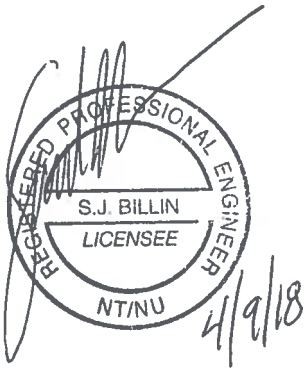
AGNICO MELIADINE WTP

DESIGN REPORT

Prepared for:

AGNICO EAGLE

April 2018



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Planning · Design · Procurement · Construction · Operation

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LIST OF ACRONYMS AND ABBREVIATIONS

CCRO	Closed Circuit Reverse Osmosis
PFD	Process Flow Diagram
TDS	Total Dissolved Solids
WTP	Water Treatment Plant

1.0 INTRODUCTION

Linkan has been commissioned by Agnico Eagle to design a water treatment plant (WTP) for use at the Meliadine facility. This project will be implemented in order to help manage containment pond inventories. This WTP will treat Containment Pond 5 (CP5) water in order to reduce its salinity. This treated water will be blended with Containment Pond 1 (CP1) water to a total dissolved solids (TDS) concentration of approximately 1,300 mg/L. This blended effluent will then be discharged to Meliadine Lake.

This treatment process was pilot tested at Linkan's Elko, NV (U.S.A.) facility in January 2018, using closed-circuit reverse osmosis (CCRO) as primary treatment. CCRO was selected for use as it produces a much lower volume of brine than conventional equipment.

The final CP5/CP1 blend generated during pilot testing was determined to have no acute aquatic toxicity per the requirements of Canada's EPS 1 / RM / 13 and 14 standards for rainbow trout and *daphnia magna*.

1.1 Site Location

The location for the WTP will be in the Kivalliq region of Nunavut, on the western shore of Hudson Bay, at 63°1'23.8"N, 92°13'6.42"W, which is a peninsula between the east, south and west basins of Meliadine Lake. This location is on Inuit owned land.

1.2 Project Duration

The duration of this project is scheduled to not exceed calendar year 2018.

1.3 Project Equipment

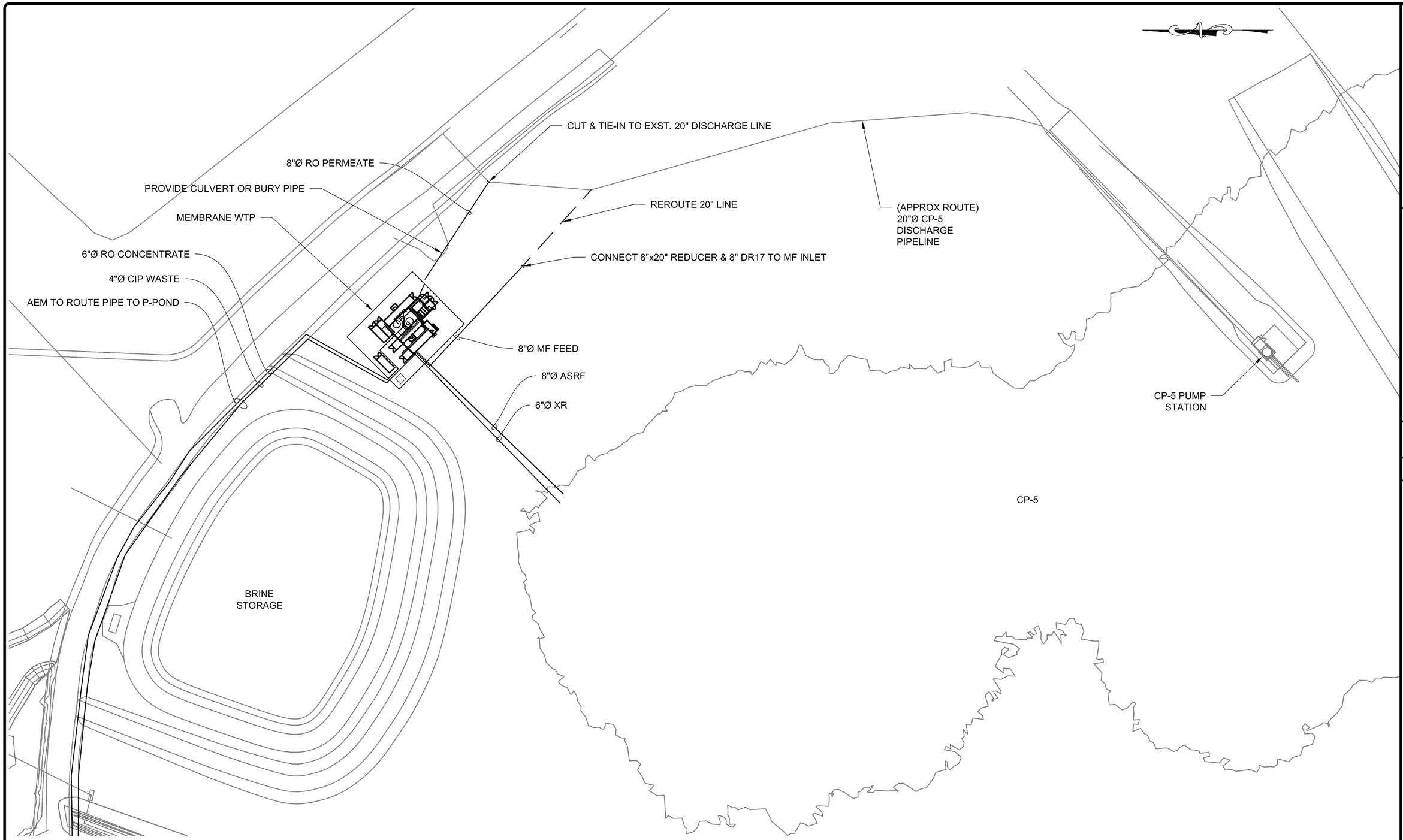
The project equipment will be mobile equipment with modular design and construction, and will house all necessary components and materials. External components such as piping and wiring will be adequately protected against environmental exposure.

2.0 DESCRIPTION OF TREATMENT SYSTEM

The WTP will consist of compartmentalized microfiltration (MF) and CCRO units, as well as post-treatment effluent storage tanks, chemical cleaning equipment and tanks, and chemical storage. Refer to Appendix A for the proposed WTP site plan. Refer to Appendix B for the proposed WTP plant layout general arrangement. Refer to Appendix C for the proposed WTP Process Flow Diagram (PFD).

APPENDIX A

SITE PLAN



GENERAL NOTES:

1. .
2. .
3. .

SITE PLAN

SCALE: 1:30

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REV.	DATE	REVISION DESCRIPTION
0	04/06/18	ISSUED FOR CONSTRUCTION

TITLE: GENERAL ARRANGEMENT
CP-5 PUMP STATION AREA

PROJECT: AGNICO EAGLE MINES LTD
MELIADINE TEMPORARY WTP

PROJECT NO.
55.02

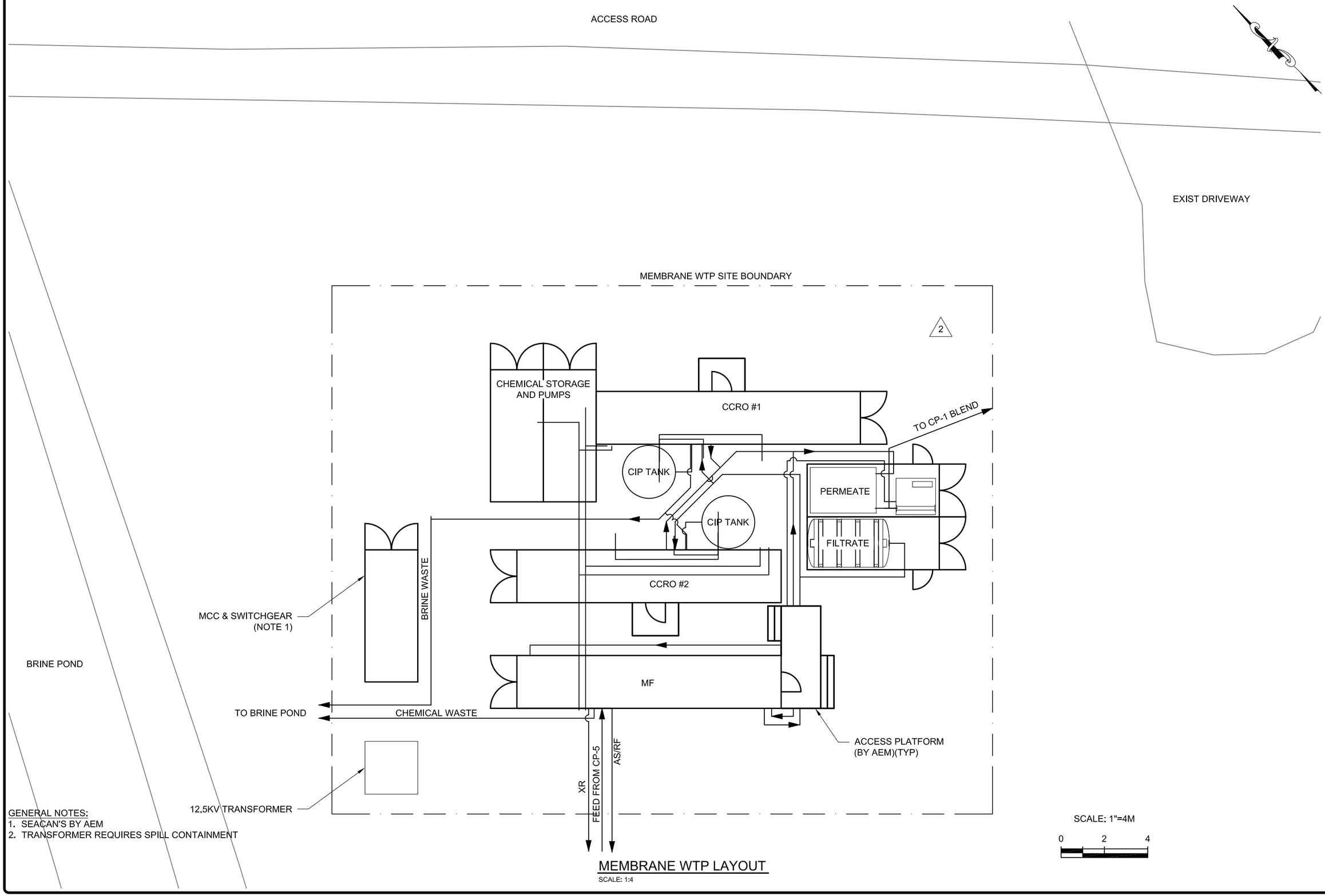
DATE:
APRIL 06, 2018

SCALE:
1:30

SHEET NO.
C-102

APPENDIX B

GENERAL ARRANGEMENT



MEMBRANE WTP LAYOUT

SCALE: 1:4

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REV.	DATE	REVISION DESCRIPTION
0	02/28/18	ISSUED FOR CONSTRUCTION
1	03/12/18	MULTIPLE CONTAINERS AND PIPING
2	04/06/18	MULTIPLE CONTAINERS AND PIPING

TITLE: GENERAL ARRANGEMENT
MEMBRANE WTP LAYOUT

PROJECT: AGNICO EAGLE MINES LTD
MELIADINE TEMPORARY WTP

PROJECT NO. 55.02

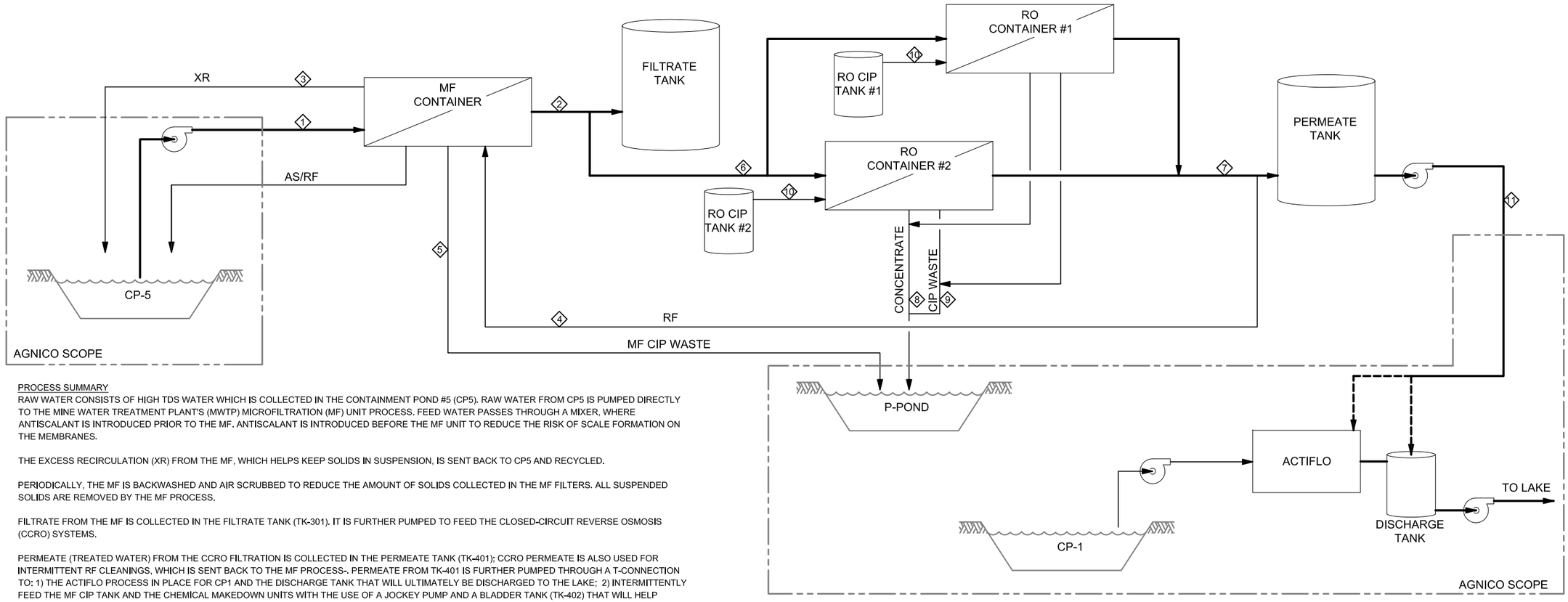
DATE: FEBUARY 28 2018

SCALE: 1:4

SHEET NO. C-101

APPENDIX C

PFD



PROCESS SUMMARY

RAW WATER CONSISTS OF HIGH TDS WATER WHICH IS COLLECTED IN THE CONTAINMENT POND #5 (CP5). RAW WATER FROM CP5 IS PUMPED DIRECTLY TO THE MINE WATER TREATMENT PLANT'S (MWTP) MICROFILTRATION (MF) UNIT PROCESS. FEED WATER PASSES THROUGH A MIXER, WHERE ANTISCALANT IS INTRODUCED PRIOR TO THE MF. ANTISCALANT IS INTRODUCED BEFORE THE MF UNIT TO REDUCE THE RISK OF SCALE FORMATION ON THE MEMBRANES.

THE EXCESS RECIRCULATION (XR) FROM THE MF, WHICH HELPS KEEP SOLIDS IN SUSPENSION, IS SENT BACK TO CP5 AND RECYCLED.

PERIODICALLY, THE MF IS BACKWASHED AND AIR SCRUBBED TO REDUCE THE AMOUNT OF SOLIDS COLLECTED IN THE MF FILTERS. ALL SUSPENDED SOLIDS ARE REMOVED BY THE MF PROCESS.

FILTRATE FROM THE MF IS COLLECTED IN THE FILTRATE TANK (TK-301). IT IS FURTHER PUMPED TO FEED THE CLOSED-CIRCUIT REVERSE OSMOSIS (CCRO) SYSTEMS.

PERMEATE (TREATED WATER) FROM THE CCRO FILTRATION IS COLLECTED IN THE PERMEATE TANK (TK-401); CCRO PERMEATE IS ALSO USED FOR INTERMITTENT RF CLEANINGS, WHICH IS SENT BACK TO THE MF PROCESS-. PERMEATE FROM TK-401 IS FURTHER PUMPED THROUGH A T-CONNECTION TO: 1) THE ACTIFLO PROCESS IN PLACE FOR CP1 AND THE DISCHARGE TANK THAT WILL ULTIMATELY BE DISCHARGED TO THE LAKE; 2) INTERMITTENTLY FEED THE MF CIP TANK AND THE CHEMICAL MAKEDOWN UNITS WITH THE USE OF A JOCKEY PUMP AND A BLADDER TANK (TK-402) THAT WILL HELP MAINTAIN PRESSURE AND FLOW.

A WASTE STREAM CONTAINING THE MF'S AND CCRO'S CIP WASTE, AS WELL AS THE CONCENTRATE (BRINE) FROM THE CCRO, WILL BE DISCHARGED TO THE P-POND. NO NEUTRALIZATION WILL BE NEEDED.

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MASS BALANCE

MIN (1 CCRO Unit in Operation)												
STREAM TAG	1	2	3	4	5	6	7	8	9	10	11	12
PROCESS PARAMETERS	MF FEED (31% XR)	MF FILTRATE	EXCESS RECIRCULATION (XR)	RF	MF CIP WASTE	RO FEED	RO PERMEATE (85%)	RO CONC.	RO CIP WASTE	PERMEATE FLUSH	FINISH WATER	WASTE TO P-POND
DESIGN FLOW (INSTANTANEOUS), M^3/HR	59	41	18	82	82	40	34	6	11	218	34	317
DESIGN FLOW, M^3/DAY	1,303	877	398	27	10	867	737	130	1	7	701	149
TOTAL SUSPENDED SOLIDS, MG/L (%)*	10	-	-	382	252	-	-	-	-	-	-	-
TOTAL SUSPENDED SOLIDS, KG/DAY*	13.0	-	-	10.4	2.6	-	-	-	-	-	-	-
SERVICE FACTOR (HR/DAY)	21.95			0.80	1.25	22.8					22.8	

DESIGN (2 CCRO Units in Operation)												
STREAM TAG	1	2	3	4	5	6	7	8	9	10	11	12
PROCESS PARAMETERS	MF FEED (31% XR)	MF FILTRATE	EXCESS RECIRCULATION (XR)	RF	MF CIP WASTE	RO FEED	RO PERMEATE (85%)	RO CONC.	RO CIP WASTE	PERMEATE FLUSH	FINISH WATER	WASTE TO P-POND
DESIGN FLOW (INSTANTANEOUS), M^3/HR	119	82	36	82	82	80	68	12	11	218	68	323
DESIGN FLOW, M^3/DAY	2,605	1,755	796	55	10	1,744	1,483	262	1	7	1,420	281
TOTAL SUSPENDED SOLIDS, MG/L (%)*	10	-	-	382	504	-	-	-	-	-	-	-
TOTAL SUSPENDED SOLIDS, KG/DAY*	26.1	-	-	20.8	5.2	-	-	-	-	-	-	-
SERVICE FACTOR (HR/DAY)	21.95			0.80	1.25	22.8					22.8	

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REV.	DATE	REVISION DESCRIPTION
0	02/28/18	ISSUED FOR CONSTRUCTION
1	03/06/18	REVISED AS NOTED
2	03/13/18	REVISED AS NOTED
3	04/06/18	PROJECT SUMMARY ADDED

TITLE: PROCESS FLOW DIAGRAM

PROJECT: AGNICO EAGLE MINES LTD
MELIADINE TEMPORARY WTP

PROJECT NO. 55.02

DATE: FEB. 28, 2018

SCALE: NA

SHEET NO. G-100