



April 27, 2020 Public Hearing

Item PUD 2020-0272

**BRODYLO FAMILY'S
PRESENTATION TO CITY COUNCIL**

Overview of Presentation

- These submissions supplement the in-writing package that was already provided to City Council
- Overview of our oral submissions to Council:
 - (1) The Providence Master Drainage Plan (“MDP”) potentially violates provincial legislation if 53rd Street is designed to act as a “**dam**”
 - (2) Critical predevelopment **studies were not completed** on our lands
 - (3) The MDP has **no modelling available for properly functioning culverts** between our lands and the ASP boundaries
 - (4) The **natural water flow from our north and south wetlands into the ASP’s** western boundary is **significantly greater than 2.4 L/s/ha** yet the MDP accounts for a max rate of only 2.4 L/s/ha

PROVINCIAL REGULATIONS RE: DESIGNING DAMS

- The Providence MDP contains no analysis of whether 53rd St functions as a dam impounding water on our lands
- A “**dam**” is defined by *Water (Ministerial) Regulation*, AR 205/98 as “**a barrier that is designed... for the purpose of retaining, storing or diverting water...** and includes all other works associated with such a barrier”
- The Providence ASP and the MDP imply that 53rd St will barricade water on our lands.
- If the City does not intend 53rd St to function as a dam, the MDP will need to be altered to ensure proper flow through of water from the Brodylo lands into Providence’s western edge.
- If the City does intend 53rd St to act as a dam, provincial processes are legally required and must be followed to protect land owners and ensure public safety

FAILURE TO CONSULT WITH BRODYLOS RE: STUDIES

- We have repeatedly advised the City that drainage studies of our lands need to be completed prior to approving a Providence MDP or ASP.
- We have been waiting for the City, EXP, and Providence landowners to consult with us so that these critical studies are completed and the ASP is not approved without key information before Council.
- We are, and always have been, willing to grant access to our lands to qualified professionals to complete proper studies.
 - For reasons that remain unexplained, the City has not done this.
 - At no time did City staff or developer consultants request access to our property to study the Wetlands prior to completing the 2018 Draft MDP, SMDPs, or the 2020 Final Approved Master Drainage Plan.
- At a minimum, this **Council should not approve the ASP and any development within Providence until these studies are completed and proper natural predevelopment flow of water from our lands into Providence is calculated.**

FAILURE TO COMPLETE STUDIES ON BRODYLO LANDS

- It is patently unreasonable, and procedurally unfair for this Council to approve this ASP when critical studies are not done and the City intends to bind our family (and other landowners) to this planning in the future.
- The City's Water Resources acknowledges that our lands were not studied during the Providence ASP process – despite the well-documented connection between our lands and Providence drainage courses.
- This Council therefore has knowledge that these studies were not done and that, if they were done, predevelopment modelling and assumptions relied upon in the MDP and the ASP are reasonably likely to be false.

CULVERT MODELLING

- The City has completed no modelling addressing what will be done in Providence if the damaged and partially blocked culverts connecting our lands to Providence are fixed or upgraded.
- Culverts are partially regulated by the provincial *Water Act* and City planning must be consistent with provincial legislation.
- All modelling completed to date in the MDP assumes (without the benefit of drainage studies of our lands) that the existing flow of water is the proper and natural flow of water predevelopment.

LIKELY FLOW RATES NOT ACCOUNTED FOR IN THE 2020 MDP

- Our family anticipates, based on guidance from our experts, and as recognized by Urban Systems, that the likely flow rates from both the south and north wetlands into Providence across 53rd St **are magnitudes larger than 2.42 L/s/ha.**
 - This number may actually be revealed to be much higher if proper studies are completed.
- The MDP only allows for a flow rate, at an upper limit, of **2.42 L/s/ha - less than 1/5 of the likely minimum natural water flow of water from the south wetland.**
- The MDP assumes that there is no outflow of water from our lands – which Urban Systems identified as patently false.
 - The MDP assumes, contrary to all available evidence (and the Urban Systems review) that there is no west to east flow from our lands into Providence.
 - This clear error will be rectified if a proper study is completed on our lands.

MDP MAY VIOLATE EXISTING LEGISLATION

- The question for this Council is what will be done if the MDP, as is almost certainly the case, does not have accurate information about large volumes of water flow.
- If we are correct, the MDP implicitly violates the *Water Act* as it entails the impoundment of water contrary to natural drainage courses and designs 53rd St to act as a dam.
- This Council must not approve a MDP that it knows, based on the evidence before it, may reasonably entail violations of the *Water Act* and other legislation.
- *In sum: this Council ought to order that the necessary studies be done and then rehear approval of this ASP with proper information.*

ADDITIONAL INFORMATION

Fish Creek Maximum Allowable
Flow Rate = 2.42 L/s/ha = 1/100
year 24 hour Peak Flow = 40 mm

How was this rate modelled by the 2020 Master Drainage Plan (MDP) for Brodylo Farms Lands?

Predevelopment water runoff from Brodylo lands outflow occurs at a much higher rate than 2.42 L/s/ha and yet no outflow is modelled at the buried culvert locations in pre or post-development.

2020 MDP Quote:

“Future Staged Master Drainage Plans (SMDPs) must adhere to the stormwater concepts and policies established in the Providence Area Structure Plan (ASP) as informed by this MDP, and to the guidelines, standards and specifications outlined in the 2011 Stormwater Management & Design Manual (or current) and subsequent Industry Bulletins.”

Pre-Development Water Storage Volume Summary of all Wetlands in Providence

WL02= North Wetland; WL06 = South Wetland

WL02 = Modelled to contain **11,960 m3**@ 19% Full = 62,947 m3 @ 100% Full = 16.8 Swimming Pools

WL06 =Modelled to contain **86,486 m3** @ 23% Full = 376,026 m3 @ 100% Full = 100.3 Swimming Pools

Storage Volume Summary

Storage Unit	Average Volume 1000 m3	Avg Pcnt Full	Evap Pcnt Loss	Exfil Pcnt Loss	Maximum Volume 1000 m3	Max Pcnt Full	Time of Max Occurrence days hr:min	Maximum Outflow CMS
WL01	5.762	37	0	0	6.469	41	0 09:05	0.287
WL02	8.801	14	0	0	11.960	19	1 00:00	0.000
WL03	17.329	24	0	0	20.373	28	1 00:00	0.739
WL04	19.846	10	0	0	23.637	12	1 00:00	0.017
WL05	6.822	6	0	0	8.437	8	0 12:43	0.021
WL06	75.825	20	0	0	86.486	23	1 00:00	0.000
WL07	10.858	11	0	0	13.182	13	1 00:00	0.000
WL08	9.158	18	0	0	10.752	21	1 00:00	0.000
WL09	2.715	7	0	0	3.243	8	0 13:09	0.007
WL10	18.937	15	0	0	23.004	18	1 00:00	0.000
WL13	9.619	7	0	0	14.296	11	0 10:35	0.413
WL14	23.184	22	0	0	28.896	27	1 00:00	0.000
WL15	13.166	11	0	0	16.795	14	0 14:32	0.083
WL16	36.385	24	0	0	47.060	31	1 00:00	0.053
WL17	9.726	12	0	0	14.888	18	1 00:00	0.000
WL18	11.678	25	0	0	14.157	30	1 00:00	0.003
WL19	1.690	1	0	0	3.892	2	0 08:27	0.968
WL21	6.266	13	0	0	8.968	19	0 09:35	0.427
WL22	9.001	10	0	0	11.391	13	0 11:45	0.092
WL23	26.954	24	0	0	31.081	28	1 00:00	0.000
WL24	4.908	17	0	0	5.871	21	0 12:29	0.016
WL25	1.312	2	0	0	2.184	4	0 08:35	0.176
WL26	3.532	11	0	0	5.300	17	0 10:11	0.244
WL27	5.024	29	0	0	6.945	40	0 14:20	0.107

Zero
Outflow
Modelled



Post Development Runoff Volumes ‘Lumped’ together

Areas with storage and irrigation volumes are subtracted from runoff to meet overall Target of 2.42 L/s/ha = 40 mm Discharge to Fish Creek
North Wetland area = 12; South Wetland Area is = 16 Note that Sub-Catchment 16 is double the pre-development size from 76.58 ha to 120.49 ha

4.10.3 Runoff Volumes

A summary of estimated average annual runoff volume discharges by each pond under post-development conditions are listed in Table 4.6 – Post-development Runoff Volume Discharges. The results demonstrate that water re-use in the form of irrigation of public open spaces can help to meet runoff 40mm volume target if the irrigable areas identified in Table 4.5 – Stormwater Reuse by Irrigation can be achieved.

Table 4.6 – Post-Development Runoff Volume Discharges

Sub-catchment ID	Pond ID	Discharge to Fish Creek (mm)
1 to 3	1 to 3	39
4	4	38
5	5	40
6	6	39
7	7	39
8	8	39
9	9	40
10	10	40
11	11	39
12	12	38
13	13	38
14	14	39
15	15	39
16 to 23	16 to 23	39
Total		40

It should be noted that at the time of preparation of this MDP report, the volume target discharge to Fish Creek was voluntary; regardless of this, the City of Calgary Water Resources department requested the MDP analysis include the previously established volume control target until the City-wide volume control targets study is finalized. Future SMDPs will need to be prepared based on established runoff volume targets set at the time of SMDP report preparation and take into account reasonable irrigable areas based on land use as well as the capital and operational costs of using stormwater for irrigation.

Pre-Development PCSWMM Link Summary

(connection of drainage from one node to another node)

Shows WL05 (Dream) flow into WL06 (Brodylo South Wetland)

Link Summary

Name	From Node	To Node	Type	Length	%Slope	Roughness
CLV1	J31	J16	CONDUIT	57.4	2.6472	0.0240
CLV2	J30	J29	CONDUIT	19.2	0.4158	0.0240
CLV3	J5	J23	CONDUIT	15.8	-0.7590	0.0240
CLV4	J1	J24	CONDUIT	16.7	1.9753	0.0240
CLV5	J25	J26	CONDUIT	19.7	-0.6082	0.0240
CLV6	J32	J18	CONDUIT	9.4	1.1753	0.0240
CLV7	J27	J28	CONDUIT	36.3	0.8811	0.0240
C-NE	J24	FC-OF5	CONDUIT	643.2	2.8121	0.0500
C-NW1	J9	J11	CONDUIT	809.1	1.8467	0.0500
OVL5	WL03	J1	CONDUIT	996.6	2.3928	0.0500
OVL6	WL05	WL06	CONDUIT	376.6	0.3452	0.0500
OVL7	WL06	J25	CONDUIT	605.9	0.1452	0.0500
OVL8	J26	WL07	CONDUIT	241.8	0.3475	0.0500
OVL9	WL08	WL07	CONDUIT	208.4	0.4319	0.0500
Road	WL02	WL02-Spill	CONDUIT	93.1	2.1486	0.0160
W1	J31	J16	WEIR			
W2	J30	J29	WEIR			
W3	J5	J23	WEIR			
W4	J1	J24	WEIR			
W5	J25	J26	WEIR			
W6	J32	J18	WEIR			
W7	J27	J28	WEIR			

PCSWMM Link Flow Summary: Volume of Water Modelled to Outfall from Wetlands: 2020 MDP

CLV5 = Culvert at South Wetland, OVL6 = Overland flow from Dream Property from west side of South Wetland, OVL7 = Overland flow from Brodylo Land across 53rd Street, W5 = Weir Dam at 53rd St. Culvert Location; Road = Road at North Wetland buried culvert;
Note: All outflow listed as ZERO, except massive amount of water modelled to inflow from Dream's property (OVL6) to the West of Brodylo property into South Wetland = WL06
Grossed up to a full 24 hour flow

Link Flow Summary

Water flowing
out of South
Wetland = Zero

Link	Type	Maximum Flow CMS	Time of Max Occurrence days hr:min	Maximum Veloc m/sec	Max/ Full Flow	Max/ Full Depth	Maximum Volume m3
CLV1	CONDUIT	1.064	0 08:20	2.21	0.85	0.98	30.13
CLV2	CONDUIT	1.202	0 11:18	2.51	2.60	1.00	9.67
CLV3	CONDUIT	0.988	0 07:55	3.49	3.41	1.00	4.47
CLV4	CONDUIT	0.329	0 10:48	2.46	1.52	0.95	2.60
CLV5	CONDUIT	0.000	0 00:00	0.00	0.00	0.00	0.00
CLV6	CONDUIT	0.029	0 07:47	0.98	1.16	0.97	0.35
OVL4	CONDUIT	1.170	0 07:31	0.27	0.19	0.85	2353.17
OVL5	CONDUIT	0.000	0 00:00	0.00	0.00	0.50	9967.11
OVL6	CONDUIT	0.021	0 12:43	0.01	0.00	0.39	1844.89
OVL7	CONDUIT	0.000	0 00:00	0.00	0.00	0.00	0.00
OVL8	CONDUIT	0.000	0 00:00	0.00	0.00	0.37	1299.30
OVL9	CONDUIT	0.000	0 00:00	0.00	0.00	0.37	1119.96
Road	CONDUIT	0.000	0 00:00	0.00	0.00	0.00	0.00
W1	WEIR	0.000	0 00:00			0.00	0.00
W2	WEIR	0.000	0 00:00			0.00	0.00
W3	WEIR	8.221	0 08:07			0.36	0.00
W4	WEIR	0.163	0 10:58			0.07	0.00
W5	WEIR	0.000	0 00:00			0.00	0.00
W6	WEIR	1.624	0 07:49			0.10	0.00
W7	WEIR	0.000	0 00:00			0.00	0.00

Pre-Development PCSWMM Outfall Loading Summary: 2020 MDP

No Drainage is Modelled to Outfall from North Wetland
WL02 or South Wetland WL06

Storage Volume Summary

Storage Unit	Average Volume 1000 m3	Avg Pcnt Full	Evap Pcnt Loss	Exfil Pcnt Loss	Maximum Volume 1000 m3	Max Pcnt Full	Time of Max Occurrence days hr:min	Maximum Outflow CMS
WL01	5.762	37	0	0	6.469	41	0 09:05	0.287
WL02	8.801	14	0	0	11.960	19	1 00:00	0.000
WL03	17.329	24	0	0	20.373	28	1 00:00	0.739
WL04	19.846	10	0	0	23.637	12	1 00:00	0.017
WL05	6.822	6	0	0	8.437	8	0 12:43	0.021
WL06	75.825	20	0	0	86.486	23	1 00:00	0.000
WL07	10.858	11	0	0	13.182	13	1 00:00	0.000
WL08	9.158	18	0	0	10.752	21	1 00:00	0.000
WL09	2.715	7	0	0	3.243	8	0 13:09	0.007
WL10	18.937	15	0	0	23.004	18	1 00:00	0.000
WL13	9.619	7	0	0	14.296	11	0 10:35	0.413

South Wetland Volume =
86,486m3 @ 23% Full
= 376,026m3 @ 100% Full

**= 100.3 Olympic Sized
Swimming Pools**
OR = 433.6m x 433.6m x 2 m
deep giant pool

Outfall Loading Summary

Outfall Node	Flow Freq Pcnt	Avg Flow CMS	Max Flow CMS	Total Volume 10^6 ltr
FC-OF-1	49.19	0.437	1.244	14.270
FC-OF2	95.81	1.051	6.326	66.042
FC-OF-2	82.51	0.231	1.281	12.463
FC-OF3	81.99	1.997	6.563	112.546
FC-OF-3	49.22	1.002	2.852	32.711
FC-OF4	45.96	0.417	1.281	12.630
FC-OF5	82.52	0.654	2.588	36.910
RDL-OF	0.00	0.000	0.000	0.000
RTC-OF1	82.35	0.847	3.049	46.599
RTC-OF2	82.89	0.192	0.736	10.962
WL02-Spill	0.00	0.000	0.000	0.000
System	59.31	6.828	23.003	345.133

Table 3.5 PCSWMM Pre-Development Runoff Volume Results from 2020 MDP

Table 3.5 — PCSWMM Runoff Volume Results

Sub-catchment ID	Area (ha)	Average Annual Runoff
S01-1	47.4	51
S01-2	39.6	52
S01-3	108.6	51
S02	25.5	105
S03	12.7	134
S04	36.5	54
S05	33.5	119
S06	72	52
S07	27.6	57
S08	23.7	57
S09	5.8	59
S10	14.4	55
S11	52.4	83
S12	40.1	83
S13	29.5	71
S14	64.6	53
S15	12.2	58
S16	98.3	53
S17	161.7	53
S18	40.2	52
S19	23	55
S20	9.4	169
S21	60.4	52
S22	61.3	53
S23e	76.6	129
S23w	18.1	103
S24	12	132
S25	20.4	124

S26	6.5	108
S27	37.6	96
Sub-catchment ID	Area (ha)	Average Annual Runoff
S28	29.5	79
S29	34	67
S30	54.7	70
S31	75	82
S32	25.2	88
S33	33.4	95
S34	28.8	56
S35	50.8	53
S36	27.2	56
S37	37.5	83
S38	10.5	90
S39	7.1	89
S40	15.1	76
S41	5.9	107
S42	26.3	51
Total Study Area	1732.6	70

3.7.2 Pre-development Peak Runoff Rate

The PCSWMM model was utilized to obtain the peak runoff rate during a 1:100 year 24 hour single event utilizing a Calgary Chicago Design Storm. The continuous model results provided the peak runoff using the recorded rainfall data over 57 years. The results are tabulated below in **Table 3.6 – Peak Flow Results:**

Table 3.6 – Pre Development Peak Flow Model Results for 1/100 year = 2.42 L/s/ha = 40 mm Fish Creek Drainage Discharge Target. Note Discharge not shown for S12 or S16 (Areas include Brodylo Lands)

Table 3.6— Peak Flow Results

Natural Channel ID	Continuous Simulation (m ³ /s)	Single Event 24h-100y (m ³ /s)
C NW 1	2.01	1.28
C-NW1	2.37	1.83
C NW2	3.43	2.31
C-NW3	6.32	4.69
C-NW4	2.37	1.84
C-NW5	7.99	5.79
C-NW6	8.84	6.33
C NE	3.87	2.59
C S1	0.18	0.11
C S2	3.37	2.31
C-SE1	1.75	0.97
C SE2	0.73	0.00
C-SE3	2.49	1.85
C-SE4	3.75	2.28
C-SE5	2.64	1.30
C-SE6	2.28	1.62
C-SE7	4.69	3.05

The analysis calculates the 1:100 year 24 hour event peak release rate from the study area based on existing/predevelopment conditions is 23.00 m³/s; equivalent to an overall 13.28 L/s/ha release rate for the study area. Potential Surface Drainage Connections

The PCSWMM schematic with the name of the potential drainage courses for illustration is in *Appendix E - PCSWMM Model Data for Pre-development*.

All four significant drainage courses were analyzed, the analysis schematic for each of these drainage channels and their corresponding flow duration curve are presented below.

North Wetland Sub-catchment area = S02

Map from 2020 MDP, shows grouping of S02 with S19-S22 despite

**Modelling zero discharge due to blocked culvert: = Modelled as
Storage, Irrigation = Negative L/s/ha discharge rate**

Project Title: Providence Master Drainage Plan 30
Project Number: CGY-00047001-00



Northeast Drainage Course

South Wetland Sub-catchment area = S23 Map from 2020 MDP, shows grouping of S23 with S24-S36 despite Modelling **zero discharge due to blocked culvert: = Modelled as Storage, Irrigation = Negative L/s/ha discharge rate**

Project Title: Providence Master Drainage Plan 32
Project Number: CGY-00047001-00



Southeast Drainage Course

From 2020 MDP Post Development Runoff Summary:

S16 = 120.49 ha (includes **South Wetland**, but double pre-development size) -

Peak Runoff = 22.28 m³/s = 22,280 L/s per 120.49 ha = 184.9 L/s/ha

S12 = 65.11 ha (includes **North Wetland**) – Peak Runoff 11.31 m³/s = 11,310 L/s
per 65.11 ha = 173.7 L/s/ha

Subcatchment Runoff Summary

Subcatchment	Total Precip mm	Total Runon mm	Total Evap mm	Total Infil mm	Total Runoff mm	Total Runoff 10 ⁶ ltr	Peak Runoff CMS	Runoff Coeff
S1	89.58	0.00	0.00	28.11	60.51	35.91	10.79	0.676
S10	89.58	0.00	0.00	29.59	59.14	74.94	22.00	0.660
S11	89.58	0.00	0.00	28.80	59.87	14.45	4.30	0.668
S12	89.58	0.00	0.00	29.59	59.14	38.50	11.31	0.660
S13	89.58	0.00	0.00	29.59	59.14	38.80	11.39	0.660
S14	89.58	0.00	0.00	29.59	59.14	35.22	10.34	0.660
S15	89.58	0.00	0.00	25.61	62.88	84.88	26.16	0.702
S16	89.58	0.00	0.00	27.61	60.98	73.48	22.28	0.681
S17	89.58	0.00	0.00	28.02	60.59	39.99	12.09	0.676
S18	89.58	0.00	0.00	28.02	60.59	31.22	9.44	0.676
S19	89.58	0.00	0.00	28.47	60.18	59.95	17.94	0.672
S2	89.58	0.00	0.00	29.59	59.14	39.14	11.49	0.660
S20	89.58	0.00	0.00	29.59	59.14	35.55	10.44	0.660
S21_N	89.58	0.00	0.00	29.59	59.14	8.42	2.47	0.660
S21_S	89.58	0.00	0.00	29.59	59.14	7.22	2.12	0.660
S22	89.58	0.00	0.00	24.04	64.37	43.10	13.34	0.719
S23	89.58	0.00	0.00	15.31	72.31	37.87	11.57	0.807
S3	89.58	0.00	0.00	29.59	59.14	44.86	13.17	0.660
S4	89.58	0.00	0.00	29.59	59.14	55.55	16.31	0.660
S5	89.58	0.00	0.00	29.59	59.14	38.75	11.38	0.660
S6	89.58	0.00	0.00	28.47	60.18	24.05	7.20	0.672
S7	89.58	0.00	0.00	29.59	59.14	50.81	14.92	0.660
S8	89.58	0.00	0.00	28.47	60.18	29.64	8.87	0.672
S9	89.58	0.00	0.00	29.59	59.14	75.91	22.29	0.660

Note: No outflow discharge Modelled in 2020 MDP for either Wetland through existing culverts: Result = 53rd Street acts as a Dam at these locations