



Baffinland Iron Mines Corporation - Mary River Project
Construction Summary Report: Explosives Facility Package - November 25, 2014

**Baffinland Iron Mines Corporation
Mary River Project**

Construction Summary Report: Explosives Facility Package



STAMP APPLIES TO CONSTRUCTION
SUMMARY AS FAR AS CONSTRUCTION PLANS
WERE FOLLOWED DURING CONSTRUCTION

PERMIT TO PRACTICE
HATCH LTD.
Signature *[Signature]*
Date 29 JAN 15
PERMIT NUMBER: P 512
The Association of Professional Engineers,
Geologists and Geophysicists of NWT/NU



STAMP DOES NOT APPLY TO
• ACTS, REGULATIONS, LICENCES
AND APPROVALS IN SECTION 1.1.
• CONSTRUCTION ACTIVITIES IN
SECTION 2 g ah
• APPENDIX A - B/C/D/E
• APPENDIX C

2015-01-15	0	Approved for Use	S. Hess	J. Kasemets	J. Cleland	D. Matthews
DATE	REV.	STATUS	PREPARED BY	CHECKED BY	APPROVED BY	APPROVED BY
HATCH					CLIENT	



H349000-4210-10-124-0001, Rev. 0
Page 1

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Facility Description Supporting Documents

1. Facility Description

1.1 Purpose and Design Basis

The explosives facility package includes the explosives plant building (i.e. the emulsion plant) and the explosives shop (storage for raw materials). These facilities were designed for modular installation in arctic conditions.

In support of the overall Mary River project development the use of explosives are required to produce construction aggregate and to facilitate mining activities. The facility's purpose is to manufacture and store the explosives and materials required to facilitate this objective and to minimize potential environmental impacts, specifically for water quality and wildlife during the period where blasting operations are conducted.

The design premise for these facilities is based on achieving a zero effluent process. Contaminated waste water generated from the manufacturing operations are collected and re-used in the process, including truck wash water.

The explosives facility and the operational policies in place meet or exceed the applicable regulations as part of the following acts:

- a. The Canada Explosives Act
- b. Transport of Dangerous Goods Act
- c. Occupational Health & Safety, Nunavut – Explosives Use Act
- d. Northwest Territories/ Nunavut Mine Health and Safety Act and Regulations.

All infrastructure and manufacturing processes are licensed and approved by Natural Resources Canada (NRCan) – Explosives Regulatory Division (ERD).

Magazine storage sites are licensed by the Nunavut Workers Safety and Compensation Commission (WSCC).

1.2 Location and Access

The explosives facility is located south of the Mine Site stockpile. The access road intersects the treated effluent pond access road mid-way between the stockpile and the treated effluent's approved discharge point. The building is located between northing N7 911 951 and N7 911 902 and easting E561 799 and E561 755.

The explosives facility is located more than 65m away from the facility's storage containers, more than 350m from the explosives magazine, and more than 970m from the ore crushing and screening pad.

The facility pad was constructed of raised earthworks complete with drainage culverts and access ramps.

2. Construction Activity Summary

Construction activities on the explosives facility package started in July 2014. Commissioning took place in September 2014. Completion of the handover certificate and closeout of the construction punchlist took place in November 2014.

The following summarizes the construction activities:

- a. Crushed blast rock and fill material was quarried, crushed, screened, and hauled from the Mine Site Quarry (QMR2) for use in the earthworks.
- b. Areas were cleared and graded to prepare the sub-base for construction.
- c. Installation of precast foundation blocks.
- d. Installation of fold-away building.
- e. Installation of floor insulation and rebar.
- f. Installation of concrete floor.
- g. Placement of modular building structures.
- h. Completion of electrical, mechanical and HVAC fit-out.

3. Photographic Records



Figure 1: Access road to explosives facility area



Figure 2: Precast foundation blocks and fold out building erection



Figure 3: Fold out building erection



Figure 4: Installation of floor insulation and reinforcing rebar

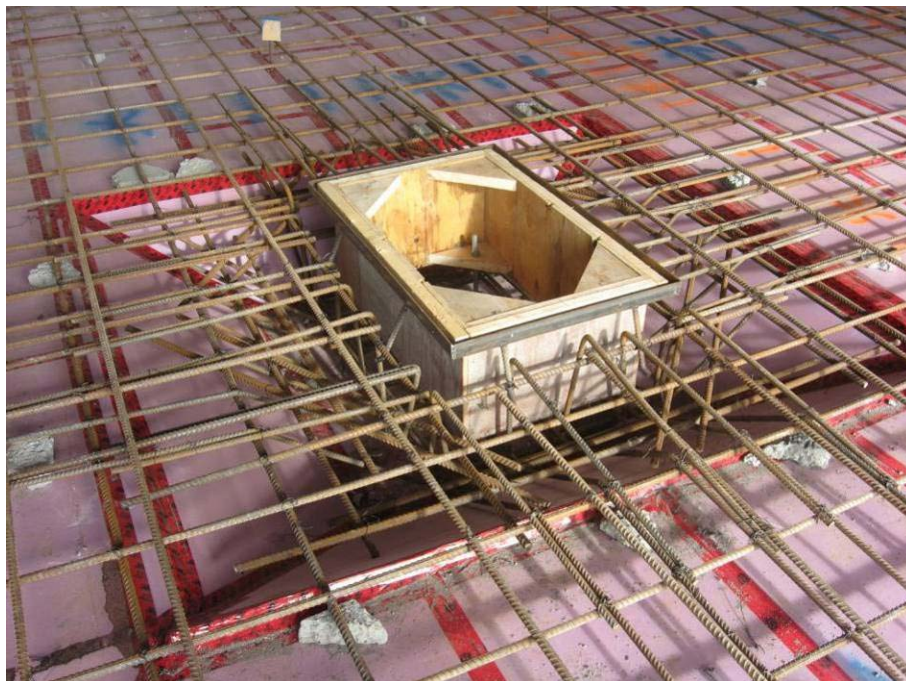


Figure 5: Installation of sump in floor of explosives facility building



Figure 6: In progress construction [south view]



Figure 7: In progress construction [east view]



Figure 8: Final earthworks construction [east view]



Figure 9: Final earthworks construction [west view]



Figure 10: Finished explosives facility [east view]



Figure 11: Finished explosives facility [west view]



Figure 12: Completed construction [south view]

4. As-Built Drawings

The as-built drawings incorporate contractor red line markups, field instructions, requests for information, field sketches, and all other inputs provided by the field engineering team. The as-built drawings are attached in Appendix A.

Table 4-1: Water Treatment System 'As-Built' Drawing List

Drawing Number	Title	Revision
H349000-4000-00-014-0014	Mine Site Explosives Storage Clearances General Arrangement	0
E349000-SX001-35-035-0005	Mary River Emulsion Plant – Unit Details Modular Plant	SUB01
E349000-SX001-35-035-0006	Mary River Emulsion Plant – General Arrangement	SUB01
E349000-SX001-35-035-0007	Mary River Emulsion Plant – Modular Plant General Arrangement	SUB01
E349000-SX001-35-035-0008	Mary River Emulsion Plant Containment Plan	SUB01

5. Field Decisions

The following sections describe the most relevant field decisions made during construction:

- a. The cut-out notch size between the explosives plant precast foundation blocks located at the module connection location linking the garage to the modules was modified. The floor level required adjustment to correct for the minor misalignment during installation.

6. Performance Evaluation

As of the data collection cut-off date for this report (November 25, 2014) there have been no adverse observations in operational performance of the explosives facility.

7. Vibration Monitoring and Quarrying Activity

No vibration monitoring was conducted during the construction of the explosives facility package as it was not deemed necessary based on scope of activities required for construction.

Control for quarrying activity was conducted as per the project's specific management plans:

- BAF-PH1-830-P16-0040 (H349000-4100-07-245-0001): Quarry Management Plan Mine Site Quarry (QMR2)
- BAF-PH1-830-P16-0004 (H349000-1000-07-126-0011): Borrow Pit and Quarry Management Plan

8. Environmental Monitoring

Environmental monitoring during the construction of the explosives facility was conducted as per the BAF-PH1-830-P16-0008 Environmental Protection Plan (EPP) recently updated in July 2014.

In addition to the EPP, BIM self-performed earthworks construction follows the requirements of the BAF-PH1-830-STD-0001 Environmental Health and Safety Management Framework issued December 2010. The Baffinland on-site Environmental Management Team was responsible for environmental monitoring at all sites during construction and following-up with the construction team(s) if there were any reported environmental incidents or non-conformances.

Explosives facility construction was also required to follow the requirements of the Surface Water and Aquatic Ecosystems Management Plan (March 2014), BAF-PH1-830-P16-0026. This Management Plan outlines the best management practices implemented to limit the potential for adverse impacts to receiving waters, aquatic ecosystems, fish and fish habitat used during construction. In addition this plan details the systems in place to mitigate and manage drainage and runoff at the building sites, address point and non-point discharges to surface waters and assess those discharges on water quality and quantity relative to their receiving water systems.

The Spill Contingency Plan (March 2014), BAF-PH1-830-P16-0036, in conjunction with the Emergency Response Plan (March 2014), BAF-PH1-830-P16-0007, provides guidance and instructions for first responders and Baffinland Management in the event of a spill event or other emergency such as fire or accident.

The risks to the water quality in the respective rivers and streams as a result of construction of the explosives facility package would originate from following sources based on construction methodology:

- Spills from equipment
- Increase in sediment load in the water

There were no recorded spills from equipment used at the construction site. During the period of construction, water quality monitoring conducted at downstream stations under Part D, Section 16 and Part I, of the Type "A" Water Licence 2AM-MRY1325 indicated total suspended solids (TSS) and other parameter at levels below the specified Water Licence criteria. The results for water quality monitoring were provided in monthly reports submitted to the Nunavut Water Board and other stakeholders. In consideration of the above, the environmental mitigation strategies were effective in maintaining runoff water quality.

9. Earthworks Data

The survey data collected has been included in Appendix B.

10. Unanticipated Observations

There were no unanticipated observations during construction of the explosives facility package.

11. Surface Monitoring

Not conducted.

12. Required Maintenance

None conducted to-date.

13. Adaptive Management

For discussion of adaptive management principles and practices applied during the Construction Phase of the Project and their overall effectiveness please refer to the 2013 Annual Report to the Nunavut Impact Review Board. Any additional adaptive management practices implemented as a result of works completed in 2014 will be reported in the updated 2014 Annual Report to the Nunavut Impact Review Board.

14. Concordance with Type “A” Water Licence

The Nunavut Water Board Type “A” Licence 2AM-MRY1325, Schedule D, outlines the requirements for Construction Monitoring Reports. The following table provides a concordance of the report, herein, with the requirements included in Part D.

Table 14-1: Table of Concordance for Schedule D

Schedule D Item No.	Schedule D Description	Corresponding Section in this Report
1a	description of all infrastructure and facilities designed and constructed to contain, withhold, divert or retain Water and/or Waste;	1
1b	a summary of construction activities including photographic records before, during and after construction of the facilities and infrastructure designed to contain, withhold, divert or retain Water and/or Waste;	2, 3
1c	as-built drawings and design for facilities and infrastructure, in Item 1(a) of this schedule, designed and constructed to contain, withhold, divert or retain Water and/or Waste;	4
1d	documentation of field decisions that deviate from the original plans and any data used to support or developed facilities and infrastructure to withhold, divert or retain Water and/or Waste;	5
1e	a comparison of measured versus predicted performance of infrastructure and facilities;	6
1f	any blast vibration monitoring and control for quarrying activity carried out in close proximity to fish bearing waters;	7
1g	monitoring conducted for sediment and explosives residue release from construction areas;	8
1h	monitoring undertaken in accordance with Part D of the during the Construction Phase of the Project;	8
1i	details confirming that the requirements of the CCME guidance document entitled “Aboveground Storage Tank Systems for Petroleum and Allied Petroleum Products (2003)” have been met by the Licensee;	N/A
1j	data collected from instrumentation used to monitor earthworks and the interpretation of that data;	9
1k	a discussion of any unanticipated observations including changes in risk and mitigation measures implemented to reduce risk during construction;	10
1l	an overview of any method including frequency used to monitor deformations, seepage and geothermal responses;	11
1m	a summary of maintenance work undertaken as a result of settlement or deformation of dikes and dams;	12
1n	a summary of adaptive management principles and practices applied during the relevant phases of the Project and their overall effectiveness.	13

Appendix A

As-Built Drawings

- A. H349000-4000-00-014-0014 Rev00: Mine Site Explosives Storage Clearances General Arrangement **[1 page]**
- B. E349000-SX001-35-035-0005 SUB01: Mary River Emulsion Plant - Unit Details Modular Plant **[1 page]**
- C. E349000-SX001-35-035-0006 SUB01: Mary River Emulsion Plant – General Arrangement **[1 page]**
- D. E349000-SX001-35-035-0007 SUB01: Mary River Emulsion Plant – Modular Plant General Arrangement **[1 page]**
- E. E349000-SX001-35-035-0008 SUB01: Mary River Emulsion Plant Containment Plan **[1 page]**

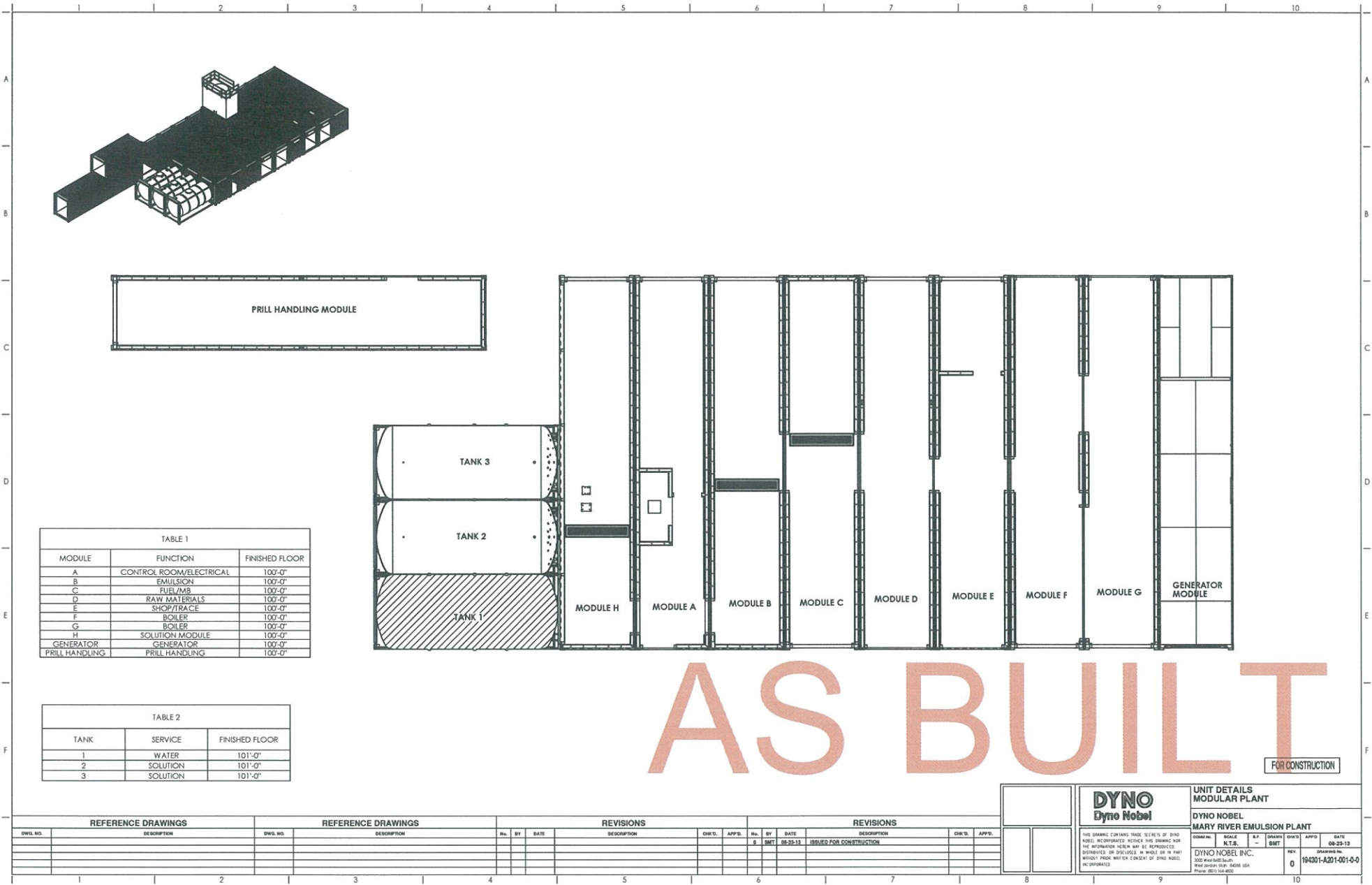


TABLE 1		
MODULE	FUNCTION	FINISHED FLOOR
A	CONTROL ROOM/ELECTRICAL	100'-0"
B	EMULSION	100'-0"
C	FUEL/MS	100'-0"
D	RAW MATERIALS	100'-0"
E	SHOP/TRACE	100'-0"
F	BOILER	100'-0"
G	SOLUTION MODULE	100'-0"
H	GENERATOR	100'-0"
PRILL HANDLING	PRILL HANDLING	100'-0"

TABLE 2		
TANK	SERVICE	FINISHED FLOOR
1	WATER	101'-0"
2	SOLUTION	101'-0"
3	SOLUTION	101'-0"

REFERENCE DRAWINGS		REFERENCE DRAWINGS		REVISIONS		REVISIONS	
DWG. NO.	DESCRIPTION	DWG. NO.	DESCRIPTION	No.	BY	DATE	DESCRIPTION

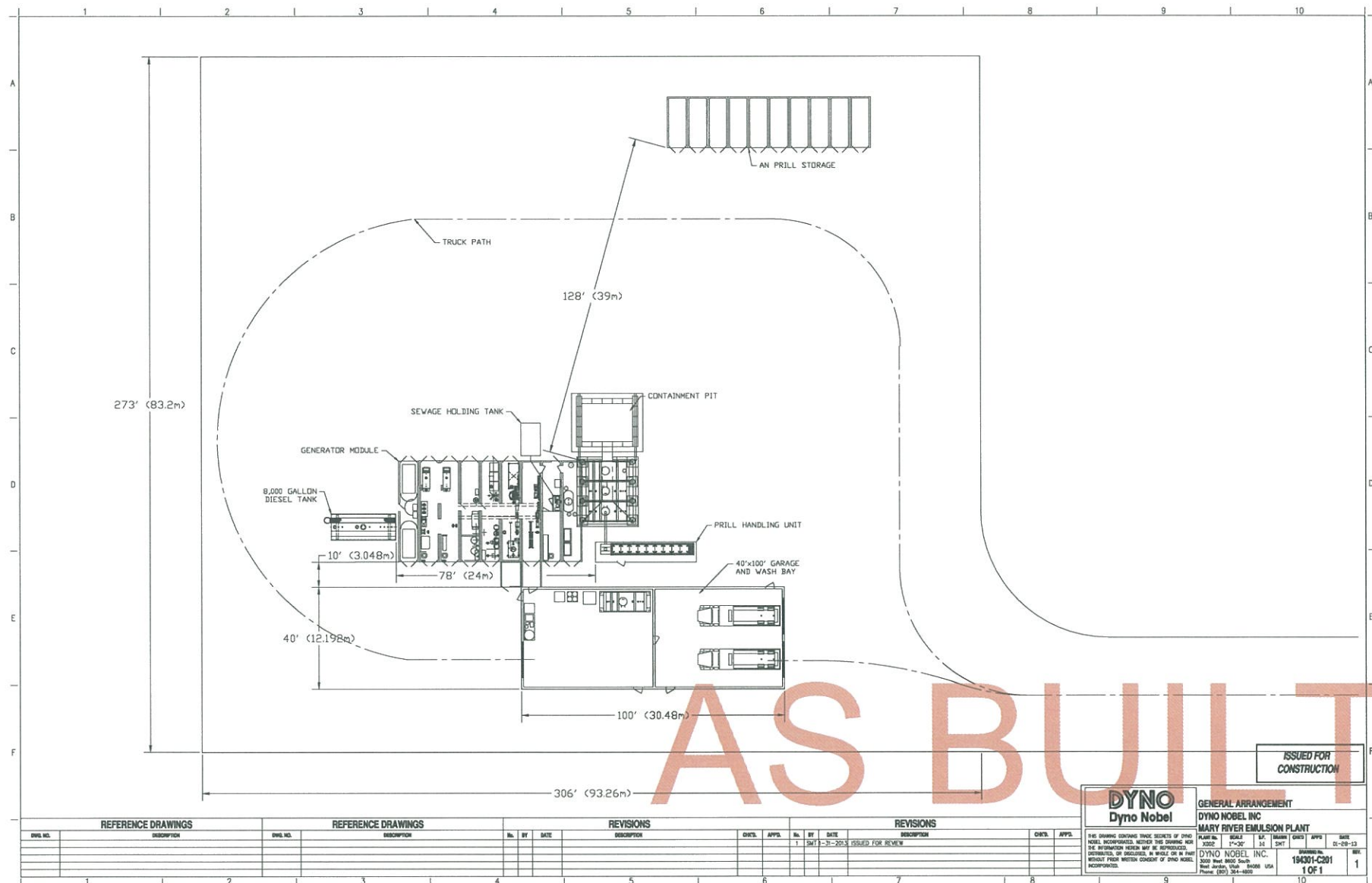
DYNO
Dyno Nobel

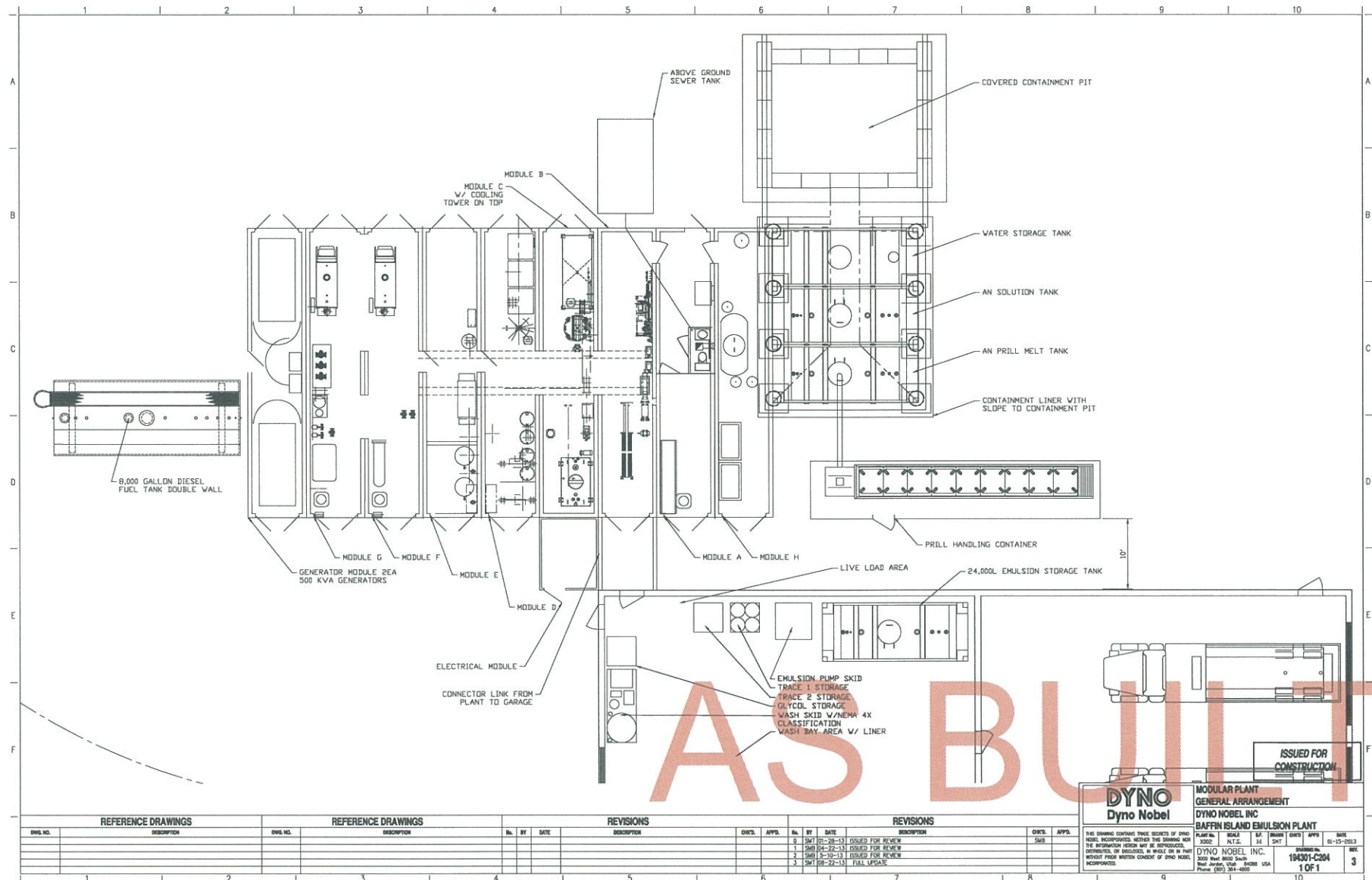
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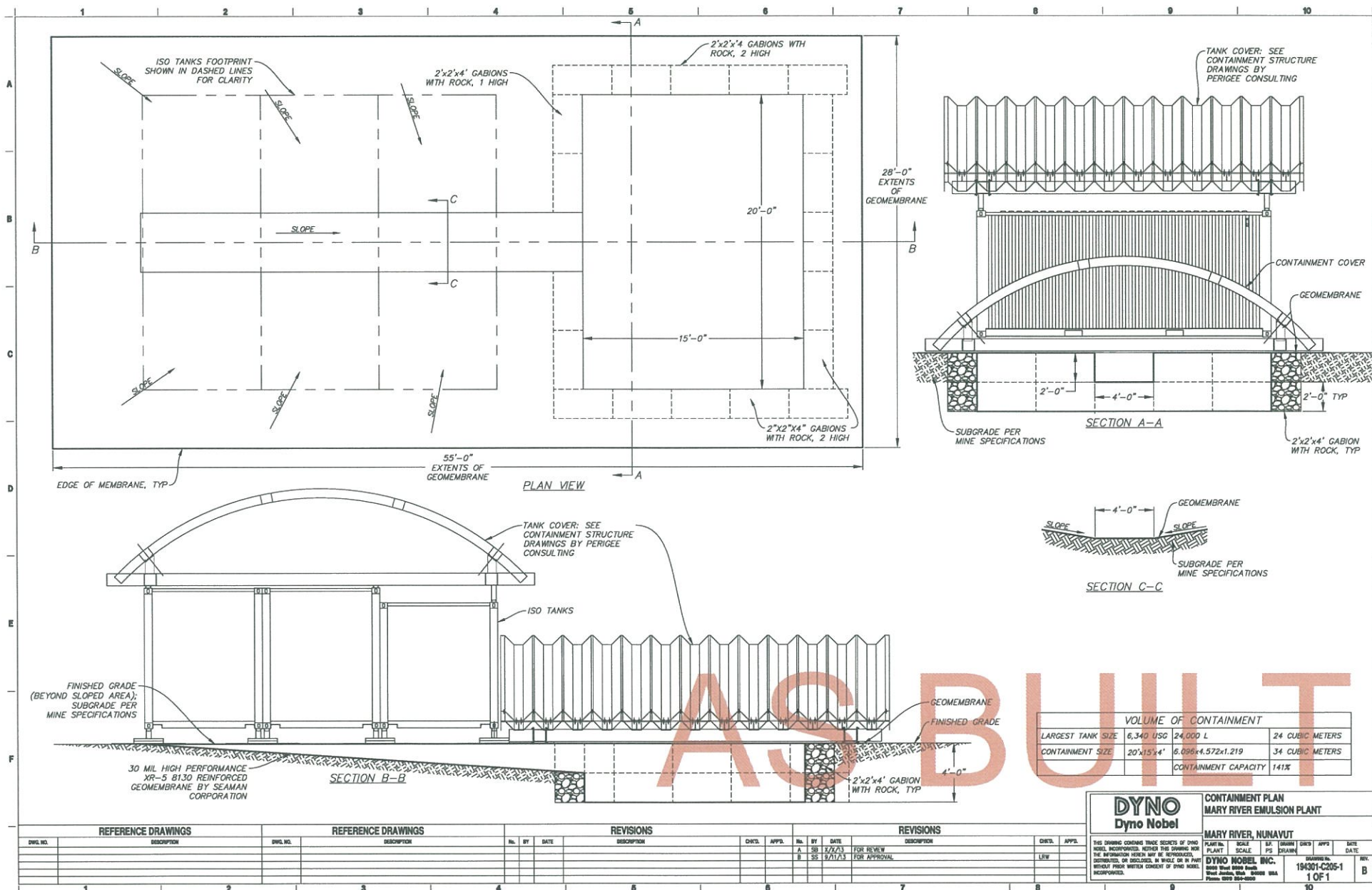
UNIT DETAILS
MODULAR PLANT

DYNO NOBEL
MARY RIVER EMULSION PLANT

CONTRACT NO.	SCALE	SHEET NO.	DATE
	AS BUILT	0	08-22-13
DYNO NOBEL INC.			
3000 West 50th South			
Midland, Texas 79701-4400			
Phone: (817) 344-8000			







Appendix B

Survey Data

Emulsion Plant As Built - 17Aug2014. asc

101	7911913.1712	561798.9193	185.0475	Node
102	7911910.2607	561796.6895	185.0486	Node
103	7911907.7090	561795.8582	185.0313	Node
104	7911905.5508	561793.4871	185.0496	Node
105	7911902.8544	561791.9582	185.0420	Node
106	7911904.4722	561789.5674	185.0363	Node
107	7911906.4887	561786.5589	185.0463	Node
108	7911908.1795	561784.0536	185.0470	Node
109	7911909.8877	561781.5189	185.0459	Node
110	7911911.9025	561778.5472	185.0492	Node
111	7911913.5540	561776.0892	185.0496	Node
112	7911915.2536	561773.5550	185.0532	Node
113	7911916.9565	561771.0245	185.0490	Node
114	7911918.9934	561768.0279	185.0432	Node
115	7911920.6363	561765.6365	185.0425	Node
116	7911923.4699	561767.8548	185.0513	Node
117	7911925.5675	561768.9732	185.0517	Node
118	7911928.3238	561770.8122	185.0530	Node
119	7911930.7069	561772.4157	185.0459	Node
120	7911929.2533	561775.0725	185.0506	Node
121	7911927.3090	561777.9692	185.0474	Node
122	7911925.5950	561780.5139	185.0486	Node
123	7911923.8828	561783.0393	185.0445	Node
124	7911922.0488	561785.7533	185.0487	Node
125	7911920.2243	561788.4684	185.0540	Node
126	7911918.5077	561790.9950	185.0446	Node
127	7911916.8090	561793.5229	185.0434	Node
128	7911914.7886	561796.5174	185.0425	Node
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201	7911913.1628	561798.8139	186.3416	ZBdg+1
202	7911902.9432	561791.9463	186.3386	ZBdg+1
203	7911911.8245	561798.2716	185.0177	ZBdg
204	7911911.9464	561798.0632	185.0224	ZBdg
205	7911908.4052	561795.6716	185.0091	ZBdg
206	7911907.9612	561796.3003	184.9693	ZBdg
207	7911907.2156	561795.7869	184.9470	ZBdg
208	7911907.6372	561795.1504	185.0028	ZBdg
209	7911904.1130	561792.7663	185.0190	ZBdg
210	7911903.9632	561792.9673	185.0285	ZBdg
211	7911902.5594	561792.0153	184.9439	ZBdg
212	7911920.5731	561765.3519	185.0072	ZBdg
213	7911921.9500	561766.2814	184.9961	ZBdg
214	7911921.8449	561766.4803	185.0187	ZBdg
215	7911925.3807	561768.8790	185.0304	ZBdg
216	7911925.5222	561768.6729	185.0294	ZBdg
217	7911930.9641	561772.3388	184.9956	ZBdg
218	7911920.6396	561765.7307	186.3461	ZBdg+1
219	7911930.8208	561772.5795	186.3830	. Bdg+1
220	7911929.3311	561774.8632	185.0501	ZBdg
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304	7911951.5260	561768.7484	189.1173	ZBdg
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307	7911929.2642	561780.2963	186.5127	ZBdg
308	7911932.0624	561776.4105	186.2620	ZBdg
309	7911929.5302	561774.6218	186.4758	. Bdg
310	7911939.7457	561786.7392	185.1277	ZBdg
311	7911946.4332	561791.0491	184.4523	ZBdg
312	7911942.1062	561797.6965	184.5457	ZBdg
313	7911935.4038	561793.3150	184.9144	. Bdg

Emul sion Pl ant As Buil t - 17Aug2014. asc

314	7911939.4719	561787.1086	187.5523	Zgl n
315	7911936.1393	561792.1616	186.4001	Zgl n
316	7911930.0428	561788.1343	186.3221	Zgl n
317	7911933.3609	561783.0770	186.1366	.gl n
318	7911928.9824	561782.9402	188.9511	ZBdg
319	7911922.2443	561792.9822	187.5762	ZBdg
320	7911920.2473	561791.6554	187.5884	ZBdg
321	7911926.9785	561781.5867	184.8587	.Bdg
350	7911941.4027	561760.7174	184.6731	Zgl n
351	7911945.0028	561755.2952	184.6877	Zgl n
352	7911947.0414	561756.6590	185.0409	Zgl n
353	7911943.4208	561762.0290	185.3750	.gl n
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1001	7911971.5520	561596.4170	182.3490	-----
1002	7911875.9010	561779.9700	182.6180	-----
1003	7911922.0620	562000.6080	184.0810	-----
1004	7911912.8334	561801.8896	184.1700	Nai l
1005	7911936.9777	561816.2112	183.6552	Nai l

Emulsion Plant with Pad As Built - 17Aug2014. asc

```

0001    5000.0000    5000.0000 100.0000 -----
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110 7911911.9025 561778.5472 185.0492 Node
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124 7911922.0488 561785.7533 185.0487 Node
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203 7911911.8245 561798.2716 185.0177 ZBdg
204 7911911.9464 561798.0632 185.0224 ZBdg
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211 7911902.5594 561792.0153 184.9439 ZBdg
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```

Emulsion Plant with Pad As Built - 17Aug2014. asc

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312	7911942.1062	561797.6965	184.5457	ZBdg
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315	7911936.1393	561792.1616	186.4001	Zgl n
316	7911930.0428	561788.1343	186.3221	Zgl n
317	7911933.3609	561783.0770	186.1366	.gl n
318	7911928.9824	561782.9402	188.9511	ZBdg
319	7911922.2443	561792.9822	187.5762	ZBdg
320	7911920.2473	561791.6554	187.5884	ZBdg
321	7911926.9785	561781.5867	184.8587	.Bdg
350	7911941.4027	561760.7174	184.6731	Zgl n
351	7911945.0028	561755.2952	184.6877	Zgl n
352	7911947.0414	561756.6590	185.0409	Zgl n
353	7911943.4208	561762.0290	185.3750	.gl n
1000	7911895.3640	561708.4890	182.7740	-----
1000A	7911895.3659	561708.4875	182.7721	Nai I
1001	7911971.5520	561596.4170	182.3490	-----
1002	7911875.9010	561779.9700	182.6180	-----
1003	7911922.0620	562000.6080	184.0810	-----
1004	7911912.8334	561801.8896	184.1700	Nai I
1005	7911936.9777	561816.2112	183.6552	Nai I
2000	7911909.2541	561801.0085	185.3519	-----
3000	7911918.3749	561781.1474	185.1350	BM__
3001	7911913.5282	561792.0347	186.0438	-----
3002	7911910.8268	561794.3956	185.9405	-----
FS1	7913345.5737	561528.6371	201.9009	-----

Appendix C

Facility Description Supporting Documents

- A. E349000-SX001-00-245-0001Sub01 Explosives Management Plan **[16 pages]**

Baffinland Iron Mines: Mary River Project

Explosives Management Plan

Nunavut, Canada

Date: Aug.28, 2013

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1 Introduction

1.1 Project Description

Baffinland Iron Ore Mines Corporation (BIM) is currently in the process of developing an iron ore mine at Mary River in the Territory of Nunavut, Canada. BIM retains the lease rights to four iron ore deposits in this area. This Explosives Management Plan focuses on the developments of the Mary River Mine Site. The Mary River project is located on the northern half of Baffin Island, approximately 160km south of Mittimatalik (Pond Inlet) and 1,000km northwest of Iqaluit, the capital of the Nunavut Territory. There is sea access from Milne Port, approximately 100km north of the project area. Milne Port is connected to the Mine Site via a tote road. This road will be maintained to facilitate transportation of all equipment, construction materials, and consumables (including pre-packaged explosives and raw materials required for explosives manufacture) required for supporting the project.

Approximately 145km south of the Mine site is a proposed location for a future dock facility (Steensby port). This port will be developed in the future and is proposed to receive all equipment, construction materials and consumables (again including pre-packaged explosives and raw materials required for explosives manufacture). A rail line may be constructed in the future to connect the proposed Steensby Port to the mine site which will be dedicated to ore shipment.

1.2 Explosives Project Description

In supporting the overall Mary River project development the use of explosives will be required to produce construction aggregates and during ore mining. The use of bulk and pre-packaged emulsion explosives will be used based on the expected site conditions. The purpose of this Explosives Management Plan is to outline the systems, procedures and best practices that will minimize environmental impacts, specifically impacts to water quality and wildlife during the period where blasting operations are conducted.

Explosive handling facilities and infrastructure to support this work includes:

- One modular emulsion manufacturing plant at the mine site,
- Storage areas for Ammonium Nitrate (in 1000 kg tote bags, stored inside weatherproof shipping containers) near the emulsion plant at the mine site,
- Storage for pre-packaged explosives at magazine depots which are separate from the emulsion plant at the mine site, and
- Raw Materials Storage *inside weatherproof shipping containers, located near the Milne port and at the mine site.*

Drawings outlining the various infrastructures are attached.

1.3 General Operating Considerations

Based on the remote nature of the site, ensuring adequate on-site support and response to potential environmental considerations is critical. All essential equipment required to support spill containment and recovery will be located on the mine site property and will be operated by Dyno Nobel Baffin Island (DNBI) and BIM mine site staff.

The design premise for all explosives manufacturing sites is based on working to achieve a zero effluent process. Contaminated waste water generated from manufacturing operations will be collected and re-used in the process including truck wash water.

1.4 Management Plan – General

This plan will outline the actions that will be taken to address any environmental spill issue at the point of origin related to the explosives manufacturing process which will in turn assist in the reduction of potential contaminant release into the environment

The control and use of explosives within Canada and the Territorial area are covered by existing federal and territorial regulations. Dyno Nobel Baffin Island will put into place operational policies and procedures which meet or exceed the required regulations.

The main applicable regulations in the case of the Mary River project include (but are not limited to):

- The Canada Explosives Act
- Transportation of Dangerous Goods Act
- Occupational Health & Safety, Nunavut – Explosives Use Act
- Northwest Territories / Nunavut Mine Health and Safety Act and Regulations

Dyno Nobel Baffin Island will maintain site specific Policies and Standard Operating Procedures. DNBI will utilize experienced personnel to design, construct, commission and manage the project.

A detailed Emergency Response Plan (ERP), prepared in accordance with the guidance provided in this standard will be prepared during development of the project. It will be integrated with the mine site ERP to maximize resource utilization, training and planning efforts.

1.5 Products & Raw Materials – General

DNBI will include a detailed procedures manual for the conduct of operations on the Mary River site for the purposes of transportation, storage, handling and manufacture of explosives. The recommended products are currently listed as approved products federally. They are industry proven for use in northern climates and are accepted globally. Dyno Nobel has experience operating in open pit iron ore mines within both Canada and globally. All proposed infrastructure and manufacturing processes will be licensed and approved by Natural Resources Canada (NRCan) – Explosives Regulatory Division (ERD).

In addition to the raw materials required for explosives manufacture, DNBI will be providing pre-packaged commercial products to support blasting operations at the Mary River sites. This will include detonators, boosters and pre-packaged explosives. All of these materials will be transported and stored in accordance with the regulations identified above. Magazine storage sites will be licenced by the Nunavut Workers Safety and Compensation Commission (WSCC).

2 Explosives Management

2.1 Operational Phases / Timelines

Based on the overall operational BIM mine site developmental planning the project will be delivered in two (2) distinct phases: 1) Construction / Pre-Development and 2) Mine Operations.

2.1.1

Construction Phase: The initial construction phase will begin with delivery of explosives, raw materials and infrastructure during a sea lift completed during the period July – October 2013. At this time pre-packaged explosives products will be shipped and stored for future use in approved and licensed explosives magazines. Magazines will be constructed in accordance with the 2001 Storage Standards for Explosives. Raw materials required for the production of bulk explosives will be shipped during the 2013 sea lift. These materials will include Ammonium Nitrate Prills. These raw materials will be stored in accordance with industry accepted storage procedures and will be subject to routine storage site inspections. Storage standards outlined in Appendix E to the Explosives Regulatory Division Bulk Guidelines, Revision 5 for the storage of large quantities of Ammonium Nitrate will be followed. The explosives manufacturing facility and support equipment will be shipped to the site during the 2013 sea lift, it will be commissioned late 2013 based on mine site forecasting. Construction phase will involve the use of explosives primarily outside the proposed open pit. The explosives will be used for the purpose of producing aggregates to construct roads, pads, settling ponds, and other sites.

2.1.2

Mine Operations Phase: Following completion of the construction phase the mine site will move into production. Based on the current mine site forecast it is anticipated that this phase will commence in October of 2014. Explosives will be used primarily in the open pit operations for blasting the iron ore and overburden/waste rock. Construction and Mine Operations phases may overlap, however handling of the explosives materials will be the same (*is this correct?*).

2.2 Overview

DNBI maintains strict handling policies with regards to the safe handling, transportation, manufacture and storage of explosives and their associated components.

2.3 Mary River Site

2.3.1

The modular manufacturing plant located at the Mary River mine site will produce most of the explosives required for construction and operations. Some pre-packaged explosives will be required prior to plant start up and even after for special blasting situations. It is expected that the plant will produce between 2 and 5 million kgs annually until 2019.

2.3.2

As above there will be the requirement to provide pre-packaged explosive products to support the site construction activities. It is forecasted that up to 1 million kilograms of prepackaged product will be required to support these activities. The magazine storage site will be established respecting the requirements outlined in the NRCAN ERD issued Quantity Distance Manual.

2.4 Raw Materials Storage

2.4.1

AN Prill. Ammonium Nitrate Prills (solid) will be stored in bulk within a dedicated storage area. AN Prill will be stored in 1 Tonne FIBC bulk bags approved for storage of this material loaded into shipping containers. If stored in this manner there will be 20 Tonne of AN Prill stored in each container. In order to ensure sufficient supply of emulsion for blasting and production of construction aggregates until a 2014 shipment is delivered to the site, a total of 2000 totes (2000 tonnes) of AN prill must be shipped in 2013. Quantities in subsequent years will vary depending upon mine forecasted production.

The AN Prill, in shipping containers will be transported from the bulk storage area to the manufacturing site using mine site heavy equipment. Container doors will be secured and internal 1 Tonne Flexible Intermediate Bulk Containers FIBC's will be tied closed to ensure no spillage during transportation from the storage site to the manufacturing site. The AN Prills will be transferred into the AN Handling Module located at the manufacturing facility for use in the manufacturing process. Individual AN 1 Tonne FIBC's will be loaded into a hopper / auger system. Spill containment will be in place in the AN handling module. The AN is augured into the AN melt tank to be manufactured into emulsion.

AN Prill is a granular or "pellet" "prill" form material. In the event of a spill of product it will be recovered using plastic or aluminum shovels, brooms and dust pans. Recovered material will be disposed of through consumption in subsequent blast holes or worked into manufactured product.

2.4.2

Fuel Phase. A fuel/emulsifier blend mixture "fuel phase" is used in the manufacturing process to enable the manufacture of bulk emulsion products. A fuel phase concentrate will be transported to the manufacturing site in IBC totes (inside containers). This material and other additives are blended with diesel fuel to create the "Fuel Phase" for supporting emulsion manufacture. These UN Approved portable containers will be stored separate from the manufacturing site and separate from the storage of bulk AN Prill. They will be transported to the manufacturing site as required to support the manufacturing process. The diesel fuel will be stored in double walled containers until required for the process. The fuel storage on site will only be used in the process and not to refuel the mobile equipment nor the trucks. This will be done by the BIM refuelling truck following SOP's for fuel transfer.

2.5 Emulsion Manufacture

The manufacturing process will be capable of producing up to 10 million kilograms of bulk emulsion product annually. The primary product to be produced will be based on a 100% emulsion. There will be no AN or ANFO added to the emulsion either in the plant or on the bulk explosive truck. The oxidizer phase (solution) is stored in ISO Tanks located above a containment system.

In the process AN Prill is blended with water and other additives and heated to create an oxidizer phase. This is then mixed, using proprietary processes with the fuel phase defined above to create an explosive emulsion. Quality control procedures are established to ensure consistency of manufactured product. The emulsion explosives manufactured will be transferred into a process vehicle for delivery to where the next blasting site is planned, and pumped into the blast holes.

The manufacturing process is an industry-proven process. It is utilized at multiple sites across Canada, USA and globally. There are documented processes and procedures for controlling the manufacturing process. Procedural items include the receiving of AN Prill, melting AN prill into ANSOL, Quality Control,

emulsion blending, equipment calibration and preventative maintenance procedures to highlight but a few.

DNBI maintains a rigid hazardous materials handling process. All chemical components are stored and handled in accordance with their respective MSDS and copies are located at the plant office. Chemical registers are also maintained and employees are trained in WHMIS.

2.6 On-Site Handling

All on-site transportation will be done in accordance with the Mines Act and Regulations as well as with the Transportation of Dangerous Goods Act. Non-process vehicles (i.e. skid steers, loaders, pick up trucks ,etc) will be maintained in sound mechanical condition and equipped with safety equipment as required under mine site policy / regulations. Process Vehicles will be maintained in accordance with internal maintenance schedules and will be subject to tank certifications under CAN/CSA B620-03.

2.7 Personnel Qualifications / Exposure

The site will be established with appropriate man-limits outlined in the NRCAN Explosives Regulatory Division Factory Licence.

DNBI will employ experienced persons in the handling, manufacturing and storing of explosives and associated raw materials. DNBI will administer a training program which will be used to hire and train local people to work at the facility.

2.8 Process Vehicles

DNBI will utilize two new 10 tonne Titan Bulk Emulsion process vehicles for the purposes of delivering bulk emulsion into the blasthole. This vehicle has the capability to pump straight 100% "gassed" homogenized emulsion through a 1" hose up to 200ft. This allows for a variable density product. The homogenized emulsion also reduces seepage into cracks and voids. There is no AN or ANFO added thus reducing ammonia contamination due to spills and seepage into the rock.

This product allows for loading into wet holes and has longer sleep time than a product that contains AN or ANFO.

The truck monitors flow rates through electronic flow meters. The truck is also equipped with visual flow meters as a back up. The units are equipped with Pump Safety Shut Down Systems required by NRCAN. Trucks are also equipped with battery master disconnect switches as well as mounted engineered fire suppression systems.

These vehicles adhere to a preventative maintenance program to ensure continued safe and compliant operation. Tanks installed on the process vehicle are subject to periodic testing requirements in accordance with CAN/CSA B620-03 as required by Transport Canada. In order to reduce the possibility of potential loss of containment of explosives product these tanks are designed to meet the TC-412 design specification.

2.9 Daily Planning / Control

The mine will provide DNBI operators with the daily load forecast. The bulk trucks will be loaded accordingly. Measurements will be taken to determine product used. This will be via a physical dip of the tank and by the onboard computer control system which monitors quantity pumped (per load and per hole)

DNBI maintains strict magazine management policies and procedures. Only explosives will be stored in explosives magazines. Detailed inventory management and authorized key control procedures ensure that only those authorized to handle explosives have access. Waste resulting from explosives packaging (boxes, etc) are considered contaminated and do not enter any landfill. They are disposed of through incineration. Resultant ash will be disposed of in accordance with the mine site waste disposal plan. Any waste or scrap explosives product generated through the manufacturing process will be disposed of in the blast hole

2.10 Blast Design / Operations

Blast design and control of blasting parameters will be controlled by BIM. The product that will be utilized has been selected to minimize waste to due spills and seepage while maintaining optimum blast results.

Blast hole loading, stemming, shot tie in and detonation will be conducted by a qualified DNBI Blaster certified to blast in Nunavut.

3 Safety Procedures

DNBI will develop site specific Policies and Procedures(SOP's) which outline on-bench activities as well as safety systems required for the handling, transport and manufacture of explosives. In addition, a comprehensive training plan is used.

DNBI is committed to ensuring that federal and territorial individual mandated qualifications and skills are maintained.

Prior to undertaking any activities on bench a tool box meeting is conducted by the blaster in charge. Any access to the site must be authorized by the blasting supervisor. All loading is done under the direct supervision of the blaster in charge of the pattern. Loading is based on the engineered design.

As an example of standard blast protocols, no personnel are permitted within 500m of the blast area(or other appropriate distance as determined by the Blaster or Mine Engineering).

This safety zone is also under observation for the potential entry of local wildlife. Blast will not be fired if this area is not clear. When the area is clear and the pattern is ready for blasting, there are a number of notifications that will occur (including sirens and radio communications as required). Following the blast, guards will remain in place until the blaster issues the all clear.

The DNBI document "Blast Site Safety Manual" is available should additional information be required on safe blasting best practices.

4 Spills & Spill Containment

4.1 AN Spills

Ammonium Nitrate is commonly used in a variety of agricultural applications and as itself is not classified as an explosive. It is WHMIS classified as 5.1 (Oxidizer). AN is soluble in water and can be dissolved to create AN Solution (ANSOL) which is in turn used in the manufacture of explosives.

Typical spill response measures for AN Prill are recovery using non-sparking shovels and packaging into designated containers. Spilled AN Prill will be worked into product and consumed in subsequent blasts.

The plant will be constructed to ensure a spill containment capacity of 110% of the largest means of containment. In the event of an ANSOL spill inside the plant the material will be recovered and if possible reworked through the process.

AN totes are loading onto a conveyor and discharged into a hopper/auger that is located inside the AN Module. This process is enclosed and protected from the elements (wind, rain).

4.2 Other Chemical / Product Spills

All on site containers of hazardous material will be located inside the plant modules or storage containers. No material will be stored outside.

Where required tanks will be of double wall construction. Response to any chemical spill or loss of containment will be covered under the site emergency response plan.

TITAN[®] XL 1000

Technical Information



Gassed Bulk Emulsion



Product Description

TITAN XL 1000 is a gassed, bulk emulsion made from TITAN 1000 or TITAN 1000 G specifically designed for quarry and open pit mining operations. Transported as an oxidizer, TITAN XL 1000 is formulated to be sensitized during the borehole loading process using Dyno Nobel's innovative chemical gassing and emulsion processing technology. The process used to manufacture TITAN XL 1000 enhances water resistance and detonation performance while improving loading characteristics. Chemical gassing allows the average density of TITAN XL 1000 to be varied as required to optimize its explosive performance for best blast results.

Application Recommendations

- The minimum cast booster weight recommended to prime TITAN XL 1000 explosive is a 340 g (12 oz) cast booster.
- TITAN XL 1000 can be used in boreholes up to 36 m (120 ft) deep.
- **ALWAYS** double prime when bulk explosive columns exceed 6 m (20 ft). One primer should be positioned near the bottom of the hole and the second near the collar.
- **ALWAYS** ensure primers are securely positioned in the explosive column.
- Do not use detonating cord as downlines with Titan XL 1000 without first consulting your dyno Nobel representative.

Properties

MSDS
#1052

Density (g/cc) Avg	1.20
The average loading density can be varied from about 1.00 to 1.25 g/cc to best match rock type and application requirements.	
Energy ^a (cal/g)	680
(cal/cc)	815
Relative Weight Strength ^{a,b}	0.77
Relative Bulk Strength ^{a,b}	1.13
Velocity ^c (m/sec)	5,200
(ft/sec)	17,100
Detonation Pressure ^c (Kbars)	81
Gas Volume ^a (moles/kg)	45.0
Water Resistance	Excellent
Minimum Diameter	
(mm)	65
(inches)	2.5
Loading Method	Pumped
Fume Class ^d	IME1

^a All Dyno Nobel Inc. energy and gas volume values are calculated using PRODET[™], a computer code developed by Dyno Nobel Inc. for its exclusive use. Other computer codes may give different values.

^b ANFO = 1.00 @ 0.82 g/cc

^c Confined in 150 mm (6 in) diameter at average density.

^d Approved for underground use as IME Fume Class 1.

Hazardous Shipping Description

TITAN XL 1000 is made from TITAN 1000 or TITAN 1000 G bulk emulsion matrix. Refer to the TITAN 1000 Technical Information Sheet for Hazardous Shipping Description information.

TITAN[®] XL 1000

Technical Information



Transportation, Storage and Handling

- TITAN XL 1000 can be stored for 3 months at temperatures between -18° C and 32° C (0° F and 90° F). Older product should be used first and all storage tanks should be kept clean of residual product.
- Use only pumps which have been approved by Dyno Nobel for 5.1 emulsion matrix transfer. Pump type, pump speed, worn pump parts, repeated repumping and pumping against high hose pressures can increase TITAN 1000 viscosity and decrease shelf life.
- **ALWAYS** monitor emulsion pump performance and check pumps periodically for excessively worn parts. Design storage facilities to minimize repeated pumping.
- Transport, store, handle and use TITAN XL 1000 in compliance with federal, state, provincial and local laws governing bulk oxidizing liquids. Refer to the TITAN 1000 or TITAN 1000 G Technical Information Sheet for Transportation, Storage and Handling requirements.
- Transport, store, handle and use TITAN XL 1000 in compliance with federal, state, provincial and local laws governing bulk explosives.

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DYNO[®]
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Groundbreaking Performance[™]

NONEL® EZ DET® 1.1B

Technical Information



Nonelectric Blast Initiation System



Product Description

NONEL® nonelectric delay detonator EZ DET® units consist of a length of orange shock tube with a surface detonator attached to one end and an in-hole, High Strength, detonator on the other. The surface detonator is inside a color-coded plastic EZ™ Connector block to facilitate easy connections to up to 6 shock tube leads. Easy-to-read, color-coded delay tags display the delay number and nominal firing time prominently.

NONEL EZ DET units can be easily connected to one another to satisfy basic blast design requirements in construction, mining, and quarry operations. They can also be used in combination with NONEL MS, NONEL EZTL™ and/or NONEL TD detonators to satisfy complex blast design requirements and minimize inventory of initiation system components.

Application Recommendations

For detailed application recommendations, **ALWAYS** request a copy of Dyno Nobel's *Product Manual: NONEL® and PRIMACORD®* from your Dyno Nobel representative.

- **ALWAYS** select a NONEL EZ DET unit having more than enough tubing length to extend from the planned primer location in the borehole to the collar of the next hole.

Properties

MSDS
#1122

Net Explosive Content per 100 units 0.1125 kg
0.1782 lbs

Nominal Time (msec)	Nominal Time (msec)	Nominal Time (msec)	Connector Block Color
17 / 350	17 / 500	17 / 700	Yellow
25 / 350	25 / 500	25 / 700	Red
42 / 350	42 / 500	42 / 700	White
25 / 375			Red

Hazardous Shipping Description

Detonator assemblies nonelectric,
1.1B, UN 0360 PG II



NONEL® EZ DET® 1.1B

Technical Information



Application Recommendations (continued)

- **ALWAYS** protect the plastic EZ Connector block and all shock tube leads from impact or damage during the loading and stemming operations. Use care when placing blasting mats and cover material on top of the blasting circuit. The EZ Connector block contains a detonator and is subject to detonation caused by abuse such as impact. Shock tube which has been cut, ruptured or damaged may cause misfires.
- **ALWAYS** be sure that the shock tube(s) are securely inserted, one at a time, into the EZ Connector block. The head of the EZ Connector block should rise to accept the shock tube and return to a closed position with an audible click.
- **ALWAYS** ensure that individual shock tubes remain aligned side by side in the connector channel and do not cross one over the another on insertion.
- **NEVER** use NONEL EZ DET units with detonating cord. The low strength surface detonator will not initiate detonating cord and may cause misfires.
- **NEVER** attempt to disassemble the delay detonator from the plastic EZ Connector block or use the detonator without the connector.
- **NEVER** place more than 6 shock tube leads into the plastic EZ Connector block. Misfires may result.
- **NEVER** pull, stretch, kink or put tension on shock tube such that the tube could break.
- **NEVER** splice NONEL EZ DET shock tube together to extend between holes.
- **NEVER** connect NONEL EZ DET units together until all holes have been primed, loaded and stemmed and the blast site has been cleared.

Transportation, Storage and Handling

- NONEL EZ Det must be transported, stored, handled and used in conformity with all federal, state, provincial and local laws and regulations.
- For maximum shelf life (3 years), NONEL EZ Det must be stored in a cool, dry, well ventilated magazine. Explosive inventory should be rotated. Avoid using new materials before the old. For recommended good practices in transporting, storing, handling and using this product, see the booklet "Prevention of Accidents in the Use of Explosive Materials" packed inside each case and the Safety Library Publications of the Institute of Makers of Explosives.

Packaging

Length		Case Type	Quantity/ Case	
m	ft		case	subpack
3.5	12	D	200	100
4.5	16	D	180	90
7	24	D	140	70
9	30	DC	120	--
12	40	DC	120	--
15	50	DC	90	--
18	60	DC	90	--
24	80	DC	50	--
30	100	DC	40	--
37	120	DC	30	--

- Length rounded to nearest one-half meter.
- Case weight varies by length & delay; see case label for exact weight.

Case Dimensions

Detpak Case (DC)	48 x 45 x 26 cm	18 ¾ x 17 ¾ x 10 ¾ in
Detpak (D)		
subpack	44 x 22 x 25 cm	17 ½ x 8 ¾ x 10 in
strapped case	44 x 45 x 25 cm	17 ½ x 17 ½ x 10 in

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DYNO
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Groundbreaking Performance™

TROJAN® SPARTAN®

Technical Information



Cast Booster



Product Description

TROJAN SPARTAN cast boosters are detonator sensitive, high density, high energy molecular explosives available in various sizes designed to optimize initiation of all booster sensitive explosives. All TROJAN SPARTAN boosters are manufactured with an internal through-tunnel and detonator well for easy application with either electric, electronic or nonelectric detonators or 10.6 g/m (50 gr/ft) minimum strength detonating cord. TROJAN SPARTAN boosters are formulated from the highest quality PETN and other high explosive materials ensuring reliability, consistency and durability in all blasting environments. The fluorescent green container makes the TROJAN SPARTAN booster more visible on the blast site and reduces the possibility of misplaced charges.

Application Recommendations

- **NEVER** force the detonator into the through-tunnel, the detonator-well or otherwise attempt to clear these areas if obstructed. If the through-tunnel or detonator-well does not accommodate the detonator, do not use the booster. Notify your Dyno Nobel representative.
- **ALWAYS** use detonating cord with a coreload of 10.6 g/m (50 gr/ft) or higher when initiating the TROJAN SPARTAN booster with detonating cord.

Properties

MSDS
#1108

Density	(g/cc) Avg	1.65
Velocity	(m/sec)	7,550
	(ft/s)	24,800
Detonation Pressure	(Kbars)	235
Water Resistance	6 months with no loss of sensitivity	
Shelf Life Maximum	5 years (from date of production)	
Maximum Usage Temperature	60°C (150°F)	

All Dyno Nobel Inc. energy and gas volume values except Velocity and Detonation Pressure are calculated using PRODET™ the computer code developed by Dyno Nobel Inc. for its exclusive use. Other computer codes may give different values.

Velocity and Detonation Pressure are the result of empirical methods during May 2009.

Hazardous Shipping Description

UN 0042 Boosters, 1.1D PG II



TROJAN® SPARTAN®

Technical Information



Application Recommendations (continued)

- Minimum detonator is No. 8 strength for temperatures above -40° C (-40° F). A high strength detonator is recommended for temperatures below -40° C (-40° F).
- Extremely low temperatures do not affect the performance of cast boosters with commercial detonators. Low temperatures do affect detonators and detonating cord. Be certain your initiation system is suitable for your application in extremely low temperatures. Cast boosters are more susceptible to breakage during handling in extremely cold temperatures.

Transportation, Storage and Handling

- Dyno Nobel cast boosters must be transported, stored, handled and used in conformity with all federal, state, provincial and local laws and regulations.
- For maximum shelf life (5 years), Dyno Nobel cast boosters must be stored in a cool, dry, well ventilated magazine. Explosive inventory should be rotated. Avoid using new materials before the old.

Packaging

Unit Weight		Unit Dimensions				Case Quantity	Gross Weight/Case	
g	oz	Length		Diameter			kg	lbs
		cm	in	cm	in			
90	3.2	11.9	4.7	2.7	1.1	150	14.0	30.8
150	5.5	11.9	4.7	3.6	1.4	95	16.7	36.7
200	7	11.7	4.6	4.1	1.6	72	16.5	36.4
350	12	11.9	4.7	5.0	2.0	49	17.9	39.5
400	14	11.9	4.7	5.5	2.2	40	17.6	38.8
450	16	11.9	4.7	5.8	2.3	36	17.8	39.2
900	32	12.9	5.1	7.9	3.1	18	17.8	39.2

Note: All weights and dimensions are approximate.

Case Dimensions

42 x 33 x 14 cm

16 ½ x 13 x 5 ½ in

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