October 20, 2020

Project No. 1420005.20

6165347 Manitoba Inc.
1383 Spruce Street
Winnipeg, MB, R3E 2V8

Attn: Andrew Marquess

Re: Parker Lands, Fulton Grove, DASZ 12/2018
Land Drainage Dry Pond in Public Reserve
Comments;

5) Public Reserve
6) Stormwater Retention

Dear Andrew:

In response to the above noted points raised in the October 15, 2020 communication from Andrew Ross, we provide the following specifically related to the proposed dry pond in the northwest portion of the Parker Lands site:

Required on-site storage is in part related to the allowable land drainage release rate as assigned by the City of Winnipeg. Due to the originally assigned land drainage release rate of 1.3 m^3/s, a significant amount of temporary stormwater storage was required. This originally assigned value was provided by design reports contributing to the Cockburn and Calrossie Combined Sewer Relief Works project, (CCSRW). The Morrison Hershfield design report, April 5, 2019 recommends achieving this storage through a combination of one on-site dry pond and five smaller vegetated trapped lows.

The CCSRW is a tremendous technical achievement, providing sewer relief for a significant area of the City. The conceptual process that delivered the CCSRW resulting in the construction of the Parker SRB made an assumption early in the process, that the future Parker Lands development would construct a retention pond to mitigate the future development land drainage discharge rate. This assumption was made even before the location of the Parker SRB was finalized. Once the location of Parker SRB was determined, the logical next step in a collaborative design process would have been to incorporate unrestricted flows from the future development into the Parker SRB as it sits on expropriated land from that very

VISION

"Major Redevelopment Sites present transformational opportunities for the redevelopment of vacant or underutilized sites within the existing urban fabric. The redevelopment of these sites will embody the principles of sustainability within a well-designed, walkable environment. The development of each site will be guided by a front end, collaborative planning process that reflects the unique character of each area, such as its existing physical and social contexts and market opportunities for redevelopment."

Complete Communities, Major Redevelopment Sites, 2012

development. An opportunity to realize the principle goals of the Complete Communities Major Redevelopment Sites Vision statement was missed by not integrating the needs of the Major Redevelopment site with the design of the relief works project.

Subsequent to the finalization of the Parker SRB, and with very little likelihood of achieving an unrestricted release rate at the late stage of the CCSRW project, Parker Lands requested equal treatment to Taylor Lands and Fort Rouge Yards, redevelopment sites within the same project boundary, being an approximate 185L/s/ha release rate, or 3.5m³/s release for the entire development. In 2019, the Water and Waste Department reviewed the impact that the requested increased Parker release rate on the functioning of the Parker SRB and found that while SRB levels exceeded original design, it still provided the required level of service to the contributing developments.

Email correspondence from WWD related to the increased release rate is appended to this letter.

We have examined the impact to the development of an increased release rate of 3.5m³/s, as negotiated with WWD in 2019. At the request of 6165347 Manitoba Inc. we have simulated the functioning of the land drainage sewer system during a 1:100 yr storm event with the 2,500 m³ storage as provided by the dry pond removed. We observe that there is no land drainage sewer surcharge to within 0.15m of surface with this dry pond completely removed from the system. Therefore, it is our considered opinion that the land drainage sewer design system will be able to function without excessive surcharge during peak periods including the 1:100 yr storm, without the northwest dry pond storage volume.

InfraCor Consulting Ltd subsequently simulated removal of all surface storage from the site and simulated pipe surcharge under this condition, with no grading revisions to mitigate the change. We determined that all surface storage may be removed from the Land Drainage design, with the use of increased pipe storage in a minority of pipe runs. Therefore, it is our considered opinion that with the increase to the allowable land drainage release rate to 3.5m³/s, there is an engineering solution that directs all surface stormwater storage to the underground system.

Multi-Use or Joint-Use Retention/Detention Facilities

Parker Lands is a 19.2 ha remnant redevelopment parcel completely constrained by existing development on all boundaries. It has remained undeveloped for several decades, and Complete Communities policy has identified it as a Major Redevelopment Site. As such, alternative servicing strategies should be implemented where they lead to design efficiency, improved site use or lower operational and maintenance costs. As an example, a standard 5 acre (2 ha) stormwater retention basin makes no practical sense on this proposed development as the remaining developable land area would greatly reduce project feasibility, and the retention basin that requires an annual operations and maintenance budget would be situated adjacent to a retention basin that was just constructed to serve, in part, the Parker catchment.

As allowed by the City of Winnipeg criteria for alternative stormwater management, minor on-site storage in specific vegetated areas such as Public Reserve B in the single-family community is still recommended. We understand that this would require a change in designation from PR to Multi-Use or Joint-Use designation. On-site, surface stormwater storage facilities are designed to restrict discharge at

localized ponding areas, thereby utilizing stormwater storage during storm events greater than the 1 in 5 yr storm. In storm events less than and including the 1 in 5 year, the outlet restriction does not cause ponding, therefore, they remain empty of water. During greater than 1 in 5 yr storm events, specific vegetated areas are designed to become inundated, with maximum levels of inundation occurring during rare, and relatively short-duration peak storm intensity periods. All catch basin infrastructure is to be located adjacent to public roadways allowing for ease of maintenance access.

This minor detention basin will perform similarly to paved commercial parking lots, with temporary ponding during storm events, and catch basin infrastructure that collects water at the low point. The only difference is that this storage basin area will be vegetated or will be a mixture of surface treatments including vegetation. Vegetation assists the process of drying these areas as the increased surface area provided by vegetation allows transpiration to remove remnant water from the surface, mainly through evaporation.

The most accurate land drainage simulations will be run during the detailed design stage, but preliminary simulations suggest that water levels will begin to lower immediately after the end of the peak rain intensity.

City of Winnipeg Criteria for Stormwater Management related to two hectare lake design stipulates drawdown time of 120 hours for the 1:100 yr storm and 48 hours for the 5 yr design storm. By comparison, when the proposed minor storage area in Public Reserve B area is simulated, we observe drawdown times, typically, of less than one hour. There is no impediment to planting of grass, trees, and shrubs in these areas, but the landscape designer will need to be aware that the areas will be subject to brief, periodic flooding during major rain events. The final landscape design drawings will provide hydraulic, maintenance and safety information as required by the City of Winnipeg Alternate Stormwater Management criteria, as appended here.

Sincerely,

InfraCor Consulting Ltd.





Douglas O. Clark, P.Eng.
Director of Operations

Professional Seal

Permit

Attach> *Email correspondence: From Marek Gajda to Andrew Marquess, March 03,2020 RE: Parks(er) Lands – Land Drainage Release Rate*

City-UDI Task Group on Criteria for Stormwater Management
Evaluation of Alternative Proposals to the Standard Minimum 5-acre (2.0 Hectare) Lake Design

From: Gajda, Marek [mailto:mgajda@winnipeg.ca]
Sent: Tuesday, March 03, 2020 3:39 PM
To: Andrew Marquess <andrew.marquess@gemequities.ca>
Cc: Patton, Geoffrey <GPatton@winnipeg.ca>
Subject: RE: Parks Lands - Land Drainage Release Rate

Andrew:

Our updated cost estimate for GEM Equities' share of the regional land drainage servicing has been determined. While the flow allowance has increased to 3.5 cubic meters per second, we have re-focused the applicable costs in the methodology which resulted in an estimated share of $734,580.00.

Please note that not all the costs are finalized at this time so the estimate will be updated in due course.

Regards,

Marek Gajda
Services Development Engineer
City of Winnipeg
T: 204-986-7626
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WATER AND WASTE DEPARTMENT
ENGINEERING SERVICES DIVISION
winnipeg.ca

From: Andrew Marquess [mailto:andrew.marquess@gemequities.ca]
Sent: Friday, December 6, 2019 4:04 PM
To: Gajda, Marek
Cc: Patton, Geoffrey
Subject: RE: Parks Lands - Land Drainage Release Rate

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Marek,

Thank you for the update and final decision excepting the cost share estimate.

Your analysis finally aligns to the InfraCor report.

I look forward to finalizing the cost share estimate which can be used whenever the City decides to allow me to proceed with the Secondary Plan and DASZ applications.

I appreciate your recent efforts to deal with this issue and get a resolution.

Regards

Andrew

From: Gajda, Marek [mailto:mgajda@winnipeg.ca]
Sent: Friday, December 06, 2019 1:50 PM
To: Andrew Marquess <andrew.marquess@gemequities.ca>
Cc: Patton, Geoffrey <GPatton@winnipeg.ca>
Subject: RE: Parks Lands - Land Drainage Release Rate

Andrew:

Water and Waste has the general results of the analysis of the increased land drainage flow rate from the DASZ lands. While the increase in peak flow will have hydraulic impacts such as increasing the stormwater retention basin water level rise, we anticipate the receiving system can accommodate the requested increased peak flow while providing an adequate level of service for others in the benefitting area.

There will be an increase to the cost share estimate. We plan to finalize the cost share estimate update from this analysis before end of month.

Regards,

Marek Gajda
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From: Gajda, Marek [mailto:mgajda@winnipeg.ca]
Sent: Wednesday, November 20, 2019 1:08 PM
To: Andrew Marquess
Cc: Patton, Geoffrey
Subject: Re: Parks Lands - Land Drainage Release Rate

Andrew:

As promised, I am writing to provide an update. We anticipate to receive the consultant report of the modeling analysis and complete our first review by Friday December 6th.

Regards,
Marek Gajda
Services Development Engineer
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On Nov 6, 2019, at 13:42, Gajda, Marek <mgajda@winnipeg.ca> wrote:

Andrew:

I have received an update regarding our consultant's work. Modelling revisions required to account for the latest construction works are in progress; we intend for this work and the analysis to be completed as soon as possible. I will provide an update in two weeks including a more precise timing of the results.

Regards,

Marek Gajda
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From: Andrew Marquess [mailto:andrew.marquess@gemequities.ca]
Sent: Friday, November 1, 2019 11:12 AM
To: Gajda, Marek
Cc: Patton, Geoffrey
Subject: RE: Parks Lands - Land Drainage Release Rate

Marek,

Given the last update was almost two months ago what is the expected timeframe for the analysis to be completed?

Andrew

From: Gajda, Marek [mailto:mgajda@winnipeg.ca]
Sent: Friday, November 01, 2019 11:10 AM
To: Andrew Marquess <andrew.marquess@gemequities.ca>
Cc: Patton, Geoffrey <GPatton@winnipeg.ca>
Subject: RE: Parks Lands - Land Drainage Release Rate

Andrew:

A brief update regarding the requested increase of release rate—the analysis is underway. Our Department is requesting an status update from our consultant regarding the analysis so that we can provide you an updated timeframe for the completion of the review.

Regards,

Marek Gajda
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From: Andrew Marquess [mailto:andrew.marquess@gemequities.ca]
Sent: Thursday, September 12, 2019 1:43 PM
To: Gajda, Marek
Cc: Patton, Geoffrey
Subject: Re: Parks Lands - Land Drainage Release Rate

Hi Marek,

Thanks for the update.

Andrew

On Sep 12, 2019, at 1:41 PM, Gajda, Marek <mgajda@winnipeg.ca> wrote:

> Hello Andrew,
>
> This is to provide an update as promised.
>
> Our Department is working to line up the engineering consultant for the analysis of the higher discharge rate. We are planning for that process to be completed by end of next week.
>
> We are planning to finalize the analysis and associated technical memorandum by the end of October.
>
> Regards,
>
> **Marek Gajda**
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>
> ---
>
> **From:** Gajda, Marek
> **Sent:** Friday, August 23, 2019 8:57 AM
> **To:** 'Andrew Marquess'
> **Cc:** Geer, Moira; Patton, Geoffrey; Zurek, Kas; Kiernan, John; Dave Stusek
> **Subject:** RE: Parks Lands - Land Drainage Release Rate
>
> Hello Andrew,
>
> Thanks for this information. The Water and Waste Department will arrange for analysis for the request flow rate, and I plan to provide an update during the week of September 9-13.

Separately, comments are forthcoming with respect to other engineering requirements identified in the ACG report for the application DASZ 12/2018.

Regards,

Marek Gajda
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From: Andrew Marquess [mailto:andrew.marquess@gemequities.ca]
Sent: Thursday, August 22, 2019 11:02 PM
To: Gajda, Marek
Cc: Geer, Moira; Patton, Geoffrey; Zurek, Kas; Kiernan, John; Dave Stusek
Subject: RE: Parks Lands - Land Drainage Release Rate

Hi Marek,

Gem would like to request a larger land drainage release rate for the Fulton Grove development.

The request is to increase the LDS release rate from ***1.3***m^3/s to ***3.5***m^3/s.

Please advise when the Water and Waste Department will be able to provide a response to this request.

As you are aware the Administration report to the City Centre community Committee on November 5, 2018 said that the DASZ application did not conform to the engineering requirements of the Water and Waste Department which was not true but still reported nonetheless. Given the inaccurate information provided about our DASZ application, I would like to have a timely and accurate response to this latest request form the Administration.

Once the decision on the request has been received, the appropriate cost share amount can be discussed.

Gem has been stating for years what the developments required LDS release rate is and although late welcomes the opportunity to have this situation rectified.

Andrew

From: Gajda, Marek <mgajda@winnipeg.ca>
Sent: Tuesday, August 6, 2019 9:43 AM
To: Andrew Marquess <andrew.marquess@gemequities.ca>
Cc: Geer, Moira <MGeer@winnipeg.ca>; Patton, Geoffrey <GPatton@winnipeg.ca>; Zurek, Kas <KZurek@winnipeg.ca>; Kiernan, John <JKiernan@winnipeg.ca>; Smith,

Braden <BradenSmith@winnipeg.ca>
Subject: Parks Lands - Land Drainage Release Rate

Hello Andrew,

The Water and Waste Department (W&W) has reviewed the InfraCor document regarding the land drainage release rate for Parker Lands. We are prepared to undertake additional modelling analysis to check a larger allowable flow rate into the Cockburn-Calrossie Combined Sewer Districts Relief Works ("relief SRB") from the GEM Equities portion of Parker Lands. The relief SRB would need to be analysed to account for a flow rate increase if requested by GEM Equities, in order to ensure the other properties relying on the system still have adequate level of service. W&W would arrange this analysis. I note that there are cost sharing implications associated with the allowable flowrate.

KGS Group issued a memorandum dated April 24, 2015 with respect to the cost sharing for the oversized "relief SRB". I am unsure if you have received a copy of this memo, so I have attached it in the case that you have not. This memo established the estimated share of cost of oversizing of the relief SRB for particular contributors, such as the Taylor Lands and GEM Equities' portion of the Parker Lands. Based on the flow rate of 1.3 L/s, the 2015 cost share estimate for the GEM Equities lands was $905,000. An increased flow rate would increase the share of cost of system to be paid as part of Development Agreement, subject to verification that a requested flow rate increase can be supported while maintaining adequate level of service for all properties relying on the relief SRB.

Could you please review this information and advise if you wish to pursue the larger allowable flow rate?

Regards,
MKG



Marek Gajda
Services Development Engineer
City of Winnipeg

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City-UDI Task Group on Criteria for Stormwater Management

Evaluation of Alternative Proposals to the Standard Minimum 5-acre (2.0 Hectare) Lake Design

Presented below are submission requirements for alternate stormwater management proposals based on the five criteria that had been developed through the review process undertaken with the joint City-UDI Task Group. The detail included for each criteria will be utilized to assess in a principled manner whether the alternative submission meets the intent of the broader criteria.

1.0 Meets the City's design requirements for design storms, hydraulics, inflow and outflow capacities, runoff coefficients and consistent with regional land drainage plan.

1.1 General

- The storm water management concept being proposed shall be consistent with the City's regional land drainage plan.

- Storm water management facilities servicing more than one privately held lot may be located on public lands, or on private lands provided appropriate caveats identifying and controlling operation and maintenance are filed against private property titles.

1.2 Design Requirements

The City will consider alternative land drainage facilities based on the following general design requirements and standards. Existing requirements identified in Tables 1 and 2 shall be considered baseline requirements for assistance in developing and evaluating alternative proposals. Any deviations from these design requirements must be identified by the developer in their submission of alternative stormwater management proposals.

Table 1
Recommended Design Requirements for Land Drainage Conveyance Systems

Enclosed Conduit or Piped Systems	Hydraulic capacity equal to or greater than a City of Winnipeg 5 year design storm (See Table A-2 Drainage Safety Guidelines for additional info).
Open Channel Systems	Local Ditches/Channels - 25 year design storm contained within channel. Regional Waterways - 100 year design storm contained within channel or floodway.
Hydraulic Calculations	Use Manning's Formula.
Hydraulic Grade Line (Enclosed Conduits)	Remains below any openings to ground level and includes appropriate allowances for minor hydraulic losses.
Inflow and Outflow	Arrange for disposal of all storm water in, from and through the development, which may be cut off from its natural drainage course.
Flow Restriction	Provide flow restriction to control maximum discharge rates to any sewer or body of water as required by the City drainage plans.
Peak Runoff Rate Calculations	May use Rational Method for Area < 100 Ha Use Hydrograph Method (e.g. SWMM) ≥ 100 Ha

Table 2
Recommended Design Requirements for Land Drainage Retention/Detention Facilities

Flood Level or High Water Level (HWL)	100 year design storm. Check Spring Condition for Tc > 6 hours.
Maximum Design Water Level Rise 25 year	1.2 m Residential. 1.8 m Industrial or Open Space (only if no backwater effect on adjacent storm water facilities).
Freeboard Elevation (from 100 year)	0.6 m.
Drawdown Time	120 hours for 100 year design storm. 48 hours for 5 year design storm.
Minimum Depth	2.5 m.
Side Slopes - (Current SRB Standard)	Varies above freeboard. On Public Lands - 7H:1V (or flatter) from freeboard to 3.0 m (hor.) from NWL. On Private Lands - 5H:1V (or flatter) from freeboard to 3.0 m (hor.) from NWL. 4H:1V from 3.0 m (hor.) from NWL to bottom.
Minimum Width	6 m or greater width at 2.5 m depth. May be reduced at bridge or crossing structures.
Inlets and Outlets	Wherever possible inlets and outlets shall be located a minimum of 0.6 m below NWL.
Minimum Outlet Structure Opening	0.45 m. Install anti-clogging protection such as trash racks or other approved devices to ensure functioning of principle outlet or spillway.
Revetment	Public Shoreline: [50 mm crushed rock on line 3.5m above and 2.0m below NWL. Private Shoreline: 50mm crushed rock or owner's responsibility
Ownership Boundary	Adjacent private landowner owns 2.5 m (hor.) into water.
Minimum Lot Depth Adjacent to Retention System	54.5 m.
Building Setback Limits measured from rear lot line	Min. of 28.4 m to any principle building. Min. of 22.9 m to any detached accessory building. Min. of 15.3 m to any temporary structures.
Public Access	0.4 Ha of land for every 1.6 Ha of impoundment area or 25 % of land reserved for public access.
Maintenance Ramp	3.0 m wide precast concrete pads 5.0 m above and 8.0 m below NWL; turfstone units above ramp
Hydraulic Calculations or Computational Methods	A detailed hydrograph method such as the EPA-SWMM must be used for final design of pipe networks, open channels, and storage facilities that incorporate regional retention/detention facilities.

Required Submittals	- Stage-discharge rating curves for each outlet and/or spillway and for combined outlet and spillway discharges. Include backwater effects.
	- Elevation-Area/Volume curves for each storage facility including notation of the storage volumes allocated for permanent residual water storage and to runoff at the 5-year, 25-year and 100-year re-occurrence intervals.
	- Routing curves for the 5-year, 25-year and 100-year design storms with time plotted as the abscissa and the following plotted as ordinates:
	  - Inflow hydrographs
	  - Outflow or discharge hydrographs
	  - Stage elevation

	- Cumulative inflow volume, discharge and storage
Drawing Submissions	The 100-year flood plain and 100-year flow line or floodway shall be indicated on the engineering plans in addition to the information normally required to build and check the design of the storm water management system.

2.0 Meets Safety Requirements

2.1 General

All retention/detention facilities must meet the City of Winnipeg's Drainage Safety Guidelines. Significant attention will be paid to multi-use or joint-use facilities that have the potential of increasing the general public's exposure to drainage hazards. The retention/detention site may present a hazard depending on site features such as playgrounds, athletic fields, etc.

Note that some of the requirements below have been listed in the previous section under "Design Requirements."

2.2 Side Slopes

Side slopes for retention/detention facilities shall respect safety, stability, ease of maintenance and aesthetics.

2.3 Inlets and Outlets

Inlet and outlet structures that incorporate and/or require safety grates in the design must be checked to ensure that dangerous pinning forces are not developed at any time during the functioning of the facility under the design event(s). This may in some instances preclude the use of the same structure as both an inlet and an outlet.

Whenever and wherever possible, inlet and outlet conduits shall be located a minimum of 0.6 metres below normal water level. Non-submerged outfalls and outfall structures shall be fenced to prevent accidental access to the receiving water course.

2.4 Access

Provisions shall be made within the retention/detention facility to permit access to and use of auxiliary equipment to facilitate emptying, cleaning, maintenance, or for emergency purposes.

2.5 Required Submittals

Submissions shall include supporting calculations and details for any drainage safety control devices included in and/or required for the development.

3.0 Compatibility with adjacent and nearby land uses.

3.1 General

Each site and proposal needs to be reviewed on an individual basis. The context of the proposal(s) is critical. The site, neighborhood and community relationships must be identified and established, and community specific solutions implemented. The solutions should encompass the needs of the entire subdivision and surrounding area not just the local area surrounding the impoundment.

Concepts should be reviewed with the Planning, Property and Development Department before embarking on detailed hydraulic computations required as part of items 1.0 and 2.0

Acceptance and evaluation will need to be on a site by site basis, depending on the context, existing open space, recreation or community potential, drainage times, soil analysis, proposed planting plans, maintenance schedules, etc.

3.2 Landscaping Plan

A landscaping plan will be required for all storm water management retention/detention facilities and ancillary park open space with sufficient information to also enable assessment of impact on hydraulics, capacity, maintenance and safety as provided in Items 1 and 2 above.

The alternative proposal shall include a landscape implementation plan and schedule, and cost sharing proposal.

3.3 Land Credit

Credit toward land dedication will be dependent upon the capability of the site to meet recreational and open space needs in the community and will be negotiated between the City and the proponent on a case-by-case basis.

4.0 Multi-use public amenity where appropriate preferred over single use facility

4.1 General

The City will consider multi-use retention/detention facilities compared to the current single-use facility standard. Following are some possible alternative concepts.

4.2 Multi-Use or Joint-Use Retention/Detention Facilities

Multi-use or joint-use detention/retention facilities that incorporate active and/or passive recreational elements may be considered if inundation is restricted to less frequent events. The following joint-use tiers or elevations versus frequency of inundation may be utilized as a starting point in evaluating various multi-use opportunities:

Table 3
Appropriate Uses for Various Frequencies of Inundation

Maximum Frequency Of Inundation	Tier	Uses
2 year	Lowest Lying areas	Semi-natural riparian (vegetated) areas
5 year	Lower elevated tiers	Picnic areas, passive turf, naturalized zone, ball fields, soccer fields
25 year	Upper elevated tiers	Court games
100 year	Above flood level	Restrooms, parking lots, slab-on-grade structures

The proposed joint-use facility will require input from various departments in the City of Winnipeg who will ultimately be responsible for operating and maintaining these types of facilities.

4.3 Linear Impoundment with Naturalized Fringe Area

Linear style lakes or impoundments may be considered for increased recreational possibilities such as canoeing, snowshoeing or alternative modes of transportation such as cycling and hiking paths. They can also be incorporated into other community amenities such regional greenbelts or parkway systems.

The developer will be required to provide appropriate signage at points around the facility and inform the general public and future homebuyers in the neighborhood that the proposed facility is a naturalized storm water management facility.

Provisions shall be made within the linear impoundment facility for access and use of auxiliary equipment for maintenance and emergency purposes through the provision of access ramps, easements, public rights-of-way, etc.

The design should also incorporate at least a biannual turnover rate in a year with average precipitation.

4.4 Wetlands

Following are guidelines to be considered when proposing the use of wetlands as a retention/detention facility in the City of Winnipeg. Wetland treatment will be subject to review by the City Naturalist and/or City Forester.

- Generally, a constructed wetland is to be about 5% of the total watershed area or drainage area, depending on the volume and quality of runoff. It is recommended that, as a minimum, constructed wetlands should be considered for storm water management only if the drainage area is greater than 20 hectares. Using the 5% rule above, this translates to a minimum constructed wetland size of 1.0 hectares (2.5 acres).

- It is recommended that a 1:1 ratio of shallow water vegetation to deep open water be considered to provide maximum habitat for waterfowl in constructed or natural wetlands intended for storm water management.

- Screening from adjacent land uses may consist of a vegetated (naturalized) buffer. For information, the City of Edmonton uses a minimum width of 8 metres from normal water level. A portion of the buffer perimeter may be reforested or allowed to be reforested by volunteer species.

- Mosquitoes inhabit most wetlands. The highest populations tend to occur in stagnant, organically rich waters. Therefore, wetlands should be designed to preclude stagnant waters wherever possible. Shading the water surface will also help minimize the mosquito problem.

- In general, the extended detention storage depth should be limited to 1.0 metres above the normal water level versus the normal water rise of 1.2 metres to 1.8 metres used in more conventional retention/detention facilities. Plant species normally found in wetland settings cannot withstand frequent water level fluctuations in excess of 1 metre.

- The developer will be required to provide appropriate signage at points around the facility and inform the general public and future homebuyers in the neighbourhood that the proposed facility is a constructed wetland operated for storm water management. It is intended to be a low maintenance, natural facility.

4.5 Offline Dry Basins

Offline or overflow type dry basins that are inundated on a relatively infrequent basis may be acceptable in large areas such as residential areas, railway yards, airports and industrial or commercial sites. These dry basins should be reviewed in a similar context to the joint-use or multi-use facilities recommended for use in recreational areas.

4.6 Ditch Storage

Generally it is not recommended that ditch storage be used for storm water management on public lands due to the inherent difficulty of designing a system that must convey and detain water at the same time. Appropriate consideration to the Drainage Safety Guidelines must be undertaken.

5.0 Lifecycle cost analysis of capital and maintenance costs to be available.

5.1 General

A proponent requesting consideration for an alternative storm water management proposal shall compare the capital cost and the ongoing operation and maintenance cost to the standard City 5-acre lake size and configuration. This cost analysis shall include the following and be submitted for the City's review.

- A life cycle cost (net present value) analysis (e.g. over 20 and 50 years) shall be provided to compare the capital cost and operating and maintenance cost of the proposed land drainage facility to the standard minimum 5-acre system.

- The Capital cost and the cost of operation and maintenance of the facility must be addressed in the proposal and any proposed conditions that would ultimately be included in the development agreement.

5.2 Capital Cost

- The Capital cost of the facility shall be identified separately from the Operation and Maintenance Costs.

- Developer Payback of the Capital cost of the facility will be based on its engineering function as a stormwater retention/detention facility and will be compared to the standard City 5-acre lake design. This clause does not limit or prevent the developer from seeking additional paybacks or credit for other uses of the land beyond a stormwater retention facility.

- Developer Payback shall be in accordance with Clause 7 of the Development Agreement Parameters (July, 1989).

5.2.1 Capital Cost Criteria

The City will review the Capital cost of alternative land drainage facilities compared to the standard 5-acre lake design based on the following items: Note the items listed may not be all-inclusive and the developer is expected to provide additional information as necessary to accurately portray the capital cost of the proposed facility.

Table 4
Capital Cost Items

Capital Cost Item	Unit	Quantity	Price	Amount
Excavation	M^3			
Grading	M^2			
Compaction	M^2			
Revetment	M^2			
Sodding	M^2			
Seeding	M^2			
Inlet Control Structures	Lump sum			
Outlet Control Structures	Lump sum			
Manhole bases	Each			
Manhole risers	Vert. M			
Manhole frames and covers	Each			
Inter-connecting piping	Lin. M.			
Outfall and piping	Lump sum			
Rip Rap	M^3			
Television Inspection	Lin. M.			
Concrete Approach	M^2			
Barrier Curb	Lin. M.			
Turf stone	M^2			
Maintenance Ramp concrete pads	M^2			
Make-up well	Lump sum			
Sod Maintenance - Warranty	M^2			

5.3 Operation and Maintenance

5.3.1 Operation and Maintenance Cost Criteria

The City will review the operation and maintenance costs of alternative land drainage facilities compared to the standard 5-acre lake design based on the following items: Note the items listed may not be all-inclusive and the developer is expected to provide additional information as necessary to accurately portray operation and maintenance costs of the proposed facility. The City can assist in the cost derivation based on budget funds currently allocated for certain activities. Examples of typical 2000 costs for certain items are shown below.

Table 5
Operation and Maintenance Cost Items

Type of Maintenance	Interval	Unit	Quantity	Price	Amount
Lake and Waterway Areas					
Herbicide / Weed Control	Every year	Ha			
Vegetation Maintenance (aquatic/shoreline fringe)	Every 5 years	Ha			
Vegetation Maintenance (upland/flood fringe)	Every 5 years	Ha			
Sediment Removal (front end loader	As required	M^3			
Sediment Removal (vacuum truck)	As required	M^3			
Remove Shoreline Debris	As required	Each			
Remove Floating Debris	As required	Each			
Aquatic Weed Harvesting	As required	Ha		* $1516	
Inlet/Outlet Pipe Maintenance	As required	Each			
Revetment Replacement	As required	M^2			
Open Areas					
Grass Cutting	3 x per year	Ha		* $1100	
Litter Removal	2 x per year	Ha		* $400	
Weed Control	Every year	Ha			
Limestone Paths	As required	M^2			
Recreational Areas					
Sports Field Preparation	Every year	Each		* $1215	
Play Equipment Maintenance	As required	Each		* $900	
Rink Installation & Maintenance	Every year	Each		* $2000	
Wetlands					
Tree plantations	Every year	Ha		* $350	
Shrub plantations	Every year	Ha		* $350	
Woodland and forest areas Occasional trimming / thinning	As required	Ha		* $350	
Edging around naturalized areas	As required	Linear M.			
Boardwalks	As required	Each			
Interpretive Signs	As required	Each			
Benches	As required	Each			

- Estimated 2000 rates

5.3.2 Operation and Maintenance Costs Estimates

If the maintenance costs are forecast to be higher, the following items may be considered in order to mitigate the cost to the City:

- A capital contribution from the developer equivalent to the additional maintenance costs.
- More private ownership and responsibility of shoreline to reduce City maintenance costs.

6.0 Joint UDI-City Advisory Committee

It is proposed that an Advisory Committee comprised of City staff and UDI representatives and/or their consultants be established to review alternative stormwater management proposals that are submitted for consideration. It is envisioned that the Advisory Committee would consist of 6 members, 3 each from the City and UDI. City representatives would be one each from the Water and Waste Department, the Planning, Property and Development Department, and the Public Works Department. Operating protocol for the Advisory Committee would be as follows:

- Participation in the Advisory Committee would be voluntary.
- UDI to submit list of volunteers to participate in the Advisory Committee.
- Alternative proposals would be reviewed by Advisory Committee members that are not proponents in the development under consideration.
- The developer and their consultant would be invited to meet with the Advisory Committee to explain and provide any additional clarification on their alternative proposal.
- Decisions of the Advisory Committee will be reached by consensus. Dissenting comments will be recorded and all advice will be reported back to the City and the proponent.
- Advice provided by the Advisory Committee shall not be binding on the City.
- Feedback of the Advisory Committee will be provided back to the proponent within one month of receipt of the alternative proposal.
- The City will work with proponents to identify additional information required when submissions are considered incomplete.
- The criteria for evaluation of alternatives, membership in the Advisory Committee, and the function and effectiveness of the review process shall be reviewed with the Joint City-UDI Task Group on Criteria for Stormwater Management in about one year but no later than March 1, 2002, or within a mutually agreed upon timeframe.