MAMMOTH LAKE TREATED WATER DIFFUSERS

WHALE TAIL PROJECT

Construction Summary Report

Submitted by:
Agnico Eagle Mines Limited
Meadowbank Division
P.O. Box 540
Baker Lake, Nunavut
X0C 0A0

September 9, 2020

EXECUTIVE SUMMARY

Agnico Eagle Mines Limited ("AEM") has prepared this as-built report (construction summary) for the treated water diffusers installed in Mammoth Lake. These diffusers are required when discharging treated water from the water treatment plant (WTP) in Mammoth Lake.

The overall schedule for the installation of the diffusers in Mammoth Lake was the following:

- On-ice installation of diffusers between April 22, 2019 and May 22, 2019
- Completion of diffuser sinking on ice sheet on July 5, 2019
- Relocation of Eastern summer diffuser on August 4, 2019
- Relocation of Western summer diffuser on August 18, 2019
- Commissioning of Western diffuser on August 26, 2019
  Commissioning of Eastern diffuser on June 17, 2020

The system was installed by AEM. The controls applied during the construction and installation were used to confirm that installation was completed in compliance with the design intent of the construction document.

During the course of the installation, a field adjustment was made to correct the installation location of the Eastern and Western diffusers which drifted during installation.

DOCUMENT CONTROL

Document Version	Date	Revised Section	Revision
Final	09/09/2020	-	-

TABLE OF CONTENTS

TABLES

APPENDICES

SECTION 1.0 – INTRODUCTION

The objective of the Treated Water Diffuser in Mammoth Lake (diffusers) is to diffuse the residual contaminants from the outflow of the water treatment plant (WTP). The diffusers are designed to attain a sufficient diffusion factor for arsenic and phosphorus, which have been identified as the main contaminants from the contact water treated by WTP.

This document presents the construction summary report of the Mammoth Lake diffusers required by the Water License 2AM-WTP1830 Part D Item 16. This report presents a summary of the installation activities, the QA/QC activities, as well as the overall information used to produce the as-built drawings.

1.1 Roles and Responsibilities

The engineering design and construction documents of the diffusers was developed by SNC Lavalin based on diffusion calculations made by Golder. Agnico Eagle Mines Limited ("AEM") was responsible for the construction and installation of the system and the QA/QC during construction.

Table 1 presents a summary of the general roles and responsibilities for each of the parties involved during the diffuser's installation. This table also includes the key companies and the key personnel that contributed to the various construction activities.

Table 1: Roles, Responsibilities and Key Personnel

Company	Role	Responsibility	Key Personnel	Position
Agnico Eagle Mines Limited	Owner	Produce as-built drawings	Yan Côté	Engineering Superintendant
		Manage construction activity	Guillaume Gemme	E&I Superintendant
		Operation of diffusers Supervise work	Shawn Valiquette / Gaetan Martel	Construction Supervisor
SNC Lavalin	Designer	Engineering of the system (report and construction drawing)	Dan Chen / Holman Tellez / Anh-Long Nguyen	Engineer

1.2 Overall Project Schedule

The overall schedule for the installation and commissioning of the diffusers in Mammoth Lake was the following:

- On-ice installation of three diffusers between April 22, 2019 and May 22, 2019
- Completion of diffusers sinking on ice sheet on July 5, 2019
- Re-Installation of Eastern summer diffuser on August 4, 2019
- Re-installation of Western summer diffuser on August 18, 2019
- Commissioning of Western diffuser on August 28, 2019
- Commissioning of Eastern diffuser on June 17, 2020

1.3 Construction Documents

The Design Report and Construction Drawings of the diffusers in Mammoth Lake were completed by SNC Lavalin. Table 2 presents the available construction documents that were submitted as part of the 60 days' notice. These documents can be found in Appendix A1. Refer to the original design report for the signed and stamped version.

Table 2: List of Construction Documents

Document Number	Date	Rev	Title
1789310_247-TM	2019/01/10	-	Technical Memorandum – Effluent Plume Modelling in Mammoth Lake
Report 651298-8000-40ER-0002	2019/02/13	E02	Treated water diffuser design
Drawing 61-695-270-204	2018/08/31	R0	Profile view - Pipeline and diffuser installed in Mammoth Lake
Drawing 61-695-270-205	2018/08/31	R1	Piping details – Typical details for diffuser and boulder installation
Drawing 61-695-270-206	2019/01/28	00	Profile view – Pipeline and diffuser installed in Mammoth Lake for winter operation
Drawing 61-695-270-207	2019/01/28	R0	Piping details – Typical details for diffuser and boulders installation for winter operation

1.4 As-Built Drawings

Table 3 presents the as-built drawings list for the diffusers installed in Mammoth Lake. The survey and the as-built drawings were done by AEM. The as-built drawings are presented in Appendix A2.

Table 3: List of As-Built Drawings

Drawing #	Drawing Title	Date	Rev
0	Drawing Index	3/08/2020	1
1	Treated Water Diffuser in Mammoth Lake – Plan View	3/08/2020	1
2	Treated Water Diffuser in Mammoth Lake – Cross-Section	3/08/2020	1
3	Treated Water Diffuser in Mammoth Lake – Outlet and Ballasting Details	3/08/2020	1

SECTION 2.0 – INSTALLATION

The diffusers system installation in Mammoth Lake consisted of the following components:

- Eastern and Western diffusers (designed for summer use) consisting each of a ballasted 14'' HDPE pipe with 10 discharge ports at a spacing of 12.5 m. The submerged diffusers were installed in a deep part of Mammoth Lake.
- Central diffuser (Winter diffuser) designed for winter use consisting of a ballasted 14'' HDPE pipe with 3 discharge ports at 14 m spacing. The submerged diffuser was installed in a deep part of Mammoth Lake.
- The Eastern and Western diffuser are connected to the WTP by an insulated 14'' HDPE pipe
- The winter diffuser will be connected to the WTP by an insulated and heat traced 6'' HDPE pipe

A blind flange was installed at the end of each the HDPE pipe. Each discharge port consisted of an Ø80 mm diameter pipe (725 mm long) mounted on a saddle. The end of the pipe is equipped with an orifice plate with an opening of 61 mm. The diffuser and submerged portion of the pipelines are weighted using boulders as ballasts. Eye bolts were installed on each boulder and they were attached by a steel wire to clamp rings installed on the pipe. The distance between each ballast was set at 20 m and the minimum weight of each boulder was set at 1500 kg. That anchoring configuration was chosen to accommodate the installation method selected which was on ice installation.

The assembly and installation of the diffusers and pipelines took place in April and May 2019 as to minimize erosion issues during installation. The sections to be submerged were assembled on the Mammoth Lake shore, before being dragged out over the ice. The diffusers were positioned at the planned location and positioned as straight as possible perpendicular to the shoreline. The Western and Eastern diffusers were positioned 100 m apart and the winter diffuser in the middle between them so there was 50 m between each diffuser. The first flange of the submerged section of pipeline of each diffuser was positioned on the shoreline and the horizontal distance from the south shoreline to the end of the diffusers was 311 m for the summer diffusers and 273.5 m for the winter diffuser.

Once the spring melt began, the winter diffuser sank as planned, but the Eastern and Western diffusers kept afloat and drifted due to the wind and the water currents. With the help of boats and professional

divers, the summer diffusers were reinstalled back into their original alignment and successfully sunk. The Eastern diffuser was sunk on August 4, 2019 while the Western diffuser was sunk on August 14, 2019.

Selected photographs of the work progress taken throughout the installation are shown in Appendix B.

SECTION 3.0 – QA/QC PROGRAM

After the installation of all equipment on ice, a quality control check was performed by AEM to confirm the system integrity. A visual inspection was done to confirm no equipment was missing or improperly installed. The location of the pipe was also surveyed on ice and on the shore.

During the reinstallation of the Western and Eastern diffusers a surveyor was present in the boat to ensure the diffusers were relocated in their original alignments.

No deficiencies were found during construction and commissioning.

SECTION 4.0 – DESIGN CHANGES AND FIELD ADJUSTMENTS

A field adjustment was implemented during the installation to adapt the construction to an unforeseen issue.

Field Adjustment – Relocation and Sinking of the Western and Eastern Diffusers

Due to air trapped in the HDPE pipe, the ballasting weight was not enough to sink the Eastern and Western diffusers. Following the ice sheet thaw of Mammoth Lake, they remained afloat and drifted out of place. With the help of boats, AEM towed the diffusers back into place. Professional divers then partially opened the blind flange letting water enter the diffuser and removed the discharge port caps letting air escape. Once the diffusers and pipelines were full of water, they sank into place on the lake bed. The divers then closed the blind flange and reinstalled the discharge port caps.

SECTION 5.0 – COMMISSIONING

The Western diffuser was commissioned on August 26 2019 and the Eastern diffuser was commissioned on June 17, 2020. The winter diffuser has not been commissioned yet.

SIGNATURE

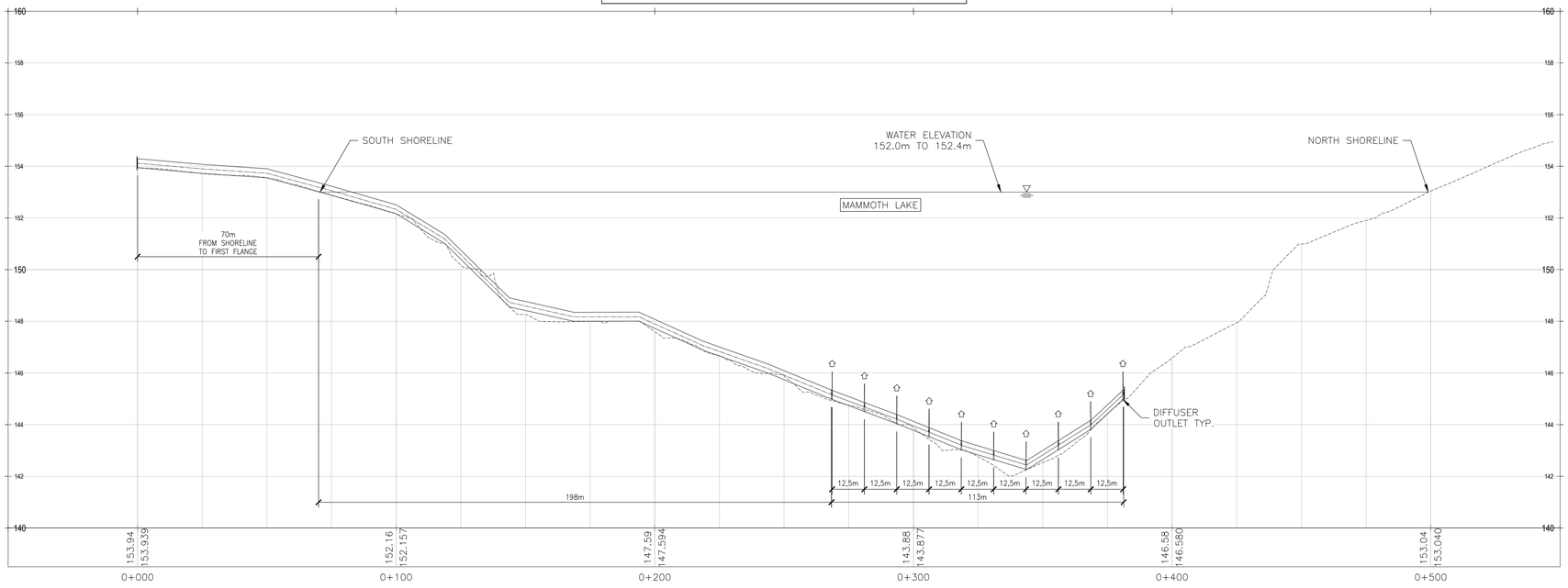
Mark Morin, Engineering General Supervisor
NAPEG # L4003
Agnico Eagle Mines Limited
Meadowbank, Nunavut Division

APPENDIX A1 – CONSTRUCTION DRAWINGS

NO. DESSIN
DRAWING NO. 651298-VIEWPORTS

FORMAT ARCHD

TYPICAL DIFFUSER PROFILE FOR LINES 5A AND 5B



PLAN CLÉ
KEY PLAN

SNC·LAVALIN

Mining & Metallurgy
5500, des Galeries Blvd., bur. 200, Quebec (Quebec), Canada G2K 2E2
Telephone: (418) 621-5500, Fax: (418) 621-8887

PROJECT No	SUBDIVISION	SUBJECT	SERIAL	REV.
651298	8200	41 D6	0005	E00

NOTES GÉNÉRALES / GENERAL NOTES

Notes:
1) The Profile view shows the pipeline and diffuser to be installed in Mammoth Lake required for lines 5A and 5B (WTP to Mammoth Lake).
2) The pipeline is a 14-in HDPE DR17.
3) Refer to drawing 61-695-270-205 for typical details on the installation of the diffuser and boulders on the pipeline.

DESSINS EN RÉFÉRENCE / REFERENCE DRAWINGS

TITRE / TITLE	# DWG

AGNICO EAGLE

REV.	DATE	DESCRIPTION	PAR/BY	APP.	CLIENT
R0	2018-10-24	ISSUED FOR CONSTRUCTION	PC	ALN	

REVISIONS

TITRE / TITLE
AGNICO EAGLE – AMARUQ DIVISION
695 – WATER MANAGEMENT
270 – PIPING
PROFILE VIEW
PIPELINE AND DIFFUSER INSTALLED
IN MAMMOTH LAKE

DESSINÉ PAR / DRAWN BY	STÉPHANE LANTEIGNE	DATE 2018-08-31
VÉRIFIÉ PAR / CHECKED BY	PIERRE CARIGNAN	2018-08-31
APPROUVÉ PAR / APPROVED BY	ANH-LONG NGUYEN, RENÉ LAVIOLETTE	2018-08-31
ÉCHELLE / SCALE	1:1000	DATE 2018-08-31

NO. DESSIN / DRAWING NO.
61-695-270-204

NO. PROJET / PROJECT NO.	REVISION	FEUILLE / SHT
6118	R0	1 / 1

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FILE NO. 651298-VIEWPORTS.dwg

NO. DESSIN
DRAWING NO. 61-695-270-205_R1

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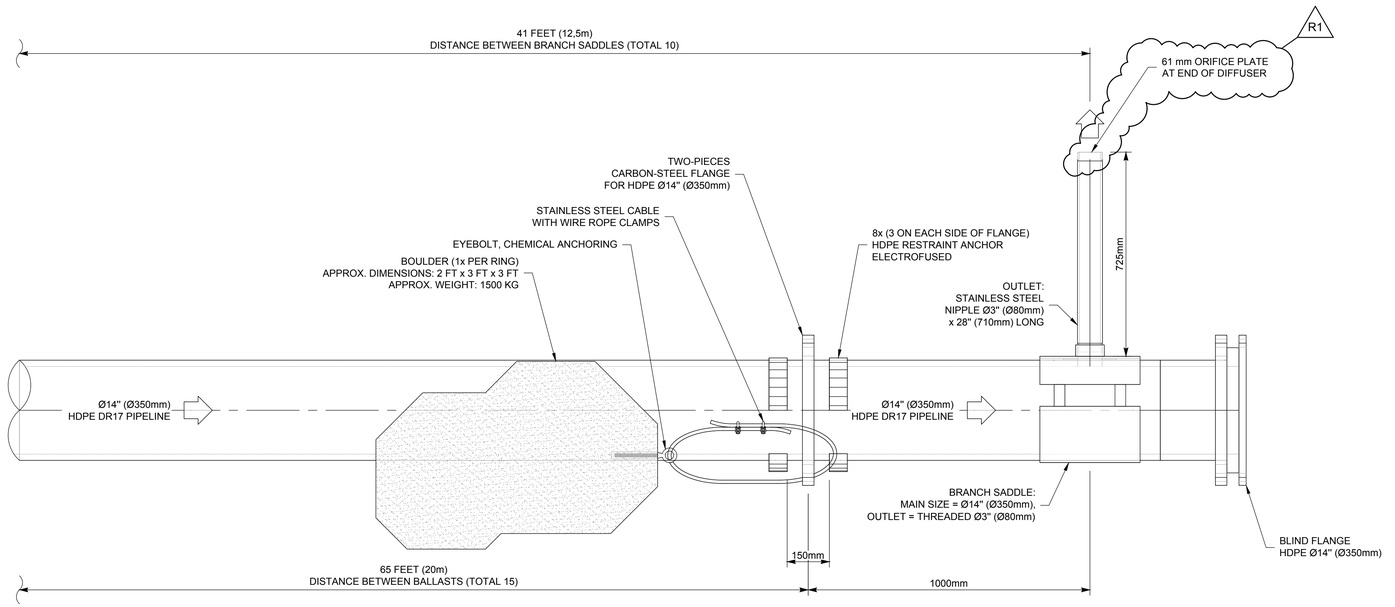
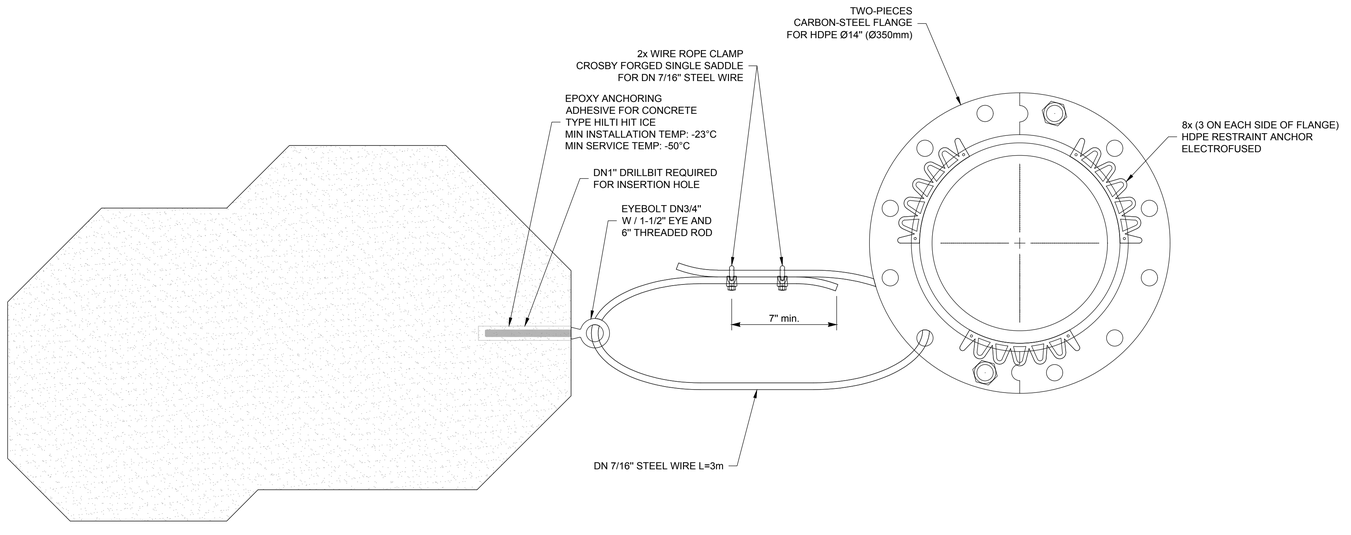


TYPICAL DETAIL
DIFFUSER OUTLETS AND BALLASTING

ELEVATION VIEW
1:10



TYPICAL DETAIL - BALLASTING

ELEVATION VIEW
1:5

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PROJECT No	SUBDIVISION	SUBJECT	SERIAL	REV.
651298	8200	41_D6	0006	E01

NOTES GÉNÉRALES / GENERAL NOTES

Notes:
1) Boulders are used as ballast. They are installed every 20m approximately along the pipeline, from the diffuser end to the shoreline.

Disclaimer :
1) The proposed method for ballasting the diffuser and submerged pipeline length is not according to standard practice nor does it comply with the pipe manufacturer's recommendations. It is based upon AEM's experience and site constraints.
2) The spacing between ballasts here specified is greater than the maximum recommended spacing and may cause the pipeline to arc upwards between ballasts. This may cause air to be entrapped along the line and reduce pumping capacity. The air should be pushed out of the line once pumping starts. However, if this is not the case, air pockets may be evacuated subsequently by drilling a small hole at the apex of the submerged arc. This will require a diver. Pre-Drilling is not recommended and will affect the pipe's structural integrity.
3) The proposed spacing dictates the boulder sizing. The greater the spacing, the greater the boulder size. The proposed boulders are important weights acting on a small pipe surface and may cause the pipeline to kink, especially given the cold temperatures that could render the pipe more brittle.
4) Given AEM's chosen installation method, the final pipeline location cannot be guaranteed. The pipeline may sink elsewhere than at the intended coordinates, determined by Golder Associates Inc. Indeed, the rate at wich it will sink, as well as where it sink are dependent upon the climate and weather as well as the rate at wich the ice melts.
To mitigate the risk:
a) Allow for a longer pipeline length on the south shore of Mammoth Lake. If the pipeline is dragged towards the lake, the end will not be lost underwater.
b) Properly anchor the pipeline on both the south and the north shores, according to recommendations. The anchors will attempt to prevent important displacements, but cannot guarantee that minor displacements will occur.

DESSINS EN RÉFÉRENCE / REFERENCE DRAWINGS

TITRE / TITLE	# DWG

AGNICO EAGLE

REV.	DATE	DESCRIPTION	PAR/BY	APP.	CLIENT
R1	2018-12-18	ISSUED FOR CONSTRUCTION	PC	ALN	
R0	2018-10-24	ISSUED FOR CONSTRUCTION	PC	ALN	

REVISIONS

TITRE / TITLE
AGNICO EAGLE – AMARUQ DIVISION
695 – WATER MANAGEMENT
270 – PIPING
PIPING DETAILS
TYPICAL DETAILS FOR DIFFUSER
AND BOULDERS INSTALLATION

DESSINÉ PAR / DRAWN BY	STÉPHANE LANTEIGNE	DATE 2018-08-31
VERIFIÉ PAR / CHECKED BY	PIERRE CARIGNAN	2018-08-31
APPROUVÉ PAR / APPROVED BY	ANH-LONG NGUYEN, RENÉ LAVIOLETTE	2018-08-31
ÉCHELLE / SCALE	1:10	DATE 2018-08-31

NO. DESSIN / DRAWING NO.: 61-695-270-205

NO. PROJET / PROJECT NO.	REVISION	FEUILLE / SHT.
6118	R1	1 / 1

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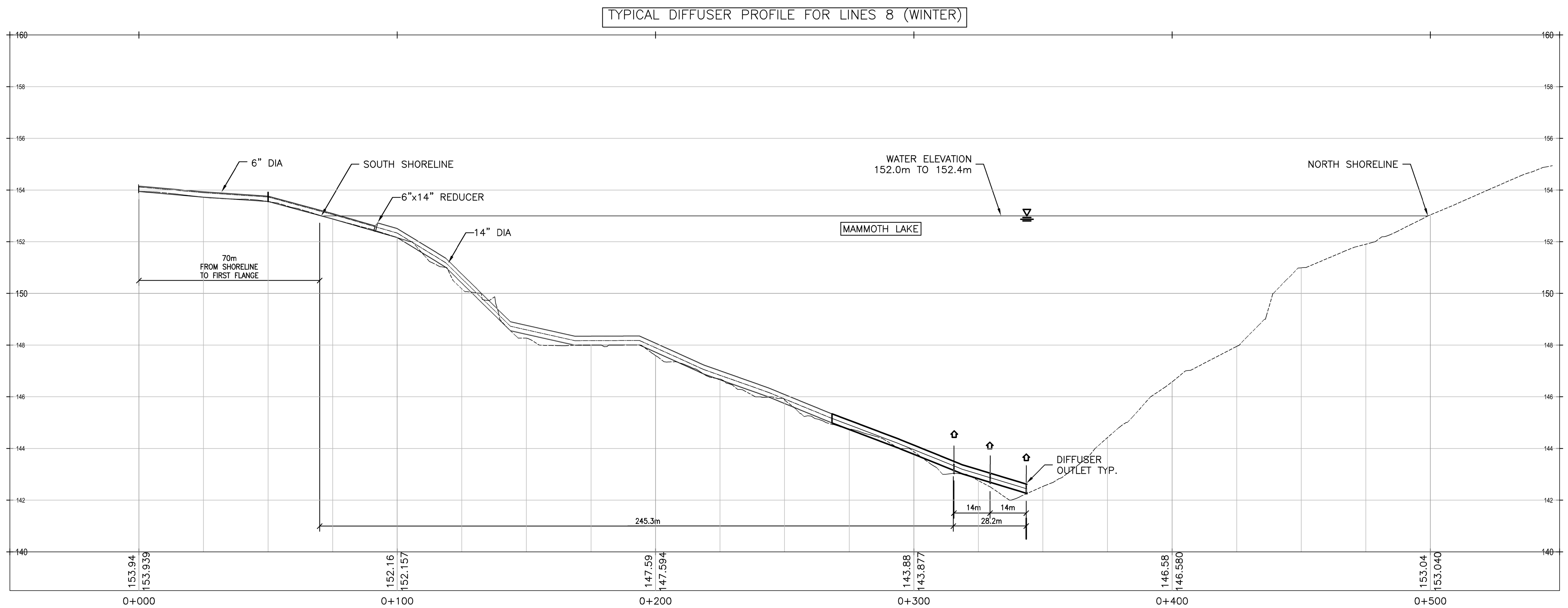

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Telephone: (418) 621-5500, Fax: (418) 621-8887

PROJECT No	SUBDIVISION	SUBJECT	SERIAL	REV.
651298	8200	41 D6	0007	E00

NOTES GÉNÉRALES / GENERAL NOTES

Notes:

1) The Profile view shows the pipeline and diffuser to be installed in Mammoth Lake required for line 8 (WTP to Mammoth Lake).
2) The submerged pipeline is a 14-in HDPE DR17.
3) Refer to drawing 61-695-270-207 for typical details on the installation of the diffuser and boulders on the pipeline.

DESSINS EN RÉFÉRENCE / REFERENCE DRAWINGS

TITRE / TITLE	# DWG

AGNICO EAGLE

REV.	DATE	DESCRIPTION	PAR/BY	APP.	CLIENT
00	2019-01-28	ISSUED FOR CONSTRUCTION	PC	ALN	

REVISIONS

TITRE / TITLE

AGNICO EAGLE – AMARUQ DIVISION
695 – WATER MANAGEMENT
270 – PIPING
PROFILE VIEW
PIPELINE AND DIFFUSER INSTALLED
IN MAMMOTH LAKE FOR WINTER OPERATION

DESSINÉ PAR / DRAWN BY	MOVILA MARIUS	DATE 2019-01-28
VERIFIÉ PAR / CHECKED BY	PIERRE CARIGNAN	2019-01-28
APPROUVÉ PAR / APPROVED BY	ANH-LONG NGUYEN, RENÉ LAVIOLETTE	2019-01-28
ÉCHELLE / SCALE	1:1000	DATE 2019-01-28
NO. DESSIN / DRAWING NO.	61-695-270-206	
NO. PROJET / PROJECT NO. 6118	REVISION R0	FEUILLE / SHT 1 / 1

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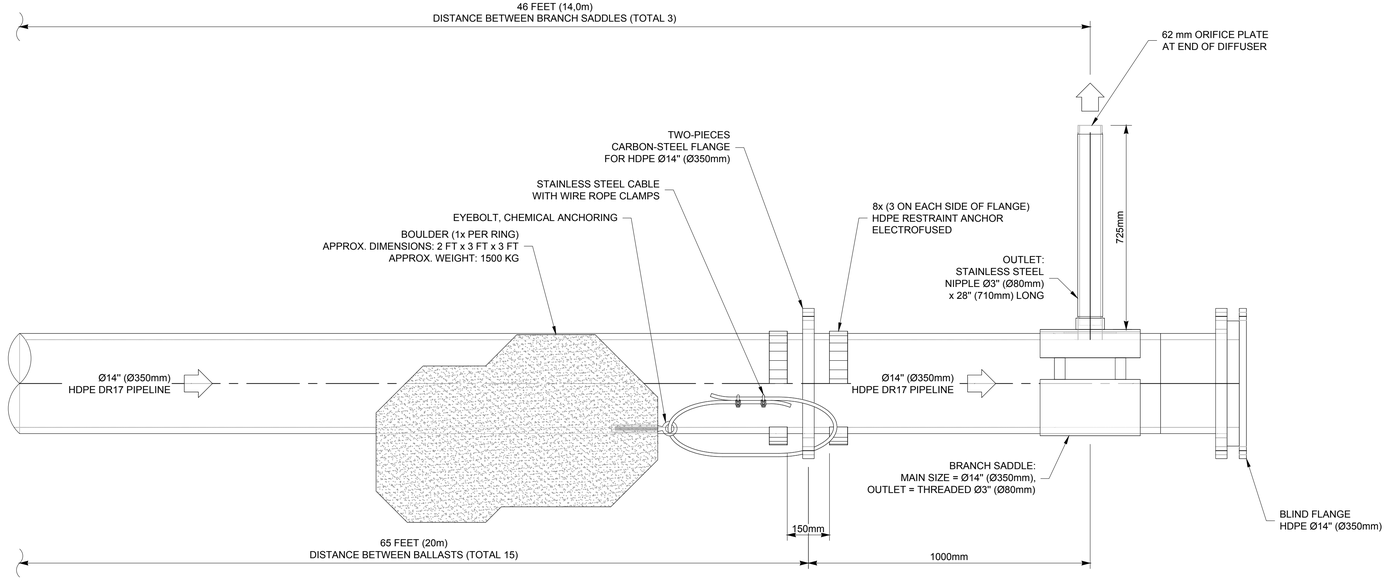
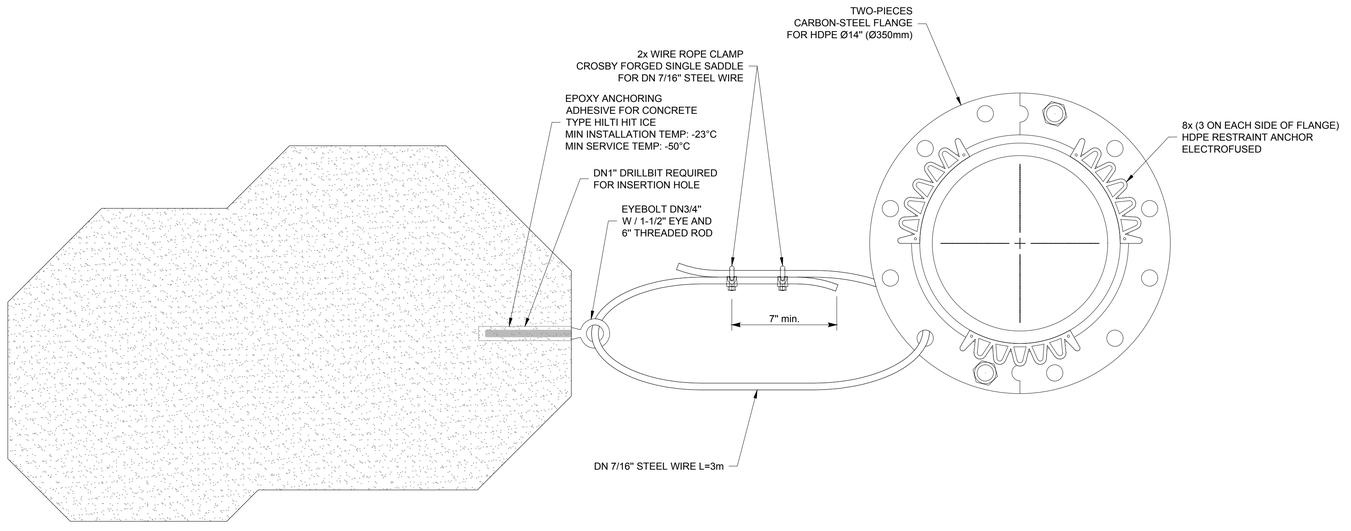


TYPICAL DETAIL
DIFFUSER OUTLETS AND BALLASTING
ELEVATION VIEW
1:10



TYPICAL DETAIL - BALLASTING
ELEVATION VIEW
1:5

PLAN CLÉ
KEY PLAN

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Mining & Metallurgy
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PROJECT No	SUBDIVISION	SUBJECT	SERIAL	REV.
651298	8200	41_D6	0008	E01

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DESSINS EN RÉFÉRENCE / REFERENCE DRAWINGS

TITRE / TITLE	# DWG

AGNICO EAGLE

REV.	DATE	DESCRIPTION	PAR/BY	APP.	CLIENT
R0	2019-01-28	ISSUED FOR CONSTRUCTION	PC	ALN	

REVISIONS

TITRE / TITLE
AGNICO EAGLE – AMARUQ DIVISION
695 – WATER MANAGEMENT
270 – PIPING
PIPING DETAILS
TYPICAL DETAILS FOR DIFFUSER AND BOULDERS INSTALLATION FOR WINTER OPERATION

DESSINÉ PAR / DRAWN BY	MOVILA MARIUS	DATE 2019-01-28
VERIFIÉ PAR / CHECKED BY	PIERRE CARIGNAN	2019-01-28
APPROUVÉ PAR / APPROVED BY	ANH-LONG NGUYEN	2019-01-28

ÉCHELLE / SCALE	DATE
1:10	2019-01-28

NO. DESSIN / DRAWING NO.
61-695-270-207

NO. PROJET / PROJECT NO.	REVISION	FEUILLE / SHT.
6118	R0	1 / 1

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FILE NO. 61-695-270-207 R0.dwg

APPENDIX A2 – AS BUILT DRAWINGS

DRAWING NO.

FORMAT ARCHD–LANDSCAPE

AGNICO EAGLE - MEADOWBANK COMPLEX

AMARUQ PROJECT

DRAWING No.	TITLE	REVISION	DATE
0	DRAWING INDEX	1	03/08/2020
1	MAMMOTH LAKE PERMANENT DIFFUSERS	1	03/08/2020
2	DIFFUSER CROSS SECTION	1	03/08/2020
3	OUTLET AND BALLASTING DETAILS	1	03/08/2020

KEY PLAN

GENERAL NOTES

TITLE	# DWG

REFERENCE DRAWINGS

REV.	DATE	DESCRIPTION	BY	APP.	CLIENT
1	03/08/2020	As Built Drawings	TD	FLB	

REVISIONS

AGNICO EAGLE
MEADOWBANK

TITLE
AGNICO–EAGLE – MEADOWBANK DIVISION
MAMMOTH LAKE PERMANENT DIFFUSERS
DRAWING INDEX

DRAWN BY	Thomas Dahm	DATE 03/08/2020
CHECKED BY	FLB, P. Eng.	03/08/2020
APPROVED BY	FLB, P. Eng.	03/08/2020
SCALE –	DATE 03/08/2020	
DRAWING NO.	0	
PROJECT NO.	REVISION 1	SHEET 1 / 4

\\Cambfs01\groups\Engineering\05–Geotechnic\14– Amaruq\04– Water Management\2– Construction\1– Dewatering PH1\4– Deliverable\1– As–Built Report\As–built Drawings\WhaleTail North Basin Dewatering Layout_V4.dwg, 03 Aug 2020

FILE NO. .DWG

DRAWING NO.

FORMAT ARCHD–LANDSCAPE

MAMMOTH LAKE

West Summer Diffuser. See Detail B Drawing #2

East Summer Diffuser. See Detail A Drawing #2

Winter Diffuser See Detail C Drawing #2

Approximate Location of Diffuser

Pit

NORTH EAST DIKE

POND AP-5

PAD D

PAD H

WHALE TAIL PIT

WTP

MAMMOTH DIKE

MAMMOTH LAKE

Sampling Port

HDPE ø14"
DR17 (2)

WHALE TAIL NORTH BASIN

WHALE TAIL DIKE

WHALE TAIL SOUTH BASIN

KEY PLAN

GENERAL NOTES

TITLE	# DWG
Diffuser Cross–Section	2
Outlet and Ballasting Details	3

REFERENCE DRAWINGS

Digitally signed by Mark Morin
Date: 2020.09.11 09:35:19 -05'00'

REV.	DATE	DESCRIPTION	BY	APP.	CLIENT
1	03/08/2020	As Built Drawings	TD	FLB	–

REVISIONS

AGNICO EAGLE
MEADOWBANK

TITLE
AGNICO–EAGLE – MEADOWBANK DIVISION
MAMMOTH LAKE PERMANENT DIFFUSERS
PLAN VIEW

DRAWN BY	Thomas Dahm	DATE 03/08/2020
CHECKED BY	FLB, P. Eng.	03/08/2020
APPROVED BY	FLB, P. Eng.	03/08/2020
SCALE N.T.S.	DATE 03/08/2020	
DRAWING NO.	1	
PROJECT NO.	REVISION 1	SHEET 1 / 3

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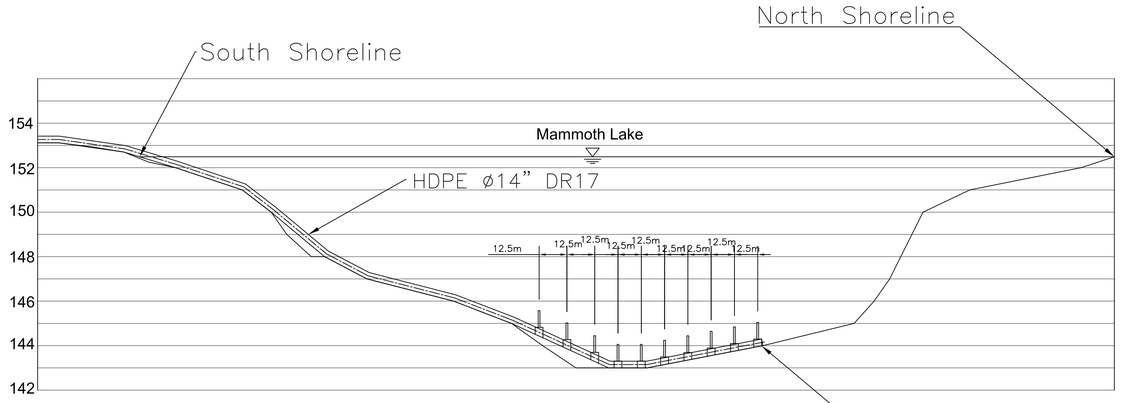
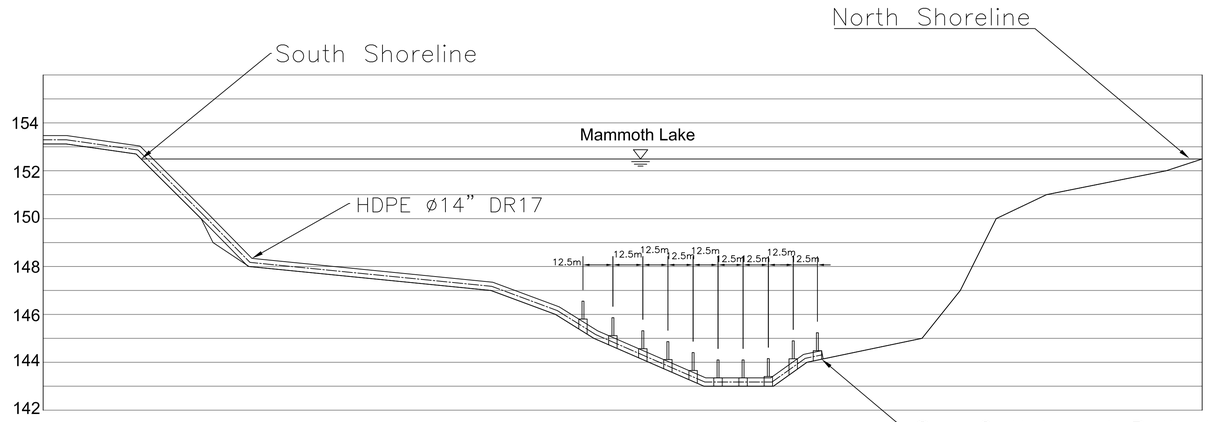
FILE NO. .DWG

DRAWING NO.

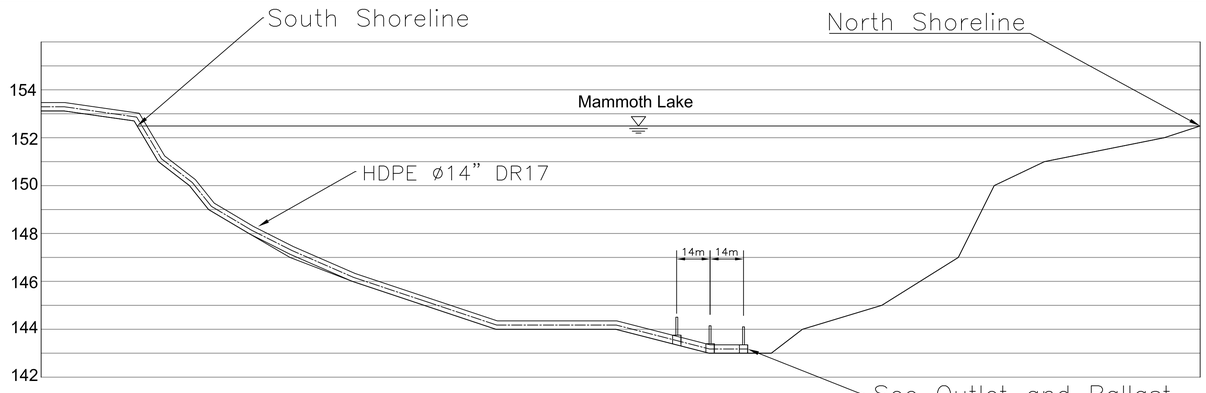
FORMAT ARCHD–LANDSCAPE



Summer Diffuser Detail 'A' East Section



Summer Diffuser Detail 'B' West Section



Winter Diffuser Detail 'C' Section

KEY PLAN

GENERAL NOTES

TITLE	# DWG
Outlet and Ballast Details	3

REFERENCE DRAWINGS

Digitally signed by Mark Morin
Date: 2020.09.11 09:35:34 -05'00'

REV.	DATE	DESCRIPTION	BY	APP.	CLIENT
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1	03/08/2020	As Built Drawings	TD	FLB	–

REVISIONS

AGNICO EAGLE
MEADOWBANK

TITLE
AGNICO–EAGLE – MEADOWBANK DIVISION
MAMMOTH LAKE PERMANENT DIFFUSERS
DIFFUSER CROSS SECTIONS

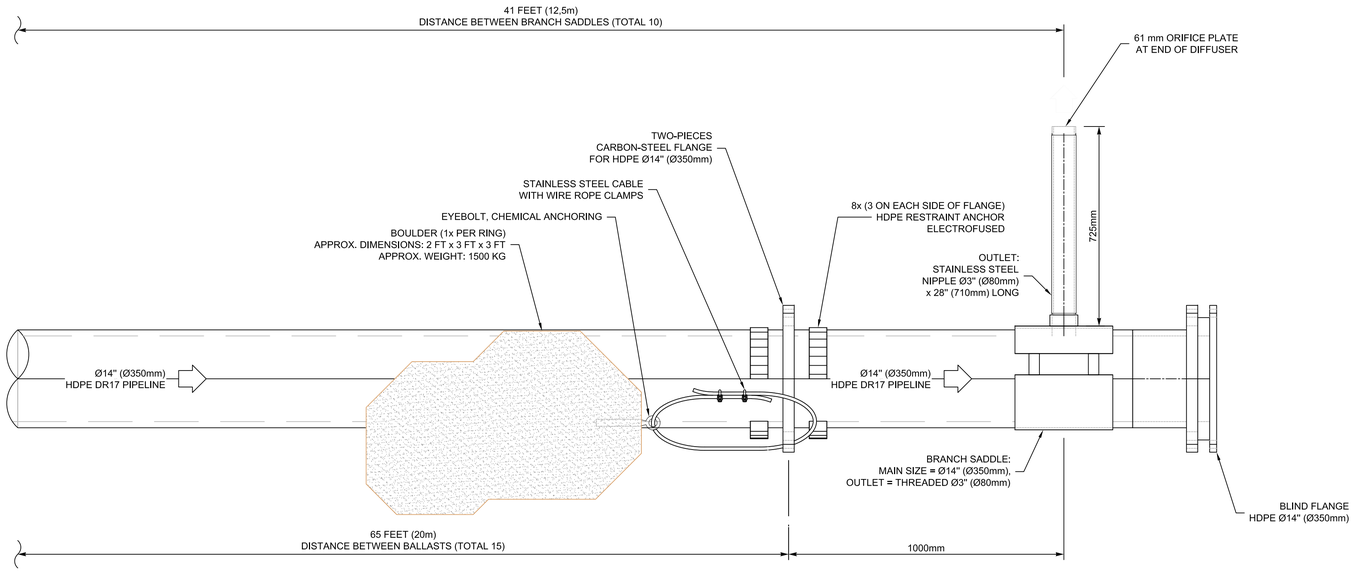
DRAWN BY: Thomas Dahm	DATE: 03/08/2020
CHECKED BY: FLB, P. Eng.	03/08/2020
APPROVED BY: FLB, P. Eng.	03/08/2020
SCALE: N.T.S.	DATE: 03/08/2020
DRAWING NO.: 2	
PROJECT NO.	REVISION: 1 / SHEET: 2 / 3

\\Combfs01\groups\Engineering\05-Geotechnic\14- Amaruq\04- Water Management\2- Construction\1- Dewatering PH1\4- Deliverable\1- As-Built Report\As-built Drawings\WholeTail North Basin Dewatering Layout_V4.dwg, 03 Aug 2020

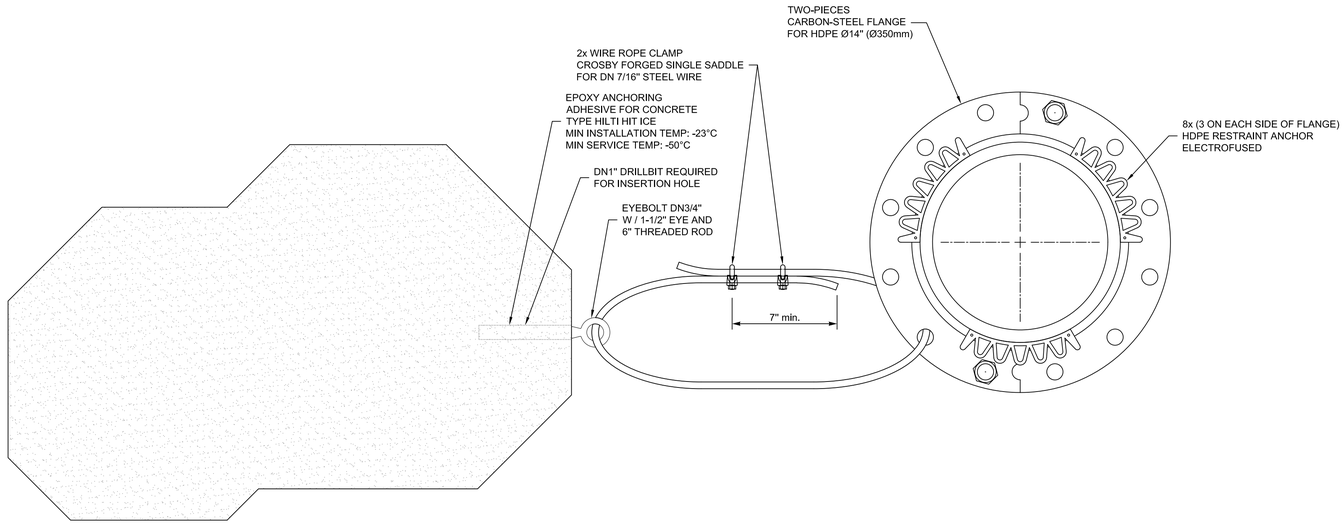
FILE NO. .DWG

DRAWING NO.

FORMAT ARCHD – LANDSCAPE



TYPICAL DETAIL
DIFFUSER OUTLETS AND BALLASTING
ELEVATION VIEW
1:10



TYPICAL DETAIL - BALLASTING
ELEVATION VIEW
1:5

KEY PLAN

GENERAL NOTES

TITLE	# DWG

REFERENCE DRAWINGS

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Date: 2020.09.11 09:36:08 -05'00'

REV.	DATE	DESCRIPTION	BY	APP.	CLIENT
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1	03/08/2020	As Built Drawings	TD	FLB	–

REVISIONS

AGNICO EAGLE
MEADOWBANK

TITLE
AGNICO–EAGLE – MEADOWBANK DIVISION
MAMMOTH LAKE PERMANENT DIFFUSERS
OUTLET AND BALLASTING DETAILS

DRAWN BY	Thomas Dahm	DATE 03/08/2020
CHECKED BY	FLB, P. Eng.	03/08/2020
APPROVED BY	FLB, P. Eng.	03/08/2020
SCALE N.T.S.	DATE 03/08/2020	
DRAWING NO.	3	
PROJECT NO.	REVISION 1	SHEET 3 / 3

\\Cambfs01\groups\Engineering\05–Geotechnic\14– Amaruq\04– Water Management\2– Construction\1– Dewatering PH1\4– Deliverable\1– As–Built Report\As–built Drawings\WhaleTail North Basin Dewatering Layout_V4.dwg, 03 Aug 2020

FILE NO. .DWG

APPENDIX B – PHOTOGRAPHS

Photograph 1 – View of the West summer diffuser installed on the icesheet (looking SE). The blind flange, discharge port and ballasting can be observed

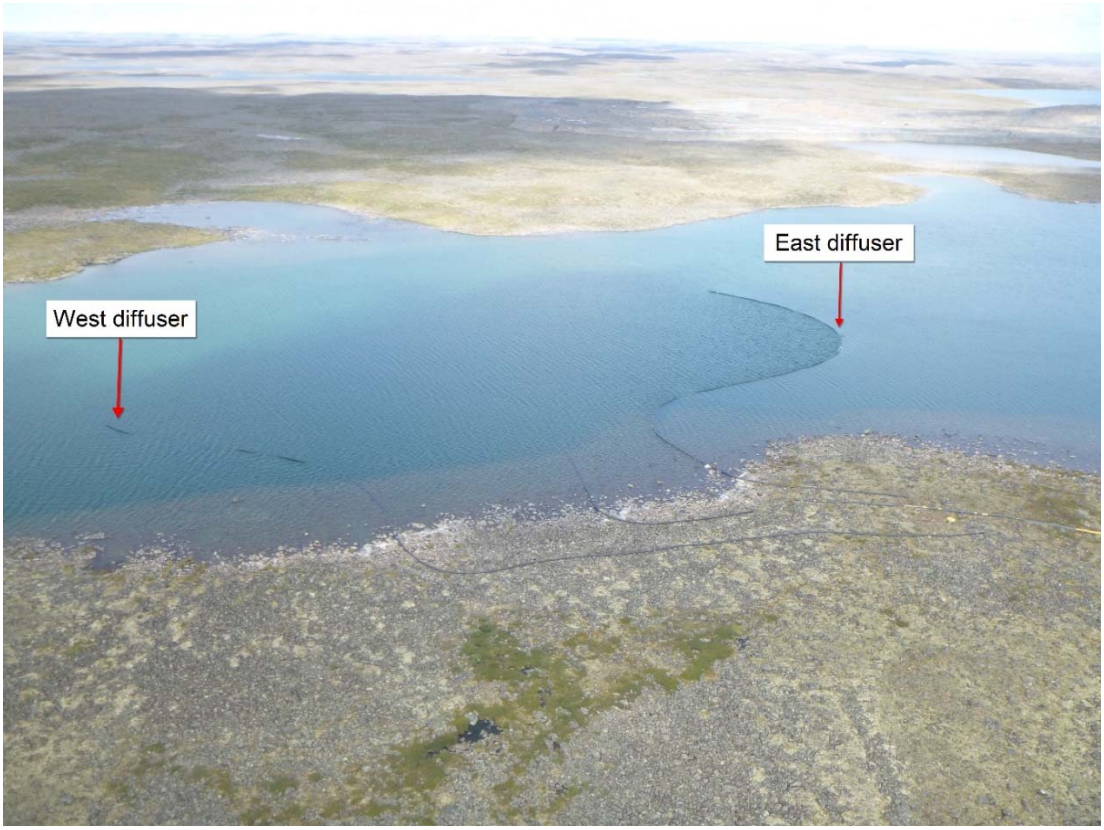
Photograph 2 – View of the East summer diffuser installed on the icesheet(looking SE). The blind flange, discharge port and ballasting can be observed

Photograph 3 – View of all three diffusers (looking South)

Photograph 4 – View of one of the discharge port

Photograph 5 – View of the boats used to re-install the diffusers into place (looking NW)

Photograph 6 – View of the summer diffusers afloat (looking SW)



Photograph 7 – Arial view of the summer diffusers afloat and the sunk winter diffuser (looking NW)

Photograph 8 – East diffuser reinstallation – Aug 2019

Photograph 9 – Aerial plan view after reinstallation – Summer 2020

Photograph 10 – View of Diffuser entering into Mammoth Lake – Summer 2020