TRIECA 2018 CONFERENCE

Thank you to all of our 2018 gold sponsors:

AQUATECH DEWATERING COMPANY

BIOCOMPOSITES GROUP

AECOM

terrafix geosynthetics inc.

R&M CONSTRUCTION

UNILOCK DESIGNED TO CONNECT.

Hydro International

filtrexx CANADA SUSTAINABLE TECHNOLOGIES let nature do it.

SOLENO Mastering Storm Water

GEMS

Credit Valley Conservation inspired by nature

TITAN ENVIRONMENTAL CONTAINMENT

armtec Solutions for a Better World

York Region

Lake Simcoe Region conservation authority

Media Partners

WATER CANADA THE COMPLETE WATER MAGAZINE

Hosts

CANIECA CANADIAN CHAPTER

Toronto and Region Conservation for The Living City

trieca.com | @TRCA_TRIECA

Stormwater Management Pond Sediment Beneficial Use
Panel Discussion on Ecotoxicity and Excess Soil BMP Legal Considerations

TRIECA Conference
March 21st, 2018





NORTON ROSE FULBRIGHT

- **Janet Bobechko**, LL.B, J.D., Certified Environmental Law Specialist

JACOBS ch2m

- **Krista Barfoot**, QP, Risk Assessor
- **Francine Kelly-Hooper**, PhD, Contaminant Scientist

Canadian History – 14 years in the Making!

- 1st regulatory approvals of non-inert SWM pond sediment beneficial use.
- Diverted from landfill.
- Used as fertilizer and topsoil amendment products.

How Was This Accomplished?

Strong Risk Based Weight of Evidence

+

Communication with Regulatory Agencies

=

Approved!

- Transparency and collaborations with regulators
- 14 years of sediment chemistry data collections from over 140 ponds
- 7-year PhD study of petroleum hydrocarbon sources in soils and sediments

Discussion Topics

- Which sediment chemistry parameters typically cause landfill disposal requirements?

- Relevance of the Ontario Excess Soil BMPs and O.Reg. 153/04 soil standards to SWM pond sediment reuse approvals.

- 2017 SWM pond sediment beneficial use case studies
  - Sediment ecotoxicity study results
  - Case Study #1 – topsoil amendments on municipal boulevards
  - Case Study #2 – topsoil amendments on agricultural tree nursery soils

Over 140 Residential SWM Ponds
Over 420 Sediment Chemistry Samples

Sediment Chemistry Analysis

- Petroleum Hydrocarbons (PHCs)
- Polyaromatic Hydrocarbons (PAHs)
- Trace metals
- Sodium Adsorption Ratio (SAR)
- Electrical Conductivity (EC)
- Total Organic Carbon (TOC)
- Nutrients
- Particle size

#1 Causes of Landfill Disposal Requirements?

PHCs

>90% of ponds would require regulated waste management due to exceedences of O.Reg. 153 Table 1 soil standards for PHCs

Different PHC Product Bioavailabilities

More Bioavailable

Less Bioavailable

Examples: gasoline, diesel and kerosene

Examples: weathered asphalt, tires, engine emissions

Asphalt and Tires

Dominant PHC Sources in SWM Pond Sediment Database

Very Low Bioavailability and Toxicity Risk

Less Bioavailable

weathered asphalt and tires

Relevance of Bioavailability?

- Regulatory standards assume that contaminants are 100% bioavailable.

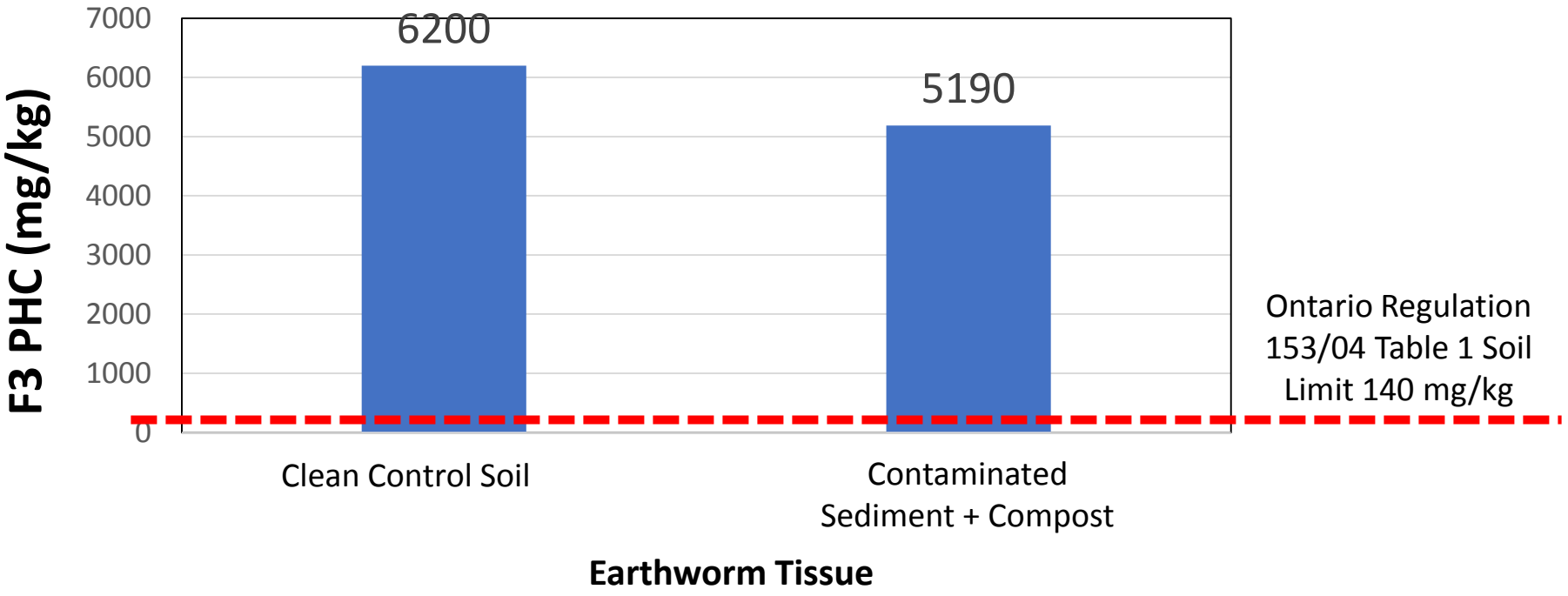
- Soil standards over estimate true toxicity risks for some PHC sources such as tires and asphalt.

Plant and Earthworm Ecotoxicity Tests of PHC Contaminated Sediment

Growth and reproduction were as good or better in the sediment mixed with 20% compost than in the clean control soil.

Earthworm Tissue PHC Analysis

Organic tissues caused false exceedences of O.Reg. 153/04 Table 1 standard



But There Is a Light at the End of Tunnel!

PHC Source Identification Methods

F. Kelly-Hooper Publications

SETAC PRESS

Environmental Toxicology and Chemistry, Vol. 32, No. 10, pp. 2197–2206, 2013

Printed in the USA

IS IT CLEAN OR CONTAMINATED SOIL? USING PETROGENIC VERSUS BIOGENIC GC-FID CHROMATOGRAM PATTERNS TO MATHEMATICALLY RESOLVE FALSE PETROLEUM HYDROCARBON DETECTIONS IN CLEAN ORGANIC SOILS: A CRUDE OIL–SPIKED PEAT MICROCOSM EXPERIMENT

FRANCINE KELLY-HOOPER,*† ANDREA J. FARWELL,† GLENNA PIKE,‡ JOCELYN KENNEDY,‡ ZHENDI WANG,§ ERIC C. GRUNSKY,‖ and D. GEORGE DIXON†

†Department of Biology, University of Waterloo, Waterloo, Ontario, Canada
‡ALS Environmental, Waterloo, Ontario, Canada
§Emergencies Science and Technology Section, Environment Canada, Ottawa, Ontario, Canada
‖Geological Survey of Canada, Ottawa, Ontario, Canada

(Submitted 22 July 2012; Returned for Revision 23 September 2012; Accepted 8 May 2013)

SETAC PRESS

Environmental Toxicology and Chemistry, Vol. 9999, No. 9999, pp. 1–7, 2014

Printed in the USA

Environmental Chemistry

FIELD SURVEY OF CANADIAN BACKGROUND SOILS: IMPLICATIONS FOR A NEW MATHEMATICAL GAS CHROMATOGRAPHY–FLAME IONIZATION DETECTION APPROACH FOR RESOLVING FALSE DETECTIONS OF PETROLEUM HYDROCARBONS IN CLEAN SOILS

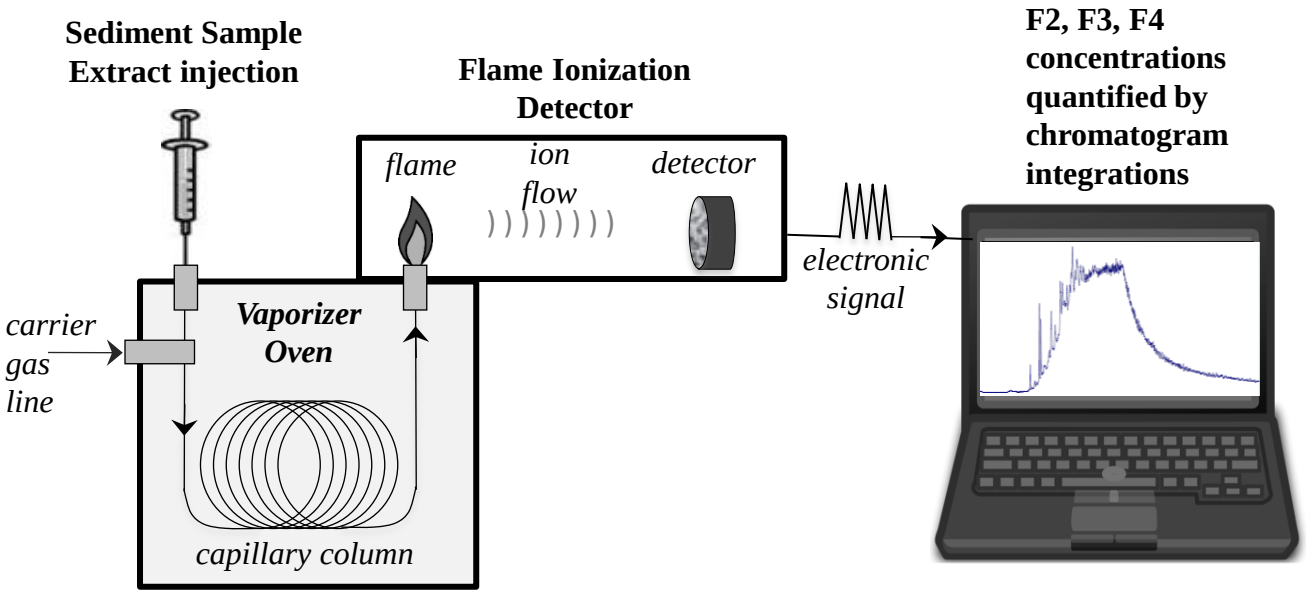
FRANCINE KELLY-HOOPER,*† ANDREA J. FARWELL,† GLENNA PIKE,‡ JOCELYN KENNEDY,‡ ZHENDI WANG,§ ERIC C. GRUNSKY,‖ and D. GEORGE DIXON†

†Department of Biology, University of Waterloo, Waterloo, Ontario, Canada
‡ALS Environmental, Waterloo, Ontario, Canada
§Emergencies Science and Technology Section, Environment Canada, Ottawa, Ontario, Canada
‖Geological Survey of Canada, Ottawa, Ontario, Canada

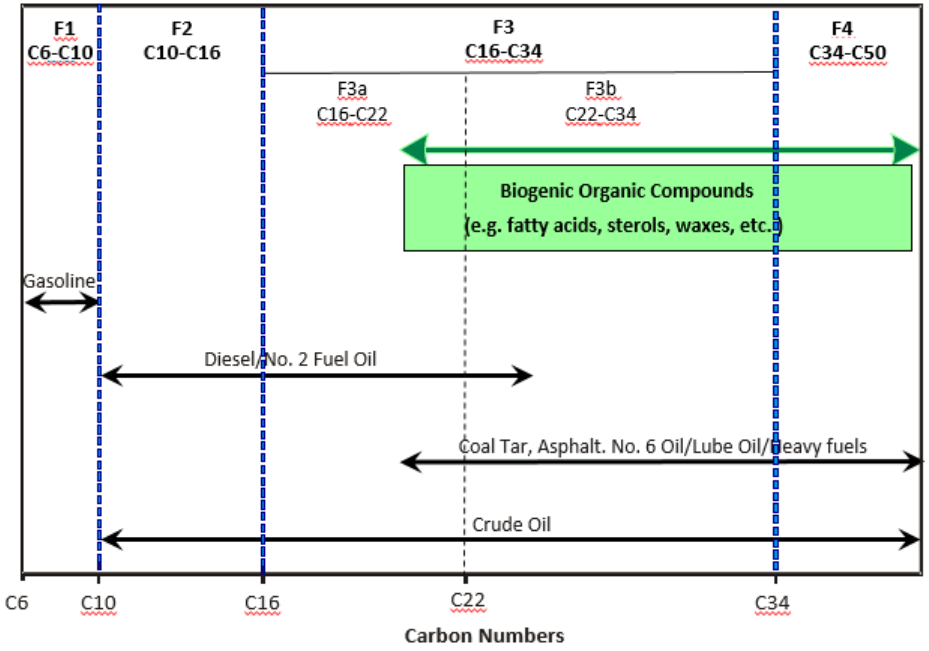
(Submitted 19 November 2013; Returned for Revision 23 December 2013; Accepted 10 March 2014)

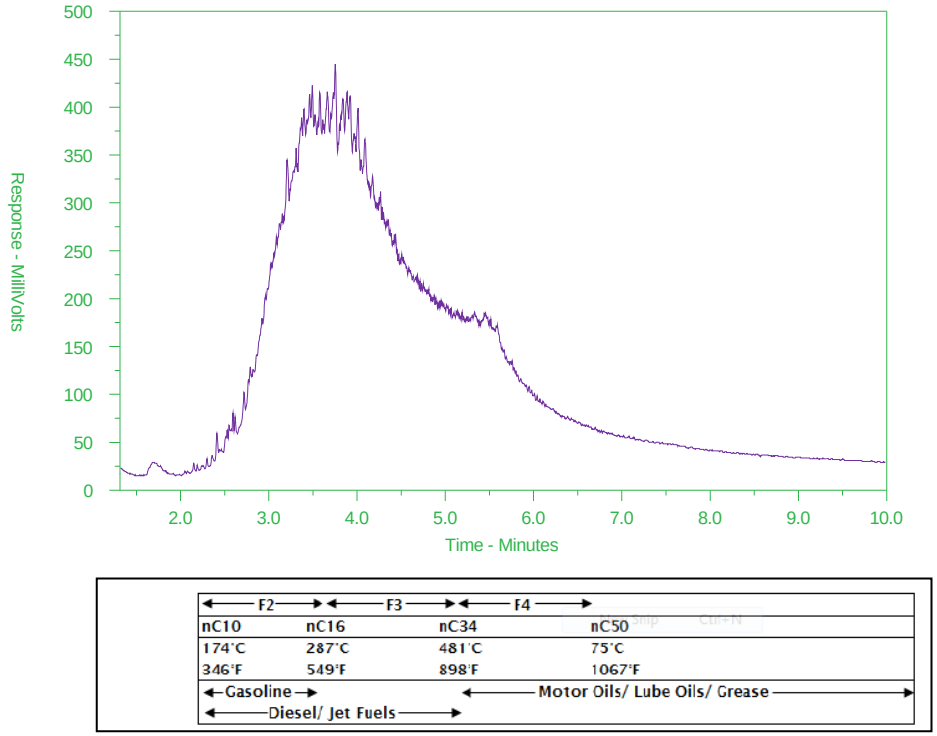
GC-FID Chromatograms

Essential to PHC Source Identifications



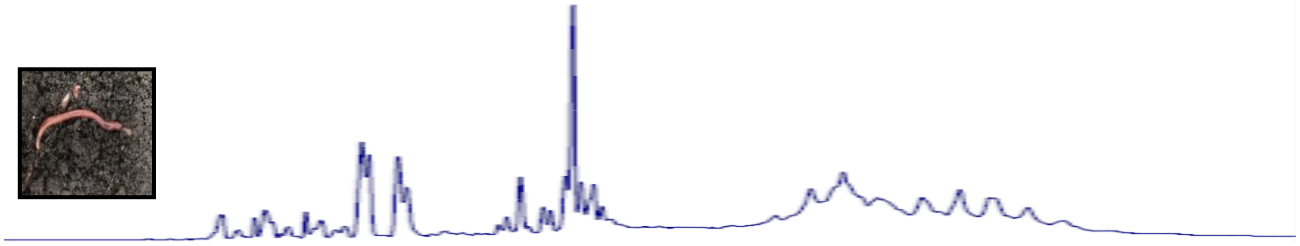
GC-FID Chromatograms Provided With Standard Laboratory Reports



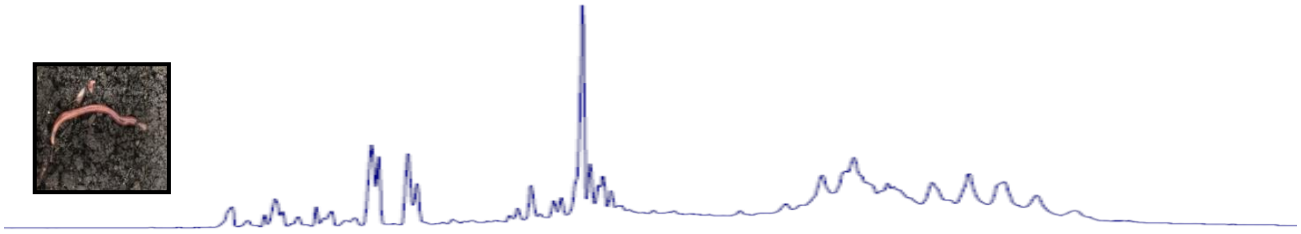


Chromatograms Show No PHC Uptake in Earthworm Tissues

Clean Control Soil



Earthworms Grown in Clean Control Soil



Earthworms Grown in Contaminated Sediment + Compost

Asphalt & Tire Contaminated Sediment

Financial institutions
Energy
Infrastructure, mining and commodities
Transport
Technology and innovation
Life sciences and healthcare

NORTON ROSE FULBRIGHT

Management of Excess Soil and Stormwater Pond Sediment

- Janet L. Bobechko B.A., LL.B., J.D.
- Senior Partner - Certified Specialist (Environmental Law)
- Norton Rose Fulbright Canada LLP

- March 21, 2018

Management of Excess Soil

MOECC initiative to ensure that excess soil can be beneficially reused.

Proposed regulatory package posted on the Environmental Bill of Rights Registry April 2017.

1. Excess Soil Reuse Regulation including excess soil management plan, tracking and registration of excess soils, and specifying when excess soil is waste.
2. Contents of an excess soil management plan.
3. Requirements related to excess soil characterization.
4. Excess soil reuse standards and approaches.
5. Amendments to Regulation 347 (General Waste Management).
6. Amendments to Ontario Regulation 153/04 (Records of Site Condition).
7. Amendment to the Building Code pertaining to applicable law.

Selected Proposed Definitions

Excess Soil

(a) means soil and sediment, which is to be removed from a property or *project area* as part of a development project,

(b) may include a mixture with incidental amounts of other finely divided material that is similar to soil (e.g., *rock*, debris, and other materials) provided, based on visual inspection, the other material is not subject to ECAs or requirements under Part V of the *EPA*, and the mixture existed pre-excavation of the soil (i.e. not as a result of purposeful mixing),

(c) does not include soil or *rock* removed from a pit or quarry regulated under the Aggregate Resources Act or a pit or quarry that would be so regulated if it was operating in an area to which the Aggregate Resources Act Applies, and

(d) Ceases to be *excess soil* when it is *liquid waste*

- **Excess soil processing site** means a waste disposal site accepting *excess soil*, including *excess soil* that is *liquid waste*, and which physically, chemically and/or biologically processes *excess soil* (including treating, remediating, mixing, sorting, filtering, dewatering, etc.).
- **Inert fill** means earth or *rock* fill or waste of a similar nature that contains no putrescible materials or soluble or decomposable chemical substances, and does not include *excess soil* as defined by the Excess Soil Reuse Regulation.
- **Liquid waste** means waste that has a slump of more than 150 millimetres using the Test Method for the Determination of Liquid Waste (slump test) as set out in Schedule 9 of Regulation 347.
- ***Liquid Soil*** *– proposed?*
- **On-site soil processing** means the processing of excavated soil that has yet not left the site for the purposes of effecting chemical or physical change to the excavated soil.
- ***Sediment*** *– no proposed definition – should one be added?*

- **Soil** means unconsolidated naturally occurring mineral particles and other naturally occurring material, smaller than 2 millimetres in size or that pass a US #10 sieve, resulting from the natural breakdown of *rock* or organic matter by physical, chemical or biological processes. This is taken from Ontario Regulation 153/04 and has the same meaning.
- **Receiving [Reuse] site** means a site where *excess soil* is deposited for final reuse, or at a soil processing site or soil bank, and does not include a *TESSS*.
- **Reuse of Excess Soil At Receiving [Reuse] Sites** means a document that provides land use based standards for the reuse of *excess soil*, as amended from time to time and available from the MOECC.

Application of Proposed Excess Soil Regulation to Stormwater Pond Sediment

Excavated Sediment

- Excess soil may include *excavated sediment* unless it is liquid waste.
- Excavated sediment that is liquid waste would be required to be dewatered before being managed as excess soil.
- Sediment that is dewatered such that it does not meet the definition of liquid waste prior to leaving a project area is excess soil,
- Sediment that is not dewatered and meets the definition of liquid waste shall be managed as liquid waste.
- *No clear tie into stormwater pond sediment*

Circumstances When Hauling Excess Soil is Exempt from ECA Requirements

- Waste management systems (includes waste haulers) required under EPA and Regulation 347, to obtain ECAs or be registered on the Environmental Activity and Sector Registry (EASR) in accordance with O. Reg. 351/12.
- Proposed exemption - Hauler transporting excess soil to Temporary Excess Soil Storage Site (TESSS) or receiving/reuse sites.
- ECAs (or EASR registrations) required for haulers transporting excess soil to waste disposal sites that are subject to ECAs (including excess soil processing sites, soil banks and landfills).
- Hauling of sediment would also be exempt from an ECA or EASR requirement. (s. 27 EPA, S. 40 EPA, s. 41 EPA).
- Haulers of excess soil subject to the operating standards for waste management systems set out in s. 16 of Regulation 347.

Managing Excavated Soil That is Liquid Waste (not Sediment)

- Proposed excess soil definition would exclude liquid waste (soil?) as defined in Regulation 347.
- Vehicles transporting excavated soil that is liquid waste, would be regulated as waste management systems under ECAs.
- ECAs could impose conditions on the types of methods that vacuum trucks may use to excavate soil.
- Excavated soil that is liquid waste taken to a site to be dewatered before reuse subject to ECA requirements.
- Dewatering site could be regulated as a standalone waste disposal site, or could be addressed in the ECA for the vacuum trucks (as a waste management system) if the person to whom the approval is issued is the same for both.
- *What about stormwater pond sediment- liquid soil?*

Stormwater Pond Sediment Reuse as Excess Soil

- Not currently accounted for in proposed regulatory package
- How should the standards for stormwater pond sediment reuse be set?
- Site Specific **Beneficial Reuse Assessment Tool** (BRAT) – under development by MOECC to allow site specific alternative standards
- Alternative Risk Assessments – what will procedure be?
- Tie into research undertaken by Francine Kelly-Hooper and Krista Barfoot.
- MOECC proposal that Dry Excess Soil can be hauled without approval
- Liquid Soils – vac truck and stormwater pond cleanout and dredging can be hauled to works yards – rules not approvals
- Propose amendment to regulatory package to deal with Stormwater pond sediment.

What's Next?

- Government of Ontario was prorogued on Thursday March 15 2018.
- Ontario Provincial Election (likely) June 7, 2018.
- Proposed DRAFT Excess Soil Regulation will be posted on the Environmental Bill of Rights Registry in the coming weeks…
- Review draft and get ready for further consultation
- Further consultation on draft– should be 90 days due to uncertainty of election.

Financial institutions
Energy
Infrastructure, mining and commodities
Transport
Technology and innovation
Life sciences and healthcare

NORTON ROSE FULBRIGHT

Janet Bobechko

- Norton Rose Fulbright Canada LLP / S.E.N.C.R.L., s.r.l.
  Royal Bank Plaza, South Tower, Suite 3800
  200 Bay Street, P.O. Box 84, Toronto, ON M5J 2Z4 Canada

  T: +1 416.216.1886 | F: +1 416.216.3930
  janet.bobechko@nortonrosefulbright.com

• Disclaimer

- **Norton Rose Fulbright US LLP, Norton Rose Fulbright LLP, Norton Rose Fulbright Australia, Norton Rose Fulbright Canada LLP and Norton Rose Fulbright South Africa Inc are separate legal entities and all of them are members of Norton Rose Fulbright Verein, a Swiss verein. Norton Rose Fulbright Verein helps coordinate the activities of the members but does not itself provide legal services to clients.**
- **References to 'Norton Rose Fulbright', 'the law firm' and 'legal practice' are to one or more of the Norton Rose Fulbright members or to one of their respective affiliates (together 'Norton Rose Fulbright entity/entities'). No individual who is a member, partner, shareholder, director, employee or consultant of, in or to any Norton Rose Fulbright entity (whether or not such individual is described as a 'partner') accepts or assumes responsibility, or has any liability, to any person in respect of this communication. Any reference to a partner or director is to a member, employee or consultant with equivalent standing and qualifications of the relevant Norton Rose Fulbright entity.**
- **The purpose of this communication is to provide general information of a legal nature. It does not contain a full analysis of the law nor does it constitute an opinion of any Norton Rose Fulbright entity on the points of law discussed. You must take specific legal advice on any particular matter which concerns you. If you require any advice or further information, please speak to your usual contact at Norton Rose Fulbright.**

Case Study Overview

Case Study #1

THE CITY OF Waterloo

Ontario
Ministry of the Environment and Climate Change

Case Study #2

Canadian Food Inspection Agency

CITY OF Guelph

Grand River Conservation Authority

GRCA
Burford Tree Nursery

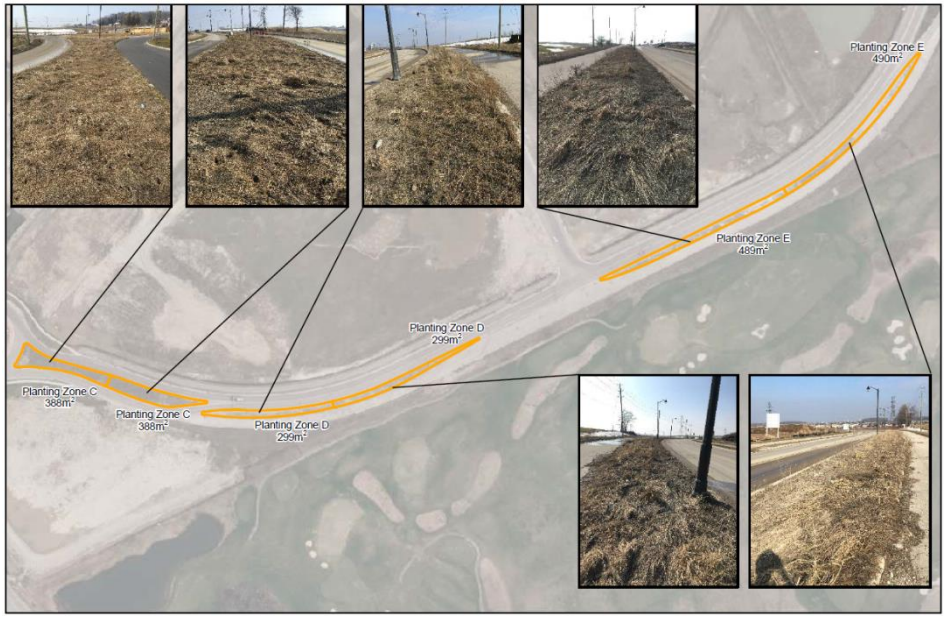
- Both residential SWM ponds require sediment cleanouts in 2017 to restore storage capacities and water quality treatment efficiencies.
- Sediment metal concentrations were low. However, PHC from tires and asphalt exceeded Ontario Regulation 153/04 Table 1 background soil standards, which triggered regulated waste management requirements.
- Non-hazardous landfill tipping fees would be $360,000 for Pond #1 and $684,000 for Pond #2.
- A risk based weight-of-evidence approach demonstrated the potential benefits of sediment reuse as an alternative to landfill disposal.

Sediment Reuse as Topsoil on City Road Boulevards

SWM Pond #1 Case Study

THE CITY OF Waterloo

Ontario
Ministry of the Environment
and Climate Change



Pilot Study Approval Process
SWM Pond #1 Case Study

PHC and PAH chemistry data identified sources and bioavailability risks

Results: Primary sources were asphalt, car tires with minimal gasoline engine emissions = low bioavailability

Plant Ecotoxicity Tests

Results: Plants thrived in the mixture of 80% sediment + 20% compost.

Months of Meetings and Phone Calls Between the City, CH2M, Ontario Ministry of Agriculture Food and Rural Affairs (OMAFRA) and the Ontario Ministry of Environment and Climate Change (MOECC) Approval Branch, Standards Development Branch and local district office.

Result: CH2M conducted a risk assessment to apply the mixture of 80% sediment + 20% compost on municipal road boulevards.

Risk Assessment Results

Development of Risk-Based Criteria for Excess Soil

Krista Barfoot

CH2M/Jacobs

Ph.D., C.Chem, QPRA

JACOBS® ch2m®

Outline

- Development of Brownfield Standards
  - Risk-based Considerations
  - Assumptions
  - Selection Process
- Considerations for Excess Soil
- Case Study – Pond Sediment
  - Re-Use Scenario
  - Parameters of Interest
  - Development of Alternate Criteria

Development of Brownfield Standards

- Brownfield Standards were developed to support management of contaminated sites
- Development is based on toxicological data available when Standards were set, and a variety of assumptions regarding:
  - volume/extent of contamination at site (13 m by 13 m by 2 m)
  - exposure of receptors to the contamination (amount of time at site, etc.)
- Component Values (CV) are developed to reflect different exposure scenarios (e.g., human and ecological direct contact, migration to air, leaching to groundwater, etc.)
- Lowest CV is selected as Standard, with cross-checking to background concentrations and analytical limitations

Development of Brownfield Standards

Ecological Direct Contact CVs

Human Direct Contact CVs

Soil Components for Table 2 - Full Depth, Potable Water Scenario													
Coarse Textured Soil		**Industrial/Commercial Land Use (ug/g)**											
	MOE	Mass.	Ont. Soil	Plants &	Mammals	Soil Contact	Soil Contact	Soil Leaching		Indoor Air	Indoor Air	Outdoor Air	Free Phase
Chemical Parameter	Soil RL	PQL	Bkgrd	Soil Org.	& Birds	S2 Risk	S3 Risk	S-GW1	S-GW3	S-IA	Odour		Threshold
Acenaphthene	0.05		0.072		46000	96	3600	2	560	120	8000	1300	2800
Acenaphthylene	0.05		0.093			9.6	360	2.	0.15	6.6		96	2900
Acetone	0.5		0.5		56	200000	660000	32	16	1900	20000	120000	92000
Aldrin	0.05		0.05	0.088	1200	4.7	6.3	3	150000		00000		5000
Anthracene	0.05		0.16	32	470000	42000	420000	1500	0.67				2700
Antimony	1		1.3	40	1500	63	63						8000
Arsenic	1		18	40	330	1.3	47						12000
Barium	5		220	1500	670	32000	8600						7700
Benzene	0.02		0.02	180	6800	13	480	0.9	14	0.32	3800	17	5000
Benz[a]anthracene	0.05		0.36	1		0.96	36	19	5.1E+11	970		330	7600
Benzo[a]pyrene	0.05		0.3	72	46000	0.096	3.6	6.	3.8E+13	12000		170	7600
Benzo[b]fluoranthene	0.05		0.47			0.96	36	6	7.7E+13	81000		2000	7600
Benzo[ghi]perylene	0.1		0.68	13		9.6	360	220	1.2E+13				7600
Benzo[k]fluoranthene	0.05		0.48	15		0.96	36	6	2.5E+13	99000		2100	7600
Beryllium	2		2.5	8	780	320	60						3900
Biphenyl 1,1'-	0.05		0.05			6000	6000	59	190		52		2600
Bis(2-chloroethyl)ether	0.5		0.5			0.44	16	0.001	92		320		6400
Bis(2-chloroisopropyl)ether	0.5		0.5			8800	8800	1	120		82		11
Bis(2-ethylhexyl)phthalate	5		5	28	140000	9500	16000	83	2.5E+09				7100
Boron (Hot Water Soluble)*	0.5		0.5	2									5000
Boron (total)	5		36		120	24000	24000						5000
Bromodichloromethane	0.05		0.05			18	660	1.	50				5500
Bromoform	0.05		0.05			140	5200	2.	21	0.61	980	91	11000
Bromomethane	0.05		0.05			66	660	0.09	1.4	0.0016	130	68	7300

Leaching to Groundwater

Migration to air

Development of Brownfield Standards

Soil Components for Table 2 - Full Depth, Potable Water Scenario														
Coarse Textured Soil		**Industrial/Commercial Land Use (ug/g)**												
	MOE	Mass.	Ont. Soil	Plants &	Mammals	Soil Contact	Soil Contact	Soil Leaching		Indoor Air	Indoor Air	Outdoor Air	Free Phase
Chemical Parameter	Soil RL	PQL	Bkgrd	Soil Org.	& Birds	S2 Risk	S3 Risk	S-GW1	S-GW3	S-IA	Odour		Threshold
Acenaphthene	0.05		0.072		46000	96	3600	21	560	120	18000	1300	2800
Acenaphthylene	0.05		0.093			9.6	360	2.3	0.15	6.6		96	2900
Acetone	0.5		0.5		56	200000	660000	320	16	1900	20000	120000	92000
Aldrin	0.05		0.05	0.088	1200	4.7	6.3	31	150000		1200000		5000
Anthracene	0.05		0.16	32	470000	42000	420000	15000	0.67				2700
Antimony	1		1.3	40	1500	63	63						8000
Arsenic	1		18	40	330	1.3	47						12000
Barium	5		220	1500	670	32000	8600						7700
Benzene	0.02		0.02	180	6800	13	480	0.92	14	0.32	3800	17	5000
Benz[a]anthracene	0.05		0.36	1		0.96	36	190	5.1E+11	970		330	7600
Benzo[a]pyrene	0.05		0.3	72	46000	0.096	3.6	6.6	3.8E+13	12000		170	7600
Benzo[b]fluoranthene	0.05		0.47			0.96	36	67	7.7E+13	81000		2000	7600
Benzo[ghi]perylene	0.1		0.68	13		9.6	360	2200	1.2E+13				7600
Benzo[k]fluoranthene	0.05		0.48	15		0.96	36	66	2.5E+13	99000		2100	7600
Beryllium	2		2.5	8	780	320	60						3900
Biphenyl 1,1'-	0.05		0.05			6000	6000	590	190		52		2600
Bis(2-chloroethyl)ether	0.5		0.5			0.44	16	0.0014	92		320		6400
Bis(2-chloroisopropyl)ether	0.5		0.5			8800	8800	12	120		82		11
Bis(2-ethylhexyl)phthalate	5		5	28	140000	9500	16000	830	2.5E+09				7100
Boron (Hot Water Soluble)*	0.5		0.5	2									5000
Boron (total)	5		36		120	24000	24000						5000
Bromodichloromethane	0.05		0.05			18	660	1.5	50				5500
Bromoform	0.05		0.05			140	5200	2.3	21	0.61	980	91	11000
Bromomethane	0.05		0.05			66	660	0.097	1.4	0.0016	130	68	7300

Cross check to background and analytical limitations

Selection of lowest CV

Considerations for Excess Soil

- Management of excess soil can involve different soil volumes and exposure scenarios than assumed in development of Brownfield Standards

- Opportunity exists to develop site-specific soil standards under the proposed Excess Soil Regulation
  - Allows consideration of re-use volume
  - Allows consideration of re-use specific exposure scenario
  - Allows consideration of updated toxicity data

- Re-use specific scenario applied to support management of pond sediment

SWM Pond Sediment Beneficial Use Case Study #1

Re-use Scenario: Topsoil amendment on municipal road boulevards

- 300 m^3 to be applied to a municipal road boulevard
- Excess soil is a mixture of 80% sediment + 20% compost
- Table 2 Industrial/Commercial/Community (ICC) Standards met, except:
  - boron (HWS) (compost sample)
  - electrical conductivity (EC) (insitu sediment sample)
  - benzo(a)pyrene [B(a)P] and benzo(b)fluoranthene [B(b)F] (mixture samples)
- Boron (HWS) and EC relevant to plant health; plant growth studies confirmed plants thrived in the soil mixture
- Human health direct contact (S2 CV) determined to be the risk-driver for B(a)P and B(b)F exceedances

SWM Pond Sediment Beneficial Use Case Study #1

O.Reg. 153/04 Table 2 ICC - S2 Soil Component Values

Table 1 Background

Adult Outdoor Worker Risk

Soil Components for Table 2 - Full Depth, Potable Water Scenario							
Coarse Textured Soil		Industrial/Commercial Land Use (ug/g)					
Chemical Parameter	MOE Soil RL	Mass. PQL	Ont. Soil Bkgrd	Plants & Soil Org.	Mammals & Birds	Soil Contact S2 Risk	Soil C S3
Acenaphthene	0.05		0.072		46000	96	
Acenaphthylene	0.05		0.093			9.6	
Acetone	0.5		0.5		56	200000	
Aldrin	0.05		0.05	0.088	1200	4.7	
Anthracene	0.05		0.16	32	470000	42000	
Antimony	1		1.3	40	1500	63	
Arsenic	1		18	40	330	1.3	
Barium	5		220	1500	670	32000	
Benzene	0.02		0.02	180	6800	13	
Benz[a]anthracene	0.05		0.36	1		0.96	
Benzo[a]pyrene	0.05		0.3	72	46000	0.096	
Benzo[b]fluoranthene	0.05		0.47			0.96	

B(a)P

Risk Based Soil CV 0.096 mg/g

Soil Standard 0.3 mg/g

- The maximum mixture B(a)P concentration of 0.5 mg/kg exceeded both values

SWM Pond Sediment Beneficial Use Case Study #1

O.Reg. 153/04 Table 2 ICC - S2 Soil Component Values

Adult Outdoor Worker Risk

Soil Components for Table 2 - Full Depth, Potable Water Scenario							
Coarse Textured Soil		Industrial/Commercial Land Use (ug/g)					
Chemical Parameter	MOE Soil RL	Mass. PQL	Ont. Soil Bkgrd	Plants & Soil Org.	Mammals & Birds	Soil Contact S2 Risk	Soil C S3
Acenaphthene	0.05		0.072		46000	96	
Acenaphthylene	0.05		0.093			9.6	
Acetone	0.5		0.5		56	200000	
Aldrin	0.05		0.05	0.088	1200	4.7	
Anthracene	0.05		0.16	32	470000	42000	
Antimony	1		1.3	40	1500	63	
Arsenic	1		18	40	330	1.3	
Barium	5		220	1500	670	32000	
Benzene	0.02		0.02	180	6800	13	
Benz[a]anthracene	0.05		0.36	1		0.96	
Benzo[a]pyrene	0.05		0.3	72	46000	0.096	
Benzo[b]fluoranthene	0.05		0.47			0.96	

B(b)F

Risk Based Soil CV of 0.96 mg/g; this value set as standard

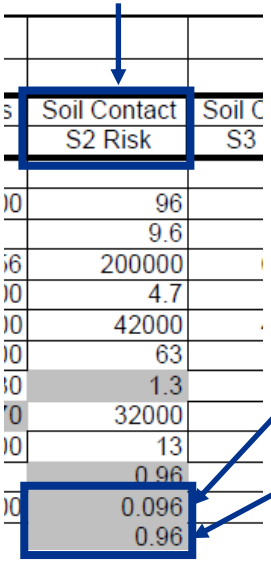
- The maximum mixture B(b)F concentration of 1.02 mg/kg exceeds S2 value

SWM Pond Sediment Beneficial Use Case Study #1

Alternate Criteria – Adjusted Exposure Frequency

- Table 2 ICC S2 value assumes contact for 5 day per week
- Maximum exposure to road boulevard soil is most likely to occur during landscaping activities which would be completed 1 day per week; time on the boulevard would likely be less than 0.5 days
- The 5 days/week exposure was reduced to 0.5 days/week

S2 Adult Outdoor Worker Risk



Soil Contact S2 Risk	Soil C S3
96	
9.6	
200000	
4.7	
42000	
63	
1.3	
32000	
13	
0.96	
0.096	
0.96	

B(a)P S2 value becomes 0.96 mg/kg

B(b)F S2 value becomes 9.6 mg/kg

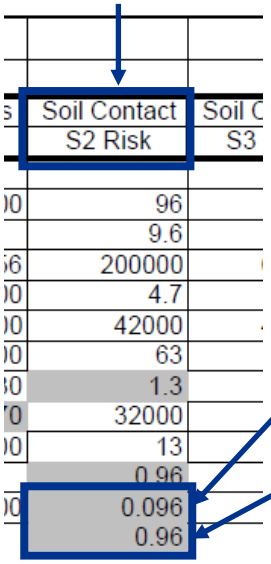
Mixture meets ✓

SWM Pond Sediment Beneficial Use Case Study #1

Alternate Criteria – Adjusted Toxicity Reference Value

- Updated toxicity data is available for these parameters
- Updated toxicity data was applied to develop an alternate CV, while leaving all exposure factors at their default values

S2 Adult Outdoor Worker Risk



Soil Contact S2 Risk	Soil C S3
96	
9.6	
200000	
4.7	
42000	
63	
1.3	
32000	
13	
0.96	
0.096	
0.96	

B(a)P S2 value becomes 0.7 mg/kg

B(b)F S2 value becomes 7 mg/kg

Mixture meets ✓

SWM Pond Sediment Beneficial Use Case Study #1

300 m^3 of Sediment Spread Across Four Boulevards
$31,000 Tipping Fee Savings

Vegetation and topsoil will be stripped and replaced with 80% sediment plus 20% compost mixture.

North Zone; Sediment+Compost

Only vegetation will be stripped. Original topsoil will remain in place.

South Zone; Original Topsoil

- Each zone will be planted with the same species and monitored for soil chemistry and plant growth over time. statistical differences over time.

SWM Pond Case Study #2

Sediment Beneficial Use as a Tree Nursery Soil Amendment Product

Canadian Food Inspection Agency

Grand River Conservation Authority
Burford Tree Nursery

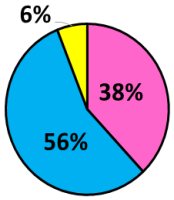
SWM Pond Sediment Versus Tree Nursery Soil Quality

SWM Pond Case Study #2

SWM Pond B Sediment

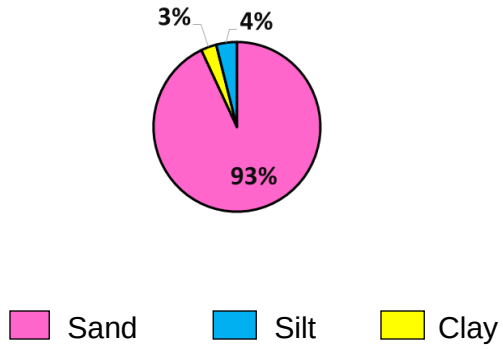
Silty Loam, 3% Organic Matter

Grain Size Analysis



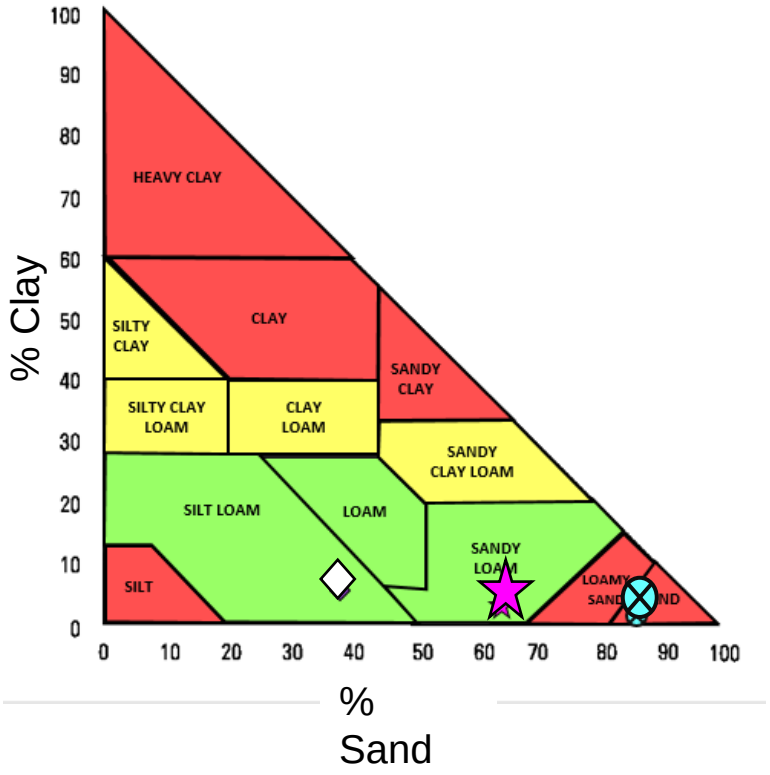
Tree Nursery Soil

Sand, 0.2% Organic Matter



Soil Texture Triangle

SWM Pond Case Study #2

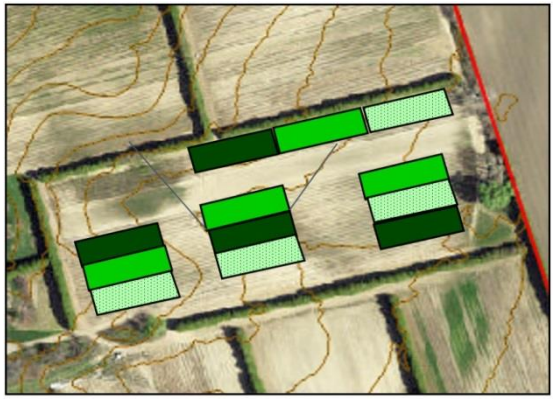


Topsoil Quality Rating

- Good
- Fair
- Poor

- ⊗ Unamended tree nursery soil
- ◇ 80% sediment + 20% compost product
- ★ Predicted future soil amended with 80% sediment + 20% compost

Tree Nursery Pilot Study Plan
SWM Pond Case Study #2



- Unamended control soil
- 100% sediment
- 80% sediment and 20% compost

Tree Nursery Pilot Study Plan

400 m^3 of Sediment Spread Across 1 acre of Land

$41,000 Tipping Fee Savings

- Four randomized treatment zones
- 25 seedlings for three tree species will be planted and monitored for 3-5 years.
- Soil chemistry analysis will also be included in the monitoring plan.

Silt Fenced Test Plots and Compost Pile

Regulatory Requirements and Challenges

SWM Pond Case Study #2

- Sediment contained 60% moisture, but dewatering agents could not be added to a fertilizer product.

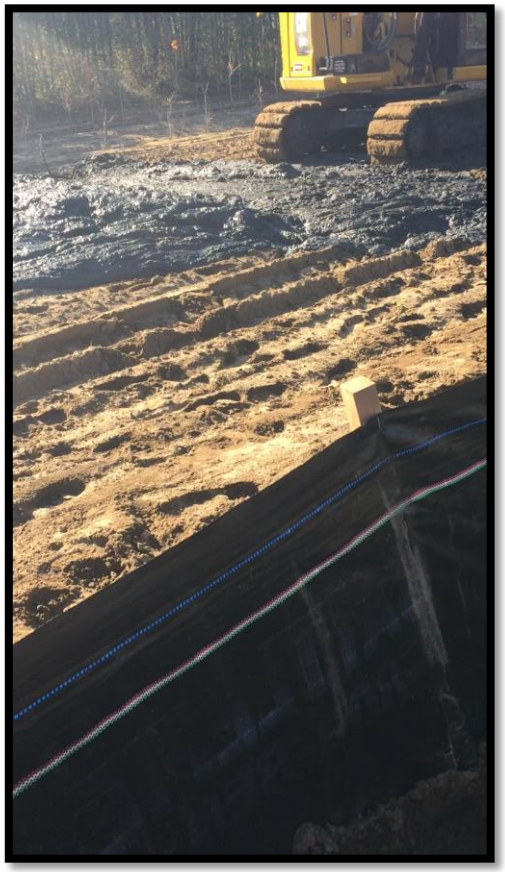
- Compost was used to plug the truck tailgates before transporting 130 miles to tree nursery

Regulatory Requirements and Challenges (cont'd)

SWM Pond Case Study #2

- Sediment needed to be spread in a 4 inch layer

- Total volume for each fenced plot was dumped and spread with a backhoe



Regulatory Requirements and Challenges (cont'd)

SWM Pond Case Study #2

- Amendment mixture was required to be 80% sediment and 20% compost

- Set volume of compost was loaded into a slinger

Regulatory Requirements and Challenges (cont'd)

SWM Pond Case Study #2

- Amendment mixture was required to be 80% sediment and 20% compost

- Set volume of compost was spread by the slinger

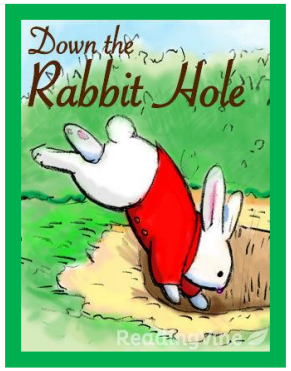
1st Test of Tilling Capabilities

Success!

Thank You to Bronte Construction

BRONTE
CONSTRUCTION

Summary



- This process involved many unexpected rabbit holes, but they ultimately led to regulatory approvals
- The risk based weight of evidence approach was essential to the approval process
- Future approvals will require match making between each SWM pond and each recipient site.

Thank You

NORTON ROSE FULBRIGHT

- **Janet Bobechko**, LL.B, J.D., Certified Environmental Law Specialist

JACOBS ch2m

- **Krista Barfoot**, QP, Risk Assessor
- **Francine Kelly-Hooper**, PhD, Contaminant Scientist

TRIECA 2018 CONFERENCE

Thank you to all of our 2018 gold sponsors:

AQUATECH DEWATERING COMPANY

BIOCOMPOSITES GROUP

AECOM

terrafix geosynthetics inc.

R&M CONSTRUCTION

UNILOCK DESIGNED TO CONNECT.

Hydro International

filtrexx CANADA SUSTAINABLE TECHNOLOGIES let nature do it.

SOLENO Mastering Storm Water

GEMS

Credit Valley Conservation inspired by nature

TITAN ENVIRONMENTAL CONTAINMENT

armtec Solutions for a Better World

York Region

Lake Simcoe Region conservation authority

Media Partners

WATER CANADA THE COMPLETE WATER MAGAZINE

Hosts

CANIECA CANADIAN CHAPTER

Toronto and Region Conservation for The Living City

trieca.com | @TRCA_TRIECA