

ABSTRACTS – PNWIS 2018

Abstracts are arranged by session, beginning with abstract 1A-1 in session 1A.

* Presenting author

Session 1A: Energy and Waste Management – Remediation

Chair: Annika Wallendahar

Affiliation: SoundEarth Strategies Inc

1A-1: Moss revegetation- a process to initiate restoration and repair natural resources damaged by mining

Author: Arundeeep Taduri

Affiliation: Montana Tech

Principal Contact: ataduri@mtech.edu

Abstract:

Mosses are small plants within the phylum Bryophyta known for their ability to grow on acidic, metal laden soil. This project proposes the restoration of moss to barren mine waste areas which will stabilize the soil, thus reducing heavy metal contaminants released to the aquifer and the surrounding environment.

In general, the mine waste areas can be naturally recolonized by native and non-native vegetation as a remediation process. This process is very slow. The removal of the mine waste, capping and replacing it with clean soil, and subsequently replanting is a common remediation method. However, this approach is very expensive and involves high maintenance. When a responsible party cannot be identified, the sites remain barren. Consequently, precipitation and wind events could transport the contaminants into the environment.

Mosses are known as pioneer plants, it is the first plant to establish in barren and disturbed soil areas. The propagation of moss and its associated organisms accelerate the natural processes that restore damaged areas to normal, steady state and biodiverse ecosystems. The advantages of moss are that, it requires

minimum amount of water to propagate, low cost and low maintenance and it does not require superior soil quality to grow.

Mosses increase the alkalinity of the soil, hence allowing all other plant forms to grow. They create rich soil by building up organic material from their growth. Moss community organisms also fix atmospheric nitrogen into bioavailable nitrogen. They are not only resistant to metals and metalloids, but they also adsorb these toxic substances and eliminate them from the surrounding soil. Ultimately, mosses provide a foundation for natural succession of other plant communities to build a stable ecosystem.

The goal of this project is to develop a replicable method to revegetate and restore mine-impacted areas by the propagation of moss and to study the growth of moss by using different hydrophilic polymers and the bacteria *Beijerinckia indica*.

1A-2: Avoiding Spontaneous Combustion: The Recovery of Pyrophoric Hazardous Waste

Author: Estee Lafrenz

Affiliation: JACOBS, Boise, Idaho

Principal Contact: Estee.Lafrenz@Jacobs.com

Abstract:

Below the Montana ground lies 500,000 gallons of elemental phosphorus-infused clarifier mud. A water cap must be maintained on the open-top clarifier to prevent pyrophoric phosphorus from igniting upon contact with air. After two decades, the Environmental Protection Agency (EPA) has approved a plan to perform on-site phosphorus recovery. This presentation details the approved mud still recovery process for elemental phosphorus and the associated air emissions.

An elemental phosphorus production facility operated near Butte, Montana from 1952 until 1997, when the facility ceased operations for economic reasons. However, the facility was no longer able to process the crude phosphorus mud that remained in the clarifier. In May 2000, the EPA inspected the closed facility and observed the clarifier tank, containing phosphorus sludge. Inspectors observed wet areas around the tank, later found to have contaminated subsurface soils and groundwater. While sampling the leaking clarifier, an inspector spilled a small amount of phosphorus sludge, which dried and then ignited, ultimately burning out. Inspectors also performed phosphine monitoring above the clarifier and concentrations were found to greatly exceed Occupational Safety and Health Administration (OSHA) limits for the toxic gas. In 2004, the facility was fined \$16.2 million and issued two federal felony counts of illegally storing hazardous waste. In April 2004, the facility entered into a corrective action order that

required them to undertake comprehensive facility-wide remedial investigations and appropriate cleanup actions. Solvay acquired the facility in 2011, with renewed focus to remediate the clarifier waste.

Three proposed closure alternatives were presented for the clarifier sludge, including off-site incineration, capping the clarifier in place, and recovery of elemental phosphorus using the mud still process. In June 2017, EPA approved using the on-site mud still process as remediation for the clarifier mud. Solvay has retained Jacobs to assist them in the engineering design of the clarifier remediation process and in preparing the associated air emissions calculations.

1A-3: Decommissioning and Clean Closure of Industrial Facilities

Author: Annika Wallendahl

Affiliation: SoundEarth Strategies Inc

Principal Contact: AWallendahl@soundearthinc.com

Abstract:

When an industrial facility is anticipating permanent shutdown, planning to meet closure requirements should begin well in advance (12 months or more) of the shutdown date. Both federal and state-specific waste regulations govern the closure requirements of industrial facilities which were hazardous waste generators while in operation. In Washington State, closure requirements extend beyond hazardous waste treatment, storage or disposal facilities (TSDF) to also include facilities which were large quantity generators (LQG) of hazardous waste. Washington State's Dangerous Waste (WAC 173-303-070) regulations call out actions that facility owners need to take in order to comply with Clean Closure requirements. Dangerous waste accumulation areas and contaminated equipment and structures must be decontaminated or properly disposed of. In addition, wash waters generated during cleanup activities and discarded chemicals must be designated and properly managed during the shutdown process. A visual inspection conducted by a professional engineer can be used to document that the facility's cleanup actions meet the federal "clean debris standard" (40 CFR 268.45) and that the facility has thus met the requirements for Clean Closure in Washington State. The ultimate goal of Clean Closure is to minimize or eliminate the post-closure release of dangerous wastes to soil, groundwater, surface water, or air.

1A-4: BC Hydro Rock Bay Remediation Program – Management and Technical Achievements of a Major Remediation Program

Authors: Ian Mace*¹, Lindsay Thompson² & Ryan Stewart²

Affiliation: ¹SNC-Lavalin Inc., Nanaimo, BC; ²BC Hydro

Principal Contact: Ian.Mace@snclavalin.com

Abstract:

A manufactured gas plant (MGP) facility, which operated between the 1860s and mid-1900s adjacent to the Victoria Harbour, resulted in widespread contamination of soil, groundwater, and sediment. BC Hydro inherited this site when BC Electric became part of BC Hydro in the 1960s.

SNC-Lavalin was engaged by BC Hydro in 2003 to develop and execute a remediation strategy to cost effectively reduce liability, comply with BC regulations and obtain a total of 16 remediation Certificate of Compliance (CofCs) for affected properties including three properties owned by BC Hydro and seven off-site stakeholders.

The remediation program at Rock Bay consisted of removal of 250,000 tonnes of material between 2004 and 2006 and an additional 65,000 tonnes of material between 2013 and 2015. Residual contamination was addressed by means of contaminant modeling and risk assessment.

Due to the size and schedule requirements of the project, a management approach tailored to Rock Bay was implemented including:

- Separation of the project into four working areas to allow for effective project management with separate project managers, reporting to a PMP certified project manager, each responsible for concurrently achieving their respective objectives, schedule and budgets.
- Creation and utilization of a Risk Register.

Beyond a standard “dig and dump” remediation program, key technical achievements that were achieved included:

- On-site senior engineers/geologists during active remediation.
- Addressing MGP sourced contamination that was comingled on third party properties with other contamination types from non-MGP sources that were not considered BC Hydro’s responsibility.
- Use of multiple shoring techniques.
- Excavation of a tar well to 14 m bgs.
- Preservation of two heritage buildings.

Session 1B: Policy and Regulation – Greenhouse Gas and Climate Change

Chair: Selina Lee-Andersen

Affiliation: McCarthy Tétrault LLP

1B-1: Green House Gas and Carbon Tax

Author: Erin Hallenburg

Affiliation: ERM

Principal Contact: erin.hallenburg@erm.com

Abstract:

Carbon pricing is gaining momentum globally. In Canada, the federal government is implementing a coordinated nation-wide carbon tax value. The British Columbia government enacted significant pieces of climate action legislation in 2007 that frame B.C.'s approach to reducing emissions and transitioning to a low-carbon economy. The Greenhouse Gas Reduction Targets Act set aggressive legislated targets for reducing greenhouse gases. With reduction targets of at least 33 percent below 2007 levels by 2020 their expansive, revenue-neutral approach is considered efficient, cost effective, and effective. Although this served as a model for other provinces and countries, adjustments to the program are constantly being made. Strategic changes are based on needs, growth and performance benchmarks. Topics covered include the history and progress of B.C's Carbon Tax, industrial sectors that are covered and exempt; points of application, methods to achieve reduction and who is benefitting from the carbon tax revenue.

1B-2: Metro Vancouver's Climate 2050 Strategy

Authors: Jason Emmert* & Conor Reynolds

Affiliation: Metro Vancouver

Principal Contact: jason.emmert@metrovancover.org

Abstract:

The Metro Vancouver Regional District is a federation of 21 municipalities, one Electoral Area and one treaty First Nation located in southwestern British Columbia. For nearly twenty years, Metro Vancouver has taken a leadership role in the region's response to climate change, embedding climate actions in its regional plans and working collaboratively with its members on various climate

projects. However, the actions in current regional and municipal plans are not sufficient to reach a regional greenhouse gas reduction target of 80% by 2050 nor to adequately respond to the unavoidable impacts of climate change.

To respond to this challenge, Metro Vancouver is currently developing *Climate 2050*, a regional climate action strategy. *Climate 2050* aims to accelerate the transition to a low carbon, resilient future for the region while increasing the health, well-being and prosperity of its residents. *Climate 2050* will include actions to both reduce carbon emissions and adapt to climate change.

The presentation will describe:

- The content of the *Climate 2050 Discussion Paper*, which sets the framework for the *Climate 2050* strategy. The Discussion Paper includes:
 - The projected climate impacts in the region
 - The main sources of greenhouse gas emissions in the region
 - Metro Vancouver's GHG reduction targets
 - Examples of Metro Vancouver's current actions on climate change
 - Proposed *Climate 2050* vision statement and guiding principles
 - Ten Issue Areas for developing goals, strategies, and actions (e.g. infrastructure, agriculture, buildings, and transportation).
- The process of developing *Climate 2050*, including:
 - Results of a public opinion survey in the Metro Vancouver region.
 - Description of first phase of the engagement process, with residents, businesses, academic institutions, community partners and other levels of government.
 - Development of the *Climate 2050 Strategic Plan*, including the identification of key Issue Areas.
 - Next steps, in particular the development of Issue Area Roadmaps.

1B-3: Beyond Social Licence: Climate Change Litigation and the Pursuit of Accountability

Author: Selina Lee-Andersen

Affiliation: McCarthy Tétrault LLP

Principal Contact: slandersen@mccarthy.ca

Abstract:

In recent years, there has been a marked increase in climate change litigation as citizens and organizations seek not only accountability for climate change impacts, but also to spur action by industry and governments. According to the Sabin Center for Climate Change Law, as of June 2018, approximately 1,150 climate change-related cases had been filed in 24 countries and in the European

Union, with 885 cases filed in the US and over 265 cases filed in other countries. Many jurisdictions have adopted the ‘polluter pays principle’. Within the context of climate change, this has been a much harder concept to apply given the potentially significant number of emitters and complexity of causal chains. As governments become saddled with the increasing costs of drought, flooding and other climate change events, a global debate is underway as to who should be held responsible for these costs. Until now, oil and gas companies have found themselves the target of climate change litigation. Recently though, governments are also finding themselves at the receiving end of litigation claims as organizations look for ways to further climate action. From enforcing environmental rights to making claims for environmental harm, plaintiffs are finding creative legal grounds to hold both companies and governments accountable for their actions (or lack thereof). This session will provide an overview of the legal basis for climate change-related claims, barriers to such claims, and the potential liability of companies and governments. In addition, the session will consider recent climate change cases in North America and internationally, and whether the wave of climate change litigation will lead to meaningful climate action.

1B-4: How the Trends since the Paris Agreement Inform Corporate Climate Strategies

Author: Wairimu Mwangi

Affiliation: ERM

Principal Contact: Wairimu.Mwangi@erm.com

Abstract:

The 2016 Paris Agreement brought forth a global movement to limit global warming by 2 degrees Celsius by 2100. To support this, a variety of regulatory and voluntary actions were set in motion.

In the three years since the Paris Agreement, there has been increased focus from countries, non-profits, investors, and industry aimed at mitigating and managing transition and physical risks. This evolution is reflected in the growth in shareholder resolutions asking for increased transparency around corporate GHG emissions disclosure, management and climate risk.

As the data has amassed, there is also widespread recognition in the global financial community that climate change could present the next economic crisis. New frameworks like the Task Force on Climate-related Financial Disclosure (TCFD) challenge companies to use a data driven approach to evaluate transition and physical risks, as well as, the use of other guidelines like the

Science Based Targets initiative (SBTi) to mitigate transition risks and reduce emissions.

With the emergence of the new IPCC study that concludes with high confidence that a 1.5°C increase of global warming above pre-industrial levels is likely between 2030 and 2052, there will be increased pressure to reduce emissions and prepare for an increasingly uncertain future.

This paper will analyze the trends that have emerged since the Paris Agreement. It will also examine the impact these trends will have on industry and introduce best-practices.

Session 2A: Energy and Waste Management – Energy Generation and Monitoring

Chair:

Affiliation:

2A-1: A Comparative Analysis of Geothermal Energy in the Western Regions of North America

Author: Rebally Aditya* & Arman Bonakdarpour

Affiliation: School of Engineering & Computing Sciences, New York Institute of Technology (Vancouver)

Principal Contact: arebally@nyit.edu

Abstract:

Geothermal energy has the global potential of producing about 44 TW of power and can potentially meet the global energy demands. However, the exploitation of this energy resource still remains quite limited worldwide. The western regions of the US and Canada have significant geothermal potentials for both thermal and power applications. Development of geothermal power in the US and Canada, however, is quite different because of availability of other energy alternatives. This work summarizes some of the key drivers with respect to demand and growth of geothermal energy, techno-economic and the socio-political aspects which could impede the penetration of geothermal power in the overall energy portfolio of these jurisdictions. A number of recommendations for further expansion of geothermal energy in the western regions of Canada are provided. According to BC Hydro and Power Authority, the main power distributor in the province of British Columbia, 1000 MW of geothermal energy can be extracted in BC (from the identified 13 sites) leading to electrical energy costs of about \$0.0509 CAD per kWh. No significant power is currently being produced in

British Columbia. In comparison, the states of Oregon, Washington and California, which also lie along the ring of fire, have a theoretical potentials exceeding 300 MW, 600 MW and 4000 MW respectively which with current state of geothermal power technology can lead to energy costs an average of \$ 0.07 USD per kWh. In these states, the installed capacity, as of 2016, is about: 37 MW for Oregon and 2716 MW for California, with more plants in construction.

2A-2: Wind Turbine Noise Assessment and Regulation

Author: Lanka Desilva

Affiliation: Ramboll

Principal Contact: ldesilva@ramboll.com

Abstract

As the use of wind energy becomes more widespread, noise created by wind farm installations is of increasing concern in the United States and Canada. Wind projects are often subject to state, provincial or county noise regulations or guidance, but in many jurisdictions, no regulatory noise limits exist. This is especially true of noise limits specific to wind energy projects. This presentation will cover the basic principles of noise, review wind energy noise rules within the United States and Canada, and discuss a case study where a suitable sound level limit was determined in a jurisdiction where none previously existed.

Analysis of atmospheric volatile organic compounds by mass spectra collected from a moving vehicle with application towards source identification and apportionment

2A-3: Substation to Community Resource – Steps to Transition

Authors: Jeromy Adams*¹ & Suzanne Dolberg²

Affiliation: ¹Tacoma Power – Generation; ²ERM

Principal Contact: JAdams2@ci.tacoma.wa.us

Abstract

A 96-year-old one-hectare substation, located in a dense residential neighborhood, distributed power to more than 60,000 residences and business has become obsolete with the changing dynamics of an evolving electrical grid and population shifts. In addition to the aboveground electrical wires and equipment, the substation was built with and operated an elaborate network of pipes that exchanged oil to and from transformers to large underground storage

tanks in a three-story maintenance building. The oil was filtered and recycled inside the building. In the 96 years of its operation, there were known leaks and spills but not one environmental sample had been collected. In addition, the building benefited from the insulation of asbestos and the durability of lead-based paint. An added complexity includes the airborne deposition of smelter emissions on to the property.

This paper addresses the process, decisions, actions, and results of the on-going transition of this property. In order to collect more than 400 samples using drilling rigs, backhoes, and hand augers from beneath live electrical wires and equipment, extraordinary safety measures and communication were employed. The partnership of the power company, with the consultant, drillers, public and private utility locators, and other specialty contractors was critical. Because of this cooperation, almost all samples were collected where they needed to be collected so that remediation strategies and costs can be developed considering different reuses.

2A-4: Keeping Emission Reductions Sustainable: Clean Diesel Truck Training Videos

Author: Maggie Corbin

Affiliation: Tacoma Power – Generation

Principal Contact: MaggieC@psc Clean Air.org

Abstract:

The Northwest Ports Clean Air Strategy is a collaborative effort between the Port of Seattle, Port of Tacoma, and Port Metro Vancouver to reduce air emissions from shipping and port operations in the region. One component of this strategy was to have all port trucks have 2007 or newer engines by 2018. The Puget Sound Clean Air Agency administered a grant program to assist drivers with their replacement of older trucks. However, the newer trucks had significantly different technology and participants of the program found they were losing money because of maintenance needs associated with the emission control system. The Agency has developed a training program to reduce driver frustration and sustain emission reductions.

Session 2B: Science and Technology – Emission Inventory and Modelling

Chair: Jim Guenthoer

Affiliation: Clean Air Engineering

2B-1: Differences in AERMOD Results Obtained Using BPIP and Equivalent Building Dimension Inputs for PRIME and PRIME2

Authors: Stephen J. Nelson*¹, Sergio Guerra², John Kirkpatrick³ & Ron Petersen⁴

Affiliation: ¹Coal Creek Environmental Associates, LLC; ²GHD ³BAF; ⁴CPPWIND

Principal Contact: snelson@coalcreekenv.com

Abstract:

The Blackfoot Facility of Basic American Foods (BAF) is a food processing facility with numerous irregularly-shaped and short (less than 15-meter high) buildings and stacks that typically extend no more than 2 to 3 meters above the roof line. Some of these stacks are also close to ambient air boundaries. Due to high predicted ambient impacts from certain stacks when using AERMOD/PRIME with the BPIP-derived building dimensions, BAF conducted an Equivalent Building Dimensions (EBD) study using a scale model in a wind tunnel to better characterize downwash impacts from these stacks.

This presentation compares differences in modeled impacts for two of the stacks when using BPIP- and EBD-derived building parameters for downwash. The BPIP-based analysis will include both the current regulatory version of BPIP/PRM (Ver 04274) as well as an experimental version of BPIP/PRM (BPIP-ORD) that incorporates modifications described in a recently published paper in Atmospheric Environment (Enhancements to AERMOD's building downwash algorithms based on wind-tunnel and Embedded-LES modeling, Atmospheric Environment (Elsevier, Vol. 179, April 2018, pp 321-330)). The comparison also encompasses the current regulatory version of AERMOD (Ver 18081) and the current working version of the PRIME2 version of AERMOD (prime2v18018e).

The results compare modeled ambient impacts for 1-hour, 24-hour, and annual averaging times, using the various combinations for downwash analysis and dispersion modeling. The differences between BPIP and EBD building parameters are also presented for the wind direction with greatest ambient impact.

2B-2: Evaluation of WRF Data for Dispersion Modeling Applications

Author: Chris Atherly

Affiliation: Ramboll

Principal Contact: Mobile: catherly@ramboll.com

Abstract:

Recent changes to Appendix W (EPA's guidance on how to conduct air modeling) have allowed the use of modeled meteorological data, as long as it can be shown to be similar to monitored data. However, EPA did not lay out a procedure for proving the quality of a modeled data set, and no formal process has been outlined. This presentation will discuss an agency-reviewed procedure for showing applicability of a modeled dataset for use with air dispersion modeling.

2B-3: Quantification of Area Fugitive Greenhouse Gas Emissions at Oil Sands Mines: Bayesian Solution to Inverse Dispersion Modelling Challenges

Author: Christian Reuten

Affiliation: RWDI

Principal Contact: Christian.Reuten@RWDI.com

Abstract:

Quantification of area fugitive emissions of greenhouse gases (GHG) at oil sands mines and tailings ponds is traditionally achieved with flux chambers by taking brief spot emission measurements and scaling the results up spatially and temporally to estimate total annual GHG flux. An alternative quantification method, the Inverse Dispersion Modelling (IDM) method, combining ambient monitoring with meteorological and dispersion modelling using CALPUFF, has been deployed and applied at an oil sands facility annually since 2015 to provide total annual fugitive GHG emission estimates for regulatory purposes. Four continuous ambient monitors performing measurements for CO₂ and CH₄ at single points or along short laser paths were deployed for two weeks, each, surrounding an active tailings pond and an active surface mine. Meteorological input was improved with on-site measurements. Three-dimensional meteorological and dispersion modelling was performed with CALPUFF (a US EPA Lagrangian puff dispersion model, recommended for regulatory use in Alberta).

In principle, time-varying emission fluxes q from a discrete subset of area sources could be estimated by applying a matrix inversion to the relationship $c=Pq$, where c is a vector of measurements and P the corresponding matrix of dispersion model predictions. In practice, a direct matrix inversion is impossible, because the prediction matrix P contains too many zeros or near-zero values. An alternative is to interpret the equation as a multilinear regression (with no intercept), in which the emission fluxes q are the slopes of the regression of the observed concentrations c against the predictions P . However, several assumptions of a multilinear regression are violated. To overcome these limitations, we developed a Bayesian solution which: fits a linear model to the data that accounts for uncertainties in observations and model predictions;

permits setting limits on the emission fluxes, for example ruling out physically unrealistic negative fluxes; and provides realistic uncertainty estimates in the absence of an intercept. We present an overview of the Bayesian solution we applied and an outlook on current developments to make the solution more accessible.

2B-4: Use of Source Emissions Testing Methods to Characterize Emissions from Biomass and Mixed Biomass/Coal Fuels, and Acceptability Determination for Production of Pipeline Quality Biogas

Author: Thomas

Affiliation: TRC Companies

Principal Contact: tdunder@trcsolutions.com

Abstract:

Source emission testing methods are commonly applied to combustion sources utilizing coal, wood, and natural gas. Increasingly, electrical utilities and boiler facilities are utilizing a wider range of fuels, including a number of types of biomass such as wood pellets, composite paper/plastic pellets, or biogases from a variety of sources including agriculture and landfills. While economic considerations are a motivation for using these fuels, there are also regulatory drivers. In the U.S., the MATS (Mercury and Air Toxics) and the National Emission Standards for Hazardous Air Pollutants for Industrial, Commercial, and Institutional Boilers and Process Heaters (Boiler MACT) mandate significant reduction in emissions of hazardous air pollutants such as mercury and hydrogen chloride. Facilities are using combinations of mixed fuels and pollution control by injection of chemical sorbents (DSI, dry sorbent injection) to achieve these emissions limits. Emission testing methods, particularly methods providing real-time or on-site data, are invaluable when determining optimal combinations of mixed fuels, sorbent injection rates, and boiler loads to achieve compliance with emissions limits. In a more recent development, agricultural facilities are now able to use anaerobic digestion and gas purification equipment to generate pipeline quality natural gas. Pipeline operators have strict limits on the composition, quality, and the presence of undesired materials of gas injected into the pipeline system. Measurement methods published by the Gas Technology Institute (GTI) derive from historical emission testing methods and are used to qualify biogas quality for acceptance as a pipeline fuel. This presentation will explore the growing application of emission measurement methods for process optimization and product quality demonstration.

Session 3A: Policy and Regulation – Air Quality and Health

Chair: April Hauk

Affiliation: Stantec Consulting Inc.

3A-1: Air Quality Health Index

Authors: Eric Taylor* & Magda Kingsley

Affiliation: BC Ministry of Environment

Principal Contact: Eric.Taylor@gov.bc.ca

Abstract:

The federal, provincial and Metro Vancouver jurisdictions use the Air Quality Health Index (AQHI) to provide Canadians with an estimate of short-term human health risks from degrading air quality. This presentation will provide an overview of the AQHI history, scientific basis, and AQHI refinements in BC.

3A-2: Implementation of Canadian Ambient Air Quality Standards (CAAQS) – a Consultant’s Perspective

Authors: Tyler Abel

Affiliation: WSP Environment

Principal Contact: Tyler.Abel@wsp.com

Abstract:

The implementation of the new Canadian Ambient Air Quality Standards (CAAQS) for sulphur dioxide (SO₂) and nitrogen dioxide (NO₂) will have implications on conducting and interpreting air quality assessments for permitting or environmental assessment applications. In the United States, following implementation of new NAAQS for SO₂ and NO₂ a number of clarifications were required in order to guide the air quality community in such topics as: determining background concentrations for dispersion modelling assessment; methods of NO_x-to-NO₂ conversion; treatment of intermittent emissions, and; the relationship of modelling and ambient monitoring in determining compliance with standards. This presentation will review some of the guidance provided by the US EPA in relation to these topics and provide a consultants perspective on their application in the context of assessments in British Columbia. The presentation will explore the required cooperation between regulatory bodies, consultants and permit holders / applicants necessary to meet the challenges of the implementation of the new CAAQS, and provide consistency in their application in the regulatory process.

3A-3: The Practice of Integrated Environmental Assessment – Using Established Frameworks to Evaluate the Inclusion of Baseline Health Data

Author: Jade Yehia

Affiliation: Department of Geography, UVic

Principal Contact: jyehia@uvic.ca

Abstract:

I would begin by painting a picture of the case study I reviewed and the climate of Environmental (Impact) Assessment (EA) processes in BC. Being the framework I used in my research is the International Finance Corporation Health Impact Assessment (HIA) Guidance material, I will need to touch on this practice. I will focus on the methodology I employed, using case study and HIA guidance, followed by a description of my findings. The story of the Ajax mine EA proposal is one I find extraordinary. Not only was the mine denied EA approval based on significant concerns regarding, e.g. health impacts and air quality but there was a public outcry for an HIA to be performed. HIA is a practice that exists (and is legislatively required) in Quebec, some US states, Australia and the UK to name but a few jurisdictions. However, in the absence of a required HIA what was and was not included as per the EA. I intend to reflect on the health-related considerations, or Valued Components, that were part of the review (such as air quality) and the mental health, health care services, and perceptions of risk that confounded stakeholders and frustrated the public. I would like to finish by having the audience think of ways we may improve on this crucial environmental management mechanism (especially, as in Canada and BC, this is currently under formal review).

3A-4: An Adaptive Management Approach to Developing Fugitive Dust Management Plans

Author: April Hauk

Affiliation: Stantec Consulting Ltd.

Principal Contact: April.Hauk@stantec.com

Abstract:

The development of a Fugitive Dust Management Plan (FDMP) is now a condition for most Mine Environmental Certificates and Waste Discharge Permits. These FDMPs must follow the British Columbia Ministry of Energy, Mines and Petroleum Resources and the Ministry of Environment and Climate Change Strategy's guidance document on the development of such plans.

The FDMP guidance document outlines an adaptive management approach to continuously improve fugitive dust management. This presentation focuses on the components required for an FDMP, and the challenges faced when developing a site specific FDMP. Topics include identification of appropriate FDMP objectives, outlining fugitive dust source inventory, appropriate best management practices, monitoring dust management effectiveness, identifying additional dust management trigger levels, and outlining the adaptive management strategies to improve on the management of fugitive dust.

Session 3B: Science and Technology – Impact of PM 2.5 and Wood Smoke in the Environment

Chair: Julie Saxton

Affiliation: Metro Vancouver

3B-1: Residential Wood Smoke in Metro Vancouver

Authors: Julie Saxton

Affiliation: Metro Vancouver

Principal Contact: Julie.Saxton@metrovancover.org

Abstract:

The Metro Vancouver Regional District is a federation of 21 municipalities, one Electoral Area and one treaty First Nation and is located at the western end of the Lower Fraser Valley in southwestern British Columbia. Metro Vancouver has delegated authority under the BC *Environmental Management Act* to manage air quality and regulate air emissions, a responsibility that is almost unique in Canada for a local government.

The regional emissions inventory indicates that wood smoke resulting from the use of indoor residential wood burning appliances is responsible for more than a quarter (32%) of fine particulate matter (PM_{2.5}) emissions in the region. PM_{2.5} is associated with chronic and acute respiratory and cardiac issues, particularly for children, the elderly, and people with lung and heart conditions. Furthermore, particulate matter in air has been classified as carcinogenic to humans by the World Health Organization's International Agency for Research on Cancer.

Metro Vancouver is pursuing a multi-faceted approach to reduce PM_{2.5} emissions in the region from indoor residential wood burning, encompassing education, equipment change-outs, and regulatory measures. Public consultation was

undertaken in 2017 and 2018 on a phased approach to regulating emissions of wood smoke from indoor residential wood burning. A bylaw comprising measures to reduce emissions with consideration for the local context is currently in development. This paper describes the critical elements of the wood smoke management program and presents a summary of a proposed phased approach to regulating emissions, which includes:

- Seasonal restrictions on the use of indoor residential wood burning appliances between May 15 and September 15, from 2020.
- Registration of indoor residential wood burning appliances meeting particulate matter emissions levels or other criteria, from 2022.
- Prohibition of smoke emissions from indoor residential wood burning appliances that are not registered, from 2025.

3B-2: Spatiotemporal Variation of PM_{2.5} in the Central Okanagan Region

Authors: Nancy Mora Castro*, Timothy Atkinson, Tarek Ayache

Affiliation: RDCO

Principal Contact: nmoracastro@kelowna.ca

Abstract:

Based on long-term monitoring data, air quality in the Central Okanagan is generally good and meeting the BC standards. However, research indicates that specific neighbourhoods may reach unhealthy PM_{2.5} levels. This study was designed to identify possible hot spots of PM_{2.5} and to further investigate whether a single monitoring station at Okanagan Collage in Kelowna can adequately represent the entire region. The project involved mobile and fixed-site monitoring during November 2015 to April 2016.

The mobile monitoring route was designed considering the density of woodstoves, land use, arterial and major roads and a previous 2005 CRUISER study. The route was 213 Km in length and monitoring was conducted by positioning DustTrak and GPS instruments inside a vehicle which was driven 26 times under a range of venting conditions and times of day. Results showed several areas that consistently had higher PM_{2.5} values and were defined as major and minor hot spots. The biggest hotspot was found in the Rutland area followed by the Mission (Okanagan view) and Lake Country (Woodsdale).

Stationary monitoring was achieved by positioning an E-BAM at two locations: Johnson Bentley Memorial Aquatic Centre in West Kelowna and City Hall in downtown Kelowna. The PM_{2.5} BC objective was never exceeded when measured

by the SHARP monitor at Kelowna College. The 24-hour rolling average recorded on the mobile E-BAM was exceeded twice; in downtown Kelowna during January 6th – 7th for over 35 hrs. and in West Kelowna on February 12th for over 20 hrs. These episodes were significant, as an air quality advisory would have been issued if these values would have been observed at the KLO Okanagan College monitoring site.

Longer-term continuous monitoring at stationary locations, stringent wood burning policy and further educational efforts on wood burning practices, especially within the identified major hot spots, were recommended.

3B-3: Examining Optic Factor from SHARP Particulate Monitors as Marker for PM2.5 Sources

Author: Jerome Robles

Affiliation: BC Ministry of Environment and Climate Change Strategy

Principal Contact: jerome.robles@gov.bc.ca

Abstract:

This presentation investigates the use of optic factor. Optic factor is known to depend on particulate matter composition but is used in SHARP monitors solely for diagnostic purposes. This presentation will examine the potential of optic factor as marker for PM2.5 source, composition, and optical characteristics.

3B-4: Particle Size Distribution Determinations Using Cascade Impactors

Author: Jim Guenthoer

Affiliation: Clean Air Engineering

Principal Contact: jguenthoer@cleanair.com

Abstract:

This presentation looks at the use of in-situ cascade impactors to provide particle size distribution data used for compliance determinations, air pollution equipment diagnostics and design, and process optimization. A brief overview of the basic underlying aerosol mechanics are presented along with examples of the equipment and actual graphical test results from several types of sources. The ability to determine size specific chemical speciation as well as the novel approach of using impactors in wet gas streams to evaluate water droplet carryover and plume simulation are also demonstrated.

Session 4A: Policy and Regulation – Odour

Chair: Jenelle Scott

Affiliation: Spring Environmental, Inc.

4A-1: An Expanded Regulatory Approach to Managing Odour in Metro Vancouver

Author: Mia Edbrooke

Affiliation: Metro Vancouver Air Quality & Climate Change Division

Principal Contact: Mia.Edbrooke@metrovancover.org

Abstract:

The Metro Vancouver Regional District is a federation of 21 municipalities, one Electoral Area, and one treaty First Nation located in southwestern British Columbia. As the delegated authority for air quality management in the region, Metro Vancouver has received a growing number of complaints about odour in recent years. Residential, industrial and commercial density is increasing in the region, and odour concerns and complaints are anticipated to rise. Odours come from a wide variety of sources including organic waste management facilities, food and animal processing facilities, as well as industrial and agricultural activities. The human nose can detect odorous air contaminants even when present at very low concentrations. For this reason, emissions of odorous air contaminants can interfere with many aspects of daily life, especially if the odour is frequent or persistent.

Metro Vancouver authorizes emissions of odorous air contaminants from various facilities through permits or through emission regulation bylaws addressing several similar, small to medium-sized facilities. Metro Vancouver is working with communities, businesses and government partners to improve its odour management framework in a way that respects both community and business values. In early 2018, Metro Vancouver led a public consultation process about new approaches to enhance the management of odorous air contaminants. This presentation will focus on Metro Vancouver's next steps for enhancing its regional odour management strategy, informed by feedback from the consultation. Metro Vancouver will develop and consult on regulatory proposals related to potential amendments to its overarching air quality management bylaws, as well as potential emission regulation bylaws for cannabis cultivation, mid-size organic waste management facilities, and food processing facilities. The regional odour management strategy will also be enhanced through increased

community outreach, research on measurement methods and regulatory effectiveness, consideration of potential ambient air quality objectives, and technical guidance.

4A-2: Odour Controls for Hot Mix Asphalt Plants in Washington: Past, Present, and Future.

Author: Brian Renninger

Affiliation: Puget Sound Clean Air Agency

Principal Contact: brianr@pscleanair.org

Abstract:

Best Management Practices and control methods for odors produced from hot mix asphalt plants. Emphasis on past practices, current practices, and possible future improvements.

4A-3: The Future of Odour Monitoring

Authors: Curtis Wan* & Chris Koscher

Affiliation: WSP Canada Inc.

Principal Contact: Curtis.Wan@wsp.com

Abstract:

Description of Presentation:

Odours are becoming a greater issue for the general population especially in major population centres, such as Metro Vancouver, as more residents are living closer to odourous sources than ever. Odours are also often the cause of air quality complaints. Currently, one of the main approaches to responding to an odour complaint is to send a field odour patrol personnel to validate the complaint. However, this often has a time delay on the scale of hours to days, after which, the odour causing the complaint is usually gone. This presentation will explore how future odour monitoring projects may be conducted, by exploring various technologies and techniques currently available. Select case studies will be shown, showcasing for example how aerial drones can assist with odour sampling, and remote-controlled air sampling canisters can be set to sample parcels of air after a complaint is received. The increased popularity of personal air monitors and citizen science will also be discussed. Finally, thoughts on how the use and application of technology can be applied to minimize, mitigate or ultimately eliminate odours will be presented.

4A-4: Developing an Effective Odour Control Strategy

Author: Mike Lewis

Affiliation: BOSSTEK

Principal Contact: mikel@bosstek.com

Abstract:

Odour is often a major operational challenge that threatens facilities within the waste and composting industries. Uncontrolled odour can result in poor public relations, leading to complaints which can deter the construction of new facilities and delay activity or even force closure of existing operations. Meeting compliance regulations as well as the expectations of surrounding communities can play a major role in avoiding the consequences of unwanted emissions. The purpose of this presentation is to educate the audience about the importance of developing an effective odour control strategy, while also exploring the innovative approaches available for eliminating odour emissions.

There are several major factors to consider when developing the best, most cost-effective odour control strategy for a given situation. It is important to evaluate the site-specific solutions available, including alternative methods for control and type of equipment that will be used as well as the choice of odour control agent. Over the past year, a variety of innovative technologies geared towards the waste and composting industries have been developed to provide facilities relief. Equipment specifically engineered to disperse eco-friendly, highly effective odour treatment agents using vapor allows operators to manage odour, meet compliance regulations and improve relationships within their community.

Session 4B: Science and Technology – Environmental Monitoring

Chair: Neil Hodgson

Affiliation: Washington State Dept. of Ecology

4B-1: Analysis of atmospheric volatile organic compounds by mass spectra collected from a moving vehicle with application towards source identification and apportionment

Authors: Larissa C. Richards^{*1,2}, Nicholas G. Davey¹, Trevor Michalchuk¹, Chris G. Gill^{1,2}, Erik T. Krogh^{1,2}

Affiliation: ¹Applied Environmental Research Labs, Department of Chemistry, Vancouver Island University, ²University of Victoria, Department of Chemistry

Principal Contact: larissa.richards@viu.ca

Abstract:

Volatile and semi-volatile organic compounds (S/VOCs) are important atmospheric pollutants affecting both human and environmental health. S/VOCs are emitted from a wide variety of point and non-point sources, both natural and anthropogenic, and their atmospheric distributions can vary widely over time and space. Direct sampling mass spectrometry techniques such as membrane introduction mass spectrometry (MIMS) and proton-transfer reaction time-of-flight mass spectrometry (PTR-ToF-MS) can be used to continuously measure S/VOCs as unresolved mixtures. Both MIMS and PTR-ToF-MS can be operated in a moving vehicle which produces temporally and spatially resolved mass spectral data. This allows chemical information to be mapped at the regional and neighbourhood scale. We describe the application of principal component analysis (PCA) and multivariate curve resolution-alternating least squares (MCR-ALS) for the analysis of full scan MIMS and PTR-ToF-MS data collected on central Vancouver Island. PCA has been used to discriminate sources of real-world VOCs measured using MIMS and PTR-ToF-MS systems to discriminate air masses impacted by anthropogenic activities and biogenic processes. MCR-ALS has been applied to continuous, full scan PTR-ToF-MS data to extract VOC source profiles and contributions. This work has applications in environmental forensics and occupational exposure, including source identification and apportionment of atmospheric pollutants.

4B-2: Wastewater-Based Epidemiology to Determine Temporal Trends in Illicit Stimulant Use in Seattle

Authors: Rosie Rushing & Dan Burgard

Affiliation: University of Puget Sound

Principal Contact: [durgard@pugetsound.edu](mailto:dburgard@pugetsound.edu)

Abstract:

Pharmaceuticals, Personal Care products, (PPCPs) as well as illicit drugs are consumed and excreted into municipal sewers, with many of these compounds ultimately making their way into the environment. While most studies of PPCPs look at wastewater treatment plant (WTP) effluent, a new field has developed in the last decade that analyzes influent to a WTP to understand consumption of these products rather than environmental loads. Wastewater-based epidemiology (WBE) has proven to be a useful tool in estimating illicit drug consumption of a community or population. WBE can determine real-time drug use without the bias of surveys, making it an invaluable, complementary tool in determining community drug use and public health. Seattle wastewater has been collected and measured for the past four years, during which the samples have

been obtained during the Seattle Pride Festival in June. This event brings thousands of visitors to Seattle, WA to participate in a variety of events, concerts, and parades. In 2017, over 200,000 people were estimated to have participated in Seattle Pride Festival on June 24th and 25th. Previous studies have shown that illicit drug use, specifically MDMA, is frequent at festivals in the U.S. and on an international scale. Wastewater was collected every day from the Westpoint treatment plant in Seattle from June 15th to June 31st for 2015, 2016, and 2017. MDMA, cocaine and its metabolite (benzoylecgonine) were extracted from wastewater using solid phase extraction and analyzed using an LC-MS/MS. Daily drug consumption estimates Show that indeed, the days surrounding Seattle Pride contained increased loads of illicit stimulants.

4B-3: Spatial and Temporal Patterns of Water Chemistry and Algal Diversity in Northwest Washington Lakes

Authors: Jeffrey Pratt* & Robin Matthews

Affiliation: Western Washington University

Principal Contact: prattj4@wwu.edu

Abstract:

The Institute for Watershed Studies has developed a data set of water quality parameters (DOC, IC, pH, temperature, ammonia, nitrate, dissolved and total metals) from over 50 Northwest lakes. General water quality parameters have been collected from these lakes since 2006 and metals have been collected since 2014. Studies have evaluated relationships between watershed characteristics, water chemistry, and algal species richness and diversity, but there has been no comprehensive analysis of the entire data set, using lakes from all elevations and including metals data.

In low elevation lakes, algal species data, water quality and chlorophyll data, and landscape characteristics are potentially useful for predicting the risk of harmful toxic algal blooms. In high-elevation mountain lakes, algae are proving to be sensitive indicators of habitat alteration and climate change.

The recent sampling analyses have included metals data, which have not yet been added to the risk evaluations for these lakes. Even low concentrations of metals can be toxic to fish and other aquatic organisms, including algae, so it is vital to incorporate the metals data when calculating risks associated with algae blooms or habitat change. The inclusion of the metals data should contribute to the creation of more comprehensive management plans for lakes in Northwest Washington.

4B-4: Mobilized Monitoring For Real-Time Geospatial Mapping of Atmospheric Contaminants

Authors: Nick Davey¹, Larissa Richards^{1,2}, Jon Davidson^{1,2}, Trevor Michalchuk¹, Chris Gill^{1,2} & Erik Krogh^{*1,2}

Affiliation: ¹Applied Environmental Research Labs, Department of Chemistry, Vancouver Island University, ²University of Victoria, Department of Chemistry

Principal Contact: Erik.Krogh@viu.ca

Abstract:

The release of atmospheric contaminants from anthropogenic and biogenic sources can have adverse impacts on human and environmental health, degrading air quality across a range of geographic scales. Because the distribution of such compounds can vary widely over time and space, discrete sampling strategies often fail to capture local variability, which can be particularly important when it comes to identifying sources, managing emergency response and informing adaptive sampling strategies. Described are hardware and software developments associated with a mobile mass spectrometry (MS) laboratory. The laboratory incorporates two complimentary MS systems ruggedized for mobile deployments and continuous operation in a moving vehicle. An electron ionization cylindrical ion trap capable of tandem MS has been modified with a heated membrane inlet and is employed for relatively nonpolar volatile organic compounds at low parts per billion levels. A proton transfer reaction time-of-flight MS is employed for the detection of more polar S/VOCs at parts per trillion levels. The mobile lab is also equipped with several optically based sensors for specific gases including NO_x, O₃, CO₂, CH₄ and H₂O, as well as an optical particle sizer for particulate matter. The vehicle is equipped with a high precision GPS and meteorological sensors including wind speed and direction for geospatial stamps and plume tracking, respectively. Data streams are handled by a customized data management system, which enables data visualization as a time-series or geospatial map in real-time. Preliminary results from several recent field campaigns in rural, urban and industrialized areas in the Pacific Northwest are presented.

Session 5A: Policy and Regulation – Wildfire Session

Chair:

Affiliation:

5A-1: Wildfire Smoke Behaviour in BC and Washington in 2018

Author: Eric Taylor

Affiliation: British Columbia Ministry of Environment

Principal Contact:

Abstract:

Wildfire smoke affected wide areas of BC and Washington in 2018. Under some atmospheric situations smoke clogged valleys, while in other situations smoke remained mostly above the mountainous terrain. The movement and behaviour of smoke during August 2018 appeared to be related to the height of the morning inversion layer as well as the intensity of the wildfires.

5A-2:

Author: Julie Saxton

Affiliation: Metro vancouver

Principal Contact:

Abstract:

Abstract to go here

5A-3:

Author: Doug Newbould

Affiliation:

Principal Contact:

Abstract:

Abstract to go here

5A-4:

Author:

Affiliation:

Principal Contact:

Abstract:

Abstract to go here

Session 5B: Science and Technology – Air Quality Measurement

Chair: Judy Aasland

Affiliation: CleanAir Engineering, Inc.

5B-1: Emerging Measurement Technologies for Air and Stack Gases

Author: Kristina Schafer* & Kevin Crosby

Affiliation: Montrose Air Quality Services, LLC

Principal Contact: kschafer@montrose-env.com

Abstract:

The techniques used for measurement of stack emissions and analysis of ambient air are jumping to a new level. Many of the test methods and instruments from the 1960's are still in use today, while others have improved in steps over the decades as we search for more accurate and precise techniques for measuring lower concentrations and for measuring compounds that have become new priorities for public health. Recent breakthroughs in applied physics are emerging as new tools once again – tools that can provide real-time measurements or continuous monitoring at ppb, ppt, and even ppq concentrations. We will present and review the capabilities of technologies such as PTR-TOF-MS, MAX, enhanced FTIR, and the various Open-Path Optical techniques. As we have seen with the emergence of smart phones, drones, etc., we will not be doing things the same old ways for much longer!

5B-2: M&C Announces New Laser Measurement Technology

Author: Bernadette Shahin

Affiliation: M&C TechGroup North America

Principal Contact: bshahin@mac-products.com

Abstract:

The AirOptic Gas Eye is a novel Spectrometer designed for industrial process applications. This versatile measurement technology utilizes diode lasers, inter band cascade laser, and wave length modulation spectroscopy. Multiple lasers can be added to one cross duct or open path unit allowing multiple gases to be measured. My presentation will address the measurement techniques and gas applications that are best suited for this new technology.

5B-3: Advancing the Application of Low-cost Sensors with Voluntary Consensus Standards

Author: David Elam

Affiliation: TRC Companies

Principal Contact: delam@trcsolutions.com

Abstract:

Electricity distribution, telecommunications, agriculture, medicine, computing, and the Internet all exist in their current form because there are voluntary consensus standards (VCS) that define procedures, communication, interoperability, data exchange, and quality. The American National Standards Institute (ANSI) coordinates and promotes VCS and serves as the U.S. representative in non-treaty international and regional standards-setting activities. VCS are published by Standard Setting Organizations (SSOs) and SSOs exist for virtually every aspect of commerce. For example ASTM and IEEE are SSOs that are well-known in the environmental monitoring community.

Although there is overwhelming interest in the use of low-cost sensors to address the full range of environmental areas, VCS for evaluating, deploying, and reporting low-cost sensor data are limited, typically drawing on elements of VCS for conventional monitoring systems. Like the technologies mentioned earlier, low-cost environmental sensors will achieve their full potential when VCS specific to low-cost sensors are available that address sensor evaluation and validation; deployment and siting, data assimilation, integration, and exchange; and reporting.

This presentation will review VCS that are being used in air sensor programs, examine how VCS are being used in conventional air monitoring programs, and outline the process for developing VCS.

5B-4: Sensor Technology – The Dawning of a New Age

Author: Jim Guenthoer

Affiliation: CleanAir Engineering, Inc.

Principal Contact: jguenthoer@cleanair.com

Abstract:

This presentation will provide a preview and discussion of some of the projects and processes that are currently being developed to support many different segments of the industry that provide and/or rely on remote and automated sampling technologies. Specifically, ongoing research and development with sensor technology is expanding to support emissions monitoring in typical facility

operations as well as locations with limited access. This emerging technology is providing cost effective cloud based measurement technology to continuously access and manage emissions 24 hours a day.

Session 6A: Policy and Regulation – Environmental Sustainability

Chair: Svend Andersen

Affiliation: GHG Accounting Services Ltd.

6A-1: Taking it to the Next Level: Embodied Sustainability in Organizations

Author: Svend Andersen

Affiliation: GHG Accounting Services Ltd.

Principal Contact: svend_selina@shaw.ca

Abstract:

In 2015, Canada and 192 other United Nations (UN) member states unanimously adopted the United Nations 2030 Agenda for Sustainable Development and its 17 Sustainable Development Goals (also known as the SDGs, which include 169 targets and over 230 indicators). Governments, businesses and citizens are mobilizing efforts to achieve the Agenda by 2030, meaning that we all have a role to play. Today's economic landscape is characterized by a complex mix of risks and opportunities. Whether an organization is faced with new and disruptive technology, or stakeholder demands for greater information disclosure on environmental and social matters, organizational leaders are increasingly aware that a short-term vision is not enough because environmental impacts can have adverse impacts on long-term planning and prosperity. Organizations that understand this challenge are stepping up to take action by actually embodying sustainability into their strategic priorities and operations, rather than only entertaining the idea. For organizations wanting to embody sustainability widely in their organizations, the path is not necessarily easy, but it involves being fully committed as well as being very well informed about how to operate more responsibly while pursuing opportunities to implement innovative practices in order to achieve the SDGs.

Each organization that is committed to embodying sustainability into its policies and operations will require a plan that articulates well-designed objectives to be applied across the organization, backed by specifications for the different areas of business – ultimately this will drive transformational change in the organization by infusing sustainability into each department, product or business line.

This panel session will explore the importance of strong leadership, collective action and multi-sectoral partnerships, as well as responsible investment in delivering transformational change. On the business side, the private sector is starting to recognize that sustainable development not only makes economic sense, but it also represents an opportunity to establish a more innovative way to do business.

6A-2: Developing a Dynamic Environmental Management System with Sustainability as the Goal

Author: Chris Kitchen

Affiliation: Sound Earth Inc.

Principal Contact: Ckitchen@soundearthinc.com

Abstract:

Environmental managers have a tough job maintaining compliance at the facility. They are generally the only environmental person on site and have many things to juggle. Creating a good environmental management system (EMS) takes time and dedication at the start but can greatly reduce stress and not only help maintain compliance but spread the workload out evenly through the year. A good EMS will help the manager stay ahead of permit or regulatory driven tasks in a proactive way, distribute workload to the appropriate person and help the facility weather employee changes. I will do a broad over view of what an EMS is and will discuss the importance and benefits on why having an EMS is a good idea. I will also go over the developing a sustainability goal and using the EMS as a structure to achieve the goal.

6A-3: A Wetland Tale – Destroy It or Sequester It

Authors: Kim Marcus* & Melody Kieneker

Affiliation: ERM

Principal Contact: kim.marcus@erm.com

Abstract:

During the process of making treated timbers and ties pentachlorophenol (penta) was applied to make the wood more decay resistant. At a manufacturing facility in Portland, Oregon (similar to factories worldwide), penta was used to treat rail ties and power poles for 30 years beginning in the early 1950s. Through the process of application (using heat and penta), the progeny byproducts Dioxins and Furans (dioxins) were generated at nanogram (one billionth of a gram)

quantitates and unknowingly released into the environment. Releases of dioxins flowed through water discharge to holding lagoons and then a series of wetlands basins.

Treating operation were closed and sold in the 1980s and the new buyer used the facility for other purposes and removed many of the structures. For the last 30 years various parties have worked to clean up the site; removing the waste lagoons, excavating and disposing of contaminated soil, monitoring groundwater, consolidating near-surface soils in one wetland in an armored repository on-site, and finally to address an even larger series of wetland (~4 hectares). Working with former and current site owners and principally the Oregon Department of Environmental Quality (ODEQ) a remedial strategy was developed for the larger wetlands.

The strategy involved:

- Determining the average concentrations using increment sampling methodologies, discrete samples, and a sampling unit approach. Samples were collected for:
 - Chemical constituents and vertical and lateral distribution,
 - Bioassay
 - Bioaccumulation Studies
- Risk Assessment
- Alternatives Analysis (Remedial Investigation and Feasibility Study and Remedial Action Plan)

Through all of this work, the overwhelming desire was to try to avoid destroying, by removal, the high quality wetland. This presentation will describe the process and implementation of the remedy.

6A-4: Towards Net Zero Waste Targets in Vancouver- One Cup at a Time

Authors: Aditya Rebally & Patricia Keen

Affiliation: School of Engineering & Computing Sciences, New York Institute of Technology (Vancouver)

Principal Contact: arebally@nyit.edu

Abstract:

Drinking coffee has become a daily necessity for most people, helped, in part, by the convenience of on-the-go cups. However, most of us forget that we are contributing to environmental damage by dumping these coffee cups in the trash bins, although they can be recycled. In Vancouver alone, 2.5 million cups end up in the trash per week, making them significantly more difficult to recycle and consuming energy and manpower to segregate them for recycling or incineration.

Typically, paper cups coated with plastic or wax are used to serve coffee in most cases, which are reusable. Vancouver has declared a commitment to achieve net zero waste by the year 2050 and this cup wastage can pose a threat to achieving this target. This paper attempts to address these issues by adopting a life cycle approach and creating a model designed to lower waste production linked to consumption of our daily coffee. The discussion will focus on mapping the gases released during the life cycle of a cup (manufacturing to the disposal), comparison of different materials used in the manufacturing of the cups and possible alternatives for the paper cups. Exploration of these aspects could potentially contribute to reducing the associated carbon footprint and achieving a net zero waste target in the city.

Session 6B: Science and Technology – Air Quality Measurement

Chair: David Elam

Affiliation: TRC Companies

6B-1: Use of the Portable In-Situ Wind Erosion Lab (PI-SWERL) to quantify potential fugitive emissions from open area sources

Authors: Maarten Schreuder^{1*}, Brian Schmid², Jessica Lovecchio³

Affiliation: ¹Air Sciences Inc., Portland, OR; ²Formation Environmental, Boulder, CO; ³Imperial Irrigation District, Imperial CA,

Principal Contact: mschreuder@airsci.com

Abstract:

Fugitive dust emissions from agricultural fields and naturally open areas in dry, windy climates can contribute significantly to episodic high atmospheric concentrations of particles with an aerodynamic diameter less than ten microns (PM₁₀), both in the United States as well internationally. This presentation will discuss a methodology to measure potential sand motion and PM₁₀ emissions based on the Portable In-Situ Wind Erosion Lab, or PI-SWERL, developed by the Desert Research Institute, Reno Nevada. A 2015-2016 field study aimed at quantifying potential PM₁₀ emissions from dry playas around the Salton Sea and adjacent desert areas in the Imperial Valley, California, will be discussed. The results indicate that there is considerable variability in potential emissions between and within surface types, both temporally and spatially. The study results were applied support the development of a PM₁₀ emissions inventory for the Imperial Valley.

6B-2: A Case Study of the Air Permitting and Modeling Analysis for a Human Crematorium in Washington State

Author: Betsy Speare

Affiliation: Spring Environmental, Inc.

Principal Contact: betsy@springenvironmental.com

Abstract:

In 2018, a human crematorium in Washington State applied for a Notice of Construction air permit. Due to high levels of toxic pollutants regulated by the Washington Department of Ecology (Ecology), the permit required further air dispersion modeling analysis in AERMOD. The project involved refining emissions based on specific refractory composition and tissue concentration data for humans developed by Ecology. Several impact scenarios were evaluated to accurately portray the batch operations that take place in a crematorium. This presentation examines the difficulties encountered and the solutions that lead to the final modeling analysis and issuance of the permit.

6B-3: A Case Study: Is Your Air Monitoring Equipment Reporting NO₂ or NO_{what}?

Authors: Charles Grimm, Kelly N. Pickrell, Christopher Swainson, Brian W. Rosentreter, Brodie D. Biggar, Charles A. Odame-Ankrah*

Affiliation: Global Analyzer Systems Ltd., Calgary, AB

Principal Contact: c.odame-ankrah@gasl.ca

Abstract:

Nitrogen dioxide, NO₂ is an air pollutant linked with negative impacts on human health, ecosystem health, and ozone production in the troposphere. The ozone made is equally toxic to the environment as well. Because of these known effects, NO₂ is regulated and classified as a criteria pollutant by the US-EPA under the Clean Air Act. NO₂ is also central in the processing of nitrogen oxide species in the troposphere to form other highly oxidized species such as peroxyacetyl nitrates (PANs), multifunctional organic nitrates (RONO₂), nitric acid (HNO₃), and particulate nitrate (pNO₃⁻). All these species together with ozone production and/or destruction can deposit to ecosystems and can adversely affect acid sensitive ecosystems, smog formation, etc. The effects of NO₂ listed above are the underlying reasons for the need for accurate quantification of this species to better understand its chemical processing in ambient air and how to implement control measures.

Recent studies published clearly show that heated Molybdenum NO₂converters inside chemiluminescent NO_x analyzers (routinely or commonly lead to overestimation of NO₂. This error can be addressed using an alternative ‘true’

NO₂ converter which selectively converts NO₂ to NO as published in literature. There are commercial photolysis based NO_x analyzers available which have been approved as a federal equivalent method (FEM) for 'true' NO₂ measurement by the US-EPA, but the question of what happens to the plethora of existing heated catalyst-based NO_x analyzers in use today remains. In this presentation, it is shown that a photolytic NO₂ converter can be used as a simple add-on to existing chemiluminescence analyzers enabling their capability to operate as indirect but 'true' NO₂ measurement devices. It has been proven through laboratory and field trials, and was tested as a direct replacement, or retrofit, of a heated Molybdenum NO₂ converter. Experiments were conducted at reduced pressure (200 mmHg), and over a wide linear dynamic range (tested from 0.03 to 37.30 ppm) with a converter efficiency greater than 96%, which shows results that have surpassed the performance of any known photolytic NO₂ converter.

A case study of device implementation in an ambient application side-by-side with an analyzer using a heated metal catalyst and another analyzer which directly measure only NO₂ is presented and discussed.

6B-4: New EPA Other Test Method (OTM) 37 Improves Measurement of Condensable Particulate Matter

Author: David Elam

Affiliation: TRC Companies

Principal Contact: delam@trcsolutions.com

Abstract:

After extensive collaboration with the emissions measurement community, the U.S. Environmental Protection Agency recently published a new, improved method for measuring condensable particulate matter (CPM) using dilution sampling – Other Test Method 37 (*Measurement of PM_{2.5} and PM₁₀ Emissions at Low Concentrations by Dilution Sampling*). CPM forms after the plume exits the emissions source and is very difficult to measure. The dilution approach mimics particulate formation after exiting the stack by mixing the sampled stack gas with cool, dry air and allowing a residence time for the particles to form and grow.

OTM-37 incorporates the dilution sampling approach established in Conditional Test Method (CTM) 39 (*Measurement of PM_{2.5} and PM₁₀ Emissions by Dilution Sampling*) and applies more sensitive ambient air gravimetric sampling and analysis methods to the diluted and cooled source gas sample to achieve greater sensitivity.

Importantly, OTM-37 overcomes the problems associated with the formation of artifact particulate matter in the Method 202 (*Dry Impinger Method for*

Determining Condensable Particulate Matter Emissions from Stationary Sources) sampling train. Artifact formation in CPM measurements has long been identified as an important source of bias in these measurements and “best practice” enhancements to Method 202 have reduced, but not eliminated the bias. OTM-37 takes an entirely new approach to sampling and collecting condensable particulate that removes this bias.

This presentation will provide an overview of CPM formation, the biases associated with historical CPM measurement methods, an overview of OTM 37, and the requirements for successful deployment of a CPM measurement program.

6B-5: A Case Study of the Air Permitting Process for a Boat Manufacturing Facility in Washington State

Author: Jenelle Scott

Affiliation: Spring Environmental Inc.

Principal Contact: jenelle@springenvironmental.com

Abstract:

Renaissance Marine, Inc. of Clarkston, WA manufactures aluminum boats. In 2015 Renaissance Marine purchased a larger facility with the intent to move manufacturing operations there in 2016. Due to the new location and increased production potential, a New Source Review application was required by the Washington State Department of Ecology. The project involved characterizing emissions based on equipment and materials used at the facility, analysis of control technology and costs, and running multiple impact scenarios using AERMOD air dispersion modeling. This presentation delves into the procedures used, challenges encountered (including toxic components of materials, proximity to property boundary, and high background levels of PM_{2.5}) and lessons learned.

Session 7A: Policy and Regulation – Environmental Management

Chair: Nancy Mora Castro

Affiliation: RDCO

7A-1: Keeping Your Facility “Inspection Ready”

Author: Chris Kitchen

Affiliation: Sound Earth Inc.

Principal Contact: Ckitchen@soundearthinc.com

Abstract:

Industrial facilities are subject to inspection at any time from their regulators. As an environmental manager it's important to stay in compliance and keep your facility inspection ready. I will share my experience as a regulator and as facility environmental manager. Being compliant is sometimes not enough if you are unorganized and cannot locate records, or worse the task was done but documentation was lost. Having poor housekeeping like dusty roads can spur on an inspection. Being inspection ready takes environmental compliance to the next level and really helps your facility to shine. If you maintain your facility like an inspection is imminent you will be a more successful manager while setting a great precedence for your team, soon this will be the new norm. I will discuss organization, facility housekeeping, the importance of developing and maintaining a good EMS. I will also cover the importance of cross training and share some tips on how to make your inspection run smoothly.

7A-2: Air Quality Management in the Central Okanagan

Author: Nancy Mora Castro

Affiliation: RDCO

Principal Contact: nmoracastro@kelowna.ca; airquality@kelowna.ca

Abstract:

As part of the 2015 Central Okanagan Clean Air Strategy, the Air Quality Technical Committee (AQTC), a working group of air quality experts from federal, provincial and local agencies, was formed to discuss best practices for integrating clean air goals into community plans, regulations, and policies. With growing scientific understanding of the health impacts of smoke, wood burning is becoming less accepted as a method of managing wood debris and its regulation is increasingly focused on air quality and health protection. Research and review of best burning practices in other municipalities and countries were discussed and consulted with several stakeholders and certain actions received public input.

Local governments have the ability to request and set better conditions to allow open burning, campfires, the use and replacement of wood burning appliances and prevent or reduce fugitive dust, as the general public repeatedly demand for new approaches and alternatives. A combination of budget increases, open burning fees, bylaw updates and options to expand the Agricultural Chipping Program are proposed. The twenty-three recommendations are based on pollution prevention strategies, focusing first on prevention, minimization and finally control of emissions encouraging the use of forced air technologies.

With the proposed actions, the region could potentially avoid the release of more than 3,700 tonnes of pollutants every year, this means 14% reduction of smog-forming pollutants in the region. Consequently, the future health related costs could be prevented or minimized, assuring that current and future generations are better protected.

7A-3: BlueSky Canada: A Wildfire Smoke Forecasting System

Author: Cindy Walsh

Affiliation: British Columbia Ministry of Environment

Principal Contact: Cindy.Walsh@gov.bc.ca

Abstract:

BlueSky Canada is a wildfire smoke forecasting system that provides daily 60-hour forecasts of ground level fine particulate matter (PM_{2.5}) due to wildfires for most of Canada and a large portion of the continental United States. The need for this type of information, particularly in light of the changing Northern climate, was recognized in 2008 and led to the development of the BlueSky Canada forecasting system derived from the United States Forest Service BlueSky system. This paper will provide a brief overview of the evolution of the BlueSky Canada system from its inception and first forecast in 2010 to present day. Highlights will include a summary of the penetration BlueSky has had with the public, particularly with regard to significant wildfire smoke events; past and present research initiatives to improve modelling of wildfire smoke events; and BlueSky Canada's role in the development of a broader wildfire smoke forecasting community network throughout Canada and the United States.

7A-4: AirAware: Next Generation Air Quality Monitors and Citizen Science in Metro Vancouver

Author: Amy Thai

Affiliation: Metro Vancouver

Principal Contact: amy.thai@metrovancover.org

Abstract:

The Metro Vancouver Regional District is a federation of 21 municipalities, one Electoral Area and one treaty First Nation in southwestern British Columbia. Metro Vancouver's air quality monitoring network includes 29 stations from Horseshoe Bay in West Vancouver to Hope. These stations use high-quality

scientific instruments meeting strict performance specifications and operating requirements.

In recent years, there has been a proliferation of “next generation” air quality monitors that are small, low-cost, easy to operate and readily available to the public, but there are limited guidelines on their appropriate use and interpretation of the data collected. Metro Vancouver and other agencies are interested in exploring the role these monitors could play in traditional monitoring networks: they can allow the public to collect their own local air quality data, supplement fixed monitoring networks by increasing the spatial resolution of data collected, and be deployed to support clean air initiatives.

Metro Vancouver initiated AirAware, an air quality monitoring and citizen science outreach project, which will unfold between early 2018 and late 2019. AirAware will review next generation air monitors, provide assistance to and develop guidance for the public in their appropriate use, and help interpret the data collected. Metro Vancouver will engage the public directly and has partnered with other agencies, such as municipalities and health authorities, in this project. Monitors are being co-located at stations in the Metro Vancouver air quality monitoring network, and the data will be compared to the data collected by the standard air quality instruments. Metro Vancouver will seek public participants for the AirAware project who will receive help to set up their monitor in a location of their choice and in interpreting the data. Metro Vancouver will create public resources outlining general usage, strengths, and limitations of next generation air monitors, based on the feedback of the participants in the project.

The presentation will summarize experience to date with evaluating next generation monitors, including any strengths and limitations uncovered so far, and the experience of engaging the public in the project.

Session 7B: Policy and Regulation – Science and Technology

Chair: Erin Hallenburg

Affiliation: ERM

7B-1: Common Indoor Radon Levels and the New Annual Radiation Dose Exposure Formula

Author: Greg Baytalan

Affiliation: Interior Health

Principal Contact: greg.baytalan@interiorhealth.ca

Abstract:

Common Indoor Radon Levels and the New Annual Radiation Dose Exposure Formula

This presentation will draw comparison to common Radon Bq/m³ exposures to that of Radiation Worker mSv/year dose equivalency, and put into context the seriousness of indoor radon exposure. Levels detected within buildings, including facilities open to the public reflect exposures equivalent to a “radiation worker”, yet the BC Occupational Health and Safety Regulation provides an exemption for Naturally Occurring Radioactive Material (NORM).

Calculations will reflect the new International Commission of Radiological Protection (ICRP) internal Alpha dose equivalency multiplication factor in effort to stimulate thought and discussion.

7B-2: Alternatives to Dustfall Monitoring in British Columbia

Author: Andres Soux

Affiliation: ERM

Principal Contact: andres.soux@erm.com

Abstract:

Dustfall monitoring has been a common approach to monitoring air quality at many industrial facilities in BC including mining operations. In addition, metals concentrations from dustfall have been used to help assess the effect of projects on human and environmental health. The methods to monitor dustfall are relatively inexpensive and simple and hence have been widely used. However, recently the BC Ministry of Environment and Climate Change Strategy has issued guidance that calls into question the effectiveness of dustfall monitoring and puts strict limits on the cases where dustfall monitoring is appropriate. A review the rationale for the changes in acceptability of dustfall monitoring will be presented. With limits imposed on the applicability of dustfall monitoring, alternative approaches will need to be developed to supplant current methods. Alternatives to dustfall monitoring will depend upon the goals of the monitoring, location of monitoring and the monitoring budget available. Monitoring considerations that will be discussed are: continuous vs. non-continuous monitors, FEM/FRM monitors, detection limits for samples and temporal and spatial scales of monitoring.

7B-3: Managing Environmental Nuisances: Odour and Noise

Authors: Anna Henolson* & Angie Wanger

Affiliation: Trinity Consultants

Principal Contact: ahenolson@trinityconsultants.com

Abstract:

Odour and noise are two of the most commonly complained about pollutants. It is important for industry leaders to have a good understanding of what odour and noise are, how to quantify and/or monitor them, and how to proactively manage nuisances.

A nuisance is defined in law as something offensive or annoying to individuals or the community, especially in violation of their legal rights. In the environmental sector, some pollutants are uniquely nuisance-based, occurring from perceived impact rather than environmental or health impact. Such adverse impacts often lead to the loss of enjoyment of property. Odour and noise are becoming two of the most common issues of complaint made to regulators and therefore must be proactively managed to keep facilities off the proverbial “radar.”

7B-4: Navigating Nuisance: Odour, Risk, and Regulations

Authors: Don Caniparoli* & Monica Wright

Affiliation: Jacobs Engineering, Portland, OR

Principal Contact: Don.Caniparoli@jacobs.com

Abstract:

Odour is regulated in many jurisdictions as a nuisance but falls under the responsibility of the air pollution control agency for regulation and is the responsibility of the environmental manager at the regulated facilities. These regulatory programs are often not well defined which brings challenges to all parties. As citizens become more engaged with regulators about the regulated industries in their communities, they are becoming more aware of odour requirements and the opportunities they have to use the odour programs to put pressure on industries and the agencies to control air emissions. In the process of pushing for odour controls they may also be pushing to reduce air toxics, sometimes but not always intentionally. This presentation will explore odour regulatory programs and give some examples of how citizens have approached the issue as well as how agencies and regulated sources have responded.

Session 8A: Science and Technology - Management and Monitoring

Chair: Harold Laurence

Affiliation: Trinity Consultants

8A-1: The Epic of Ajax: The Ajax Mine Air Quality Assessment

Authors: Peter Reid

Affiliation: Stantec Consulting Inc.

Principal Contact: Peter.Reid@stantec.com

Abstract:

Ajax is a mythological Greek hero. In epic poems and stories Ajax is portrayed as a towering figure; a warrior of great courage. While notable for his abundant strength and courage, Ajax is conquered by his own sorrow after he is deceived by Athena.

The Ajax Mine is a proposed open pit copper and gold mine located just south of City of Kamloops, BC. The Environmental Assessment considered the mine producing 65,000 tonnes per day ore for processing, producing copper/gold concentrate that was to be transported to the Port of Vancouver for shipment to offshore smelters. The projected life of 31 years consists of Construction (3 years), Operations (23 years), and Decommissioning / Closure (5 years).

The Air Quality Valued Component of the Ajax Environmental Assessment was a 'Pathway VC' to the Human Health VC. This VC was found to have residual effects that were deemed not significant. The significance determination was made with low confidence due to the numerous uncertainties identified during the review, including uncertainties associated with the effectiveness of mitigation measures, analytical techniques, and available information. In December 2017, citing the compounding potential of the adverse effects, and significant adverse effects to Indigenous heritage and to the current use of lands and resources for traditional purposes the BC Government decided not to issue an EA certificate.

In this presentation the air quality assessment and results are described. While a full suite of potential pollutants was considered, the air quality assessment focused on the effects of PM_{2.5}. It scrutinized potential effects of various activities and mine features on PM_{2.5} air quality. The assessment is discussed as well as rework that followed to refine the assessment of fugitive dust from haul roads and the tailings storage facility, plus mitigation strategies involving curtailment of mining activities.

8A-2: Minimizing Risk from Overlapping Emission Inventory Requirements

Author: Harold Laurence

Affiliation: Trinity Consultants

Principal Contact: HLaurence@Trinityconsultants.com

Abstract:

Organizations looking to fortify environmental records should consider best practices for documenting overlapping emission inventories. An overlap occurs when two or more inventories request similar emission information, with variations in calculation method, prescriptive emission factors, or inventory scope boundaries. A similar effect is created when year-over-year changes are made to regulatory or industry standards for emission calculation. Affected facilities are at risk of reporting multiple datasets that give an incorrect first impression of being inconsistent, because they are similar but not directly comparable.

As new emission inventory requirements come into effect across the PNWIS region, overlaps have been observed in different jurisdictions. Examples include:

- Forthcoming changes in storage tank emission calculation methods (U.S. EPA AP-42 guide) will create step changes in emission numbers in the year they are implemented;
- Canadian federal National Pollutant Release Inventory (NPRI) reports often rely on the same process information as provincial greenhouse gas (GHG) emission inventories;
- Oregon air toxics inventories requested in April 2017 overlap with Hazardous Air Pollutant (HAP) emission inventories in Air Contaminant Discharge Permit applications, as well as with annual U.S. Toxic Release Inventory (TRI) forms;
- Washington state greenhouse gas (GHG) inventories overlap with federal inventories and with project-based GHG disclosures under the State Environmental Policy Act (SEPA).

These appearances of inconsistency can lead to miscommunication with regulators and the general public, unless the reasons behind each inventory are clearly communicated. By using best practices for documenting each emission inventory, facilities can quickly prepare internal comparisons and external communication about the contents of the different reports.

Examples of best practices include:

- Building the inventories using the same underlying process information when possible, and documenting all differences;
- Documenting statistical methods used to obtain process information;

Documenting differences in scope between inventories, e.g., between a TRI and a U.S. Clean Air Act emission inventory.

8A-3: Computer Controlled Scanning Electron Microscopy with Energy-Dispersive X-Ray Spectroscopy As A Component of Lichen Biomonitoring in Seattle, Washington

Author: T.G. Guddal* & R.M. Sofield

Affiliation: Western Washington University

Principal Contact: guddalt@wwu.edu

Abstract:

Computer controlled scanning electron microscopy (CCSEM) with energy-dispersive X-ray spectroscopy (EDS) can be used to determine the size and composition of filtered particulate matter (PM). This information is valuable for determining the identity and contribution of overlapping air emissions. One limitation of this technique is the cost of filtering PM at enough locations to give meaningful spatial data. This study aims to address this limitation by demonstrating the use of *Ramalina farinacea* as a low-cost tool for collecting PM for CCSEM analysis as a component of a lichen biomonitoring study. To do this, bags of lichen were transplanted in 9 locations in South Seattle for 3 months. Upon collection, metal bioaccumulation was determined using inductively coupled plasma mass spectrometry, and PM deposition on the lichen was characterized using CCSEM with EDS. A total of 18,750 particles were identified and analyzed using a two-stage classifier system. Preliminary findings suggest *R. farinacea* are an effective tool for collecting PM, and show the greatest increase in both metal and mineral particles on lichen adjacent to Interstate 5. Additionally, the absence of several expected particle classes may indicate a removal or integration mechanism which would have implications on PM bioavailability and lichen biomonitoring.

8A-4: Regional Impact of a Biomass-fueled Co-generation Boiler on Ultrafine Particle (UFP) Concentration

Author: Lauren Whybrew

Affiliation: Olympic Region Clean Air Agency

Principal Contact: lauren.whybrew@orcaa.org

Abstract:

The Nippon Paper Company, located in Port Angeles, WA, applied for a permit in 2010 to

replace a decades-old boiler that fired on mixed hog-fuel, wastewater treatment plant sludge

and #6 fuel oil. Nippon proposed a 20-megawatt co-generation plant, fueled by a mixture of

biomass, dewatered clarified sludge, and #2 fuel oil. Some residents were concerned that

emissions from the new boiler would degrade air quality and cause health problems. The cogen

plant was approved in 2011 and began operating in September 2014. This study evaluated the

effect of Nippon's biomass co-generation facility on ultra-fine particles (UFP) in the region and

identified the primary sources of pollutants in the region. Particulate and gas-phase

measurements were made between January 2014 and June 2015, ensuring that both winter

and summer months prior to and following operational changes were represented. Gaston et al

(2016) showed that higher particle concentrations in winter, relative to summer months, were

from residential wood-fired heaters and stoves. In summer, winds more frequently blow from the

mill toward the monitoring site and background PM_{2.5} concentrations are low. These conditions

made summer an ideal time to evaluate air quality impacts of the biomass co-generation plant.

A comparison of the data during operating hours with non-operating hours in May and June

2015, indicate that although air monitors could detect carbon monoxide emissions from the

boiler, no measurable effect on ambient PM_{2.5} or UFP concentrations was found.

Session 8B: Science and Technology – Land Remediation

Chair:

Affiliation:

8B-1: Regulatory Requirements for Contaminated Soil Management

Author: Kerri Skelly,

Affiliation: Land Remediation Section, Ministry of Environment & Climate Change Strategy

Principal Contact:

Abstract: pending

8B-2: Pending

Author: Peter Kickham

Affiliation: Land Remediation Section, Ministry of Environment & Climate Change Strategy

Principal Contact:

Abstract: Pending

8B-3: Perspectives and Case Studies on the CSR Omnibus Amendments

Author: Chuck Jochems

Affiliation: Hemmera

Principal Contact:

Abstract:

The Contaminated Sites Regulation's (CSR) Omnibus Standards came into effect one year ago with numerous changes to standards, technical guidance, and protocols in contaminated site assessment. To provide better context on some of

the key changes, case studies will be presented by a Contaminated Sites Approved Professional that cover an array of topics.

Generally, soil standards for metals became more stringent to be protective of the groundwater pathway. One example will look at a site with poor quality metal-contaminated fill and compare the extent of contamination and implications for both pre- and post-Omnibus scenarios.

Some existing groundwater standards and those for new contaminants were implemented with Omnibus. Case studies will look at implications of both new and more stringent drinking water standards for dissolved metals and polycyclic aromatic hydrocarbons.

Some relief was provided for soil vapour when assessing a common solvent, trichloroethylene (TCE). An example will show the differences in assessment approach for both pre- and post-omnibus scenarios.

In an effort to streamline soil relocation, Protocol 27 (P27) was brought in to assess soil relocation using a standardized leachability test. An example is given where significant cost-savings were realized by a developer using P27 on soils containing low concentrations of arsenic above the applicable soil standard.

8B-4: Incorporating Bioavailability in Contaminated Site Risk Assessment

Author: Matt Dodd

Affiliation: Royal Roads University

Principal Contact: Matt.Dodd@royalroads.ca

Abstract:

The United States Environmental Protection Agency (USEPA) has defined bioavailability as the fraction of an ingested dose that crosses the gastrointestinal epithelium and becomes available for distribution to internal target tissues and organs. Bioavailability data can be used to provide realistic information on potential health effects of contamination, modify site-specific soil clean-up levels saving time and money and help prioritize sites for subsequent evaluation. Metal bioavailability is best measured using in vivo animal models. However, due to cost and time requirements for the animal studies in vitro models based on physiologically based extraction tests (PBET) have been developed. The PBET models usually measure bioaccessibility, which is the fraction of the metal that becomes dissolved in the gastrointestinal tract fluids and is available for

absorption. Comparisons of in vitro and in vivo results show that the bioaccessibility data generated from PBET models can provide good prediction of selected metal bioavailability. This talk will provide a brief overview of the use of PBET in risk assessment using case examples from selected sites for illustration.