PACIFIC

Passive seismic techniques for environmentally friendly and cost efficient mineral exploration

D5.3 – Annual Risk Management Report 1

Grant agreement number	776622	**Due date of Deliverable**	31/05/2019
Start date of the project	01/06/2018	**Actual submission date**	31/08/2020
Duration	36 months	**Lead Beneficiary**	BEOW

Description
The ESMC will report on the implementation of mitigation actions defined in the risk register for the first year.

Dissemination Level		
PU	Public	X
CO	Confidential, only for members of the consortium (including the Commission Services)	

Table of content

Executive Summary

This document reports on the risks identified during field operations carried out in the first year of the PACIFIC project, from June 2018 to June 2019. During this period, two surveys were carried out, one at Stillwater Canada Inc. (SCI)' s Marathon PGU-Cu Project ("Marathon"), and another one at the Las Cruces site in Spain, an operating mine run by Cobre Las Cruces. The document builds on D5.2 – Environmental and Safety Risk Database adopted in 2018.

The procedures outlined in these documents were implemented during the surveys. No injuries were reported in either survey and impact on the local environment was found to be minimal.

1 Introduction

The purpose of this document is to identify risks associated with passive seismic surveys of the type conducted in the PACIFIC project and to take measures to eliminate where possible or minimize these risks. In addition, practices that potentially damage the environment are identified and measures to mitigate such damage are implemented.

More specifically, the goals are:

- to eliminate where possible, and minimize where not, the potential to cause harm to any stakeholders and other interested parties, and to eliminate or minimize potential environmental issues, including local wildlife and flora and the concerns of indigenous populations.
- to ensure that an appropriate risk assessment is performed whenever: a) a safety concern is identified through analysis of safety data or other means, or b) a new or revised policy, procedure or work practice is being considered that could potentially affect the safety of employees, the operation, the public, or the environment.

A risk assessment is performed as soon as practicable after identification of the safety concern and prior to initiation of the project and implementation of the change.

Passive seismic surveys require instuments to be deployed, like any geophysical exploration method. Thus field crews must access the area of interest, usually far from centre of population, roads or any other transport infrastructure. The deployments of nodes for passive seismis surveys have major advantages over other geophysical methods, summurized in table 1.

Table 1 Health, Safety and Environmental Risks associated with Geophysical exploration Methods

Method	Deployment	Access	Grid	Accessory equipment	Health and Safety Risks	Environmental Risk
Passive seismic	light*	using existing paths	not required	none	minor, limited to risks associated with working in remote locations	minimal
Gravity	light	new access paths	yes	none	slight, associated mainly with cutting of grid lines	slight, associated mainly with cutting of grid lines
Magnetic	light	new access paths	yes	none	slight, associated mainly with cutting of grid lines	slight, associated mainly with cutting of grid lines
Magneto-telluric	light	new access paths	yes	none	slight, associated mainly with cutting of grid lines	slight, associated mainly with cutting of grid lines
Electromagnetic	ATV	new access paths	yes	electric generators	moderate, associated with use of large electric currents and cutting of grid lines	moderate, associated with deployment of generators and cutting of grid lines
Ground-penetrating radar	ATV	new access paths	yes	electric generators	moderate, associated with use of large electric currents and cutting of grid lines	moderate, associated with deployment of generators and cutting of grid lines
Active seismic	heavy trucks	new roads	yes	heavy trucks and cables	major, associated with road construction and operation of heavy equipment or explosives	major, due to road construction and noise and vibrations during deployment

* individuals with backpacks supplemented with all-terrain vehicles (ATV)

2 Surveys carried out between June 2018 and June 2019

2.1 The Marathon PGM-Cu deposit

The Marathon PGM-Cu deposit, owned by Stillwater Canada Inc. (hereafter referred to as SCI or SIBSTIL), is one of the two project sites for testing the mineral exploration techniques developed within PACIFIC.

SIBSTIL is a partner in the research initiative with the PACIFIC group to conduct surveys using "passive seismic techniques for environmentally friendly and cost-efficient mineral exploration".

SIBSTIL provides access to the Marathon PGM-CU project site to test the passive seismic technique as well as obtain all the required permits and regulations.

Experiment layout/location:

- Deployment of a total of 1025 nodes
- 425 as an array (for 3D reflection imaging) and 600 as a profile (for 2D reflective imaging)
- 2D array will have a spacing of 150m and cover an area from the Pic River in the east, to the powerline in the north, to Hare Lake in the west and to the Airport in the south.
- While the 2D profile line will have a spacing of 50m and overlay the 2D array. The line will have a length of 6000m and extend from the Pic River to Hare Lake.

The workplan for the passive seismic project can be divided into four parts:

1. Pre-inspection and site preparation
2. Sensor Deployment
3. Data acquisition
4. Sensor Retrieval.

Although part of the workplan took place along a trail system (with access), the overall project was considered a 'remote access' project because the majority of the work site was accessed by either helicopter or an All-Terrain Vehicle (ATV) trail access only. This determined the use of 'remote access' procedures.

SCI has studied an assessment of the potential hazards that could be encountered during operations.

The Risk Assessments listed below (see section 3) were selected by SCI to cover the activities and these were deemed to be adequate.

2.2 Las Cruces site

The Las Cruces site is an operating mine run by Cobre Las Cruces, a filiere of First Quantum. PACIFIC conducted a passive seismic survey at this site in collaboration with INFACT in March-April 2019.

The site is an active open pit mine located on a rolling plain in a rural area about 16 kilometers northwest of Sevilla, Spain. The area surrounding the open pit within the mine property is generally low hills created from tailing from the mine. The hills have been reclaimed with grasses and other local vegetation. Outside of the mine property is farming and some light commercial facilities. The

extent of the survey was limited to the mine property controlled by First Quantum which is protected by a chain-linked fence surrounding the property.

The initial design for the deployment covered a large area, about 7 x 4 km extending to the north and south of the mine but this was reduced to a smaller tighter 1 x 1 km array. A collapse of the north side of the open pit then eliminated the possibility of placing nodes to the west of the pit and this resulted in the still smaller array. 131 short-period 1-component nodal sensors were installed and recorded continuously ambient noise for 33 days, in April 2019.

3 Risk assessments

3.1 Marathon survey

The selected SCI Risk Assessments have been compared to the original Risk Assessments prepared in D5.2 – Environmental and Safety Risk Database, both for nomenclature and content, see below:

SCI Risk Assessment (RA) Number	Equivalent Document in D5.2	RA Title in Document D5.2	RA Title in Document D5.3
RA001	Para 2.1	Site Access	Travelling/Vehicle Travel/ATV/Helicopter/ Traversing (modifications)
RA002	Para 5.1	Lone Working	Working in the Field (modifications)
RA003	Para 7.1	Safe Use of Hand Tools	Safe use of Hand Tools (minor modifications)
RA004	Para 9.1	Manual Handling	Manual handling (minor modifications)

Before starting each task or operation, an appropriarate training were held to the persons performing the task or operation. Safety working procedures were assimilated before performing the work task. The adherence/compliance to the Risk Assessments can be assessed by checking:

- Training record
- Vehicle maintanance record
- GPS trackers
- Workplace Inspection Form
- Supervisors reports
- Any Incident Reports
- Contents of the Accident Recording Book
- Records of any Complaints
- Any modifications which were implemented during the activity.

The additional documents used alongside the Risk Assessment (Work Inspection Form and Safety Data Sheet (Control of Substances Hazardous to Health (COSHH Assessment) have been included in this document for reference.

3.2 Work Inspection Form

STILLWATER CANADA INC.	Workplace Inspection Form
Work Plan #	PACIFIC Passive Seismic techniques for environmentally friendly and cost efficient mineral exploration

Inspector: (Print Name)	**Signature:**
1.	**1.**
2.	**2.**
3.	**3.**
Date:	
Location(s):	
Activities:	
Contractor:	
Supervisor:	**Signature:**
Comments:	

3.3 Working with Hazardous Materials - Safety Data Sheets (Full document available)

fairfieldnodal

Safety Data Sheet (SDS)

ZLand® Lithium-ion 1C Battery Pack

Part Number	**221.7702.0002**	**May be used to comply with OSHA's HAZCOM Standard; 29 CFR 1910.1200 must be consulted for specific requirements.**
SDS Revision	-	
Date	**06-24-2015**	
Approved by	**FairfieldNodal HSE Department**	

NOTE

Important Note: As a solid, manufactured article per 29 CFR 1910.1200 (b)(6)(v) and (c), user exposure to potentially hazardous battery cell ingredients is not anticipated or expected with normal prescribed use under normal prescribed conditions.

The information contained in this Safety Data Sheet (SDS) contains valuable recommendations for the safe handling and proper use of the ZLand® product. This SDS should be retained and made readily available for employees and other users of this product.

Section 1 – Chemical and Company Identification

Commercial Product Name: **Unit, Assy, ZL2, BATTERY PACK**

Use of Product: **Unit, Assy, ZL2**

Manufacturer: **FairfieldNodal**
Division: Systems
Part Number: 221.7702.0002

Company Identification
FairfieldNodal
1111 Gillingham Lane
Sugar Land, TX 77478, USA
281-275-7500

www.FairfieldNodal.com

Emergency Contact: **CHEMTREC**

800-424-9300 (US and Canada)

+1 (703) 527-3887 **International and Maritime Telephone Number**

Z Land® Node Gen II 1 of 7 Safety Data Sheet (SDS)

3.4 Las Cruces survey

Being an operating mine, PACIFIC field personnel could only access and perform field work accompanied by and under the supervision of mine personnel. Prior to accessing the mine property, Pacific personnel were provided safety training and, if needed, provided Personal Protection Equipment (PPE) that met mine safety standards. The risks associated with deployment and recovery of the passive seismic nodes were those risks associated with walking, driving and heat-related health issues, but were mitigated by standard safety procedures for those risks. The mine had an on-site urgent care medical facility and emergency care was available by hospital facilities in Sevilla. Special care was taken to keep the environmental impact at an absolute minimum.

4 Conclusion

This document demonstrates that D5.2 – Environmental and Safety Risk Database adopted in 2018 has been effective.

However, some modifications to generic Risk Assessments may be needed to account for prevailing health, safety and environment (HSE) laws, individual company HSE policies, local conditions and HSE matters arising before and during operations.