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ESTIMATE OF CAPITAL & OPERATING COST
FOR PELLETIZING & ELECTRIC REDUCTION
SMELTER TO PRODUCE 540,000
METRIC TONS OF PIG IRON PER YEAR
JULIAN LAKE, LABRADOR
KILBORN ENGINEERING FEB. 26, 1962

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KILBORN ENGINEERING LTD.

CONSULTING ENGINEERS

K. M. DEWAR, B.Sc., P. ENG., ONT. AND QUE.
PRESIDENT

February 26, 1962.

PLEASE ADDRESS ALL CORRESPONDENCE
TO THE COMPANY AND NOT INDIVIDUALS

B. S. CROCKER, M.A.Sc., P. ENG.
VICE-PRESIDENT

J. T. DEW, B.A.Sc., P. ENG.
GENERAL MANAGER

36 PARK LAWN ROAD
TORONTO 18, ONT.
CLIFFORD 9-9607

N. FARRAR, B.Sc., P. ENG., ONT. AND QUE.
CHIEF MECHANICAL ENG.

REF: FILE NO.

Mr. W. H. Roxburgh,
Canadian Javelin Ltd.,
680 - 5th Avenue,
New York, N.Y.

Dear Mr. Roxburgh:

We enclose herewith 3 copies of our Preliminary Estimate of Capital and Operating Costs, dated Feb. 13, 1962, for a Smelter Plant to produce 540,000 Metric Tons of Pig Iron per year at your Julian Lake, Labrador, property.

All major equipment costs incorporated in this report are as obtained from Professor H. U. Ross, equipment suppliers or supplied by yourself.

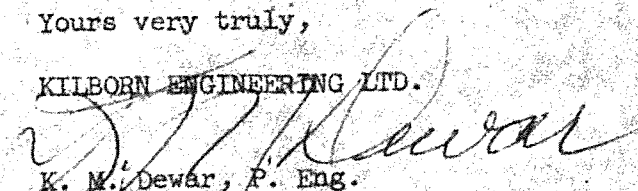
The labour costs used have been based on those derived from the collective agreement the Iron Ore Company of Canada have with the United Steel Workers of America.

Cost of required supplies have been based on laid down prices at Seven Islands with a nominal freight allowance from Seven Islands to the mine, etc.

May we express our sincere appreciation of your request to prepare this report, which we trust provides you with all the necessary information you require at this time. However, not having visited the site, we ask you to consider this report as being of a preliminary nature.

Yours very truly,

KILBORN ENGINEERING LTD.


K. M. Dewar, P. Eng.
President.

KMD/ml.

Encls.

CANADIAN JAVELIN LTD.

PRELIMINARY ESTIMATED CAPITAL & OPERATING COST

FOR

A PELLETIZING & ELECTRIC REDUCTION SMELTER PLANT

TO PRODUCE

540,000 METRIC TONS OF PIG IRON PER YEAR

AT

JULIAN LAKE, LABRADOR

Prepared by:

Kilborn Engineering Ltd.,
Consulting Engineers,
36 Park Lawn Road,
Toronto 18, Ont.

Dated: February 13, 1962.

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CANADIAN JAVELIN LTD.
PRELIMINARY ESTIMATED CAPITAL & OPERATING COST
FOR
A PELLETTIZING & ELECTRIC REDUCTION SMELTER PLANT
TO PRODUCE
540,000 METRIC TONS OF PIG IRON PER YEAR

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CANADIAN JAVELIN LTD.

PRELIMINARY ESTIMATED CAPITAL & OPERATING COSTS

FOR

A PELLETIZING & ELECTRIC REDUCTION SMELTER PLANT

TO PRODUCE

540,000 METRIC TONS OF PIG IRON PER YEAR

GENERAL

An electric smelter plant capable of producing 540,000 metric tons of pig iron per year will require approx. 840,000 long tons of 64.5% iron concentrates as well as coal, coke, limestone, cement, fluxes, etc.

It is assumed that this plant will be located reasonably close to the Concentrator plant in order that concentrates may be handled economically, and that all other raw materials will have to be transported to the site by R.R. cars and/or by trucks.

This will require the installation of adequate storage and handling facilities at the plant.

The concentrates as received, will have to be further processed in order to obtain a satisfactory pelletizing product.

Some of the other raw materials will also require treatment before they can be satisfactorily utilized.

Consequently, we have incorporated a regrind and raw material preparation section in the overall plant requirements.

Preliminary flow sheets and capital cost estimates are in general as covered in Kilborn Engineering Ltd. report to Professor H. U. Ross, dated Nov. 17, 1961.

CANADIAN JAVELIN LTD.

GENERAL DATA FROM WHICH
PRELIMINARY FLOW SHEETS & CAPITAL COST ESTIMATES
HAVE BEEN COMPILED

Production to be 540,000 metric tons per year of Pig Iron.

350 operating days per year - approx. 1540 metric tons per day (3 furnaces).

Power requirements - 1200 K.W. hours per short ton of pig iron.

Furnace capacity - 30,000 K.W.

$$\frac{30,000 \times 24}{1200} = 600 \text{ short tons per day.}$$

Assume 2% waste and losses = 555 metric tons per day production.

Thus it will require 3 furnaces to produce required production.

Requirements per metric ton of pig iron:

- 3500# of 64.5 iron concentrates
- 750# of coal
- 230# of cement
- 465# of limestone
- 335# of coke

Fluxes required: Alumina approx. 55#
 Flourspar and/or silica depending
 on silica in concentrates, etc.
 approx. 250#

The iron concentrates will be obtained from the concentrate plant at -35 mesh and reground to 70% -200 mesh. Surge capacity at regrind plant is 4500 tons. The product will be pumped to filters over surge bins at furnaces.

Necessary coal will be received in R.R. gondolas, crushed and sized as required to 70% -200 mesh. Dry surge capacity at regrind plant approx. 350 tons. Also supplied is a 20,000 ton outside storage or approx. 4 weeks emergency supply. The product will be pumped via air lift to bins at furnaces.

The limestone will be received by R.R. gondolas or trucks in lump form. This may be crushed and sized only or crushed and ground dry to 70% -200 mesh. Surge capacity at regrind plant approx. 4 weeks supply. Sized material to be transported to Smelter Bldg. by belt conveyor. Ground material to be air lifted to bins at furnace.

Coke may be received as lump coke or as coke breeze. If lump coke is used, it is crushed and sized and transported to Smelter Building by belt conveyor. If coke is received as coke breeze, it will be handled by air lift to storage silos, 6 - 22' x 60' units, capacity approx. 400 tons each or 2,400 tons, that is approx. 8 days supply. The coke breeze pumped via air lift to bins at furnaces.

Necessary cement is received in bulk in covered gondolas and air lifted to 2 - 22' x 60' storage silos, capacity approx. 1,000 tons each or 2,000 tons total, which is approx. 12 days supply. Cement is pumped from silos via air lift to bins at furnaces.

The heating boilers may be coal-fired, average requirements approx. 4 tons per day.

The thaw shed has a capacity of 8 cars.

The expected number of cars per day:	Coal	-	6
	Coke	-	3
	Limestone	-	4
	Cement	-	2

A part only of the above will have to be thawed and these only during winter operation.

Fluxes - Alumina, flourspar and/or silica will be supplied in powder or granular form, the assumption has been made that they can be handled from R.R. cars or trucks to surge storage or to furnace bins via air lift or conveyor belt.

The furnace bins are approx. 14' x 20' with conical bottom having approximately 3,000 cu.ft. capacity.

Weights assumed for various materials:

Concentrates	200#/cu.ft.	or	11 cu.ft./long ton
Cement	100#/cu.ft.	or	22 cu.ft./long ton
Coal	50#/cu.ft.	or	44 cu.ft./long ton
Coke	40#/cu.ft.	or	55 cu.ft./long ton
Limestone	100#/cu.ft.	or	22 cu.ft./long ton
Flourspar & Silica	100#/cu.ft.	or	22 cu.ft./long ton
Alumina	100#/cu.ft.	or	22 cu.ft./long ton

4.

CANADIAN JAVELIN LTD.

PRELIMINARY CAPITAL COST ESTIMATE
FOR
A PELLETIZING & SMELTER LAYOUT
TO PRODUCE
540,000 METRIC TONS OF PIG IRON PER YEAR

SUMMARY

1. <u>GRINDING & RAW MATERIAL PREPARATION</u>			
A. Building	\$ 414,000.00		
B. Equipment	<u>1,213,000.00</u>	\$1,627,000.00	
2. <u>THAW SHED & RAW MATERIAL STORAGE & HANDLING</u>			
A. Building - including silos	1,140,000.00		
B. Equipment	<u>731,000.00</u>	1,921,000.00	
3. <u>PELLETIZING & SMELTER BUILDING</u>			
A. Building	2,805,000.00		
B. Equipment	<u>11,136,000.00</u>	13,991,000.00	
4. <u>BOILER HOUSE</u>			
A. Building	40,000.00		
B. Equipment	<u>112,000.00</u>	152,000.00	
5. <u>SUBSTATION & POWER DISTRIBUTION</u>			
		750,000.00	
6. <u>ROADS & YARDS</u>			
		100,000.00	
7. <u>R. R. TRACKS</u>			
		180,000.00	
8. <u>WATER SUPPLY INCLUDING PUMP, PIPE LINES & WATER TANK</u>			
		<u>200,000.00</u>	
TOTAL			\$18,921,000.00
Overhead, Engineering & Design			<u>2,779,000.00</u>
			<u>\$21,700,000.00</u>
(See Page 5 for Explanation of Items Below)			
9. Sprinklers			
		100,000.00	
10. Subdivision at Wabush			
		<u>2,000,000.00</u>	
Total Items 9 & 10			<u>2,100,000.00</u>
TOTAL ESTIMATED PLANT AND SERVICE EXPENDITURES			<u>\$23,800,000.00</u>

Consideration of the following items is a matter of policy to be established by the client and could have considerable bearing on overall capital and indirect operating cost of the project.

9. SPRINKLERS

All surface structures covered under Smelter Layout are of a fire resistant type of construction and no sprinkler cost was included in the main estimate.

However, general experience shows that the reduction in fire insurance premiums for a sprinklered risk as against a non-sprinklered risk will pay for the cost of the sprinkler installation in from 2 to 5 years. The use of sprinklers in and about the furnace bay is not recommended.

Cost of sprinklers for balance of plant \$ 100,000.00

10. SUBDIVISION AT WABUSH

If the main living accommodation is constructed at Wabush, this will require a subdivision of at least 100 dwellings, which together with services, etc. would entail an expenditure of at least

2,000,000.00

The Total Cost of these Items is Estimated at

\$2,100,000.00

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CANADIAN JAVELIN LTD.

PRELIMINARY CAPITAL COST ESTIMATE

FOR

A PELLETIZING & SMELTER LAYOUT

TO PRODUCE

540,000 METRIC TONS OF PIG IRON PER YEAR

1. GRINDING & RAW MATERIAL PREPARATION BUILDING

A. Building

Excavation & preparation of site	\$ 6,000.00
Backfill	5,000.00
Concrete	80,000.00
Structural steel	170,000.00
Sidewalls	35,000.00
Robf Deck & Roofing	12,500.00
Doors & Windows	6,000.00
Plumbing, Heating & Ventilation	40,000.00
Lighting	10,000.00
Finishing & Misc.	12,000.00
Contingencies	<u>37,500.00</u>

Total for 'A' Building

\$414,000.00

B. Equipment

5 - Surge Bins 22' x 45' at \$10,000.00 each	50,000.00
3 - Concentrate Feeders	16,000.00
2 - Coal & Limestone Feeders	5,500.00
3 - 9' x 14' Ball Mills for concentrate complete with motors, lines & drives	420,000.00
1 - 7' x 11' Ball Mill for limestone complete	55,000.00
1 - Coal Mill	28,000.00
2 - 14' air classifiers	12,000.00
2 - 10' air classifiers	8,000.00
Krebs type cyclone	9,000.00
2 - Air handling systems for coal & limestone	50,000.00
Pumps & Pump Boxes	22,000.00
Pipes & Piping	35,000.00
1 - 25 ton service crane	32,000.00
Conveyors & Misc.	40,000.00
Electrical & controls	100,000.00
Installation	220,000.00
Contingencies	<u>110,500.00</u>

Total for 'B' Equipment

\$1,213,000.00

TOTAL FOR 'A' & 'B' BUILDINGS & EQUIPMENT

\$1,627,000.00

2. THAW SHED & RAW MATERIAL HANDLING

A.1 Building including Conveyor Galleries, Tunnels, etc.

Excavation & Preparation of site	13,000.00
Backfill	11,500.00
Concrete	290,000.00
Structure Steel	300,000.00
Sidewalls	40,000.00
Roof Deck & Roofing	16,000.00
Doors & Windows	6,500.00
Heating & Ventilation	35,000.00
Lighting	15,000.00
Finishing & Misc.	10,000.00
Contingencies	<u>73,000.00</u>

Total for 'A1' Building 810,000.00

A.2

2 Cement Silos 22' x 60'	60,000.00
8 Coke Silos 22' x 60'	240,000.00
Contingencies	<u>30,000.00</u>

Total for A.2 Silos 330,000.00

Total for 'A' Building 1,140,000.00

B. Equipment

Car Dump & shake out	50,000.00
Conveyors & Trippers	300,000.00
Gates & Chutes	60,000.00
Air pump system cars to silos 30 T/H	30,000.00
Air pump system silos, etc. to furnace bins	60,000.00
Electrical & Controls	50,000.00
Installation	160,000.00
Contingencies	<u>71,000.00</u>

Total for 'B' Equipment 781,000.00

TOTAL FOR 'A' & 'B' BUILDING & EQUIPMENT \$1,921,000.00

8. PELLETIZING & SMELTER BUILDINGA. Building

Excavation & site preparation	30,000.00
Backfill	60,000.00
Concrete	800,000.00
Structural steel	1,200,000.00
Sidewalls	100,000.00
Roof deck & roofing	120,000.00
Doors & windows	40,000.00
Finishing & Miscellaneous	80,000.00
Lighting	120,000.00
Contingencies	<u>255,000.00</u>

Total for 'A' Building 2,805,000.00

B. Equipment

3 - 6'9" x 3 disc Special Taconite type disc filters complete with motors & auxiliaries	60,000.00
Furnace & auxiliaries as per Elekrtokemisk letter of Sept. 6/61	6,300,000.00
24 - Bins approx. 14'x 20' straight sides 30' overall with supporting legs, etc.	240,000.00
3 - Concentrate feeders	30,000.00
21- Standard feeders	45,000.00
3 - Mixers	48,000.00
3 - Balling Drums	180,000.00
Conveyors	270,000.00
3 - Screens	18,000.00
Chutes & spouts	65,000.00
Vacuum Pump Compressors & Misc.	90,000.00
Laboratory	60,000.00
Instrumentation	80,000.00
Electrical & controls	700,000.00
Installation	2,000,000.00
Contingencies	<u>1,000,000.00</u>

Total for 'B' Equipment 11,186,000.00

TOTAL FOR 'A' & 'B' BUILDING & EQUIPMENT

\$13,991,000.00

4. BOILER HOUSEA. Building

Excavation & Preparation of site	1,000.00
Backfill	1,200.00
Concrete	9,000.00
Structural Steel	10,000.00
Sidewalls	5,000.00
Roof Deck & Roofing	3,000.00
Doors & Windows	1,200.00
Heating & Ventilating	3,500.00
Finishing & Misc.	1,200.00
Lighting	1,000.00
Contingencies	<u>3,900.00</u>

Total for 'A' Building 40,000.00

B. Equipment

3 - 150 H.P. Boilers complete	40,000.00
Breeching & stacks	10,000.00
Pumps & Misc.	4,000.00
Piping	6,000.00
Coal Handling Equipment including stoker	12,000.00
Electrical & Hookup	10,000.00
Installation	20,000.00
Contingencies	<u>10,000.00</u>

Total for 'B' Equipment 112,000.00

TOTAL FOR 'A' & 'B' BUILDING & EQUIPMENT 152,000.00

5. SUBSTATION & POWER DISTRIBUTION 750,000.00

6. ROADS & YARDS 100,000.00

7. R.R. TRACKS 180,000.00

8. WATER SUPPLY, INCLUDING PUMPS, PUMP LINES,
WATER TANK, ETC. 200,000.00

Total 18,921,000.00

Overhead, Engineering, Design, etc. 2,779,000.00

TOTAL COST OF JOB \$21,700,000.00

PRELIMINARY ESTIMATED SMELTER OPERATING COSTSSUMMARYBASIS

540,000 metric tons of pig iron per year,
produced from approx. 840,000 tons of 64.5% Fe concentrate.

$\frac{540,000}{350 \times 24} = \text{approx. } 64 \text{ metric tons per hour net.}$

Concentrates fed approx. 100 tons per hour.

<u>Cost Summary</u>	<u>Per Metric Ton of Pig Iron</u>
1. Concentrate cost \$2.55 x 1.55 long tons	3.953
2. Operating Labour	2.697
3A. Supervision	0.180
3B. Smelter Laboratory	0.080
4. Power	5.682
5. Supplies	
(1) Steel	0.231
(2) Coal	6.446
(3) Coke	2.870
(4) Limestone	1.403
(5) Carbon	1.275
(6) Cement	3.857
(7) Silica	0.740
(8) Miscellaneous	<u>2.080</u>
	18.902
6. Water	.001
7. Maintenance	<u>0.374</u>
	Total
	31.869
	Contingencies 10%
	<u>3.187</u>
Cost Per Metric Ton of Pig Iron	<u><u>35.056</u></u>

ESTIMATED OPERATING COST FOR SMELTER PLANT

2. <u>OPERATING LABOUR</u>	No. of Men/Shift	No. of Men Per Day	Total	Cost Per Ton of Pig Iron
Concentrate Grinding Mill Operator	1	3		
Assistant Grinding Mill Operator & Belt Attendant	1	3		
Raw Material Preparation Operator	1	3		
Assistant Raw Material Preparation Operator & Belt Attendant	1	3		
Raw Material Receiver & Unloader Lead Man	1	3		
Raw Material Receiver & Unloader Assistant	2	6		
Bulldozer Operator	1	3		
Mixer Operator	1	3		
Pelletizing Drum Operator	1	3		
Front End Loader Operator	1	3		
Assistant Mixer & Pelletizing Operator & Belt Attendant	4	12		
Filter Operator	1	3		
Furnace Operator	3	9		
Assistant Furnace Operator	6	18		
Crane Operator	1	3		
Tapper & Assistant	2	6		
Mould Preparation Operator	1	3		
Mould Preparation Operator & Helper	4	12		
Furnace Repair Man	1	3		
Assistant Furnace Repair Man	2	6		
Mould Filler	1	3		
Mould Strippers	2	6		
Sampler & sample handling	1	3		
Labourers		<u>24</u>	144	

41 Swing Men are provided for these operators
Total number of men required - 185

Summary of hourly rated labour 144. These men would be paid from
\$2.10 to \$3.30 per hour with an average of \$2.85.

144 men @ \$2.85 per hour = 144 x \$2.85 x 8 = \$3,283.20

Cost per metric ton of pig iron produced:

Labour	2.132	
Fringe		
Benefits	.320	
Misc.	<u>.245</u>	<u>\$2.697</u>

Estimated Operating Cost for Smelter Plant (Cont'd)

3A. <u>SUPERVISION</u>	Cost Per Day
1 - Smelter Superintendent \$15,000.00 per year	42.85
1 - Asst. Smelter Supt. \$11,000.00 per year	31.42
4 - Mill Foremen @ \$8,000.00/year	91.42
4 - Clerks @ \$400.00/month	<u>54.85</u>
Total for Supervision	220.54
Cost per metric ton of pig iron - 0.143	
Fringe Benefits & Misc. - <u>0.036</u>	<u>0.180</u>

3B. <u>SMELFER LABORATORY</u>		
1 - Metallurgical Chemist @ \$10,000/year	28.58	
4 - Technicians @ \$6,000.00/year	<u>68.58</u>	
Total for Salaries	97.16	
Cost per Metric ton of pig iron - 0.063		
Fringe Benefits & Misc. - <u>0.017</u>		<u>0.080</u>

4. <u>POWER</u>	<u>Installed H.P.</u>	<u>H.P.H. Per Day</u>
Conveyor to Smelter	35	840
Concentrate regrind & raw material preparation	3500	84,000
Raw material handling	1050	25,200
Smelter Bldg.	<u>125975</u>	<u>3,023,400</u>
	130560	3,133,440
Demand Load 80% - 2,506,802 H.P.H.		
Say - 2,500,000 H.P.H.		
Assume Power Costs @ 3.5 mills/H.P.H.		
Total Cost Per Day will be -		\$8,750.00

Cost per Ton of Pig Iron \$5.682

Note: The general supervisory staff is covered by Kilborn Engineering Ltd. Report dated Feb. 2, 1962, for Mining & Concentrating Plant to produce 3,000,000 Long Tons of Concentrates per year. Some additional clerical and maintenance help may be required.

Estimated Operating Cost for Smelter Plant (Cont'd)

5. SUPPLIES

(1) <u>Steel</u>			
Mill Liners, Balls, etc.	15¢/ton		0.231
(2) <u>Coal for Pelletizing</u>			
580 tons/day @ \$17.00/ton			
\$9,860.00	-	6.402	
Heating \$68.00	-	.044	6.446
(3) <u>Coke</u>			
260 tons/day @ \$17.00/ton			
\$4,420.00	-		2.870
(4) <u>Limestone</u>			
360 tons/day @ \$6.00/ton			
\$2,160.00	-		1.403
(5) <u>Carbon</u>			
15 tons/day @ \$130.00/ton			
\$1,950.00	-		1.275
(6) <u>Cement</u>			
180 tons/day @ \$33.00/ton			
\$5,940.00	-		3.857
(7) <u>Silica</u>			
190 tons/day @ \$6.00/ton			
\$1,140.00	-		0.740
(8) <u>Miscellaneous</u>			
Fluxes	-	0.850	
Filter cloth	-	0.020	
Fire brick	-	0.705	
Misc.	-	0.505	2.080
			18.902

6. WATER .001

7. MAINTENANCE
4% of Bldg. Costs - \$250,000.00 0.374

Note: Prices incorporated for supplies under Item 5 above are approx. prices only. This item could be materially changed if accurate laid down prices at the Smelter site for the items listed were available.

CANADIAN JAVELIN LTD.ESTIMATED H. P. REQUIREMENTSSMELTER AREA

1. <u>Regrind & Raw Material Handling</u>		
Concentrate Feeders, etc.	25 H.P.	
Ball Mills 3 @ 800	2400	
1 @ 300	300	
Crusher & Coal Mill	300	
Service crane	50	
Air pumps	200	
Pump	150	
Conveyors & Misc.	75	3500 H.P.
2. <u>Raw Material Handling</u>		
Thaw shed	300 H.P.	
Air Pumps	300 H.P.	
Conveyors	450	1050 H.P.
3. <u>Smelter Building</u>		
Filter	75 H.P.	
Furnaces	120,000	
Auxiliaries	4,000	
Feeders & Mixers	250	
Pelletizing units	300	
Service crane	250	
Conveyor & Misc.	600	
Ventilation & Dust control	500	<u>125,975 H.P.</u>
Total		130,525 H.P.
Say - 130,000		
Demand load 80% - 104,000 H.P.		
Say - 100,000 K.W. substation		

CANADIAN JAVELIN LTD.GENERAL SPECIFICATION & DESCRIPTION OF SURFACE PLANT1. GRINDING & RAW MATERIAL PREPARATION

This will be a structural steel frame building on reinforced concrete foundation and floor system, with insulated metal panel walls, Q. deck roof and built-up roofing, and with necessary doors, lighting, heating, plumbing, etc.

Equipment will consist of a filter, surge bins and necessary regrind mills, screen and pumping equipment to receive and regrind approx. 840,000 tons of -35 mesh 65% iron concentrate per year and reduce this ore to approx. 70% -200 mesh as feed for pelletizing plant.

Also incorporated in this structure are a Ball Mill, Crusher, Screens, Air Separators, Air Pumps, etc. required to process and prepare coal, coke, limestone and/or other raw materials.

2. THAW SHED & RAW MATERIAL HANDLING

Provision has been made for receiving and storing all necessary raw materials (apart from concentrates) in silos or stock piles as required.

A Thaw Shed has also been incorporated in layout to facilitate handling cars during winter conditions.

The buildings supplied to handle these requirements are to be reinforced concrete or structural steel metal clad and with the necessary insulation, heating, lighting, etc. as required.

3. PELLETIZING & SMELTER BUILDING

The layout proposed for this structure is, in general, as shown on Elektrokemisk Drawing 1-23942, and is a structural steel metal clad building carried on reinforced concrete foundations, and with reinforced concrete ground and intermediate floors, insulated as required, with the necessary lighting, heating, plumbing and ventilating.

The structure houses the pelletizing, drying and electric smelter equipment including all auxiliaries.

4. BOILER HOUSE

The Boiler House, as shown, covers requirements for the smelter area only and is a structural steel insulated metal clad structure on a reinforced concrete foundation shown attached to the grinding and raw material preparation building. The layout, as shown, will use pulverized coal or fuel oil as desired.

The enlarging of the Concentrator Boiler House to supply the smelter area could be incorporated if found feasible.

5. SUBSTATION & POWER DISTRIBUTION

A 100,000 K.W. substation to include the necessary transformers, switching structures, etc. on a reinforced concrete base with the necessary protecting fence, will be required. The structure, as submitted, covers distribution lines from the substation to various control rooms but does not include cost of transmission line from power service to substation.

6. ROADS & YARDS

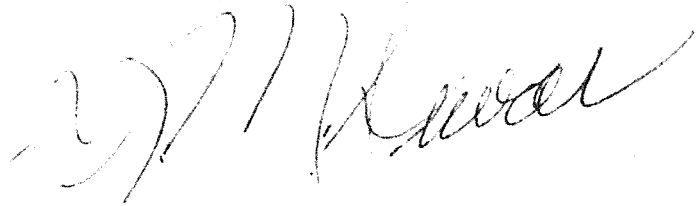
This item includes roads and general yard area around smelter layout and covers general grading and crushed rock surfacing only. Estimate, as submitted, covers roadway between concentrator and smelter layouts but does not include cost of roadway from Wabush townsite to plant area.

7. R. R. TRACKS

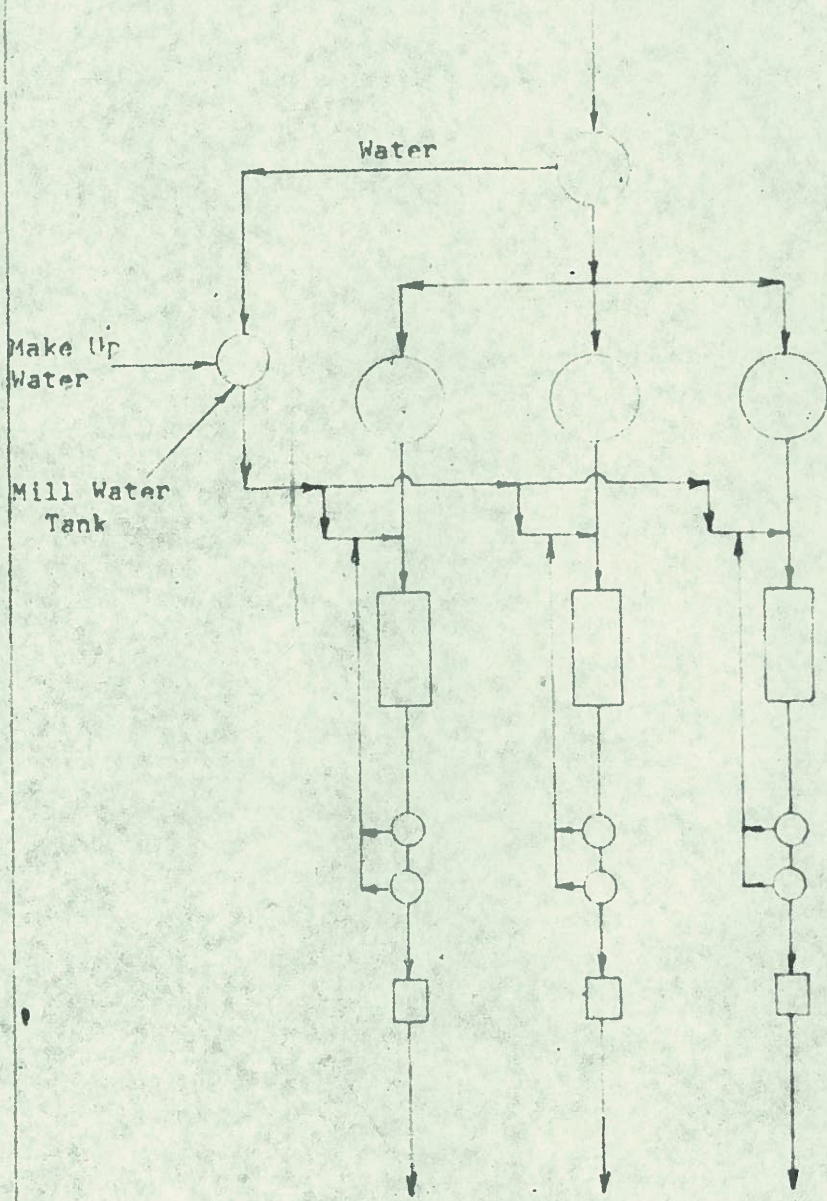
R. R. tracks and sidings to be provided, shall be capable of handling the receiving and shipping of all raw materials and pig iron together with necessary internal interchanging. Estimated cost does not include R.R. track requirements from Wabush line to plantsite.

8. WATER SUPPLY

The estimate, as submitted, visualized a completely independent water supply system, actual layout if plant located as noted can be incorporated with concentrator water requirement layout. Overall costs will, however, be approx. as noted.

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Proposed Flow Sheet
 For Concentrate Re grind
 From -35 Mesh to 70% -200 Mesh
 Average Requirement 11⁴ T/H



10" Pipe Line from
 Concentrate Plant

1 - 15' Horizontal Filter
 Capacity 125 T/H Reduction
 To approx. 8% Moisture

3 - 22' x 45' Cone Type
 Surge Pins

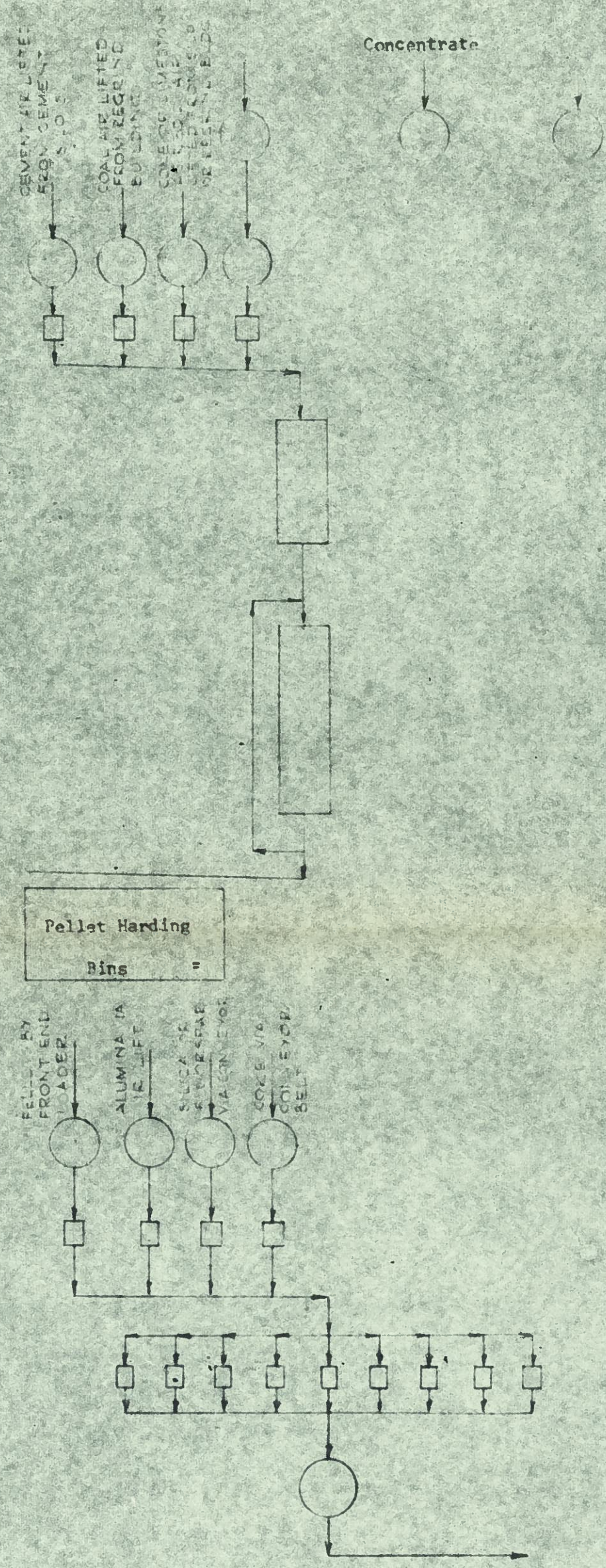
3 - 9' x 14' Ball Mills
 650 H.P. Capacity Approx.
 50 T/H Each Including
 Recirculating Load

Kreb Type Cyclones

Pumps & Pump Boxes

To Filter in Smelter Plant

PROPOSED
SMELTED FLOW SHEET
3 - 30,000 K. W. FURNACES



Concentrates Pumped from Receiving Building
3 - 12'-6" x 10' Disc Type Filters, Capacity approx. 50 T/1" Each

4 - 14' Dia. by 20' Surge Bins Per Furnace 12 in All

4 - Constant Weight Adjustable Feeders per Furnace 12 Feeders in All

3-Mixing Drums

3 - Balling Drums

6 - Pellet Hardening Bins Approx. 20' x 100' x 10' High Per Furnace, 18 in All

4 - 14' Dia. x 20' Surge Bins per Furnace, 12 in All

4-Constant Weight Feeders Per Furnace, 12 in All

9 - Shaft Furnaces Per Each Electrical Furnace 27 in All

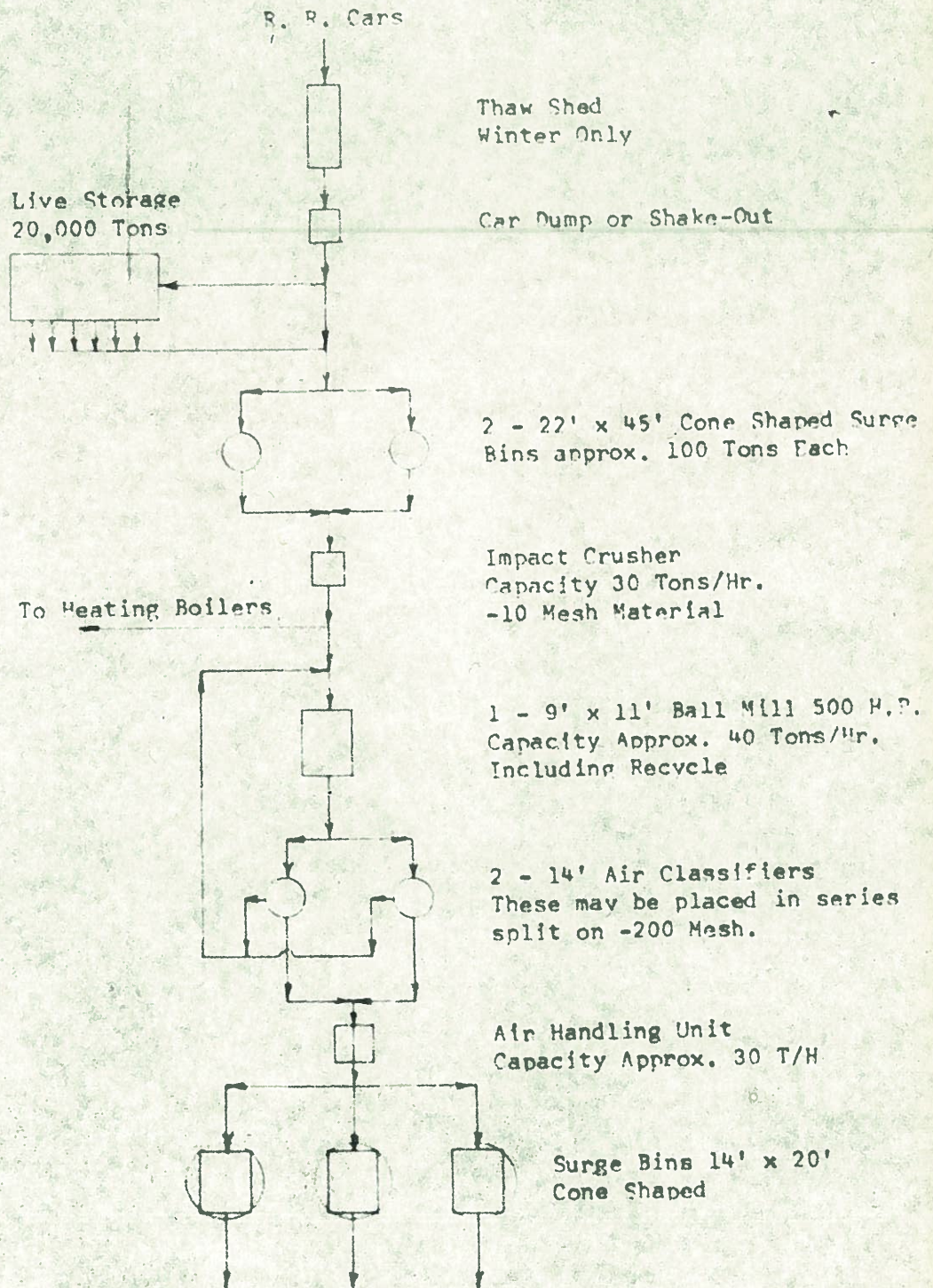
3 - 30,000 K.W. Furnaces Complete with Gas Scrubbers & Auxiliary Equipment

Molten Iron Via Ladle, Service Crane & Auxiliary Equipment to Moulds, etc.
Sheet No. 2

PROPOSED FLOW SHEET
FOR COAL PREPARATION

Process Coal - 760# Coal/Ton of Pig Iron
205,200 Tons/Year
350 Days/Year = 586 Tons/Day
24 Hrs./Day = 24.4 Tons/Hr.
Cav 24 Tons/Hr.

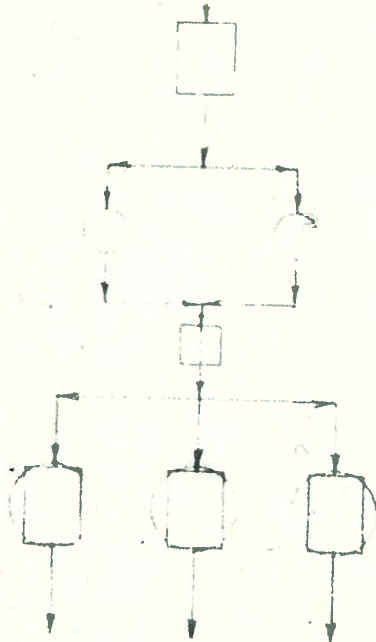
Heating Coal Max. Rate 4 1/2 Tons/Hr. Crushed Only



PROPOSED FLOW SHEET
FOR CEMENT HANDLING

235# of Cement/Ton of Pig Iron
63,450 Tons/Year
350 Days/Year = 181 Tons/Day
24 Hrs./Day = 7 Tons/Hr.

R. P. Cars (Covered Gondolas)



Air Handling Unit
Capacity Approx. 30 Tons/Hr.

2 - Cement Silos
22' Dia. x 60' High
Capacity 1,000 Tons Each

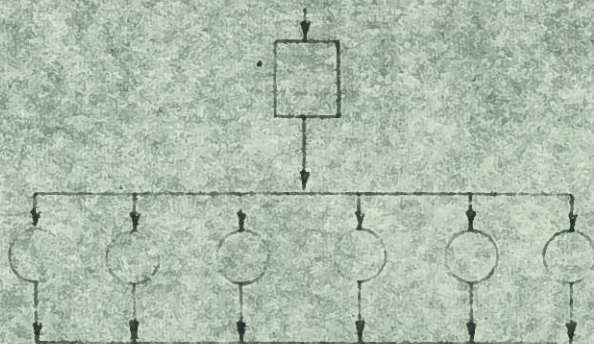
Air Handling Unit
Capacity approx. 10 T/H

Surge Bins 14' x 20'
Cone Shaped

Constant Weight Feeders
To Mixer

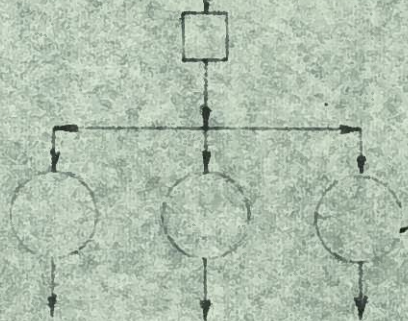
PROPOSED FLOW SHEET
 FOR COKE HANDLING
 340#/Ton of Pig Iron
 91,900 Tons/Year
 350 Day/Year = 262 Tons/Day
 24 Hr/Per Day = 11 Tons/H.

A. IF HANDLED AS COKE BREFZE



Air Handling Unit
 Capacity Approx. 30 Tons/H

6 - Coke Silo's
 22' Dia. x 60' High
 Capacity 400 Tons Each

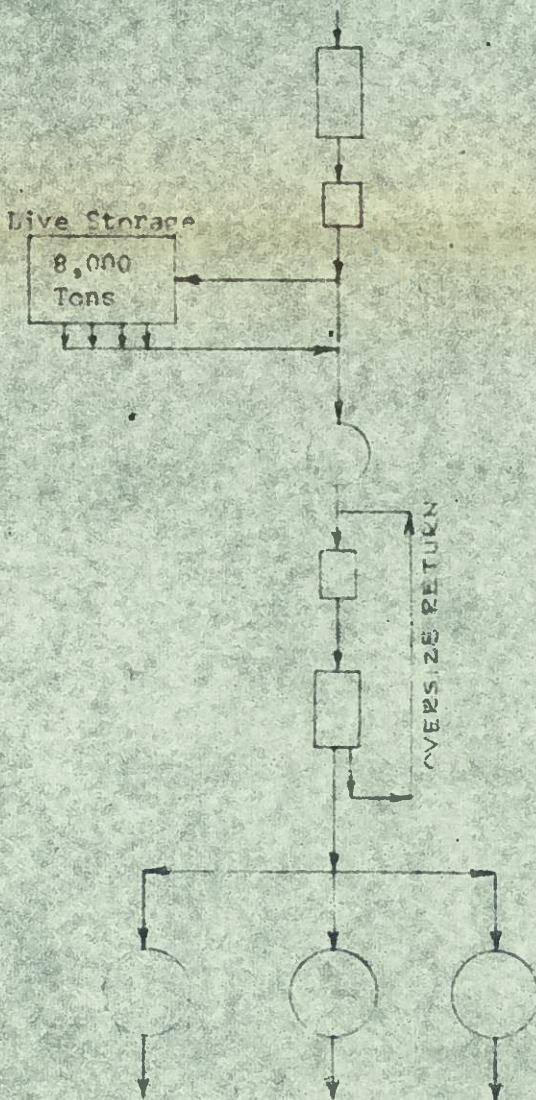


Air Handling Unit
 Capacity Approx. 15 T/H.

Surge Bins 14' x 20'
 Cone Shaped

Constant Weight Feeder
 To Furnace Conveyor Belts.

B. IF HANDLED AS LUMP COKE



P. R. Cars
 Thaw Shed, Winter Only

Car Dump or Shake Out

22' x 45' Cone Shaped
 Surge Bin

Impact Crusher
 Capacity Approx. 40 Tons/H.
 (Can be used for other products)

Sizing Screen Approx. 4' x 8'

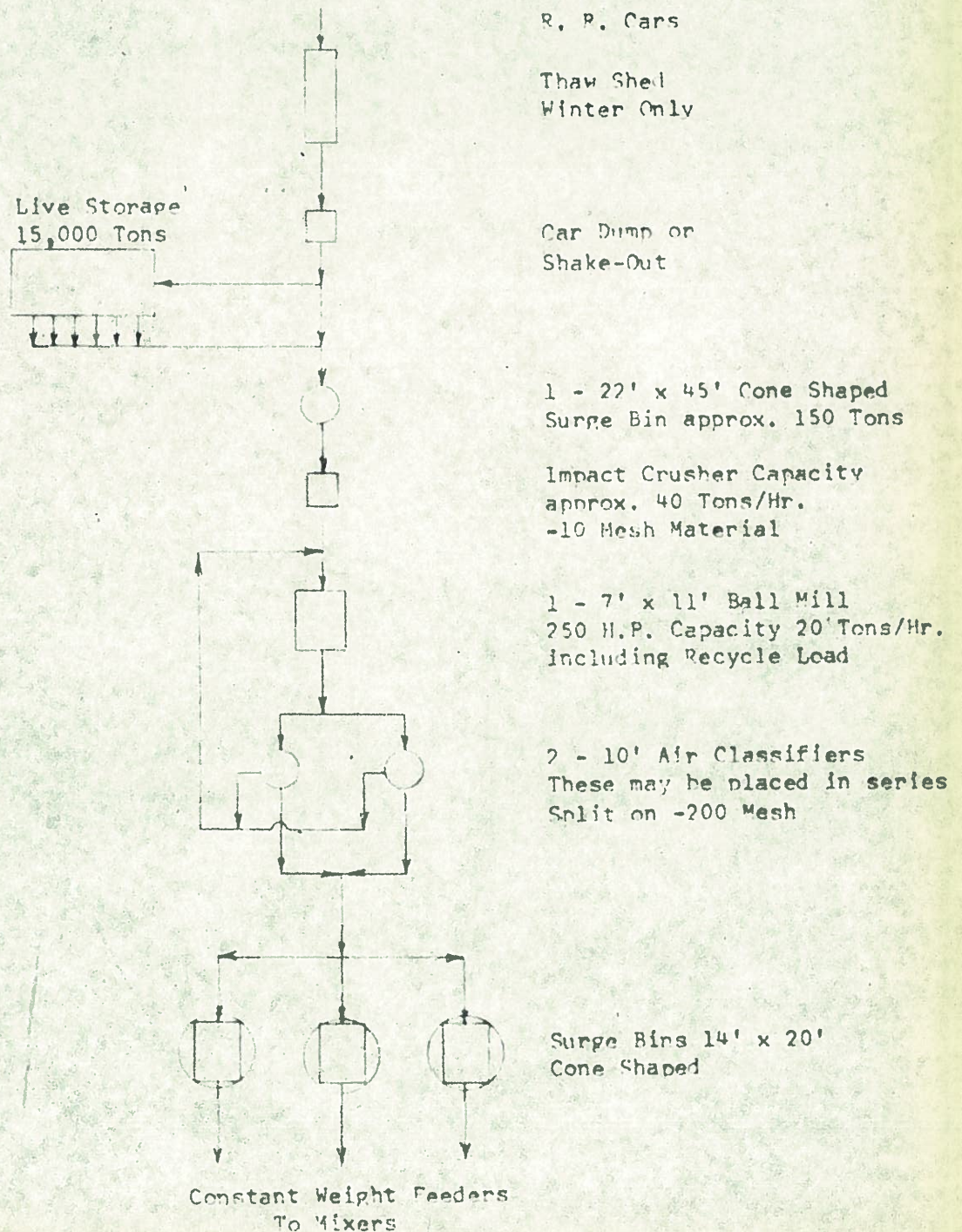
Surge Bins 14' x 20'
 Cone Shaped

Constant Weight Feeders
 To Furnace Conveyor Belts

PROPOSED FLOW SHEET
FOR LIMESTONE PREPARATION

470#/Ton of Pig Iron
126,900 Tons/Year
350 Days/Year = 362 Tons/Day
24 Hrs./Day = 15 Tons/Hr.

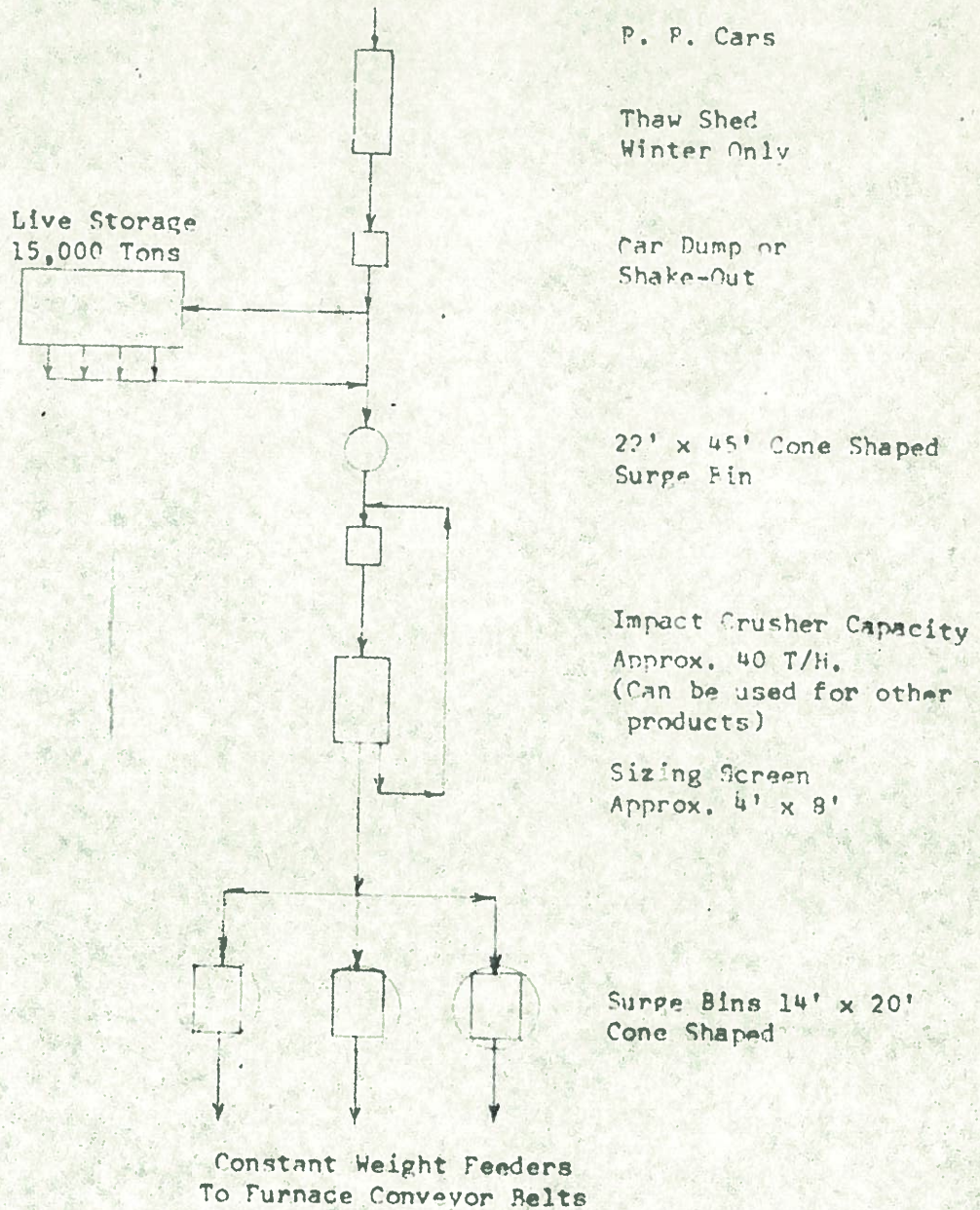
A. IF LIMESTONE ADDED TO PELLETT MIX



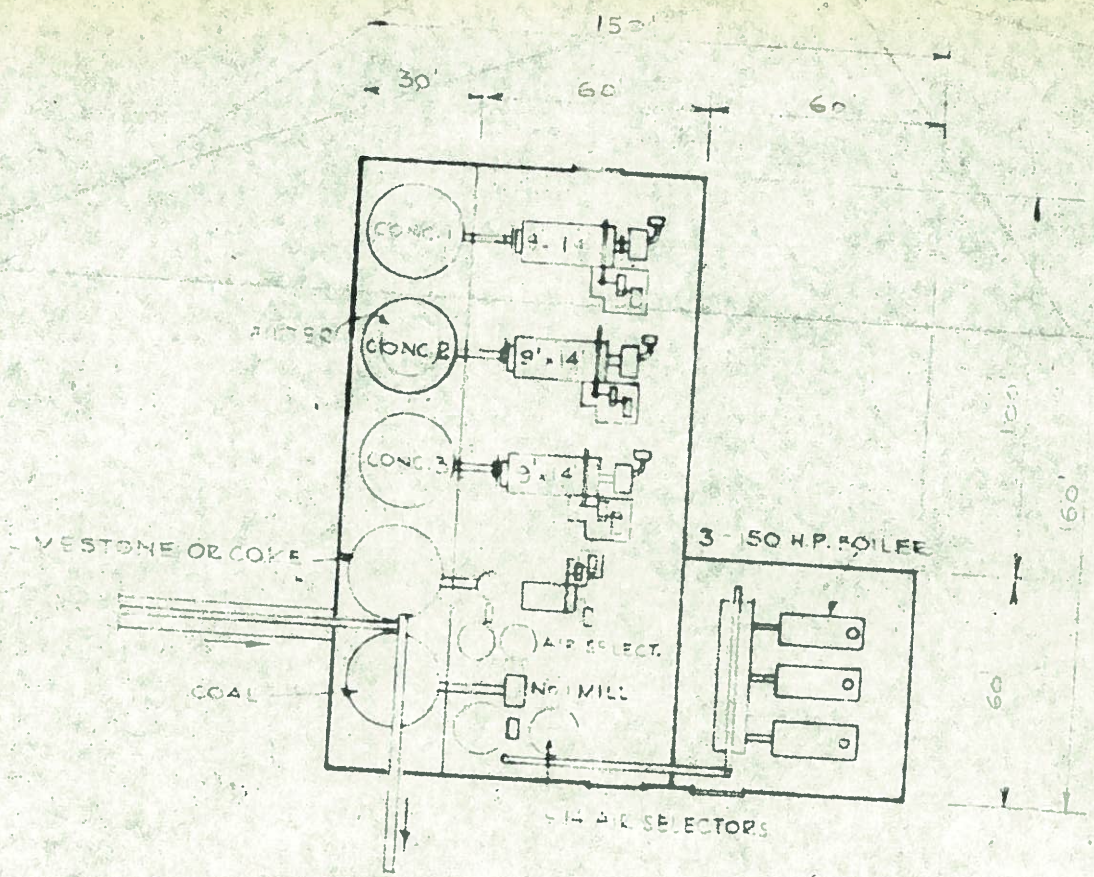
PROPOSED FLOW SHEET
FOR LIMESTONE PREPARATION

470#/Ton of Pig Iron
126,900 Tons/Year
350 Days/Year = 362 Tons/Day
24 Hrs./Day = 15 Tons/Hr.

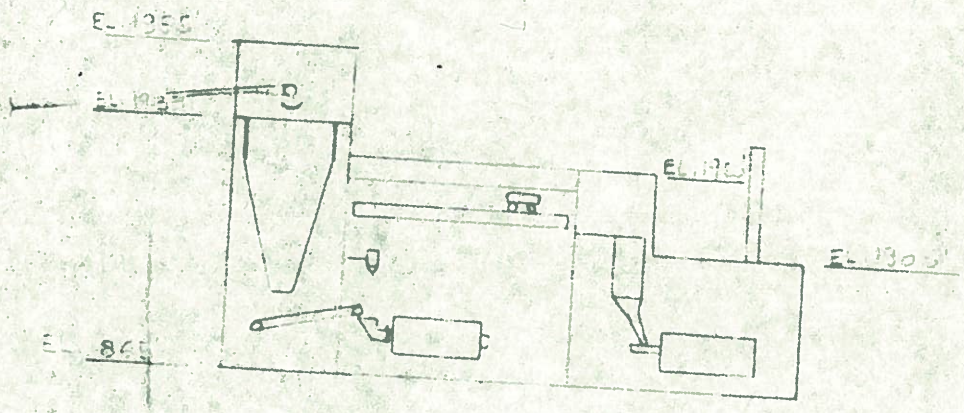
B. IF LUMP LIMESTONE FED TO FURNACE DIRECT



27



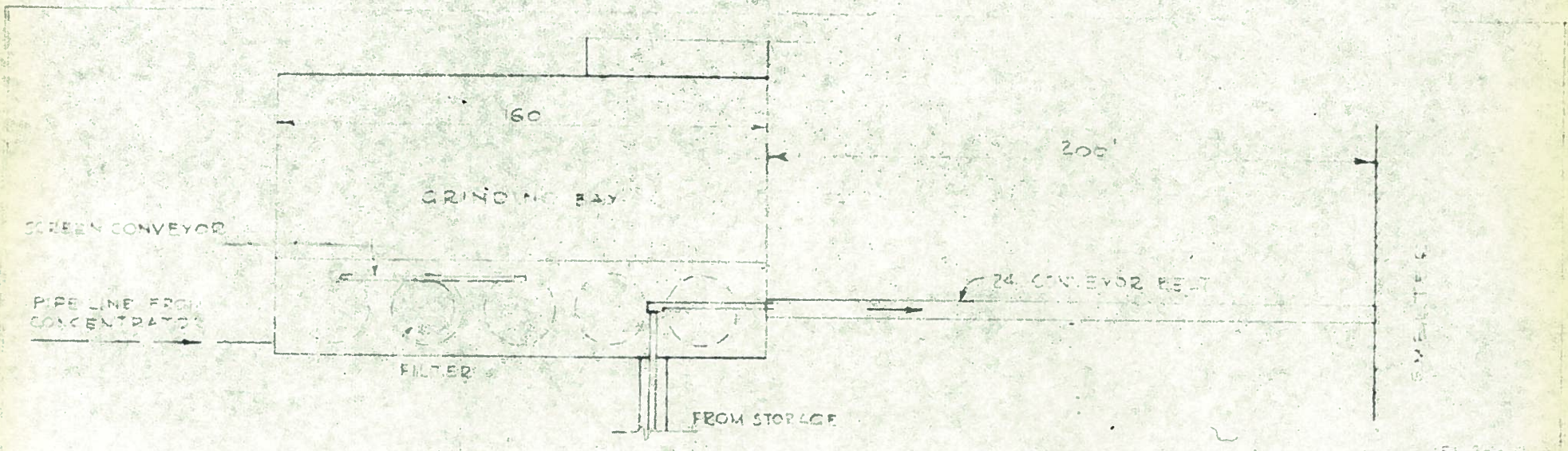
PLAN



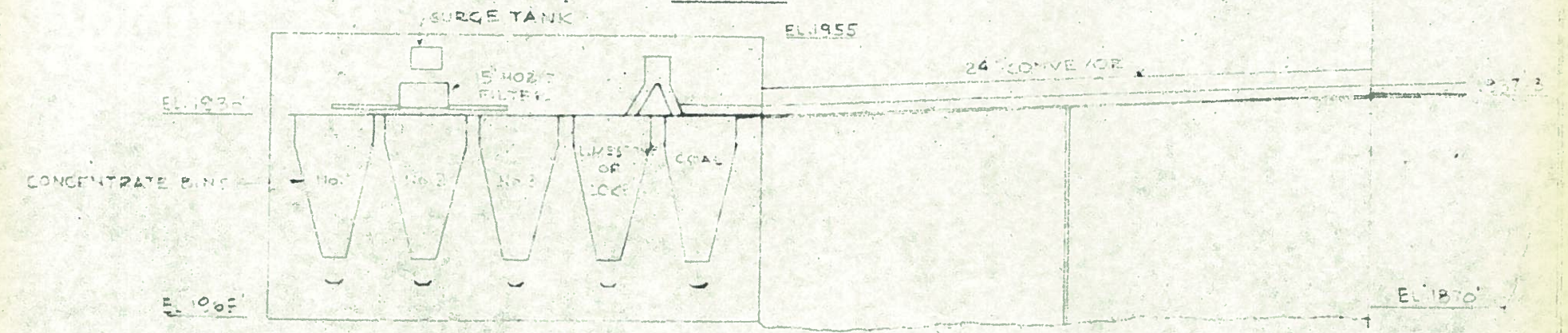
ELEVATION
SCALE 1" = 50'

GRINDING & RAW MATERIAL HANDLING
FOR SMELTER PLANT

SKETCH NO. 1

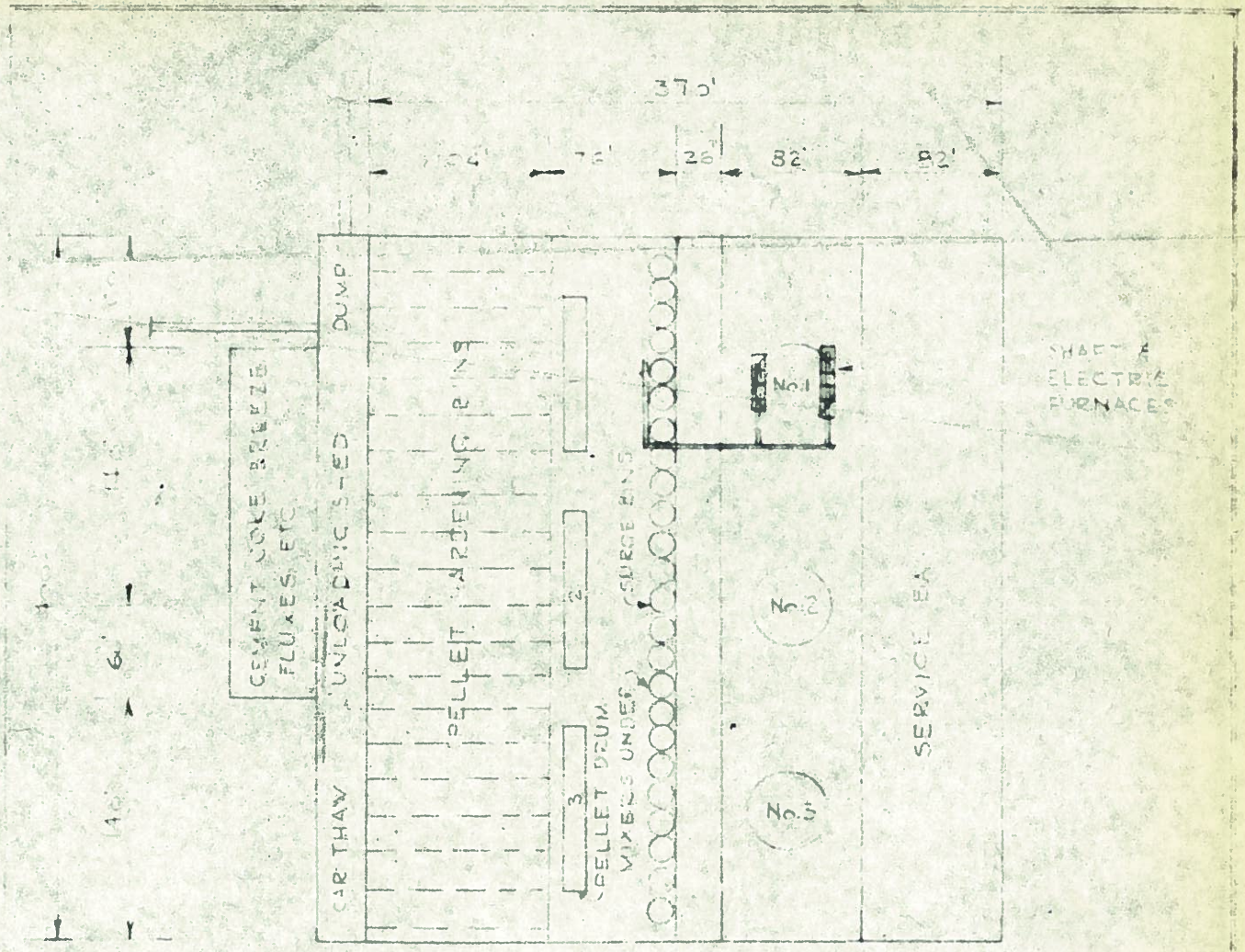


PLAN

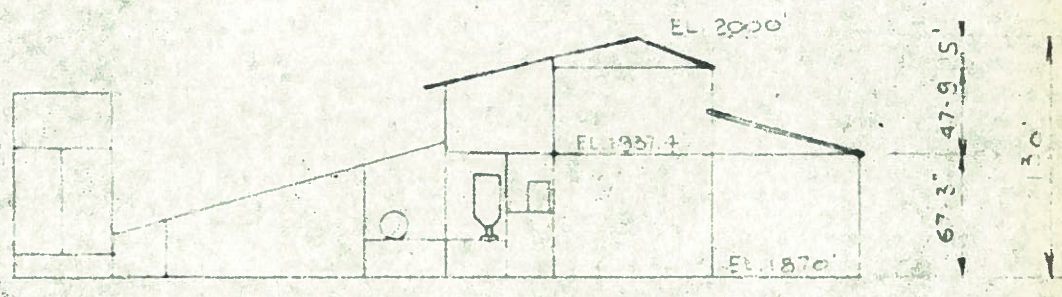


ELEVATION SCALE 1" = 50'

CONVEYOR LAYOUT TO HANDLE COARSE MATERIALS TO SMELTER SURGE BINS

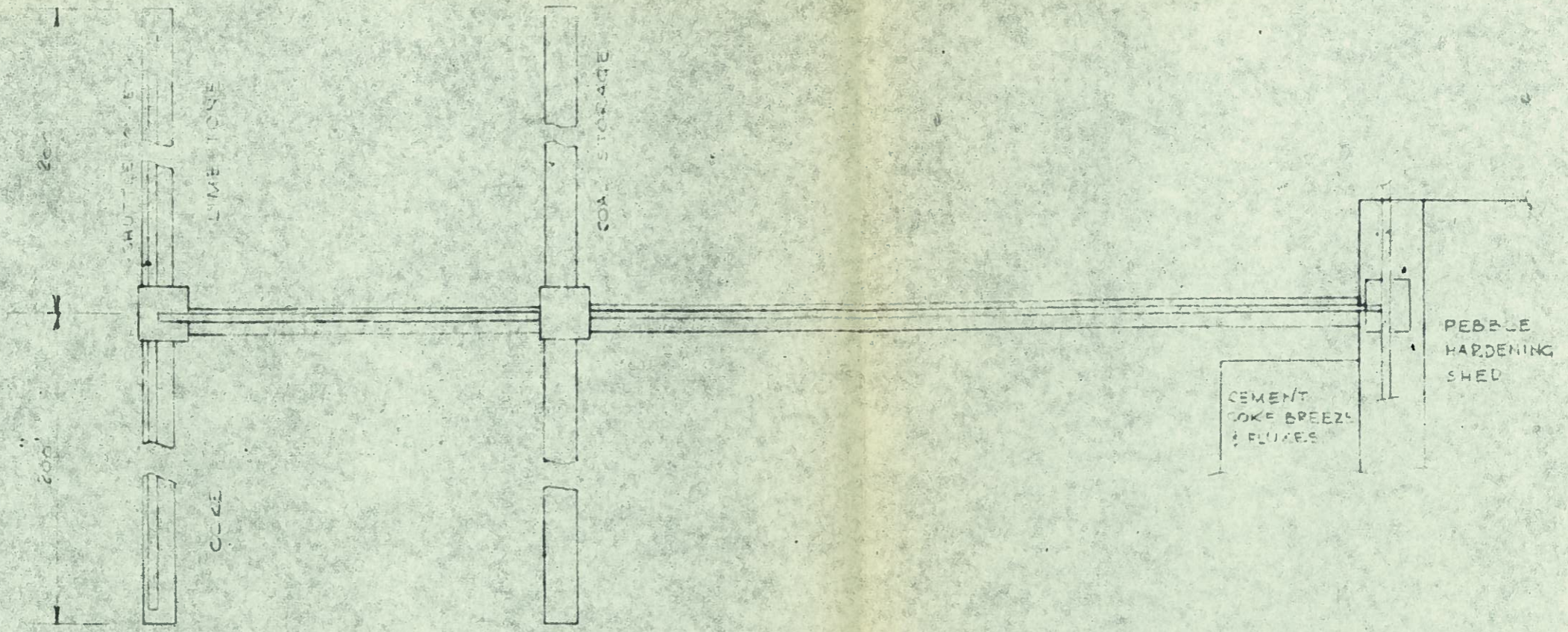


PLAN

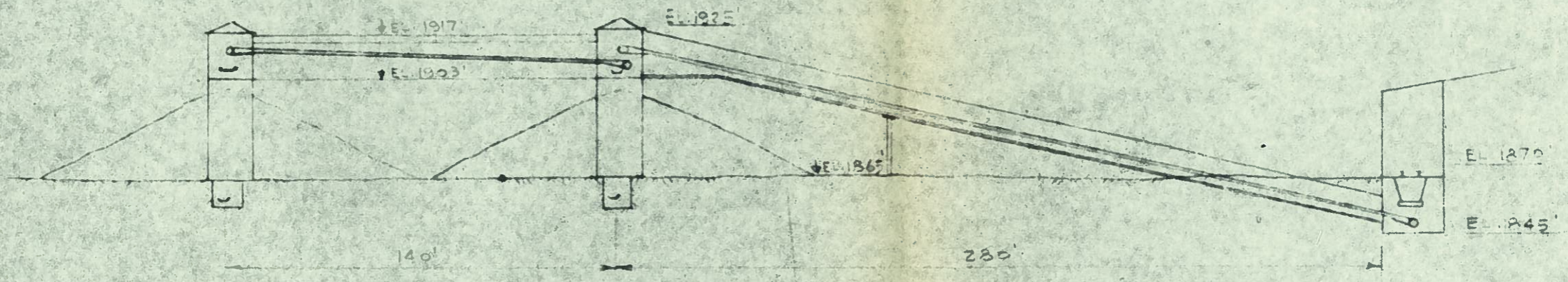


SECTION
SCALE: 1/4" = 10'

PLAN & SECTION
PELLETIZING HARDENING STORAGE,
SHAFT & ELECTRIC FURNACES



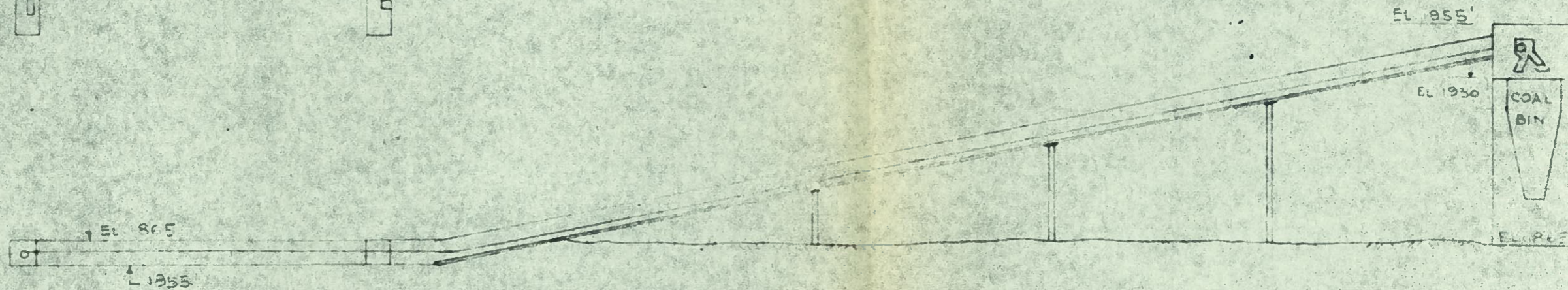
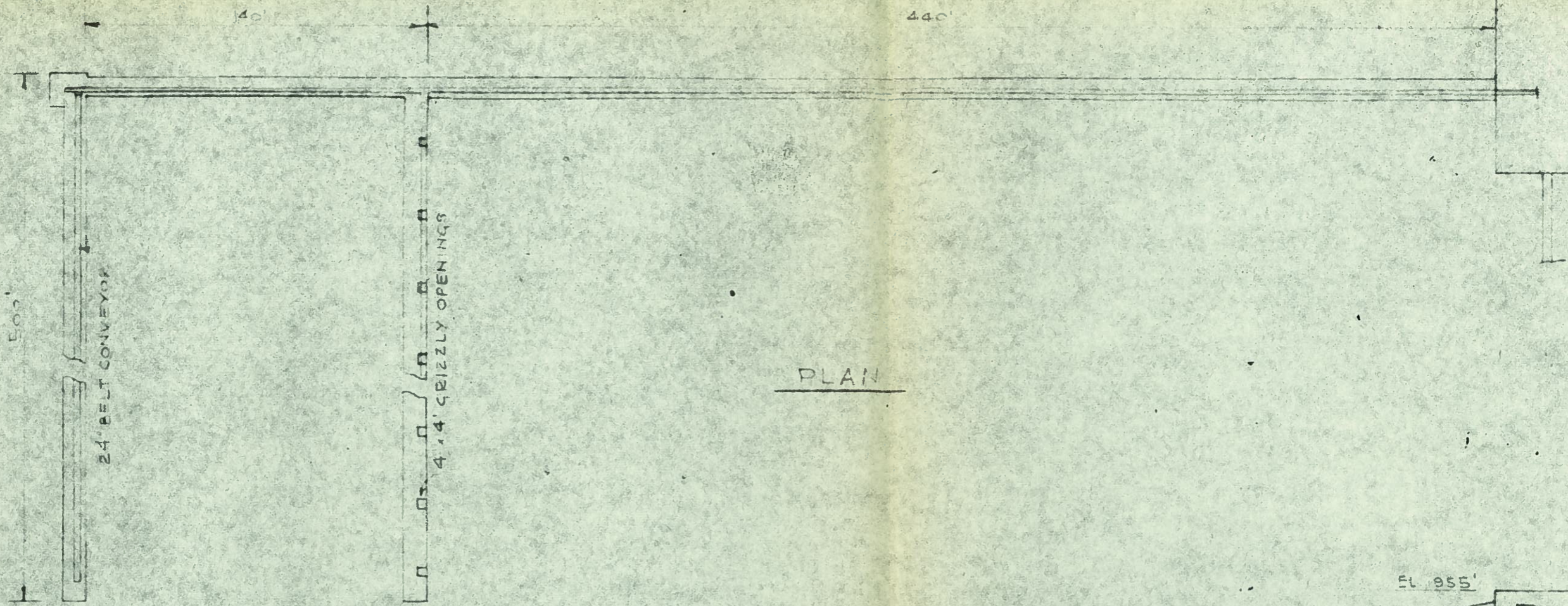
PLAN



ELEVATION

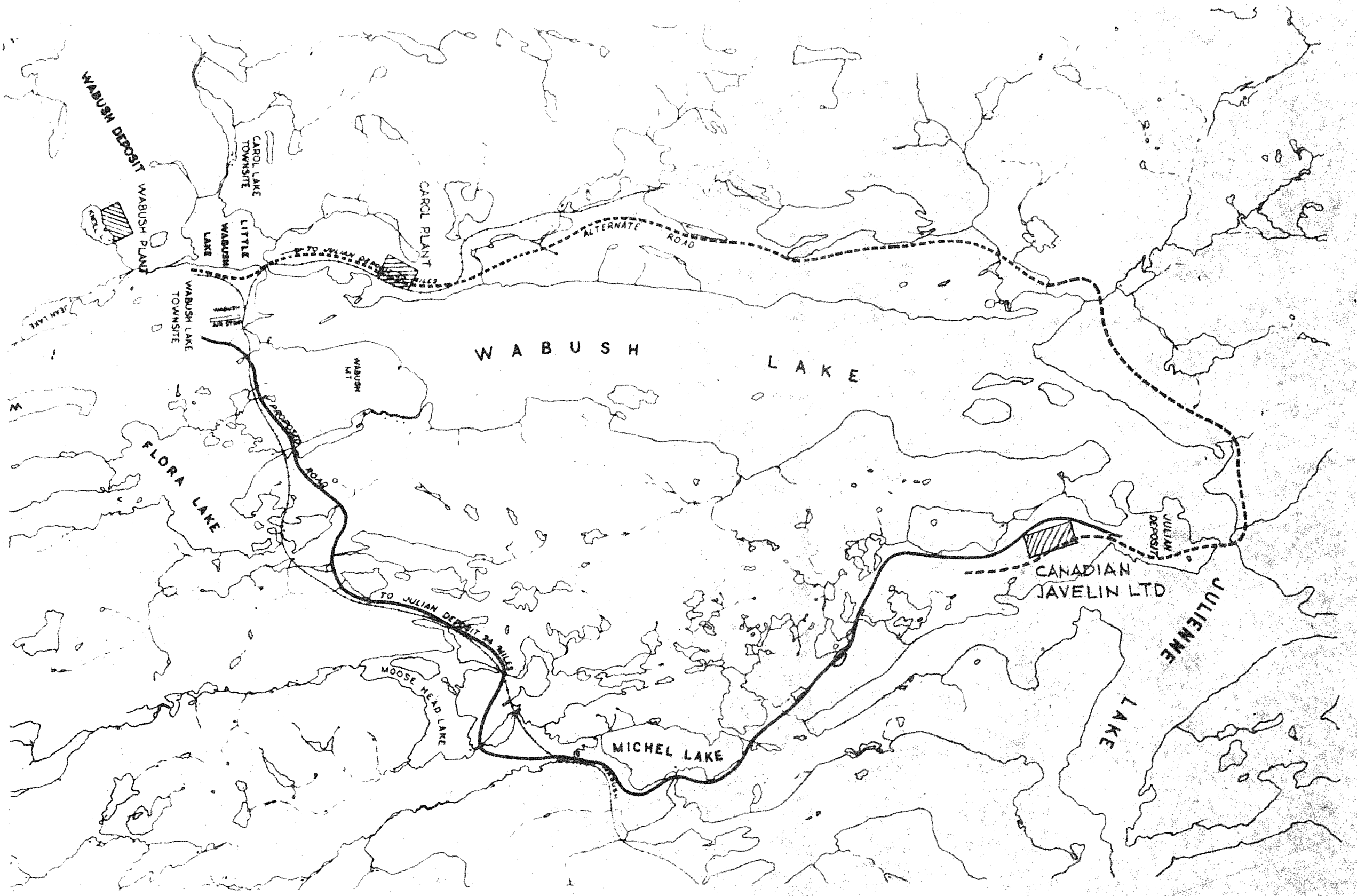
SCALE: 1" = 50'

LOADOUT & CONVEYOR SYSTEM TO STORAGE



ELEVATION
SCALE: 1" = 50'

PICKUP CONVEYOR SYSTEM FROM STORAGE



GENERAL LOCATION PLAN
SKETCH No. 7