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Juin 2019

ANALYSE INDÉPENDANTE DE LA VIABILITÉ TECHNIQUE ET ÉCONOMIQUE DU PROJET MINIER DE NOUVEAU MONDE GRAPHITE À SAINT-MICHEL-DES-SAINTS, QUÉBEC

Independent Technical & Economic Review of Nouveau Monde Graphite's Mining Project in Saint-Michel-des-Saints, Quebec, Canada

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RÉSUMÉ EN FRANÇAIS

À la demande de citoyens affectés par le projet la compagnie minière Nouveau Monde Graphite à Saint-Michel-des-Saints (Québec)[1], MiningWatch Canada a retenu les services d'ingénierie de Kuipers & Associates[2] pour faire l'analyse de la viabilité technique et économique dudit projet. La firme devait notamment répondre aux deux questions suivantes :

- Le projet Matawinie de Nouveau Monde Graphite est-il viable économiquement?
- Quels sont les principaux risques techniques et financiers du projet?

À la suite de l'analyse des études techniques et économiques du projet,3 de même que du marché mondial du graphite, la firme Kuipers & Associates conclut que :

- Le projet minier de Nouveau Monde Graphite demeure spéculatif et sa viabilité économique n'est pas démontrée. Les hypothèses financières qui sous-tendent l'étude de faisabilité sont généralement optimistes et peu prudentes, tout particulièrement concernant le prix et le marché du graphite qui demeurent hautement spéculatifs et dominés par de grands joueurs internationaux qui contrôlent le marché[4]. De nombreux analystes, dont le *U.S. Geological Survey*, observent également une part croissante du graphite synthétique sur les marchés mondiaux, de même que la diminution prévisible, voire l'élimination de l'utilisation du graphite naturelle pour la fabrication des piles pour le transport électrique. Le projet est vulnérable face aux forces dominantes du marché mondial du graphite. La multinationale Imerys, déjà implantée au Québec, a notamment préféré acheter un autre projet plutôt que celui-ci.
- Du côté des revenus anticipés, le prix de vente du graphite mentionné dans l'étude de faisabilité (1730 $US) n'est pas soutenu dans la documentation et il est incohérent si on réfère aux prix variant de 1124 $US à 1532 $US utilisés dans les études précédentes de l'entreprise (écarts de 11 à 35%). De plus, le taux de change de 0.76:1.00 $CD/US utilisé est peu prudent et gonfle sans doute les revenus anticipés. Les données statistiques des 15 dernières années indiquent que le taux de change a largement dépassé ce niveau, ce qui représente un risque financier significatif.
- Du côté des dépenses, de nombreux coûts de capitalisation et d'opération sont sous-estimés ou non documentés de façon adéquate. C'est le cas des coûts de gestion, de traitement et de stockage de plus de 100 millions de tonnes de déchets miniers, dont près de la moitié présente des risques de contamination acide; les coûts de traitement des eaux contaminées à court, moyen et long terme; la garantie financière pour assurer la sécurisation du site minier après la fermeture; les coûts pour des mesures de mitigation efficace de la poussière et du bruit; les compensations possibles pour les résidents limitrophes, la municipalité et les Nations autochtones. De plus, la viabilité technique et économique d'une mine « toute électrique » ne sont pas démontrées: les coûts de capitalisation et d'opération ne sont pas détaillés, ni les difficultés et les délais d'opération possibles. Le promoteur prévoit d'ailleurs recourir au diesel au départ, ce qui pourrait être maintenu à long terme.

1 Coalition citoyenne des opposants à un projet minier en Haute-Matawinie (COPH)

2 Jim Kuipers, ingénieur principal chez Kuipers & Associates, a plus de 35 ans d'expérience dans le secteur minier au Canada, aux États-Unis et à l'international. Il est membre de l'Ordre professionnel des ingénieurs du Montana et du Colorado. Il a témoigné comme expert devant différentes commissions et divers tribunaux au Canada et aux États-Unis. Il est reconnu comme une « personne qualifiée » selon la définition des normes NI 43-101 appliquées par les Autorités canadiennes en valeurs mobilières.

3 Principalement l'étude de faisabilité du projet: *MC-DRA 2018 TFSR. NI 43-101 Technical Feasibility Study Report for the Matawinie Graphite Project, by Met-Chem, DRA Americas Inc. for Nouveau Monde Graphite Inc., December 2018.*

4 La Turquie, le Brésil, la Chine et plusieurs pays d'Afrique dominent et contrôlent le marché mondial du graphite.

1 INTRODUCTION

Mining Watch Canada retained Kuipers & Associates to review and provide professional opinions concerning the economic evaluation of Nouveau Monde Graphite's Matawinie Graphite Project, located less than 1km from the closest residences and cottages, and about 4km from the edge of the community of Saint-Michel-des-Saints, Quebec, Canada. Specifically, the client requested that we address the following questions:

- *Is the proposed project economically viable based on existing NI43-101 report filings by the company, or any other professional judgments by the assessor?*
- *Has the proponent met the requirements of Section 101 of the Quebec Mining Act?*
- *What are the major technical or financial risks to highlight at this stage?*

2 QUALIFICATIONS

I have an extensive background with more than 35 years involvement in mining metals and minerals including in the full-life cycle of exploration, project development, project permitting, construction, operations, reclamation, and closure. I graduated in 1983 with a B.S. in Mineral Processing from Montana School of Mines. In addition to growing up in a mining family and gaining practical experience prior to entering University, I have worked as a senior engineer, chief metallurgist, mill superintendent, mine manager, project manager, and consulting engineer. Since 1996 I have been the principal consulting engineer with Kuipers & Associates. My work during that time has focused on providing technical expertise to public interest groups, tribes and first nations, and governments concerning mining and environmental concerns. The primary areas of expertise I have provided have included site characterization, water quality predictions, mine planning and mitigations, tailing storage facilities, mine reclamation and closure, site investigations and remediation, water treatment, financial assurance, and economic evaluations.

I am a registered Professional Engineer in Mining in the U.S. States of Montana and Colorado. I have been qualified as an expert witness in mining and related matters in numerous administrative hearings in the U.S. and Canada, and have been qualified as an expert witness in U.S. Federal and State Courts. I have conducted numerous feasibility analysis and well as extensive reviews of similar analysis throughout my professional career. I am highly familiar with the NI 43-101 Guidelines[1] and meet the definition of a "qualified person" consistent with the guidelines. My professional resume is attached as Exhibit A.

3 DOCUMENTS AND OTHER INFORMATION RELIED UPON

The primary documents I have reviewed in conducting this analysis are as follows:

> MC-DRA 2018 TFSR. *NI 43-101 Technical Feasibility Study Report for the Matawinie Graphite Project*, by Met-Chem, DRA Americas Inc. for Nouveau Monde Graphite Inc., December 2018.

In addition, I have relied on graphite commodity analysis performed by the United States Geological Survey (USGS) and other documents as referenced in this report.

1 NATIONAL INSTRUMENT 43-101 STANDARDS OF DISCLOSURE FOR MINERAL PROJECTS, Rules and Policies, June 24, 2011. http://web.cim.org/standards/documents/block484_doc111.pdf

4 SUMMARY OF PRIMARY DOCUMENTS

The following summarizes the *NI 43-101 Technical Feasibility Study Report for the Matawinie Graphite Project*, by Met-Chem, DRA Americas Inc. (MC-DRA) for Nouveau Monde Graphite Inc (NMG) (MC-DRA 2018 TFSR).

4.1 MC-DRA 2018 TFSR

The results of the MC-DRA 2018 TFSR are summarized in Table 4.1. The Feasibility Study follows National Instrument 43-101 (NI 43-101) rules and guidelines. The proposed project is based on probable mineral reserves estimated at 59.8 M tonnes[2] ore at a contained carbon as graphite Cg) grade of 4.35%, containing approximately 2.6 M t Cg.

Material from the Tony Block would be mined using an open pit truck and shovel operation consisting an all-electric fleet. In addition, an in-pit crushing and conveying system would supply crushed ore to the concentrator. A mine plan was developed which supplies the required amount of ore to produce 100,000 tonnes of graphite concentrate per year. The ultimate pit design consists of five (5) phases
of production to assure a consistent feed grade for the entire 26-year mine life of the Project. The
disposal of waste, PAG and NAG tailings can commence backfilling in-pit as early as Year 5 of production.
According to the report, the driving factor for the mining sequence is the progressive reclamation of the site while minimizing the environmental footprint and assuring a consistent feed grade (Cg %) to the mill. This involves maximizing the backfilling of waste and tailings in-pit and minimizing the size of any external co-disposal stockpile. The mining and crushing would be performed by a mining contractor five days per week, 16-hours per day.

Processing would consist of crushing, grinding and flotation concentration methods with an average mill feed capacity of 2.37 million tonnes per year of ore to produce a final graphite concentrate that is thickened, filtered and dried, then dry screened into four (4) products and bagged in super sacks for transport. According to the report, the concentrator tailings would be initially thickened for process water recovery and then pumped to the de-sulphurization plant. The concentrator tailings would be de-sulphurized by sulphide flotation and magnetic separation to produce clean Non-Acid Generating ("NAG") tailings. The NAG tailings and the sulphide concentrate ("PAG" tailings) would be filtered and stockpiled before being trucked to a co-disposition site. De-sulphurized tailings (NAG) and sulphide concentrate (PAG) would be placed with the waste rocks in co-disposition cells to form a co-disposal stockpile. From Year 5, co-disposition will also be carried out in the mine pit. A total of 56.49 Mm^3 of waste rocks and tailings will be managed out of which 22.6 Mm^3 (40 %) will be placed in-pit. Progressive restoration of the codisposal stockpile will also be carried out starting at Year 4 of mine operation.

2 All units are metric unless otherwise noted.

TABLE 4.1-1 NOUVEAU MONDE GRAPHITE, MATAWINIE GRAPHITE PROJECT, SUMMARY OF MC-DRA 2018 TFSR

Mineral Reserves	Probable - 59.8 M t @4.35 Cg% (6.2 M t contained Cg)
Production	
Mining	59.9 M t @ 4.35% Cg, 26 years LOM, 0.8 waste:ore
Processing	59.9 M t @ 4.35% Cg, 6,449 tpd
Concentrate	2.5 M t @ 97.0% Cg
Costs	
Capital Costs	$350.4 m
Operating Costs	
Mill Feed per ton	$21.05/t
Total	$1,261.2 million
Revenue	
Price	$1,730 USD/t Cg
Exch Rate	0.7651:1.00 USD:CAD
Net Revenue	$5,703.0 million
Financial Results	
Pre-Tax	
Cash Flow	$4,091.4 million
IRR	40.6%
NPV @8%DR	$1,286.8 million
Payback	2.2 years
Post-Tax	
Cash Flow	$2,449.5 million
IRR	32.2%
NPV @8%DR	$750.8 m
Payback	2.6 years

Project infrastructure would include a 120 kV electrical power line, a main access road and site roads, general site works, site electrical distribution and communication, site fire protection, fresh water, potable water and sewage treatment, auxiliary buildings, water treatment and tailings and water management facilities.

The projected life-of mine capital costs for the project are $350.4[1] million which includes $66.9 million in sustaining capital. Operating costs are estimated at $49.9 million per year ($21.05/t processed) or $499 per tonne of graphite concentrate produced.

The graphite concentrate sales price used for the FS was established at $2,261 ($1,730 USD) per tonne. The selling price was calculated using price forecasts provided by Benchmark Mineral Intelligence ("Benchmark"). No contracts relevant to the FS have been established by NMG.

The projected revenue from sales of graphite concentrate is estimated to be $5.7 billion. The report used an exchange rate of 0.7651:1.00 (US dollar to Canadian dollar). The results suggested a pre-tax cash flow of $4.1 billion, an internal rate of return (IRR) of 40.6% with a payback period of 2.2 years and a net present value (NPV) at 8% discounted rate of return (DROR) of $1.3 billion. The results suggested an after-tax cash flow of $2.4 billion, an internal rate of return (IRR) of 32.2% with a payback period of 2.6 years and a net present value (NPV) at 8% discounted rate of return (DROR) of $751 million.

The report included a sensitivity analysis which suggested the NPV is most sensitive to graphite price and, in decreasing order, exchange rate, operating costs, and capital costs. The IRR is most sensitive to the graphite price followed exchange rate, capital costs, and operating costs.

1 All dollar units are Canadian unless otherwise noted as United States (US).

5 PROJECT ECONOMIC VIABILITY

The Matawinie Graphite Project would produce crystalline flake graphite. The United States Geographical Survey (USGS) is considered to be an authoritative entity with respect to world-wide minerals commodity exploration, production, and distribution, including for graphite. The USGS produces an annual Mineral Commodity Summary for graphite, and as graphite has been identified as a critical mineral resource to the U.S., the USGS in 2017 also produced a professional paper on graphite titled *Chapter J of Critical Mineral Resources of the United States—Economic and Environmental Geology and Prospects for Future Supply*.[3]

According to the USGS, global graphite resources are large relative to annual global consumption, and undoubtedly extensive, but their extent is poorly defined. Therefore, the resources are typically not defined far in advance of project development. Of the total identified graphite resources of approximately 1.5 billion tonnes worldwide, approximately one-half is crystalline flake graphite. The USGS report notes that "*Future exploration is likely to result in the discovery of world resources that are many times this estimate; however, many new discoveries are likely to be located in remote areas with high mining costs and limited access to infrastructure and industrial markets that use graphite*." The report identifies the Lac Knife deposit in Quebec, Canada, as a specific example of a relatively recent discovery in a remote setting.

The MC-DRA 2018 TFSR identifies the Lac-Des-Îles mine, owned by Imerys Graphite and Carbon and located near the town of Lac-Des-Îles, Quebec, as the only presently active crystalline flake graphite producer in Quebec. It suggests Lac-Des-Îles and is an archetypal example of this type of graphite deposit. The report also identifies three (3) other known significant crystalline graphite flake deposits found in eastern Canada and within the Grenville geological Province: Focus Graphite's Lac Knife deposit and Mason Graphite's Lac Guéret deposit, both located in Northern Quebec, as well as Northern Graphite's Bissett Creek deposit in Ontario.

The mineral resources and mineral reserves from the MC-DRA 2018 TFSR for the project are summarized in Table 5.1 and discussed in the following sections. The mineral resources for the Matawinie Graphite Project contain 155 million metric tons at a grade of 4.1% graphite containing of 6.4 M tonnes Cg. By comparison, according to the USGS, the largest known flake graphite deposit, the Zavalyevskiy deposit in Ukraine, has total resources on the order of 100 million metric tons at a grade of 5 to 7 percent graphite containing 6.4 million tonnes.

3 https://pubs.usgs.gov/pp/1802/j/pp1802j.pdf

TABLE 5.1 - NOUVEAU MONDE GRAPHITE, MATAWINIE GRAPHITE PROJECT, SUMMARY OF MINERAL RESOURCES AND RESERVES

Category	MC-DRA 2018 TFSR		
	Tonnage (Mt)	Average %Cg	Graphite (Mt)
Mineral Resources			
West Zone			
Indicated	95.8	4.28%	4.10
Inferred	14.0	4.19%	0.59
Total	109.8	4.27%	4.69
South Zone			
Indicated	26.3	3.73%	0.98
Inferred	19.2	3.67%	0.71
Total	45.5	3.70%	1.69
Combined Zones			
Indicated	122.1	4.16%	5.08
Inferred	33.2	3.90%	1.30
Total	155.3	4.10%	6.38
Mineral Reserves			
Proven	0	0	0
Probable	59.8	4.35%	2.60
Total	59.8	4.35%	2.60

5.1 MINERAL RESOURCE

As was noted in the report, the mineral resource estimates were conducted following the Canadian Institute of Mining, Metallurgy and Petroleum (CIM) Definitions Standards for Mineral Resources in accordance with NI 43-101 Standards of Disclosure for Mineral Projects.[4] The CIM Definitions Standards[5] specifically contain the following information with respect to indicated and inferred mineral resources.

Inferred Mineral Resource

> **An Inferred Mineral Resource is that part of a Mineral Resource for which quantity and grade or quality are estimated on the basis of limited geological evidence and sampling. Geological evidence is sufficient to imply but not verify geological and grade or quality continuity.**
>
> **An Inferred Mineral Resource has a lower level of confidence than that applying to an Indicated Mineral Resource and must not be converted to a Mineral Reserve. It is reasonably expected that the majority of Inferred Mineral Resources could be upgraded to Indicated Mineral Resources with continued exploration.**
> *An Inferred Mineral Resource is based on limited information and sampling gathered through appropriate sampling techniques from locations such as outcrops, trenches, pits, workings and drill holes. Inferred Mineral Resources must not be included in the economic analysis, production schedules, or estimated mine life in publicly disclosed Pre-Feasibility or Feasibility Studies, or in the Life of Mine plans and cash flow models of developed mines. Inferred Mineral Resources can only be used in economic studies as provided under NI 43-101.*

4 https://www.bcsc.bc.ca/Securities_Law/Policies/Policy4/PDF/43-101__NI___May_9__2016/

5 https://www.bcsc.bc.ca/uploadedFiles/For_Companies/Mining/CIM_DEFINITION_STANDARDS_MAY_10_2014.pdf?t=1558374601336

There may be circumstances, where appropriate sampling, testing, and other measurements are sufficient to demonstrate data integrity, geological and grade/quality continuity of a Measured or Indicated Mineral Resource, however, quality assurance and quality control, or other information may not meet all industry norms for the disclosure of an Indicated or Measured Mineral Resource. Under these circumstances, it may be reasonable for the Qualified Person to report an Inferred Mineral Resource if the Qualified Person has taken steps to verify the information meets the requirements of an Inferred Mineral Resource.

Indicated Mineral Resource

An Indicated Mineral Resource is that part of a Mineral Resource for which quantity, grade or quality, densities, shape and physical characteristics are estimated with sufficient confidence to allow the application of Modifying Factors in sufficient detail to support mine planning and evaluation of the economic viability of the deposit.

Geological evidence is derived from adequately detailed and reliable exploration, sampling and testing and is sufficient to assume geological and grade or quality continuity between points of observation.

An Indicated Mineral Resource has a lower level of confidence than that applying to a Measured Mineral Resource and may only be converted to a Probable Mineral Reserve.

Mineralization may be classified as an Indicated Mineral Resource by the Qualified Person when the nature, quality, quantity and distribution of data are such as to allow confident interpretation of the geological framework and to reasonably assume the continuity of mineralization. The Qualified Person must recognize the importance of the Indicated Mineral Resource category to the advancement of the feasibility of the project. An Indicated Mineral Resource estimate is of sufficient quality to support a Pre-Feasibility Study which can serve as the basis for major development decisions.

5.2 MINERAL RESERVES

According to the CIM Definitions Standards:

Mineral Reserves are sub-divided in order of increasing confidence into Probable Mineral Reserves and Proven Mineral Reserves. A Probable Mineral Reserve has a lower level of confidence than a Proven Mineral Reserve.

A Mineral Reserve is the economically mineable part of a Measured and/or Indicated Mineral Resource. It includes diluting materials and allowances for losses, which may occur when the material is mined or extracted and is defined by studies at Pre-Feasibility or Feasibility level as appropriate that include application of Modifying Factors. Such studies demonstrate that, at the time of reporting, extraction could reasonably be justified.

The reference point at which Mineral Reserves are defined, usually the point where the ore is delivered to the processing plant, must be stated. It is important that, in all situations where the reference point is different, such as for a saleable product, a clarifying statement is included to ensure that the reader is fully informed as to what is being reported.

The public disclosure of a Mineral Reserve must be demonstrated by a Pre-Feasibility Study or Feasibility Study.

Mineral Reserves are those parts of Mineral Resources which, after the application of all mining factors, result in an estimated tonnage and grade which, in the opinion of the Qualified Person(s) making the estimates, is the basis of an economically viable project after taking account of all relevant Modifying Factors. Mineral Reserves are inclusive of diluting material that will be mined in conjunction with the Mineral Reserves and delivered to the treatment plant or equivalent facility. The term 'Mineral Reserve' need not necessarily signify that extraction facilities are in place or operative or that all governmental approvals have been received. It does signify that there are reasonable expectations of such approvals.

'Reference point' refers to the mining or process point at which the Qualified Person prepares a Mineral Reserve. For example, most metal deposits disclose mineral reserves with a "mill feed" reference point. In these cases, reserves are reported as mined ore delivered to the plant and do not include reductions attributed to anticipated plant losses. In contrast, coal reserves have traditionally been reported as tonnes of "clean coal". In this coal example, reserves are reported as a "saleable product" reference point and include reductions for plant yield (recovery). The Qualified Person must clearly state the 'reference point' used in the Mineral Reserve estimate.

5.3 CONCLUSIONS

- The information provided in the MC-DRA 2018 TFSR is consistent with CIM definitions for mineral resources and mineral reserves.
- The mineral resources indicated for the Tony Block of 155 million metric tons at a grade of 4.1% graphite containing of 6.4 M t Cg suggests the resource is of significant size and grade comparable to other large graphite resources worldwide and in Canada.
- The mineral reserves of 59.8 M t at a grade of 4.35% graphite containing 2.6 M t Cg form the basis for the proposed project to be mined at a rate of 6,449 tpd of ore with a strip ratio of 0.8 waste:ore over a period of 26-years.
- It is significant that only probable mineral reserves were identified in the report. While probable mineral reserves are considered economically mineable, only application of the proven mineral resource category suggests to readers of the report that the Qualified Person has the highest degree of confidence. MC-DRA 2018 TFSR does not identify proven reserves and instead relies solely on probable mineral reserves which suggests that variation in the estimate could significantly affect potential economic viability as discussed further in this review.

6 REQUIREMENTS OF SECTION 101 OF THE QUEBEC MINING ACT

The applicant is required by Section 101 of the Quebec Mining Act[6] and a 2018 ministerial directive[7] to meet the following three criteria of Section 101 of the Act: *(i) "...a report describing the nature, extent and probable value of the deposit, certified by an engineer or a geologist who meets the qualification requirements determined by regulation," (ii) a project feasibility study," (iii) "as well as a scoping and market study as regards processing in Québec."*

CONCLUSIONS

- The MC-DRA 2018 TFSR has been certified by a qualified person as defined by CIM and provides a feasibility study based on economically mineable mineral reserves.
- The MC-DRA 2018 TFSR also contains *Section 19.0 Market Studies and Contracts* (p. 234-243). The person responsible for the section was not identified as a QP, and the section, while informative, is not a market study per se regarding processing in Québec. A market study would more thoroughly and robustly analyze the activities in a market in regard to such influences as location, demand, and competition which may or may not affect the value of the proposed project. Therefore, in our professional opinion the requirement for a scoping and market study has not entirely been met as required by Section 101 of the Quebec Mining Act.

7 MAJOR TECHNICAL AND FINANCIAL RISKS

As previously noted, MC-DRA 2018 TFSR included a sensitivity analysis which suggested the NPV is most sensitive to graphite price and, in decreasing order, exchange rate, operating costs, and capital costs. In addition to these financial risks, several major technical risks are present for the project as proposed including the production of suitable quality graphite and environmental risks.

6 http://legisquebec.gouv.qc.ca/en/ShowDoc/cs/M-13.1

7 https://mern.gouv.qc.ca/english/publications/mines/rights/Directive-etude-faisabilite_2018.pdf

7.1 GRAPHITE MARKET

The apparent demand for the proposed project comes from two primary opportunities. The first is the imminent closure in 2020 of the Lac-des-Îles mine located in Quebec owned by Imerys Graphite and Carbon. The second is the emerging demand for graphitic carbon used in lithium batteries.

NMG on its website[8] specifically identifies the closure of Imerys Lac-des-Îles mine as "an interesting business opportunity." According to Imerys website, the Lac-des-Îles mine is Imerys only fully owned natural graphite mine and the graphite concentrates are directly sold to various applications or further processed by Imerys at plants in Bodio, Switzerland and Terrebone, Canada. However, it is notable that Imerys has started a new natural graphite mine in Otjiwarongo, Namibia that could replace production from Canada. However, the Imerys October 31, 2018 Q3 results[9] note uncertainty in the automotive sector and a slowdown of graphite demand for lithium-ion batteries in China, and that after experiencing start-up difficulties, the mine has been put on a care and maintenance program. The potential for replacement of lithium-ion batteries relying on graphite for the anodes has been noted by firms such as Tesla[10], and is predicted to occur by as early as 2025[11] or 2030[12].

As previously mentioned, the Matawinie Graphite Project is one of several projects being currently promoted in Quebec, including as replacements for the Lac-des-Îles mine. However, given that Imerys is a fully integrated carbon and graphite company, it is probable that they have resolved future supply issues and their existing markets would not need to be filled by a competitor. Furthermore, were they to identify a need to continue mining in Quebec, it would be highly probable that they would purchase a mine rather than forego their existing markets to a competitor, or buy concentrate from a non-owned mine.

Despite the uncertainty in the automotive market and the current slowdown in the lithium-ion battery market, as noted by Imerys current graphite strategy, the MC-DRA 2018 TFSR suggests that NMG is focusing its marketing effort towards the lithium-ion battery market. Given the tendency towards oversupply in the market, the extent to which NMG could potentially fill future demand for high-purity crystalline flake graphite is largely dependent on China as well as other well-established competitors such as Imerys, and any other new competitors. It can be anticipated that even with a requirement for double or even quadruple the current graphite supply in the next 10 years, existing producers will likely continue to make the market extremely competitive. If the market were to materialize, NMG could become a source supplier to a major battery manufacturer in North America such as Tesla. However, Tesla's troubles are well known and the success of the company is far from guaranteed, and as noted in MC-DRA 2018 TFSR, "No contracts have been established by NMG."

The MC-DRA 2018 TFSR is based on an aggregated graphite sales price of $1,730 USD per tonne. However, in providing the basis for the price the report presents graphite concentrate prices in USD for various size fractions calculated for years 2022 through 2047, based on price forecasts provided by a firm called Benchmark[13], which result in a weighted average of $1,532 USD per tonne. The supporting methodology used by Benchmark was not provided and the extent to which their forecasts can be relied upon is uncertain. The discrepancy between the weighted average price of $1,532 USD/t indicated in Table 19.3 of the report and the use of $1,730 USD/t for the analysis is not explained in the report. Additionally, in an earlier 2018 pre-feasibility study[14] and in an October 2018 press release, a Benchmark average price of $1,429 USD/t was used over 25 years. At the same time NMG has used a selling price of $1,124 USD/t in the generation of its resource estimates.[15]

Attempts to predict the future demand as well as price for natural crystalline graphite are inherently speculative given the current highly fluid nature of the industrial minerals market combined with emerging renewable energy and zero carbon initiatives being take both locally and globally. As an example, the USGS 2017 report suggests that synthetic graphite produced as a byproduct of carbon capture and sequestration could be used to replace natural graphite mining in the future.

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8 http://nouveaumonde.ca/en/matawinie-deposit/ April, 24, 2019

9 https://www.imerys.com/sites/imerys.com/files/2019/05/22/IMERYS_%20Q3%202018%20Results_presentation_ENG.pdf

10 https://www.electrive.com/2018/11/21/tesla-electric-car-batteries-ahead-of-the-pack/ and https://www.allaboutcircuits.com/news/lithium-ion-batteries-silicon-energy-storage/ and https://spectrum.ieee.org/energy/renewables/to-boost-lithiumion-battery-capacity-by-up-to-70-add-silicon

11 https://www.solarpowerworldonline.com/2019/01/10-disruptive-battery-technologies-trying-to-compete-with-lithium-ion/ and https://investingnews.com/daily/resource-investing/battery-metals-investing/graphite-investing/graphite-outlook/

12 https://www.bloomberg.com/news/articles/2019-01-06/before-the-electric-car-takes-over-someone-needs-to-reinvent-the-battery and https://investingnews.com/daily/resource-investing/battery-metals-investing/graphite-investing/scaling-graphite-anode-supply-critical/?mqsc=E4028512

13 https://www.benchmarkminerals.com/forecasts/

14 http://nouveaumonde.ca/wp-content/uploads/2018/10/101790-PFS-Update-43101-FINAL.pdf

15 http://nouveaumonde.ca/en/press/nouveau-monde-increases-its-indicated-resources-to-95-8mt-at-a-grade-of-4-28cg-for-its-west-zone-graphite-deposit-matawinie-property/

Conclusions

- NMG's suggestion that Imerys closure of the Lac-des-Îles Mine presents an opportunity for the Matawinie Graphite Project appears to be highly speculative. The most likely outcome in that regard would be acquisition of the Matawinie Graphite Project by Imerys as a replacement for the Lac-des-Îles Mine, however, the author considers that unlikely given the options available to Imerys for supply both in Quebec as well as worldwide.

- NMG's apparent focus on the lithium-ion battery market suggests the potential for the mine is linked to increased demand for carbon associated with energy storage and other applications addressing climate change. While increased demand from the sector is likely to be significant, there is no guarantee that lithium-ion batteries will be used, and any demand is in the future and there is likely to be significant competition by large suppliers. Nouveau Monde Graphite would be a relatively small and vulnerable player in this market.

- The use of $1,730 USD per tonne graphite concentrate in the economic analysis does not appear to be supported by the identified data and is not consistent with NMG's own previous analyses, with prices ranging from $1,124 USD/t to $1,532 USD/t. Future pricing of natural graphite is highly speculative and it is plausible that future demand for natural graphite could decrease or be mostly eliminated.

7.2 EXCHANGE RATE

The MC-DRA 2018 TFSR used an exchange rate of 0.7651:1 US Dollar to Canadian Dollar. The exchange rate was 0.74 as of 22 April, 2019. However, the past fifteen years have seen an exchange rate greater than 0.75:1 US Dollar to Canadian Dollar.[16] The proposed project is particularly affected because the graphite carbon market is based on US dollars, and based on the estimate of $1,730 US per tonne, the market price would be $2,261 Canadian per tonne.

Conclusions

While the likelihood of future changes to the exchange rate are difficult to estimate, it is probable, based on the last 15 years of data, to suggest that the CAN:US exchange rate is more likely to increase than decrease, which impact on the project's economic viability would be significant. Therefore, the exchange rate represents a significant or high project risk.

7.3 OPERATING AND CAPITAL COSTS

Operating and capital costs are significant factors for any mining and processing operation regardless of commodity. Even for well known tasks such as are proposed for this project for mining (open pit) and processing (grinding and flotation) have inherent risks associated with the estimation of capital and operating costs. For example, Export Development Canada[17] reported in 2015 that for mining projects capital costs were typically exceeded by 37%. Operating costs similarly are commonly under-estimated, and are particularly subject to fluctuating economic conditions.

Conclusions

- The project economics are dependent on achieving the projected capital and operating costs. Given that capital costs are frequently underestimated, and that the project is dependent on a proprietary process that apparently is not proven at scale, the project is at high risk of not achieving the economic results resulting from the MC-DRA 2018 TFSR.

16 https://www.ofx.com/en-ca/forex-news/historical-exchange-rates/

17 http://www.cimmes.org/wp-content/uploads/2016/05/Capital-Cost-Overrun-and-Operational-Performance-in-Mining-Industry-Tin-Lwin-25May2016.pdf

8 ENVIRONMENTAL CONSIDERATIONS

The proposed project has the potential for a variety of environmental impacts, including short and long- term water quality issues, dust, noise, site reclamation and perpetual costs, and compensation costs for up to 100-200 property owners in the vicinity.

As noted by the MC-DRA 2018 TFSR, Federal regulations including the *Canadian Environmental Assessment Act* (CEAA) and the *Metal Mining Effluent Regulations* do not generally apply to graphite mines – although CEAA allows for some ministerial discretion in this matter.[18] The project would be subject to the provincial *Environmental Quality Act* (EQA) triggering the Quebec Environmental Assessment Process and the *Quebec Mining Act*.

The report notes that a key element of the Project's critical path is the undertaking of the ongoing ESIA and the submission of the ESIA is expected to be followed by the BAPE hearings in the course of 2019 or early 2020.

8.1 WATER QUALITY

According to the MC-DRA 2018 TFSR, geochemical testing shows that the graphite recovery process tailing material is potentially acid generating (PAG). The proponent proposes to de-sulphur the tailing material by sulphide flotation and magnetic separation to produce both non-acid generating (NAG) and PAG tailing. Tailing and waste rock would be backfilled in the mine pit when access is available during the mining operations. During years 0-5, tailing and waste rock would be managed solely in a co-disposal stockpile. During years 6 to 26, tailing and waste rock would be both backfilled in the mine pit and in by co-disposal. Table 8.1 provides a summary of the quantity of waste rock and tailings, as well as their disposal locations, for the proposed project.

According to the report, the tailing and waste rock materials will be arranged in co-disposition cells to ensure the geotechnical and geochemical short and long-term stability of the stockpile. PAG waste rock would be encapsulated in a layer of fine-grained material (NAG) to limit the oxygen flow. The PAG tailing would be placed and compacted in layers, and superposed on the coarser materials (waste rock or NAG) to increase the degree of saturation in PAG tailings, limiting air diffusion and thus, reaction of sulphide minerals. The co-disposal pile would be gradually covered, using a cover with capillary barrier effect ("CCBE"), as soon as it reaches its final elevation in the pile. This cover would act as an oxygen barrier and is designed to ensure long-term geochemical stability within the pile.

Co-disposal of potentially acid generating waste rock and tailings has been proposed by the mining industry in general as a means of mitigating both short-term and long-term water quality impacts. As noted by Ulrich and Coffin (2015)[19] while in theory co-disposal has potential advantages, it is not a proven technology and does not eliminate the need for long-term monitoring, maintenance and in some cases water treatment. According to MEND (2017)[20], there are no examples of practical application of co-disposal of PAG tailings with waste rock or non-PAG tailings. Additionally, as noted by Ulrich and Coffin, "*closure covers have been shown to reduce, but not eliminate, water and oxygen transport into waste rock. Excavated rock begins oxidizing as soon as it is exposed to the environment, and after that oxidation, products are either stored in the waste rock matrix or flushed out by precipitation infiltration.*" The MC-DRA 2018 TFSR does not appear to have recognized the risks and limitations associated with addressing PAG materials.

18 Section 14(2) of CEAA https://laws-lois.justice.gc.ca/eng/acts/c-15.21/page-3.html#docCont

19 Ulrich B., J. Coffin, ***Combined Tailings and Mine Waste,*** Proceedings Tailings and Mine Waste 2015, Vancouver, BC, October 26 to 28, 2015. https://open.library.ubc.ca/media/download/pdf/59368/1.0314301/5

20 Study of Tailings Management Technologies, MEND Report 2.50.1, October 2017. http://mend-nedem.org/wp-content/uploads/2.50.1Tailings_Management_TechnologiesL.pdf

TABLE 8.1 - NOUVEAU MONDE GRAPHITE, MATAWINIE GRAPHITE PROJECT, SUMMARY OF WASTE ROCK AND TAILING MATERIAL

Material	Tonnage (Mt)	Volume (Mm^3)
Waste Rock (81% PAG)	49.96	22.63
Potentially Acid Generating (PAG) Tailing	12.57	6.39
Non-Acid Generating (NAG) Tailing	44.89	27.47
Total Waste Material	107.43	56.49
Co-Disposal Pile Capacity	64.46	33.89
In-Pit Disposal Capacity	42.97	22.60

The combination of co-disposal pile and backfill is designed to manage all the waste materials produced in the 26-Year mine plan while minimizing the total footprint of the Project. Approximately 40 % of the entire volume of mining waste produced would be backfilled. The co-disposal pile would then contain about 60 % of total waste material produced. According to the MC-DRA 2018 TFSR "*In relation to waste rock and overburden, ABA data suggests up to 81 % of waste rock will be potentially acid generating (PAG)...*" This suggests that about 50% of the total waste materials produced will be PAG, which potentially limits the effectiveness of the proposed co-disposal approach.

The MC-DRA 2018 TFSR contains limited information on the geochemistry, hydrology and hydrogeology in addition to surface water quality and groundwater quality. The report indicated that a hydrogeological conceptual model was developed based on fieldwork results and some assumptions that allowed creating a 3D model simulation (FEFLOW) calibrated for the natural groundwater flow condition. Modelling of contaminant transport for the tailing and waste co-disposal pile was in progress in order to evaluate the potential contaminant impacts on neighbouring wells and receptors. However, the report suggests that preliminary results show no contaminated flow to receptors. These results as well as appropriated mitigation measures (if required) would be integrated in the Environmental Impact Assessment Report.

Conclusions

Due to the potentially acid generating nature of the material associated with the proposed project, the project would pose a significant risk to both groundwater and surface water quality. The information provided in the MC-DRA 2018 TFSR is not sufficient to determine actual potential water quality impacts, the impact of the proposed mitigation measures (de-sulphurization and co-disposal), or other required mitigation to protect water quality, including long-term water treatment. It will be important that the potential for impacts due to potential acid generation and metal leaching are addressed both comprehensively and conservatively. The geochemical characterization and modeling of potential impacts should be performed consistent with accepted industry standards and at the same time recognize the inherent uncertainty in water quality predictions and require development and funding of a contingency plan.

8.2 AIR QUALITY

According to the MC-DRA 2018 TFSR, the initial air quality of the project site is considered to be good. NMG has conducted a preliminary atmospheric dispersion modelling of total particulate matter and fine particulate emissions from mining operations. Current mitigation measures for fugitive dust emissions were considered in the analysis. Preliminary results show potential exceedances of ambient air quality standards for fine particles and total particulate matter at the limit (300 meters from the mine site infrastructure) of application of the Clean Air Regulation, as well as at a sensitive receptor (residence) for total particulate matter. Additional mitigation measures were recommended. According to the report, "In light of available studies on air quality, it appears that air quality could be an environmental issue for the residents located very close to the mine site, but there is no indication at this time that the project could have a large enough impact on air quality to jeopardize its implementation."

Conclusions

Without a high level of priority to air quality mitigation, both in terms of installed features and operational practices, there is a very high risk that air quality will be an environmental issue for residents located in close proximity to the mine site. While the project may meet air quality regulations dealing with some pollutants, impacts from fugitive dust in particular, because it is not necessarily regulated, are likely to be significant. This aspect is an example of where the proponent could commit to and undertake the necessary measures to address this issue, but it will be largely dependent on voluntary actions directed to addressing local observations or complaints rather than measures required solely by regulations.

8.3 NOISE

According to the MC-DRA 2018 TFSR, a baseline noise survey has been conducted and noise modeling was under preparation and appropriate mitigation measures would be incorporated in the project.

Conclusions

Without a high level of priority to noise mitigation, both in terms of installed features and operational practices, there is a very high risk that noise will be an aesthetic and possible health issue for residents located in close proximity to the mine site. This aspect is an example of where the proponent could commit to and undertake the necessary measures to address this issue, but it will be largely dependent on voluntary actions directed to addressing local observations or complaints rather than measures required solely by regulations.

8.4 SITE RECLAMATION AND CLOSURE, FINANCIAL ASSURANCE

As noted by the report, the *Mining Act* provides a legal framework for developing, operating and closing mines, as well as for the mining site restoration process. It provides for the obligation for companies to submit a site restoration plan prior to project approval, and to provide financial guarantees.

According to the report, a reclamation and rehabilitation plan is in preparation as part of the Project progress activities and would be presented to the MERN in early 2019. The rehabilitation and reclamation plan would be developed following the provincial Guidelines for Preparing a Mining Site Rehabilitation Plan and General Mining Site Rehabilitation Requirements (2017) which provides to the proponents the rehabilitation requirements. No details are provided in the report, however it does suggest that there may be post-closure water treatment required, and a lake is expected to form at the northern portion of the pit. No financial assurance estimate is provided however the MC-DRA 2018 TFSR did include a provision of $12.5 M for closure and rehabilitation of the mine site.

Conclusions

Given the importance of reclamation and closure measures to address potential water quality as well as other impacts, the lack of a more detailed reclamation and closure plan, as well as detailed cost estimate, to inform the MC-DRA 2018 TFSR, as well as the public, is problematic. As the public is highly concerned about potential environmental impacts and their associated costs, and the mining industry touts their ability to identify and address environmental concerns, the proponent should have provided a more detailed reclamation and closure plan and corresponding financial assurance estimate at the earliest opportunity in both their project development process as well as their public engagement process undertaken thus far. It is highly likely in our experience that additional reclamation and closure measures than those identified in the report, such as long-term water treatment, may be required and are not accurately reflected in the information as presented.

8.5 PROPERTY OWNER COMPENSATION

The MC-DRA 2018 TFSR does not mention or address property owner compensation, outside of the company's attempt to acquire homes or cottages located within one kilometer of the mine pit boundary. According to the report, the proponent has a procedure that includes provision for the independent evaluation of the property value, and promotes dialogue leading to consensual agreements. Home or cottage and land owners within the area are divided into three (3) groups and described in the report as follows:

- *Lac aux Pierres*: Owners were invited to five (5) meetings since July 2014, and group representatives were met at several other moments. Properties have been evaluated and a meeting was held in 2017 to present the results and to begin the negotiation process. Within the 1-km area, 5 out of 11 properties have been acquired and NMG continues to discuss with the other owners.
- *Domaine Lagrange*: An initial meeting was held with the owners back in 2015. Since then, NMG has acquired two (2) properties, and an agreement was signed to acquire a third property in 2020. NMG continues discussions with other interested owners.
- *Bellerose:* Two (2) forestry land parcels are located along the future mine site, one of which encroaches the planned open pit over an area of approximately 7,250 square metres according to a public land use database acquired from the MRC in 2015. Owners have been met and their properties have been evaluated.

Conclusions

The report does not address how property owners who chose not to sell will be dealt with or treated. Similarly, it does not address the difference between the property value of land that is already reduced in value due to the stigma of future mining, and the cost of acquiring a property of similar value where such stigma does not exist. Given the reluctance of landowners to move and their inability to easily acquire and move to new locations, this aspect is likely to be of significant difficulty to the proponent.

8.6 ALL ELECTRIC MINE

According to the MC-DRA 2018 TFSR, the mining method selected would consist of an open pit truck and shovel operation considering an all-electric fleet. This is premised on the electrical power for the Matawinie Mine being supplied by Hydro-Québec through a new 120 kV transmission line which is estimated at $14M, although an estimate from Hydro Quebec was not obtained for the study. The total power demand is estimated at 29 MW. The report is based on the assumption that the mining would be performed by a contractor that would provide and own the all-electric fleet.

Conclusions

The proposal to operate an all-electric mining fleet is progressive, particularly given the use of hydropower. In addition to resulting in less carbon emissions an electric fleet is likely to result in reductions in noise. Additionally, the mining industry expects that electric power will make the mine more operationally efficient and significantly improve health and safety performance.[21] However, the study does not provide any details on the nature or size of the equipment that will be used and in this regard it appears to rely on highly uncertain information and appear to be highly speculative. As noted by the CEO of NMG, the development of an all-electric approach to mining is in its infancy,[22] and the applicability to this particular project is not certain in terms of either economics, technical feasibility, or availability.

21 https://www.icmm.com/en-gb/case-studies/all-electric-mine-of-the-future

22 http://magazine.cim.org/en/projects/all-in-for-electric-en

9 SUMMARY OF CONCLUSIONS

Based on the information provided and evaluated in the MC-DRA 2018 TFSR as well as other information as cited in this evaluation, the proposed Matawinie Graphite Mine is highly speculative for the following reasons:

- The world-wide graphitic carbon market is limited and highly influenced by existing major producers that in many cases are integrated from materials production to final formed products. As a result, the likelihood of the Matawinie Graphite Mine being developed as a new and independent source of graphitic carbon is highly unlikely. The most likely scenario would be for Imerys to purchase the Matawinie Graphite Mine to replace its mined-out Lac-Des-Îles project, however Imerys appears to have already identified alternative supplies outside of Canada.

- The project's capital costs, operating costs, and graphite price are optimistic and given the mineral reserves are probable rather than proven, the project's estimated economic feasibility should not be given a high level of confidence. Rather than be advanced as a viable project, the proponent should undertake a more robust and informed study of the project including development of at least 50% of the mineral reserves into the proven category, perform high level of confidence capital and operating cost estimates including the estimation of detailed mining costs, and use of a carbon graphite price actually likely to reflect future conditions under less than optimistic circumstances.

- The project, while mining a relatively mundane commodity, is hosted in and includes geology that is conducive to acid mine drainage and potential metal leaching. It is located in close proximity to sensitive water resources, including the Matawin River and the Lac Taureau Regional Parc located downstream. In addition, the mine is adjacent to existing residential dwellings and even with additional mitigation impacts on those residents' quality of life, and potentially health, are likely to be appreciable. The proponent has suggested a variety of mitigation measures to address potential impacts to water quality, air, noise, and residential impacts, however the detailed data necessary to evaluate the impacts and any mitigation measures is not currently available and out of scope of the current analysis.

- The project has the potential to result in significant impacts and liabilities, while at the same time the economic viability of the project is highly uncertain, making the project relatively high risk in terms of liability to the community.

- If the project were ultimately advanced by a more experienced owner integrated in the graphitic carbon market, and the potential environmental risks conservatively evaluated and mitigated including by providing adequate financial assurance for both short-term and long-term costs, the project might serve to provide a necessary component of renewable energy and an example of modern mining. However, the project is highly speculative and it is not apparent they have incorporated measures, based on the limited information in the feasibility study, that would adequately address environmental and social risks.

APPENDIX A

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SUMMARY OF EXPERIENCE

Over 35 years experience in mining and environmental process engineering design, operations management, regulatory compliance, waste remediation, reclamation and closure, and financial assurance. Over 20 years experience providing technical assistance to public interest groups and tribal, local, state and federal governments on technical aspects of mining and environmental issues.

EDUCATION

Montana College of Mineral Science and Technology, B.S. Mineral Process Engineering, 1983.

PROFESSIONAL REGISTRATION

Professional Engineer (PE Mining/Minerals): Colorado (No. 30262), Montana (No. 7809 & Corp. No. 197)

PROFESSIONAL EXPERIENCE

1996 to Present	Kuipers & Associates/J. Kuipers Engineering, Butte, MT.
1993 - 1995	Denver Mineral Engineers, Inc..
1991 - 1992	Western States Minerals Corp.
1986 - 1991	Western Gold Exploration and Mining Co. (WESTGOLD) / Minorco
1984 - 1985	Canyonlands 21st Century Corporation
1983 - 1984	Cumberland Mining Corporation

SOME RECENT PUBLICATIONS AND PRESENTATIONS

- *Hardrock Mine Financial Assurance Training Workshop,* National Tribal Mining Workgroup, McCall, ID, October 11-12, 2017.
- *The Development of Remedial Design Options for the Questa Mine Waste Rock Piles using a Collaborative Approach,* Kuipers, J. et al, Tailings and Mine Waste 2017, Nov 5-8, Banff, Alberta, Canada
- *Mine Reclamation and Closure Planning: Reducing the Risk from Mining Influenced Water, Mine Financial Assurance: Addressing the Cost of Mining Influenced Water,* U.S. EPA The Mining Lifecycle: Tribal Engagement and Responsibility Conference, Phoenix, AZ, November 2-4, 2016.
- *Mine Tailings Fundamentals: Current Technology and Practice for Mine Tailings Facilities Operations and Closure*, U.S. EPA Contaminated Site Clean-Up Information Webinar Series May 19-20, 2015
- *North American Indigenous Peoples Perspectives on the Reliability of Mine Water Technology,* International Mine Water Association, Golden, CO, 2013 Annual Conference.
- *Financial Assurance Regulations and Cost Estimation at US Hardrock Mines,* U.S. Chile Mining Financial Assurance Seminar, US Office of Surface Mining and Environmental Protection agency and Chilean Ministry of Mining, Santiago, Chile, May 2012.

- *Mining Reclamation and Closure Regulations and Best Practices*, 2012 International Conference on Mining in Mindanao, Ateneo de Davao University, Davao City, Philippines, January 26-27, 2012.
- Beyond the Global Acid Rock Drainage Guide, Lake Superior Binational Program, Mining in the Lake Superior Basin Webinar Series, Environmental Impacts of Mining in the Lake Superior Basin, October 27, 2009
- Characterizing, Predicting, and Modeling Water at Mine Sites, California Environmental Protection Agency, California Water Board Training Academy, May 18 - 21, 2009
- Mitigating Mining Impacts: Principles and Practices, Lake Superior Binational Program, Mining in the Lake Superior Basin Webinar Series, Environmental Impacts of Mining in the Lake Superior Basin, March 24, 2009
- *Long-term Requirements & Financial Assurance at Superfund & Other Mine Sites*, Mine Design, Operations and Closure Conference, Fairmont Hot Springs, MT, April 2008.
- *Reclamation Planning and Financial Assurance Practice in the United States,* Kamchatka Mining Conference, Kamchatka Oblast People's Council of Deputies, the Committee on Ecology and Resource Management of Kamchatsky Krai, the Rosprirodnadzor Division of Kamchatka Oblast and Koryaksky Autonomous Okrug, the Division for Minerals Management for Kamchatka Krai, and the Kamchatka Oblast Council of the All-Russia Society for Nature Protection, Petropavlovsk-Kamchatsky, Russia, October 2007.
- *The Good Neighbour Agreement: A Proactive Approach to Water Management through Community Enforcement of Site-Specific Standards*, w Sarah Zuzulock, Greener Management International, Issue 53, Spring 2006, Greenleaf Publishing. 2007.
- *Sustainable Development at the Anaconda Superfund Site, Mine Design*, Operations and Closure Conference, Fairmont Hot Springs, MT, April 2007.
- *Comparison of Predicted and Actual Water Quality at Hardrock Mines: The reliability of predictions in Environmental Impact Statements with A. Maest, K. MacHardy, G. Lawson. Predicting Water Quality at Hardrock Mines: Methods and Models, Uncertainties, and State-of-the-Art* with A. Maest, Final Report Release December 2006.
- *Reclamation and Bonding in Copper Mining*, U.S. EPA Hardrock 2006: Sustainable Modern Mining Applications, Tucson, Arizona, November 2006.
- *Sustainable Development at the Anaconda Superfund Site*: U.S. EPA Hardrock 2006: Sustainable Modern Mining Applications, Tucson, Arizona9, November 2006.
- *U.S. Perspective on Financial Assurance for Mine Cleanup*, presented at International Bar Association Conference, Chicago, Illinois, September 2006.
- *Comparison of Predicted and Actual Water Quality at Hardrock Mines: The reliability of predictions in Environmental Impact Statements* with A. Maest, K. MacHardy, G. Lawson, presented at Mine Design, Operations and Closure Conference, Fairmont Hot Springs, MT, April 2006.
- *Predicted Versus Actual Water Quality at Hardrock Mine Sites: Effect of Inherent Geochemical and Hydrological Characteristics* with A. Maest, K. MacHardy, and G. Lawson at International Congress on Acid Rock Drainage (ICARD), March 2006, St. Louis, MS.