

'Communication of technical information in the Urban Systems-Carollo (US-C) Draft Technical Memo – Review and Refine Options Sets, regarding biochar and 'biosolids' treatment.

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Addressing the TOP – ToR:

4. *Will provide independent oversight to the work of the engineering, business case, lifecycle costing and other project analysis done post August 2015. The panel must be proactive, jointly preparing a work plan with the consultant to be proposed to the CALWMC, vetting the options in conjunction with the consultant, identifying items that should be taken to the CALWMC and the public **early in the process**. The Technical Oversight Panel (TOP), in conjunction with experienced consultants, must undertake a “**rapid assessment**” to assess if a concept or configuration is feasible or not, and whether it should be taken to the next level of analysis or not.*

and TOP Criteria #3:

3. *Resource recovery – wastewater reuse (irrigation, purple pipe), district energy systems, energy conversion systems and other community benefits, and ability to evaluate technologies to allow for **integration of other waste streams into the wastewater treatment in the future**.*

'Biosolids' and Effluents

Bringing sewage sludge to land makes the 'last error worse than the first'. The first error – screening and deep ocean outfalls is made worse by bringing the pollution to land, watersheds and waterways and eventually back to the ocean anyway – and at exorbitant cost.

What is concentrated in the 'biosolids' is of concern:

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1. **Micro-plastics** are being banned from products: however, they will persist in the environment.
2. **Micro-fibres** are produced by the laundering of certain fabrics. This will continue to be a concern in wastewater for decades.
3. **Flame-retardants and other sources of endocrine disruptors.**
4. **Multi-drug resistant organisms:** superbugs. Superbugs actually flourish in the warm wet nutrient-rich sewage treatment processes. The organisms are perhaps killed during anaerobic digestion but their plasmids are not. These persist in the environment and can be absorbed into living organisms creating whole regions that are superbug breeding areas.
5. **Hartland Landfill Leachate** averaging a million litres per day, is proposed to be mixed into sewage treatment process. It will affect the biological processes. It is highly corrosive and will shorten equipment lifespans.

"... Average leachate flow in 2013/14 was 10.95 L/s, ... The highest monthly leachate flow recorded in 2013/14 was 69,824 m3 (with an average flow rate of 26.07 L/s) for March 2014."

"Leachate from the lagoons is discharged from the site through an 8.6 km long pipeline that discharges to the Saanich sanitary sewer and ultimately to an ocean outfall at Macaulay Point."

3 Here is an excerpt page and a date table from the 213-page leachate report showing both the comprehensive data and the challenge to human eyes to read it:

AECOM

Capital Regional District

Harland Landfill Groundwater, Surface Water and
Leachate Monitoring Program Annual Report
(April 2013 to March 2014)

North of the Landfill

- Operation of the Phase 1 north purge well system (wells 80-1-0-P8 and 52-4-0-P7) continues to mitigate leachate impacts north of the landfill, as indicated by relatively stable or slowly decreasing concentrations of leachate indicator parameters at locations 20 and 21. The north purge wells should continue to reinforce leachate containment and conveyance measures north of Phase 1 by maintaining water levels below the average elevation of the lower leachate lagoon (114.29 m ASL in 2013/14). In 2013/14, the average pumping elevations in the north purge wells were 114.15 m ASL (P7) and 114.36 m ASL (P8). These wells should continue to be operated in conjunction with one another and consideration should be given to slightly lowering the set points or increasing pumping rates to improve leachate capture. This should continue to improve water quality at locations 40, 20 and 21.
- Water quality west of the lower leachate lagoon (well 40-1-1) remained impacted by leachate in 2013/14 and should continue to be closely monitored. The persistently elevated concentrations of leachate indicator parameters west of the lower lagoon (40-1-1) may indicate the need for additional leachate collection in this area. Consideration should be given to converting well 40-1-1 into a leachate collector (purge) well, or otherwise augmenting leachate collection around location 40.
- Water quality at locations 29 and 30 continues to be impacted by road salt application on Willis Point Road. Concentrations of conductivity and chloride show seasonal fluctuations and exhibit the highest concentrations in winter months, while ammonia concentrations remain relatively low. Low ammonia concentrations suggest that leachate is not the primary cause of groundwater quality impacts and that road salt may be the primary contributor to water quality degradation north of Willis Point Road.
- Dilute leachate impacts in well 36-3-1 associated with the Phase 2 leachate storage tests conducted in September 2007/08 appeared to be slowly dissipating in the immediate vicinity of Phase 2, although leachate indicator parameter concentrations increased again in 2013. Sulphate concentrations increased above historical high values, which may be the result of nearby aggregate placement. The water quality impacts associated with the leachate storage test on the shallow well at location 37 (37-3-1) suggest that the minor leachate impacts associated with the leachate storage tests have been reversed in this well. Shallow groundwater quality should continue to be closely monitored at these locations to verify the effectiveness of leachate containment. Cement used during well construction continues to impact well water quality in wells 36-2-1 and 37-2-1, as it has since the wells were installed.
- In the shallow well at location 27 (27-1-2), located at the base of the Toutle valley, sulphate continues to be present at concentrations above historical (background) concentrations throughout the year. This is likely related to quarrying, aggregate stockpiling and road building activities in this area. The deep well at this location (27-1-1) shows no signs of impacts.
- Groundwater quality 100 metres north of Phase 2 at locations 25 and 53 continued to be show low concentrations of leachate indicator parameters in 2013/14. Water quality in this area should continue to be closely monitored for changes in the future.
- Water quality at location 78 continued to report slightly elevated concentrations of conductivity and sulphate in 2013/14. Additional well development efforts appear to be improving water quality at this location which is supported by statistically significant declining conductivity concentrations in the deep well at this location. The presence of mineralized bedrock near the well or the remnants of drill cuttings in the borehole may be the cause of some elevated parameters. Water levels in well 78-1-1 are at an elevation of approximately 130 m ASL and approximately 17m above levels in the Phase 2 basin (113 m ASL). Groundwater quality at location 78 should continue to be monitored.

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Table 3-1. Groundwater Quality QA/QC - Relative Percent Difference

Station	Replicate	Date sampled	Chloride Dissolved mg/L	Sulfate Dissolved mg/L	Conductivity-electrical Dissolved µS/cm	Hardness Dissolved mg/L CaCO ₃	Alkalinity Total mg/L CaCO ₃	pH Dissolved pH	Iron Dissolved mg/L	Manganese Dissolved mg/L	Nitrogen - ammonium Dissolved mg/L	Nitrogen - nitrite Dissolved mg/L	Nitrogen - nitrate Dissolved mg/L	Nitrogen - nitrate plus nitrite Dissolved mg/L	Comments
01e-19-1-2	RFD	2014 Feb 20	0.6%	0.5%	0.3%	2.7%	na	1.4%	14.3%	3.7%	78.8%	na	4.1%	0.6%	
	FR2	2014 Feb 20	3.28	33.8	330	152	---	7.4	0.003	0.0010	0.02	< 0.01	0.215	0.22	
	FR3	2014 Feb 20	3.25	33.7	331	148	---	7.3	0.0020	0.0011	0.043	< 0.01	0.204	0.22	
01e-17-1-1	RFD	2013 Sep 13	0.0%	2.1%	0.0%	3.8%	na	1.3%	54.9%	14.4%	na	na	30.3%	28.5%	
	FR2	2013 Sep 13	12.3	43.1	453	234	---	7.8	0.0012	0.0015	< 0.005	< 0.01	0.042	0.04	
	FR1	2013 Sep 13	12.3	42.7	453	242	---	7.7	0.0011	0.0013	0.013	< 0.01	0.031	0.03	
01e-18-2-1	RFD	2013 Sep 25	3.7%	2.2%	0.5%	2.1%	na	0.9%	29.8%	8.5%	41.2%	na	8.8%	22.2%	
	FR2	2013 Sep 25	13.8	17.8	370	188	---	7.7	0.0022	0.0020	0.0079	< 0.01	0.047	0.05	
	FR1	2013 Sep 25	13.1	18.7	370	192	---	7.7	0.0017	0.0002	0.012	< 0.01	0.044	0.04	
01e-19-2-1	RFD	2013 Oct 02	0.0%	0.2%	0.0%	0.0%	na	0.0%	3.7%	0.6%	17.1%	na	23.5%	0.0%	
	FR2	2013 Oct 02	18.2	62.1	458	230	---	7.9	0.130	0.12	0.016	< 0.01	0.015	0.02	Artesian
	FR1	2013 Oct 02	18.2	62	458	235	---	7.8	0.131	0.12	0.019	< 0.01	0.019	0.02	
01e-20-1-1	RFD	2014 Mar 06	0.0%	0.7%	1.4%	3.2%	na	0.0%	na	0.3%	18.2%	na	na	na	
	FR2	2014 Mar 06	7.49	14.5	258	83.2	---	8	< 0.01	0.0348	0.16	< 0.01	< 0.01	< 0.01	
	FR1	2014 Mar 06	7.42	14.4	251	80.8	---	8	< 0.01	0.0348	0.16	< 0.01	< 0.01	< 0.01	
01e-21-1-1	RFD	2013 Sep 13	2.4%	0.0%	0.0%	0.2%	na	0.0%	29.1%	5.3%	12.0%	na	na	na	
	FR2	2013 Sep 13	12.8	13.1	355	63.8	---	8.2	0.028	0.0088	0.0052	< 0.01	< 0.01	< 0.01	
	FR1	2013 Sep 13	12.5	13.1	355	63.8	---	8.2	0.0082	0.0088	0.0055	< 0.01	< 0.01	< 0.01	
01e-21-1-2	RFD	2014 Mar 06	9.4%	1.1%	3.2%	1.6%	na	0.0%	5.4%	1.3%	30.9%	na	na	na	
	FR2	2014 Mar 06	23.4	12	412	130	---	7.6	0.041	1.65	4.1	< 0.01	< 0.01	< 0.01	
	FR1	2014 Mar 06	22.7	10.8	421	128	---	7.6	0.027	1.53	3.8	< 0.01	< 0.01	< 0.01	
01e-25-1-1	RFD	2013 Dec 04	1.3%	4.0%	0.4%	0.8%	na	1.3%	4.7%	1.7%	14.9%	na	na	na	
	FR2	2013 Dec 04	15.3	81.8	448	217	---	7.8	0.103	0.0015	0.030	< 0.01	0.043	---	
	FR1	2013 Dec 04	15.5	85.1	444	219	---	7.7	0.104	0.0011	0.031	< 0.01	< 0.01	---	
01e-27-1-1	RFD	2013 May 10	5.7%	0.0%	0.0%	0.7%	na	0.0%	34.5%	10.0%	32.8%	na	3.6%	18.2%	
	FR2	2013 May 10	7.2	11.8	187	60.8	---	8	0.0024	0.0073	0.022	< 0.1	0.08	0.8	
	FR1	2013 May 10	8.8	11.6	187	59.1	---	8	0.0019	0.0061	0.020	< 0.1	0.04	0.5	
01e-28-1-2	RFD	2013 Sep 26	2.9%	0.5%	1.2%	0.0%	na	0.0%	30.6%	13.9%	45.0%	na	3.5%	3.6%	
	FR2	2013 Sep 26	22.2	30.8	325	107	---	7	0.103	0.0128	0.012	< 0.01	0.078	0.28	
	FR1	2013 Sep 26	28	30.2	301	107	---	7	0.0752	0.0113	0.008	< 0.01	0.067	0.27	
01e-30-1-2	RFD	2013 May 23	0.3%	0.0%	0.8%	0.5%	na	2.5%	10.3%	3.4%	78.4%	na	0.0%	0.0%	
	FR2	2013 May 23	62	13.1	366	41.8	---	7.1	0.0011	0.0007	0.009	< 0.1	1.09	1.1	
	FR1	2013 May 23	61.8	13.1	369	41.8	---	6.9	0.0043	0.0007	0.017	< 0.1	1.09	1.1	
01e-37-1-1	RFD	2013 May 10	1.4%	0.5%	0.6%	5.8%	na	0.0%	8.4%	0.7%	1.7%	na	25.5%	18.2%	
	FR2	2013 May 10	7.1	63.6	405	183	---	7.5	1.03	0.309	0.08	< 0.1	0.62	0.6	
	FR1	2013 May 10	7	63.9	405	184	---	7.5	1.12	0.309	0.07	< 0.1	0.48	0.5	
01e-37-1-1	RFD	2013 Dec 04	0.0%	0.0%	0.0%	3.2%	na	2.7%	2.0%	0.7%	21.7%	na	na	na	
	FR2	2013 Dec 04	14.7	122	608	252	---	7.3	1.18	0.42	0.51	< 0.01	< 0.01	---	
	FR1	2013 Dec 04	14.7	121	608	244	---	7.5	1.71	0.417	0.53	< 0.01	< 0.01	---	
01e-38-1-1	RFD	2013 May 10	2.8%	0.4%	0.5%	0.6%	na	1.3%	4.9%	0.5%	25.5%	na	22.0%	25.0%	
	FR2	2013 May 10	7.8	24.7	371	176	---	7.9	0.004	0.0041	0.024	< 0.1	0.74	0.7	
	FR1	2013 May 10	7.8	24.6	372	178	---	7.8	0.0042	0.0041	0.021	< 0.1	0.63	0.6	

na - Not applicable, some replicates less than the detection limit
 * - Coefficient of variation greater than 25% and all replicates greater than the limit of quantitation
 * - Coefficient of variation greater than 25% with some replicates less than the limit of quantitation

Land Application of Biosolids

There is a ban on land application of biosolids. This has been sustained a number of times when motions have come forward to lift the ban. So, if the CRD does produce "biosolids" where will they go? The option put forward by Seaterra was a 25-year contract with a company that would use the solids "beneficially" up on the northern end of Vancouver Island. This can only mean "land application." Are we willing to risk someone else's land to contamination?

The US-C Memo states:

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"The ban on land application of wastewater solids represents a limitation on the single best use for the biosolids and the biochar."

Combining 'the single best use of the 'biosolids' and biochar' in one statement does not recognize their inherent differences.

Further the Memo states:

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"The end product of the gasification technology is a biochar that does not look like a soil material. It has the composition and physical properties of activated carbon but is irregular and may produce dust."

Is this useful information?

Clarification and description is needed:

1. Waste water treatment produces sewage sludge or residuals. Anaerobic Digestion produces "biosolids". The latter has been "treated" so it no longer contains live bacteria that can transmit diseases.
2. Gasification destroys substances of concern in sewage sludge.
3. Gasification processes work best with the raw sludge.
4. Syngas and biochar ash are outputs of gasification.
5. Biochar is one-tenth the volume of inputs.
6. Biochar was used to build 'terra preta' soil in South America- still fertile after thousands of years.

Further, the US-C Memo states:

⑦ *"There are other disposal options including the sample inventory provided in the following table. Estimated costs or values are based on project experiences and research across North America. However, since there is no established market for solids reuse in the region, alternative uses and costs are presented as possible outcomes **pending changes in the regulatory environment or the local market for these materials.**"*

'Pending changes in the regulatory environment' implies a removal of the ban on land application.

Does this mean the secondary sewage treatment options would be better without the ban?



Will there be forthcoming pressure to remove or skirt the ban in some way?

'Local market for these materials' could include the mixing of 'biosolids' to make a 'compost' product for market (i.e. Milagro, Tagro, etc.) This mixing of municipal sewage waste with organics, peat, humus, sand or other extenders does not mask the error of land application through market means – effectively skirting the ban.

This table from the US-C Memo shows '*disposal options including the sample inventory*'.



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Use	Biochar	Biosolids Cake	Estimated Cost/(Value) Per Tonne
			
Landfilling	X	X	\$121
Soil Amendment	X	X	\$30 – (\$15)
Potting Soil	X		variable
Fuel Source	X		(\$10 - \$30)
Mine Reclamation	X	X	\$0
Retail Sale	X		(\$10 - \$30)
Nutrient Recovery	X	X	(\$10 - \$30)
Insulation	X		Currently unknown
Air Purification	X		Currently unknown
Water Purification	X		Currently unknown

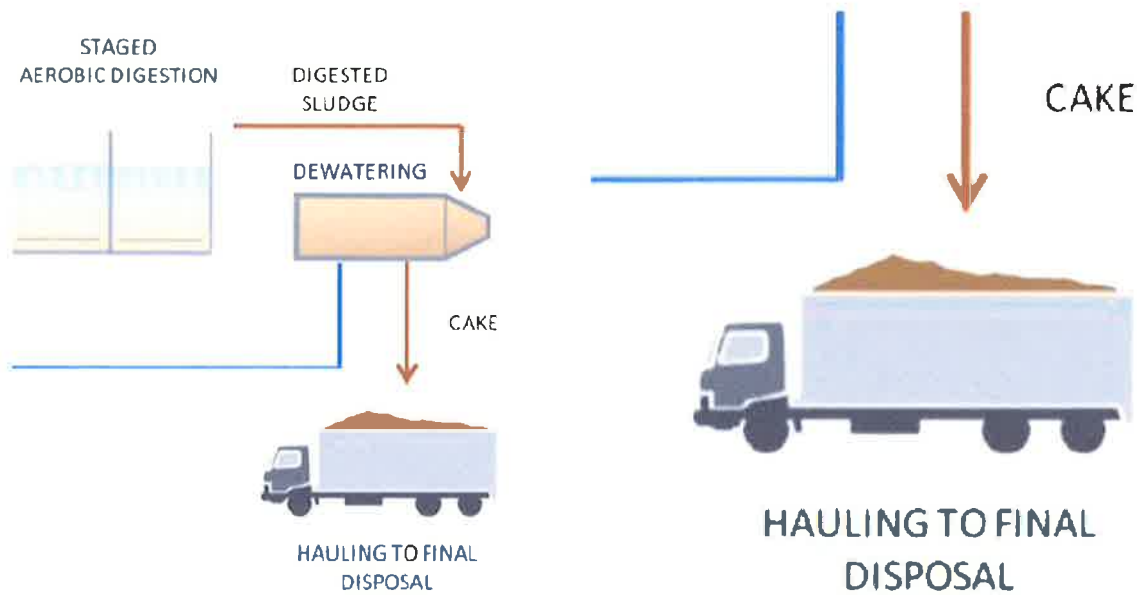
p. 16-17 WWT SYSTEM FEASIBILITY AND COSTING ANALYSIS | TECHNICAL MemoRANDUM #2

An examination of the table indicates biochar has more uses than ‘biosolids cake’. The fourth column does not distinguish which of the two we are costing, implying similarity.

The terms ‘biosolids’ and ‘cake’ are misleading in the public ear. Consider calling it dried sewage sludge.

There are ‘biosolid’ classifications and rules for their respective handling and application. Such classification and rules do nothing to mitigate the essential harm created by the application of ‘biosolids’ to land in whatever instance.

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Following excerpts from the Memo, indicate movement to land application of 'biosolids' through the processing of products for market:

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"This document would be issued to the general private market to propose on resource recovery opportunities with their technologies and provide the CRD with an all-in cost to install the technology, receive (solids or liquid) the product, process it and provide a higher value material as well as the recovered materials extracted from the product. In particular, the market for residual solids recovery (e.g. biochar, biosolids) is uncertain therefore life-cycle costing models will provisionally assume that the cost for delivery of the product a customer will be less than the cost to landfill."

p. 20 WWT SYSTEM FEASIBILITY AND COSTING ANALYSIS | TECHNICAL MemoRANDUM #2

Further, Resource Recovery Opportunities Characterization Methodology" for solids includes:

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4. **Organic Soil Amendment:** *The use of treated sewage solids to offset the use of commercial fertilizers"*

p. 18 WWT SYSTEM FEASIBILITY AND COSTING ANALYSIS | TECHNICAL MemoRANDUM #2

The Memo says:

2.3 Solids Treatment Options and Representative Designs

Solids treatment alternatives are narrowed based largely on these local boundary conditions:

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1. **The land application of any sewage solids is not allowed.** *This includes highly processed forms like pelletized solids, biochar or solids converted through thermochemical methods. New markets must be developed through partnerships to reflect the value of the by-product in an effort to offset the treatment and development costs.*

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2. *The landfilling of sewage solids is strongly discouraged by the CRD. Under extraordinary circumstances, the landfill may accept sewage solids at a cost of \$121 dollars per wet tonne.*
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3. *The CRD is considering an integrated waste resource plant that may include sewage solids in addition to select yard, garden and kitchen waste managed in an integrated manner with solid waste management services.*

Therefore, in order to apply biochar to land in the CRD the ban will have to be lifted. By proximation, does this mean the ban on 'biosolids' will be lifted too?

Which 'new markets must be developed' through which partners?

The land application of sewage sludge is not allowed.

Landfilling of sewage solids is 'strongly discouraged' by the CRD.

Land application of treated sewage solids appears again in the US-C Memo, this time referred to as 'an organic soil amendment':

3.0 Resource Recovery Opportunities Characterization / Methodology / Solids

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1. *Nutrients: Ammonia and Phosphorus recovery from the sewage solids.*
 2. *Energy: The thermal conversion of the carbon contained in the sewage solids.*
 3. *Bio plastics: The conversion or refinement of bioplastics from the sewage solids.*
 4. ***Organic Soil Amendment: The use of treated sewage solids to offset the use of commercial fertilizers.***

I thank you for doing whatever you can to uphold the ban on land application of 'biosolids' – dried sewage sludge. Is the discouragement strong enough to overcome the 'extraordinary circumstances' that will permit the storage, dumping, sequestration, 'application', in a landfill – what have you, that may accept sewage solids at a cost of \$121 per wet tonne, (at Hartland, or some other unfortunate watershed, forest, mine, downstream community, etc.)?

Conclusion and Suggested Solutions:

Earn Social License

Secondary treatment is production of 'biosolids' and 'effluent' suitable for ocean dumping that contains 'regulated' levels of pollution. Regulations and criteria for land application of 'biosolids', effluent dumping, leachate monitoring do not protect people, ocean, land, or watersheds from the fact of harmful effects – unless it leads to doing something positive about it.

Tertiary treatment is token in all the proposed option sets. We are presented with additional, incremental tertiary treatment as costly add-ons to a centralized secondary treatment plant – add-ons that could be easily trimmed for perceived cost savings.

The McLoughlin site was perceived to be lost on a political technicality. However, there is a broad lack of social license for proposed secondary treatment and conveyance, and growing awareness of the technical, environmental and health significance of the options.

'Rapid assessment' by the Technical Oversight Panel should include a full tertiary option, including a distributed system for public presentation – sooner rather than later. It will be the fastest way to earn social license at the upcoming public engagement.

The results of a poll confirm that Westside residents overwhelmingly prefer to 'pay more to build a solution that allows potential reuse of water and removed solids for energy recovery' (81%) over 'pay less to build a solution that meets current regulation but does not allow reuse of water or solids removed during treatment' (16%). When asked about support for a variety of higher and lower cost design solutions, the more expensive solutions are preferred by a strong majority of residents in all instances.'

Centralized secondary treatment with negligible resource recovery does not meet community criteria. Anaerobic digestion is dated technology. Look for in-depth analysis of advanced gasification.

Treat Hartland Landfill leachate on site before discharge into the larger system. This source control would be worth paying for.

Assure citizens the CRD has no intention to lift the ban on land application of sewage sludge, residuals, 'biosolids'; nor skirt the ban through developing a market for products that contain sewage sludge.

Eschew Obfuscation

Aided by jargon and obscure terminology, 'rapid assessment' has caused key facts and truth to be glossed over, avoided or reduced. Touted 'beneficial biosolids' terminology and outdated industry jargon obfuscates. Retire the terminology. Be clear what is being referred to in each instance. Do not suggest we eat cake.

Buy Time

Federal and provincial regulations for secondary-level treatment is not sufficient to protect the public and the environment from substances of concern that remain in the effluent. Higher levels of treatment are necessary.

The Ask

16 Please consider to request an extension to the funding deadline to allow a complete analysis of the option sets and an IRM-based full 50-year life-cycle analysis and costing of a distributed or decentralized enhanced tertiary system with advanced gasification which mainly uses existing infrastructure.

Presented by Soren Henrich
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