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VAPOUR INTRUSION: WHAT YOU CAN'T SEE, SMELL, HEAR, TASTE OR FEEL CAN HURT YOU!

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Willms & Shier Environmental Lawyers LLP

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VAPOUR INTRUSION: WHAT YOU CAN'T SEE, SMELL, HEAR, TASTE OR FEEL CAN HURT YOU![1]

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1 INTRODUCTION

When it comes to contaminated property and its impacts to the environment, there is more than meets the eye. What may first come to mind are rusted barrels, oil stains, impacted soil and groundwater, industrial operations, service stations, dry cleaners, excavation and remediation and other more high-tech remedial options. And, in many instances there is a "hidden", but ever present issue that can wreak havoc for those assessing, remediating or risk assessing contaminated sites, and for those selling, purchasing, mortgaging and redeveloping these properties. It is vapour intrusion.

Across Canada, there is limited consistency in how vapour intrusion is regulated. Some provinces address the issue directly through their site assessment and remediation regime for contaminated sites, while others do not. The federal government has published some helpful guidance on the issue. This paper provides an overview of the vapour intrusion regulatory framework and guidance across Canada and into the United States.

Also, vapour intrusion litigation is percolating to the surface in Ontario and south of the border in the United States. We briefly describe a select number of cases below.

2 WHAT IS VAPOUR INTRUSION AND WHY WORRY ABOUT IT?

Vapour intrusion, though invisible to the eye and inaudible to the ear, gives many in-the-know cause to pause. Vapour movement via preferential pathways into overlying buildings and other enclosed spaces is the concern. The toxicity of vapour and its potential impact on human health is the overriding peril.

Vapour intrusion results when volatile chemicals from sub-surface contaminated groundwater or soil enter an overlying building or enclosed space.[3] Vapours are emitted from volatile chemicals and may migrate through subsurface soil and into indoor air spaces.[4] Examples of volatile

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1 An earlier version of this paper was presented to the Ontario Bar Association on February 27, 2013.

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3 United States Environmental Protection Agency ("US EPA"). Online: http://www.epa.gov/oswer/vaporintrusion/basic.html.

4 *Ibid*.

chemicals include volatile organic compounds, select semi-volatile organic compounds, and some inorganic analytes, such as elemental mercury, radon, and hydrogen sulfide.[5]

Safety hazards, acute health effects, and/or odours are examples of some of the impacts that may result from vapour intrusion.[6] In many cases, the chemical concentrations are low, or depending on site-specific conditions, vapours may not be present at detectable concentrations.[7] However, low concentrations of volatile chemicals are not necessarily without their impacts.[8] The main concern in situations where low concentrations of volatile chemicals are present is that long-term exposure to such chemicals may pose an unacceptable risk of chronic health effects.[9]

What can complicate the picture of impacts from vapour intrusion is the potential presence of some of the same chemicals from emission sources within the building or enclosed space (e.g., household solvents, gasoline, cleaners). These other sources may pose, separately or in combination with soil vapour, a significant human health risk.[10] Distinguishing contributions from different emission sources can pose intricate investigation and remedial challenges, and legal complexity.[11]

Consultants collect samples from different media (e.g., indoor air, outdoor air, sub-slab soil gas) in carrying out vapour intrusion assessments.[12] Soil samples are the least likely of the different media to be significantly affected by background interferences that can confound the interpretation of indoor air sample results.[13] Thus, a critical component of vapour intrusion assessment is soil gas sampling.[14] The challenge with soil gas sampling and analysis is the use of widely differing protocols.[15] Environmental consultants may employ modified methods which may lead to further differences in testing outcomes.[16]

Vapours arising from the presence of volatile chemicals in contaminated soil and groundwater plumes follow the path of least resistance. These can include cracks in the foundation of buildings and openings for utility lines. This area above the water table to surface is the "vadose zone" or unsaturated zone. In the vadose zone, migration pathways of least resistance and building ventilation systems influence vapour entry points and the rate of intrusion into the building.[17] Vapour intrusion has given rise to concern about risks to human health and property

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5 *Ibid.*
6 *Ibid.*
7 *Ibid.*
8 *Ibid.*
9 *Ibid.*
10 *Ibid.*
11 *Ibid.*
12 Geosyntec, *Final Scoping Assessment of Soil Vapour Monitoring Protocols for Evaluating Subsurface Vapour Intrusion into Indoor Air.* Prepared for the Canadian Council of Ministers of the Environment ("CCME") (July, 2008). Online: http://www.ccme.ca/assets/pdf/pn_1427_vapour_scoping1.pdf.
13 *Ibid.*
14 *Ibid.*
15 *Ibid.*
16 *Ibid.*
17 US EPA, OSWER *Final Guidance Assessing and Mitigating the Vapor Intrusion Pathway from Subsurface Sources to Indoor Air (External Review Draft)* (2013). Online: http://www.epa.gov/oswer/vaporintrusion/documents/vaporIntrusion-final-guidance-20130411-reviewdraft.pdf.

devaluation. In turn, this has led to the publication of guidance by governments, regulation and litigation between private parties.

Vapour intrusion impacts often give rise to many questions. What standards and tools exist for both employers and employees to address vapour intrusion in the workplace? For buyers and sellers of contaminated property, the old adage, buyer beware, can take on a new meaning. Are vendors expected to disclose? How clean is clean in addressing vapour intrusion? What are prudent buyers expected to discover in the face of a patchwork of vapour intrusion standards and guidance? How does vapour intrusion risk management impact who will foot the bill to address those impacts? Will banks be wary about financing transactions where vapour intrusion is an issue? And, how far will insurers go in placing coverage and excluding vapour intrusion related risks? These questions underscore the importance of owners of contaminated sites turning their minds to these issues.

3 REGULATION OF VAPOUR INTRUSION IN CANADA

3.1 GENERAL

Federal and provincial governments focus their vapour intrusion efforts on protection of the environment and human health. In all cases, consideration of the applicable contaminated sites regime is necessary.

At the federal level, "a contaminated site is one at which substances occur at concentrations above background levels and pose, or are likely to pose, an immediate or long-term hazard to human health or the environment, or exceed the levels specified in policies and regulations."[18] There are no contaminated sites federal statutes or regulations. However, the federal government has published contaminated sites and vapour intrusion guidance.

At the provincial level, "contaminated site" is not always legally defined. For example, in Ontario, the assessment of contaminated sites is grounded in definitions such as "contaminant" and "adverse effect", and the application of the Records of Site Condition Regulation. But, in Ontario there is no legal definition of "contaminated site". In British Columbia, on the other hand, "contaminated site" is defined by regulation.

The power to regulate contaminated sites at both the federal and provincial level is grounded in the constitutional powers allocated to each level of government. Property and land management falls within provincial jurisdiction. The federal government has the power to regulate lands over which it owns or has an interest.[19] Where both federal and provincial legislation exists, Environment Canada states that the more stringent of the two regimes will apply to federal contaminated sites.[20]

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[18] Office of the Auditor General of Canada, *2012 Spring Report of the Commissioner of the Environment and Sustainable Development* (2012).
Online: http://www.oag-bvg.gc.ca/internet/English/parl_cesd_201205_03_e_36775.html.

[19] CCME, *Guidance Document on Management of Contaminated Sites in Canada* (April, 1997) at page 4.
Online: http://www.ccme.ca/assets/pdf/pn_1279_e.pdf.

[20] *Ibid* at page 5.

4 FEDERAL REGULATION OF CONTAMINATED SITES AND VAPOUR INTRUSION

4.1 LEGISLATION

One objective of the *Canadian Environmental Protection Act, 1999*[21] ("*CEPA*") is to protect the environment and human health from unregulated exposure to toxic substances. There are a number of regulations under *CEPA* that relate to contaminated sites including the PCB Treatment and Destruction Regulations, Storage of PCB Material Regulations and Contaminated Fuel Regulations. However, no federal law directly regulates the investigation and remediation of federally regulated contaminated sites.

A number of guidelines about the assessment and monitoring of vapour intrusion at contaminated sites have been developed by Environment Canada for federal properties. These guidelines are not legally enforceable unless expressly adopted by reference in regulatory instruments such as control orders.[22] In addition to guidelines, there are federal programs and initiatives in place to address federal contaminated sites and vapour intrusion.

The federal government is responsible for land and natural resources in northern regions of the country along with pockets of land scattered across the country, such as military bases and training areas, airports, ports and harbours, laboratories, and other areas used for federal operations.[23] Contaminated sites on Aboriginal reserves also form part of the federal government's responsibility.[24]

4.2 FEDERAL SITES ACTION PLAN

The Federal Contaminated Sites Action Plan ("FCSAP"), a $3.5 billion 15 year program established in 2005, is a long-term program that funds 16 federal departments, agencies, and Crown corporations (called custodians). The program also funds experts to provide support to four federal departments.[25] The purpose of the FCSAP is to reduce environmental and human health risks from known federal contaminated sites and associated federal financial liabilities. The FCSAP is rolling out in phases. Phase I (2004-2011) dealt with assessing 6,400 sites and remediating approximately 650 sites. Phase II (2011-2016) continues Phase I with focus on remediating the highest priority sites.

In the *2012 Spring Report of the Commissioner of the Environment and Sustainable Development*, the Commissioner reported that in March 2011 the government had identified around 22,000 sites with suspected or actual contamination in the Federal Contaminated Sites Inventory.[26] The inventory contains sites under federal custodianship as well as non-federal sites for which the government accepts responsibility.[27]

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21 *Canadian Environmental Protection Act, 1999* SC 1999, c 33.

22 CCME, *Guidance Document on Management of Contaminated Sites in Canada* (April, 1997) at page 7. Online: http://www.ccme.ca/assets/pdf/pn_1279_e.pdf.

23 *Supra* note 18.

24 *Ibid*.

25 *Ibid*.

26 *Ibid*.

27 *Ibid*.

The federal government has systems and processes to assess risks at contaminated sites as well as current or potential adverse impacts on human health or the environment.[28] There is a process to prioritize sites for action based on risk level.[29]

Most confirmed federal contaminated sites have soil contamination from fuelling activities, spills, leaks from above ground storage tanks, or dumping of contamination.[30] Often there are contaminant impacts to groundwater and surface water quality.[31] Further, mobile contaminants can volatilize and affect outdoor and indoor air quality.[32]

Vapour intrusion is considered part of the FCSAP through the recognition of impacts to human health due to the volatilization of contaminant vapour. The FCSAP is aimed at timely assessment and remediation of contaminated sites, and minimizing vapour intrusion impacts on human health. Contaminated sites are assessed using the FCSAP and based on their current or potential to create adverse impacts on human health and the environment.[33] The Canadian Council of Ministers of the Environment's ("CCME") National Classification System for Contaminated Sites ("NCSCS") is an important management and screening tool for prioritizing, investigating and remediating contaminated sites under the federal program.[34]

4.3 CCME GUIDANCE ON VAPOUR INTRUSION

4.3.1 THE NATIONAL CLASSIFICATION SYSTEM FOR CONTAMINATED SITES, 2008 (2010 CORRECTIONS)

The NCSCS is a guidance document originally published in 1992, revised in 2008, and further revised in 2010 to correct formula errors.[35] This guidance document provides a method to identify, evaluate and classify, and prioritize contaminated sites. This is done according to their current or potential adverse impact on human health and the environment.[36] Finally, NCSCS assists the government to allocate funding to investigate and remediate contaminated sites based on their priority level.[37]

Under the NCSCS, contaminated sites are assessed and ranked taking into account three key factors: contaminant characteristics, migration potential and exposure.[38] The CCME has developed a Soil Quality Index Calculator for use under the NCSCS. The calculator aids in evaluating the relative hazard by comparing contaminant concentrations with soil quality guidelines.[39] The identification and assessment of vapour issues under the NCSCS is caught within the net of contaminants of potential concern in vapour, migration potential and potential

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28 *Ibid*.
29 *Ibid*.
30 *Ibid*.
31 *Ibid*.
32 *Ibid*.
33 CCME, *National Classification System for Contaminated Sites Guidance Document* (2008). Online: http://www.ccme.ca/assets/pdf/pn_1403_ncscs_guidance_e.pdf.
34 *Ibid* at page 1.
35 *Ibid*.
36 *Ibid*.
37 *Ibid* at page 3.
38 *Ibid* at page 6.
39 *Ibid* at page 4.

for human exposure.[40] The NCSCS is intended for use by those with contaminated site experience.[41] Site classification should be amended as steps are taken towards remediation and to reflect the appropriate site classification and prioritization.[42]

4.3.2 FINAL SCOPING ASSESSMENT OF SOIL VAPOUR MONITORING PROTOCOLS FOR EVALUATING SUBSURFACE VAPOUR INTRUSION INTO INDOOR AIR, 2008

In 2008, the CCME commissioned a study titled, *Final Scoping Assessment of Soil Vapour Monitoring Protocols for Evaluating Subsurface Vapour Intrusion into Indoor Air.* The study culminated in a summary of existing guidance documents that convey a clearer understanding about requirements for vapour intrusion assessment under different site conditions.[43] The study revealed that there is no one guidance document that includes all information and processes required to adequately assess vapour intrusion at contaminated sites.[44]

Recommendations in the study directed the CCME to the following options

- endorse several documents allowing for flexibility in carrying out site assessments at properties with different site conditions
- write a new and more comprehensive document
- write a companion document that identifies factors leading to low quality data, or
- compile recommendations from the commissioned study into a procedure that would allow the appropriate flexibility required for different sites.[45]

Although the CCME has not directly adopted any of these options, CCME is now reviewing its latest guidance titled the draft *Guidance Manual for Environmental Site Characterization in Support of Environmental and Human Health Risk Assessment*.

4.3.3 DRAFT GUIDANCE MANUAL FOR ENVIRONMENTAL SITE CHARACTERIZATION IN SUPPORT OF ENVIRONMENTAL AND HUMAN HEALTH RISK ASSESSMENT, MAY 2012

In 1989, the CCME initiated the National Contaminated Sites Remediation Program (NCSRP), a five year program, to develop a consistent national approach for the assessment and remediation of Canada's contaminated sites. In an effort to provide national site characterization tools, the NCSRP released the *Guidance Manual on Sampling, Analysis, and Data Management for Contaminated Sites (Volume I: Main Report, and Volume II: Analytical Method Summaries)* in 1993, and the *Subsurface Assessment Handbook for Contaminated Sites* in 1994. In 2012, the CCME's Soil Quality Guidelines Task Group created a replacement for the 1993 sampling and

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40 *Ibid.*
41 *Ibid.*
42 *Ibid.*
43 *Supra* note 12 at page 22.
44 *Ibid.*
45 *Ibid.*

analytical guidance document, namely the draft *Guidance Manual for Environmental Site Characterization in Support of Environmental and Human Health Risk Assessment.*[46]

The 2012 draft *Guidance Manual for Environmental Site Characterization in Support of Environmental and Human Health Risk Assessment (Volume I: Guidance Manual)* has a chapter devoted to soil vapour guidance. The chapter describes methodologies for completing site characterization programs at sites evaluated for soil vapour intrusion into buildings. This 2012 draft guidance document was developed in parallel with similar guidance on soil vapour for the Ontario Ministry of the Environment ("MOE") and Alberta Environment. The 2012 draft *Guidance Manual for Environmental Site Characterization in Support of Environmental and Human Health Risk Assessment (Volume III: Suggested Operating Procedures)* provides guidance about

- the installation of soil gas probes *(Suggested Operating Procedure No. 4: Soil Gas Probe Installation)*
- the collection of soil gas and subslab gas samples for chemical analysis *(Suggested Operating Procedure No. 5: Soil Gas Sampling)*
- a suggested procedure for conducting leak testing of a soil gas probe and sampling train (*Suggested Operating Procedure No. 6: Soil Gas Probe Leak Tests*).[47]

The 2012 draft *Guidance Manual for Environmental Site Characterization in Support of Environmental and Human Health Risk Assessment* was made available for public comment until November 30, 2012. CCME expected to publish the final *Guidance Manual for Environmental Site Characterization in Support of Environmental and Human Health Risk Assessment* in late 2013. To date, CCME has not published a final version.

4.4 HEALTH CANADA

4.4.1 FEDERAL CONTAMINATED SITE RISK ASSESSMENT IN CANADA, PART VII: GUIDANCE FOR SOIL VAPOUR INTRUSION ASSESSMENT AT CONTAMINATED SITES, 2010

Health Canada plays a part in assessing risks posed by sites and in evaluating toxicity of chemicals and wastes, and in monitoring human exposure to contaminants.[48]

Health Canada is also part of the FCSAP which forms part of the framework designed to ensure improved and continuing federal environmental stewardship relating to contamination at federally owned or operated sites.[49]

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[46] CCME, draft *Guidance Manual for Environmental Site Characterization in Support of Environmental and Human Health Risk Assessment* (May, 2012).

[47] CCME, draft *Guidance Manual for Environmental Site Characterization in Support of Environmental and Human Health Risk Assessment (Volume III Suggested Operating Procedures)* (May, 2012).

[48] *Supra* note 19 at page 6.

[49] Health Canada, Environmental and Workplace Health, *Federal Contaminated Site Risk Assessment in Canada, Part VII Guidance for Soil Vapour Intrusion Assessment at Contaminated Sites* (2010). Online: http://www.hc-sc.gc.ca/ewh-semt/pubs/contamsite/soil_vapour-vapeurs_sol/index-eng.php.

The *Federal Contaminated Site Risk Assessment in Canada, Part VII: Guidance for Soil Vapour Intrusion Assessment at Contaminated Sites* guideline provides guidance to federal departments about determining if there is potential for subsurface vapours to migrate into a building.[50] If there is vapour intrusion, the guidance document assists in determining if it poses an unacceptable risk to human health.[51] The document sets out questions and steps to follow to evaluate potential risks.[52] In addition, the guidance is intended for application where there is current occupation at residential or commercial contaminated sites, or where there is potential for the presence of occupied buildings in a future land use scenario.[53]

The guidance document was meant to supplement the Health Canada *Guidance on Human Health Preliminary Quantitative Risk Assessment* ("PQRA"), which does not provide quantitative guidance for the soil vapour intrusion pathway.[54] Under the PQRA, there are minimum data requirements for vapour intrusion including

- ensuring that chemicals of potential concern ("COPC") are analyzed based on historical land use
- soil and/or groundwater are sampled a minimum of two times at a minimum of two sampling locations on either side of a building
- samples should be collected at depth if not under the building, and
- there should be a detailed conceptual site model.[55]

The *Federal Contaminated Site Risk Assessment in Canada, Part VII: Guidance for Soil Vapour Intrusion Assessment at Contaminated Sites* guideline focuses on vapour intrusion analysis in two tiers.[56] The first tier uses qualitative screening to categorize sites according to their potential for vapour intrusion. Under this tier, a determination is also made about whether the assessment should proceed to the second tier.[57] The second tier uses a quantitative risk assessment where representative semi-site-specific vapour attenuation factors allow for an estimation of indoor air concentrations and prediction of human health risk.[58]

The focus of this guidance document is on chronic health risks associated with long-term exposure to vapours at low concentrations and the protection of human health under these conditions. Worker exposure to chemicals in industrial processes is evaluated under this guidance document based on legislation and guidance developed for occupational settings. This is the preferred approach as opposed to relying on conservative human health toxicity reference values ("TRVs").[59]

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50 *Ibid*.
51 *Ibid*.
52 *Ibid*.
53 *Ibid* at page 4.
54 *Ibid* at page 1.
55 Health Canada, Contaminated Sites Division, *Vapour Intrusion Guidance: Status Report* at slide 8. Online: http://www.env.gov.bc.ca/epd/remediation/presentations/feb16-17-09/health-can-vapour.pdf.
56 *Supra* note 49 at page 1.
57 *Ibid*.
58 *Ibid*.
59 *Ibid* at page 4.

This guidance document sets out significant limitations associated with the use of soil data at sites that are contaminated with chlorinated hydrocarbons. It recommends that additional information such as groundwater data and indoor air data be obtained for chlorinated hydrocarbon impacted sites. [60]

5 PROVINCIAL REGULATION OF CONTAMINATED SITES AND VAPOUR INTRUSION

5.1 ONTARIO

Ontario's contaminated sites regulatory regime is legally based on Ontario's *Environmental Protection Act* and the Records of Site Condition Regulation, O Reg 153/04. Its purpose is to ensure that contaminated sites are remediated to meet Ministry generic standards or property specific risk-based standards. These standards factor in both ecological risk and risk to human health.

A Record of Site Condition ("RSC") is designed to document what is known about the environmental condition of the property as of the "certification date". This is the date on which the Qualified Person ("QP") last worked at the property.[61] The RSC must confirm that the contaminants at the property do not exceed: (1) the Ministry standards which are based on concentration limits, or (2) property specific risk-based standards in a Risk Assessment.[62] A RSC is signed by both a QP, the person who conducts or supervises an Environmental Site Assessment ("ESA") and the property "owner".[63] The RSC lists the environmental reports that the QP relies on to certify the RSC.[64]

RSCs are required when there is a change of property use to a more sensitive use.[65] The types of property use are defined by O Reg 153/04 to include "agricultural or other use", "commercial use", "community use", "industrial use", "institutional use", "parkland use", and "residential use".[66] Generally, the most sensitive uses are residential, agricultural, parkland, institutional and community uses.[67] The RSC is filed on the MOE Environmental Site Registry ("ESR") and has two main purposes. First, the RSC filed on the ESR provides public access to information set out in the RSC.[68] Second, the RSC filed on the ESR precludes the MOE from issuing certain orders relating to the property, save and except where a statutory reopener applies.[69]

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60 *Ibid* at page 3.

61 Ministry of the Environment ("Ontario MOE"), *Guide for Completing Phase One Environmental Site Assessments under Ontario Regulation 153/04* (June, 2011) at page 2. Online: http://www.ene.gov.on.ca/stdprodconsume/groups/lr/@ene/@resources/documents/resource/stdprod_087932.pdf.

62 *Ibid*.

63 *Ibid*.

64 *Ibid*.

65 *Ibid* at page 4.

66 O Reg 153/04, Records of Site Condition – Part XV.1 of the Act, s 1.

67 *Supra* note 61 at page 4.

68 Ontario MOE, *Records of Site Condition: A Guide on Site Assessment, the Cleanup of Brownfield Sites and the Filing of Record of Site Condition* (October, 2004) at page 31. Online: http://www.mah.gov.on.ca/AssetFactory.aspx?did=8991.

69 *Ibid* at page 27.

Before the RSC can be filed on the ESR, an ESA must be undertaken to identify and delineate contaminants that are present at the site.[70] There are two types of ESAs available under a RSC, namely a Phase One ESA and a Phase Two ESA.

A Phase One ESA identifies potential contaminants of concern based on historic and current use, and occupation of the property and nearby properties. O Reg 153/04 sets out the following components for Phase One ESAs:[71] a records review, interviews, site reconnaissance, an evaluation of the information gathered and a Phase One ESA report delivered to the owner of the property.[72] A Phase Two ESA involves an intrusive investigation to eventually delineate the environmental condition of the property.[73] A Phase Two ESA is also used where a Phase One ESA indicates that there has been or is likely contamination at the site or potential contamination at the site.[74] Finally, a Phase Two ESA is required when there is contamination that has affected any land and/or water on, in or under the property.[75] The ESAs may lead to remediation to Ministry generic standards, or to a Risk Assessment ("RA") with Risk Management Measures ("RMM") and a Certificate of Property Use ("CPU").

The RSC Regulation includes regulatory standards for Phase One ESAs and Phase Two ESAs, including testing protocols. At the end of the ESA, a conceptual site model is created to provide a summary of the review and evaluation done for the ESA and any remediation or risk assessment that might be required.[76]

The information listed below must be reviewed and evaluated to prepare a Phase Two ESA conceptual site model to demonstrate the current condition of the property before remedial actions are undertaken.[77] A Phase Two ESA conceptual site model must, pursuant to the Regulation, include the following information about vapour intrusion where a contaminant is present on, in or under a property at a concentration greater than the applicable site condition standards

(A) relevant construction features of a building, such as a basement or crawl space

(B) building heating, ventilating and air conditioning design and operation, and

(C) subsurface utilities.[78]

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70 Ontario MOE, *Guide for Completing Phase One Environmental Site Assessments under Ontario Regulation 153/04* (June, 2011) at page 2.
Online: http://www.ene.gov.on.ca/stdprodconsume/groups/lr/@ene/@resources/documents/resource/stdprod_087932.pdf.

71 O Reg 153/04, Records of Site Condition – Part XV.1 of the Act, s 24.

72 *Supra* note 70 at page 14.

73 Ontario MOE, *Guide for Completing Phase Two Environmental Site Assessments under Ontario Regulation 153/04* (June, 2011) at page 15. Online: http://www.mah.gov.on.ca/AssetFactory.aspx?did=9279.

74 *Ibid* at page 6.

75 *Ibid*.

76 Ontario MOE, *Ontario's Brownfield Reforms – Enhanced Record of Site Condition Integrity* (January, 2010) at page 2.
Online: http://www.ene.gov.on.ca/stdprodconsume/groups/lr/@ene/@resources/documents/resource/std01_079193.pdf.

77 O Reg 153/04, Records of Site Condition – Part XV.1 of the Act, Schedule E – Phase Two ESAs, s 43(7)(f).

78 *Ibid*.

The RSC Regulation incorporates by reference the *"Soil, Ground Water and Sediment Standards for use Under Part XV.1 of the Environmental Protection Act (April 15, 2011)"* ("Soil, Ground Water and Sediment Standards"). These standards are linked to the seven property uses already mentioned, namely industrial, commercial, residential, parkland, agricultural, community, or institutional. The standards are set out in a series of nine tables. They reflect several different approaches to site clean up, such as clean up to background standards or generic standards, stratified clean up, and standards for areas where groundwater is used for drinking or not (potable and non-potable).[79] Under each scenario, the concentration of each contaminant on, in or under the property must not exceed the applicable site condition standards for the contaminant, unless there are site specific standards identified in a risk assessment for the property.[80]

The rationale for the MOE *Soil, Ground Water, and Sediment Standards* was established by Ontario's MOE Standards Development Branch in the *Rationale for the Development of Soil and Ground Water Standards for Use at Contaminated Sites in Ontario* (*"Rationale"*).[81] Vapour intrusion is incorporated into the MOE *Soil, Ground Water, and Sediment Standards* through the application of the MOE's *Rationale* document wherein soil vapour features prominently. In fact, vapour intrusion drives many of the contaminant concentration thresholds in the MOE *Soil, Ground Water, and Sediment Standards* because of the potential for contaminant vapours to adversely affect human health.

The MOE *Rationale* document addresses adverse impacts to human health associated with vapour intrusion through the use of Human Health Component Values ("HHCVs"). HHCVs are concentrations of specific chemicals in soil and groundwater, and correspond to either one or two pathways of exposure and one receptor.[82] One of the exposure pathways considered is through inhalation of indoor air for contaminants that exist as a result of subsurface vapour intrusion.[83] HHCVs were considered in setting site condition standards for soil and groundwater and were based on the relevant land use categories, approaches to clean up, and the likely receptors including toddler residents and adult long term workers.[84]

"Clean up" of a contaminated site may involve achieving MOE generic criteria or completing a RA, which may include a modified generic RA, that is accepted (not approved) by the MOE.

A RA approach is used when the owner elects to develop site specific criteria usually when the cost to clean up to the *Soil, Ground Water and Sediment Standards* is too high to justify the expenditure. The RA report documents that the levels of contaminants found at the property are of no risk to human health or

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79 *Supra* note 73 at page 18-19.

80 *Ibid*.

81 Ontario MOE, Standards Development Branch, *Rationale for the Development of Soil and Groundwater Standards for Use at Contaminated Sites in Ontario* (April, 2011) at page 18. Online: http://www.ene.gov.on.ca/stdprodconsume/groups/lr/@ene/@resources/documents/resource/stdprod_086518.pdf.

82 *Ibid*.

83 *Ibid*.

84 *Ibid* at pages 18-22.

the environment despite exceedances of the MOE *Soil, Ground Water and Sediment Standards*.[85] A RA may incorporate RMMs which usually involve engineering controls at the property to protect the site, surrounding users, and human health and the environment from contaminants that remain at the site.[86] Frequently, RMMs include indoor air quality measures that derive from vapour intrusion.

The MOE may require a CPU. A CPU is a MOE document used to impose restrictions or controls such as RMMs specified in the RA.[87] The named person to whom a CPU is issued has a right to appeal the CPU to the Environmental Review Tribunal. Non-compliance with a CPU is an offence under the *Environmental Protection Act.* The MOE may require a summary of the CPU to be registered on title to the property in a Certificate of Requirement.[88]

A "Modified Generic RA" is used where clean up to the MOE *Soil, Ground Water and Sediment Standards* cannot be achieved, but a full RA is not required. A Modified Generic RA is a "streamlined" risk assessment that allows the QP to vary a limited list of parameters used in the RA modelling.

Soil vapour is considered during a Phase Two ESA for Modified Generic RAs and RAs. Soil vapour is investigated through depth to soil vapour measurements and soil vapour concentrations. The requirements are set out in Table 4 of O Reg 153/04. They include sampling procedures and analysis for soil vapour concentrations in each area in which a volatile contaminant is present in soil and groundwater in excess of the applicable site condition standard for the contaminant.

The QP must determine the appropriate sampling locations for sampling soil vapour. This determination includes ascertaining the appropriate depth for each location, including areas where the QP considers that vapour intrusion related exposures may be of potential concern.

The requirements for Modified Generic Risk Assessment reports are set out in Table 1 of O Reg 153/04. They require a description of the data, sampling and analysis of soil vapour when a soil vapour concentration is entered into the report. Whenever an assumed value for depth below soil surface to soil vapour is entered in a Modified Generic Risk Assessment, the report must include discussion about soil vapour preferential pathways present or anticipated at the property, and whether and how they may affect vapour intrusion into existing and any known future buildings.

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85 Ontario MOE, *Procedures for the Use of Risk Assessment under Part XV.1 of the Environmental Protection Act* (Ontario MOE PIB 5404e, October, 2005) at page 1-2.
Online: http://www.ene.gov.on.ca/stdprodconsume/groups/lr/@ene/@resources/documents/resource/stdprod_081550.pdf.

86 *Ibid* at page 17.

87 Ontario MOE, *Frequently asked Questions on Brownfields*.
Online: http://www.ene.gov.on.ca/environment/en/subject/brownfields/STDPROD_086237.html#CofP1.

88 *Ibid*.

As part of the requirements for RAs under the O Reg 153/04, a Pre-Submission Form must be submitted by a QP to the MOE for comment on the proposed RA approach.[89] The Pre-Submission Form is based on the results of the Phase One ESA, the Phase Two ESA and on any other information that the QP considers relevant.[90] If vapour intrusion is relevant to the site, the pre-submission form must address vapour intrusion.[91]

Records of Site Condition: A Guide of Site Assessment, the Cleanup of Brownfield Sites and the Filing of Records of Site Condition provides some insight into the assessment of vapour intrusion at contaminated sites. Where contamination extends more than 1.5 metres below the final grade, there is the option to remediate soil to full depth or to undertake a stratified remediation. [92] When surface soil site condition standards were developed, generic components were examined for protection of vapour to indoor air.[93] Where these standards are met, the potential for vapour movement from contaminated soil or groundwater, will not adversely affect air quality when living space is located above or below the 1.5 metre soil depth.[94] These site condition standards were also meant to protect against vapour intrusion from volatile chemicals in groundwater. [95]

In September 2013, the MOE posted for public comment *Draft Technical Guidance on Soil Vapour Intrusion Assessment.* This guidance document provides those undertaking risk assessments with tools to identify, review and evaluate sites for vapour intrusion.[96] The guidance document specifies requirements and best practices for designing, conducting and assessing site conditions (i.e., soil vapour and sub-slab vapour quality) that allow for accurate assessments of potential impacts to indoor air quality.[97] It provides a screening level assessment methodology for prediction of potential risks through indoor vapours, and guidance about modeling of vapour transport from subsurface to indoor air. It sets out guidance to proponents about sub-slab vapour investigation, assessment and remediation of contaminated sites. It also functions as a tool for MOE staff in identifying sites where soil vapour, sub-slab vapour and/or indoor air should be monitored, in formulating assessment requests and in issuing EPA orders. [98] This latest guidance is based on current standards of practice and is generally consistent with recent guidance from other sources (Health Canada, 2010,[99] ITRC, 2007[100]; EPRI, 2005[101]). [102]

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89 *Supra* note 66, Schedule C – Risk Assessment Mandatory Requirements, s 2(1)1.

90 *Ibid* s 3(3).

91 *Ibid* s 3(8)(a.4).

92 *Supra* note 68 at page 15.

93 *Ibid*.

94 *Ibid*.

95 *Ibid*.

96 Ontario MOE, *Draft Technical Guidance on Soil Vapour Intrusion Assessment* (September, 2013) at page (1-2). Online: http://www.downloads.ene.gov.on.ca/envision/env_reg/er/documents/2013/011-2912.pdf . Currently before the Environmental Registry for comment. Comment period closed November 24, 2013.

97 *Ibid* at page (1-3).

98 *Ibid*.

99 Health Canada, Environmental and Workplace Health, *Federal Contaminated Site Risk Assessment in Canada, Part VII Guidance for Soil Vapour Intrusion Assessment at Contaminated Sites* (2010). Online: http://www.hc-sc.gc.ca/ewh-semt/pubs/contamsite/soil_vapour-vapeurs_sol/index-eng.php.

100 Interstate Technology and Regulatory Council, *Vapor Intrusion Pathway: A Practical Guideline* (2007). Online: http://www.itrcweb.org.

101 Electric Power Research Institute, *Reference Handbook for Site-Specific Assessment of Subsurface Vapor Intrusion to Indoor Air* (2005). Online: http://www.epri.com.

In addition to the QP's reliance on the MOE *Rationale* document, the QP (Risk Assessment) may also look to Ontario Ministry of Labour Occupational Exposure Limits for guidance about the concentration and length of time a worker can be exposed to airborne concentrations of hazardous biological or chemical agents.[103] Of particular concern to employees and employers are the occupational exposure limits and requirements for designated substances including benzene and vinyl chloride. These are set out in O Reg 490/09 Designated Substances made under Ontario's *Occupational Health and Safety Act*. The Regulation applies to every workplace where vinyl chloride is present, produced, processed, used, handled or stored and at which a worker is likely to be exposed to vinyl chloride.[104]

Under O Reg 490/09, employers must take every reasonable precaution in the circumstances to protect third party workers whose health is likely to be affected by exposure to vinyl chloride.[105] Further, employers must take all necessary measures and implement procedures including engineering controls, work practices, and hygiene facilities and practices to ensure that a worker's airborne exposure to vinyl chloride[106] is reduced to the lowest practical level. The employer must ensure that vinyl chloride levels do not exceed the limits set out in Table 1 of the Regulation.[107]

QPs also refer to Threshold Limit Values ("TLVs") in making decisions about safe levels of exposure to contaminants in the workplace.[108] The TLVs are accessed through the American Conference of Governmental Industrial Hygienists and are health-based values established by committees that review existing, peer-reviewed literature in a number of scientific disciplines.[109]

5.2 BRITISH COLUMBIA

British Columbia has a contaminated sites regime and published vapour intrusion guidance under that regime. Part 4 of British Columbia's *Environmental Management Act* specifically addresses contaminated site remediation. The *Environmental Management Act* sets standards for site identification, assessment, clean up and soil relocation. Contaminated sites are to undergo a five step review process: screening, investigation/determination, planning, remediation and evaluation/monitoring.

The *Environmental Management Act* sets out a definition of contaminated sites. The Contaminated Sites Regulation includes remediation standards in various schedules to the Regulation. The Contaminated Sites Regulation allows for the creation of protocols (20 to date) that expand on the Regulations, including the creation of a site classification system.[110]

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[102] *Supra* note 96 at page (1-2).
[103] Ontario Ministry of Labour, Occupational Health Exposure Limits. Online: http://www.labour.gov.on.ca/english/hs/topics/oels.php.
[104] O Reg 490/09 – Designated Substances, s 13.
[105] *Ibid* s 15(1)(a)-(b).
[106] *Ibid* s 16(2)7.
[107] *Ibid* s 16(12).
[108] American Conference of Governmental Industrial Hygienists. Online: http://www.acgih.org/tlv/.
[109] *Ibid*.
[110] British Columbia Ministry of Environment – Contaminated Sites Protocols. Online: http://www.env.gov.bc.ca/epd/remediation/policy_procedure_protocol/.

British Columbia has *Technical Guidance on Contaminated Sites – Vapour Investigation and Remediation.*[111] This Technical Guidance came about as a result of 2009 amendments to the Contaminated Sites Regulation under the *Environmental Management Act.* The amendments added vapour as a regulated environmental medium and a new schedule was added: Schedule 11 "Generic Numerical Vapour Standards".[112] The British Columbia Ministry of Environment created Technical Guidance to outline its expectations about

- identifying site use, areas of potential environmental concern ("APECs"), and potential contaminants of concern ("PCOCs")
- refining the list of vapour PCOCs
- characterizing vapour contamination, and
- remediating vapour contamination.[113]

5.3 THE ATLANTIC PROVINCES – NOVA SCOTIA, PEI, NEWFOUNDLAND AND NEW BRUNSWICK

The Atlantic Provinces do not have general vapour intrusion guidance for contaminants save for petroleum impacted sites. The Atlantic Provinces are part of the Atlantic Partnership in Risk-Based Corrective Action which published *Guidance for Soil Vapour and Indoor Air Monitoring Assessment under Atlantic RBCA Version 2.0 for Petroleum Impacted Sites in Atlantic Canada User Guidance* (July 2006).[114]

This Guidance document was created to assist those involved with contaminated site management for petroleum impacted sites.[115] It sets out guidance about technical options and requirements, and responsibilities of those involved in contaminated sites management from site characterization to site closure.[116] More directly, this Guidance document provides information about the assessment of subsurface vapours from petroleum impacted sites to indoor air exposure pathways.[117] The Guidance document focuses on the protection of chronic human health risks due to long term exposure, and sets out both recommended and mandatory considerations for assessment of vapour intrusion.[118]

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111 British Columbia Ministry of Environment, *Technical Guidance on Contaminated Sites – Vapour Investigation and Remediation* (September, 2010).
Online: http://www.env.gov.bc.ca/epd/remediation/guidance/technical/pdf/tg04.pdf.

112 *Ibid* at page 1.

113 *Ibid*.

114 Atlantic Partnership in Risk-Based Corrective Action ("Atlantic PIRI") *Guidance for Soil Vapour and Indoor Air Monitoring Assessments under Atlantic RBCA Version 2.0 for Petroleum Impacted Sites in Atlantic Canada User Guidance* (July, 2006).
Online: http://www.atlanticrbca.com/data_eng/atlantic_rbca_soil_vapour_guidance.pdf.

115 *Ibid* at page iii.

116 *Ibid*.

117 *Ibid*.

118 *Ibid*.

The Guidance document addresses

- completing adequate site characterization and developing appropriate conceptual site models
- developing sampling strategies and determining proper sample collection and analysis methods
- interpreting the results within the Atlantic Risk Based Corrective Action framework, and
- applying the results within Provincial contaminated site management processes to obtain site closure.[119]

5.4 NORTHWEST TERRITORIES AND NUNAVUT

The Northwest Territories utilizes the *Environmental Guideline for Contaminated Site Remediation* to manage contaminated sites. The Guideline was drafted under the broad power of protection and preservation of the environment in Northwest Territories' *Environmental Protection Act*.

The Northwest Territories' *Guideline for Contaminated Site Remediation* requires consideration of vapour intrusion at contaminated sites during the site assessment process and includes vapour inhalation clean up criteria for polychlorinated hydrocarbons at the subsurface level (>1.5 m depth) and surface level (0 m to 1.5 m depth) at agricultural, residential, commercial and industrial properties.[120]

5.5 SASKATCHEWAN

Saskatchewan has a contaminated sites regime. Contaminated site remediation is addressed in the *Environmental Management and Protection Act* and a series of guidelines created by the Saskatchewan Petroleum Industry / Government Environmental Committee ("SPIGE"). The SPIGE guidelines apply only to the oil and gas industry and are not mandatory. For other forms of site contamination, there are no express guidelines that outline how to proceed with remediation.

Saskatchewan's *Environmental Management and Protection Act* addresses contaminated sites in Part 3, Division 2. Where a site has been designated as a contaminated site, a remedial action plan must be developed. There is no guidance about what the remedial action plan must propose to do or how to measure completion.

Saskatchewan has adopted the CCME's NCSCS in order to identify, track and prioritize impacted sites.[121] Recall that under the NCSCS, contaminated sites are assessed and ranked taking into account three factors: contaminant characteristics, migration potential and exposure. Under NCSCS, vapour intrusion is to be addressed.

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[119] *Ibid.*

[120] Government of Northwest Territories, Department of Environment's Environmental Protection Division, *Environmental Guideline: Contaminated Site Remediation* (November, 2003). Online: http://mvlwb.com/sites/default/files/documents/Environmental-Guideline-for-Contaminated-Site-Remediation.pdf.

[121] Saskatchewan Ministry of the Environment, *Saskatchewan Adopts National Classification System for Contaminated Sites New Requirements as of February 15, 2010* (January, 2010). Online: http://www.saskspills.ca/PDF/IR2SkAdoptsNationalClassificationSystemContaminatedSites.pdf.

5.6 YUKON

Yukon manages contaminated sites through its Contaminated Sites Regulation. The Contaminated Sites Regulation is promulgated under Yukon's *Environment Act.* The Regulation creates a process for identifying and managing contaminated sites. A series of protocols have been created under the Contaminated Sites Regulation. The protocols define acceptable standards and measurement techniques.[122]

Once a site has been found to be contaminated, a Plan of Restoration must be developed by the responsible party, approved by Environment Yukon, and implemented by the responsible party. The Plan of Restoration outlines remedial or containment steps to be taken.[123]

The Contaminated Sites Regulation establishes clean up standards, which include both generic and site-specific standards, processes for identifying and investigating contaminated sites, and permits for managing contaminated material within Yukon.[124] Vapour intrusion is taken into account during site assessment and implementation of risk management measures to deal with the removal of harmful vapours.[125]

5.7 ALBERTA

Alberta's contaminated sites regime is set out under Part 5, Division 2 of the *Environmental Protection and Enhancement Act*.[126] Where a site is contaminated, the site owner can prepare a remedial action plan. If there is concern about serious harm, an Environmental Protection Order can be issued requiring site clean up.

The *Environmental Protection and Enhancement Act* sets regulatory requirements for substance release, remediation and reclamation. Under the *Environmental Protection and Enhancement Act*, the Director can issue remediation certificates. These certificates recognize that the land has been remediated and protects the responsible party from future environmental protection orders requiring remediation.

Alberta's Tier 1 and Tier 2 Guidelines are part of Alberta's remediation framework under the *Environmental Protection and Enhancement Act*. Both Guidelines utilize risk based assessments to determine acceptable contamination levels.

In December 2010, Alberta published the *Alberta Tier 2 Soil and Groundwater Remediation Guidelines.* The Tier 2 Guidelines applies vapour inhalation guidelines for soil and groundwater to contaminated sites bordered by a more sensitive land use anywhere within 30 metres of the more sensitive property boundary.[127] Tier 1 and Tier 2 remediation objectives are based on land use and human exposure pathways including inhalation of vapours migrating into indoor air.[128]

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122 YOIC 2002/171 – Contaminated Sites Regulation, s 21(1)(j).

123 Yukon Environment, *Guide to the Contaminated Sites Regulation* (May, 2010) at page 1-2. Online: http://www.env.gov.yk.ca/air-water-waste/documents/csr1_guide_to_csr_2010.pdf.

124 *Ibid* at page 2.

125 *Ibid*.

126 *Environmental Protection and Enhancement Act*, RSA 2000, c E-12.

127 Government of Alberta, *Tier 2 Soil and Groundwater Remediation Guidelines* (December, 2010) at page 9. Online: http://environment.gov.ab.ca/info/library/7752.pdf.

128 *Ibid.*

Alberta utilizes Exposure Control site management measures. These measures are intended to ensure that human and ecological risk from exposure to contaminants does not exceed acceptable levels.[129] The need to ensure that management of a contaminated site remains consistent with assumptions built into a risk assessment requires the use of the Exposure Control option.[130] Use of Exposure Control is required, for example, where site-specific parameters or modifications are applied to reflect current site conditions or land uses, but the site conditions have a reasonable potential to change with time.[131]

5.8 MANITOBA

Manitoba's regime for contaminated sites is set out in the *Contaminated Sites Remediation Act.*[132] The criteria, standards and guidelines adopted for remediation of contaminated sites in Manitoba are the CCME Canada Wide Standards for Petroleum Hydrocarbons in Soil, the CCME Environmental Quality Guidelines and the Canadian Drinking Water Guidelines. These guidelines do not specifically address vapour intrusion.[133] Despite this, vapour is mentioned in Manitoba's *Guide to The Contaminated Sites Remediation Act* as a common pathway to be investigated and identified at contaminated sites.[134]

5.9 QUÉBEC

Québec has limited vapour intrusion guidance. The CCME commissioned study, *Final Scoping Assessment of Soil Vapour Monitoring Protocols for Evaluating Subsurface Vapour Intrusion into Indoor Air* revealed that there are no specific soil gas sampling protocols in Québec.[135] Quebec regulates the remediation of contaminated land through the *Environment Quality Act*[136] and the Soil Protection and Contaminated Soils Rehabilitation Policy. The *Environment Quality Act* allows the government to regulate contaminated sites and remediation.[137] The policy states that rehabilitation should 'upgrade' sites – return sites to the maximum number of uses. Contaminated sites should be reintegrated into the system of sustainable development.[138]

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129 *Ibid* at page 36.
130 *Ibid*.
131 *Ibid*.
132 *Contaminated Sites Remediation Act, 1996,* CCSM c C205.
133 Manitoba, *Environmental Services Criteria/Standards and Guidelines* (2013). Online: http://www.gov.mb.ca/conservation/envprograms/contams/standards/index.html.
134 Manitoba Conservation, *Guide to The Contaminated Sites Remediation Act* (2013) at page 2. Online: http://www.gov.mb.ca/conservation/envprograms/contams/standards/guide_csract.pdf.
135 *Supra* note 12 at page 3.
136 *Environment Quality Act,* RSQ c Q-2.
137 *Environment Quality Act*, RSQ c Q-2, s 31(69).
138 Developpement durable, Environnement et Parcs Quebec, *Soil Protection and Contaminated Sites Rehabilitation Policy*. Online: http://www.mddep.gouv.qc.ca/sol/terrains/politique-en/intro.htm.

6 U.S. REGULATION OF VAPOUR INTRUSION

The United States Environmental Protection Agency ("US EPA") has recently published extensive guidance about subsurface vapour intrusion[139] and vapour intrusion in the redevelopment of Brownfields.[140]

From 2002 through 2012 the US EPA's Office of Solid Waste Emergency Response ("OSWER") prepared its most recent guidance for the vapour intrusion pathway, engaging stakeholders, and inviting public comment with the aim of issuing a final Subsurface Vapour Intrusion Guidance document.[141] In April 2013, the US EPA released its final draft for external review titled, *OSWER Final Guidance Assessing and Mitigating the Vapor Intrusion Pathway from Subsurface Sources to Indoor Air (External Review Draft*) ("2013 Draft VI Guidance").[142] The 2013 Draft VI Guidance presents the US EPA's most current recommendations about identifying and considering key factors when assessing vapour intrusion, making risk management decisions and implementing mitigation pertaining to any potential exposure pathway.[143] The 2013 Draft VI Guidance document replaces all Agency Guidance documents addressing assessment and mitigation of the vapour intrusion pathway[144], with the exception of petroleum hydrocarbons that arise from petroleum released from Subtitle I underground storage tank systems. For those situations, the US EPA has recently developed a companion to the 2013 Draft VI Guidance, titled *Guidance for Addressing Petroleum Vapor Intrusion at Leaking Underground Storage Tank Sites (External Review Draft)* ("Petroleum VI Guidance"). The Petroleum VI Guidance focuses on how intrusion should be assessed for petroleum hydrocarbons in underground storage tank systems.[145] The US EPA accepted public comments on both draft Guidance documents until June 24, 2013.[146]

The US EPA's standards for vapour intrusion are set out as concentration levels for numerous contaminants in Tables to the 2013 Draft VI Guidance.[147] These standards and the 2013 Draft VI Guidance incorporate models that predict indoor air concentrations and associated health

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139 US EPA, *OSWER Final Guidance Assessing and Mitigating the Vapor Intrusion Pathway from Subsurface Sources to Indoor Air (External Review Draft)* (2013). Online: http://www.epa.gov/oswer/vaporintrusion/documents/vaporIntrusion-final-guidance-20130411-reviewdraft.pdf.

140 US EPA, *Brownfields Technology Primer: Vapor Intrusion Considerations for Redevelopment* (2008). Online: http://www.brownfieldstsc.org/pdfs/BTSC%20Vapor%20Intrusion%20Considerations%20for%20Redevelopment%20EPA%20542-R-08-001.pdf. This document was incorporated into the latest 2013 Draft VI Guidance found at note 136.

141 US EPA, Online: http://www.epa.gov/oswer/vaporintrusion/.

142 *Supra* note 138.

143 *Ibid* at page 3.

144 Including US EPA, *OSWER Draft Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils (Subsurface Vapor Intrusion Guidance)* (2002). Online: http://www.epa.gov/epawaste/hazard/correctiveaction/eis/vapor.htm.

145 US EPA, *Guidance for Addressing Petroleum Vapor Intrusion at Leaking Underground Storage Tank Sites (External Review Draft)* (2013). Online: http://www.epa.gov/oust/cat/pvi/petroleum-vapor-intrusion-review-draft-04092013.pdf.

146 *Supra* note 140.

147 *Supra* note 138.

risks[148] at contaminated sites.[149] The 2013 Draft VI Guidance document is to be read in conjunction with institutional controls found in the US EPA's Guidance document, *Institutional Controls: A Guide to Preparing Institutional Control Implementation and Assurance Plans at Contaminated Sites.*[150] Institutional controls may be used to restrict certain land uses or activities that could otherwise give rise to vapour intrusion pathways.[151]

Many industry analysts believe that the updated guidance documents will result in stricter clean up and monitoring requirements at contaminated sites and will add more sites to the Superfund list.[152] The 2013 Draft VI Guidance document addresses Superfund sites that require five year reviews. These Superfund sites have limited use and restricted exposure resulting from the remedial work chosen in the past, which left residual hazardous substances. Now, during the five year review process the US EPA will gather data from vapour intrusion pathways and assess the selected remedy. Consequently, this could result in the re-opening of longstanding Superfund remedial projects to address vapour intrusion levels.[153]

Some of the main additions and changes to the 2013 Draft VI Guidance document include

- updated toxicity values and the incorporation of the Screening Level calculator tool to assist in comparing subsurface or indoor data against US EPA recommended screening levels[154]
- consideration of whether preemptive mitigation measures are appropriate. For example, the 2013 Draft VI Guidance suggests that installing vapour mitigation systems in new buildings may at times be more efficient than performing a detailed vapour intrusion assessment[155]
- a more comprehensive guidance regime for conducting follow-up operation and monitoring of installed vapour intrusion control systems, and determining when vapour intrusion mitigation is no longer necessary[156]
- increased study and review requirements associated with Superfund sites to evaluate the effectiveness of the former remedial project and technology used.[157]

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148 US EPA, Johnson and Ettinger Model (1991) for estimating the transport of contaminant vapours emanating from either subsurface soils or groundwater into indoor spaces.
Online: http://www.epa.gov/oswer/riskassessment/airmodel/johnson_ettinger.htm.

149 US EPA, *Risk Assessment Guidance for Superfund (RAGS), Volume I: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment)* (2009)
Online: http://www.epa.gov/oswer/riskassessment/ragsf/index.htm.

150 US EPA, *Institutional Controls: A Guide to Preparing Institutional Control Implementation and Assurance Plans at Contaminated Sites* (2012f).
Online: http://www.epa.gov/superfund/policy/ic/guide/ICIAP%20guidance%20(FINAL)%20-%2012.04.2012.pdf.

151 *Supra* note 138 at page 105.

152 Environmental Standards, *EPA Releases Long-Awaited Draft Guidance for Vapor Intrusion* (2013). Online: http://www.envstd.com/epa-releases-long-awaited-draft-guidance-for-vapor-intrusion/.

153 John A. Heer, Walter Haverfield LLP, *EPA's Latest Guidance on Vapor Intrusion Adds New Considerations to Old Risks* (April 25, 2013). Online: http://www.crainscleveland.com/article/20130425/BLOGS05/304259999.

154 Updates from the US EPA, *Human Health Toxicity Values in Superfund Risk Assessments* (2003). Online: http://www.epa.gov/oswer/riskassessment/pdf/hhmemo.pdf; For calculator see *Supra* note 138 at Appendix B.

155 *Supra* note 138 at page 30.

156 *Supra* note 138 at page 97.

The most recent guidance documents have changed to reflect former concerns and issues set out in the 2002 Draft VI Guidance. Nevertheless, there are many potential issues that industry analysts feel still need attention. Areas of particular concern include[158]

- the guidelines are designed for the most stringent remediation sites that require multiple rounds of sampling and they may not adapt properly to smaller time-limited projects
- the excessive push for indoor air sampling could cause further problems in potential liability issues faced by owners and operators
- the Petroleum VI Guidance requires more rounds and types of soil and groundwater samples than most state clean up programs at a petroleum underground tank site and that could cause compliance problems.

The effect that the most recent Guidance documents have on existing state guidance programs is unknown. For example, the new preemptive mitigation measures[159] (as an interim solution) with state voluntary and Brownfield programs could be confusing for proponents. Issues remain about how the new guidance documents will be integrated into state programs and the complexity of vapour intrusion prevention.

The guidance documents incorporate an entirely new approach to vapour intrusion and associated requirements. They set out much more than a minor update from the 2002 Draft VI Guidance. Recently, the Utility Solid Waste Activities Group ("USWAG") wrote the US EPA to say that the comment period for the guidance documents was too short and that the guidance documents are too complex for the general public to properly participate during the comment period.[160] They also criticize the new guidance documents for looking more like a rule than guidelines and predicted them to be applied in a prescriptive manner by the US EPA.[161] The US EPA extended the initial May 24, 2013 deadline to June 24, 2013 to accommodate the active public participation.[162]

Several states have recently been grappling with vapour intrusion including New Jersey. In January 2013, the New Jersey Department of Environmental Protection ("NJDEP") updated its vapour intrusion screening levels ("VISLs") and the *Vapor Intrusion Technical Guidance* document that addresses vapour intrusion investigations at contaminated sites.[163] A VISL is a

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157 US EPA, *Assessing Protectiveness at Sites for Vapor Intrusion: Supplemental Guidance to the Comprehensive Five-Year Review Guidance* (2012d). Online: http://www.epa.gov/superfund/cleanup/postconstruction/pdfs/V_FYR_Guidance-Final-11-14-12.pdf.

158 McGuireWoods LLP, *EPA Issues Long-awaited Vapor Intrusion Guidance for Public Comment* (2013). Online: http://www.mcguirewoods.com/Client-Resources/Alerts/2013/4/EPA-Seeks-Comment-Long-Awaited-Vapor-Intrusion-Guidance.aspx#.

159 *Supra* note 138 at page 30. The term 'preemptive' refers to various types of controls that can prevent vapour intrusion from occurring prior to having fully demonstrated unacceptable vapour intrusion in buildings under review.

160 Letter from James R. Roewer, Executive Director, USWAG to US EPA (13 April, 2013) addressing the *OSWER Final Guidance for Assessing and Mitigating the Vapor Intrusion Pathway from Subsurface Sources to Indoor Air; Guidance for Addressing Petroleum Vapor Intrusion at Leaking Underground Storage Tanks*. (Docket No. EPA-HQ-RCRA-2002-033) at page 2-3.

161 *Ibid*.

162 US EPA, Online: http://www.epa.gov/oswer/vaporintrusion/.

163 NJDEP, Online: http://www.nj.gov/dep/srp/guidance/vaporintrusion/index.html.

screening tool used to assess if volatile chemicals in soil or groundwater pose a significant or potential cancer risk or non-cancer hazard through the inhalation pathway.[164] New Jersey updated its VISL tables using newly published risk-based information from the US EPA.[165] The recent US EPA information lead to increases in VISLs for some compounds and decreases for others as a result of changes to toxicity factors and risk-based equations used to calculate the VISLs.[166]

Among the changes to the VISL tables were the addition of two new chemicals, 2-Methylnaphthalene and Naphthalene, and the removal of five other chemicals.[167] It is reported that on-site and off-site vapour intrusion assessments may become more common due to these amendments to the New Jersey groundwater screening levels.[168]

Compliance timeframes and reporting obligations for vapour intrusion levels are likely to be affected by the changes impacting priority levels.[169] Licensed Site Remediation Professionals in New Jersey must confirm and justify a change in status of vapour intrusion conditions to either: (1) a high priority immediate environmental concern, or (2) a lesser priority vapour concern.[170] Technical Rules and regulatory timeframes are in place for the new VISLs for all new cases initiated after January 16, 2013.[171] Existing cases dealing with vapour intrusion investigations prior to January 16, 2013 must follow a VISL implementation strategy.[172] NJDEP predicts that these changes to the VISL are likely to result in legal and technical ripples as the state of vapour intrusion investigation breaks new ground in New Jersey.[173]

In California, the Department of Toxic Substances Control ("DTSC")[174] has developed a guidance document dealing with various aspects of vapour intrusion, including guidance about performing soil gas investigations, evaluating and mitigating subsurface vapour intrusion to indoor air, remediating vapour source areas, performing long-term monitoring, and conducting public participation activities. In September 2012, the California State Water Resources Control Board ("SWRCB") issued an update to its Leaking Underground Fuel Tank Guidance Manual ("LUFT Manual").[175] The updated LUFT Manual includes guidance about evaluating the potential for vapour intrusion pathways at LUFTs that parallels the federal update.

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164 US EPA, *Vapor Intrusion Screening Levels*. http://www.epa.gov/oswer/vaporintrusion/guidance.html.

165 Manko Gold Katcher Fox LLP, *New Jersey Department Updates Vapor Intrusion Screening Levels and Guidance – Time to Pay and Reassess Your Cleanup* (2013). Online: http://www.mgkflaw.com/specAlert2013/NJDEP_Updates_Vapor_Intrusion_Screening_Levels_and_Guidance.html.

166 *Ibid*.

167 *Ibid*.

168 *Ibid*.

169 *Ibid*.

170 *Ibid*.

171 *Ibid*.

172 *See* NJDEP, *Implementation Strategy for Revised Vapour Intrusion Screening Levels* (January, 2013). Online: http://www.nj.gov/dep/srp/guidance/vaporintrusion/visl_implementation_strategy.pdf.

173 *Ibid*.

174 DTSC, *Final Guidance for the Evaluation & Mitigation of Subsurface Vapor Intrusion to Indoor Air* (2011). Online: http://www.dtsc.ca.gov/SiteCleanup/Vapor_Intrusion.cfm.

175 SWRCB, *Leaking Underground Fuel Tank Guidance Manual* (2012). Online: http://www.swrcb.ca.gov/ust/luft_manual.shtml.

In May 2013, the Michigan Department of Environmental Quality ("MDEQ") released its guidance document about the evaluation of vapour intrusion. MDEQ's guidance document details practices for evaluating vapour pathways, assessing risk, conducting investigations and formulating response actions. The new MDEQ guidance sets out stricter vapour intrusion standards than the MDEQ generic clean up standards.[176]

Once the US EPA's 2013 Draft VI Guidance and Petroleum VI Guidance documents pass the public commentary stage, parties performing vapour intrusion assessments and mitigation will need to carefully assess which regulatory authorities and corresponding regulatory agency guidance apply to their projects. In addition, many states have adopted their own screening levels that could present future problems with jurisdictional overlap. Given the amount of work, extensive public participation and updated drafts, regulated industries and other affected stakeholders should expect changes to their state regulatory regime in light of the US EPA's new and updated screening levels.

On November 6, 2013, ASTM released the revised Standard Practice for Environmental Site Assessments E1527-13. This new ASTM Standard requires the assessment of vapour intrusion in Phase I Environmental Site Assessments ("Phase I"). Importantly, the standard revises the definition of "migrate" and "migration" to include subsurface vapours.[177]

On December 30, 2013, the US EPA published a Final Rule to amend the existing "All Appropriate Inquiry" or AAI regulation to incorporate the new ASTM Standard. AAI is a process for evaluating environmental conditions and is required to be followed in every Phase I where EPA Brownfields Assessment Grants are available. This regulatory change raises the profile of vapour intrusion for property owners and their environmental consultants. The US EPA withdrew a previous Proposed Rule after comments indicated concern about allowing the AAI regulation to incorporate both 2005 and 2013 ASTM Standards. The US EPA addresses these concerns in the Final Rule by strongly urging parties to apply the new standard in order to qualify for a limited defense to Superfund liability. The US EPA also indicates that it will shortly publish a rule to remove the 2005 ASTM Standard.[178]

7 RECENT VAPOUR INTRUSION CASE LAW

7.1 CANADIAN CASE EXAMPLES

Windsor v Canadian Pacific Railway Ltd.[179] is about vapour intrusion from contamination arising from the use of a degreaser. The solvent known as trichloroethylene ("TCE") was used in the repair and maintenance of engine and railway rolling stock.

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[176] Jeffrey Bolin and Arthur Siegal, *Vapour Intrusion – A New and Challenging Issue* (2013) 30 Michigan Defense Quarterly 17 at 19.

[177] Winston & Strawn LLP, "Environmental Due Diligence Update: New Phase I ESA Standard", online: http://d4qxztsgsn706.cloudfront.net/images/content/7/4/v2/74673/Environmental-Due-Diligence-Update-11-15-13v2.pdf.

[178] Jonathan Spergel and Michael C. Gross, "EPA Formally Recognizes New Environmental Due Diligence Standard" (30 December 2013) online at: http://www.mankogold.com/publications-489.html

[179] *Windsor v Canadian Pacific Railway Ltd.* [2007] 12 WWR 5.

In September 2007, the Alberta Court of Appeal upheld the certification of a class action against Canadian Pacific Railway ("CPR"). The action was brought by residents of properties adjacent to a CPR maintenance and repair shop in southeast Calgary.[180] CPR used TCE as a degreasing solvent in its maintenance shop from the 1950s through the 1980s.[181]

The Plaintiffs alleged that TCE from the CPR shop contaminated groundwater beneath their properties and then seeped into indoor air in their homes.[182] There was evidence before the Court that CPR voluntarily installed fans in affected homes to vent the vapours.[183]

The plaintiffs are claiming damages for reduction in property values and rental values, as well as physical damage to property resulting from remediation measures.[184]

The case is currently proceeding through the litigation discovery process. Whether the case settles or proceeds to trial is not yet known.

In *Wamboldt v Northstar Aerospace*,[185] a January 2006 class action was brought by Cambridge, Ontario residents who were neighbouring property owners to the Northstar Aerospace plant.

The neighbours claim that TCE contamination from the Northstar Aerospace facility resulted in vapour intrusion into their homes causing significant damages. Specifically, their claim alleges that TCE from the Northstar plant migrated into soil and groundwater beneath the Plaintiffs' homes. The Plaintiffs claim $200 million in damages for reduction of property value, loss of rental income, and inability to obtain mortgage financing, plus $10 million for punitive damages.

Subsequent testing of indoor air revealed concentrations of TCE at levels requiring remedial action. Out of 261 residences tested between July 2005 and January 2006, 54% required ongoing monitoring of indoor air quality, 39% required installation of basement ventilation, and 6% required temporary evacuation until basement ventilation could be established.[186] At the time, Northstar took a range of steps to reduce TCE concentrations in the indoor air of individual homes, including installing soil vapour extraction units, heat recovery ventilator systems and photo-catalytic oxidation units. Remediation of TCE in groundwater is expected to take up to ten years, potentially resulting in long-term impacts on property values.[187]

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180 *Ibid* at para 2.
181 *Ibid*.
182 *Ibid* at para 3.
183 *Ibid* at para 4.
184 *Ibid* at para 2.
185 *Wamboldt v Northstar Aerospace* [2012] OJ No 3689.
186 The Region of Waterloo's Public Health Department requires ongoing indoor air quality when TCE levels are between 2.3 ug/m^3 and 23 ug/m^3; basement ventilation when TCE levels are between 23 ug/m^3 and 230 ug/m^3; and temporary relocation until basement ventilation can be established when TCE levels are above 230 ug/m^3. See: *Region of Waterloo, Public Health Report* (E-06-007/PH-06-003), January 17, 2006. Online: http://www.region.waterloo.on.ca/web/region.nsf/8ef02c0fded0c82a85256e590071a3ce/3ABE244AF3D6D4EB852570F400748AB0/$file/PH-06-003.pdf?openelement.
187 Valco Consultants Inc., *Summary of Report on Property Values in the Bishop St. Community* (Dec. 4, 2006). http://www.city.cambridge.on.ca/relatedDocs/Valco%20Report%20Summary.pdf.

In 2009, there was negotiation of a settlement agreement.[188] The settlement took the form of a series of funds set up for class members.[189] Specifically, a property damages fund and extraordinary damages fund were set up for the class members.[190] The property damages fund is distributed to members on a pro-rata basis and the extraordinary damage fund compensates members for damages not covered by the damages fund.[191] Northstar paid $1 million into the property damage fund and another $3 million was paid by promissory note to the fund.[192] Northstar contributed $500,000 to the extraordinary damages fund and $550,000 towards the legal costs of class members.[193] The settlement did not affect any personal injury claims, remediation required by the MOE or Northstar's payment to members for increased charges on their hydro bills.[194]

Northstar's legal troubles continued beyond the settlement in *Wambolt* in *Baker et al v Director (Ministry of the Environment).* Northstar was in the process of voluntarily remediating its contaminated sites when the company encountered financial difficulty. To ensure the continuation of clean up, the MOE issued Orders against Northstar to require further remediation and the posting to the MOE of $10 million in financial assurance.[195] The company became insolvent and sold its assets, at which time the MOE took over remediation due to ongoing human health concerns.

In November 2012, the MOE issued an Order to remediate against Northstar corporate directors pursuant to Ontario's *Environmental Protection Act*, ss. 17 and 18. The corporate directors, lead by Mr. Baker, applied for a stay of the Order, which the Environmental Review Tribunal ("ERT") did not grant.[196] The ERT found that to interrupt the remediation program posed serious ongoing risks to human health and the natural environment. The ERT found the corporate directors responsible for the remediation program.[197] Mounting litigation and remediation costs forced them to pursue settlement.

On October 28, 2013, the Environmental Review Tribunal accepted Minutes of Settlement that saw several former corporate directors personally pay $4.75 million in exchange for a release from the MOE's clean up Order.[198] Many of the directors named on the Order had not been involved with Northstar at the time the contamination took place. This precedent-setting case has dramatically altered the scope of environmental regulatory liability for corporate directors and officers in Ontario.

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[188] Ontario Superior Court of Justice, Notice of Proposed Settlement of TCE Class Action Against Northstar Aerospace Companies (August 23, 2005). Online: http://www.gowlings.com/restructuring/northstar/PDFs/notice_20090604_Notice.PDF.

[189] *Ibid*.

[190] *Ibid*.

[191] *Ibid*.

[192] *Ibid*.

[193] *Ibid*.

[194] *Ibid*.

[195] *Baker et al v Director (Ministry of the Environment) (Hearing)* (2013), Case Nos 12-158 to 12-169 (ERT) at 4.

[196] *Ibid* at 97.

[197] *Ibid* at 95.

[198] *Baker et al v Director (Ministry of the Environment) (Minutes of Settlement)* (2013), Case Nos 12-158 to 12-169 (ERT).

7.2 AMERICAN CASE EXAMPLES

In *Burley v Burlington N. & Santa Fe Ry. Co.*,[199] the Supreme Court of the State of Montana considered whether the continuing tort doctrine should apply to the vapour intrusion claims of the Plaintiffs. The Plaintiffs alleged that Burlington N. & Santa Fe Ry. Co. released hydrocarbons and toxic solvents into the environment surrounding the Yard. This company operated at the Livingston Rail Yard for nearly a century.[200] The toxic pollutants then migrated off-site, into groundwater below and eventually into the air above the neighbouring properties.[201]

Several law suits were filed and eventually consolidated into one claiming nuisance, negligence, strict liability, trespass, wrongful occupation, unjust enrichment, restoration damages, constructive fraud/misrepresentation and misconduct in federal court.[202] The Burlington N. & Santa Fe Ry. Co. filed a motion for summary judgment arguing that the applicable statute of limitations barred the separate claims filed by the property owners.[203]

The Court in *Burley* rejected the U.S. District Court's formulation in *Hoery v United States*[204] that the contamination need be "readily or easily abatable" in order to constitute a continuing tort.[205] The Court held that the contamination continues to migrate despite being stabilized in terms of quantity or concentration, and as a result defeats the statute of limitations until the harm can no longer reasonably be abated.[206] The Court held that the limitation period begins to run when abatement is not reasonable or complete abatement cannot be achieved, and a permanent injury exists.[207] The Court held

> A tortfeasor who impairs the property rights of another should not prevail simply because its pollution or interference with another's property takes a lengthy amount of time or a large amount of money to abate. The trier of fact must determine whether further abatement would be reasonable under the evidence presented. This formulation balances the need for finality with a tortfeasor's obligation to restore substantially the injured party to his pre-tort position.[208]

In 2012, the District Court of New Jersey in *Leese et al v Lockheed Martin Corp.*[209] was confronted with vapour intrusion litigation. The claim was filed under the *New Jersey Spill Act*, the *New Jersey Water Pollution Control Act*, the *Resource Conservation and Recovery Act* ("*RCRA*"), and New Jersey common law under theories of nuisance, trespass, strict liability and negligence.[210]

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199 *Burley v Burlington N. & Santa Fe Ry. Co.* 2012, LEXIS 31 (Mt. 2/7/2012)
200 *Ibid* at para 5.
201 *Ibid*.
202 *Ibid* at para 9.
203 *Ibid* at para 10.
204 *Hoery v United States*, 64 P.3d 214 (Colo. 2003).
205 *Supra* note 199 at para 4.
206 *Ibid*.
207 *Ibid* at para 99.
208 *Ibid* at para 100.
209 *Leese v Lockheed Martin Corp.*, 2012 (No. 11-5091) U.S. Dist. LEXIS 50963 (D.N.J. April 11, 2012).
210 *Ibid* at page 5.

Mr. and Mrs. Leese and their children alleged that groundwater contaminated with TCE and tetrachloroethylene ("PCE") was causing vapour intrusion into their home, and both health and property value damages. Lockheed Martin Corp., the neighbouring property owner, previously remediated the TCE contamination at its property as a result of an agreement with the NJDEP.[211]

At the request of NJDEPs, Lockheed Martin Corp. conducted near-slab and sub-slab soil vapour testing at surrounding residences.[212] The results of sampling indicated elevated PCE levels under the Plaintiff's property. The air quality testing results identified PCE in the basement and first floor of the Plaintiff's home.[213]

Soon after the claim was initiated, Lockheed Martin Corp. brought a motion to dismiss the claim.

Lockheed Martin Corp. argued that there was no possible connection between TCE in groundwater underneath the Plaintiff's home and any exposure inside the residence.[214] This argument was rejected by the Court. In dismissing the motion, the Court cited the Environmental Protection Agency's finding that

> TCE can be released into indoor air from … vapor intrusion … and volatilization from the water supply.[215]

The Court also found that the Plaintiffs had provided Lockheed Martin Corp. sufficient notice of their claims and had raised a reasonable expectation that evidence would be uncovered during the litigation to support all of their claims.[216] In allowing the Plaintiff's claim to proceed, the Court recognizes that vapour intrusion is a legitimate basis for environmental claims in New Jersey.

In *Voggenthaler v Maryland Square*[217] there was alleged PCE contamination at a shopping center in Las Vegas. The contamination allegedly came from a dry cleaning facility that operated in the shopping center for over 30 years. PCE contamination had migrated into residential areas and the Court granted a group of homeowners a motion for summary judgment for injunctive relief under the *RCRA*, s. 7002.[218] *RCRA* Citizen Suit provisions provide Plaintiffs the opportunity to seek injunctions ordering responsible parties to remediate contaminated properties. When successful, the Plaintiff can also recover their litigation costs including attorneys' fees and expert fees.[219] In 2008, the Nevada Division of Environmental Protection ("NDEP") notified Maryland Square that it had incurred substantial remedial costs and would seek to recover. In 2010, the Court confirmed migration of the PCE plume into residential areas.

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211 *Ibid* at page 3.
212 *Ibid*.
213 *Ibid* at page 3-4.
214 *Ibid* at page 5.
215 *Ibid* at page 13 in footnote 8.
216 *Ibid* at page 11.
217 *Voggenthaler v Maryland Square*, 2012 US Dist. LEXIS 69395 (D.Nev. 5/17/12).
218 *Resource Conservation and Recovery Act*, 42 USC, s 7002.
219 *Ibid*.

In 2012, the Court granted the NDEP motion for summary judgment to recover legal fees pursuant to the *Comprehensive Environmental Response, Compensation and Liability Act* ("CERCLA"), declaratory relief pursuant to CERCLA, cost recovery and injunctive relief. The owner of the shopping center argued that it met the Bona Fide Purchaser Exemption of CERCLA. However, the only evidence to support the defence was an affidavit.[220]

8 CONCLUSION

In both Canada and the United States, there is limited consistency in how vapour intrusion is regulated. Generally, federal, provincial and state governments have to date opted to focus on guidance rather than implementing laws. Much focus has been on streamlining what we know about vapour intrusion into guidance documents. Authorities are also trying to achieve consistency and uniformity in sampling methods and mitigative approaches. Courts on both sides of the border are grappling with the nexus (causal connection) and evidentiary burden of vapour intrusion claims. Most recently, the Courts have dealt with motions brought by defendants seeking the dismissal of vapour intrusion lawsuits. In the future, we expect there to be more focus on vapour intrusion and the reopening of previously assessed contaminated sites where vapour intrusion was not then known to be a concern. This will undoubtedly spin-off environmental litigation.

Document #: 675353

[220] Schnapf LLC, *Ct Grants Summary Judgment in Maryland Square Vapor Intrusion Case* (2013). Online: http://www.environmental-law.net/2012/05/ct-grants-summary-judgment-in-maryland-square-vapor-intrusion-case/.