

Manitoba



Infrastructure

Highway Planning and Design Branch
Environmental Services Section
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April 12, 2018

Tracey Braun, M. Sc.
Director, Environmental Approvals Branch
Manitoba Sustainable Development
123 Main St., Suite 160
Winnipeg, MB R3C 1A5

RE: City of Winnipeg - Biosolids Land Application Program
Client File No. 5951.00

Dear Ms. Braun:

MI has reviewed the proposal under the *Environment Act* noted above and offers the following comments/concern:

Regional Operations

There shall be no application of the biosolids within MI right of way as this may effect quality of surface run off entering MI ditches. In addition, the Proponent should ensure any proposed construction (berms or other) proposed within the Controlled Area must be applied for, and permitted by Manitoba Infrastructure and/or the Highway Traffic Board before any construction begins.

For permit applications, please contact Karen Toews-Therrien at
Karen.ToewsTherrien@gov.mb.ca or at (204) 945-0324.

Water Management, Planning and Standards

Water Management, Planning and Standards notes that the Red River Valley Designated Flood Area and the Lower Red River Designated Flood Area are shown as unavailable constraint areas in the proposal, which notes: "Biosolids will not be applied on lands located within 30 metres of Provincial flood designated areas." Designated Flood Areas are regulatory areas in which a designed flood area permit is required, as per Section 14 of the Water Resources Administration Act and Designated Flood Area Regulation 59/2002. Designated Flood Areas do not include all flood prone land in the region, such as those areas adjacent to the Seine River, the Assiniboine River, and Lake Manitoba.

Water Management, Planning and Standards has no objections to EAP 5951.00. If further

flood risk information is required, beyond the extent of the Designated Flood Areas noted in the EAP, inquiries can be directed to:

Development Review
Manitoba Infrastructure
2nd Floor 280 Broadway
Winnipeg, Manitoba R3C 0R8
MITWaterReview@gov.mb.ca
204-945-2121

Thank you very much for providing us the opportunity to review the proposal.

Sincerely,



Kimber Osiowy, M. Sc., P. Eng.
Manager of Environmental Services

Boswick, Robert (SD)

Subject: FW: Request for Review/Comment - Environment Act Proposal – City of Winnipeg Biosolids Land Application Program - File 5951.00 - Due April 3, 2018
Attachments: Pages from eap_citywpgbiosolids_appendix_c_table c1_notes BW.pdf;
eap_citywpgbiosolids_reportbody_final-annotatedBW.pdf

From: Wiebe, Brian (SD)

Sent: April-11-18 2:52 PM

To: Boswick, Robert (SD)

Cc: Page, Elaine (SD)

Subject: RE: Request for Review/Comment - Environment Act Proposal – City of Winnipeg Biosolids Land Application Program - File 5951.00 - Due April 3, 2018

Hi Rob,

This proposal was a tricky read but here finally are my comments.

General comments:

Application of biosolids at 2x crop P removal assuming 25% of total biosolids P is plant available would be a good place to start (note below that in Table C.2 the selected application rate is listed as 2X but the 18 tonne/ha rate is a 3x rate). Under Monitoring (section 9.1.3) I would add that we need crop yield data and an analysis of Total Phosphorus from a sample of any crop removed (grain and also straw if removed from the field) to be able to estimate crop removal of P (important for fine tuning application rates). Addition of a small amount of starter P with the seed will be important for many crops especially in cool/wet springs (for canola 10 lbs P₂O₅/acre would be the AgVise labs recommendation) but is generally a good idea when the main phosphorus application is broadcast and incorporated so that emerging seeds have ready access to P during early growth. As per other biosolids programs, biosolids should only be applied to fields with an Olsen-P soil test value (0-15cm) of less than 60 mg/kg.

I have attached a copy of their proposal/report with my comments/notes although most are listed below.

Appendix C – Table C.2 (annotated copy of table attached)

1. The soil test data section should not be titled “Plant Available Nutrients Soil Test Data” but rather “soil test data” because the soil test phosphorus value is not a measure of plant available P. Olsen-P and all other soil test P methods are extractions which when correlated with field data for the area give guidance as to the probability of a crop response to fertilizer P. Calling it Available P is misleading and causes confusion in those reading the table. “Available Phosphate-P” should be labelled “Phosphorus (Olsen-P)”. The soil test results were not attached so I do not know what tests were used on the other elements but all should be labelled by the method and not the word “available”.
2. The calculations look fine and use an estimate of 25% of total P being plant available which is acceptable for now. However at the bottom of the table they have a section “Selected Application Rate” which indicates that they have selected to apply at a 2X crop P removal rate but the application rate they list (18 tonnes/ha) is based on a 3x crop P removal. I would not be in favour of a 3x rate especially since we are only assuming 25% available which could well turn out to be too low.

The proposal includes a brief literature review which in the Phosphorus section (6.2.2.2) contains several points which are inaccurate/misquoted/misunderstood:

1. The modified Kelowna extraction is not a recognized nor useful measure of plant available phosphorus in biosolids. I have been following the scientific literature and to date no one has found an extraction which can accurately predict plant available P from biosolids (plant availability is a function of the biosolid properties, the soil properties and how they interact – each biosolid-soil mixture is unique).
2. The reference to Pastene (1981) relies on a few lines referenced in O'Connor et al (2002) {which is not in their reference list but they may mean O'Connor et al (2004)}. This reference does not contain any information as to the

type of biosolid, the Fe and Al concentration or how the P-supplying power was assessed so Pastene's finding may or may not be relevant but cannot be given any weight without more information from the actual thesis. Basing their conclusions that the Winnipeg biosolids will provide a low percentage of plant available P on the Al-Fe/P molar ratio as per Pastene (1981) is unwarranted, especially since they have other actual references with detailed method descriptions indicating the 25-75% plant available P is likely appropriate for Winnipeg biosolids.

3. O'Connor et al (2004) found that biosolids containing >50g/kg total Fe+Al AND a solids content >60% had bio-availability
4. McCoy et al (1986) used TSP (triple super phosphate) not MCP (monocalcium phosphate) and compared it to composted sewage sludge (high solids and potentially lower plant available P due to drying) which had been treated with Fe or Fe+Al and found it was 10% as plant available as fertilizer P (Fe+AL of 45 and 54g/kg for the 2 composts). The proposal mistakenly attributes some results from de Haan (1980) to McCoy et al. de Haan (1980) who used MCP found 4% P bio-availability for non-biosolid sludges (called "chemical" sludge in the paper – either effluent or surface water treated with Fe/Al to remove P/impurities) which were a very different material from biosolids. For actual sewage sludges, De Haan found 17-54% P bioavailability for Fe treated sewage sludge and the only Fe treated sludge to have lower P availability than other sewage sludges was one that had 15% Fe content (150 g/kg which is much higher than Winnipeg biosolids).
5. Vaneeckhaute et al (2015) did not study biosolids but rather Fe treated liquid hog manure. They found that corn grown with the FePO₄-sludge yielded as well as with P fertilizer despite lower P uptake – they do not clarify whether the fertilizer treatment had luxury uptake or if the sludge treatment was considered P deficient. The low water solubility indeed indicates poor suitability as a starter fertilizer and would suggest a small amount of starter P fertilizer may be warranted but otherwise the sludge appeared to meet crop P requirements.

Please contact me if you have any questions.

Brian

Brian Wiebe, Ph.D., P.Ag.
Senior Land-Water Specialist
ph: 204-945-0585

Table C.2. Example of Field Prescription Application Rate, 20,000 Tonnes

Nov. 8, 2017

Field ID:	Sample	
Land Area Available (ha):		64
2018 Crop:	Canola	
2018 Target Yield:	55 bu/ac	
	lb/ac	kg/ha
Target Nitrogen total less soil residual:	135	151
Fertilizer Phosphate (P2O5) total less soil residual:	40	45
1 x P2O5 Crop Removal @ target Yield:	55	62
2 x P2O5 Crop Removal @ target Yield:	110	123
3 x P2O5 Crop Removal @ target Yield:	165	185
Sulfate-S target:	20	22

62/2.2915 = 27 kg P/ha
54 kg P/ha
81 kg P/ha

Plant Available Nutrients Soil Test Data			
Sample Depth		W0001	W0002
		0-15 cm	15-60 cm
Units		mg kg ⁻¹	kg ha ⁻¹
Total Nitrogen		0.318	0.202
Available Nitrate-N		02.6	2
Available Phosphate-P Olsen-P		12.6	25
Available Potassium		418	636
Available Sulfate-S		-	-
Sample Depth		W0002	W0002
		0-15 cm	15-60 cm
Units		mg kg ⁻¹	kg ha ⁻¹
Total Nitrogen		0.238	0.254
Available Nitrate-N		02.0	2
Available Phosphate-P Olsen-P		07.0	14
Available Potassium		309	618
Available Sulfate-S		-	-

City of Winnipeg Biosolids Characteristics and Analysis

Parameter Name	Parameter Description	Unit	Biosolid Analysis Pilot Project
Estimated Biosolid Volume	In-field	m ³	20,000
Specific Gravity	As Received	g cm ⁻³	1.00
Estimated Biosolids		tonnes	20,000
Dry tonnes biosolids available (=wet tonnes x %solids)	Dried Basis	tonnes	5,379
Moisture	As Received	%	73.1
Total Solids	As Received	%	26.9
Total Volatile Solids	Dry Basis	%	-
Organic Matter	Dry Basis	%	-
Inorganic Content	Dry Basis	%	-
Total Organic Carbon	Dry Basis	%	29.42
N:P Ratio	Dry Basis	x:1	2.10
pH	Saturated Paste		6.15
Total N	Dried Basis	%	3.8
	Dried Basis	mg kg ⁻¹	38,014
	Dried Basis	kg Tonne ⁻¹	38.0
Ammonium - N (NH4-N)	wet	mg kg ⁻¹	4,795.0
	Dried Basis	mg kg ⁻¹	1,290.4
	Dried Basis	kg Tonne ⁻¹	1.3
Available Nitrate-N	Dried Basis	mg kg ⁻¹	3.77
Available Nitrate-N	Dried Basis	kg Tonne ⁻¹	0.004
Total Phosphorus	Dried Basis	mg kg ⁻¹	18,097
Phosphate P (Modified Kolowna solution)	Dried Basis	mg kg ⁻¹	637
Total P:Phosphate-P ratio	Dried Basis	x:1	28
Percent Phosphate of Total		%	4

Amount of Biosolids Nutrient Available to Crop

Organic N (=TN-ammonium N)	Dried Basis	mg kg ⁻¹	36,724
Organic N	Dried Basis	kg Tonne ⁻¹	37
Method of Application:			Incorporated
Anticipated Weather			Cool/dry
Anticipated Volatilization (%)	within 1 day		15
Available Organic N (@ 20%)	Dried Basis	kg Tonne ⁻¹	7.3
Ammonium nitrogen available	Dried Basis	kg Tonne ⁻¹	1.10
Plant Available Nitrogen (PAN) (Year 1)	Dried Basis	kg Tonne ⁻¹	8.4
PAN Year 2 (@12% mineralization)	Dried Basis	kg Tonne ⁻¹	4.4
PAN Year 3 (@6% mineralization)	Dried Basis	kg Tonne ⁻¹	2.2
Phosphorus	Dried Basis	kg Tonne ⁻¹	18.1
P ₂ O ₅ equivalent	Dried Basis	kg Tonne ⁻¹	41.6
Total Available P ₂ O ₅ (estimate based on 25% of total)	Dried Basis	kg Tonne ⁻¹	10.4

Application Rate based on Nitrogen				Land Area Required
Nitrogen Based Application Rate	Dried Basis	tonnes ha ⁻¹	18	301 Ha
Amount of Available P2O5 applied	Dried Basis	kg ha ⁻¹	186	744 Ac
P ₂ O ₅ Application check		%	415	
Application Rate based on Phosphorus (1xCR)				Land Area Required
Total Phosphorus Based Application Rate	Dried Basis	tonnes ha ⁻¹	6	909 Ha
	Dried Basis	kg ha ⁻¹	50	2,244 Ac
Amount of Nitrogen applied		lb ac ⁻¹	44	
		kg ha ⁻¹	101	
Additional Nitrogen required		lb ac ⁻¹	90	
Application Rate based on Phosphorus (2xCR)				Land Area Required
Total Phosphorus Based Application Rate	Dried Basis	tonnes ha ⁻¹	12	484 Ha
Amount of Nitrogen applied	Dried Basis	kg ha ⁻¹	100	1,122 Ac
Additional Nitrogen required		kg ha ⁻¹	51	
Application Rate based on Phosphorus (3xCR)				Land Area Required
Total Phosphorus Based Application Rate	Dried Basis	tonnes ha ⁻¹	18	303 Ha
Amount of Nitrogen applied	Dried Basis	kg ha ⁻¹	150	748 Ac
Additional Nitrogen required		kg ha ⁻¹	1	

Selected Application rate based on:			
Selected Application Rate	Dried Basis	2x CR P	18
		tonnes ha ⁻¹	18
	Wet Basis	tons ac ⁻¹	8
Estimated Biosolids Volume Applied		tonnes ha ⁻¹	76
Estimated Biosolids Volume Remaining	Wet	tons ac ⁻¹	31
	Wet	Tonnes	4,479
	Wet	Tonnes	15,521

2X crop removal would be 12 tonnes/ha not 18 (see above)

Notes:

Available Ammonium N - Volatilization loss associated with different application methods (0% with Injection)

Organic N - TN - Ammonium N

Available Organic N - Organic N x 0.20 year 1 (Ross and Racz, 2003)

Mineralization of Year 2 = 12%, Year 3 = 6%

Plant Available Nitrogen = (NO₃-N) + Volatilization factor (NH₄-N) + Organic N Mineralization

Estimated P2O5 Available based on 25% of total Phosphorus as directed by MSD.

Note: the biosolids are FeCl treated and fixes the majority of the total P. The proportionate lab analysis indicates on ly 4% of total P is in the Fe-P form. Section 5.1.2 of the proposal

Soil Phosphorus Olsen method.

* See Estimates of Ammonium-N Retained After Biosolids application

DATE: April 5, 2018

TO: Robert Boswick, P.Eng.
Environmental Engineer
Environmental Approvals Branch
Sustainable Development
1007 Century Street
Winnipeg MB R3H 0W4

FROM: Nada Suresh/Julie Froese/Sonja Bridges
Environmental Compliance and
Enforcement
Sustainable Development
1007 Century Street
Winnipeg MB R3H 0W4

SUBJECT: City of Winnipeg Bio solids Land Application Program (Client File No. 5951.00)

Winnipeg District Office, Environmental Compliance and Enforcement Branch (ECE) of Manitoba Sustainable Development has reviewed the above noted Environmental Act Proposal (EAP) on biosolids land application program and has the following comments to provide:

1. EAP propose a 75 meters setback distance (pages 13 & 39) from any occupied residence for land application of biosolids. However it was noted that Clause 13(a) in EAL 1089 ERR prescribe 300 meter setback distance.
2. ECE is concerned about odour issues emanating from the field storage and land application of biosolids program. Therefore, it is recommended that the best management practices and the mitigatory measures stated in the EAP and brought up in the review process must be incorporated into the Licence conditions.
3. ECE noted several people expressed their concerns about "Emerging substances of concern (ESOC)" through City's website dedicated to biosolids. Section 6.2.5 of the EAP states that proponent will continue to monitor academic literature to keep up with up to date information on ESOC. Thus, it is recommended that approval process must take into account of this aspect and consider inclusion of continues monitoring of scientific research and literature on ESOC as part of the reporting procedures for its Licence requirement.

Regulatory concerns - Environmental Act Licence No. 1089 E RR

4. It is noted that Environmental Act Licence No. 1089 E RR issued to City of Winnipeg is also dealing with temporary storage, transportation of biosolids and the disposal of biosolids on agricultural lands. It is also noted that several clauses under the above-mentioned Licence directly infringe upon activities proposed in the Environmental Act proposal. Clause 6 of the EAL 1089 E RR effectively prohibits temporary storage of biosolids other than designated temporary storage pad in RM of West St. Paul. EAP for the biosolids land application program propose field storage of biosolids for a period of five months, which is also considered as a temporary storage of biosolids. Thus, it is recommended that suspension of relevant clauses in the EAL 1089 E RR, which have a bearing on the field storage component of the present EAP, be considered as part of review process. Further, it is recommended that as part of the review process of this EAP, which proposed to obtain a new Environment Act Licence, to consider cancellation of existing EAL#1089 ERR which deals with management of City's biosolids.

Miscellaneous comments:

5. It is mentioned in Section 2.1.1 that Class A biosolids likely will not require an Environment Act Licence (EAL). However, ECE noted that present Classes of Development Regulations MR 164/1988 as amended by MR 39/2016 does not recognize the different categories of biosolids and require an EAL for any biosolids application.
6. Section 5.2.2 (page 25) states that a report entitled "Summary Report City of Winnipeg Biosolids land Application Field Storage Assessment" dated November 2017 was provided as a supplementary report to the above EAP under review. However, it was noted that this report was not part of package for this EAP in Public Registry.

Boswick, Robert (SD)

From: Richards, Lisa (WRHA)
Sent: April-04-18 12:57 PM
To: Boswick, Robert (SD)
Subject: City of Winnipeg Biosolids Land Application Program
Attachments: ATT00001.txt; ATT00002.htm

Hi Robert. I support this initiative and believe that the health benefits of the program (climate change mitigation and economic benefits to farmers) will outweigh the potential harms, especially in light of the mitigation measures outlined in the document.

I concur with mitigation measures outlined in the proposal, including the odor control measures for storage sites and the adoption of "good neighbor practices" with respect to odor issues, as well as soil monitoring for heavy metals and regular review of the academic literature pertaining to ESOCs.

I would suggest including a Medical Officer of Health (MOH) on the Advisory Committee to consult on odor and other health-related concerns. As well, I would request to be notified of any significant odor or other health related issues if/when they emerge.

Thanks for the opportunity to review.

Lisa

Lisa Richards, MD MSc FRCPC
Medical Officer of Health
Winnipeg Regional Health Authority
2nd Floor, 490 Hargrave St.
Winnipeg, MB
R3A 0X7

Administrative Assistant: Crystal Swain
cswain@wrha.mb.ca
Tel: 204 940-1907
Fax: 204-956-4494

Boswick, Robert (SD)

Subject: RE: Request for Review/Comment - Environment Act Proposal – City of Winnipeg Biosolids Land Application Program - File 5951.00 - Due April 3, 2018

From: Vitt, Cory (SD)

Sent: March-06-18 1:34 PM

To: Boswick, Robert (SD)

Subject: RE: Request for Review/Comment - Environment Act Proposal – City of Winnipeg Biosolids Land Application Program - File 5951.00 - Due April 3, 2018

Ensure:

(from the EAP)

Applicable setback distances around residential areas, residences, groundwater wells, surface water drainage systems and sensitive areas/features will be established as outlined in the provincial *Nutrient Management Regulation* under *The Water Protection Act* and the *Farm Practices Guidelines for Pig Producers in Manitoba* (April 2007).

The Office of Drinking Water wants to ensure that setback distances are written into the License or the applicable legislation is referenced;

ODW is concerned specifically about surface water, groundwater, and wells.

Thanks.

Cory Vitt, M.Eng. P.Eng.

Approvals Engineer

Office of Drinking Water

Manitoba Sustainable Development

1007 Century Street

Winnipeg, Manitoba R3H 0W4

Phone: 204-806-1363

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