INTRODUCTION

The Ontario Environmental Protection Act (EPA) is the main provincial legislation that controls pollution. The EPA prohibits the discharge of any contaminants into the environment that cause or are likely to cause adverse effects.

This is a very broad definition that encompasses a variety of factors and is subject to interpretation. The main objective of the EPA is to protect the natural environment. There are specific regulations that relate to discharges to air, water and soil as well as noise, dust and vibration.

Due to the complexity of the EPA and the associated regulations, it is not easy to understand exactly what your business needs to do in terms of protection of worker health and safety and identifying which environmental compliance requirements are applicable. In today's competitive market, compliance to regulatory requirements may be one of the main areas of cutting costs; however, the repercussions of not being compliant can often outweigh the consequences.

In this paper, Peritus Environmental Consultants Inc. (Peritus) presents typical regulatory requirements of which the industrial sector should be aware. The paper also includes examples of projects that Peritus has been involved in and lessons learned from each of these projects. The topics covered in this paper include environmental emergency preparedness, environmental regulatory compliance considerations, indoor air quality testing, compliance considerations for discharging groundwater to storm sewer and designated substances surveys.

PART A: ENVIRONMENTAL EMERGENCY PREPAREDNESS

"Emergency" is defined by Emergency Management Ontario (EMO) as "a situation or impending situation that constitutes a danger of major proportions that could result in serious harm to persons or substantial damage to property".

In Canada, regulatory requirements for emergency preparedness are driven by the Canadian EPA, the Fisheries Act and the Transportation of Dangerous Goods Act.

In Ontario, the applicable regulatory regulations include:

- Ontario EPA
- Ontario Regulation (O. Reg.) 224/07 Spill Prevention and Contingency Plans
- O. Reg. 675/98 Classification and Exemption of Spills
- Ontario Clean Water Act (which defines risk management plans)
- Ontario Water Resources Act (which prohibits discharges to surface water)

Ontario has adopted the following five key components for emergency management:

1. Prevention: Actions taken to avoid an emergency or disaster and the associated impacts of a hazard (Glossary of Terms, 2011). The single best method for managing any emergency is to prevent it – "an ounce of prevention is worth a pound of cure". If it cannot be prevented, then a mitigation program must be in place.
2. Mitigation: Actions taken to reduce the adverse impacts of an emergency or disaster (Glossary of Terms, 2011). Mitigation must be employed during all phases of an emergency to reduce the overall impact of the incident.
3. Preparedness: Actions taken prior to an emergency or disaster to ensure an effective response. These actions include the formulation of emergency response plans, business continuity/continuity of operations plans, training, exercises, public awareness and education (Glossary of Terms, 2011).
4. Response: The provision of emergency services and public assistance or intervention during or immediately after an incident in order to protect people, property, the environment, the economy and/or services (Glossary of Terms, 2011).
5. Recovery: The process of restoring to a pre-disaster level of functioning (Glossary of Terms, 2011).

To effectively respond to emergencies, the Incident Management System (IMS) was developed as a standardized approach. The IMS structure encompasses personnel, facilities, equipment, procedures and processes, and communications. This approach has been adopted by various municipalities across Ontario. Developing and implementing an effective emergency plan can help a business respond to an unexpected situation. The IMS will help define a business's methods for timely communications between both internal and external stakeholders, responsibility and the chain of command, and the actual logistics of returning to normal operation.

CASE STUDY: EMERGENCY WATER SPILL IN KITCHENER

The following example illustrates the need for having an emergency response system in place during construction activities.

Peritus was originally retained by a property developer to obtain a record of site condition (RSC) for a former commercial site fronting on a major street in Kitchener (Site). The Site was a commercial property that was used for automotive related operations such as gasoline service stations, car rental and used car sales. As part of the RSC process, Peritus completed detailed environmental investigations of the soil and groundwater conditions at the Site between 2011 and 2012 and prepared the Phase One and Two Environmental Site Assessment (ESA) reports.

Peritus also completed strategic remediation combined with a risk assessment to obtain RSCs for the two separate parcels in 2015. In 2018, Peritus was retained by the new owner of the Site to provide environmental consulting services for the proposed redevelopment. The redevelopment plan included a one-level underground parking garage that extended to the property boundary on all four sides and construction of a raft slab beneath the entire underground parking garage for structural support. The proposed depth of the underground and parking garage and raft slab is a maximum of 6.1 m below ground surface (bgs). Peritus prepared a remedial action plan and soil management plan for the excavation of the soil. Peritus was also responsible for providing oversight for the removal of the contaminated soil.

In April 2019, the contractor responsible for installing shoring at the Site hit a 600 mm water main along one of the streets bordering the Site. This resulted in loss of drinking water service to a large portion of the City of Kitchener impacting residences, schools and businesses. When the broken watermain was isolated and shut off, the Site was significantly flooded with water filling the low-lying areas. The broken watermain also resulted in overland flooding of two major streets and a few smaller streets. The overland flood resulted in water discharging into a spillway to Schneider's Creek via the municipal storm sewers.

The owner of the Site asked Peritus to help coordinate the details of the environmental spill with the Ministry of the Environment, Conservation and Parks (MECP) and the Region of Waterloo. Peritus personnel who responded to this situation included the General Manager and one of the Senior Project Managers. Peritus worked with the MECP, Region of Waterloo, the City of Kitchener, the Site owner and various contractors at the Site to identify priorities for the Site, including:

- Prevent continued discharge into Schneider's Creek. The MECP's primary concern was the presence of suspended solids in the water that was being discharged into Schneider's Creek. Peritus worked with contractors to mobilize vacuum trucks to clean out the spillway and storm sewers leading to the spillway, to respond to MECP's primary concern.
- The weather forecast on April 25 and 26, 2019 included 30 mm of rain, Peritus identified that a key priority was to prevent additional overland flooding from the Site due to the rain since the low-lying areas were already filled with water.
- Peritus also worked with the contractors to deliver a weir tank with two bag filters, which allowed the suspended solids to settle before being discharged into the storm sewer.
- Based on the plan to use a weir tank to reduce the sediment loading, Peritus obtained verbal approval from both the MECP and the Region of Waterloo to discharge the water from the south end of the Site to the storm sewer once the spillway was cleaned up.

- Peritus also collected water samples from the areas that had contaminated soil (north end of the Site) and submitted the sample for rush analysis. Confirmatory samples indicated that this water did not meet the storm sewer discharge criteria. Peritus worked with the Site owner's representative to arrange for this water to be taken offsite via vacuum trucks.
- Peritus provided several updates to the MECP regarding the actions taken to address the spill. Some of these updates included telephone calls after hours with the MECP Spills Action Centre to provide additional details that were missing when the MECP on-site representative opened the spill file.

Lessons Learned:

In the above case, the incident resulted in impacts to several hundred homes, businesses and schools. The Region of Waterloo responded and was able to reroute the municipal water to a parallel water main and restore service within 2 hours of the incident.

Previously, there had been significant construction along the roadways in the vicinity of the Site. As a result, the as-built drawings were not fully reflective of the actual conditions.

Even though Peritus was not directly involved with the incident, Peritus was working on overseeing soil excavation on the north end of the Site. This familiarity with the project allowed Peritus to respond to the spill in a manner that helped the developer identify the key issues and move forward with implementing solutions that satisfied the MECP and the municipalities (Region of Waterloo and the City of Kitchener). The MECP's priority was to prevent further discharge into Schneider's Creek. The plan to use a weir tank and vacuum trucks satisfied the MECP personnel.

While the developer and its contractors had basic emergency response plans in place, the possibility of hitting a water main was not included as part of overall emergency plan. As a result, the response plans to the spill were reactionary.

The key lesson learned in this case is to always complete detailed utility locates. If necessary, conduct a ground penetrating radar (GPR) survey if there has been significant construction in the area that may have resulted in changes to the existing as-built drawings.

PART B: ENVIRONMENTAL COMPLIANCE

For the industrial sector, a facility needs to obtain an environmental approval from the MECP if the facility discharges or may discharge, a contaminant into any part of the natural environment. The discharge may include air emissions, noise and vibration. Other factors that need an environmental approval include water, waste disposal/transfer and discharges to sewer.

A business needs to apply for an environmental approval before commencing operation of a new facility or if significant changes are made to the equipment/process. The purpose of the approval is to demonstrate that the discharges from the facility meet the MECP standards, guidelines or levels. If the emissions do not meet the regulatory limits, then additional measures may need to be implemented to meet the applicable discharge limits.

In Ontario, environmental compliance may be obtained as an Environmental Compliance Approval (ECA) or an Environmental Activity and Sector Registry (EASR).

The MECP website states that "businesses with complex or unique types of operations, such as landfill sites or wastewater treatment plants must apply for an ECA. By law, your business must meet the specific conditions set out in the ECA". Many businesses usually do obtain an ECA; however, this ECA is not necessarily updated when new equipment is added or a process is changed significantly.

ECAs are reviewed and approved by MECP staff. Historically, one of the main problems associated with applying for an ECA was that approval could take several years. As of January 2018, the MECP introduced a one-year service standard for ECAs. The MECP will stop the clock on the one-year timeline at the screening stage or the review stage if they ask for more information, which means that the one-year can still stretch out to a longer period.

To deal with the volume of ECA applications and to maintain the one-year service standard, the MECP introduced the EASR. The intention of the EASR is to obtain compliance approvals for less complex processes that pose a minimal risk to the environment – specifically for air, odour and dust. EASR submissions are submitted online.

For either type of application (i.e. an ECA or EASR for air and noise), an emission summary dispersion modelling (ESDM) report must be completed to demonstrate compliance with MECP standards when there are air discharges. The modelling is completed based on equipment specifications, manufacturer's data, emission factors, published data or other available resources. A noise screening and/or an acoustic assessment also need to be completed and submitted with the application.

For ECA applications related to landfills, wastewater treatment systems and other complex systems, detailed design drawings and reports need to be included as part of the submission.

Once an ECA has been approved, the business (or designated employee or consultant) needs to review the conditions set out in the ECA. The ECA may need to be amended from time to time, if there are significant changes to the overall operation.

For either an ECA or an EASR, the business needs to prepare an operation and maintenance manual, procedures for record keeping and responding to complaints. For an ECA, the MECP

needs to be notified within two days of a complaint while for an EASR the MECP needs to be notified immediately.

The EASR requirements also include developing preventative maintenance schedules and monitoring procedures as well as training requirements. An EASR needs to be updated regularly and reviewed every 10 years.

The following examples illustrate the complexity of ECAs and EASRs.

CASE STUDY 1: ECA SUBMISSION

Peritus was retained by an industrial client partway through the installation of equipment to complete an ECA for a new metal extrusion facility in Cambridge. The extrusion facility was being installed within an existing building leased by the industrial client. Peritus treated this project similar to other ECA projects and submitted the ECA for air emissions. In previous experience, the MECP would accept submissions without assessing noise and allow for some discussions about noise. This time the MECP rejected the ECA submission and requested a noise assessment. Due to the proximity between the facility and property line, the MECP indicated that an acoustic assessment was required.

Peritus then retained a partner to assist with the noise assessment. The noise sources were typical for an industrial facility and included items such as HVACs, open doors and small roof top stacks. Due to the distance between the stacks and neighbour residential properties, noise mitigation was required for some of the stacks.

While working on the permitting process, the facility started running some production tests. While they were running their tests, some of the closest residential neighbours noticed their houses starting to vibrate which caused knives to fall, china to rattle and create a general annoyance. The residents were already dealing with noise issues from a facility to their south, so they knew they could call and complain to the MECP. After following up with the residents, the MECP identified the industrial client as the source of vibrations. The MECP requested a vibration assessment to be included with ECA submission.

The extrusion facility was significantly impacting the residential neighbours; therefore, a substantial amount of monitoring was required. The vibration assessment included in-residence testing because the MECP's vibration limits are set for "in-residence impacts", not for property line or building façade impacts. Peritus and its partner completed vibration assessments primarily in two residential houses, based on who was willing to allow access. Since there were known vibration issues, the MECP required vibration mitigation with follow up vibration assessments.

The ECA was eventually approved by the MECP, over 18 months after Peritus was first retained to start the ECA application. Once the revised ECA was re-submitted, the MECP requested vibration mitigation with multiple rounds of vibration assessment and several on-site meetings

and conference calls. Even though the MECP did approve the ECA, they included several conditions that limit some of the operations the industrial client can conduct. The MECP also required a follow up noise and vibration audit to assess conditions six months after the mitigation measures were installed. The follow up assessment was required to determine whether settling soil had reduced the effectiveness of the mitigation measures.

The mitigation and assessments led to significant expenditures, including:

- Three in-residence vibration assessment rounds: Two of which were completed to assess the effectiveness of the mitigation system while the ECA was under review and one as a follow up audit assessment required as a condition of the approved ECA;
- Installing two separate mitigation trenches filled with low-density geofoam;
- Adjusting the equipment programming to reduce the pressure and timing of the equipment; and
- Installing vibration isolation springs on the hydraulic pumps associated with the extruder.

Even though the post-mitigation vibration assessments showed the vibration levels were compliant, some of the neighbouring residents are still not overly happy.

Lessons Learned:

Plan ahead: If you know you are starting a new process that will have emissions (air, noise, vibration or water), start the permitting process as soon as possible. If there is a problem, the Ministry can shut down or restrict your operations until they are satisfied.

Understand the process: Will your process emit anything to the environment? What permits do you require based on your emissions? When do you need the permits in order to start manufacturing?

Think about your impacts: What will you be discharging? Who are your neighbours and how could they be impacted by your new project? Is there something you can change (i.e. placement of equipment) during project development?

CASE STUDY 2: EASR SUBMISSION

The MECP completed a facility inspection of an automobile dealership with a carwash. The facility inspection was due to a noise complaint issued by a nearby resident. The used automobile dealership is located near a major city with some industrial neighbours, but primarily within a rural setting with no municipal services such as sewers.

The dealership operated an evaporator to manage water used within the carwash. The evaporator had a blower that was the cause of the noise complaint. Based on the facility inspection and the noise complaint, the MECP issued a report that required an EASR be filed by

a certain date to bring the dealership into compliance. The dealership retained Peritus and its partner to complete the EASR for air and noise emissions.

The acoustic assessment determined that the evaporator blower required mitigation to reduce the noise emitted and bring the facility into compliance. The air dispersion modelling determined that the HVAC and evaporator emissions complied with the MECP limits.

During the EASR submission Peritus helped the dealership set up their EASR account through the MECP website. The MECP EASR filing process is not straight forward and requires the property owner to answer a series of complex questions before they can authorize the consultant to fill out the forms.

Lessons Learned:

Understand the process: Will your process emit anything to the environment? Then you will be required to obtain permits. What permits do you require based on your emissions? Noise can be an issue, even in a semi-rural area.

PART C: INDUSTRIAL HYGIENE CONSIDERATIONS

One of the most common factors in protecting workers is industrial hygiene, which may include considerations for indoor air quality (IAQ), noise and vibration. As of January 1, 2020, O.Reg.185/19 will require employers to take all reasonable measures to protect workers from exposure to hazardous biological or chemical agents in the workplace.

Under the regulatory requirements, the measures to be taken shall include the provision and use of:

- Substitution of the hazardous biological or chemical agent;
- Engineering controls;
- Administrative controls, including work practices;
- Hygiene facilities and practices; and
- Personal protective equipment.

The hierarchy of controls of the above factors include elimination of hazards in the design stage as the preferred method. An alternative to elimination of a hazard is to substitute a different chemical, equipment or work method. Anticipating and eliminating hazards through designing tools, processes, equipment, materials, structures and organization of work is the most effective way to prevent occupational injuries, illnesses and/or fatalities. It is important to consider worker safety and health when designing or redesigning facilities and equipment.

If hazards cannot be entirely eliminated, then engineering controls need to be implemented to protect employees effectively without placing primary responsibility onto the employee. This may include isolating a hazard or placing a guard or control that will reduce the overall impact. An example of an engineering control may include increasing ventilation or dilution to improve IAQ.

Administrative controls may include employee training and work scheduling. Use of personal protective equipment should be the last resort.

CASE STUDY 1: INDUSTRIAL AIR QUALITY – IMPACTS ON PRODUCT

In January 2019, Peritus was contacted by a sister company. A mattress manufacturing company had moved into a brand-new building in late 2018. When the workers returned after a week shut down period in late December, they noticed that the white foam used for the mattresses had "yellowed". White caulking on the walls and conduit were also discoloured.

The first problem was identifying the appropriate parameters to test since the source and reason for the discolouration was unknown. To narrow down the parameters, Peritus used a handheld gas monitor equipped with three sensors for nitric oxide (NO), nitrogen dioxide (NO_2) and sulfur dioxide (SO_2). Peritus also conducted indoor air testing by placing two 8-hour flow regulated canisters in strategic locations inside the facility. One canister was placed in the industrial manufacturing area, near the entrance to the main office while a second canister was placed in the heart of the manufacturing area. A third canister was placed outside the building to assess ambient air quality. The following analytical scans to characterize the indoor and ambient air quality:

- 63 volatile organic compounds (VOCs),
- 22 sulfur and mercaptan compounds, and
- 5 fixed gases compounds.

Based on the results of the indoor air quality testing, Peritus ruled out VOC, sulfur and mercaptan compounds, since the concentrations of these parameters were not high enough to attribute to the discolouration or odour occurring inside the building.

The fixed gas parameters tested included carbon monoxide, carbon dioxide (CO_2), methane, nitrogen and oxygen. Combustion gases can result from processes within the facility such as operation of the propane fire forklift and emissions from direct fired heaters if they are not functioning properly (faulty). The fixed gas parameters were tested because these may result from combustion processes. Based on the results, elevated levels of NO, NO_2 and CO_2 were detected inside the facility. The elevated concentrations of these parameters are associated with

emissions from forklifts and gas fired heating systems. The CO_2 concentrations were above the Occupational Exposure Limits (OEL) in some parts of the facility.

Due to the results, Peritus reviewed an air balancing report and the heating system report provided by the facility owner. In the "Industrial Ventilation Manual" (2013) published by the American Conference of Governmental Industrial Hygienists (ACGIH), the recommended dilution ventilation rates based on average operating conditions is 10,000 cfm (5.00 m^3/s) (or more) per operating truck. This recommendation applies when:

- Vehicles are maintained regularly and appropriately.
- Lift trucks are used less than 50% of the working day (less than 4 hours in an 8-hour shift).
- A reasonably good air flow distribution.
- Volume of space is 150,000 ft^3 (13,500 m^3) per lift truck or more.
- Lift truck is powered by an engine of less than 60 horsepower (745 watts).

Based on the above, emissions from fork lifts may be contributing to the overall accumulation of higher NO and CO_2 in the manufacturing area. The overall conclusion was that the ventilation requirements of the overall plant could be increased to accommodate the specific uses of the facility. Portable fans were recommended to move the air near the floor to increase the overall ventilation and air movement around the manufacturing area.

Lessons Learned

Newer buildings may have tighter building envelopes with reduced air exchanges (i.e. less leaks). As a result, the impacts of the manufacturing environment should be considered when sizing ventilation systems and establishing air exchange rates. Even though the ventilation and air exchange requirements met the regulatory standards, the rates were insufficient for the manufacturing process.

CASE STUDY 2: INDOOR AIR QUALITY – IMPACT ON WORKERS

An industrial facility in Cambridge Ontario received a health and safety complaint from one of their employees. The facility manufactures and shapes aluminum and steel parts. An employee raised concerns that the metal working fluid was being aerosolized and entering the air and posing a respiratory health risk. The complaint was escalated to the Ministry of Labour (MOL). The MOL inspected the facility and issued an order to complete air quality testing in coordination with the joint health and safety committee (JHSC).

The JHSC member contacted Peritus to complete the required air quality testing. Peritus staff toured the facility to determine the most appropriate sample locations and analysis. It was decided in coordination with facility management and the JHSC to test for not only metal working

fluid, as required by the MOL order, but any potential air quality impacts from the facility processes. Air samples were collected and analyzed for: respirable particulate matter, airborne metal particulates, welding gasses, sodium hydroxide and metal working fluid.

Analytical results indicated that the only air quality impact that did not meet the Occupational Safety and Health Administration (OSHA) standards was metal working fluid. All other tested parameters indicated that the air concentrations were below OSHA standards.

The facility is in the process of adjusting the spray nozzles and guards on the impacted equipment. Once this is complete, Peritus will return to the facility to collect confirmatory samples to confirm that the adjustments are sufficient to prevent the metal working fluid from entering the air. In the mean time staff members in that production area have been given dust mask respirators.

Lessons Learned

Taking the design of the manufacturing process into consideration could have potentially reduced the impacts on indoor air quality. In this case, it was possible to adjust the existing equipment by implementing engineering controls.

CASE STUDY 3: NOISE INDUCED HEARING LOSS – SOUND LEVEL MONITORING

A heat-treating facility received a notice of complaint from the Workplace Safety and Insurance Board (WSIB) on behalf of a former employee. The former employee issued a claim for Noise Induced Hearing Loss (NIHL) due to his time working at the facility. The WSIB requested a sound survey of the area(s) where the former employee worked and a summary of the noise levels to which the worker would have been exposed. The heat-treating facility retained Peritus to complete the noise survey and summarize the noise levels to provide to the WSIB.

For the noise survey, Peritus completed spot measurements using a TSI sound meter displaying 1/3 octave band measurements. The spot measurement locations were completed in areas where a typical employee may perform daily activities for an extended period. The spot measurements were taken from areas such as near control panels, operating ventilation points, between functioning equipment such as furnaces or compressors and near maintenance desks where employees spend time throughout the day. Peritus also recruited the help of an employee who wore a dosimeter throughout an 8-hour shift. The dosimeter measured noise levels the employee was exposed to as he worked. The employee who wore the dosimeter performs similar tasks as the complainant formerly did.

The results of the spot measurements and the dosimeter readings indicate that sound levels have the potential to exceed the MOL 8-hour time weighted average noise exposure limit of 85 dBA ($L_{ex,8}$). During discussions with the client, it was discovered that their written policy was not overly

clear regarding hearing protection. The company provided hearing protection for employees who wished to use them.

Peritus recommended that mitigation measures be completed to reduce the noise levels for employees. These mitigation measures could include reducing noise at the equipment and/or requiring hearing protection be worn by all employees on the plant floor. Peritus also assisted the company to complete other mandatory WSIB forms and suggested strengthening their written policy regarding hearing protection.

Lessons Learned:

Review Health and Safety Policies: Does the policy make it clear to employees what they are required to do? Could someone interpret the policy as "not mandatory"? Follow up WSIB claims are costly.

PART D: OTHER COMPLIANCE CONSIDERATIONS

While ECAs and EASRs are the most common types of environmental approvals in Ontario, there are several other compliance factors that may be applicable for an industrial facility.

These regulatory requirements may include:

- Federal Approvals (e.g. National Pollutant Registry Inventory (NPRI), Department of Fisheries and Oceans)
- Other Provincial Approvals (Ministry of Natural Resources and Fisheries fish permit, Permit to Take Water, ECA for sewer discharge)
- Municipal Permits (discharge to storm and sanitary sewers, building permits, site plan approvals)
- Conservation Authority permits

An example of a typical storm sewer discharge project is described below.

CASE STUDY 1: GROUND WATER TREATMENT AND DISCHARGE TO STORM SEWER

A vacant site (the Site) was formerly used for cheese manufacturing. The previous reports indicate that chlorinated solvents are flowing onto the site from the upgradient neighbouring property. Historical operations at the neighbouring property include a decorative zinc plating facility on the property. In 2009, operations at the neighbouring property ceased and the site was decommissioned. The MECP issued an Order against the neighbouring property owner to address the issue of the chlorinated solvent contamination migrating off-site.

The site property owner (the client) plans to redevelop with a commercial / industrial building(s). The Town requires a RSC on the property before it will issue a building permit for the new

development. To obtain the RSC, the client is advancing a risk assessment and risk management measures (i.e. groundwater barrier) to mitigate trichloroethylene (TCE) contamination entering and leaving the property.

In 2014, the client retained Peritus to design a pump and treat (P&T) system to create a hydraulic barrier along the upgradient and downgradient property boundaries, which was required as part of the risk assessment. Peritus completed a peer review of the existing data and the risk management plan developed by others. Peritus used the existing data to identify the compounds that needed to be treated and completed the detailed design of the groundwater capture system.

The P&T system consists of twenty-one extraction wells, four air sparging vessels and two air phase granular activated carbon filters. The P&T system prevents the contaminated groundwater from migrating onto the site and through the site. The operation of this P&T system required an ECA from the MECP for air, noise and sewage works to confirm that any contaminants being released in the air and into the storm sewer meet provincial and city guidelines. To obtain the ECA, Peritus was required to conduct a detailed hydrogeology investigation. The hydrogeology report concluded that the extraction wells would create sufficient hydraulic containment and prevent contaminated groundwater from flowing off-site.

Following the issuance of the ECA, the client retained Peritus to commission the system and to provide on-going system performance monitoring. To reduce the costs associated with installing the P&T system, the client sourced some of the equipment on their own. During commissioning, it was found that the air carbon filters were the wrong type and air was short-circuiting through the carbon vessels. Once the correct carbon filters were installed, Peritus found that the air and water discharge from the system met the applicable provincial and city guidelines.

The on-going performance monitoring includes collection of groundwater samples and groundwater elevations to demonstrate that the P&T system is maintaining sufficient hydraulic containment. Both air and water effluent samples are collected quarterly from the P&T system to demonstrate that the on-going operation and discharge of potential contaminants into the air and storm sewer meet provincial and city guidelines. All of the data collected is summarized in an annual report to demonstrate compliance with the ECA for the P&T system.

The on-going operation of the P&T system does require regular maintenance. In the third year of operation, the water effluent testing revealed that the water discharged into the storm sewer had elevated chlorinated solvents. It was determined that the P&T system needed regular flushing to reduce scaling and maintain effective treatment of the contaminated water.

Lessons Learned:

Follow the consultant's recommendations and source the correct equipment. On-going testing is an important component of operations; conditions can change, equipment can require

maintenance, etc. Be prepared for on-going costs for monitoring as a necessary business expense.

PART E: DESIGNATED SUBSTANCES SURVEYS

Section 30 of the Occupational Health and Safety Act (OHSA) requires owners or their representative to prepare a designated substances survey (DSS) for hazardous materials. The owner must provide a prospective contractor with a DSS report before entering into a binding contract. The owner is liable to the contractor for damages and costs arising from unreported materials (of which the owner should reasonably have been aware) and could also be subject to orders and fines from the MOL.

In addition to the requirements under the OHSA, Section 6 of the MOL Regulations for Construction Projects requires the contractor, when submitting a Notice of Project form, to report any designated substances likely to be used, handled or disturbed during the project.

Under Ontario Regulation 278/05, as amended (O.Reg.278/05), there are 11 hazardous materials that are defined as designated substances:

Acrylonitrile	Coke Oven Emissions	Mercury
Arsenic	Ethylene Oxide	Silica
Asbestos	Isocyanates	Vinyl Chloride Monomer
Benzene	Lead	

Of the parameters listed above, the specific materials of concern that are commonly encountered at most facilities include asbestos, lead and silica. Fluorescent light bulbs and older thermostats contain small quantities of mercury.

In addition to the above designated substance parameters, polychlorinated biphenyls (PCBs), Urea Formaldehyde Foam Insulation (UFFI), ozone depleting substances and mould are considered to be “hazardous materials”. These materials may require special handling during construction or demolition activities.

The disturbance of asbestos materials on construction projects is administered by O.Reg.278/05. The disposal of asbestos waste is administered by the MECP O.Reg.347, as amended.

There are no specific MOL regulations for control of the other designated substances on construction projects. The MOL actively enforces the general duty clause of OHSA which protects workers and provides guidance on exposure monitoring, permissible exposure levels and medical monitoring, for designated substances.

The following projects demonstrate the challenges and lessons learned while conducting DSSs and mould surveys.

CASE STUDY 1: CONDUCTING A DSS AT A SECURED FACILITY

In May 2017, Peritus completed a project-specific DSS prior to a lighting retrofit project. The Site included four buildings: The Jail Building, the Courthouse, the Land Registry Office and the Parole and Probation building. The Ministry of Community Safety and Correctional Services occupied two of the buildings, while the remaining two buildings were occupied by the Ministry of the Attorney General and Service Ontario, respectively. Due to the nature of the services provided within the buildings, access was restricted to all four buildings. Peritus personnel were only able to access the buildings after close of business (after 4:30 PM). Since the buildings were locked after hours, Peritus personnel coordinated with the company who was administering the project on the site owner's behalf and the onsite security guard to access the secured areas of the four buildings, particularly the Jail Building to not interfere with regular operations.

While on-site, the Peritus field person realized that they needed taller ladders since the ceilings were higher than the 10 ft ceilings. As a result, the field staff needed to leave the secured access building, rent a taller ladder, return to the site and coordinate access back to the necessary areas. The field person had to return the next day to complete the less secure areas as well. Peritus successfully completed the investigation over two days and prepared the report in time to meet the lighting retrofit schedule.

Lessons Learned:

Each facility is different and has different access requirements, whether access is restricted due to physical constraints (building size) or access is only granted outside of normal working hours. Peritus personnel and the facility site representative must both be flexible to account for the various access requirements that can sometimes only be determined when the investigation commences.

CASE STUDY 2: MOULD ASSESSMENT

Peritus completed an indoor air mould assessment of a 4-storey condominium in Kitchener. The property management company wanted to verify the indoor air quality in two different areas of the building that had experienced moisture leaks for due diligence purposes. An overflow in one unit on the 4th floor resulted in water damage to the unit directly below. In another area of the building, a roof leak resulted in minor water damage in the vicinity of two units on the 4th floor as well as the 3rd floor. The roof leak and the overflow were fixed; however, the Client wanted to test the air quality to confirm that there were no longer term concerns (including the presence of mould) in the affected areas related to the moisture leaks. Peritus completed an initial site visit in early April 2019. Signs of mould growth on the wall and ceiling surfaces were not observed during the site inspection; therefore, bulk mould samples were not collected.

A control air sample is required to establish an average background mould spore concentration. During the initial site visit, weather conditions were not suitable to collect an outdoor air sample (very windy conditions) and the control sample was collected from the lobby of the building. The laboratory analytical results indicated that the control sample had elevated concentrations of Aspergillus/Penicillium-like spores. Following discussions with the property manager, a second air sample from the lobby and an outdoor ambient air control sample was collected outside the building to verify the initial results. The second round of sampling confirmed that these spores were only present in the ambient air (since the building is near a wetland area) and was not present in the sample collected from the lobby. The air quality assessment identified mould spores that are commonly found in both indoor and outdoor air. Cladosporium spores (identified inside the building) are typically found in the outdoor air but can also be found on wet building materials and foodstuffs; however, the measured concentrations of Cladosporium spores were relatively low and within the ranges found at other sites (indoor and outdoor) in Southern Ontario. Further action was not required based on the results of the mould air sampling.

Lessons Learned

Weather conditions can greatly impact sampling results. Re-scheduling site visits around weather conditions may be preferable to having field personnel return to the site to collect additional samples.

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