Review of the Benefits and Challenges of Various Components of the Proposed Wetland

ASSESSMENT OF LONG-TERM MANAGEMENT ALTERNATIVES, BELLE PARK LANDFILL SITE, KINGSTON, ONTARIO

		Alternative 1: Maintain Existing Containment System			Alternative 2: Constructed Treatment Wetland			Alternative 3: Perimeter Leachate Collection and Offsite Treatment			Alternative 4: Hybrid Alternative			Alternative 5: Clay Cap
Evaluation Criteria	***Criteria Weight (A)***	**Assigned Score (B)**	**Composite Score = (A) x (B)**	**Comment**	**Assigned Score (C)**	**Composite Score = (A) x (C)**	**Comment**	**Assigned Score (D)**	**Composite Score = (A) x (D)**	**Comment**	**Assigned Score (E)**	**Composite Score = (A) x (E)**	**Comment**	**Assigned Score (F)**	**Composite Score = (A) x (F)**	**Comment**
Technical Considerations																
Maximize Reliability (baseline is assigned 0 [zero], i.e. no interception/treatment – pre-1997)	8.3	7	58.1	Reliable based on recent testing. There is the potential for future leachate seepage at new breakout locations. There is not complete containment and allows for diffuse seepage.	8	66.4	Highly reliable during spring, summer, and fall but poor ammonia removal during the winter. A long hydraulic retention time or added aeration will help provide required water quality improvement.	10	83	Installation of a barrier wall and collection system will provide the highest level of contaminant reduction to the river of all the alternatives.	9	74.7	Installation of selected additional barrier wall sections tied in with the current collection system, poplar tree plantations, and wetlands will provide a very high level of contaminant reduction to the river and will be very close to that of Alternative 3.	7	58.1	On its own, capping does not address the seepage problem since the groundwater flow issue represents the majority of the current contaminant problem. It has been assumed that the existing system will continue to be operated and therefore reliability will be similar to the existing system.
Compatibility with Existing Systems	6.7	10	67	This is the existing system.	5	33.5	Existing system will not be required. However, the existing system could be utilized during the winter period only or as a backup, as required.	5	33.5	Some of the existing piping/infrastructure/ electrical may be incorporated into the design.	9	60.3	Existing piping will be maintained and added to. Could also provide winter backup for the natural treatment areas.	8	53.6	The existing system, which is currently addressing the majority of the contaminant problem, could continue to be operated to provide some reasonable level of protection
Maximize Ease of Implementation	7.7	9	69.3	Minor changes may be required, otherwise already implemented.	5	38.5	Construction of berm into the river around the perimeter of the project site will provide some challenge, but not insurmountable. The south shore is a high energy area (wind/waves).	5	38.5	Tree removal and piping, manhole, and pump installation may have some small level of complexity. Excavation and management of waste onsite/offsite must be addressed.	7	53.9	Some small challenge to this approach will be related to the implementation of the wetland within the West Stream and the impact on the golf course during the installation of the stands of poplar trees.	4	30.8	This is a straightforward clearing and grubbing, and earth moving exercise. Disposal and management of the large volume of waste trees and brush may be a challenge depending on the management method. Requires importing of soil and working around the current collection system, and then revegetating the entire site. Regrowth will be a long-term effort. Locating a clay borrow source may be difficult without significant trucking. Traffic issues with the large volume of truck traffic must be managed.
Regulatory Considerations																
Minimize Duration of Approval (baseline is assigned 5 [five], i.e. current conditions)	7.7	5	38.5	While this alternative may appear to be a "do nothing" approach by the agencies and public, the 8 years of monitoring data has demonstrated that this system has been effective and can be a long-term solution. The system provides for interception and treatment of the majority of the leachate, with some diffuse seepage producing a minimal discharge to the environment.	3	23.1	The approval process may be a challenge since the MOE has had a mixed reaction to constructed treatment wetland projects in the past – assuming worst case scenario if wetland is to be relied on through the winter months. C of A may be granted on a provisional basis since this approach represents a major change to the current approach and since it would be releasing the treated water to the environment directly rather than being treated at a conventional WWTP. The wetland system may also require a backup system that could be the current system.	8	61.6	Due to the reliability of this approach and that the system would not be discharging to the environment, MOE approval efforts are anticipated to be minimized.	7	53.9	Due to the reliability of this approach, MOE approval efforts are anticpated to be minimized, with some added effort to qualify the use of the wetland and poplar tree technologies. The system provides for interception and treatment of the majority of the leachate with some diffuse seepage producing a minimal, but less than in Alternative #1, discharge to the environment. This approach may require the demonstration of reduced groundwater flow due to interception by the poplar tree roots that are anticipated will likely reduce pumping requirements reducing the cost of O&M.	1	7.7	With a cap alone, the approval process will likely reject this approach since it does not address the problem to a sufficient degree. Loss of or impact on the floodplain will extend to the 76 m contour and based on previous experience with the installation of the wetland along the north shore.
Maximize Regulatory Compliance	8.3	8	66.4	Already compliant based on testing.	7	58.1	Compliance is possible.	10	83	Due to the reliability of this approach, compliance is expected to be maximized.	9	74.7	Due to the reliability of this approach, compliance is expected to approach the maximum criteria.	1	8.3	Minimal regulatory compliance will be realized.
Cost Considerations																
Minimize O&M Costs (Net Present Value) 10 – <$1.0 M 9 – $1.0 M to $1.5 M 8 – $1.5 M to $2.0 M 7 – $2.0 M to $2.5 M 6 – $2.5 M to $3 M 5 – $3.0 M to $3.5 M 4 – $3.5 M to $4.0 M 3 – $4.0 M to $4.5 M 2 – $4.5 M to $5.0 M 1 – $5.0 M to $5.5 M 0 – >$5.5 M	7.5	3	22.5	NPV O&M costs: $4.2M	8	60	NPV O&M Costs:$1.8 M (Assuming the passive wetland approach is used, O&M will be minimal. If aeration is incorporated and/or the existing system continued to be used through the winter months, O&M costs are increased. For costing, it has been assumed that the existing system will be required to be operated in the winter months.)	0	0	NPV O&M Costs: $7.3 M (Additional pumping stations and power costs will add to the O&M requirements.	3	22.5	NPV O&M Costs: $4.4 M (The requirement to keep close vigil on the poplar trees to ensure they receive adequate water and are not impacted by rodents and disease in the first few years, as well as O&M on the wetland in the first years to ensure adequate growth and coverage of the wetland, will add in the short term to the current O&M costs. However, the reduced generation of leachate due to infiltration reduction and interception of groundwater is likely to reduce pumping and hence O&M costs. May be able to shut off pumps during high ET periods if groundwater impact is minimal.)	2	15	NPV O&M Costs: $4.9 M (O&M will be mowing, erosion repairs, cap integrity monitoring, summer desication prevention, etc.)
Minimize Capital Costs 10 – <$100,000 9 – $100,000 to $1 M 8 – $1 M to $2 M 7 – $2 M to $3 M 6 – $3 M to $4 M 5 – $4 M to $5 M 4 – $5 M to $6 M 3 – $6 M to $7 M 2 – $7 M to $8 M 1 – $8 M to $9 M 0 – >$9 M	8.0	9	72	Capital Costs: $0.5 M (Site grading and automation upgrades required.)	6	48	Capital Costs: $4.0 M (Cost of implementation will be relatively high due to the need to work in open water)	7	56	Capital Costs: $2.4 M	7	56	Capital Costs: $2.6 M (Added cost will be for tree planting, topsoil, and site preparation for the ski hill and golf course area, limited golf course reconstruction efforts, the construction of a treatment wetland in the south and west stream area, and testing alternative methods of leachate collection.)	1	8	Capital Costs: $8.4 M (Costs of completely capping the site as per current provincial landfill regulatory requirements for new or expanding sites.)
Social Considerations																
Maximize Public Acceptance	7.0	7	49	Public is currently accepting of existing system.	9	63	Public will generally be in favour of the improved recreational uses.	8	56	Similar to existing system.	7	49	Depending on the extent to which the poplar tree plantation encroaches on the golf course to maximize the leachate flow reduction, the golf course layout could be reduced to some extent.	1	7	Public acceptance will be negatively affected by increased truck traffic and disruption to existing site uses during the implementation stage
Maximize Public Safety	8.6	10	86	No added public risk once the system is installed.	8	68.8	Some risk to public safety if perimeter berm is open to the public (water access).	10	86	No added public risk once the system is installed.	10	86	No added public risk once the system is installed.	8	68.8	Since there will be no access during construction, no public safety will be compromised. Once the site is revegetated and public enjoyment amenities added, risk will likely be as it is currently. The new cap and limited vegetation could encourage offroad vehicle use.
Minimize Constraints to Current Recreational Use	8.8	9	79.2	Minimal impact on recreational use are currently experienced and are not expected to change.	10	88	Improves recreational use for walking and wildlife viewing, and general public enjoyment.	7	61.6	Once installed, there should be little if any constraint to the recreational use. However, the golf course will be required to be shut down for about one season during construction.	9	79.2	Once installed, there should be little if any constraint to the recreational use, but rather an improvement due to added habitat features.	5	44	There will be a fairly long period of time before the site is revegetated, thus reducing the recreational use of the site. If the golf course is not rebuilt, the recreational use is reduced further.
Minimize Negative Impact to Private Property (baseline is assigned 5 (five), i.e. current conditions)	7.0	5	35	No change to current impact.	7	49	Wetlands have been known to add to property value.	5	35	No change to current impact.	6	42	No change to current impact. In fact, there may be an improvement to property values.	1	7	The construction process and the long revegetation process will likely have a negative effect on the adjacent private property.
Minimize Degradation to Visual Character (baseline is assigned 5 (five), i.e. current conditions) (Minimization is based on the short term of 5-years)	7.0	5	35	No change to current impact.	7	49	Wetlands add to the visual character.	5	35	No change to current impact.	6	42	No change to current impact. In fact, there may be an improvement to visual character.	1	7	Visual character will suffer for a period of time and then slowly be revived.
Natural Environment Considerations																
Maximize Improvement in Water Quality	7.6	8	60.8	Currently provides sufficient contaminant control.	8	60.8	Would provide sufficient contaminant control.	10	76	Maximizes water quality improvement capability.	9	68.4	Approaches maximum water quality improvement capability.	1	7.6	Little positive impact will be noted in the geochemistry. In fact, it will become degraded without the current collection system.
Maximize Improvement to Wildlife Habitat (baseline is assigned a value of 5 [five], i.e. current conditions) (Improvement is based on the short term of 5 years)	8.8	5	44	No improvement to habitat is currently a part of this alternative.	9	79.2	An entirely new habitat type will be created with the construction of the wetland.	5	44	No improvement to habitat.	9	79.2	Added wetland and poplar stands provide increased wetland and terrestrial habitat and diversity.	1	8.8	Terrestrial habitat will be in a degraded state until revegetation occurs and matures. This will likely be 10's of years. The site will also be mowed and manicured to allow for monitoring of the vegetated cap.
Minimize Disturbance to Floodplain (based on impact to entire Cataraqui River floodplain)	9.2	10	92	No change to current impact.	7	64.4	There will be some encroachment into the river that will reduce the water surface area of the river likely a small fraction of a percentage point.	10	92	No change to current impact.	9	82.8	Some small changes to current impact since some wetland sections may be developed into the Cataraqui River similar to those constructed along the north shore.	4	36.8	The toe of the cap would likely extend out into the river.
Minimize Disturbance of and Destruction to Existing Fish Habitat	9.2	10	92	No change to current impact.	2	18.4	Near shore fish habitat will be disturbed by the wetland construction, but can also be replaced during construction. There will be a net gain in fish habitat in the long term.	10	92	No change to current impact.	7	64.4	Little change to current impact with the exception of the West Stream conversion to a wetland may change the fish species using this water corridor as well as accessibility to the wetland by fish may be somewhat hampered.	5	46	Nearshore fish habitat will be covered where the cap extends into the river but could be restored. Stormwater runoff during construction and before vegetation is firmly established will negatively impact fish habitat if sediment controls become compromised.
TOTAL COMPOSITE SCORE			**967**			**868**			**933**			**989**			**415**	

Notes:
1. Criteria Weight (A) is the weighting assigned to each of the Evaluation Criteria during a workshop by attendees representing MOE, CRCA, MNR, KEAF, City Parks
2. Assigned Score (B), (C), (D), (E), (F) is the score assigned by the project team (CH2M HILL, Malroz, and City Environment Division based on engineering experience and understanding of the site constraints
3. Composite Score is the product of the the Criteria Weight x Assigned Score
4. Each alternative represents a stand alone approach. The capping option (Alternative 5) was carried through to the alternatives section from the methods section at the request of the MOE during the June 28, 2005 workshop due the sentencing requirement that the City provide a capping plan to the MOE

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