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Client **Public Works and Government Services Canada**
Project USAT Brigadier General M. G. Zalinski
Subject Final Report
Date 20 January 2014

Mr.Anstey:

The following document is intended to provide a summary of the salvage services provided to the Canadian Coast Guard and Public Works and Government Services Canada during the Zalinski oil removal operations.

Kind regards,

Mammoet Salvage Americas, Inc.

Kyle Holderfield

Project Controller



Client **Canadian Coastguard DFO** SAP nr.
Project **USAT Brigadier General M. G. Zalinski** Doc. nr.
Subject **Analyzing dives of January & March 2013** Ref.

Page 2 of 8
Date 26 March 2013
Rev.

Contents	1	Introduction	3
	2	Scope	4
	3	Stability Assessment	5
	4	Oil and Cargo Survey	6
	5	Oil Removal Operations	7
	6	Conclusions	8



Client **Canadian Coastguard DFO** SAP nr.
Project **USAT Brigadier General M. G. Zalinski** Doc. nr.
Subject **Analyzing dives of January & March 2013** Ref.

Page 3 of 8
Date 26 March 2013
Rev.

1 Introduction

The U.S. Army Transportation Corps vessel Brigadier General M.G. Zalinski (Zalinski), a ship used in both the first and second world wars, ran aground and sank in 1946 in about 34 meters (110 feet) of water during poor weather in the Grenville Channel. The wreck rests in 34m (110 ft) of water and is located in approximate position 53-31-21 N, 129-34-55 W. The wreck lies approximately 100 kilometers (54 M) south of Prince Rupert and 2.5 kilometers (1.3 M) southeast of James Point on Lowe Inlet in the Grenville Channel.

The vessel sank with a cargo of lumber, army vehicles and munitions. It was estimated that a maximum of 750 tons of bunker fuel oil and 100 tons of miscellaneous pollutants might also remain onboard.

The Zalinski slowly deteriorated throughout the years and as a result the ship slowly began to leak what remained of its fuel bunkers. Persistent leaking lead to concerns over the ships current condition and the potential for a large scale environmental impact so on September 19, 2013 Mammoet Salvage Americas was contracted to mobilize a salvage team and equipment to the site of the Zalinski in order to remove the bunker oil and other possible pollutants that might remain inside the hull of the wreck (Annex A).

Mammoet Salvage Americas' personnel mobilized to the Zalinski site in the Grenville Channel on October 15, 2013 to install rock anchors and stand-off moorings while a dive-support barge, the Seaspan 202, was constructed in Vancouver. The Seaspan 202 arrived and was moored on site October 26th.



Client **Canadian Coastguard DFO** SAP nr.
Project **USAT Brigadier General M. G. Zalinski** Doc. nr.
Subject **Analyzing dives of January & March 2013** Ref.

Page 4 of 8
Date 26 March 2013
Rev.

2 **Scope**

Mammoet Salvage was contracted to perform three tasks per the statement of work from the Canadian Coast Guard.

- Task 1 Stability Assessment and Stabilization Operations
- Task 2 Oil Assessment and Removal Operations
- Task 3 Cargo Assessment and Removal Operations



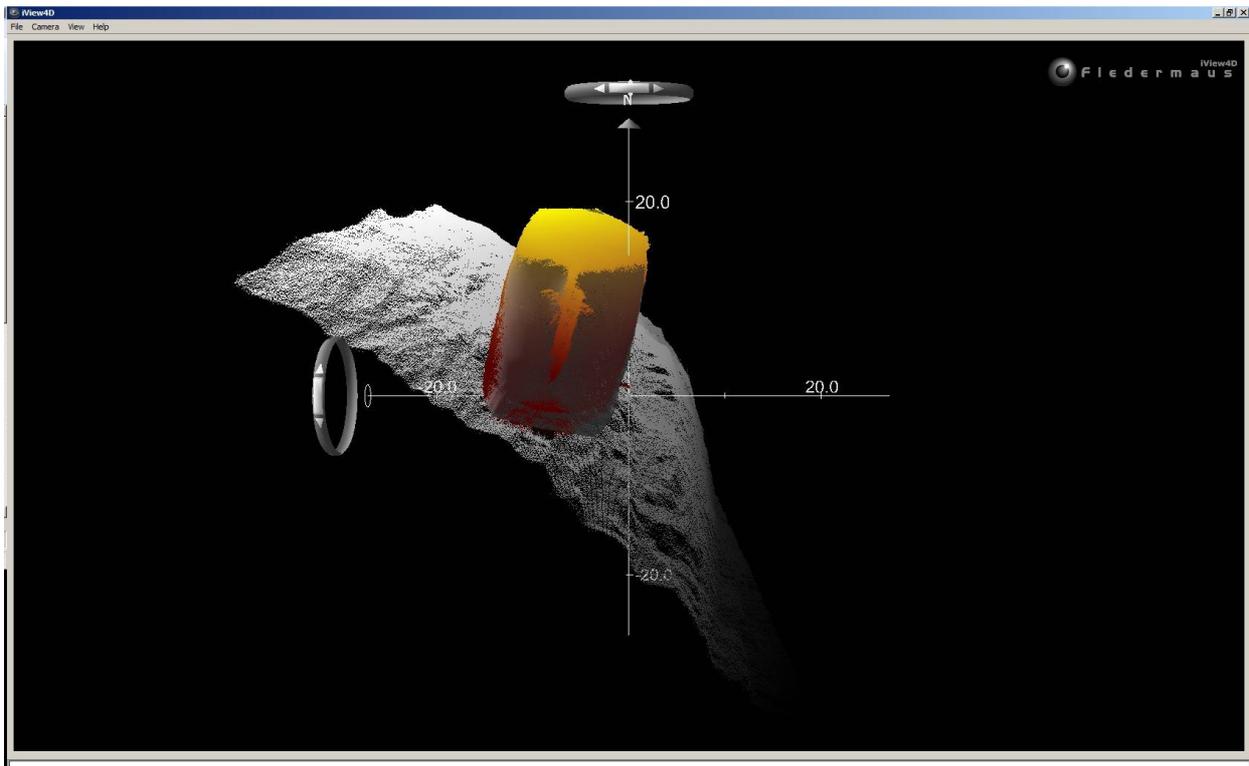
Client **Canadian Coastguard DFO** SAP nr.
Project **USAT Brigadier General M. G. Zalinski** Doc. nr.
Subject **Analyzing dives of January & March 2013** Ref.

Page 5 of 8
Date 26 March 2013
Rev.

3 Stability Assesment

The first dive on the Zalinski wreck took place 17:00 on October 27th. Several days were spent doing overall inspections of the wreck, with a particular focus on the issue of the wreck's stability, its risk of rolling off the ledge where it is resting, and the feasibility and advisability of installing a hold-back system to insure it wouldn't slip off during fuel removal operations.

Mammoet mobilized a combination of chain, rock anchors and dyneema pennants specifically for the purpose of tying back the wreck. However, after extensive inspections and discussions, Mammoet decided that the installation of a hold back system represented a greater risk to the stability and integrity of the Zalinski than proceeding without tying the wreck back. The pumping plan specifically addressed the possibility that replacing oil with salt water during pumping might destabilize the wreck, and the sequence of pumping was planned to prevent that.



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Client **Canadian Coastguard DFO** SAP nr.
 Project **USAT Brigadier General M. G. Zalinski** Doc. nr.
 Subject **Analyzing dives of January & March 2013** Ref.

Page 6 of 8
 Date 26 March 2013
 Rev.

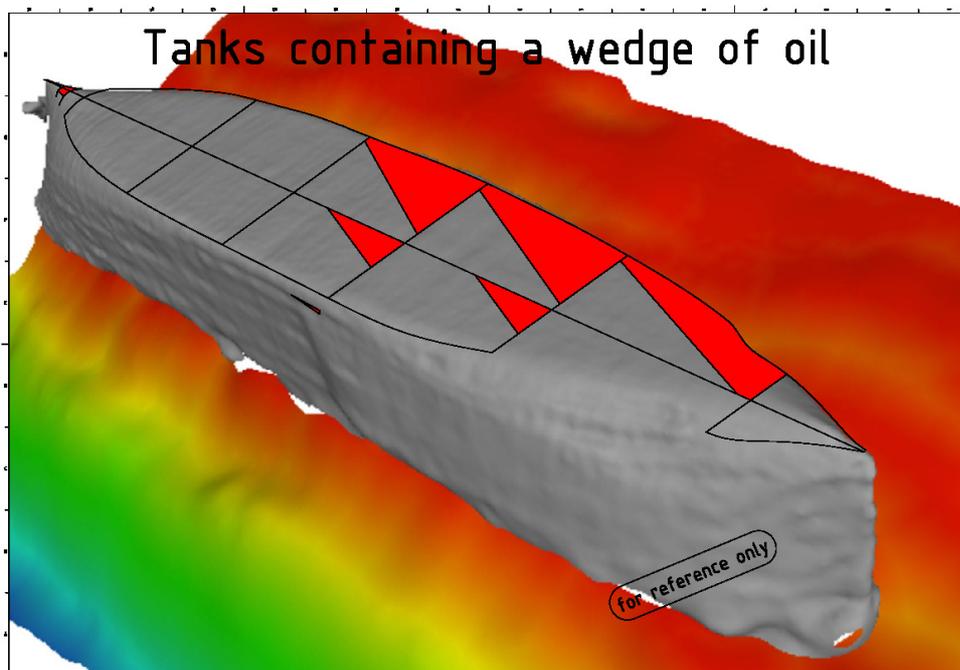
4 Oil and Cargo Survey

October 29th, the salvage crew gave 24-hour notice to the Canadian Coast Guard of the intent to begin drilling test holes, testing for oil in various locations in the hull.

There was a degree of uncertainty about both the volume and location of the bunkers. Mammoet's Naval Architect, Han Scheit, had studied the Zalinski-class ships extensively, and had blueprints for many ships of the class. However, shortly after she was built, the ship was converted from coal to Bunker C oil. Her plans did not have any oil tanks. Lacking "as-built" plans for the conversion, Han had to try to guess which tanks might have been converted to oil.

As test drilling proceeded oil was found in some places Han expected it, and also where it should not have been. In light of the confusing data, we decided to cut an access in hold #1 to allow for an ROV inspection of the internal bulkheads.

On Nov. 7th, the first ROV inspection was conducted. This survey revealed that the bulkheads were wasted away, and at least some of the structures that would have initially contained the fuel were gone. Further ROV inspections confirmed the loss of structural integrity in the internal bulkheads and tank tops. During these surveys it was also determined that any attempt to remove the drums of pollutants on board the Zalinski would be useless as all of the barrels observed had deteriorated to a point where any pollutant they once contained would already be gone (Appendix A).





Client **Canadian Coastguard DFO** SAP nr.
Project **USAT Brigadier General M. G. Zalinski** Doc. nr.
Subject **Analyzing dives of January & March 2013** Ref.

Page 7 of 8
Date 26 March 2013
Rev.

5 Oil Removal Operations

The final results of the survey work revealed that there was less oil to remove than originally thought, initial estimates were up to 145 ton, but that it would prove more challenging and labor-intensive to remove because it was in pockets scattered throughout the internal structure of the vessel's bottom. This realization forced Mammoet to revisit the original salvage plan and propose an alternate method of cold pumping from an increased number of locations (Appendix B). By increasing number of locations per "tank" the loss of effectiveness from not circulating hot water could be reduced.

It was in this context that there was a discussion within the Canadian Coast Guard, and between the Coast Guard and Mammoet regarding "How clean is clean?" There was a recognition on both parts that there was no way to remove every trace of oil from the Zalinski without removing the Zalinski herself, and the focus of the project evolved with an understanding that the logical goal should be to eliminate the risk of a major pollution event, while recognizing the limits of what was the possible.

Zalinski was hot tapped in 20 locations. In each of these locations, 6-inch spool pieces were installed first. In the 15 locations known to have oil, 6" gate valves were installed on top of the spool pieces, and hot tapping was done through the gate valves. The additional hot taps were "vents" to insure that as the oil was pumped out of a space, seawater would readily flow into the hull, preventing the development of any pressure differential which might damage the shell plating.

First oil was pumped from the wreck on November 19th. Each of the valves with oil was pumped three times: two consecutive times and a third after waiting a period of time to allow for any internal migration towards the tap locations. Following the end point document produced by the Canadian Coast Guard on November 25th (Annex D), the third time each valve was pumped until the discharge showed only traces of oil. That point was agreed on by the Canadian Coast Guard representative on site, and the Salvage Master on site per the end point document. Samples were taken and sent to the Canadian Coast Guard.

The endpoint agreement also called for an internal inspection by ROV or diver. Upon entering the wreck, divers were able to see oil trapped in frame bays on the port side of the engine room and along the starboard side of the wreck from approximately mid ship forward. Several shifts were spent with a hand wand vacuuming visible oil out of the frame bays.

When all of the pumping was complete and signed off, all of the hot taps were sealed with blind flanges. As called for in the contract, all valves and spool pieces were left in place. For final locations and images see Appendix C. The access points cut for ROV surveys and hull penetration dives were patched and sealed to insure no points of entry into the Zalinski hull were left as a result of the operation. Oil removal operations were concluded on December 2, 2013.

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Client **Canadian Coastguard DFO**
Project **USAT Brigadier General M. G. Zalinski**
Subject **Analyzing dives of January & March 2013**

SAP nr.
Doc. nr.
Ref.

Page 8 of 8
Date 26 March 2013
Rev.

6 Conclusion

The significant threat to the environment and the people who live near the Zalinski wreck site has been removed through the efforts of all the parties involved in the Zalinski project. However the Canadian Coast Guard has expressed the intention to return to the wreck in May 2014 and pump off any further bunker fuel which has migrated to the pumping points in the intervening period. This should be a fairly simple and quick job with all the tap locations and valves still in place. Because of the intent to return to re-pump the ship, the Canadian Coast Guard requested that the rock anchors installed by Mammoet for mooring be left in place.

None of the survey work conducted throughout the project indicated that any of the cargo that was originally listed as possible pollutants still remained. For that reason no attempts to remove any of the ship's cargo were made.

In the end, Mammoet delivered the following quantities of pollutants to Newalta's facility in Surrey BC

- 48.5 m³ of Bunker C (Appendix D)
- 337.8 m³ of oily water (Appendix D)

