			OPTION 2	OPTION 3	OPTION 4	COMMON TO ALL
1	**Process -** Ability to meet all the license requiremen ts	+	◦Very flexible operation to meet the license. ◦Recommended by Stantec and approved by IRT. ◦N, P removal without chemicals.	◦Very flexible operation to meet license – Use of methanol for TN. ◦Can meet license sooner with phased construction.	◦Very flexible operation to meet license - Use of methanol for TN. ◦Can meet license sooner with phased construction. ◦P removal can be easily controlled through coagulant dosage.	◦No problem--proven technology.
		-	◦Wastewater quality fluctuations may affect TP removal (back-up coagulant is available)	◦Moderate use of chemicals to trim the process effluent (delivery issues)	◦Full dependednce on chemicals to meet the effluent permit (delivery issues)	◦Blending with storm water is common concern.(Compliance with license limits for disinfection, and other parameters?) ◦Compact design may compromise ammonia – based on monthly ammonia limit.
		?		◦How much sooner can the license be met with phased construction?	◦How much sooner can the license be met with phased construction?	◦Ammonia never to exceed the limits?
2	**Process -** Reliability and risk of failure	+	◦Ability to meet license with very minimal chemical use (supply and safety issues). ◦Very simple control system. ◦Operator familiarity with similar process at WEWPCC. ◦Use of conventional equipment and technology for BioP . ◦Use of conventional equipment and technology for TN removal. * Not dependant on chemical deliveries	◦Lower effluent TSS due to filters Performance of secondary clarifiers not critical. ◦Use of conventional equipment and technology for Bio-P. ◦Ability to meet license with minimal/medium chemical use. ◦Methanol provides consistent source of carbon for denitrification.	◦Lower effluent TSS due to filters Very simple control system. ◦Multiple cells increase reliability. ◦Methanol provides consistent source of carbon for denitrification. ◦No filamentous and bulking problem.	◦Should do better than the license. ◦WWF treatment is separate.
		-	◦Robustness of secondary clarification -consider Biogradex? ◦Lack of fermenter is a risk. ◦Possible filamentous growth potential with low carbon: can be mitigated.	◦More complex control system (Operating AS & BAF). ◦Lack of fermenter is a risk. ◦Chemical supply/cost fluctuations. ◦Possible filamentous growth potential can be mitigated. ◦Chemical delivery interruptions (MeOH)	◦Danger of chemical use. ◦Risk of power failure/intermediate pumping - compared to flow-through systems. ◦Chemical supply/cost fluctuations. ◦More components to be controlled. ◦Chemical delivery interruptions (MeOH)	◦Septage shock load potential can be mitigated by equalization and monitoring. ◦Need for pretreatment due to the need to protect media or screens.
		?	◦Stability of Bio-P removal- Ability to add FeCl3 to primaries?	◦Stability of Bio-P removal- Ability to add FeCl3 to primaries?	^Impact of ferric on UV?	
			OPTION 2	**OPTION 3**	**OPTION 4**	**COMMON TO ALL**
3	**Process -** Redundan cy / Availability of the plant	+	◦Ability to add additional media.	◦Multiple BAF cells offer built-in redundancy. ◦Existing screens sufficient for biological treatment trains. ◦Ability to bypass flow to nitrification BAF for complete treatment BOD/Nit.	◦Multiple BAF cells offer built-in redundancy.	◦inherently robust.
		-	◦Handling of media while not in service.	◦Sensitive to power due to intermediate pumping- can be mitigated by standby power	◦Single barrier for P (only chemical). ◦Sensitive to power due to intermediate pumping- can be mitigated by standby power.	◦Lack of redundancy during WWF actiflo.
		?				◦Replacement of existing screens necessary - hydraulic profile needs checking. ◦Clarification needed for process and equipment redundancy and firm capacity.
4	**Process -** Sensitivity of design to the	+	Crossed out			
		-				
		?				
5	**Process -** Sensitivity of operating cost to the sewage quality	+	◦Relatively insensitive (not chemical-dependent and not heavy power dependency)	◦Relatively insensitive (less chemical dependent). ◦Cells can be taken out-of-service and brought back in at any time.	◦Cells can be taken out-of-service and brought back in at any time.	◦Chemical treatment can readily accommodate influent water quality changes.
		-	* Influent fluctuations in BOD/TKN/TP could impact biological process performance	◦Power dependency (Intermediate pumping after PC) – mitigated by standby power. ◦Potentially sensitivity to ammonia spike.	◦Chemicals-dependent. ◦Power dependency (Intermediate pumping after PC) – mitigated by standby power. ◦Potentially sensitivity to ammonia spike.	◦By-pass and WWF (I&I and pumping station operation) should be addressed.
		?				◦Acceptance of treatment of septage. ◦Rate of development of population growth. ◦Operation and maintenance of collection system.
			OPTION 2	**OPTION 3**	**OPTION 4**	**COMMON TO ALL**
6	**Process -** Ability to operate at low DWF	+	◦Not affected by low flows.	◦Multiple BAF cells can be put off-line as needed, even for short duration.	◦Multiple BAF cells can be put off-line as needed, even for short duration.	
		-				
		?				

7	**Process -** Ability to accomodate WWF	+	◦Availability to handle high flow inherently built into design.	◦Availability to handle high flow inherently built into design.	'◦Availability to handle high flow inherently built into design.	◦Media retains nitrification capacity.
		-				
		?				◦Actiflo redundancy. ◦Peak wet (and dry) weather flow control strategy. ◦How to handle disinfection.
8	**Process -** Track records in similar climate	+	◦Extensive track record in Western Canada and USA (Kalispell MT, Durham) * Nitrification experience from Scandanavia.	◦Extensive track record of BAF.	◦Extensive track record of BAF.	◦Actiflo is a proven technology. ◦Low sensitive to low temperature.
		-				
		?		◦References will be provided by VW.	◦References will be provided by VW.	
9	**Process -** Flexibility regarding the nitrogen issue	+	◦Flexible process, denitrify as required to maintain sustainable process with available carbon i.e. No methanol.	◦Flexible process, denitrify as required to maintain sustainable process with available carbon ◦Multiple barriers for denitrification. ◦Post DN cells can be used as nitrification cells – may take weeks depending on temps.	◦Denitrification cells can be used for nitrification – may take weeks depending on temps.	
		-	◦Early consideration in detail design.	◦Early consideration in detail design. ◦Partial use of methanol.	◦Full use of methanol.	◦Driven by license requirement. ◦Must build in added process flexibility.
		?				
			OPTION 2	**OPTION 3**	**OPTION 4**	**COMMON TO ALL**
10	**Process -** Flexibility to upgrade to more stringent requiremen ts	+	◦Building a fermenter for additional bio-P & TN removal. ◦Flexible: can be done through additional filtration and specific chemical addition. ◦Add more media. ◦Bio-Actiflo on WWF is possible.	◦Flexible: can be done through additional specific chemical addition. ◦Add more BAF units. ◦Bio-Actiflo on WWF is possible. ◦Building a fermenter for additional bio-P & TN removal.	◦Flexible: can be done through more chemical addition. ◦Add more BAF units.	
		-	◦Potential hydraulic limitation under current design.	◦Potential hydraulic limitation under current design.	◦Very stringent TP may require tertiary P removal through coagulation. ◦Bio-Actiflo on WWF is not possible/no RAS/WAS stream.	
		?			Could ferric fo P removal be addedd directly to BAF as they perform solids eparation?	◦Effectiveness of disinfection quality (UV) - impact of the extent of treatment on transmissivity. ◦Hydraulic considerations when filtration is added.
11	**Construct ability -** Expandabil ity / modularity	+	◦Not land constrained.	◦Modular design of Biostyr. ◦Less land consumptive (smaller footprint).	◦Modular design of Biostyr. ◦Least land consumptive (least footprint).	◦Capability exists.
		-	◦More land consumptive (bigger footprint). ◦Not as modular as other options (larger unit processes).	◦Additional secondary clarification needed for expansion.		
		?	◦Does staging compromise redundancy? ◦Hydraulically constrained. ◦Can additional clarifer need be mitigated with Biogradex?	◦Does staging compromise redundancy? (for AS) ◦Can additional clarifer need be mitigated with Biogradex?	◦Hydraulically constrained.	◦Master buildout to ultimate site development.
			OPTION 2	**OPTION 3**	**OPTION 4**	**COMMON TO ALL**
12	**Construct ability -** Ease of constructio n (Land constrainst, Construction phasing, Constructabi lity, Ease of start-up / commissioni ng)	+		◦Reduced impact on existing plant operation during construction.	◦Reduced impact on existing plant operation during construction.	◦Logical phasing of implementation, easy of startup and commissioning. ◦Utilizing some existing structures.
		-	◦Complex implementation during construction while maintaining plant operation.	◦Instrument commissioning is more complex.	◦Instrument commissioning is more complex.	◦Possible tie-ins to cause potential disruption.
		?				◦Operation during construction should be considered during the design stage – to mitigate possible problems. ◦Not far enough along in the design process to fully assess this issue.
	Construct ability -	+		◦Less trucking during operation.	◦Minimal upset during construction. ◦Less concrete requirement (less trucking during construction).	

13	Environmental impact (Environmental risk, Traffic frequency (chemicals, sludges, …))	-	◦More trucking during construction. ◦Potential process upset during construction.	◦More trucking during construction. ◦Methanol may be needed.	◦Highest chemical addition. ◦Methanol required ◦More amount of sludge generated. ◦More trucking during operation.	
		?				◦Sludge amount unknown yet. ◦Energy & chemical consumption. ◦Review sustainability.
14	**Constructability -** Construction duration	+			◦Fastest.	
		-				
		?				◦Veolia to estimate the schedule in terms of required months. ◦Can you meet the deadline? ◦Can you extend the schedule? ◦Can we negotiate with province for early implementation of P removal by extending the schedule for nitrogen removal?
			OPTION 2	**OPTION 3**	**OPTION 4**	**COMMON TO ALL**
15	**Operation -** Ease of operation	+	◦Operator familiarity & consistency with West End. Less operator training. Easier transfer of staff between plants. ◦Minimal instrumentation requirements. ◦Least chemicals to deal with. ◦No methanol. ◦Less sludge to deal with (less trucking).	◦Medium sludge mass to deal with (less trucking). ◦BAF components fully automated. ◦Some operator familiarity (AS and Bio-P), not BAF.	◦Fully automated like water treatment plant.	
		-	◦Potential sludge bulking & foaming.	◦Increased operation complexity (BAF and AS). ◦Increased operator training. ◦Increased instrument requirements. ◦Post-denitrification with methanol. ◦Lack of operator familiarity.	◦Lack of operator familiarity. ◦More instrument control required. ◦More chemical. ◦Use of methanol. ◦More sludge production.	
		?				
16	**Operation -** Constructability - Ability to recover Phosphorus	+	◦Biological P removal favors towards P recovery.	◦Biological P removal favors towards P recovery.		
		-	◦Requires Mg and NaOH (struvite)	◦Requires Mg and NaOH (struvite)	◦Inability to recover P in the form available for plant recovery.	
		?	◦Possible benefits to be assessed (market). ◦On-site recovery potential (additional training required). ◦Recovery at North End potential.	◦Possible benefits to be assessed (market). ◦On-site recovery potential (additional training required). ◦Recovery at North End potential.		
17	**Operation -** Sludge production	+	See previous categories			
		-			◦Highest of all other options	
		?				◦Quantity need to be determined by VW.
			OPTION 2	**OPTION 3**	**OPTION 4**	**COMMON TO ALL**
18	**Operation -** Ease of maintenance	+	◦Coarse bubble aeration to reduce maintenance cost. ◦System-wide standardization. * Fewer mechanical and automation to maintain	◦Biostyr requires low maintenance.	◦Biostyr requires low maintenance.	◦Opportunity to buy quality components to reduce life-cycle cost.
		-		◦Lots of instruments (maintenance). ◦Instruments and control unknown to operator.	◦Field instrument intensive. ◦Instruments and control unknown to operator.	◦Maintenance of screen or nozzles to keep media in.
		?		◦Fine bubble aeration may increase maintenance cost.	◦Fine bubble aeration may increase maintenance cost.	◦Number of pieces of equipment and primary elements needed to be maintained.
19	**Operation -** Operator safety	+	◦No methanol hazard.			
		-		◦Methanol hazard.	◦Methanol hazard.	◦Corrosive chemical (ferric) hazard.
		?				◦Safety consideration should be built into design. ◦Number of safety risks should be identified by VW. ◦SWP(Safe Work Procedure)'s and SOP(Standard Operating Procedure)'s need to be developed prior to implementation for training purposes as this is a new process for operators & staffs.