Final report: Volume 1. 1982

Green Bay, WI: Foth and Van Dyke, 1982

Report

Foth & Van Dyke
engineers/architects
2737 S. RIDGE ROAD
P.O. BOX 3000
GREEN BAY, WI
54303-1200

A FINAL REPORT FOR:

EXXON MINERALS COMPANY

PRELIMINARY ENGINEERING

MINE/MILL ACCESS ROAD (ALTERNATE ALIGNMENT)

Contract # 21615

VOLUME I

AUGUST, 1982

OTHER OFFICES: ISHPEMING, MI · MILWAUKEE, WI
Green Bay Office: (414)497-2500

INDEX

VOLUME I

VOLUME II

CHAPTER 1

INTRODUCTION

Introduction

In response to Exxon Minerals Co. Contract #21615 with Foth & Van Dyke and Associates, Inc. we are submitting the final report on the preliminary plans for the Mine/Mill Access Road at Crandon, Wisconsin.

The final report is presented in two volumes. Volume I includes this narrative, discussion and response to various tasks of the project and one set of reduced size engineering drawings which are separate from this report.

Volume II is an appendix and contains a detailed breakdown of various tasks and responses.

WISCONSIN
PETER R. WILLS E-12933 Abrams, Wis.
PROFESSIONAL ENGINEER

August 19, 1982

WISCONSIN
THOMAS J. JANSSEN, SR. E—18613 DE PERE, WIS.
REGISTERED PROFESSIONAL ENGINEER

19 Aug 82

WISCONSIN
KENNETH A. ENGLEBERT E-16310 Green Bay, Wis.
PROFESSIONAL ENGINEER

August 25, 1982

Exxon 7/30/82

CHAPTER 2

PROJECT DESCRIPTION

CHAPTER 2. PROJECT DESCRIPTION

This project was the preliminary design of an access road from State Trunk Highway 55 (STH 55) to the Exxon Minerals Co. (Exxon) mine/mill plant site located in Forest County, Wisconsin, near Crandon, Wisconsin.

This particular project is an alternate alignment to the study completed by our firm in 1981. The alternate alignment does utilize, as much as practical, information gathered or developed for the 1981 study that is still pertinent to the new (alternate) alignment.

The project was completed by survey crews and design teams within a time period of approximately two months.

In general, the access road is an all-weather, two (2) lane rural road of design class C-4 approximately 4.8 km (2.98 miles) in length with a right-of-way width of 30.48 m (100 ft.). The alignment crosses several minor drainages and one (1) major stream, Swamp Creek, where a structure was required.

The alternate alignment does minimize the crossing of wetlands along the access road route.

Engineering criteria for the project is contained in Appendix 1 in Volume II of this report.

CHAPTER 3

SUMMARY OF SOILS INVESTIGATION

CHAPTER 3

PRELIMINARY REPORT
SOIL INVESTIGATION FOR
ALTERNATE RIGHT-OF-WAY FOR
EXXON MINE/MILL ACCESS ROAD

SCOPE OF WORK

On July 6, 7, and 8, geotechnical personnel from FOTH & VAN DYKE and Associates, Inc. performed a soil investigation program along the alternate right-of-way for the mine/mill access road. The purpose of the investigation was to provide information for design of pavement, determination of suitability of material for fill, and to locate unsuitable subgrade materials.

SUMMARY OF RECOMMENDATIONS

We feel at this time that further laboratory testing to determine soil properties is not necessary based on the similarity of the subsoils along the two routes. We do, however, recommend that at the time of construction more detailed laboratory soils work be performed to define and confirm the engineering properties of the soils as related to compaction and stability.

The plans and/or specifications should contain the following clauses for roadway subgrade construction:

1) The roadway section shall be cleared and grubbed and all topsoil, peat or other deleterious soils removed. Removal of the above should extend downward out from the outer edge of the roadway at a 1:1 slope or flatter.

2) Topsoil, peat and other organic soils shall be stockpiled for later use as landscaping materials.

3) For silty or clay soils in place or used as fill, consideration should be given to requiring a minimum of 1.2 meters below the pavement.

4) Silty or clayey soils used as fill shall be compact at or near optimum moisture to 100% of the Standard Proctor Density.

5) Sandy soils shall be compacted at or near optimum moisture to 95% of the Standard Proctor Density.

6) Erosion control measures such as silt fences, settlement ponds, berms and ditches will be required as necessary to minimize siltation of nearby streams and wetlands.

7) Subsequent to placing fill, especially in drainageways, the subgrade should be "proof rolled" to locate any "soft" areas. Any "soft" areas encountered shall be undercut and replaced with properly compacted fill material.

8) Further laboratory testing of soils for engineering properties should be accomplished when construction begins.

9) Undercutting of deleterious soils and the placement and compaction of fill soils shall be monitored as part of a field quality control program.

CHAPTER 4

SUMMARY OF DRAINAGE SYSTEM

CHAPTER 4. DRAINAGE SYSTEM STUDY

by Mike Liebman, P.E.
Water Resource Engineer

The watershed through which the preferred access road will lie, was divided into sub-basins according to existing drainage patterns. Runoff flows for the discharge points of each sub-basin were then estimated using the hydrologic computer simulation model TR-20 which was calibrated for this area. Culverts were then sized for non-navigable discharge points so as to minimize adverse backwater affects and provide adequate drainage through the access road.

The navigable stream crossing at Swamp Creek required additional study. The hydraulic computer simulation program HEC-2 was used to determine the regional or 100-year flood elevations along Swamp Creek in the vicinity of the proposed crossing (472.03). The proposed bridge was then sized so as to not increase these flood elevations by more than 3 cm. (0.1 ft.) as required by NR116 of the Wisconsin Administrative Code.

The various discharge points or crossings are listed as follows with the recommended drainage structure:

Station 7620	27 - inch culvert
Station 8104	24 - inch culvert
Station 1100	24 - inch culvert
Station 1352.6	24 - inch culvert
Station 1701	24 - inch culvert
Station 2535.6	24 - inch culvert
Station 2780 (Swamp Creek)	Four 10 x 8 ft. box culverts or a span exceeding 39 feet
Station 4135	24 - inch culvert

Ditch drainage between culverts was also examined. It was found that a minimum depth in the ditch of one foot would suffice provided side-slopes of at least four to one were maintained and that a minimum ditch slope of about 0.5 percent be set. Ditch configurations at different locations along the access road could vary, but proper conveyance should be maintained.

In addition to the various discharge points analyzed, members of the engineering design team determined a culvert would be required at Sta. 7920 and that a .61 m (24") culvert would suffice.

CHAPTER 5

SUMMARY OF SWAMP CREEK CROSSING

CHAPTER 5

CROSSINGS CONSIDERED

By Ken Englebert, P.E.
Structural Engineer

I. General

Alternative bridge structures have previously been investigated for the Swamp Creek crossing as shown in Appendix 4, Volume II, of the final report (Exxon Contract No. 21704). For reference, the pertinent excerpts of the above report are included in Appendix 5 of this report.

The previous alternatives were based upon a 95 foot span and were as follows:

	Est. Cost
Steel Plate Girder Structure	$ 215,000.00
Prestressed Girder Structure (54 inch)	175,000.00
Poured in Place Box Culvert	225,000.00
Precast Box Culvert	285,000.00

II. Alternatives Considered This Report

The physical requirements of the stream crossing site dictate the use of a 70 inch prestressed girder bridge spanning 126 feet. As the preliminary cost estimate for this structure of $206,480.00 is less than other alternates for a 95 foot span above, no other alternatives were considered cost effective nor researched in this report.

CHAPTER 6

SUMMARY OF ENVIRONMENTAL ASPECTS

CHAPTER 6 SUMMARY OF ENVIRONMENTAL ASPECTS

This summary of environmental aspects of construction and Appendix 6, which contains excerpts from the Facilities Development Manual and the environmental screening worksheets for the project, is intended to aid in the evaluation of environmental concerns.

The physical construction of the access road would require close inspection by the construction engineer/inspectors and the contractor to minimize the amount of erosion/siltation/dust and noise pollution. Erosion bales and erosion mat, proper construction methods and seeding in the first year to re-establish ground cover will significantly reduce the amount of erosion which will occur from the construction. Specifications will require the Contractor to maintain dust and noise abatement.

During grading and construction of the ditches, erosion bales as ditch dikes will be required and the use of erosion mat will be required where ditch grades exceed 2%. Where ditch grades are between 1% to 2% erosion mat ditch dikes will be required. Rip-rap shall be placed at the discharge of all culvert pipes and in any area that requires to prevent erosion. It is foreseen that once ground cover is re-established, very little maintenance would be required with the exception of periodic monitoring or inspection.

The construction of Swamp Creek bridge will be difficult because of the remote location and require close coordination of the construction effort. There is no new construction within Swamp Creek and heavy construction equipment will not be permitted to "wade" the river for the bridge or road construction. In addition, the Contractor would be required to closely monitor his maintenance program to ensure no waste oil or other substances are incorrectly disposed of.

This alternate was selected to minimize the crossing of any wetlands and the only wetland crossed is in the immediate vicinity of Swamp Creek. Construction methods will require the marsh material to be removed and disposed of as shown on the typical section.

The positive effects of low temperature during the first three months of the year will enable the clearing of the wetland areas as this may be the only time these areas will be accessible for the logging vehicles to perform their work.

Cold weather also enables the marsh excavation and backfill without damage and runoff to the stream.

The firm ground situation will enable a better placement of the granular material backfill for the marsh excavation.

Close monitoring and use of erosion bales, erosion mat, and settling basins will significantly reduce siltation to Swamp Creek or adjacent wetlands.

8/18/82

CHAPTER 7

COST ESTIMATES

Project Total

Engineering - Final Design

Engineering - Construction

Roadway Construction

Bridge Construction

Construction Cost Summary

	Cost	Contingency	Total
Access Road @	$ 868,500.00	$ 130,000.00	$ 998,500.00
Swamp Creek Bridge @	$ 187,710.00	$ 18,770.00	$ 206,480.00
*Construction Engineering	$ 82,600.00	$ ---	$ 82,600.00
	$1,138,810.00	$ 148,770.00	$1,287,580.00

NOTE:

A 15% contingency factor was used for the access road estimate. A 10% contingency factor was used for the bridge construction.

*The construction engineering cost is based on the 1 January 18 month project schedule/start date.

Reference Section #4 of Chapter 10 for a summary of the factors used in the preparation of the quantity estimates for various bid items. Appendix 9 of Volume II contains the detailed breakdown of the cost estimates for the Access Road and Swamp Creek Bridge.

The actual construction cost for the access road and the bridge may vary dependent on the schedule/start date selected. By shortening the available construction days, i.e. probable work days, during months that are favorable to this type of construction, the Contractor would be forced to hire more laborers and purchase or rent/lease additional equipment to complete the job in the time available. This in turn increases his bid item price which would be reflected in the total cost for the project.

Engineering Cost Estimate

Design - Final Plans & Specifications

Task		Man Hours	Est. Labor & Expenses
Work Plan		15	$ 510
Schedule		11	400
Review & Supplement Criteria		32	1,230
Field Surveys		144	3,620
Alignment & Profile		72	2,730
Soils Investigation		99	2,930
Drainage System		32	1,170
Structure Design		196	7,330
Final Engineering Drawings		306	7,770
Prepare Specifications		52	1,860
Cost Estimate		118	3,560
Construction Schedule		46	1,730
Draft/Final Report		86	2,990
Meetings & Bid Opening		121	5,100
Print Plans & Specs		--	1,600
Estimated Total	Man Hours	1,330	$ 44,530

NOTE: If the alternate site for the crossing of Swamp Creek is considered as discussed in previous transmittals, it will cost an additional $6,050.00 in labor and expenses. In addition, two soil borings and lab analyses of soils at approximate cost of $1600. For a total design engineering cost of $52,200.00.

Construction Engineer Services Cost Estimate

Resident Engineering

	Jan. 1 12 Mo. Sch.		June 1 12 Mo. Sch.		Jan. 1 18 Mo. Sch.	
	Labor	Exp.	Labor	Exp.	Labor	Exp.
Resident Engineer	$10,500	$ 5,000	$ 8,700	$ 4,000	$12,900	$ 6,000
Bridge Inspector	6,200	3,000	6,400	3,500	6,300	3,000
Constr. Inspector	14,350	6,000	12,200	5,500	10,200	8,500
Staking Crew	14,400	6,000	14,150	5,500	15,350	8,500
	$45,450	$20,000	$41,450	$18,500	$44,750	$26,000

Project Engineering

	Labor	Exp.	Labor	Exp.	Labor	Exp.
Project Engineer	$ 3,700	$ 500	$ 3,000	$ 400	$ 4,700	$ 650
Principle	4,000	500	4,000	500	4,000	500
Record Drawings	2,000	--	2,000	--	2,000	--
	$ 9,700	$ 1,000	$ 9,000	$ 900	$10,700	$ 1,150
	$55,150	$21,000	$50,450	$19,400	$55,450	$27,150
	$ 76,150		$ 69,850		$ 82,600	

ESTIMATED LABOR COSTS

JANUARY - 12 MONTH SCHEDULE

ACCESS ROAD

JANUARY	432	M.H.	X	@	$ 12.50	=	$ 5,400
FEBRUARY	512	M.H.	X	@	$ 12.50	=	$ 6,400
MARCH	732	M.H.	X	@	$ 12.50	=	$ 9,150
APRIL	780	M.H.	X	@	$ 12.50	=	$ 9,750
MAY	2,960	M.H.	X	@	$ 12.50	=	$ 37,000
JUNE	2,648	M.H.	X	@	$ 12.50	=	$ 33,100
JULY	2,352	M.H.	X	@	$ 12.50	=	$ 29,400
AUGUST	2,825	M.H.	X	@	$ 12.50	=	$ 35,300
SEPTEMBER	600	M.H.	X	@	$ 12.50	=	$ 7,500
							$ 173,000

SWAMP CREEK BRIDGE

MAY	720	M.H.	X	@	$ 12.50	=	$ 9,000
JUNE	1,360	M.H.	X	@	$ 12.50	=	$ 17,000
JULY	1,104	M.H.	X	@	$ 12.50	=	$ 13,800
AUGUST	752	M.H.	X	@	$ 12.50	=	$ 9,400
							$ 49,200

TOTAL ESTIMATED LABOR COST

ACCESS ROAD	$ 173,000
SWAMP CREEK BRIDGE	$ 49,200
	$ 222,200

ESTIMATED LABOR COSTS

JUNE - 12 MONTH SCHEDULE

ACCESS ROAD

JUNE	928	M.H.	X	@	$ 12.50	=	$ 11,600
JULY	2,480	M.H.	X	@	$ 12.50	=	$ 31,000
AUGUST	3,939	M.H.	X	@	$ 12.50	=	$ 49,250
SEPTEMBER	3,880	M.H.	X	@	$ 12.50	=	$ 48,500
OCTOBER	2,656	M.H.	X	@	$ 12.50	=	$ 33,200
							$ 173,550

SWAMP CREEK BRIDGE

JULY	184	M.H.	X	@	$ 12.50	=	$ 2,300
AUGUST	1,440	M.H.	X	@	$ 12.50	=	$ 18,000
SEPTEMBER	992	M.H.	X	@	$ 12.50	=	$ 12,400
OCTOBER	1,112	M.H.	X	@	$ 12.50	=	$ 13,900
NOVEMBER	60	M.H.	X	@	$ 12.50	=	$ 750
							$ 47,350

TOTAL ESTIMATED LABOR COST

ACCESS ROAD	$ 173,550
SWAMP CREEK BRIDGE	$ 47,350
	$ 220,900

ESTIMATED LABOR COSTS

1 JANUARY - 18 MONTH SCHEDULE

Access Road

January	432	M.H.	X	@	$12.50	=	$ 5,400
February	288	M.H.	X	@	$12.50	=	$ 3,600
March	568	M.H.	X	@	$12.50	=	$ 7,100
April	336	M.H.	X	@	$12.50	=	$ 4,200
May	664	M.H.	X	@	$12.50	=	$ 8,300
June	2944	M.H.	X	@	$12.50	=	$ 36,800
July	1640	M.H.	X	@	$12.50	=	$ 20,500
August	1834	M.H.	X	@	$12.50	=	$ 22,925
September	2464	M.H.	X	@	$12.50	=	$ 30,800
October	384	M.H.	X	@	$12.50	=	$ 4,800
July	2136	M.H.	X	@	$12.50	=	$ 26,700
							$171,100

SWAMP CREEK BRIDGE

May	80	M.H.	X	@	$12.50	$ 1,000
June	1120	M.H.	X	@	$12.50	$ 14,000
July	1048	M.H.	X	@	$12.50	$ 13,100
August	1208	M.H.	X	@	$12.50	$ 15,100
September	88	M.H.	X	@	$12.50	$ 1,100
						$ 44,300

Total Estimate Labor Costs	
Access Road	$171,100
Swamp Creek Bridge	44,300
	$215,400

CHAPTER 8

FINAL ENGINEERING AND CONSTRUCTION SCHEDULES

Manpower & Equipment Requirements

Engineering - Final Design - Plans & Specs

Engineering - Construction - Resident Engineering & Inspection

Roadway Construction

Bridge Construction

Design Engineering - Manpower Requirements

	Plans & Specs	Meetings & Bid Opening	Total
E-4	77	32	109
E-3	199	55	254
E-2	339	16	355
Tech.-3	221	12	233
Tech.-2	232	0	232
Tech.-1	112	0	112
Typing	29	6	35
	1209	121	1330

NOTE:

If the alternate site for the crossing of Swamp Creek is considered as discussed in previous transmittals, it will require an additional 238 man hours. Additional time would be required for E-4, E-3, T-3, T-2, T-1.

SECTIONS

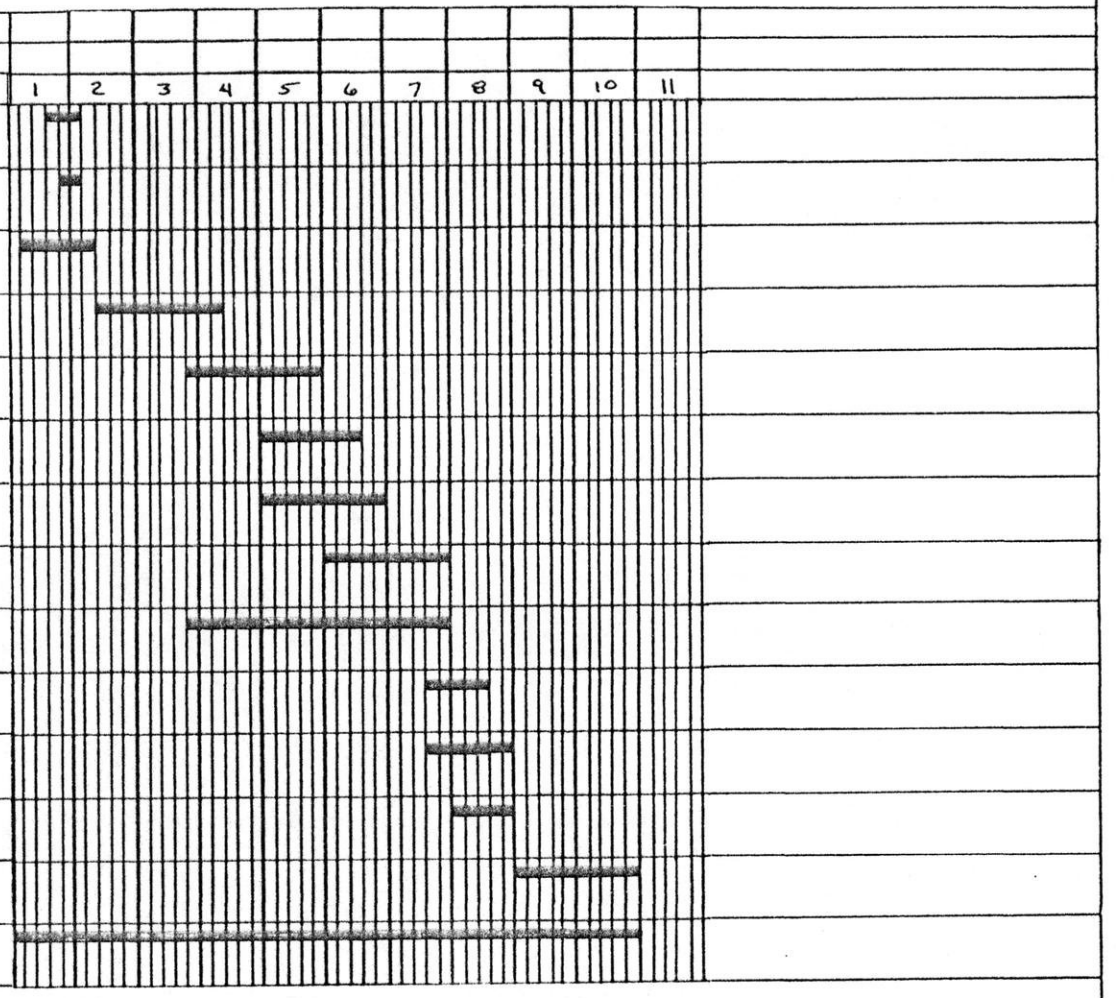
TRN- TRANSPORTATION
CPT- COMPUTER
SVY- SURVEY
GEO- GEOTECHNICAL
HYD- HYDROLOGY
STR- STRUCTURES
PLN- PLANNING

EXXON CRANDON PROJECT

FINAL DESIGN WORK SCHEDULE

(BASED ON 5 DAY WORK WEEK)

NO	TASK DESCRIPTION	PROJECT WEEK
4.1	PREPARE WORK PLAN	TRN
4.2	PREPARE SCHEDULE	TRN
4.3	REVIEW AND SUPPLEMENT CRITERIA	TRN-CPT
4.4	FIELD SURVEYS	TRN-SVY
4.5	PLAN ALIGNMENT AND PROFILE	TRN-CPT
4.6	SOILS INVESTIGATION	TRN-GEO
4.7	PLAN DRAINAGE SYSTEM	TRN-HYD-SVY
4.8	FINAL STRUCTURE DESIGN	TRN-STR
4.9	PREPARE FINAL ENGINEERING DRAWINGS	TRN
4.10	OUTLINE SPECIFICATIONS FOR MATERIALS AND CONSTRUCTION	TRN-STR
4.11	PREPARE COST ESTIMATE	TRN-STR
4.12	PREPARE CONSTRUCTION SCHEDULE AND MANPOWER ESTIMATES.	TRN-STR
4.13/4.14	PREPARE DRAFT AND FINAL REPORTS	TRN-PLN-STR
4.15	MEETINGS AND REPORTS	TRN



Construction Engineering

The project will have a full time field resident engineer from the beginning to the completion of the project. He will be the field engineer and co-ordinator for all phases of the project, such as the roadway and the Swamp Creek Bridge.

The resident engineer shall have a 2-3 man staking crew, bridge construction inspectors, roadway construction inspector available as the need arises during the various phases of construction.

The construction engineering schedule is shown with the Access Road and Swamp Creek Bridge Construction Schedule.

CONSTRUCTION ENGINEERING MANPOWER REQUIREMENTS

	Jan. 1 12 Mo. Schedule	June 1 12 Mo. Schedule	Jan. 1 18 Mo. Schedule
Project Engineering	211	168	264
Resident Engineer	736	608	904
Bridge Inspector	488	504	496
Construction Inspector	1,504	1,280	1,072
Field Crew	1,536	1,480	1,608
	4,475 man hrs.	4,040 man hrs.	4,344 man hrs.

EXXON ACCESS ROAD

MANPOWER/EQUIPMENT REQUIREMENTS ESTIMATES

JANUARY - 12 MONTH SCHEDULE

JANUARY			
Foreman	48 Manhours		EQUIPMENT MANHOURS
Laborer	192 Manhours	Logging Truck	96
Truck Driver	96 Manhours	Skidder	96
Operator	96 Manhours		192
	432		
FEBRUARY			
Foreman	64 Manhours	Logging Truck	64
Laborer	192 Manhours	Skidder	64
Truck Driver	64 Manhours	Hydraulic Hoe	64
Operator	192 Manhours	Dozer	64
	512		256
MARCH			
Foreman	92 Manhours	Logging Truck	88
Laborer	272 Manhours	Skidder	88
Truck Driver	88 Manhours	Hydraulic Hoe	96
Operator	280 Manhours	Dozer	96
	732		368
APRIL			
Foreman	76 Manhours	Hydraulic Hoe	88
Laborer	120 Manhours	3-Dozers	240
Truck Driver	32 Manhours	6-24 CY Scrapers	192
Operators	552 Manhours	1-Grader	32
	780	2-Lowbed Tractor Trailers	32
			584
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Foreman	184 Manhours	6-24 CY Scrapers	768
Laborer	304 Manhours	2-Dozers	256
Truck Driver	824 Manhours	Dragline	40
Operator	1648 Manhours	Grader	128
	2960	2-Vibratory Rollers	256
		Water Truck	128
		10-12 CY Trucks	640
		Loader	64
		Crushing Plant	40
		Hydraulic Hoe	56
		Flatbed Truck	56
			2432

JUNE			
Foreman	120 Manhours	6-24 CY Scrapers	288
Laborer	400 Manhours	2-Dozers	80
Truck Driver	1,136 Manhours	Grader	144
Operator	992 Manhours	2-Vibratory Rollers	288
	2648	Water Truck	144
		10-12 CY Trucks	960
		Crushing Plant	96
		2-Lowbed Tractor Trailers	32
			2032

JULY			
		3-Rollers	120
		Paver	40
Foreman	136 Manhours	2-Dozers	48
Laborer	392 Manhours	2-24 CY Scrapers	48
Truck Driver	1272 Manhours	Grader	72
Operator	552 Manhours	10-12 CY Trucks	1200
	2352	Water Trucks	72
		2-Vibratory Rollers	224
		Crushing Plant	72
		Loader	96
			1992

AUGUST			
		Grader	40
		2-Vibratory Rollers	80
		Crushing	40
Foreman	248 Manhours	10-12 CY Trucks	1200
Laborer	393 Manhours	2-Loaders	128
Truck Driver	1408 Manhours	1-Dozer	64
Operator	776 Manhours	Paver	32
	2825	Mulcher	48
		3-Rollers	96
		Post Driver	40
		3-Utility Tractors	200
		2-Flatbed Trucks	128
		2-Paint Trucks	80
			2176

SEPTEMBER			
Foreman	40 Manhours	2-Flatbed Trucks	80
Laborer	280 Manhours	Post Driver	40
Truck Driver	160 Manhours	Utility Tractor	40
Operator	120 Manhours	2-Paint Trucks	80
	600		240

SWAMP CREEK BRIDGE

MANPOWER/EQUIPMENT REQUIREMENTS ESTIMATES

JANUARY - 12 MONTH SCHEDULE

MAY		EQUIPMENT MANHOURS	
Foreman	88 Manhours		
Laborers	176 Manhours	Hydraulic Hoe	88
Operators	264 Manhours	Crane/with Pile Driver	88
Carpenters	48 Manhours	Loader/with Compactor	88
Rodmen	96 Manhours		264
Finishers	48 Manhours		
	720		

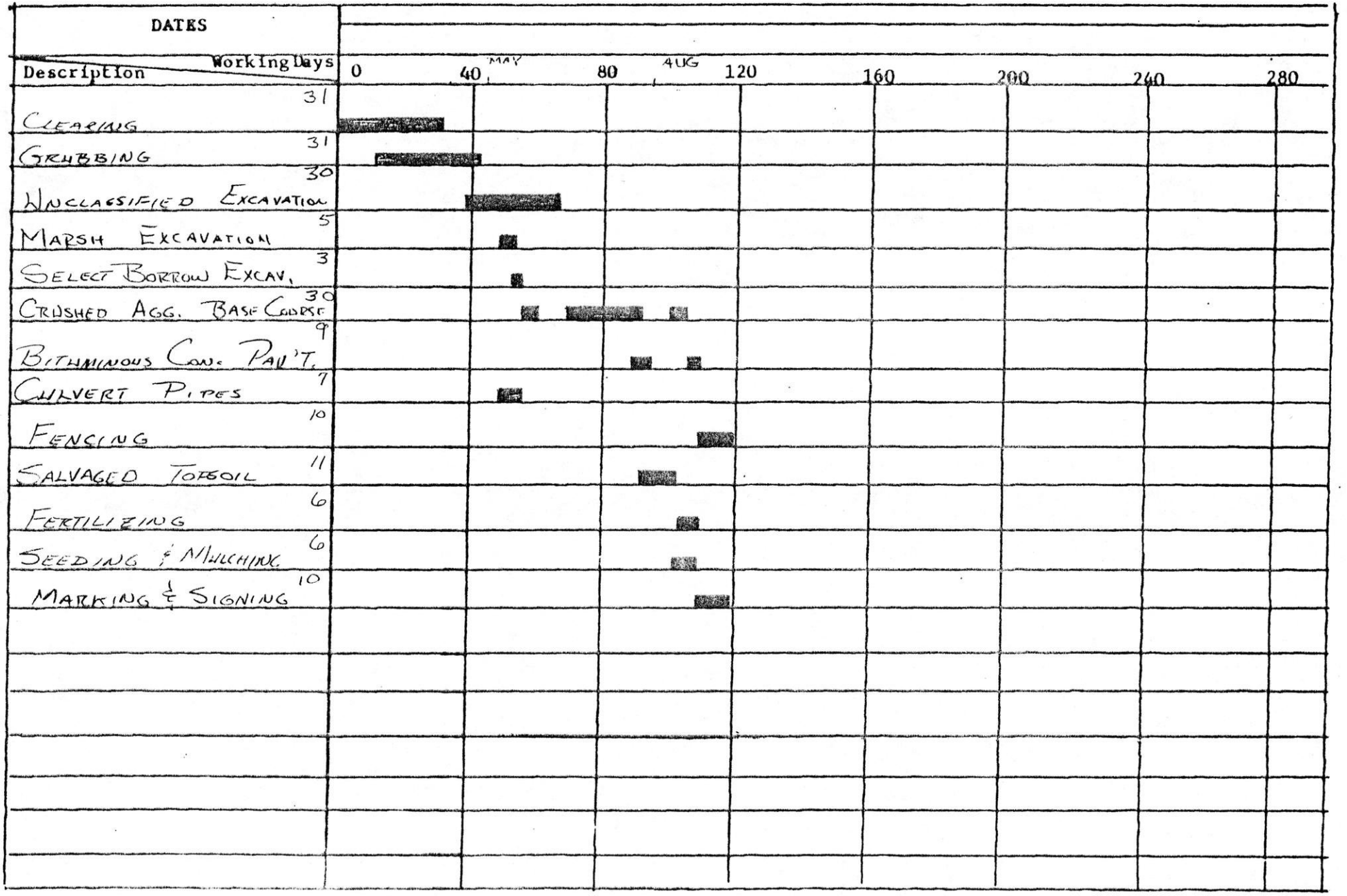
JUNE			
Foreman	144 Manhours	Crane/with Pile Driver	144
Laborers	288 Manhours	Loader/with Compactor	96
Operators	336 Manhours	Hydraulic Hoe	96
Carpenters	384 Manhours	Flatbed Truck	144
Rodmen	96 Manhours		480
Finishers	112 Manhours		
	1360		

JULY			
Foreman	136 Manhours	Crane	136
Laborers	272 Manhours		
Operators	136 Manhours		
Carpenters	320 Manhours		
Rodmen	160 Manhours		
Finishers	80 Manhours		
	1104		

AUGUST			
Foreman	104 Manhours	Crane	80
Laborer	208 Manhours	Paver	8
Operators	88 Manhours		88
Carpenters	160 Manhours		
Rodmen	80 Manhours		
Finishers	112 Manhours		
	752		

CONTRACT TIME ANALYSIS -

PROJECT Exxon Access. Rd, CONT. NO. 21615, TYPE 2 LANE ALL-WEATHER RURAL ROA
LOCATION CRANDON WISC.
DATE OF LETTING _____ PROBABLE START DATE JAN 1 12 months



CONTRACT TIME ANALYSIS - II

PROJECT Exxon Access Rd. CONT. NO.

ITEM	CONTRACT QUANTITY	UNIT	AMT. WORK PER DAY	WORKING DAYS
Clearing	12.12	HA.	0.40	31
Grubbing	12.12	HA.	0.40	31
Unclassified Excavation	86000	CM	2850	30
Marsh Excavation	1800	CM	400	5
Select Borrow	2340	CM	1130	3
Crushed Agg. Base Course	56700	MT	1800	30
Bit. Conc Pavement	7216	MT	820	9
Culvert Pipes	196.6	LM	30	7
Fencing & Gates	2650	LM/EA	290	10
Topsoil (Salvaged)	76113	SM	7500	11
Fertilize, Seed, & Mulch	2600	KG	450	6
Marking & Signing	14.1	KM	1.5	10

MONTH	DAYS Mon.	DAYS Tot.	Sat-Day	Sun-Day	Holi Day	Poss. Wk. Days	Prob. Wk. Days Month	Prob. Wk. Days Total	
Jan 83	31	31	5	5	0	21	58%	12.1 (12)	12
Feb	28	59	4	4	0	20	43%	8.6 (8)	20
Mar	31	90	4	4	0	23	58%	13.3 (12)	32
Apr	30	120	5	4	0	21	58%	12.1 (12)	44
May	31	151	4	5	1	21	80%	16.8 (16)	60
June	30	181	4	4	0	22	80%	17.6 (18)	78
July	31	212	5	5	1	20	85%	17.0 (17)	95
Aug	31	243	4	4	0	23	85%	19.5 (19)	114
Sept	30	273	4	4	1	21	76%	15.9 (16)	130
Oct	31	304	5	5	0	21	77%	16.1 (16)	146
Nov	30	334	4	4	2	20	70%	14.0 (14)	160
Dec.	31	365	5	4	1	21	58%	12.1 (12)	172

REMARKS:

TOTAL CONTRACT TIME: 304 CAL. DAYS

PREPARED BY: [signature], 7-24 1982

CONTRACT TIME ANALYSIS - 1

PROJECT Swamp Creek Bridge, CONT. NO. _____, TYPE Bridge Const.

LOCATION _____

DATE OF LETTING _____ PROBABLE START DATE Jan 1 12 Month

DATES / Working Days / Description	0	40	80	120	160	200	240	280
Mobilize								
Excavate & Backfill								
Piling								
Abutements								
Fip Pad								
Beams								
Diaphrams								
Deck Forms								
Reinf. Steel								
Deck Pour								
Bridge Railings								
Clean Up & Demobilize								

CONTRACT TIME ANALYSIS - II

PROJECT SWAMP CREEK BRIDGE. CONT. NO.

ITEM	CONTRACT QUANTITY	UNIT	AMT. WORK PER DAY	WORKING DAYS
MOBILIZE				5
EXCAVATE & BACKFILL				7
PILING				10
ABUTEMENTS				6
RIP RAP				5
BEAM PLACEMENT				2
DIAPHRAMS				3
DECK FORM				7
SET REINF. STEEL				5
POUR DECK				1
RAILINGS				4
CLEAN UP & DEMOBILIZE				5
				60

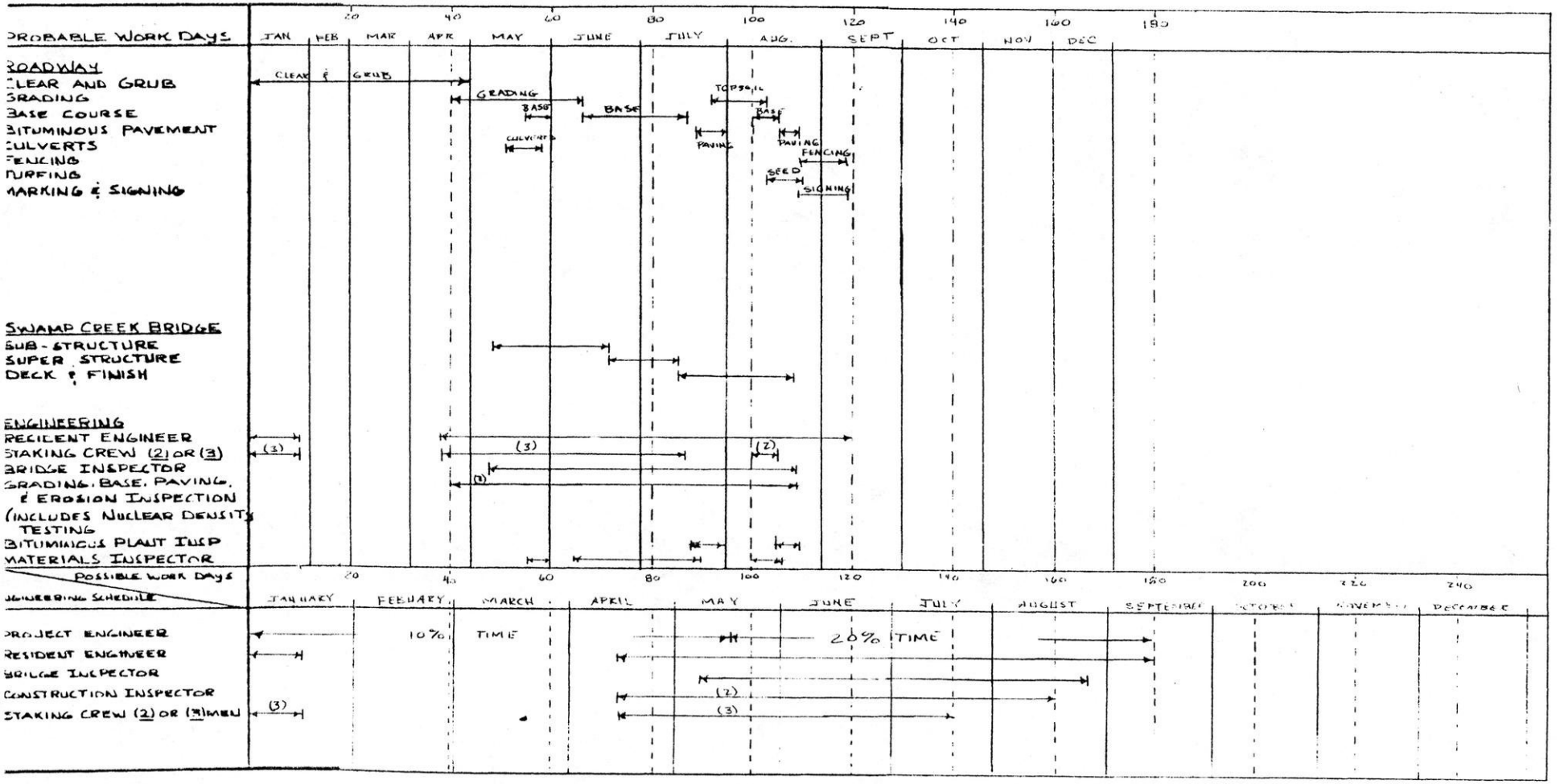
MONTH	DAYS Mon.	DAYS Tot.	Sat-Day	Sun-Day	Holi Day	Poss. Wk. Days	Prob. Wk. Days Month	Prob. Wk. Days Total	
JAN									12
FEB.									20
MAR									32
APR									44
MAY									60
JUNE									78
JULY									95
AUG									114
SEPT									130
OCT									146
NOV									160
DEC									172

SAME AS JAN. 1 — 12 MONTH START

REMARKS:

TOTAL CONTRACT TIME: _____ CAL. DAYS

PREPARED BY: _____ 19____


PROBABLE WORK DAYS
JAN
FEB
MAR
APR
MAY
JUNE
JULY
AUG.
SEPT
OCT
NOV
DEC
ROADWAY
CLEAR AND GRUB
GRADING
BASE COURSE
BITUMINOUS PAVEMENT
CULVERTS
FENCING
TURFING
MARKING & SIGNING
CLEAR & GRUB
GRADING
BASE
BASE
BASE
TOPSOIL
CULVERTS
PAVING
PAVING
FENCING
SEED
SIGNING
SWAMP CREEK BRIDGE
SUB-STRUCTURE
SUPER STRUCTURE
DECK & FINISH
ENGINEERING
RESIDENT ENGINEER
STAKING CREW (2) OR (3)
BRIDGE INSPECTOR
GRADING, BASE, PAVING, & EROSION INSPECTION
(INCLUDES NUCLEAR DENSITY TESTING
BITUMINOUS PLANT INSP
MATERIALS INSPECTOR
(3)
(3)
(2)
(1)
POSSIBLE WORK DAYS
ENGINEERING SCHEDULE
JANUARY
FEBRUARY
MARCH
APRIL
MAY
JUNE
JULY
AUGUST
SEPTEMBER
OCTOBER
NOVEMBER
DECEMBER
PROJECT ENGINEER
RESIDENT ENGINEER
BRIDGE INSPECTOR
CONSTRUCTION INSPECTOR
STAKING CREW (2) OR (3) MEN
10% TIME
20% TIME
(3)
(2)
(3)

EXXON ACCESS ROAD

MANPOWER/EQUIPMENT REQUIREMENTS ESTIMATES

JUNE - 12 MONTH SCHEDULE

JUNE

			EQUIPMENT MANHOURS
Foreman	144 Manhours	Logging Truck	144
Laborer	288 Manhours	Skidder	144
Truck Driver	144 Manhours	Hydraulic Hoe	104
Operator	352 Manhours	Dozer	104
	928		496

JULY

Foreman	136 Manhours	Logging Truck	104
Laborer	400 Manhours	Skidder	104
Truck Driver	472 Manhours	Hydraulic Hoe	136
Operator	1472 Manhours	3-Dozers	328
	2480	6-24 CY Scrapers	576
		Dragline	40
		Grader	96
		2-Vibratory Rollers	192
		Water Truck	96
		10-12 CY Trucks	240
		2-Lowbed Tractor Trailers	32
			1944

AUGUST

Foreman	456 Manhours	2-Dozers	304
Laborer	632 Manhours	6-24 CY Scrapers	843
Truck Driver	1072 Manhours	Grader	104
Operator	1779 Manhours	2-Vibratory Rollers	208
	3939	Water Truck	104
		10-12 CY Truck	800
		2-Loaders	176
		Crushing Plant	80
		Hydraulic Hoe	64
		Flatbed Truck	168
		2-Lowbed Tractor Trailers	32
			2883

SEPTEMBER

Foreman	152 Manhours	2-Dozers	80
Laborer	448 Manhours	2-24 CY Scrapers	80
Truck Driver	1768 Manhours	Grader	152
Operators	1512 Manhours	2-Vibratory Rollers	304
	3880	Water Truck	152
		10-12 CY Trucks	1520
		2-Loaders	304
		Crushing Plant	152
		Post Driver	48
		3-Utility Tractor	240
		2-Flatbed Truck	96
			3128

OCTOBER

Foreman	208 Manhours	10-12 CY Trucks	1040
Laborer	616 Manhours	Loader	32
Truck Driver	1304 Manhours	Crushing Plant	32
Operator	528 Manhours	Paver	72
	2656	3-Rollers	216
		2-Paint Trucks	160
		Flatbed Truck	104
		Post Driver	32
		Utility Tractor	32
			1720

SWAMP CREEK BRIDGE

MANPOWER/EQUIPMENT ESTIMATE

JUNE - 12 MONTH SCHEDULE

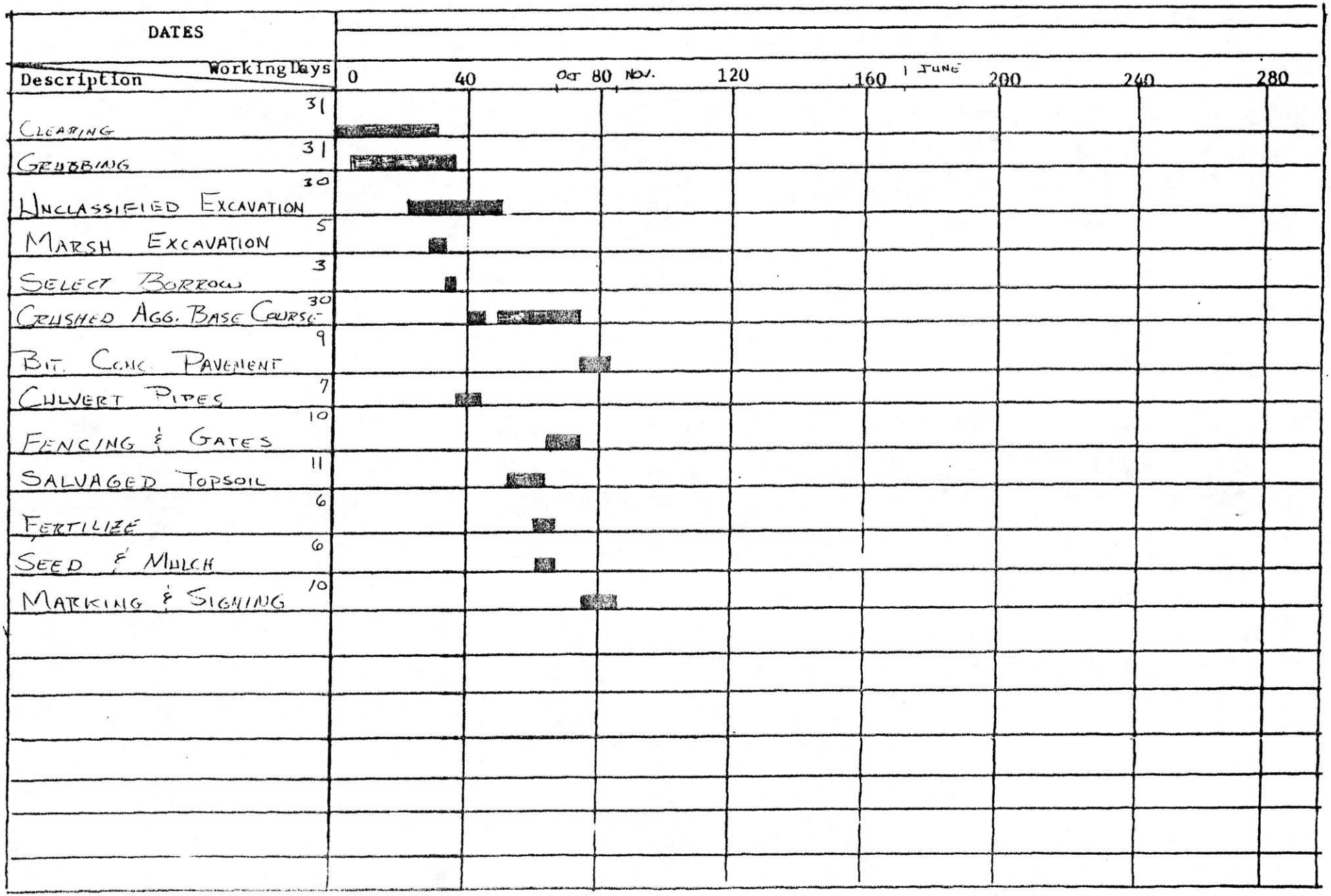
JULY			
Foreman	48 Manhours	EQUIPMENT MANHOURS	
Laborers	96 Manhours	Hydraulic Hoe	16
Operators	40 Manhours	Crane/with Pile Driver	8
	184	Loader/with Compactor	16
			40
AUGUST			
Foreman	152 Manhours	Hydraulic Hoe	152
Laborers	304 Manhours	Crane/with Pile Driver	152
Operators	456 Manhours	Loader/with Compactor	152
Carpenters	240 Manhours		456
Rodmen	96 Manhours		
Finishers	192 Manhours		
	1440		
SEPTEMBER			
Foreman	128 Manhours	Crane	128
Laborers	256 Manhours		
Operators	128 Manhours		
Carpenters	320 Manhours		
Rodmen	80 Manhours		
Finishers	80 Manhours		
	992		
OCTOBER			
Foreman	128 Manhours	Crane	128
Laborers	256 Manhours	Paver	8
Operators	136 Manhours		136
Carpenters	192 Manhours		
Rodmen	224 Manhours		
Finishers	176 Manhours		
	1112		
NOVEMBER			
Foreman	12 Manhours	Flatbed Truck	24
Laborers	24 Manhours		
Truck Driver	24 Manhours		
	60		

CONTRACT TIME ANALYSIS - 1

PROJECT Exhibition Access Rd, CONT.# NO. 21615, TYPE 2 LANE ALL-WEATHER RURAL ROAD

LOCATION Canyon West

DATE OF LETTING _____ PROBABLE START DATE JUNE 1 12 MONTH



CONTRACT TIME ANALYSIS - II

PROJECT Exxon Access Rd CONT. NO.

ITEM	CONTRACT QUANTITY	UNIT	AMT. WORK PER DAY	WORKING DAYS
Clearing	12.12	HA	0.40	31
Grubbing	12.12	HA	0.40	31
Unclassified Excavation	86000	CM	2850	30
Marsh Excavation	1800	CM	400	5
Select Borrow	2340	CM	1130	3
Crushed Agg. Base Course	56700	MT	1800	30
Bit. Conc Pavement	7216	MT	820	9
Culvert Pipes	196.6	LM	30	7
Fencing & Gates	2650	LM	290	10
Topsoil	76113	SM	7500	11
Fertilize, Seed & Mulch	2600	KG	450	6
Marking & Signing	14.1	KM	1.5	10

MONTH	DAYS Mon.	DAYS Tot.	Sat-Day	Sun-Day	Holi Day	Poss. Wk. Days	Prob. Wk. Days Month	Prob. Wk. Days Total	
June 83	30	30	4	4	0	22	80%	17.6 (18)	18
July	31	61	5	5	1	20	85%	17.0 (17)	35
Aug	31	92	4	4	0	23	85%	19.5 (19)	54
Sept	30	122	4	4	1	21	76%	15.9 (16)	70
Oct	31	153	5	5	0	21	77%	16.1 (16)	86
Nov	30	183	4	4	2	20	70%	14.0 (14)	100
Dec	31	214	5	4	1	21	58%	12.1 (12)	112
Jan	31	245	4	5	1	21	58%	12.1 (12)	124
Feb	28	273	4	4	0	20	43%	8.6 (8)	132
Mar	31	304	4	4	0	23	58%	13.3 (12)	144
Apr	30	334	5	5	0	20	58%	11.6 (12)	156
May	31	365	4	4	1	22	80%	17.6 (16)	172

REMARKS:

TOTAL CONTRACT TIME: 360 CAL. DAYS

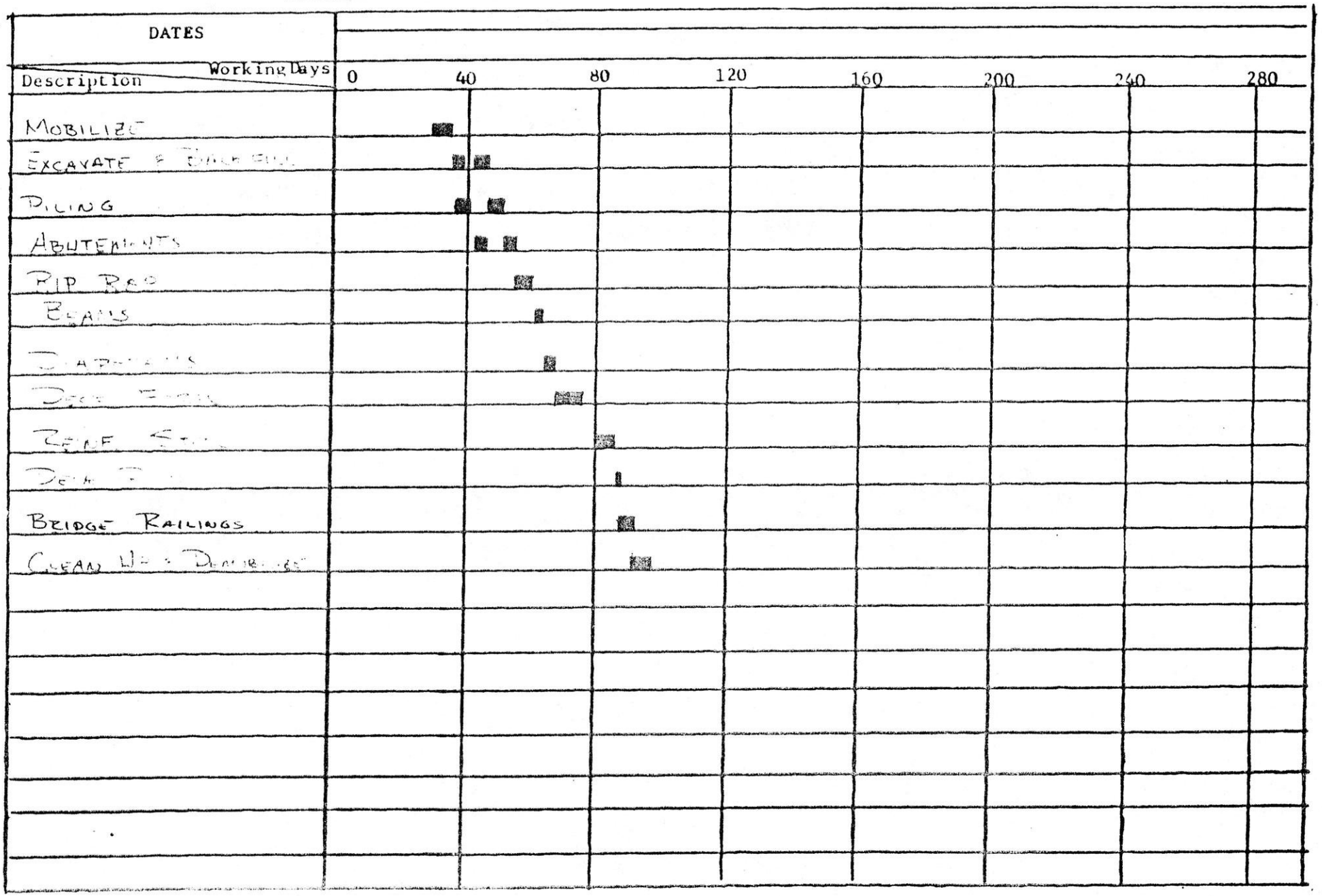
PREPARED BY: [signature] 7-24 1982

CONTRACT TIME ANALYSIS - I

PROJECT [illegible] Creek Bridge, CONT. NO. _____, TYPE Bridge Const

LOCATION _____

DATE OF LETTING _____ PROBABLE START DATE June 1, 12 Month



CONTRACT TIME ANALYSIS - II

PROJECT Swamp Creek Bridge CONT. NO.

ITEM	CONTRACT QUANTITY	UNIT	AMT. WORK PER DAY	WORKING DAYS
Mobilize				5
Excavate & Backfill				7
Piling				10
Abutements				6
Rip Rap				5
Beam Placement				2
Diaphrams				3
Deck Form				7
Set Reinf. Steel				5
Pour Deck				1
Form & Pour Parapets				4
Clean Up & Demobilize				5
				60

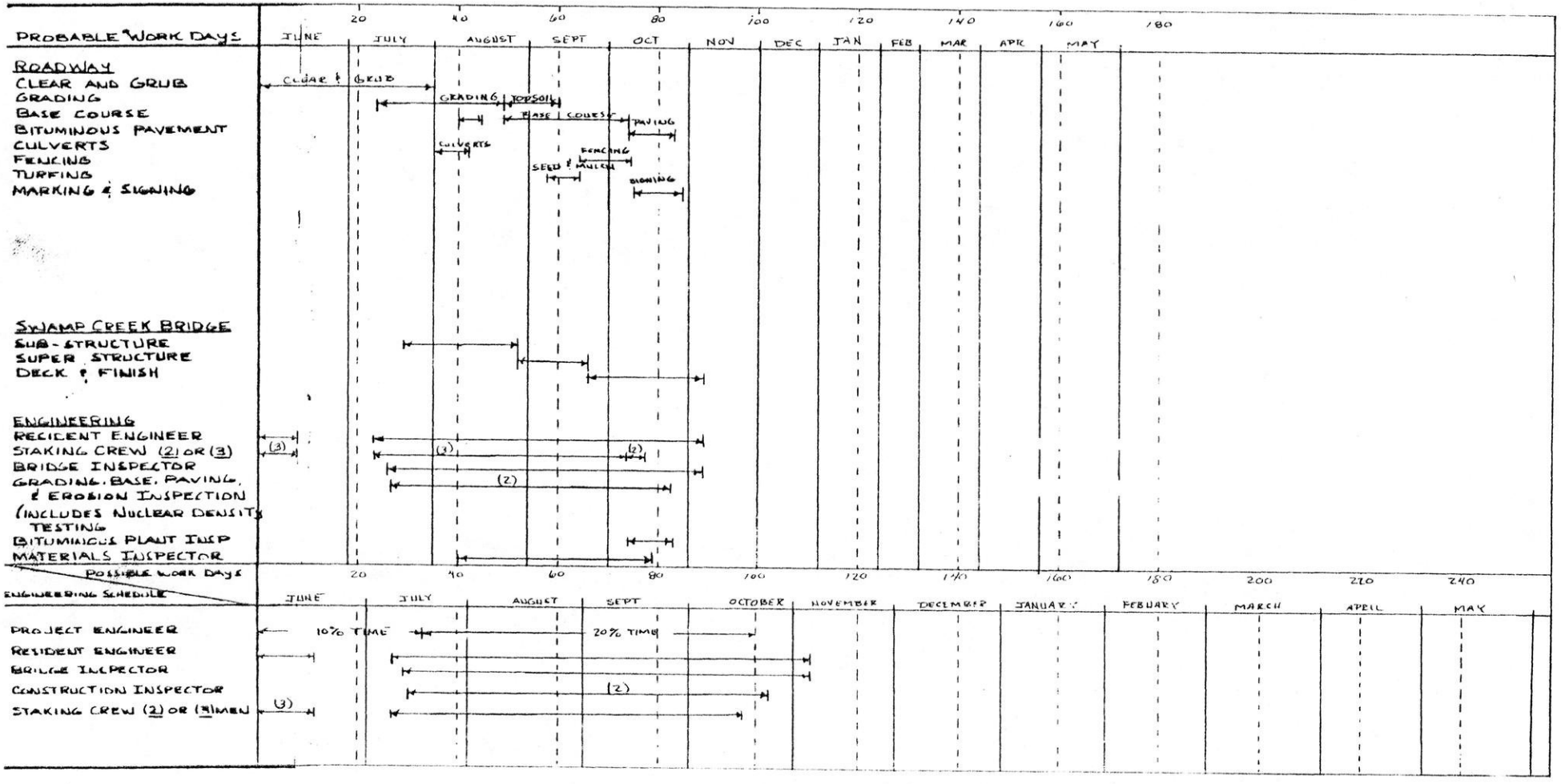
MONTH	DAYS Mon.	DAYS Tot.	Sat-Day	Sun-Day	Holi Day	Poss. Wk. Days	Prob. Wk. Days Month	Prob. Wk. Days Total	
June 83									18
July									35
Aug									54
Sept									70
Oct									86
Nov									100
Dec									112
Jan									124
Fer									132
Mar									144
Apr									156
May									172

SAME AS JUNE 12 MONTH START

REMARKS:

TOTAL CONTRACT TIME: _____ CAL. DAYS

PREPARED BY: _____, _____ 19____


PROBABLE WORK DAYS
20
40
60
80
100
120
140
160
180
JUNE
JULY
AUGUST
SEPT
OCT
NOV
DEC
JAN
FEB
MAR
APR
MAY
ROADWAY
CLEAR AND GRUB
GRADING
BASE COURSE
BITUMINOUS PAVEMENT
CULVERTS
FENCING
TURFING
MARKING & SIGNING
CLEAR & GRUB
GRADING
TOPSOIL
BASE COURSE
PAVING
CULVERTS
FENCING
SEED & MULCH
SIGNING
SWAMP CREEK BRIDGE
SUB-STRUCTURE
SUPER STRUCTURE
DECK & FINISH
ENGINEERING
RESIDENT ENGINEER
STAKING CREW (2) OR (3)
BRIDGE INSPECTOR
GRADING, BASE, PAVING, & EROSION INSPECTION
(INCLUDES NUCLEAR DENSITY TESTING
BITUMINOUS PLANT INSP
MATERIALS INSPECTOR
(3)
(2)
POSSIBLE WORK DAYS
ENGINEERING SCHEDULE
20
40
60
80
100
120
140
160
180
200
220
240
JUNE
JULY
AUGUST
SEPT
OCTOBER
NOVEMBER
DECEMBER
JANUARY
FEBUARY
MARCH
APRIL
MAY
PROJECT ENGINEER
RESIDENT ENGINEER
BRIDGE INSPECTOR
CONSTRUCTION INSPECTOR
STAKING CREW (2) OR (3)MEN
10% TIME
20% TIME
(3)
(2)

EXXON ACCESS ROAD

MANPOWER/EQUIPMENT REQUIREMENTS ESTIMATE

JANUARY - 18 MONTH SCHEDULE

There are several advantages and important considerations which do occur if we were to utilize an 18 month project schedule. We did assume for planning purposes a schedule of 18 "construction months" which has a total construction time of greater than 18 months.

By going to a schedule of 18 "construction months", henceforth referred to as the 18 month schedule, the project does lend itself to the concept of staged construction. The grading occurring during year 1 and the paving during year 2. For the purposes of this project we shall include the base course as part of the first years work. Leaving only the bituminous paving and shouldering for year 2. The bituminous paving would be done during the "hot" summer months of June, July and August.

Another advantage will be the additional compaction of the base course that traffic would apply. This would increase the strength of the pavement section.

By increasing the amount of time available the grading of the project can then be scheduled to occur during "drier" summer months. This would aid in the reduction of siltation and erosion from storm runoff. Erosion control per se would be easier to maintain and less costly for the project. Environmentally the longer schedule reduces the peak amount of construction noise and dust pollution.

In addition, the 18 month schedule facilitates the construction of the Swamp Creek bridge. Because of the remote location, the bridge construction must be closely coordinated with the grading effort to allow for the delivery of materials to the project site.

Economically, the longer schedule reduces the total amount of equipment and manpower required during the summer months that would be necessitated if a shorter schedule is used. The economic impact of supporting a smaller workforce would be easier for the surrounding communities when the project is extended over a longer time period.

8/18/82

The positive effects of low temperature during the first three months of the year will enable the clearing of the wetland areas, as this may be the only time these areas will be accessible for the logging vehicles to perform their work.

Cold weather also enables the marsh excavation and backfill without damage and runoff to the stream.

The firm ground situation will enable a better placement of the granular material backfill for the marsh excavation.

EXXON ACCESS ROAD

MANPOWER/EQUIPMENT REQUIREMENTS ESTIMATE

JANUARY - 18 MONTH SCHEDULE

January		EQUIPMENT	MANHOURS
Foreman	48 Manhours	Logging Truck	96
Laborer	192 Manhours	Skidder	96
Truck Driver	96 Manhours		192
Operator	96 Manhours		
	432		

February			
Foreman	32 Manhours	Logging Truck	64
Laborer	128 Manhours	Skidder	64
Truck Driver	64 Manhours		128
Operator	64 Manhours		
	288		

March			
Foreman	48 Manhours	Logging Truck	88
Laborer	232 Manhours	Skidder	88
Truck Driver	88 Manhours	Hydraulic Hoe	56
Operator	200 Manhours	Dozer	56
	568		288

April			
Foreman	48 Manhours	Dozer	96
Laborer	96 Manhours	Hydraulic Hoe	96
Operator	192 Manhours		192
	336		

May			
Foreman	64 Manhours	3 - Dozers	152
Laborer	136 Manhours	6 - 24 C.Y. Scrapers	96
Truck Driver	48 Manhours	Hydraulic Hoe	120
Operator	416 Manhours	Grader	16
	664	Water Truck	16
		2 - Vibratory Rollers	32
		2 - Lowbed Tractor Trailers	32
			464

June			
Foreman	144 Manhours	2 - Dozers	288
Laborer	480 Manhours	6 - 24 C.Y. Scrapers	864
Truck Driver	600 Manhours	Grader	144
Operator	1720 Manhours	Water Truck	144
	2944	2 - Vibratory Rollers	288
		Flatbed Truck	56
		Hydraulic Hoe	56
		10 - 12 C.Y. Trucks	400
		Crushing Plant	40
			2280

July			
Foreman	136 Manhours	2 - Dozers	208
Laborer	208 Manhours	6 - 24 C.Y. Scrapers	480
Truck Driver	320 Manhours	Grader	80
Operator	976 Manhours	Water Truck	80
	1640	2 - Vibratory Rollers	160
		Loader	48
		5 - 12 C.Y. Trucks	240
			1296

August			
Foreman	114 Manhours	Loader	40
Laborer	360 Manhours	10 -12 C.Y. Trucks	840
Truck Drive	920 Manhours	Grader	80
Operator	440 Manhours	Water Truck	80
	1834	2 - Vibratory Rollers	160
		Crushing Plant	80
			1280

September			
Foreman	128 Manhours	Crushing Plant	128
Laborer	376 Manhours	10 - 12 C.Y. Trucks	1280
Truck Driver	1320 Manhours	Grader	128
Operator	640 Manhours	Water Truck	128
	2464	2 - Vibratory Rollers	256
		Flatbed Trucks	40
			1960

October			
Foreman	48 Manhours	Flatbed Truck	48
Laborer	48 Manhours	Mulcher	48
Truck Driver	96 Manhours	3 - Utility Tractors	144
Operator	192 Manhours		240
	384		

July

Foreman	112 Manhours	Paver	72
Laborer	656 Manhours	10 - 12 C.Y. Trucks	720
Truck Driver	880 Manhours	3 - Rollers	216
Operator	488 Manhours	Post Driver	80
	2136	Utility Tractor	80
		Flatbed Truck	80
		2 - Paint Trucks	80
			1328

SWAMP CREEK BRIDGE

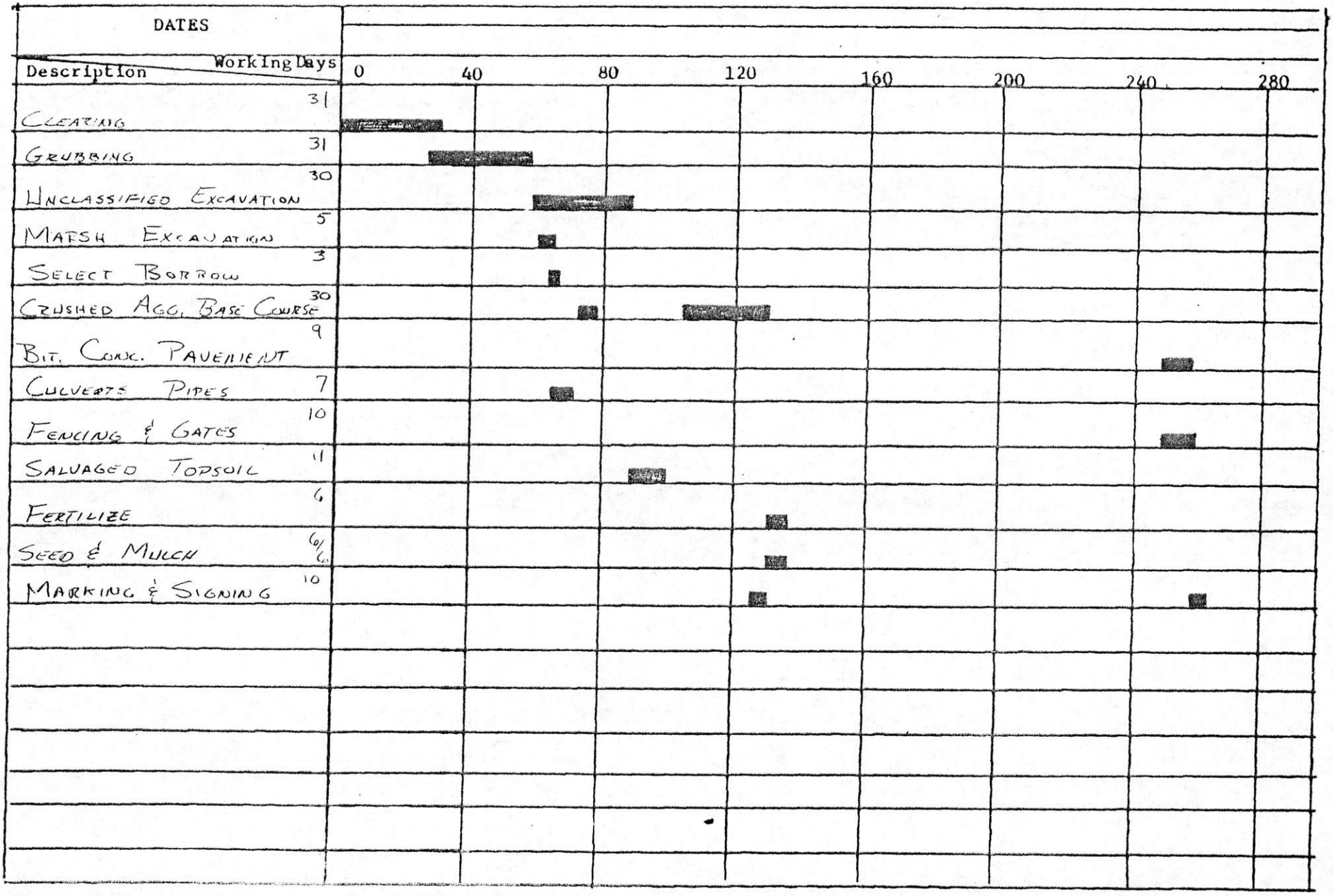
MANPOWER/EQUIPMENT REQUIREMENTS ESTIMATES

JANUARY - 18 MONTH SCHEDULE

May			
Foreman	16 Manhours	Hydraulic Hoe	16
Laborers	32 Manhours	Crane w/Pile Driver	16
Operators	32 Manhours		32
	80		
June			
Foreman	144 Manhours	Hydraulic Hoe	144
Laborers	288 Manhours	Crane w/Pile Driver	144
Operators	432 Manhours	Loader w/Compactor	144
Carpenters	96 Manhours		432
Rodmen	96 Manhours		
Finishers	64 Manhours		
	1120		
July			
Foreman	144 Manhours	Crane	136
Laborers	288 Manhours		
Operators	136 Manhours		
Carpenters	320 Manhours		
Rodmen	80 Manhours		
Finishers	80 Manhours		
	1048		
August			
Foreman	152 Manhours	Crane	152
Laborers	304 Manhours	Paver	8
Operators	160 Manhours		160
Carpenters	224 Manhours		
Rodmen	160 Manhours		
Finishers	208 Manhours		
	1208		
September			
Foreman	24 Manhours	Crane	16
Laborers	48 Manhours		
Operators	16 Manhours		
	88		

CONTRACT TIME ANALYSIS - I

PROJECT Ennco Access Rd., CONT. NO. 21615, TYPE 2 LANE ALL WEATHER RURAL ROAD
LOCATION CRANBROOK W.S.
DATE OF LETTING _____ PROBABLE START DATE JULY 1 18 MONTH



CONTRACT TIME ANALYSIS - II

PROJECT Exxon Access Rd. CONT. NO.

ITEM	CONTRACT QUANTITY	UNIT	AMT. WORK PER DAY	WORKING DAYS
CLEARING	12.12	HA	0.40	31
GRUBBING	12.12	HA	0.40	31
UNCLASSIFIED EXCAVATION	86000	CM	2850	30
MARSH EXCAVATION	1800	CM	400	5
SELECT BORROW	2340	CM	1130	3
CRUSHED AGG BASE COURSE	50700	MT	1800	30
BIT. CONC PAVEMENT	7216	MT	820	9
CULVERT PIPES	196.6	LM	30	7
FENCING & GATES	2650	LM	290	10
TOPSOIL	76113	SM	7500	11
FERTILIZE, SEED & MULCH	2600	KG	450	6
MARKING & SIGNING.	14.1	KM	1.5	10

MONTH	DAYS Mon.	DAYS Tot.	Sat-Day	Sun-Day	Holi Day	Poss. Wk. Days	Prob. Wk. Days Month	Prob. Wk. Days Total	
JAN	31	31	5	5	0	21	58%	12.1 (12)	12
FEB	28	59	4	4	0	20	43%	8.6 (8)	20
MAR	31	90	4	4	0	23	58%	13.3 (12)	32
APR	30	120	5	4	0	21	58%	12.1 (12)	44
MAY	31	151	4	5	1	21	80%	16.8 (16)	60
JUNE	30	181	4	4	0	22	80%	17.6 (18)	78
JULY	31	212	5	5	1	20	85%	17.0 (17)	95
AUG	31	243	4	4	0	23	85%	19.5 (19)	114
SEPT	30	273	4	4	1	21	76%	15.9 (16)	130
OCT	31	304	5	5	0	21	77%	16.1 (16)	146
NOV	30	334	4	4	2	20	70%	14.0 (14)	160
DEC	31	365	5	4	1	21	58%	12.1 (12)	172
JAN	31	396	4	5	1	21	58%	12.1 (12)	184
FEB	28	424	4	4	0	20	43%	8.6 (8)	192
MAR	31	455	4	4	0	23	58%	13.3 (12)	204
APR	30	485	5	5	0	20	58%	11.6 (12)	216
MAY	31	516	4	4	1	22	80%	17.6 (16)	232
JUNE	30	546	4	4	0	22	80%	17.6 (16)	248

REMARKS:

TOTAL CONTRACT TIME: 577 CAL. DAYS

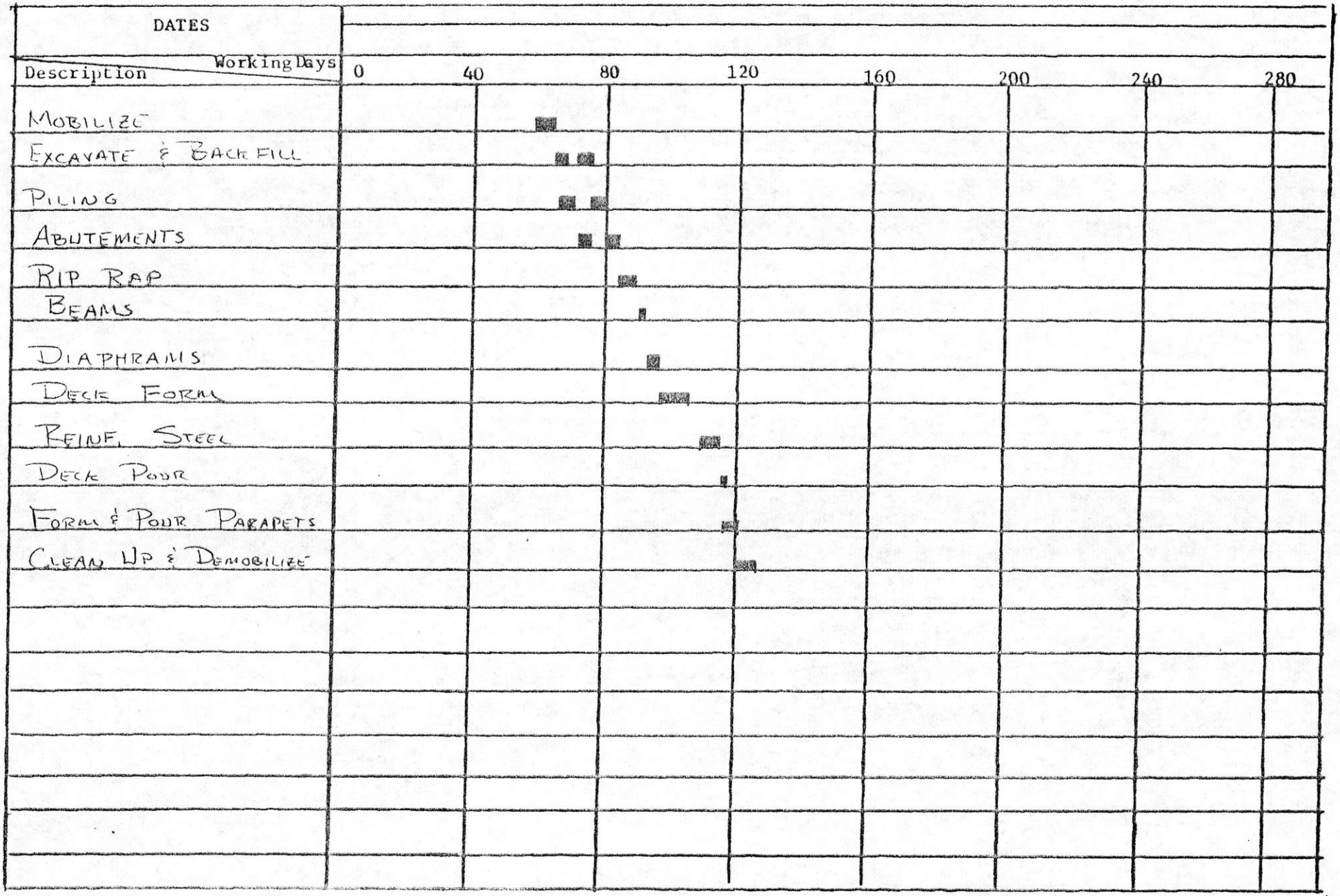
PREPARED BY: J. Lawrence 1982

CONTRACT TIME ANALYSIS - 1

PROJECT SWAMP CREEK BRIDGE, CONT. NO. _____, TYPE BRIDGE CONST.

LOCATION _____

DATE OF LETTING _____ PROBABLE START DATE JAN 18 MONTH



CONTRACT TIME ANALYSIS - II

PROJECT Swamp Creek Bridge CONT. NO.

ITEM	CONTRACT QUANTITY	UNIT	AMT. WORK PER DAY	WORKING DAYS
Mobilize				5
Excavate & Backfill				7
Piling				10
Abutements				6
Rip Rap				5
Beam Placement				2
Diaphrams				3
Deck Form				7
Set Reinf Steel				5
Pour Deck				1
Form & Pour Parapets				4
Clean up & Demobilize				5
				60

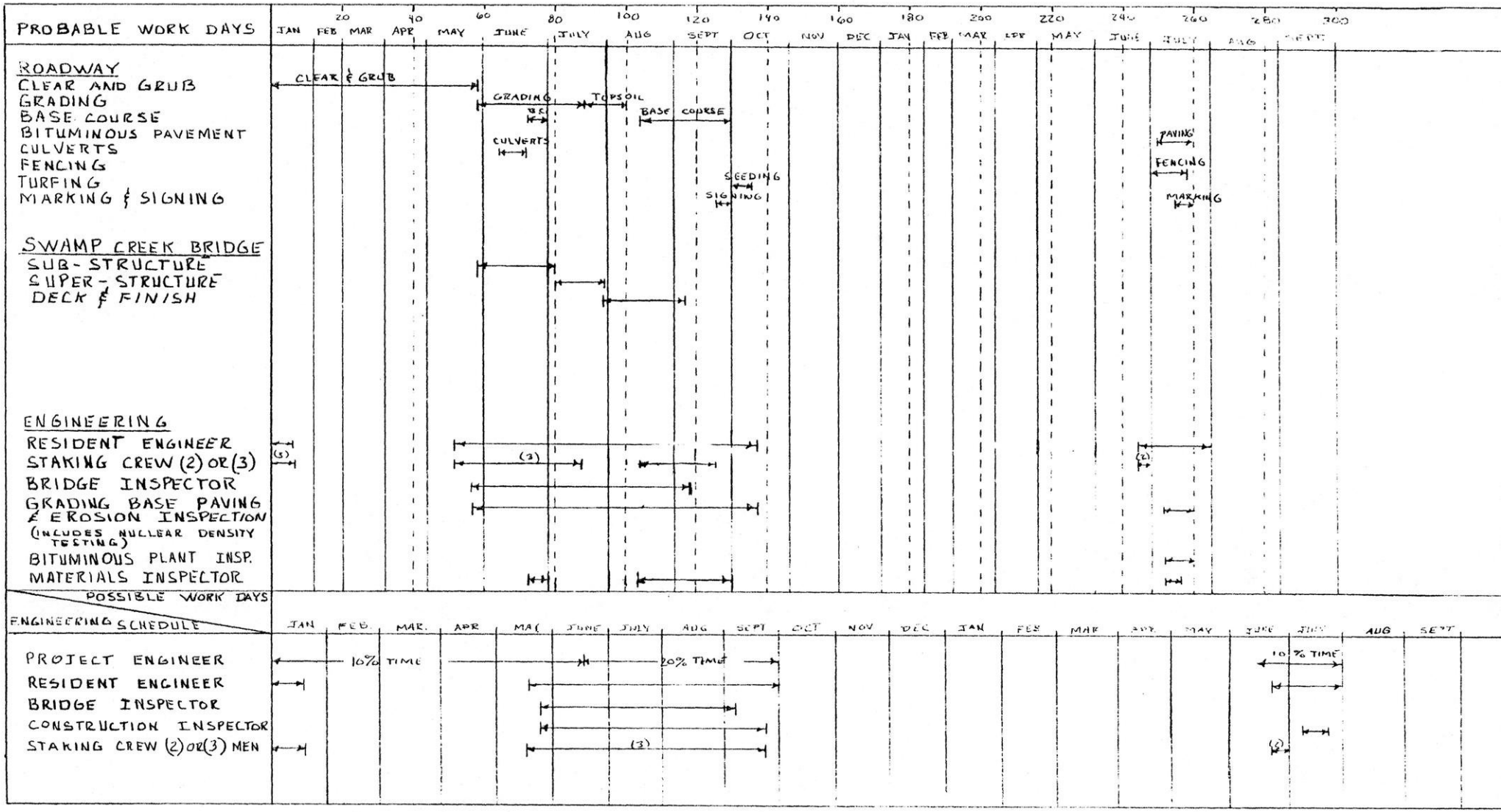
MONTH	DAYS Mon.	DAYS Tot.	Sat-Day	Sun-Day	Holi Day	Poss. Wk. Days	Prob. Wk. Days Month	Prob. Wk. Days Total	
JAN									12
FEB									20
MAR									32
APR									44
MAY									60
JUNE									78
JULY									95
AUG									114
SEPT									130
OCT									146
NOV									160
DEC									172
JAN									184
FEB									192
MAR									204
APR									216
MAY									232
JUNE									248

SAME AS JAN. 1 18 MONTH START

REMARKS:

TOTAL CONTRACT TIME: _____ CAL. DAYS

PREPARED BY: _____, 19____


PROBABLE WORK DAYS
20
40
60
80
100
120
140
160
180
200
220
240
260
280
300
JAN
FEB
MAR
APR
MAY
JUNE
JULY
AUG
SEPT
OCT
NOV
DEC
JAN
FEB
MAR
APR
MAY
JUNE
JULY
AUG
SEPT
ROADWAY
CLEAR AND GRUB
GRADING
BASE COURSE
BITUMINOUS PAVEMENT
CULVERTS
FENCING
TURFING
MARKING & SIGNING
CLEAR & GRUB
GRADING
TOPSOIL
B.C.
BASE COURSE
CULVERTS
PAVING
FENCING
SEEDING
SIGNING
MARKING
SWAMP CREEK BRIDGE
SUB-STRUCTURE
SUPER-STRUCTURE
DECK & FINISH
ENGINEERING
RESIDENT ENGINEER
STAKING CREW (2) OR (3)
BRIDGE INSPECTOR
GRADING BASE PAVING & EROSION INSPECTION (INCLUDES NUCLEAR DENSITY TESTING)
BITUMINOUS PLANT INSP.
MATERIALS INSPECTOR
(3)
(2)
POSSIBLE WORK DAYS
ENGINEERING SCHEDULE
JAN
FEB
MAR.
APR
MAY
JUNE
JULY
AUG
SEPT
OCT
NOV
DEC
JAN
FEB
MAR
APR
MAY
JUNE
JULY
AUG
SEPT
PROJECT ENGINEER
RESIDENT ENGINEER
BRIDGE INSPECTOR
CONSTRUCTION INSPECTOR
STAKING CREW (2) OR (3) MEN
10% TIME
20% TIME
10% TIME
(3)
(2)

CHAPTER 9

REDUCED SIZE ENGINEERING DRAWINGS

(ISSUED SEPARATELY)

CHAPTER 10

SUMMARY AND RECOMMENDATIONS

CHAPTER 10 SUMMARY AND RECOMMENDATIONS

The preceding chapters of this report have briefly summarized specific portions of the preliminary engineering design for the mine/mill access road. This chapter will summarize additional information that was generated as a result of the preliminary design, or was used in the preparation of the plans and report.

1) Consideration of Alignment Shift Vicinity Swamp Creek:

With reference to the transmittal of July 19, 1982 with regards to structure sizing, and Chapter 5 and Appendix 5 of this report, a line shift was discussed to reduce the size and cost of the Swamp Creek Bridge. The existing location of the Swamp Creek crossing was selected during initial preliminary engineering studies and is on that portion of the Alternate #2 alignment which remained the same. Meandering of the river (at this location) causes the alignment to cross Swamp Creek at one of its widest points.

During the structure sizing it was noted that a shift to the west of approximately 15 meters (50 ft.) would considerably reduce the span required which would reflect in a lower cost for the structure. By reducing the span required, smaller prestressed girders could be utilized and further material would be saved because of the shorter deck. Decreasing the amount of material and/or size of members would also decrease the amount of time required to complete the structure. This factor should be considered due to the remote location of the crossing site.

Based on 1981 dollars for the average cost per square foot of prestressed girder bridges of $30.28/sf., a reduction in span from 38.5 m (126 ft.) to approximately 24.5 m (80 ft.) or approximately 2000 s.f. could save @ $61,000.00. By deducting the additional costs for engineering and soil testing (from Chapter 7) of @ $8,000.00 the net savings could be approximately $53,000.00.

Shown on the attached diagram is the line shift discussed. The PI #3 at Sta. 2309.123 would remain in its existing location. PI #4 at Sta. 2659.606 would then be shifted westerly so that the line from PI #4 to PI #4A, Sta. 3138.134, would be parallel to the land section line. This line would be parallel by approximately 45 m (150 ft.) to the section line. The old alignment from PI #4A to the mine/mill site was parallel to the section line by @ 45 m or 150 ft. Curves 3, 4, and 4A would still have a degree of curvature of D = 0°-30'. The crossing of Swamp Creek will still be on a tangent portion of the alignment out approximately 15.5 m (50 ft.) west of the existing crossing site. As noted there is a considerably narrower channel to the west of existing site. By shifting the alignment it would require additional field survey work from approximately Sta. 2200 to 3240 or 1040 meters.

2) Traffic Analysis: (Appendix 7)
This section was prepared from data available and used in the design of the S.T.H. 55 intersection.

3) Flexible Pavement Design: (Appendix 8)
By using the Wisconsin D.O.T. design procedures, the following pavement section was determined:

3"	Bituminous Concrete Pavement
12"	Crushed Aggregate Base Course
15"	Total Thickness

It is recommended that the surface course be placed in two layers for staged construction.

A 2" binder course of Gradation #2 (3/4") shall be placed initially over the 12" of crushed aggregate base course.

It is further recommended that the crushed aggregate base course be placed in two layers with the lower 6" meeting Gradation # 1 (1½") and the upper 6" lift meet Gradation # 2 (3/4").

At such time that the mine/mill complex is completed, the surface irregularities of the first layer should be corrected and a 1" minimum surface layer of Gradation # 3 (5/8") should be placed with the shoulder aggregates meeting Gradation # 3 (5/8") placed adjacent to the live traffic lanes.

4) Preliminary Plans: (Chapter 9)

The roadway and structure plans are presented as prints from pencil on mylar base. The roadway and structure plans may be to true scale in most instances. Many typical sections, special details, and enlargements may be at a variable scale or to no scale.

In preparing the estimate of quantities, quantity computation procedures were used that are normally applied to that item. Several factors used in preparing the estimate of quantities are based on engineering experience and/or D.O.T. specifications which are briefly summarized as follows:

For earthwork computations, unclassified excavation used in fill, a 30% shrinkage factor was applied in determining the appropriate earth volumes.

The mass diagram of earthwork volumes at the proposed gradeline is in a balanced condition from S.T.H. "55" to Swamp Creek and from Swamp Creek to the plant site mine/mill interface.

The quantity of marsh excavation as shown in the estimate of quantities is located in the vicinity of Swamp Creek between Stations 2820 to 2920.

Crushed aggregate base course was computed on the basis of 2.6 MT/Cubic Meter (2.2 Tons/C.Y.) compacted in place.

Bituminous concrete pavement was estimated on the basis of 20.9 KG/SM/CM (117 Lbs/SY/IN) and converted to metric tons (Tons).

Fertilizer and seed, based on Wisconsin D.O.T. application and sowing rates from their specifications, were estimated at 0.028 KG/SM.

5) Methods of Measurement:

The practice of unit price and measurement of quantity actually in place has been used in the computation of pay estimate quantities.

Although this sometimes requires a small amount of additional resident engineering cost, the resulting control of the; quantity, location, and proper placement of the material, many times more than offsets this small additional engineering cost.

6) Timing of Construction: (Chapter 8)

From Chapter 8, three project schedules were considered. Noting the discussion of the advantages of the January 1, 18 month schedule and after review the 18 month schedule could be the most suitable for this project.

The positive effects of low temperature during the first three months of the year would enable the clearing of woods and any wetland area. This normally is the time these areas would be accessible for the logging vehicles to perform their work.

By maintaining the construction schedule as presented, each item would be performed in its proper season and a very high quality product should result.

7) Methods of Construction:

Care shall be taken to minimize erosion and any resulting siltation of the trout streams in the project area. The utilization of runoff containment ponds and settling basins constructed during the grubbing operation to collect the surface runoff and stabilize it prior to release to the streams will for the most part accomplish this.

The marsh excavation and topsoil stripping should be scheduled and accomplished in a manner to control and direct the runoff into the settling basins.

Throughout the project the contractor must be aware of the penalties for not adhering to strict erosion control from the start to the finish.

8) Materials:

All materials proposed to be used on this project should be source sampled, laboratory tested and reports submitted to the Final Design Engineer to use in computations where necessary.

The use of commercially available materials may be the most economical, if the plant production rates and delivery times are acceptable, rather than the move in and set up of portable plants for relatively small quantities.

Commercial plants for supplying redi-mix concrete, bituminous concrete pavement mix and crushed aggregate base course should be reviewed for compliance with the State of Wisconsin specifications and A.S.T.M. standard methods.

A source sample of these resulting products should be obtained and submitted to a recognized certified testing laboratory to verify adequacy with as much lead time as possible prior to anticipated construction.

9) Plans and Specifications:

Where it has been stated that the ultimate acceptance of the mine/mill access road and it's possible future extension may be by the state, county, or local authorities, a review of the plans and specifications by the Wisconsin Department of Transportation Division of Highways District #7 in Rhinelander should be considered.

The timing of this review and comments should be prior to the preparation of final plans and specifications.

This decision would be an Exxon policy decision.

N = 106,467
E = 153.143

225.58

N 0°-10'-24" W 25

317.143

N 0°-10'-24" W

START
LINE SHIFT

PC

2288.622

37,734.845
693,863.050

③

R = 3492.758
D = 0°-30'-00"
Δ = 0°-40'-22"
L = 41.013
T = 20.507
C = 41.012
M = 0.060
E = 0.060

2329.635

PT

37,734.2332
693,794.2974
E 1/4 COR
Sec. 24
N 89°-29'-25" E
225.5758'

S 59°-08'-12" E
OLD ALIGNMENT
2525.111

242.486

N 0°-50'-46" W

PC

EXISTING
ALIGNMENT

2576.719

NEW CURVE
D = 0°-30'
T = 140.50m
I = 4° 36' 25"
37384.404
693845.188

④ 37,384.404
693,868.225

(122,652.000
2,276,466.000)

R = 3492.758
D = 0°-30'-00"
Δ = 20°-43'-08"
L = 165.744
T = 82.887
C = 165.728
M = 0.983
E = 0.983

2742.463

PT

SWAMP
CREEK

N 0°-50'-46" W 2638.1826

289.313

3031.776

36,928.659
693,853.326

74.0449'

36,930.2012
693,806.1706
See. Cue

154.74

36,906.102
693,852.588
④A

150'

R = 3492.758
D = 0°-30'-00"
Δ = 3°-29'-18"
L = 22.649
T = 106.358
C = 22.616
M = 1.618
E = 1.619

END
LINE SHIFT

N 0°-58'-W
5930

3244.425