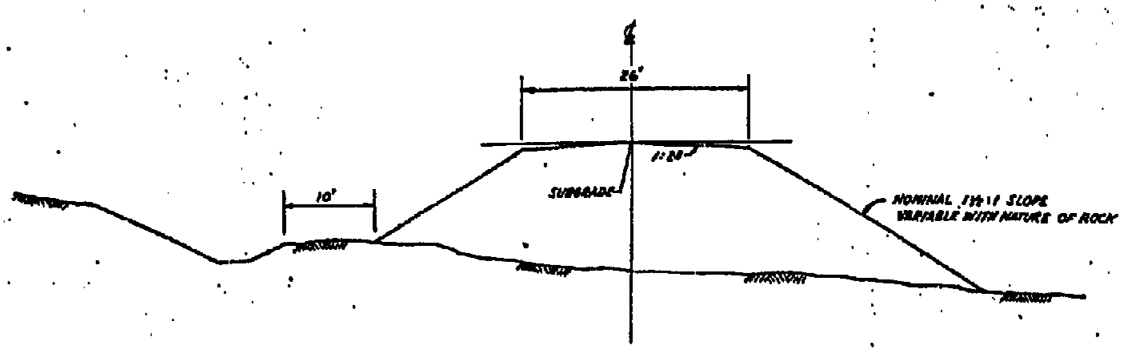


R.A. FISK & ASSOCIATES LTD.
VICTORIA B.C.

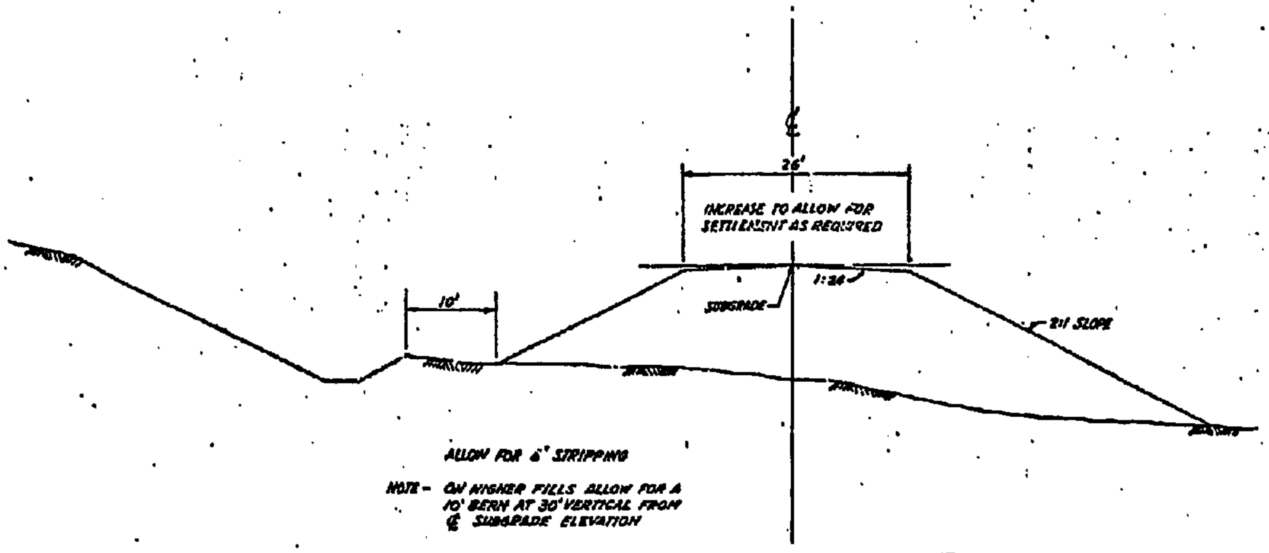
BELUGA METHANOL PROJECT
RAILWAY LINE — PROFILE

DRAWN BY: R.A.F.
CHECKED BY: R.H.F.
DATE: July 8, 1981.
SCALE HOR. 1" = ½ MILE VERT. 1" = 200'
DRAWING No. 18-28-8A 002

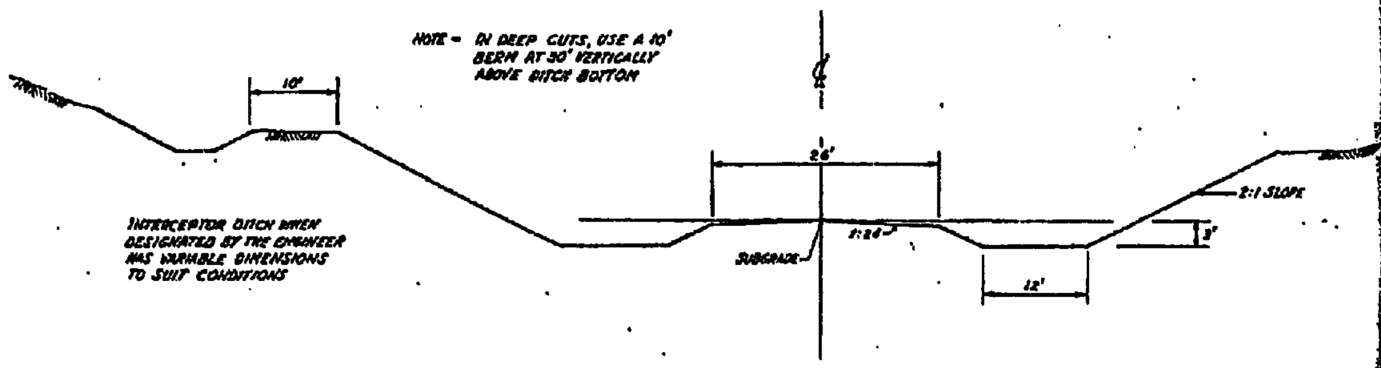
No. | REVISIONS | DATE



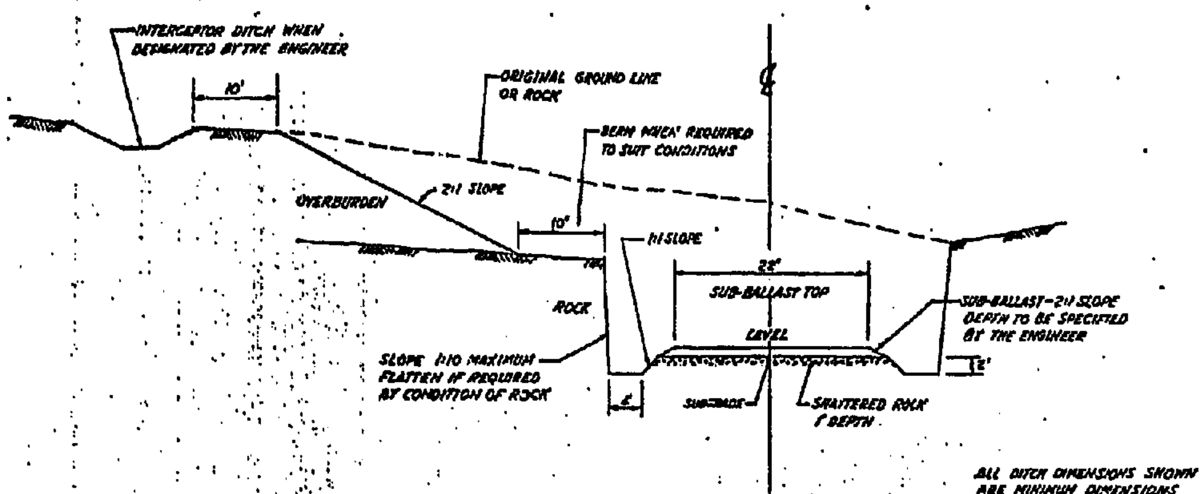
ROCK EMBANKMENT



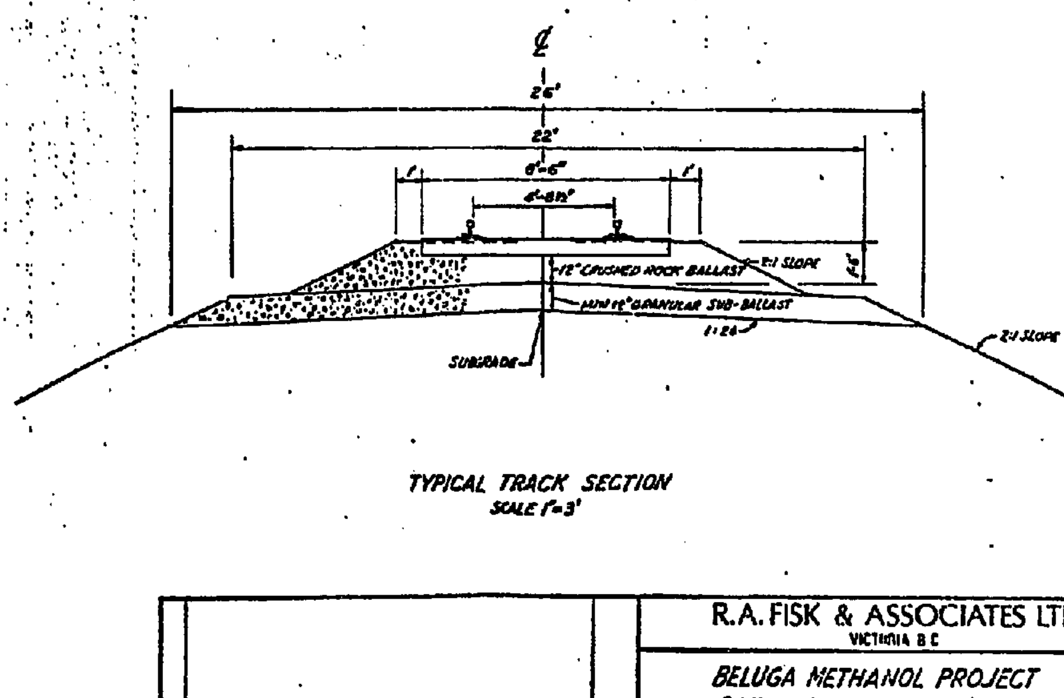
COMMON MATERIAL EMBANKMENT



COMMON MATERIAL EXCAVATION



ROCK EXCAVATION



TYPICAL TRACK SECTION
SCALE 1"=3'

R.A. FISK & ASSOCIATES LTD. VICTORIA B.C.	
BELUGA METHANOL PROJECT RAILWAY LINE — TYPICAL SECTIONS	
DRAWN BY: D.R.F. CHECKED BY: R.A.F. DATE: July 8, 1981	SCALE: 1"=10'
DRAWING No.	18-28-8A 003
No. REVISIONS DATE	

APPENDIX B

ROUTE DESCRIPTION

Commencing at the point of intersection of the turnout at the north end of the unloading and storage loop (Eastings 241,000 Northings 2,577,680) the projected line heads northward through lowlying swamp area to the west and north of Lake Congahbuna on a 1.4% grade.

At Mile 3.5 the line crosses Stedatna Creek and the grade increases to 1.75%. Leaving the swamp area the line continues along the sidehill to Mile 6.7 where the grade increases to 1.91%. The first 6000 foot siding is at Mile 5.9.

The long steep climb to the first load out point is through an area characterized by small hillocks of volcanic tuff deposits.

The centre of the 6000 foot siding is at Mile 11.1 while the centre of the load out spur is at Mile 11.3. Leaving this load out point the line skirts the southern edge of a deep gully on a 2.0% grade and curves around the topmost part, thereby eliminating the need for a bridge over the gully.

Once around this gully the grade decreases to 1.75% and continues on this grade to Mile 14. The centre of the third siding is at Mile 16.8. At Mile 14.1 the line crosses over the divide between west and east flowing streams. The terrain now is more susceptible to erosion. This is indicated by the numerous gullies with streams flowing into the Chuitna River. All these gullies have to be crossed with bridges or fills with large culverts.

At Mile 15.1 the line crosses the first bridge 450 feet long and 70 feet high. From here the line continues to climb on a 0.9% grade to Mile 15.9 at which point the grade levels for a distance of 8000 feet.

The line keeps to the west side of the Chuitna River Valley, crossing many deep gullies and rises on a 1.3% grade to the Capp's Mine Loop Mile 21.01 at elevation 1880.

The last six miles of grade has the most expensive excavation and the most bridges per mile on the entire line. The gradient however is the easiest.

APPENDIX C

GREEN CONSTRUCTION COMPANY
125 West fifth Avenue □ P.O. Box 2800 □ Anchorage, Alaska 99510 U.S.A.
Telephone (907) 279-5456 □ Telex 090-25-231

May 26, 1981

Cook Inlet Region Inc. & Place Amex Inc.
One California Street, Suite 2500
San Francisco, CA 94111

Attn: Benno J. G. Patsch

Dear Sir:

Pursuant to our agreement, I am hereby forwarding to you cost data for use in determining the cost of construction of a railroad in the Beluga Coal Field. In arriving at this cost data, I have assumed various parameters which are as follows:

1. That there is no gravel or other suitable material between the Capps Creek deposit and the "Tuff" deposits located at approximately Mile 10 of the proposed alignment.

2. That there is sufficient rippable material in the "Tuff" deposits at Mile 10 to build at least two-thirds of the total grade.

3. That there will be suitable gravel deposits found in the South one-third of the railroad alignment so that the average haul distance will be approximately one mile.

4. That there is sufficient gravel of good quality in the Chakachatna River to produce the required subbase material by a simple screening operation. Also that there exists or will exist good access from these deposits to the vicinity of the railroad alignment.

5. That there exists in the Chakachatna River deposits material of such quality and quantity as would fit the requirements for production of ballast rock by a standard crushing plant.

6. That board and room would be provided by the Owner at a camp at the terminal site.

These are the basic assumptions that were made in the preparation of the cost estimate. Other assumptions were made which relate directly to a particular item of work and these will be listed when detailing the work item.

Work Item No. 1 -- Mobilization and Demobilization $375,000

Work Item No. 2 -- Clearing $211,371

This cost was based on an estimated 260 acres of clearing of which 75% was hydroax clearing where the resulting debris is removed with the strippings or just covered with embankment, as in normal highway construction practice.

Work Item No. 3 -- Subgrade Construction from Borrow $4.91/CY

This is a composite price based on the above assumptions as to availability (or lack thereof) of suitable construction material. If gravel or rippable rock could be found between Mile 1 and 10 which would fit the requirements of subgrade construction this price per cubic yard would be reduced as this was the more expensive section of railroad grade.

Work Item No. 4 -- Subbase $11.65/CY

This price includes the screening of gravel, hauling and placing of a 6 inch minus product from the Chakachatna River gravel deposits.

Work Item No. 5 -- Ballast $12.00/TON

Here the price includes the production of ballast rock at the Chakachatna River pits and the hauling of this ballast 15 miles to the terminal plant site at Tidewater for loading into railcars.

Work Item No. 6 -- Finishing $176,508

This price includes the finishing of the top of subbase to blue tops, slope dressing, dressing of waste areas and general cleanup.

Work Item No. 7 -- Waste Excavation $1.72/CY

The assumptions here were that the waste material would rip easily and there would be a disposal site within 1000 feet.

Work Item No. 8 -- Culverts Installed

8A 24" CMP	$35/LF
8B 36" CMP	$45/LF
8C 48" CMP	$75/LF
8D 60" CMP	$100/LF
8E 72" CMP	$140/LF
8F 84" Multiplate	$400/LF
8G 96" Multiplate	$500/LF
8H 108" Multiplate	$575/LF

Work Item No. 9 -- Typar Installed $0.75/SY

Work Item No. 10 -- Riprap (Culverts) $30.00/CY

Total manhours or manhours per unit of work are listed below. In determining mandays, the normal work day we experience is a 10 hour day. Camp costs are about $50.00 per manday x 7/6 to include Sundays.

Work Item No.	
1	1000 Manhours
2	1745 Manhours
3	53 C.Y./MH
4	11 C.Y./MH
5	12 Ton/MH
6	1800 Manhours
7	109 C.Y./MH
8a	3½ LF/MH
8b	3 LF/MH
8c	2 LF/MH
8d	1.7 LF/MH
8e	1.5 LF/MH
8f	1 LF/MH
8g	3/4 LF/MH
8h	½ LF/MH
9	250 S.Y./MH
10	5 C.Y./MH

I have not addressed the bridges as it is my understanding that this is to be handled by Dennis Nottingham.

Please do not hesitate to call if you have further questions or need clarification of any aspect of this report.

Very truly yours,

GREEN CONSTRUCTION COMPANY

W. S. Powell

William S. Powell
Assistant Vice President

sb

MEMORANDUM OF CALL

On June 15, a call was placed to Mr. W.S. Powell, of Green Construction, to explore the statement in his letter of May 26, Work Item No. 3, page 2, to the effect that if suitable material for subgrade construction was available between Mile 1 and 10 (our Miles 11 and 20) the price per cubic yard could be reduced. After referring to his work sheets, Mr. Powell advised that the price on this basis would be $3.16 instead of $4.91. Accordingly, $4.91 was used for the "worst case", while $3.16 was used for the "normal case".

APPENDIX D

Peratrovich & Nottingham, Inc.
Engineering Consultants
1506 W. 36th Ave. • Suite 101 • Anchorage, Alaska 99503 • 907-272-8491

June 1, 1981

P&N 81030

Mr. Ray Fisk, P.Eng., B.A.Sc.
210 Pennbridge Building
4475 Vermont Avenue
Victoria, B.C. V8Z 6L8

Re: Beluga Railway Bridge Cost Estimate

Dear Mr. Fisk:

Per your request we have prepared a preliminary cost estimate for typical E80 loading railway bridges envisioned along Alignment No. 7 of the plans submitted to us.

Shown on these preliminary plans are eight bridges with spans varying from 70 to 120 feet and lengths varying from 250 to 400 feet, for a total length of 2620 feet.

Using some of our past experience with Alaskan railway bridges to meet the short study time, we established a typical simple span steel girder bridge as shown on the attached drawing. Here concrete piers are shown, but they could possibly be constructed of steel, subject to further study; likewise the superstructure could be concrete.

Pier heights on the plans varied from approximately 50 to 90 feet so we based our costs on about a 60- to 70-foot average pier height. All abutments were considered to be of concrete and the same type.

To present a worst case situation all substructure units were assumed to be pile supported resulting in about 15 to 20 percent higher bridge costs than had spread footings been considered.

As constructed unit costs used in this study, assuming late 1981 construction, were as follows:

ITEM	UNIT COST
Structural Steel	$1.50 per pound
Steel Piles	$80 per foot
Reinforced Concrete	$800 per cubic yard
Excavation	$30 per cubic yard
Ballast	$50 per cubic yard
Track & Embankment	Not included

We foresee increasing inflationary trends for the future in Alaska so caution against indiscriminate use of these prices.

Comparing multiple spans from 70 to 110 feet in length it soon became apparent that bridge costs were consistent in the range of $5000 per foot for all construction costs. Longer spans had higher superstructure costs and lower substructure costs and vice versa. A large project such as this could result in lower costs due to repetition, possibly as low as $4000 per foot.

Using this approach our best estimate for construction cost of the eight bridges on this project would be $11 to $13 million exclusive of administrative, engineering and other miscellaneous costs. To present a project budget figure, a value of about $15 million would seem reasonable at this time. Of course as we discussed previously, many things, such as soils, geometry changes, inflation, etc. could alter this figure significantly.

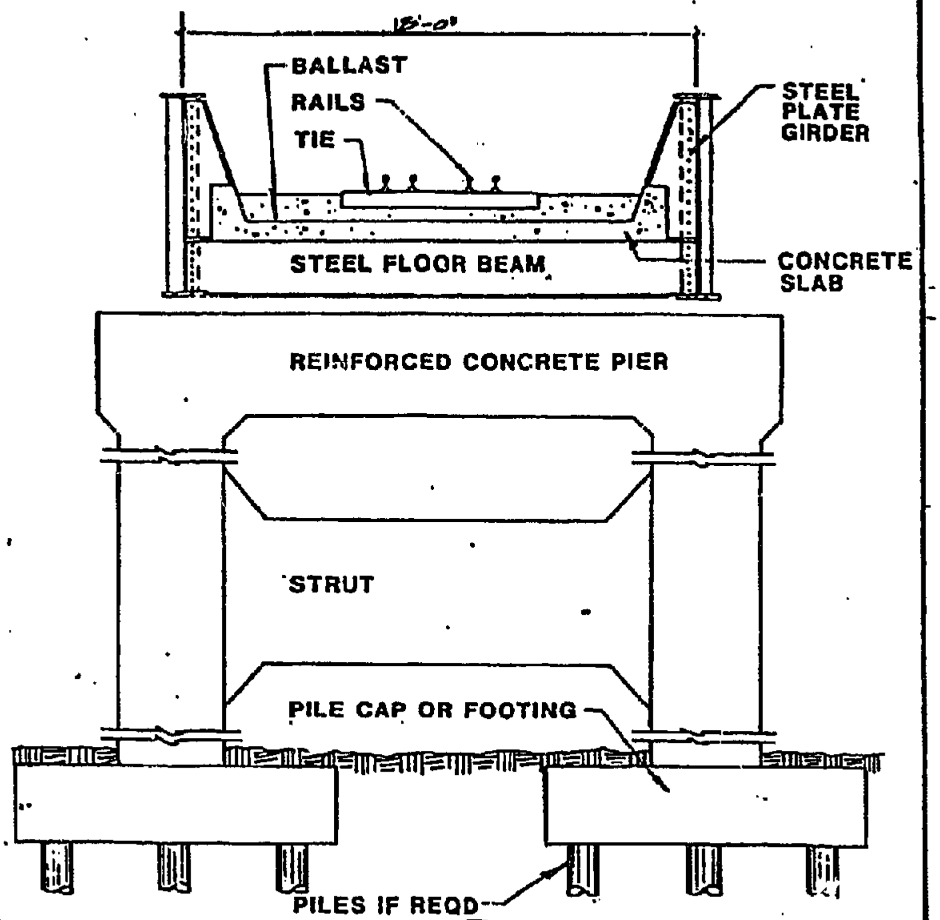
We hope this brief study will be adequate for your needs and should you have any questions or if we may be of additional service, please contact us at any time.

Sincerely yours,

PERATROVICH & NOTTINGHAM, INC.

Dennis Nottingham
President

DN/kd/L3-oo



TYPICAL SECTION
E80 RAILWAY BRIDGE
BELUGA, ALASKA

R.A. FISK & ASSOCIATES LTD.
RAILWAY ENGINEERING
210 Pennbridge Building
4475 Viewmont Ave.
Victoria, B.C.
V8Z 6L8
Phone (604) 727-2522

July 30, 1981

Placer Amex Inc.
One California Street
Suite 2500
San Francisco, Ca.
U.S.A. 94111

ATTENTION: Mr. C. E. McFarland

Reference: Operating Cost - Beluga Rail Line
Our File 18-28-8B

Dear Sirs:

This letter report is in response to Mr. Kirshenbaum's recent request, and our discussion at Vancouver July 22.

We had made calculations on the basis of 10,500,000 net tons of coal annually as shown on Davy McKee drawings, and using Alaska RR wage scale. At the meeting in Vancouver, you requested re-calculation on the basis of 8,500,000 tons annually, and using wage rates averaging $215 per day, including fringe benefits.

You could handle the reduced tonnage in two ways:

a) by running the same number of shorter trains (5 days/week operation)

b) by running a fewer number of the same size trains (4 day/week operation)

Under (a), you need only 57 coal cars and 16 ash cars per train.

Under (b), you need the original design consisting of 70 coal cars and 19 ash cars.

Wages and fuel costs were worked out for both cases, and illustrate an annual saving of almost $650,000 for alterative (b) compared to alternative (a). Weighing this against the capital cost of 32 cars, roughly $2,500,000, the incremental cost appears to be justifiable. In addition, under alternative (b), you have the ability to increase capacity at any time up to 10,500,000 tons annually, without further capital expenditure.

. . . /2

The calculations for operating costs are attached. These are all in 1981 dollars, and do not include administrative support, which it is assumed will be provided by the plant general office.

In summary:

(a) For 5 day/week operation

Transportation & Mechanical Maintenance

Wages	2,319,000
Fuel	2,122,000
Parts replacement	1,000,000
Lube oil, sand, etc.	100,000
	5,541,000

Track & Structures Maintenance

Wages & supplies	1,238,000
Equipment rental	232,000
Misc. contracts	100,000
	1,570,000
TOTAL	7,111,000

Plus the following additional program work:

Rail renewal - every 33 years	2,283,000
Rail renewal - every 44 years	2,075,000
Tie renewal - years 3,9,15,21, etc.	214,000
Tie renewal - years 6,12,18,24, etc.	716,000
Ballast - every 6 years	1,200,000
Rail joint welding - every 6 years	150,000
Ballast rehabilitation - every 24 years	1,872,000

(b) For 4 day/week operation

Transportation & Mechanical Maintenance

Wages	2,044,000
Fuel	1,751,000
Parts replacement	1,000,000
Lube oil, sand, etc.	100,000
	4,895,000

. . . /3

Track & Structures Maintenance

Same as (a)	1,570,000
	6,465,000
Annual savings (b) over (a)	646,000

General Comments

1. As we understand the proposed operation, the three locomotive units are to be divided two on the head end, one on the rear. This is unconventional, and is presumably to accommodate switching ash cars at the plant due to the ash track requiring a facing point movement. Such an arrangement requires either two enginemen on each train, or else remote control. It also results in marshalling the train in an undesirable manner; i.e., going northward the loaded ash cars are behind the empty coal cars.

   Our wage calculation, you will note, includes provision for two enginemen.

   In our report dated June 30, 1981, a comment is made on page 15 that the unloading loop could be better located on level, or more nearly level ground. A comment was made at the Vancouver meeting that the plant site would be shifted northerly. If so, perhaps the loop could be better located; also, it may be possible in any re-arrangement to connect the ash track at both ends, thereby permitting a more conventional train operation, with all units on the head end. Either this arrangement, or alternately the provision of remote control, would result in a reduction in wage cost of approximately $257,000 annually from the figures shown.

2. You will require two spare locomotive units and a minimum of 5% spare cars in order to maintain continuous service. The spare locomotives will be usable in snow service and work train service as well.

3. You will require a wrecking crane, as there will inevitably be mishaps.

4. Snow fighting equipment will require careful study and will be governed to some extent by experience. One of the units of track equipment you will probably have can be equipped with snow plow and switch broom, and can cope with some of the requirements. You will possibly equip some of your locomotive units with plows. A spreader will definitely be required, and this can include a plow as well. Canadian railways used to have an extensive fleet of wedge plows and some rotary plows, but these have been used less extensively following track improvements which incorporated raised track, larger ditches and more open cuts, all of which are provided

in your track design. However, if drifting snow conditions at Beluga are severe and cannot be controlled by snow fences and normal methods, it may be necessary to have a wedge plow or even a rotary plow. Alaska RR experience will be valuable in determining the total requirements.

Snow melters are a definite requirement for your switches.

I trust that these estimated operating costs and comments will be helfpful.

Yours truly,

R. A. FISK & ASSOCIATES LTD.

R. A. Fisk

R. A. Fisk, P. Eng.

RAF:kt

Enc.

ESTIMATE ANNUAL WAGE COST

OPERATING AND MECHANICAL

1	Trainmaster		60,000.00
1	Mechanical Superviser		60,000.00
3 4/5	Despatchers	19 x 231.17 x 52	228,395.96
8 2/5	Mechanical-Electrician-Machinist	42 x 189.03 x 52	412,841.52
8 2/5	Carmen	42 shifts x 189.03 x 52	412,841.52
1	Labourer	5 " x 124.00 x 52	32,240.00
12	Enginemen	5 days x 164.95 x 52	514,644.00
6	Condr.	5 " x 156.32 x 52	243,859.20
6	Trainmen	5 " x 149.30 x 52	232,908.00
2	Enginemen	2 " x 164.95 x 52	34,309.60
2	Condr.	2 " x 156.32 x 52	32,514.56
2	Trainmen	2 " x 149.30 x 52	31,054.40
Snow Plow Service			
1	Engineer	50 x 164.95	8,247.50
1	Condr.	50 x 156.32	7,816.00
1	Trainman	50 x 149.30	7,465.00
Estimate		Total Wage Cost	2,319,137.00

Based on 5 day a week Coal Hauling
2 day a week Ash Hauling
50 trips snow plow annually

R.A. FISK & ASSOCIATES LTD.

DIESEL FUEL CONSUMPTION

0645 - 0845		Idle	12.5 gal.
0845	0930	Full Throttle	149.6
0930	10000	Set off - meet	10.0
1000	1030	Full Throttle	99.7
1030	1230	Idle	12.2
1230	1300	Dynamic	12.5
1300	1415	Meet & Lift	25.0
1415	1445	Dynamic	12.5
		Total Consumption	334.0 gals.

1 Unit 8 hours	334 gals.
1 " 24 "	1002
3 " 24 "	3006
3 " 5 days per week	15030
3 " 5 " " " 1 year	781560
Second Train Set	781560
Total	1563120 gals.

Weekends.

0945 - 1100		Switch	5.0 gals.
1100	1200	Full Throttle	199.5
1200	1245	Idle	4.5
1245	1315	Dynamic	12.5
1315	1530	Idle	13.5
1530	1630	Full Throttle	199.5
1630	1715	Idle	4.5
1715	1745	Dynamic	12.5
1745	2000	Idle	13.5
2000	2100	Full Throttle	199.5
2100	2145	Idle	4.5
2200	2230	Dynamic	12.5

Total 1 unit 681.5 gals 3 trips
3 " 2044.5 " 3 trips
3 trips second day 2044.5 gals

Total weekend consumption	4089.0 gals.
Annually	212628.0 gals.

Total daily consumption 52 weeks	1,563,120 gals.
weekend consumption 52 weeks	212,628
snow plow consumption 50 trips	22,500
Estimate total consumption annually	1,798,248 gals.
Cost of Diesel Fuel 1.18 per gal.	
Estimate Annual Cost	$2,121,932.00

R.A. FISK & ASSOCIATES LTD.

Lube Oil and Sand $100,000.00

Lube Oil 3.90 per gal.

Table

SD 45 Diesel Unit Burns

199.5	Gals.	per	Hour	Full Throttle
25	"	"	"	Dynamic Braking
20	"	"	"	Switching
6	"	"	"	Idling

ESTIMATE WAGE COST 4 DAY COAL HAUL

1	Trainmaster	Annually	60,000.00
1	Mechanical Superviser		60,000.00
3 1/5	Despatcher	16 x 231.17 x 52	192,333.44
8	Carmen	40 shifts x 189.03 x 52	393,182.40
8	Mechanical	40 " x 189.03 x 52	393,182.40
1	Labourer	5 " x 124.00 x 52	32,240.00
12	Enginemen	4 days x 164.95 x 52	411,715.20
6	Condr.	4 " x 156.32 x 52	195,087.36
6	Trainmen	4 " x 149.30 x 52	186,326.40
2	Enginemen	2 " x 164.95 x 52	34,309.60
2	Condrs.	2 " x 156.32 x 52	32,514.56
2	Trainmen	2 " x 149.30 x 52	31,054.40
Snow Plow Annually			
1	Engineer	46 x 164.95	7,587.20
1	Condr.	46 x 156.32	7,190.72
1	Trainman	46 x 149.30	6,867.80
			$2,043,590.00

Based on 4 days a week Coal Hauling
2 days a week Ash Hauling
46 Trips Snow Plow Annually

R.A. FISK & ASSOCIATES LTD.

ESTIMATE FUEL COST 4 DAY WEEK COAL HAULING

4 days Coal Hauling	24 trips x 1,002 gals. x 52	1,250,496 gals.
2 days Ash Hauling	4,089 gals. x 52	212,628
Snow Plow 46 trips	450 gals. per trip	20,700
		1,483,824 gals.

Fuel 1,483,824 gals. @ 1.18 gal. = $1,750,912.00

Total Cost:

Fuel	1,750,912.00
Wages	2,043,590.00
Lube & Sand	100,000.00
	$3,894,502.00

Saving compared to 5 day week operation $646,567.00

Assumed Engines not equipped with Locotrol.
If so, then deduct wages for 6 Enginemen per week $4,948.50
Annually $257,322.00

R.A. FISK & ASSOCIATES LTD.

ESTIMATE PARTS REPLACEMENT

Hopper Cars   Wheels - Brake Shoes - Brake Beams

Brake shoes required at least every 2 months on each wheel

8 x $25 x 180 cars x 6 =		$ 216,000.00
Wheels - Brake Beams		284,000.00
	Say	$ 500,000.00
Locomotive	8 - 61,000 each say	500,000.00
Parts too numerous to mention		
	Total	$ 1,000,000.00

TRACK AND STRUCTURES MAINTENANCE

Civil Engineer		60,000
Engineering Assistant		47,000
General Foreman	25.80 x 40 x 52	53,664
Assistant Foreman	22.58 x 40 x 52	46,966
2 Heavy Equipment Operators	2 x 21.50 x 40 x 52	89,440
3 On-track Equipment Operators	3 x 19.35 x 40 x 52	120,744
4 Track Maintainers	4 x 18.27 x 40 x 52	152,006
		569,820
Fringe benefits 25%		142,455
		712,275
Materials & Supplies		250,000
		962,275
Overtime for snow removal, derailments, etc.		
Weekdays	26 wks. @ 10 hrs. @ 333.77	86,780
Saturdays	10 @ 10 hrs. @ 333.77	33,377
Sundays	10 @ 10 hrs. @ 445.02	44,502
		164,659
Fringe benefits 25%		41,165
		205,824
Materials & Supplies		70,000
		275,824
Total wages, materials, supplies		1,238,099
Equipment Rental (Dragline, front-end loader, tamper, liner, ballast regulator, hydraulic crane, misc. small tools.)		232,000
Miscellaneous Contract Work (Rail testing, rail grinding, vegetation control, bridge inspection, etc.)		100,000
Total		1,570,099
Say		1,570,000