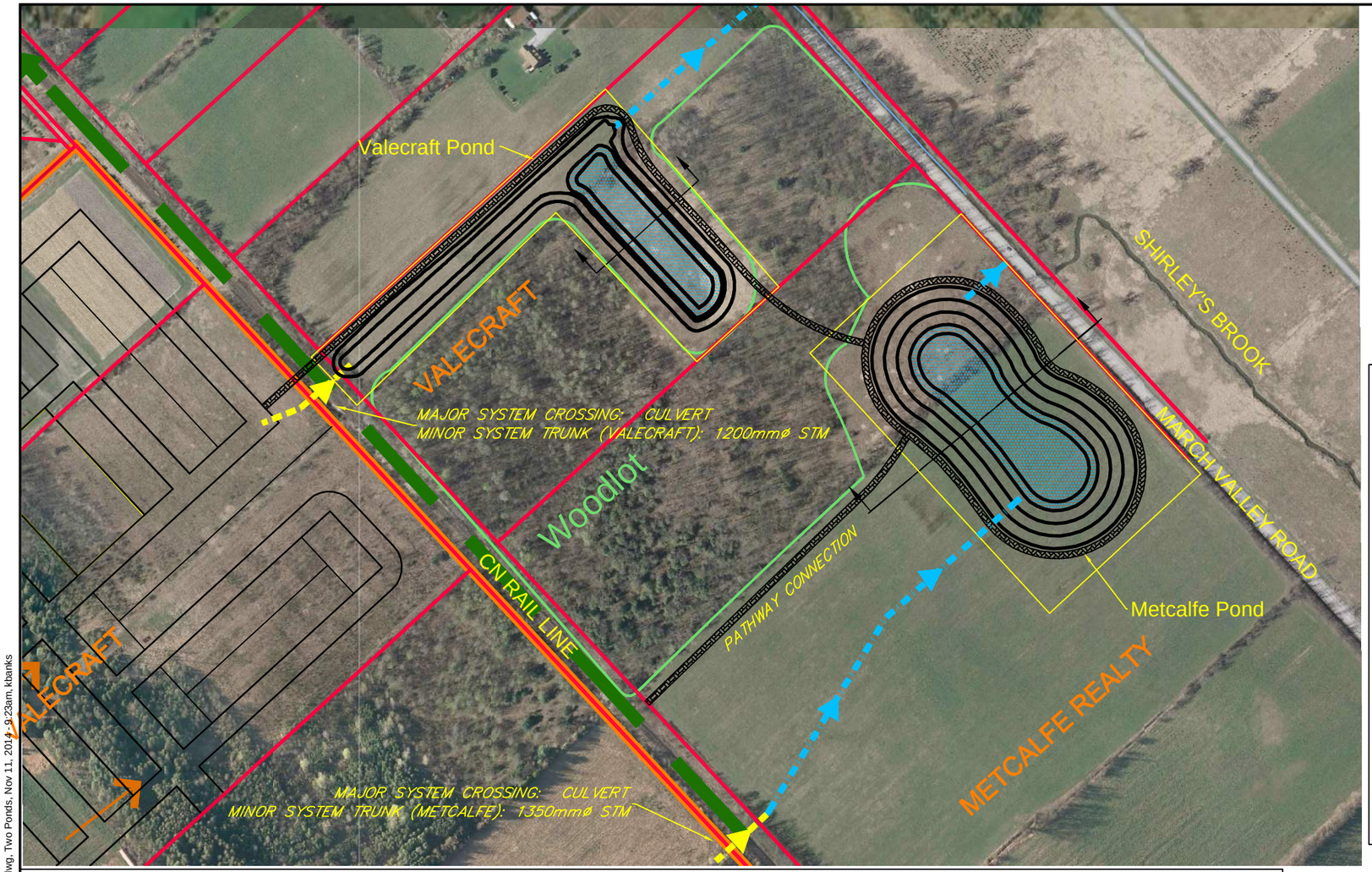
Evaluation Matrix: SWM Facility Options for KNUEA Lands East of March Road

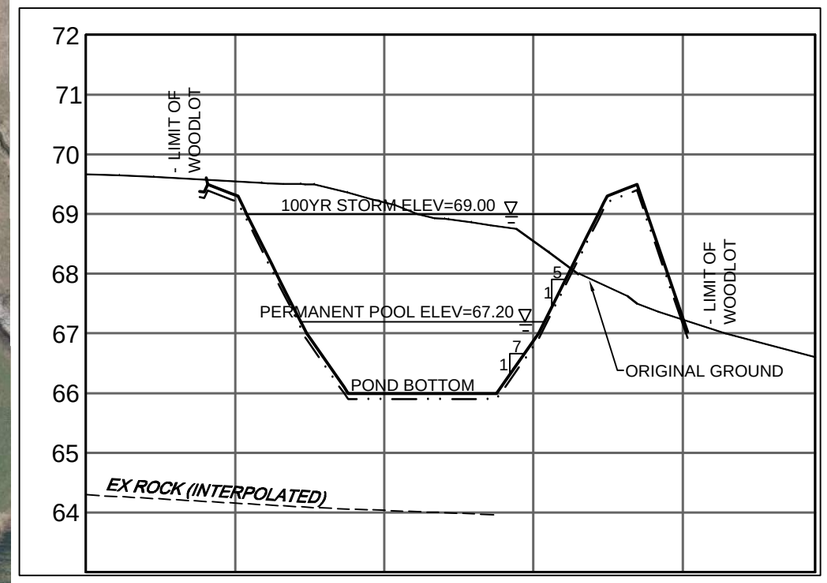
Criteria	*Indicators*	**Option 1 (Figure EAST SWM1)** *Two Ponds outside of KNUEA Limits*	**Option 2 (Figure EAST SWM2)** *One pond outside of KNUEA limits adjacent to CN rail line*	**Option 3 (Figure EAST SWM3)** *One pond outside of KNUEA limits adjacent to March Valley Road*	**Option 4 (Figure EAST SWM4)** *One Pond inside of KNUEA limits southeast corner of Metcalfe property*	**Option 5 (Figure EAST SWM5)** *One pond inside KNUEA limits adjacent to Valecraft lands*
Geotechnical	*Pond Depth / Rock Excavation / Pond Liner*	• Total depth of approx 3.0 – 3.5m below existing ground (both ponds). • No bedrock excavation required. • Geotechnical liner not required.	• Total depth below existing ground ranges from 3.0m (near March Valley Road) to 5.5m (near CN Rail line). • Requires some excavation into bedrock in the vicinity of CN Rail line. • Geotechnical liner required.	• Total depth of approx 3.0m below existing ground. • Does not require excavation into bedrock • Geotechnical liner not required.	• Total depth of approx. 6.0m below existing ground. • Requires excavation into bedrock. • Geotechnical liner required (potential concern with liner uplift from groundwater).	• Total depth of approx. 6.0m below existing ground. • Requires significant excavation into bedrock. • Geotechnical liner required (potential concern with liner uplift from groundwater).
Storm & Sanitary Servicing	*Trunk Sewers / Rail Crossings / Major System/ SAN Overflow*	STM Servicing • STM crossing(s) of CN Rail required (uncontrolled 5yr post-dev. flow) • Two ponds reduce the total length of trunk sewers required for servicing. Major System • Major system crossing(s) of CN rail line required (culverts). SAN Overflow • SAN overflow to Metcalfe pond. (Overflow INV = 67.40)	STM Servicing • STM crossing of CN Rail required (uncontrolled 5yr post-dev. flow) Major System • Major system crossing(s) of CN rail line required (culverts). SAN Overflow • SAN Overflow INV = 67.40	STM Servicing • STM crossing of CN Rail required (uncontrolled 5yr post-dev. flow) Major System • Major system crossing(s) of CN rail line required (culverts). Open Channel • Open channel required D/S of CN rail crossing to convey major & minor system flows to SWMF. SAN Overflow • SAN Overflow INV = 67.40	STM Servicing • No CN Rail crossing required for trunk sewers. Major System • Overland drainage to SWMF will converge in southeast corner. May require over-sizing of STM trunks to reduce overland flows in R.O.W. Open Channel • Open channel required D/S of CN rail crossing to convey SWMF outflows to Shirley's brook. Channel will have very flat grade (roughly 0.05%) due to location and depth of pond. SAN Overflow • SAN Overflow INV = 67.40	STM Servicing • No CN Rail crossing required for trunk sewers. Major System • Overland drainage will be directed to SWMF. Location provides flexibility for multiple overland inlets to pond. Open Channel • Open channel required D/S of CN rail crossing to convey SWMF outflows to Shirley's brook. Channel will have very flat grade (roughly 0.05%) due to location and depth of pond. SAN Overflow • SAN Overflow INV = 67.40
SWMF Operation	*Operating Levels / SWMF Outlet*	Water Levels (Metcalfe Pond) • 1.5m active storage depth • 100yr WL =66.50 (below SAN overflow) • NWL=65.00m (approx. 2yr WL in Shirley's Brook) Water Levels (Valecraft Pond) • 1.8m active storage depth. • Operating levels based on STM inlet elevation and HGL requirements. SWMF Outlet • Two outlets to Shirley's Brook (controlled to pre-development levels) • Reduced erosion potential at outlets (vs. single outfall).	Water Levels • 1.5m active storage depth. • 100yr WL =66.50 (below SAN overflow) • NWL=65.00m (approx. 2yr WL in Shirley's Brook). SWMF Outlet • Single outlet to Shirley's Brook at March Valley Road (controlled to pre-development levels).	Water Levels • 1.5m active storage depth. • 100yr WL =66.50 (below SAN overflow) • NWL=65.00m (approx. 2yr WL in Shirley's Brook). SWMF Outlet • Single outlet to Shirley's Brook at March Valley Road (controlled to pre-development levels).	Water Levels • 1.5m active storage depth. • 100yr WL = 67.00 (below SAN overflow) • NWL=65.50m. SWMF Outlet • Open channel through Metcalfe property east of CN Rail line to Shirley's Brook at March Valley Road (controlled to pre-development levels).	Water Levels • 1.5m active storage depth. • 100yr WL = 67.00 (below SAN overflow) • NWL=65.50m. SWMF Outlet • Open channel through Metcalfe property east of CN Rail line to Shirley's Brook at March Valley Road (controlled to pre-development levels).
Land Requirements	*Pond Footprint / Setbacks /*	Pond Footprint • 4.5 ha (Metcalfe) / 3.0 ha (Valecraft) • Setbacks to Woodlot S23 TBD by environmental studies.	• Pond Footprint = 7.0 ha • Setback to Woodlot S23 TBD by environmental studies.	• Pond Footprint = 5.5 ha	• Pond Footprint = 8.0 ha • Location dependant on elimination of Woodlot S20.	• Pond Footprint = 8.0 ha • Buffer to ex. residential development (Brookside Subdivision) TBD.

Criteria	*Indicators*	**Option 1 (Figure EAST SWM1)** ***Two Ponds outside of KNUEA Limits***	**Option 2 (Figure EAST SWM2)** ***One pond outside of KNUEA limits adjacent to CN rail line***	**Option 3 (Figure EAST SWM3)** ***One pond outside of KNUEA limits adjacent to March Valley Road***	**Option 4 (Figure EAST SWM4)** ***One Pond inside of KNUEA limits southeast corner of Metcalfe property***	**Option 5 (Figure EAST SWM5)** ***One pond inside KNUEA limits adjacent to Valecraft lands***
Connectivity	*Integration with Development / Amenity Features*	• SWM facilities can be integrated into community using pathway system adjacent to Woodlot S23. • Approx. 1km walk from centre of KNUEA East lands to Metcalfe pond. • Rural area provides space and opportunity for natural features and amenity spaces to be integrated into SWM blocks.	• SWM facility can be integrated into community using pathway system adjacent to Woodlot S23. • Approx. 500m walk from centre of KNUEA East lands to Metcalfe pond. • Rural area provides space and opportunity for natural features and amenity space to be integrated into SWM block.	• SWM facility can be integrated into community using pathway system adjacent to SWMF inlet channel and/or adjacent to Woodlot S23. • Approx. 1km walk from centre of KNUEA East lands to Metcalfe pond. • Rural area provides space and opportunity for natural features and amenity space to be integrated into SWM block.	• SWM facility located within urban area. • Limited opportunity for amenity space due to land and grading requirements associated with depth of pond.	• SWM facility located within urban area. • Limited opportunity for amenity space due to land and grading requirements associated with depth of pond.
Summary & Recommendation		Preferred Option. Lowest cost, no bedrock excavation required. Provides maximum flexibility for servicing and development. SWMFs can be integrated into community using pathway system with space for amenities or other features.	2nd lowest cost. Some rock excavation required. SWMF can be integrated into community using pathway system with space for amenities or other features.	3rd lowest cost. No rock excavation required. SWMF can be integrated into community using pathway system with space for amenities or other features.	Not recommended. 2nd highest cost. Rock excavation and pond liner required. Potential issues with uplift of liner from groundwater. Overland flow routing may require over-sizing of sewers. Pond depth results significant additional land requirement within development area. Limited opportunity for creation of amenity space due to grading requirements.	Not recommended. Highest cost. Significant rock excavation and pond liner required. Potential issues with uplift of liner from groundwater. Pond depth results significant additional land requirement within development area. Limited opportunity for creation of amenity space due to grading requirements.



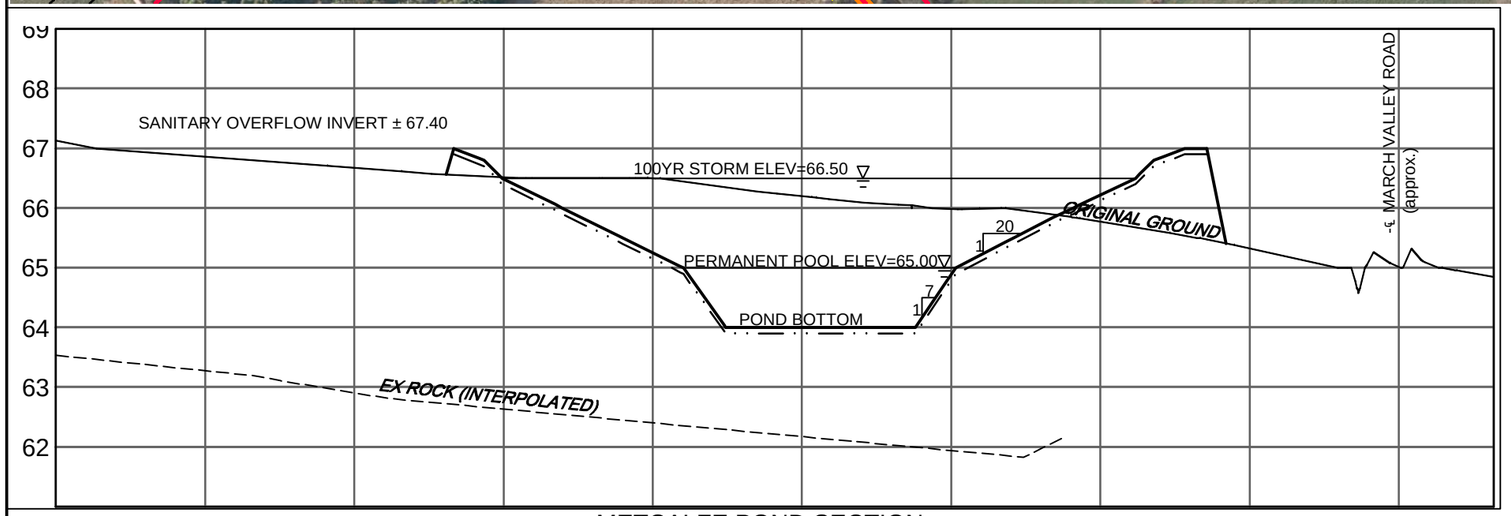
LEGEND

- Proposed Development Area
- Existing Property Lines
- Woodlot Boundary
- SWMF Footprint (approx.)
- Storm Trunk
- Ditching
- Pathway Linkage



VALECRAFT POND SECTION

SCALE 1:1000



METCALFE POND SECTION

SCALE 1:1000

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CITY OF OTTAWA
KANATA NORTH URBAN EXPANSION AREA STUDY

East Stormwater Facility Option #1

SCALE 1:4000

DATE NOV 2014 | JOB 112117 | FIGURE EAST SWM1

SHT11X17.DWG - 279mmX432mm

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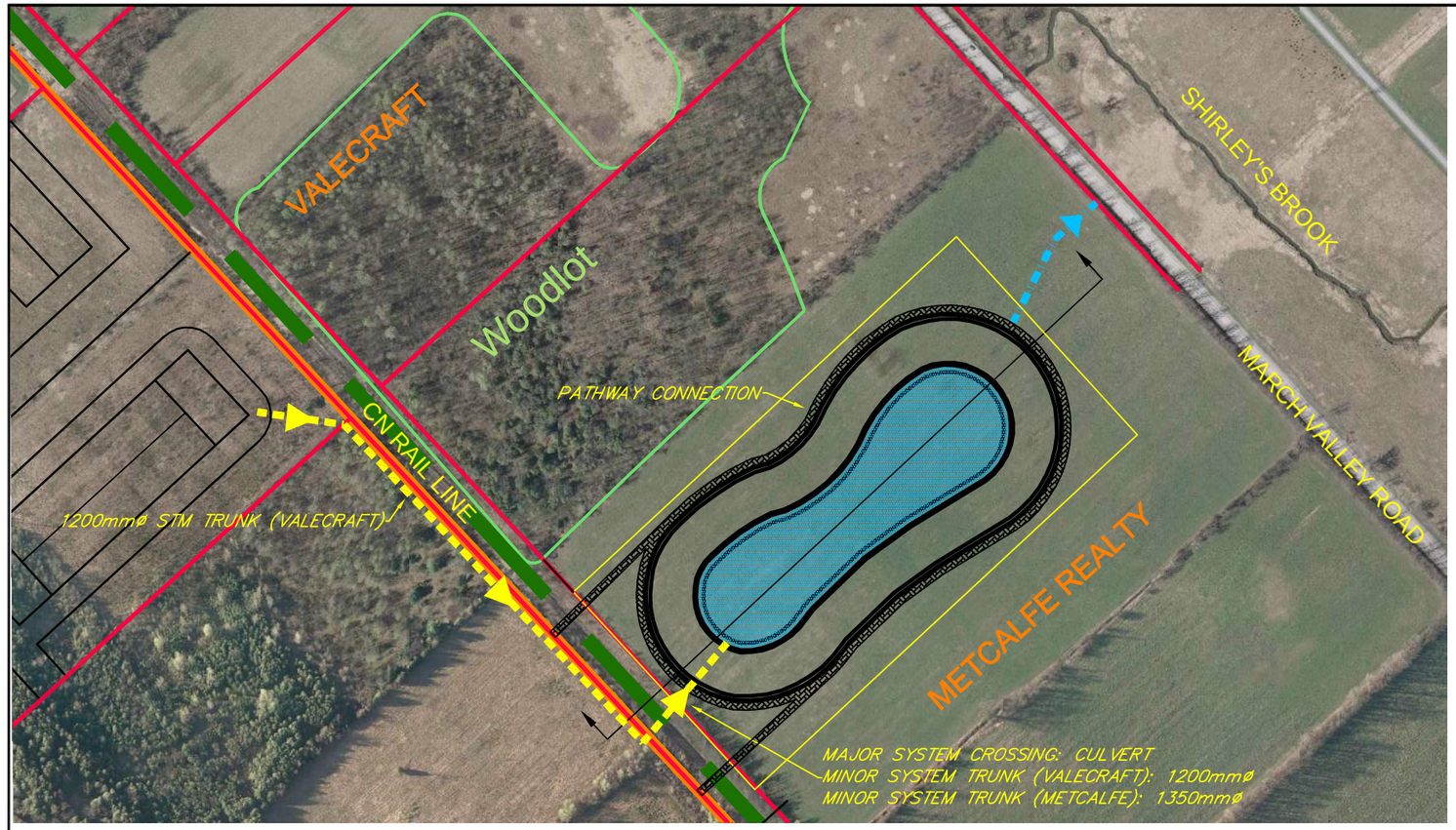
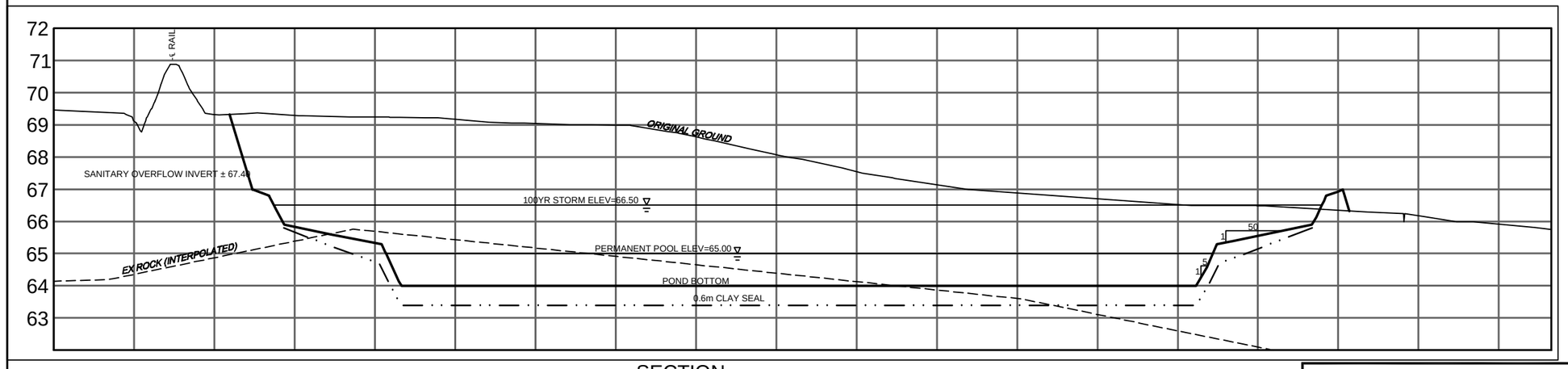


LEGEND

- Proposed Development Area
- Existing Property Lines
- Woodlot Boundary
- SWMF Footprint (approx.)
- Storm Trunk
- Ditching
- Pathway Linkage

N



SECTION

SCALE 1:1500

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CITY OF OTTAWA
KANATA NORTH URBAN EXPANSION AREA STUDY

Stormwater Facility Option #2

SCALE		
1:4000		
DATE	JOB	FIGURE
NOV 2014	112117	EAST SWM2

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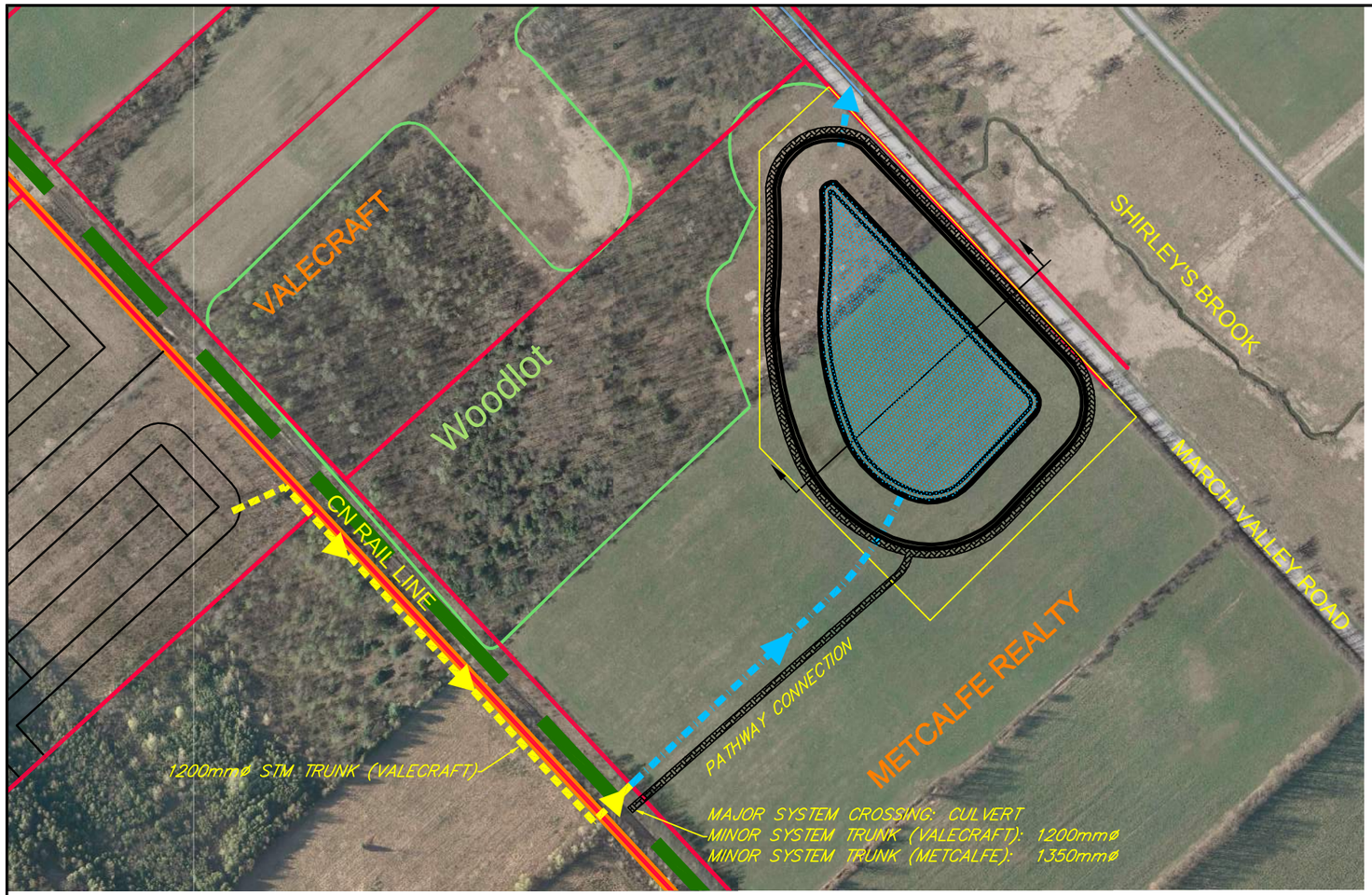
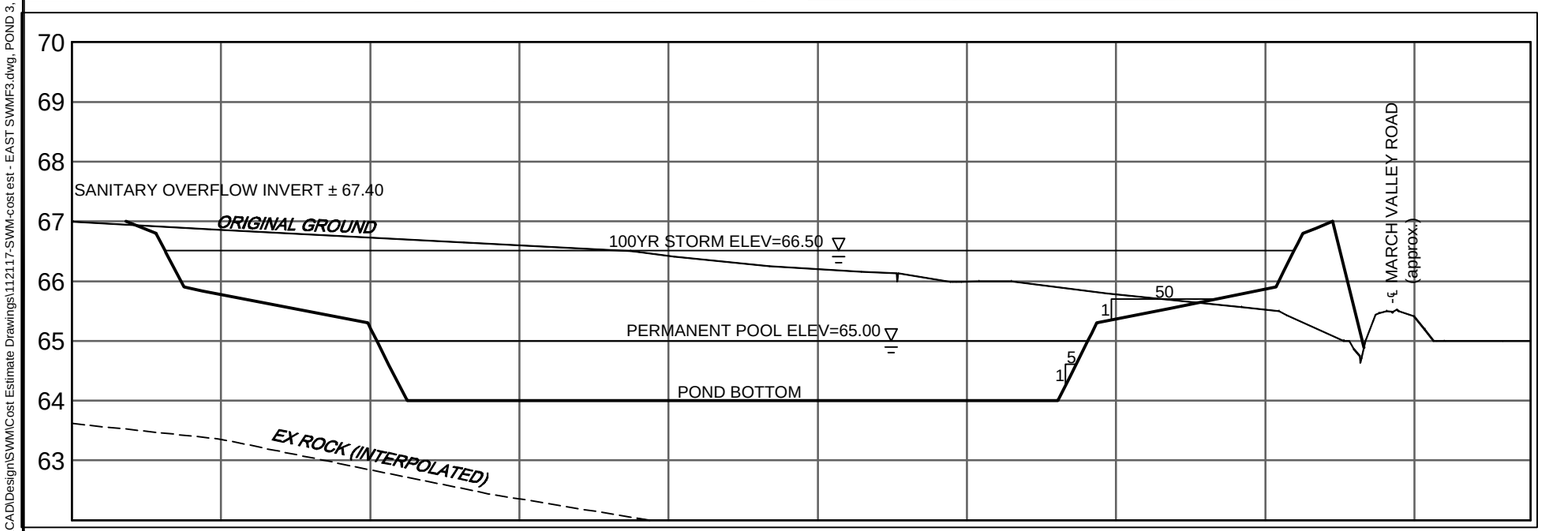


LEGEND

- Proposed Development Area
- Existing Property Lines
- Woodlot Boundary
- SWMF Footprint (approx.)
- Storm Trunk
- Ditching
- Pathway Linkage

N



SECTION

SCALE 1:1000

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CITY OF OTTAWA
KANATA NORTH URBAN EXPANSION AREA STUDY

East Stormwater Facility Option #3

SCALE 1:4000

DATE NOV 2014 | JOB 112117 | FIGURE EAST SWM3

SHT11X17.DWG - 279mmX432m

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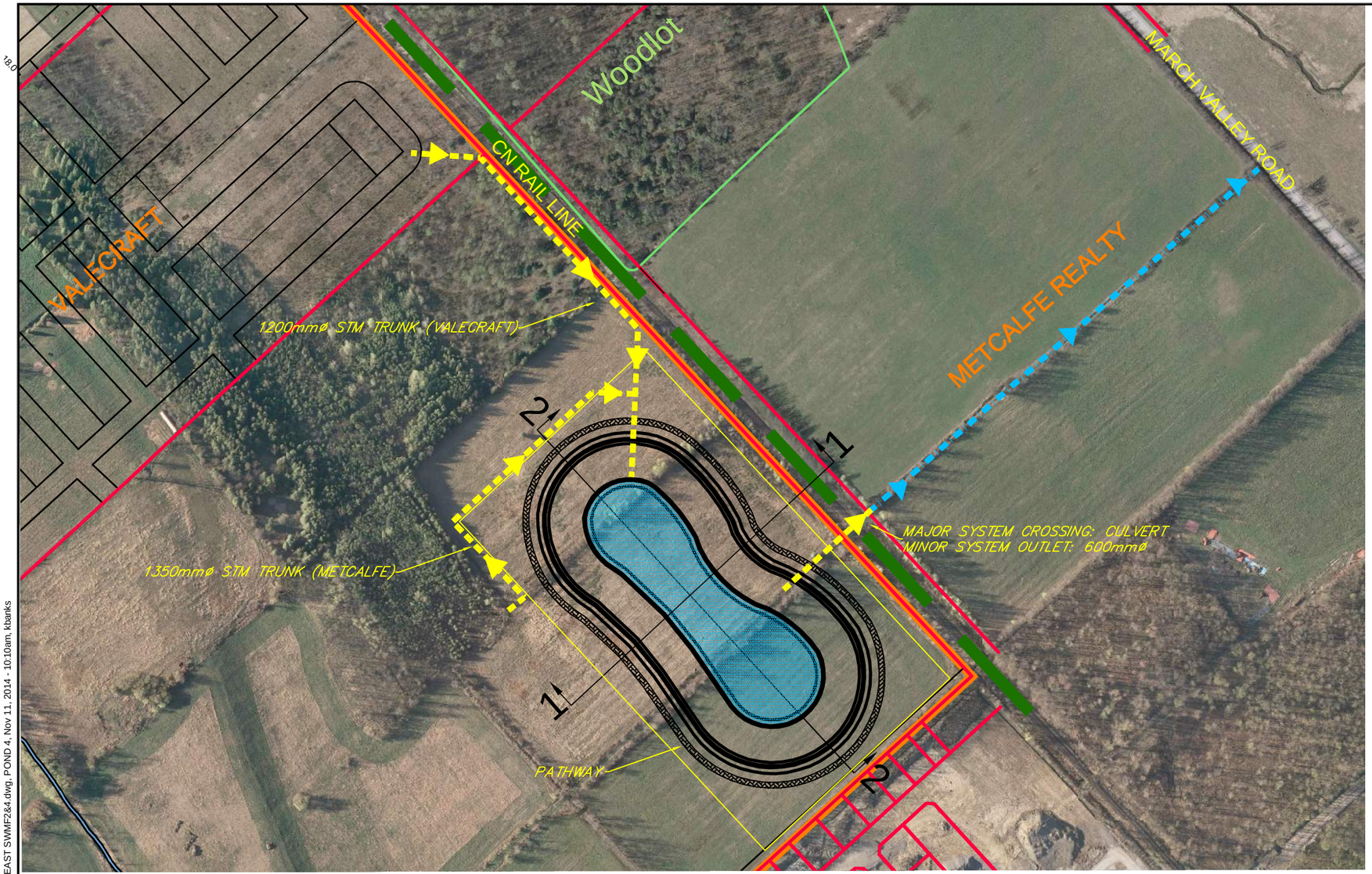
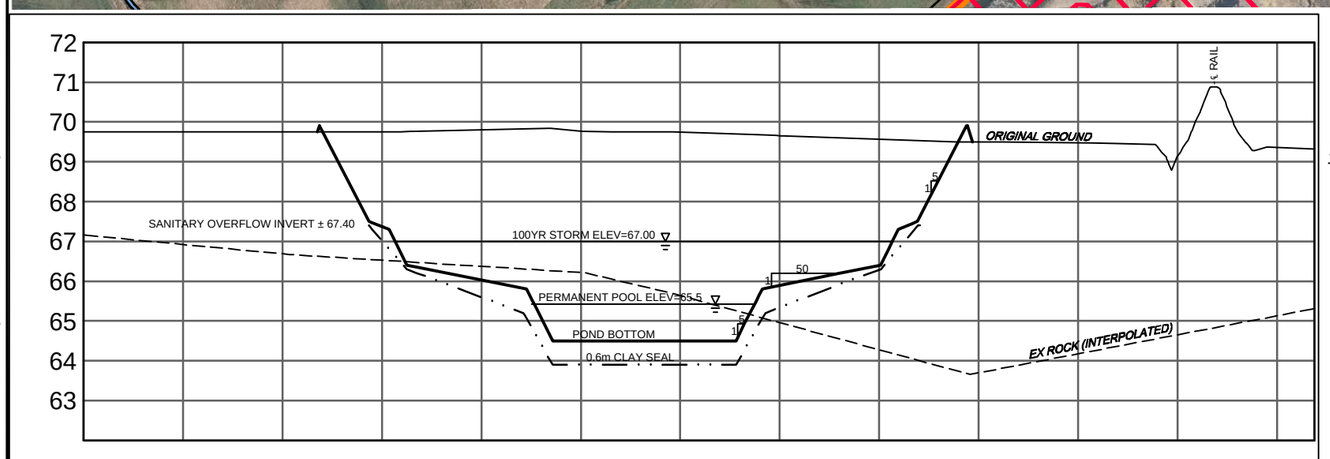


LEGEND

- Proposed Development Area
- Existing Property Lines
- Woodlot Boundary
- SWMF Footprint (approx.)
- Storm Trunk
- Ditching
- Pathway Linkage



SECTION 1-1
SCALE 1:1500

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CITY OF OTTAWA
KANATA NORTH URBAN EXPANSION AREA STUDY

East Stormwater Facility Option #4

SCALE		
1:4000		
DATE	JOB	FIGURE
NOV 2014	112117	EAST SWM4

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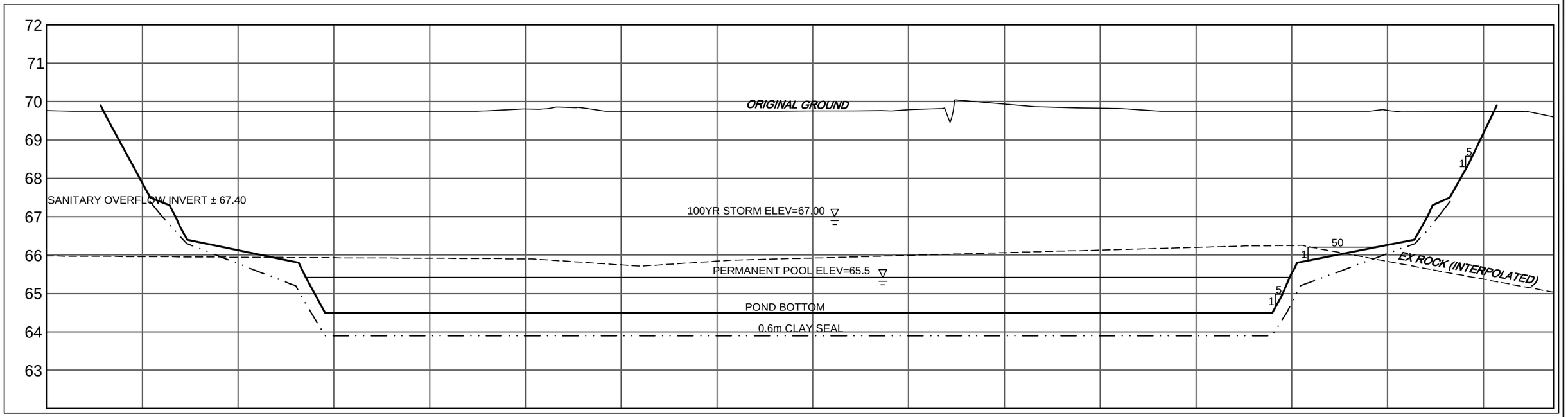

SECTION 2-2

SCALE 1:1000

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CITY OF OTTAWA
KANATA NORTH URBAN EXPANSION AREA STUDY

East Stormwater Facility Option #4
SECTION 2-2

SCALE		
1:1000		
DATE	JOB	FIGURE
NOV 2014	112117	EAST SWM4 S2-2

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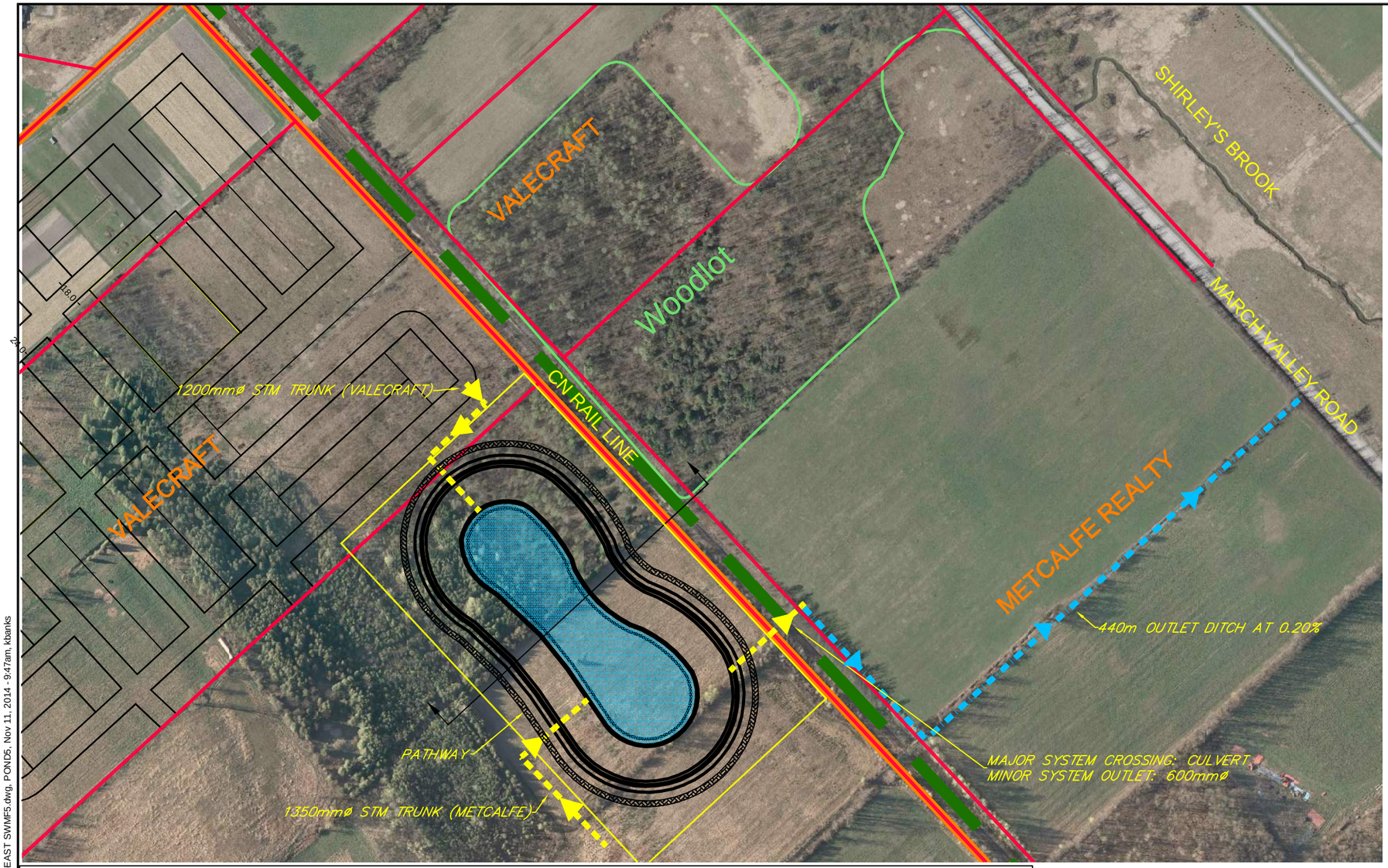
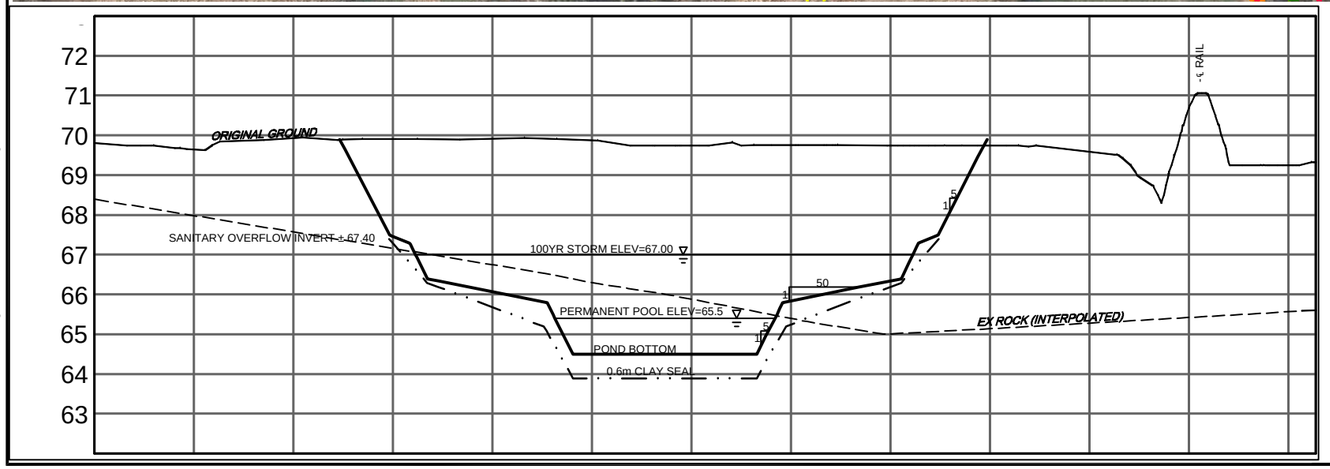


LEGEND

- Proposed Development Area
- Existing Property Lines
- Woodlot Boundary
- SWMF Footprint (approx.)
- Storm Trunk
- Ditching
- Pathway Linkage

N



SECTION

SCALE 1:1500

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CITY OF OTTAWA
KANATA NORTH URBAN EXPANSION AREA STUDY

East Stormwater Facility Option #5

SCALE		
1:4000		
DATE	JOB	FIGURE
NOV 2014	112117	EAST SWM5

SHT11X17.DWG - 279mmX432mm

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MARCH VALLEY ROAD
CN RAIL LINE
TP 21 65.90 (TILL @ 61.94)
TP 4-14 66.08
TP 20 66.31 (CLAY @ 62.65)
TP 19 66.43 (CLAY @ 62.77)
TP 6-14 69.52 (TILL @ 64.34)
TP 5-14 68.72 (CLAY @ 63.84)
TP 23 66.94 (64.10)
TP 18 67.12 (CLAY @ 63.46)
TP 7-14
TP 17 69.25
TP 16 69.61 (TILL @ 69.95)
TP 15 68.82 (64.55)
TP 16 70.73 [68.63]
TP 11 70.87 (68.03)
TP 12 70.75 (68.77)
TP 15 70.32 [66.42]
TP 21 70.09 [66.79]
TP 10-13 70.25 (65.73)
TP 1-14 69.73 (TILL @ 65.03)
TP 11-13 69.75 (64.11)
TP 13 71.05 (68.56)
TP 17 70.77 [68.67]
TP 10 70.80 (68.36)
TP 14 70.57 [68.57]
TP 20 70.03 [67.63]
TP 12 69.71
TP 13 69.87 (CLAY @ 66.21)
TP 14 69.90
TP 9 71.50 (69.06)
TP 18 70.96 [68.36]
TP 19 70.36 [69.16]
BH 1-13 70.75 (70.09)
TP 13 72.12 [71.92]
TP 8 72.92 (70.79)
TP 7 72.82 (71.91)
BH 2-13 70.0 (67.56)
TP 24 75.76 [72.51]
TP 9-13 70.85 [69.1]
TP 10 70.43 [68.60]
TP 11 70.02 [68.75]
TP 9 79.59
TP 8 79.41
TP 6 79.50
TP 4 79.62
TP 3-13 79.3
TP 4-13 77.0 (72.22)
TP 5-13 71.0 [70.6]
TP 8-13 70.65 [69.9]
TP 5 78.70 (75.04)
TP 3 78.49
TP 10 79.21
TP 7 79.41
TP 2-13 79.5
TP 1-13 79.5
TP 9 78.71
TP 7-13 73.0 [70.1]
TP 6-13 74.0 [74.2]
TP 4 78.84 (75.79)
LEGEND
TEST PIT LOCATION, CURRENT INVESTIGATION PATTERSON GROUP MEMO PG2878
TEST PIT LOCATION, PREVIOUS INVESTIGATION PATTERSON GROUP REPORT PG2878
TEST PIT LOCATION, PREVIOUS INVESTIGATION PATERSON GROUP REPORT PG2256, 2011
TEST PIT LOCATION, PREVIOUS INVESTIGATION PATERSON GROUP REPORT PG1823, 2009
BORE HOLE LOCATION, PREVIOUS INVESTIGATION
TEST PIT LOCATION BY OTHERS
78.55 GROUND ELEVATION (m)
[76.39] BEDROCK ELEVATION (m
(64.10) PRACTICAL REFUSAL TO EXCAVATION ELEV. (m)
OWNERSHIP BOUNDARY
STUDY AREA BOUNDARY
RIVER OR STREAM
CN RAILWAY TRAIN TRACKS
79.00
MAJOR CONTOURS & ELEVATION LABELS
East SWMF Option 1
East SWMF Option 2
East SWMF Option 3
East SWMF Option 4
East SWMF Option 5

NOTE:
THE POSITION OF ALL POLE LINES, CONDUITS, WATERMAINS, SEWERS AND OTHER UNDERGROUND AND OVERGROUND UTILITIES AND STRUCTURES IS NOT NECESSARILY SHOWN ON THE CONTRACT DRAWINGS, AND WHERE SHOWN, THE ACCURACY OF THE POSITION OF SUCH UTILITIES AND STRUCTURES IS NOT GUARANTEED. BEFORE STARTING WORK, DETERMINE THE EXACT LOCATION OF ALL SUCH UTILITIES AND STRUCTURES AND ASSUME ALL LIABILITY FOR DAMAGE TO THEM.

No.	REVISION	DATE	BY
2.	UPDATED POND LOCATIONS & NUMBERING	OCT 2014	KJA
2.	UPDATED TEST PIT INFORMATION, POND 1B UPDATED	OCT 2014	KJA
1.	ROCK ELEVATIONS	JAN 2014	ARM

SCALE 1:2000

1:2000 0 20 40 60 80

DESIGN KJM
CHECKED MAB
DRAWN DTD
CHECKED MAB
APPROVED JGR

FOR REVIEW ONLY

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CITY OF OTTAWA
KANATA NORTH EXPANSION AREA CDP

TEST PIT LOCATIONS & EAST SWMF OPTIONS

PROJECT No. 112117
REV REV # 3
DRAWING No. 112117-TPSWMF

PLANB1.DWG - 1000mmx707mm

NOVATECH

Kanata North

Preliminary Stormwater Facility Cost
Metcalfe & Valecraft SWMF - Option 1

ITEM NO.	ITEM	EST. QTY	UNIT	UNIT PRICE	TOTAL AMOUNT
SECTION A - METCALFE STORMWATER FACILITY (33,900m³)					
1	Earthworks				
	i) Earth Excavation (incl Topsoil Stripping)	26,600	m³	$10.00	$266,000.00
	ii) Rock Excavation	0	m³	$40.00	$0.00
	iii) Clay Liner (0.6m Thick)	0	m²	$9.00	$0.00
2	Storm Trunk Pipe - 1350mm	75	m	$1,600.00	$120,000.00
3	Inlet - Ditching	290	m	$200.00	$58,000.00
4	Inlet - Concrete Headwall	1	ea.	$84,000.00	$84,000.00
5	Outlet - Structure (Including Pipe)	1	ea.	$98,000.00	$98,000.00
6	Outlet - Ditching	25	m	$100.00	$2,500.00
7	Rail Line Crossing - 1950mm	50	m	$2,500.00	$125,000.00
8	Rock Check Dam	2	ea.	$3,000.00	$6,000.00
9	Hydro Seeding	28,000	m²	$4.00	$112,000.00
10	Landscaping Allowance	1	LS	$105,000.00	$105,000.00
11	Access Road/ Pathway Connection	960	m	$205.00	$196,800.00
TOTAL SECTION A - STORMWATER FACILITY					**$1,173,300.00**

Construction Total		**$1,173,300.00**
25% Soft Costs and Contingency		**$293,325.00**
Net Rural Land (ac) at	**11.5**	
Subtotal (Metcalfe)		**$1,466,625.00**

ITEM NO.	ITEM	EST. QTY	UNIT	UNIT PRICE	TOTAL AMOUNT
SECTION B - VALECRAFT STORMWATER FACILITY (26,500m³)					
1	Earthworks				
	i) Earth Excavation (incl Topsoil Stripping)	30,000	m³	$10.00	$300,000.00
	ii) Rock Excavation	0	m³	$40.00	$0.00
	iii) Clay Liner (0.6m Thick)	0	m²	$9.00	$0.00
2	Storm Trunk Pipe - 1200mm	75	m	$1,500.00	$112,500.00
3	Inlet - Ditching	0	m	$200.00	$0.00
4	Inlet - Concrete Headwall	1	ea.	$60,000.00	$60,000.00
5	Outlet - Structure (Including Pipe)	1	ea.	$70,000.00	$70,000.00
6	Outlet - Ditching	150	m	$100.00	$15,000.00
7	Rail Line Crossing - 1950mm	50	m	$2,500.00	$125,000.00
8	Rock Check Dam	2	ea.	$3,000.00	$6,000.00
9	Hydro Seeding	18,000	m²	$4.00	$72,000.00
10	Landscaping Allowance	1	LS	$75,000.00	$75,000.00
11	Access Road/ Pathway Connection	650	m	$205.00	$133,250.00
TOTAL SECTION A - STORMWATER FACILITY					**$968,750.00**

Construction Total		**$968,750.00**
25% Soft Costs and Contingency		**$242,187.50**
Net Rural Land (ac) at	**7.5**	
Subtotal (Metcalfe)		**$1,210,937.50**

Total	**$2,677,562.50**

NOVATECH

Kanata North

Preliminary Stormwater Facility Cost
Metcalfe & Valecraft SWMF - Option 2

ITEM NO.	ITEM	EST. QTY	UNIT	UNIT PRICE	TOTAL AMOUNT
SECTION A - STORMWATER FACILITY (63,000m³)					
1	Earthworks				
	i) Earth Excavation (incl Topsoil Stripping)	12,800	m³	$10.00	$128,000.00
	ii) Rock Excavation	17000	m³	$40.00	$680,000.00
	iii) Clay Liner (0.6m Thick)	18,700	m²	$9.00	$168,300.00
2	Storm Trunk Pipe - 1200mm Valecraft	360	m	$1,500.00	$540,000.00
3	Rail Line Crossing - twin 1950mm	50	m	$5,000.00	$250,000.00
4	Inlet - Ditching	0	m	$200.00	$0.00
5	Inlet - Concrete Headwall	1	ea.	$150,000.00	$150,000.00
6	Outlet - Structure (Including Pipe)	1	ea.	$175,000.00	$175,000.00
7	Outlet - Ditching	100	m	$100.00	$10,000.00
8	Rock Check Dam	2	ea.	$3,000.00	$6,000.00
9	Hydro Seeding	45,000	m²	$4.00	$180,000.00
10	Landscaping Allowance	1	LS	$188,000.00	$188,000.00
11	Access Road/ Pathway Connection	1,050	m	$205.00	$215,250.00
TOTAL SECTION A - STORMWATER FACILITY					**$2,690,550.00**

Construction Total		**$2,690,550.00**
25% Soft Costs and Contingency		**$672,637.50**
Net Rural Land (ac)	**16.5**	

Total	**$3,363,187.50**

NOVATECH

Kanata North

Preliminary Stormwater Facility Cost
Metcalfe & Valecraft SWMF - Option 3

ITEM NO.	ITEM	EST. QTY	UNIT	UNIT PRICE	TOTAL AMOUNT
SECTION A - STORMWATER FACILITY (63,000m³)					
1	Earthworks				
	i) Earth Excavation (incl Topsoil Stripping)	39,000	m³	$10.00	$390,000.00
	ii) Rock Excavation	0	m³	$40.00	$0.00
	iii) Clay Liner (0.6m Thick)	0	m²	$9.00	$0.00
2	Storm Trunk Pipe - 1200mm Valecraft	400	m	$1,500.00	$600,000.00
3	Rail Line Crossing - twin 1950mm	50	m	$5,000.00	$250,000.00
4	Inlet - Ditching	270	m	$200.00	$54,000.00
5	Inlet - Concrete Headwall	1	ea.	$150,000.00	$150,000.00
6	Outlet - Structure (Including Pipe)	1	ea.	$175,000.00	$175,000.00
7	Outlet - Ditching	40	m	$100.00	$4,000.00
8	Rock Check Dam	2	ea.	$3,000.00	$6,000.00
9	Hydro Seeding	45,500	m²	$4.00	$182,000.00
10	Landscaping Allowance	1	LS	$188,000.00	$188,000.00
11	Access Road/ Pathway Connection	1,100	m	$205.00	$225,500.00
TOTAL SECTION A - STORMWATER FACILITY					**$2,224,500.00**

Construction Total		**$2,224,500.00**
25% Soft Costs and Contingency		**$556,125.00**
Net Rural Land (ac)	**14.5**	

Total	**$2,780,625.00**

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Kanata North

Preliminary Stormwater Facility Cost
Metcalfe & Valecraft SWMF - Option 4

ITEM NO.	ITEM	EST. QTY	UNIT	UNIT PRICE	TOTAL AMOUNT
SECTION A - STORMWATER FACILITY (63,000m³)					
1	Earthworks				
	i) Earth Excavation (incl Topsoil Stripping)	183,000	m³	$10.00	$1,830,000.00
	ii) Rock Excavation	40,500	m³	$40.00	$1,620,000.00
	iii) Clay Liner (0.6m Thick)	21,000	m²	$9.00	$189,000.00
2	Clearing and Grubbing	4	ha	$10,000.00	$40,000.00
3	Storm Trunk Pipe - 1350mm Metcalfe	300	m	$1,600.00	$480,000.00
4	Storm Trunk Pipe - 1200mm Valecraft	300	m	$1,500.00	$450,000.00
5	Rail Line Crossing - twin 1950mm	50	m	$5,000.00	$250,000.00
6	Inlet - Concrete Headwall	1	ea.	$150,000.00	$150,000.00
7	Outlet - Structure (Including Pipe)	1	ea.	$175,000.00	$175,000.00
8	Outlet - Ditching	440	m	$100.00	$44,000.00
9	Rock Check Dam	2	ea.	$3,000.00	$6,000.00
10	Hydro Seeding	54,000	m²	$4.00	$216,000.00
11	Landscaping Allowance	1	LS	$188,000.00	$188,000.00
12	Access Road/ Pathway Connection	900	m	$205.00	$184,500.00
TOTAL SECTION A - STORMWATER FACILITY					**$5,822,500.00**

Construction Total		**$5,822,500.00**
25% Soft Costs and Contingency		**$1,455,625.00**
Net Urban Land (ac)	**20.5**	
Total		**$7,278,125.00**

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Kanata North

Preliminary Stormwater Facility Cost
Metcalfe & Valecraft SWMF - Option 5

ITEM NO.	ITEM	EST. QTY	UNIT	UNIT PRICE	TOTAL AMOUNT
SECTION A - STORMWATER FACILITY (63,000m³)					
1	Earthworks				
	i) Earth Excavation (incl Topsoil Stripping)	172,600	m³	$10.00	$1,726,000.00
	ii) Rock Excavation	54,500	m³	$40.00	$2,180,000.00
	iii) Clay Liner (0.6m Thick)	21,000	m²	$9.00	$189,000.00
2	Clearing and Grubbing	4	ha	$10,000.00	$40,000.00
3	Storm Trunk Pipe - 1350mm Metcalfe	75	m	$1,600.00	$120,000.00
4	Storm Trunk Pipe - 1200mm Valecraft	150	m	$1,500.00	$225,000.00
5	Rail Line Crossing - twin 1950mm	50	m	$5,000.00	$250,000.00
6	Inlet - Concrete Headwall	1	ea.	$150,000.00	$150,000.00
7	Outlet - Structure (Including Pipe)	1	ea.	$175,000.00	$175,000.00
8	Outlet - Ditching	600	m	$100.00	$60,000.00
9	Rock Check Dam	2	ea.	$3,000.00	$6,000.00
10	Hydro Seeding	54,000	m²	$4.00	$216,000.00
11	Landscaping Allowance	1	LS	$188,000.00	$188,000.00
12	Access Road/ Pathway Connection	900	m	$205.00	$184,500.00
TOTAL SECTION A - STORMWATER FACILITY					**$5,709,500.00**

Construction Total		**$5,709,500.00**
25% Soft Costs and Contingency		**$1,427,375.00**
Net Urban Land (ac)	**20.5**	
Total		**$7,136,875.00**

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M E M O R A N D U M

DATE: **MAY 28, 2015**

TO: **KNUEA TAC**

FROM: **M.PETEPIECE / K.AULD/ A.MCAULEY**

RE: **KANATA NORTH SWM FACILITY OPTIONS – EAST OF MARCH ROAD**
FILE NO.: **112117**

CC: **FILE**

1.0 INTRODUCTION

This memorandum provides a summary and evaluation of the most recently updated and circulated SWM facility location alternatives for the KNUEA lands on the east side of March Road.

1) Novatech Memo - KNUEA SWM Facility Options (East) (October 3, 2014)
2) Novatech Memo – Additional SWM Facility Options (East) (October 23, 2014)
3) Novatech Memo – Additional SWM Facility Options (East) (November 11, 2014)
4) Novatech Memo – Kanata North SWM Facility Options – East of March Road (May 19, 2015)

2.0 DESIGN CONSIDERATIONS

The SWM facility alternatives for the KNUEA lands east of March Road have been developed and evaluated based on the following design factors:

Connectivity

The City has indicated that SWM facilities should be integrated into the community. Ponds located outside the urban area should provide connectivity to the community through the use of pathways or other linkages.

Storm Drainage

The size and length of the storm infrastructure (sewers, culverts, open channels) required to convey storm runoff to the ponds have been accounted for in the cost estimates:

- Storm drainage within the urban area will be provided using storm sewers sized to convey the uncontrolled 5-year post-development peak flow.
- Storm drainage outside the urban area (east of the rail line) will be conveyed in open channels.
- Storm crossings of the CN Rail are to have sufficient capacity to convey the 100-year peak flow, and may consist of either combined or separate major and minor system crossings.

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SWM Facility Outlet

The proposed ponds will outlet to Shirley's Brook at March Valley Road. Several alternatives for routing the outflows from the ponds to Shirley's Brook have been developed and are presented in a separate memo:

- The outlets to Shirley's Brook should be designed to minimize adverse impacts (primarily erosion).
- Outlets placed further north along March Valley Road will reduce the extent of improvements required to mitigate erosion in Shirley's Brook where the watercourse is immediately adjacent to the road.

Storm / Sanitary Trunk Sewers

The location and elevation of the storm and sanitary trunk sewers have been reviewed for each proposed SWMF alternative to determine any potential conflicts with pipe crossings. In some instances, the operating levels of the proposed SWM facilities have been adjusted (from the previous submissions) to accommodate the required crossings.

Sanitary Overflow

A sanitary overflow will be required on the proposed trunk sewer servicing the KNUEA lands east of March Road to ensure the HGL elevation is below the underside of footings of the proposed residential units. The City has indicated that, where possible, sanitary overflows are to be routed to SWM facilities. City design standards for overflows are currently in development. The following sanitary overflow criteria have been applied to the KNUEA lands:

- Sanitary overflows are to operate by gravity and be directed to a SWM facility.
- The sanitary overflow must be above the 100-year elevation in the SWM facility.
- The HGL elevation in the sanitary trunk is based on the overflow elevation at the Pumping Station.

Based on these criteria, the invert elevation for the sanitary overflow has been set at 67.40m. Consequently, the 100-year water level in the SWM facility must be below this elevation.

Geotechnical / Rock Elevation

Where possible, the facilities have been designed to be above the bedrock. For some options, the sanitary overflow requires the bottom of the pond to be below the bedrock elevation, which significantly increases the cost of excavation and will likely require a lining for the pond.

Drawing **112117-TPSWMF** outlines the proposed pond locations, along with test pit data as provided by Paterson Group. Bedrock elevations have been interpolated from the provided data to estimate the quantity of rock excavation, if any, which will be required for each of the pond options.

Quantity Control

The proposed SWM facilities have been designed to control post-development peak flows to pre-development levels for all storms up to and including the 100-year event. Runoff hydrographs and storage requirements were evaluated using VISUAL OTTHYMO.

- Pre-development conditions were modeled using the hydrologic parameters from the Shirley's Brook Existing Conditions Model developed by AECOMM.
- Post-development conditions were modeled using hydrologic parameters consistent with the current concept plan and conforming to the Ottawa Sewer Design Guidelines.

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Quality Control

The proposed SWM facilities have been designed to provide an *Enhanced* level of water quality treatment for the proposed development, based on the recommended water quality volumes (permanent pool / extended detention) listed in the MOE SWM Planning and Design Manual.

3.0 SWM FACILITY OPTIONS (EAST)

An evaluation matrix (attached) has been prepared to provide an overview and comparison of the various options based on the design considerations listed in Section 2.0.

Three (3) SWM facility options have been developed for the KNUEA lands east of March Road. Drawing **112117-TPSWMF** shows the locations of the three options, along with test pit data as provided by Paterson Group. The bedrock surface profiles shown on the plan and profile drawings for each option have been interpolated from the geotechnical data.

OPTION 2

This option consists of a single wet pond SWM facility located outside the urban boundary (refer to **Figure EAST SWM2**).

The pond would be located entirely on the Metcalfe property east of the CN Rail line, south of the wooded area, perpendicular (length-wise) to the rail line. The inlet to the pond would be adjacent to the CN rail corridor.

The pond would have a tributary drainage area of approximately 95 ha, with a 5-year flow of 10.5 m^3/s, and a total volume of approximately 63,000 m^3. The total area of the pond block is approximately 7.0 ha and includes provision for grading, access roads, pathway linkages, and sediment management. The permanent pool elevation has been set at 65.5 m, which is just above the 2-year water level in Shirley's Brook at the outlet of the pond.

Design Considerations

The operating levels in the SWM facility would be dictated by the elevation of the required sanitary overflow, which is to be above the 100-year elevation in the pond. As a result, the required excavation depth adjacent to the CN rail line is relatively deep (approximately 5.0 m) and will be partially below the bedrock.

The pond would be connected to the KNUEA lands using a pathway system. A servicing corridor parallel to the CN rail line will be required to connect the Valecraft lands to the pond and will need to be designed to carry both the major and minor system flows.

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OPTION 2a

This option consists of a single wet pond SWM facility located outside the urban boundary (refer to **Figure EAST SWM2a**).

As with Option 2, the pond would be located on the Metcalfe property east of the CN rail line, south of the wooded area. The difference being, Option 2a would be situated parallel (length-wise) to the rail line. The inlet to the pond would be adjacent to the CN Rail corridor.

The pond would have a tributary drainage area of approximately 95 ha, with a 5-year flow of 10.5 m^3/s, and a total volume of approximately 63,000 m^3. The total area of the pond block is approximately 8.8 ha and includes provision for grading, access roads, pathway linkages, and sediment management. The permanent pool elevation has been set at 65.5 m, which is just above the 2-year water level in Shirley's Brook at the outlet of the pond.

Design Considerations

The operating levels in the SWM facility would be dictated by the elevation of the required sanitary overflow, which is to be above the 100-year elevation in the pond. As a result, the required excavation depth adjacent to the CN rail line is somewhat deep (approximately 4.0 m) and will be partially below the bedrock.

The pond would be connected to the KNUEA lands using a pathway system. A servicing corridor parallel to the CN rail line will be required to connect the Valecraft lands to the pond and will need to be designed to carry both the major and minor system flows.

OPTION 6

This option consists of a wet pond SWM facility with two forebays, and a single main cell located outside the urban boundary (refer to **Figure EAST SWM6**).

Forebay Design

One forebay would be located on the Metcalfe property adjacent to March Valley Road, south of wooded area. The second forebay would be located on the Valecraft property in the open space between the north property line and the existing wooded area. The inlets to each forebay would run parallel to the existing wooded area, with the main cell of pond located in the clearing as shown on the attached figure.

The Metcalfe forebay would have a tributary drainage area of approximately 53 ha, and 5-year flow of 6.3m^3/s (60%). The Valecraft forebay pond would have a tributary drainage area of approximately 42 ha, and 5-year flow of 4.2m^3/s (40%).

Overall Pond

The main cell of the pond will span both properties, with a total volume (including forebays) of approximately 63,000 m^3. The total area of the pond block would be approximately 10.0 ha and includes provision for grading, access roads, pathway linkages, and sediment management. The permanent pool elevation has been set at 65.5 m, which is just above the 2-year water level in Shirley's Brook at the outlet of the pond.

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Design Considerations

The proposed ponds would be connected to the KNUEA lands using a pathway system. Two separate SWM forebays would increase servicing flexibility and reduce the required size of the trunk sewers. The Metcalfe forebay would serve as the outlet for the proposed sanitary overflow. Each pond would have a total depth of approximately 3.0m and are expected to be above the underlying bedrock.

Two separate crossings of the CN Rail line would be required (major and minor systems). Having two major system outlets will reduce the potential for major system drainage issues that could result from directing all runoff from the lands east of March Road towards a single outlet.

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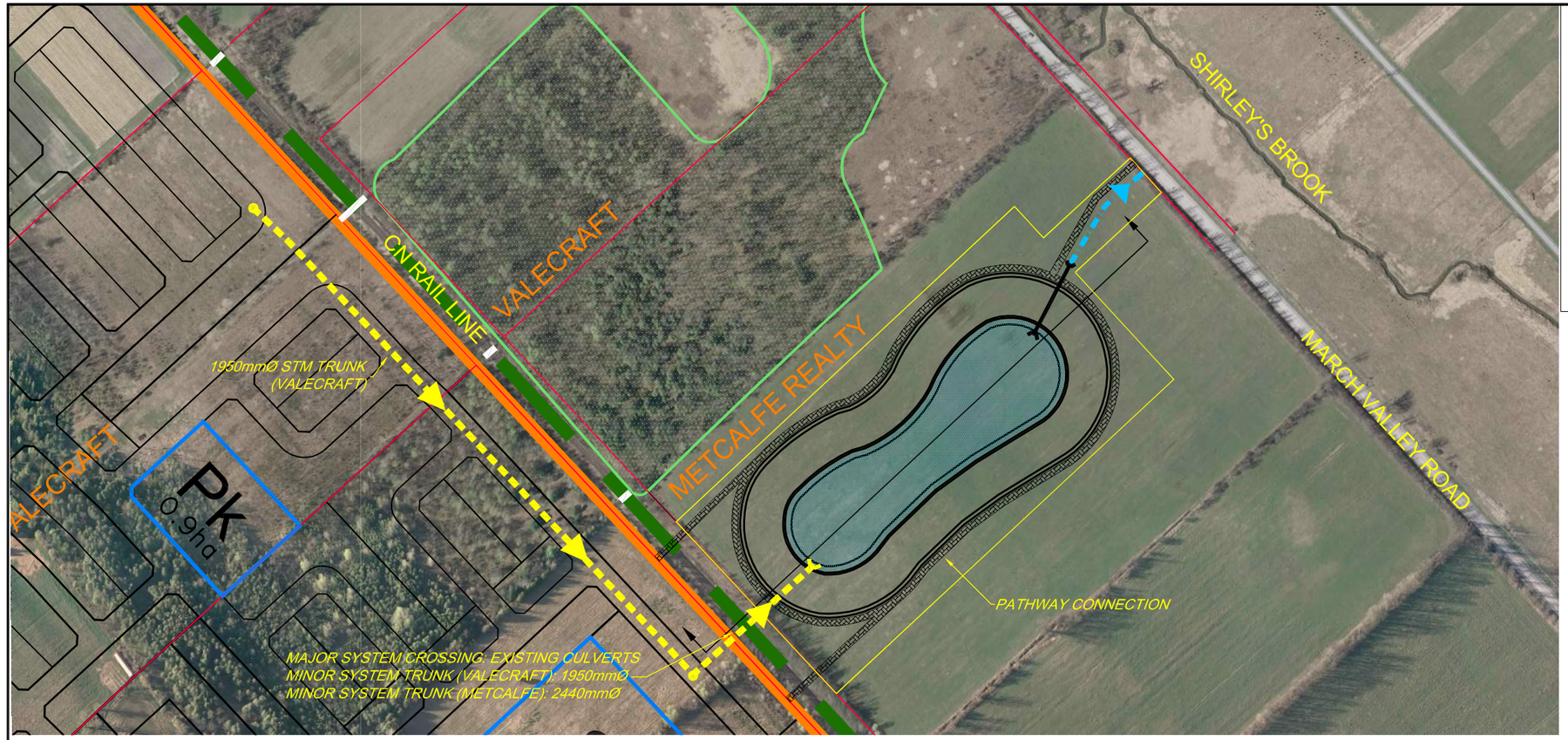
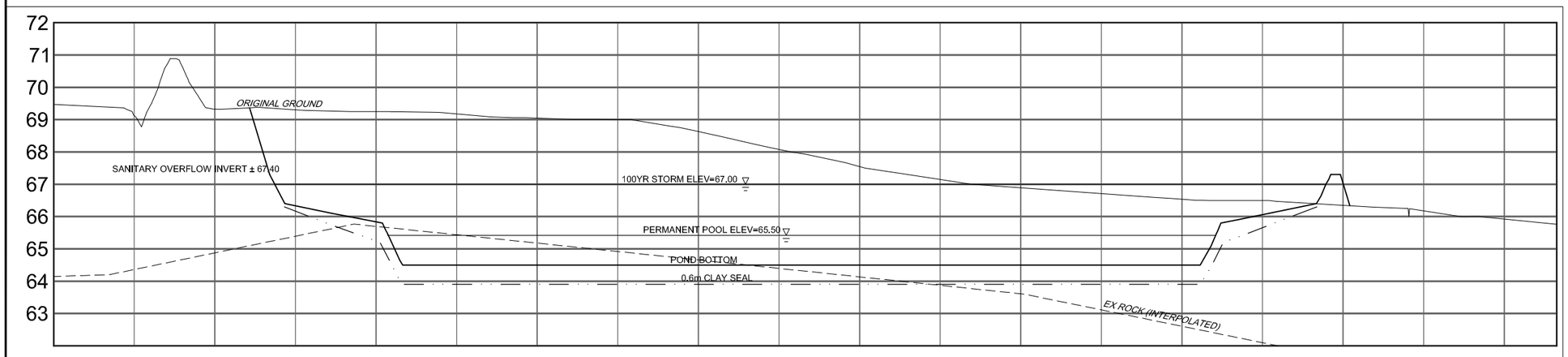


LEGEND

- Proposed Development Area
- Existing Property Lines
- Woodlot Boundary
- SWMF Footprint (approx.)
- Storm Trunk / Railway Crossing
- Ditching
- Pathway Linkage
- Existing Culverts



SECTION

SCALE 1:1500

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CITY OF OTTAWA
KANATA NORTH URBAN EXPANSION AREA STUDY

Stormwater Facility Option #2

SCALE 1:4000 (0, 40, 80, 120, 160)

DATE MAY 2015 | JOB 112117 | FIGURE EAST SWM2

SHT11X17.DWG - 279mmX432mm

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Kanata North

Preliminary Stormwater Facility Cost
Metcalfe & Valecraft SWMF - Option 2

ITEM NO.	ITEM	EST. QTY	UNIT	UNIT PRICE	TOTAL AMOUNT
SECTION A - STORMWATER FACILITY (63,000m³)					
1	Earthworks				
	i) Earth Excavation (incl Topsoil Stripping)	110,500	m³	$10.00	$1,105,000.00
	ii) Rock Excavation	9,100	m³	$40.00	$364,000.00
	iii) Clay Liner (0.6m Thick)	18,700	m²	$9.00	$168,300.00
2	Inlet - Concrete Headwall	1	ea.	$150,000.00	$150,000.00
3	Outlet - Structure (Including Pipe)	1	ea.	$175,000.00	$175,000.00
4	Outlet - Ditching	90	m	$100.00	$9,000.00
5	Rock Check Dam	2	ea.	$3,000.00	$6,000.00
6	Hydro Seeding	44,000	m²	$4.00	$176,000.00
7	Landscaping Allowance	1	LS	$188,000.00	$188,000.00
8	Access Road/ Pathway Connection	1,100	m	$205.00	$225,500.00
TOTAL SECTION A - STORMWATER FACILITY					**$2,566,800.00**

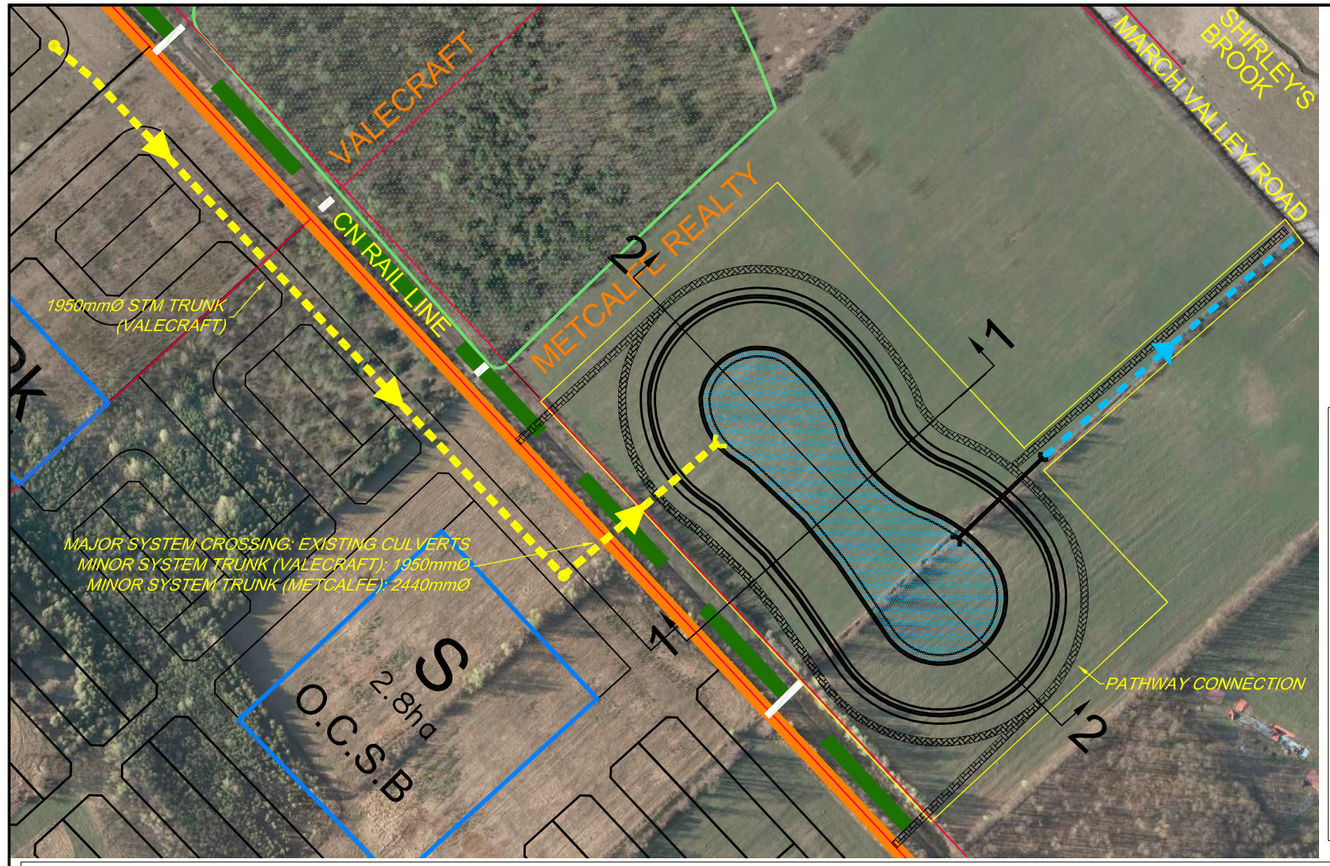
Construction Total		**$2,566,800.00**
25% Soft Costs and Contingency		**$641,700.00**
Net Rural Land (ac)	**16.7**	
Sub-Total Stormwater Facility		**$3,208,500.00**

ITEM NO.	ITEM	EST. QTY	UNIT	UNIT PRICE	TOTAL AMOUNT
SECTION B - VALECRAFT STORM TRUNK					
1	Storm Trunk Pipe - 1950mm Valecraft	490	m	$2,500.00	$1,225,000.00
2	Rail Line Crossing - 1950mm Valecraft	125	m	$2,500.00	$312,500.00
TOTAL SECTION B - VALECRAFT STORM TRUNK					**$1,537,500.00**

Construction Total	**$1,537,500.00**
25% Soft Costs and Contingency	**$384,375.00**
Sub-Total Valecraft Trunk	**$1,921,875.00**

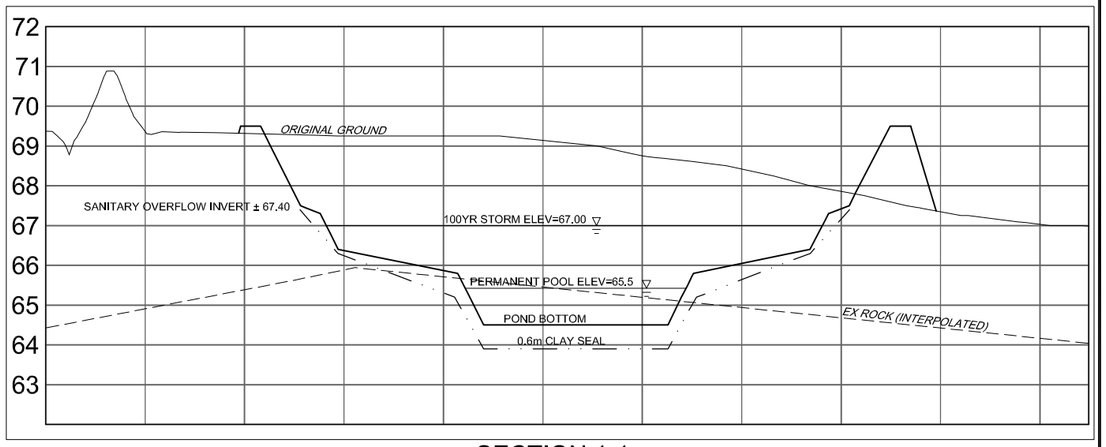
ITEM NO.	ITEM	EST. QTY	UNIT	UNIT PRICE	TOTAL AMOUNT
SECTION C - METCALFE STORM TRUNK					
1	Rail Line Crossing - 2440mm Metcalfe	125	m	$3,700.00	$462,500.00
TOTAL SECTION C - METCALFE STORM TRUNK					**$462,500.00**

Construction Total	**$462,500.00**
25% Soft Costs and Contingency	**$115,625.00**
Sub-Total Metcalfe Trunk	**$578,125.00**
Total Pond Cost	**$5,708,500.00**



LEGEND

- Proposed Development Area
- Existing Property Lines
- Woodlot Boundary
- SWMF Footprint (approx.)
- Storm Trunk / Railway Crossing
- Ditching
- Pathway Linkage
- Existing Culverts



SECTION 1-1

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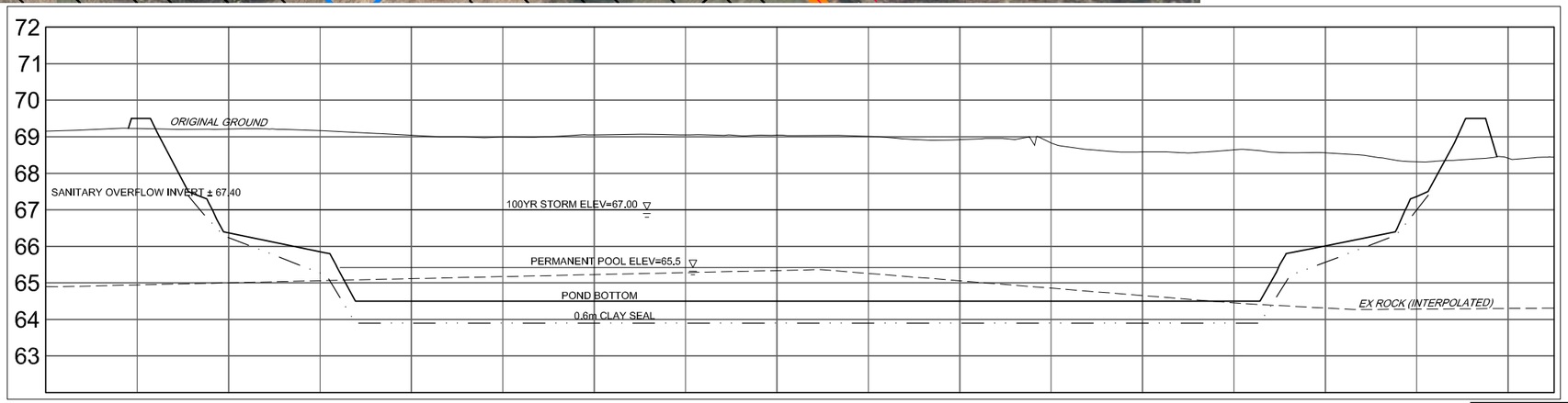

SECTION 2-2

SCALE 1:1500

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CITY OF OTTAWA
KANATA NORTH URBAN EXPANSION AREA STUDY

Stormwater Facility Option #2a

SCALE 1:4000 (0 40 80 120 160)

DATE MAY 2015 | JOB 112117 | FIGURE EAST SWM2a

SHT11X17.DWG - 279mmX432mm

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Kanata North

Preliminary Stormwater Facility Cost
Metcalfe & Valecraft SWMF - Option 2a

ITEM NO.	ITEM	EST. QTY	UNIT	UNIT PRICE	TOTAL AMOUNT
SECTION A - STORMWATER FACILITY (63,000m³)					
1	Earthworks				
	i) Earth Excavation (incl Topsoil Stripping)	148,500	m³	$10.00	$1,485,000.00
	ii) Rock Excavation	19,000	m³	$40.00	$760,000.00
	iii) Clay Liner (0.6m Thick)	21,000	m²	$9.00	$189,000.00
2	Inlet - Concrete Headwall	1	ea.	$150,000.00	$150,000.00
3	Outlet - Structure (Including Pipe)	1	ea.	$175,000.00	$175,000.00
4	Outlet - Ditching	220	m	$100.00	$22,000.00
5	Rock Check Dam	2	ea.	$3,000.00	$6,000.00
6	Hydro Seeding	57,000	m²	$4.00	$228,000.00
7	Landscaping Allowance	1	LS	$188,000.00	$188,000.00
8	Access Road/ Pathway Connection	1,500	m	$205.00	$307,500.00
TOTAL SECTION A - STORMWATER FACILITY					**$3,510,500.00**

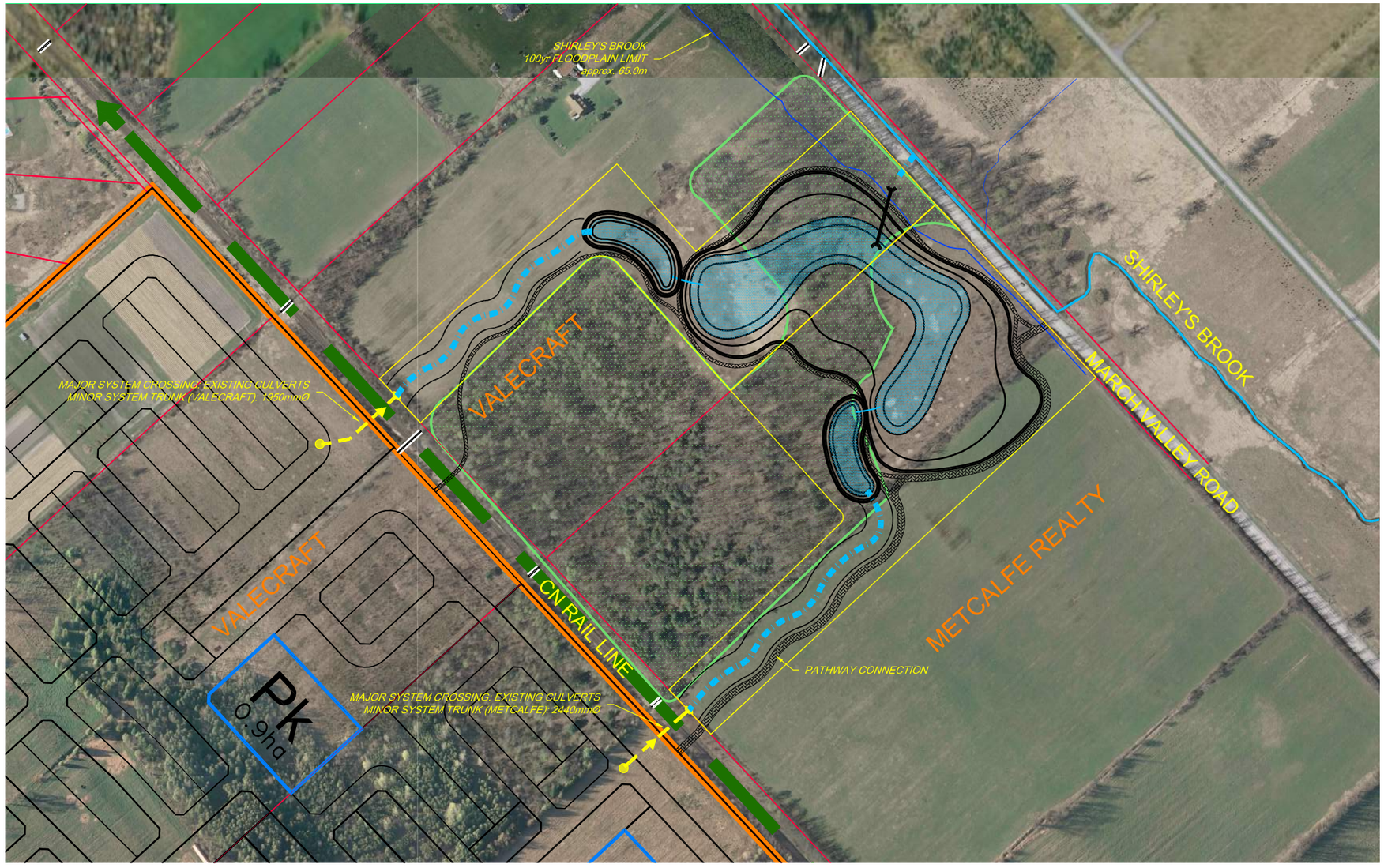
Construction Total		**$3,510,500.00**
25% Soft Costs and Contingency		**$877,625.00**
Net Rural Land (ac)	**21.7**	
Sub-Total Stormwater Facility		**$4,388,125.00**

ITEM NO.	ITEM	EST. QTY	UNIT	UNIT PRICE	TOTAL AMOUNT
SECTION B - VALECRAFT STORM TRUNK					
1	Storm Trunk Pipe - 1950mm Valecraft	490	m	$2,500.00	$1,225,000.00
2	Rail Line Crossing - 1950mm Valecraft	130	m	$2,500.00	$325,000.00
TOTAL SECTION B - VALECRAFT STORM TRUNK					**$1,550,000.00**

Construction Total	**$1,550,000.00**
25% Soft Costs and Contingency	**$387,500.00**
Sub-Total Valecraft Trunk	**$1,937,500.00**

ITEM NO.	ITEM	EST. QTY	UNIT	UNIT PRICE	TOTAL AMOUNT
SECTION C - METCALFE STORM TRUNK					
1	Rail Line Crossing - 2440mm Metcalfe	130	m	$3,700.00	$481,000.00
TOTAL SECTION C - METCALFE STORM TRUNK					**$481,000.00**

Construction Total	**$481,000.00**
25% Soft Costs and Contingency	**$120,250.00**
Sub-Total Metcalfe Trunk	**$601,250.00**
Total Pond Cost	**$6,926,875.00**



LEGEND

- Proposed Development Area
- Existing Property Lines
- Woodlot Boundary
- SWMF Footprint (approx.)
- Storm Trunk / Railway Crossing
- Ditching
- Pathway Linkage
- Existing Culverts

N

M:\2012\112117\CAD\Design\SWM\Cost Estimate Drawings\112117-SWM-cost est -EAST SWMF6.dwg, E-SWMF6-FULL (small), May 28, 2015 - 4:35pm, kbanks

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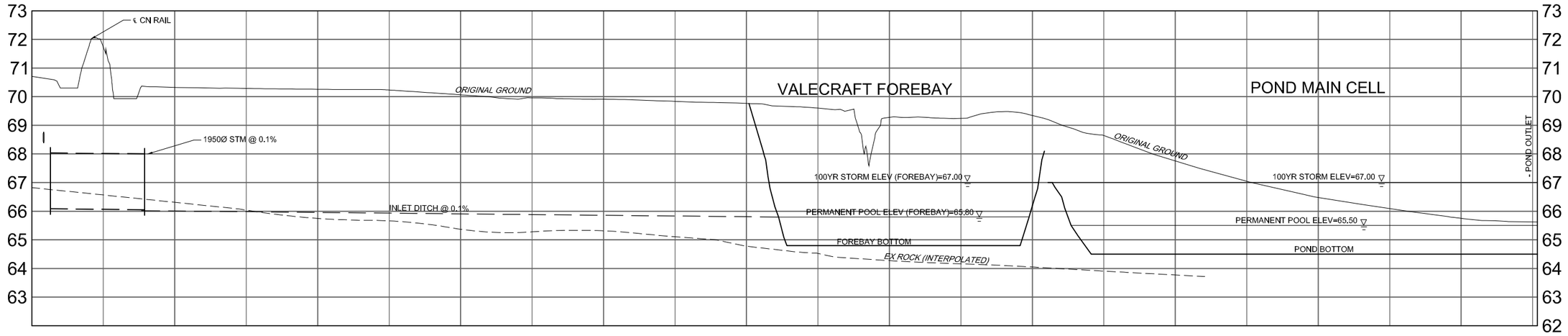
CITY OF OTTAWA
KANATA NORTH URBAN EXPANSION AREA STUDY

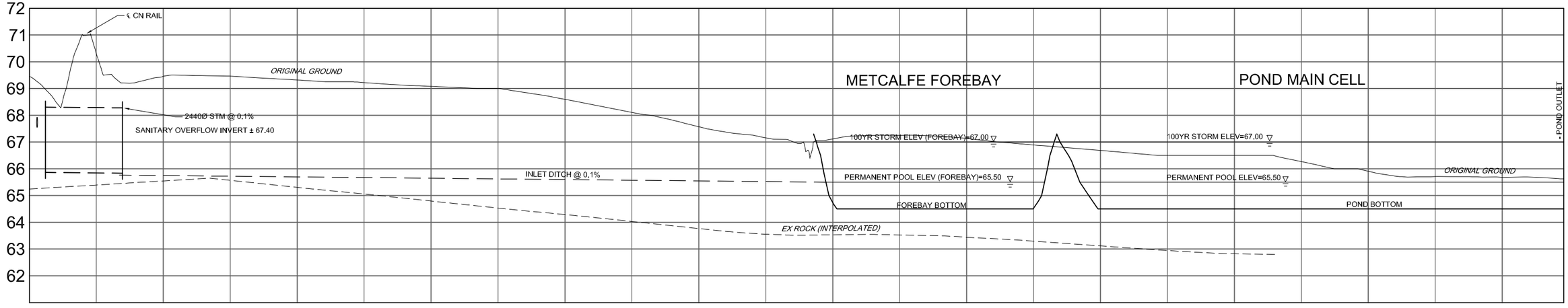
Stormwater Facility Option #6

SCALE 1:4000 (0, 40, 80, 120, 160)
DATE MAY 2015
JOB 112117
FIGURE EAST SWM6

SHT11X17.DWG - 279mmX432mm



VALECRAFT POND OUTLET
SECTION
SCALE 1:1500



METCALFE POND OUTLET
SECTION
SCALE 1:1500

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CITY OF OTTAWA
KANATA NORTH URBAN EXPANSION AREA STUDY

Stormwater Facility Option #6

SCALE 1 : 1500 (0 15 30 45 60)
DATE MAY 2015
JOB 112117
FIGURE EAST SWM6-PR

SHT11X17.DWG - 279mmX432mm

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Kanata North

Preliminary Stormwater Facility Cost

Metcalfe & Valecraft SWMF - Option 6

ITEM NO.	ITEM	EST. QTY	UNIT	UNIT PRICE	TOTAL AMOUNT
SECTION A - VALECRAFT FOREBAY (3,000m³)					
1	Earthworks				
	i) Earth Excavation (incl Topsoil Stripping)	10,700	m³	$10.00	$107,000.00
	ii) Rock Excavation	0	m³	$40.00	$0.00
	iii) Clay Liner (0.6m Thick)	0	m²	$9.00	$0.00
2	Clearing and Grubbing	0.5	ha	$10,000.00	$5,000.00
3	Rail Line Crossing -1950mm	80	m	$2,500.00	$200,000.00
4	Inlet - Concrete Headwall	1	ea.	$60,000.00	$60,000.00
5	Inlet - Ditching	200	m	$350.00	$70,000.00
6	Outlet - Structure (Including Pipe)	1	ea.	$50,000.00	$50,000.00
7	Rock Check Dam	1	ea.	$3,000.00	$3,000.00
8	Hydro Seeding	3,100	m²	$4.00	$12,400.00
9	Landscaping Allowance	1	LS	$30,000.00	$30,000.00
10	Access Road/ Pathway Connection	500	m	$205.00	$102,500.00
TOTAL SECTION A - STORMWATER FACILITY					**$639,900.00**

Construction Total	**$639,900.00**
25% Soft Costs and Contingency	**$159,975.00**
Sub-Total (Valecraft Forebay)	**$799,875.00**

ITEM NO.	ITEM	EST. QTY	UNIT	UNIT PRICE	TOTAL AMOUNT
SECTION B - METCALFE FOREBAY (3,000m³)					
1	Earthworks				
	i) Earth Excavation (incl Topsoil Stripping)	5,400	m³	$10.00	$54,000.00
	ii) Rock Excavation	0	m³	$40.00	$0.00
	iii) Clay Liner (0.6m Thick)	0	m²	$9.00	$0.00
2	Clearing and Grubbing	1	ha	$10,000.00	$10,000.00
3	Rail Line Crossing - 2440mm	70	m	$3,700.00	$259,000.00
4	Inlet - Concrete Headwall	1	ea.	$60,000.00	$60,000.00
5	Inlet - Ditching	260	m	$350.00	$91,000.00
6	Outlet - Structure (Including Pipe)	1	ea.	$50,000.00	$50,000.00
7	Rock Check Dam	1	ea.	$3,000.00	$3,000.00
8	Hydro Seeding	3,000	m²	$4.00	$12,000.00
9	Landscaping Allowance	1	LS	$30,000.00	$30,000.00
10	Access Road/ Pathway Connection	450	m	$205.00	$92,250.00
TOTAL SECTION B - STORMWATER FACILITY					**$661,250.00**

Construction Total	**$661,250.00**
25% Soft Costs and Contingency	**$165,312.50**
Sub-Total (Metcalfe Forebay)	**$826,562.50**

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Kanata North

Preliminary Stormwater Facility Cost
Metcalfe & Valecraft SWMF - Option 6

ITEM NO.	ITEM	EST. QTY	UNIT	UNIT PRICE	TOTAL AMOUNT
SECTION C - STORMWATER FACILITY SHARED COSTS (57,000m³)					
1	Earthworks				
	i) Earth Excavation (incl Topsoil Stripping)	40,000	m³	$10.00	$400,000.00
	ii) Rock Excavation	0	m³	$40.00	$0.00
	iii) Clay Liner (0.6m Thick)	0	m²	$9.00	$0.00
2	Clearing and Grubbing	4	ha	$10,000.00	$40,000.00
3	Outlet - Structure (Including Pipe)	1	ea.	$175,000.00	$175,000.00
4	Outlet - Ditching	160	m	$100.00	$16,000.00
5	Rock Check Dam	2	ea.	$3,000.00	$6,000.00
6	Hydro Seeding	44,000	m²	$4.00	$176,000.00
7	Landscaping Allowance	1	LS	$130,000.00	$130,000.00
8	Access Road/ Pathway Connection	1,100	m	$205.00	$225,500.00
TOTAL SECTION C - STORMWATER FACILITY					**$1,168,500.00**

Construction Total		**$1,168,500.00**
25% Soft Costs and Contingency		**$292,125.00**
Valecraft Rural Land (ac)	**10.1**	
Metcalfe Rural Land (ac)	**14.5**	
Sub-Total (Main Cell)		**$1,460,625.00**
Total (Main Cell + Forebays)		**$3,087,062.50**

Evaluation Matrix: SWM Facility Options for KNUEA Lands East of March Road (2, 2a, and 6 only)

Criteria	*Indicators*	**Option 2 (Figure EAST SWM2)** ***One pond outside of KNUEA limits, perpendicular (length-wise) to rail line***	**Option 2a (Figure EAST SWM2a)** ***One pond outside of KNUEA limits adjacent to CN Rail Line, parallel (length-wise) to rail line***	**Option 6 (Figure EAST SWM6)** ***One pond outside of KNUEA limits adjacent to March Valley Road***
Geotechnical	*Pond Depth / Rock Excavation / Pond Liner*	• Total depth below existing ground ranges from 3.0m (near March Valley Road) to 5.5m (near CN Rail line). • Requires some excavation into bedrock in the vicinity of CN Rail line. • Geotechnical liner required.	• Total depth below existing ground ranges from 4.5m (near southern boundary of KNUEA lands) to 5.5m (near woodlot). • Requires additional excavation into bedrock in the vicinity of CN Rail line. • Geotechnical liner required.	• Total depth below ground is approximately 3.0m across entire pond & forebays, up to 4.0m(near CN Rail line) • Will not require any excavation into bedrock • Will not require a geotechnical liner
Storm & Sanitary Servicing	*Trunk Sewers / Rail Crossings / Major System/ SAN Overflow*	<u>STM Servicing</u> • New STM crossing of CN Rail required (uncontrolled 5yr post-dev. flow) <u>Major System</u> • Major system crossing(s) of CN rail line required (existing culverts). <u>SAN Overflow</u> • SAN Overflow INV = 67.40	<u>STM Servicing</u> • New STM crossing of CN Rail required (uncontrolled 5yr post-dev. flow) <u>Major System</u> • Major system crossing(s) of CN rail line required (existing culverts). <u>SAN Overflow</u> • SAN Overflow INV = 67.40	<u>STM Servicing</u> • New STM crossings of CN Rail required (uncontrolled 5yr post-dev. flow) <u>Major System</u> • Major system crossing(s) of CN rail line required (existing culverts). <u>SAN Overflow</u> • SAN Overflow INV = 67.40
SWMF Operation	*Operating Levels / SWMF Outlet*	<u>Water Levels</u> • 1.5m active storage depth. • 100yr WL =67.00 (below SAN overflow) • NWL=65.50m (approx. 2yr WL in Shirley's Brook). <u>SWMF Outlet</u> • Single outlet to Shirley's Brook at March Valley Road (controlled to pre-development levels).	<u>Water Levels</u> • 1.5m active storage depth. • 100yr WL =67.00 (below SAN overflow) • NWL=65.50 m (approx. 2yr WL in Shirley's Brook). <u>SWMF Outlet</u> • Single outlet to Shirley's Brook at March Valley Road (controlled to pre-development levels).	<u>Water Levels</u> • 1.5m active storage depth. • 100yr WL =67.00 (below SAN overflow) • NWL=65.50m (approx. 2yr WL in Shirley's Brook). <u>SWMF Outlet</u> • Single outlet to Shirley's Brook at March Valley Road (controlled to pre-development levels).
Land Requirements	*Pond Footprint / Setbacks*	• Pond Footprint = 6.4 ha	• Pond Footprint = 8.3 ha	• Pond Footprint = 7.8 ha
Connectivity	*Integration with Development / Amenity Features*	• SWM facility can be integrated into community using pathway system adjacent to woodlot. • Approx. 500m walk from centre of KNUEA East lands to edge of pond. • Rural area provides space and opportunity for new natural features and amenity space to be integrated into SWM block. • Minimal integration of existing natural features	• SWM facility can be integrated into community using pathway system adjacent to woodlot. • Approx. 500m walk from centre of KNUEA East lands to edge of pond. • Rural area provides space and opportunity for new natural features and amenity space to be integrated into SWM block. • Minimal integration of existing natural features	• SWM facility can be integrated into community using pathway system adjacent to/ within woodlot. • Approx. 670m walk from centre of KNUEA East lands to edge of pond (including 170m along pond inlets). • Rural area provides space and opportunity for new and existing natural features and amenity space to be integrated into SWM block. • Integration of pathways and SWMF into existing mature natural features and topography
Cost	*Construction / Maintenance*	• High construction cost • High maintenance cost, up to 5.5m deep	• Highest construction cost • Higher maintenance costs, up to 5.5m deep and furthest from March Valley Road	• Lowest construction cost • Lower maintenance cost, shallowest option, adjacent to March Valley Road for ease of access
Summary & Recommendation		High cost. Some rock excavation required. Minimal integration of existing natural features.	Highest cost. Large rock excavation required. Minimal integration of existing natural features.	<u>Preferred Option</u> Lowest cost. No excavation into bedrock required. Good integration with existing natural features, and space for amenities or other features.

MARCH VALLEY ROAD
CN RAIL LINE
LEGEND
TEST PIT LOCATION, CURRENT INVESTIGATION PATTERSON GROUP MEMO PG2878
TEST PIT LOCATION, PREVIOUS INVESTIGATION PATTERSON GROUP REPORT PG2878
TEST PIT LOCATION, PREVIOUS INVESTIGATION PATERSON GROUP REPORT PG2256, 2011
TEST PIT LOCATION, PREVIOUS INVESTIGATION PATERSON GROUP REPORT PG1823, 2009
BORE HOLE LOCATION, PREVIOUS INVESTIGATION
TEST PIT LOCATION BY OTHERS
78.55 GROUND ELEVATION (m)
[76.39] BEDROCK ELEVATION (m
(64.10) PRACTICAL REFUSAL TO EXCAVATION ELEV. (m)
OWNERSHIP BOUNDARY
STUDY AREA BOUNDARY
RIVER OR STREAM
CN RAILWAY TRAIN TRACKS
MAJOR CONTOURS & ELEVATION LABELS
East SWMF Option 2
East SWMF Option 2a
East SWMF Option 6
TP 4-14 66.08 (TILL @ 61.20)
TP 3-14 65.95 (TILL @ 60.77)
TP 20 66.31 (CLAY @ 62.65)
TP 19 66.43 (CLAY @ 62.77)
TP 5-14 68.72 (CLAY @ 63.84)
TP 23 66.94
TP 18 67.12 (CLAY @ 63.46)
TP 7-14 70.04 (TILL @ 65.16)
TP 16 69.61
TP 17 69.25 (CLAY @ 65.59)
TP 16 70.73 [68.63]
TP 11 70.87 (68.03)
TP 12 70.75 (68.77)
TP 15 70.32 [66.42]
TP 21 70.09 [66.79]
TP 10-13 70.25 (65.73)
TP 1-14 69.73 (TILL @ 65.03)
TP 2-14 69.65 (CLAY @ 64.77)
BH 3-13 69.75 (63.35)
TP 11-13 69.75 (64.11)
TP 13 71.05 (68.56)
TP 17 70.77 [68.67]
TP 10 70.80 (68.36)
TP 14 70.57 [68.57]
TP 20 70.03 [67.63]
TP 12 69.71 (TILL @ 66.05)
TP 13 69.87 (CLAY @ 66.21)
TP 14 69.90 (CLAY @ 66.24)
TP 9 71.50 (69.06)
TP 18 70.96 [68.36]
TP 19 70.36 [69.16]
BH 1-13 70.75 (70.09)
TP 13 72.12 [71.92]
TP 8 72.92 (70.79)
TP 7 72.82 (71.91)
BH 2-13 70.0 (67.56)
TP 24 75.76 [72.51]
TP 9 79.59
TP 8 79.41
TP 9-13 70.85 [69.1]
TP 10 70.43 [68.60]
TP 11 70.02 [68.75]
TP 6 79.50
TP 4 79.62
TP 3-13 79.3
TP 4-13 77.0 (72.22)
TP 5-13 71.0 [70.6]
TP 8-13 70.65 [69.9]
TP 5 78.70 (75.04)
TP 3 78.49
TP 10 79.21
TP 7 79.41
TP 2-13 79.5
TP 1-13 79.5
TP 9 78.71
TP 7-13 73.0 [70.1]
TP 6-13 74.0 [74.2]
TP 4 78.84 (75.79)

NOTE:
THE POSITION OF ALL POLE LINES, CONDUITS, WATERMAINS, SEWERS AND OTHER UNDERGROUND AND OVERGROUND UTILITIES AND STRUCTURES IS NOT NECESSARILY SHOWN ON THE CONTRACT DRAWINGS, AND WHERE SHOWN, THE ACCURACY OF THE POSITION OF SUCH UTILITIES AND STRUCTURES IS NOT GUARANTEED. BEFORE STARTING WORK, DETERMINE THE EXACT LOCATION OF ALL SUCH UTILITIES AND STRUCTURES AND ASSUME ALL LIABILITY FOR DAMAGE TO THEM.

No.	REVISION	DATE	BY
4.	UPDATED POND LOCATIONS & NUMBERING	MAY 2015	KJA
3.	UPDATED POND LOCATIONS & NUMBERING	OCT 2014	KJA
2.	UPDATED TEST PIT INFORMATION, POND 1B UPDATED	OCT 2014	KJA
1.	ROCK ELEVATIONS	JAN 2014	ARM

SCALE 1:2000

DESIGN KJM
CHECKED MAB
DRAWN DTD
CHECKED MAB
APPROVED JGR

FOR REVIEW ONLY

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CITY OF OTTAWA
KANATA NORTH EXPANSION AREA CDP

TEST PIT LOCATIONS & EAST SWMF OPTIONS

PROJECT No. 112117
REV # 4
DRAWING No. 112117-TPSWMF

NOVATECH
Engineers, Planners & Landscape Architects

M E M O R A N D U M

DATE: **AUGUST 10, 2015**

TO: **NATIONAL CAPITAL COMMISSION**

FROM: **M.PETEPIECE**

RE: **KANATA NORTH URBAN EXPANSION AREA STORM OUTLET TO SHIRLEY'S BROOK AT MARCH VALLEY ROAD**

CC: **FILE**

The Kanata North Urban Expansion Area (KNUEA) is situated in the Shirley's Brook subwatershed. The lands west of March Road will outlet to the Northwest Branch Tributary of Shirley's Brook, while the lands east of March Road will outlet directly to the main Branch of Shirley's Brook at March Valley Road.

While the KNUEA boundary stops at the former CN Rail line, storm drainage will be directed under the former rail corridor, through lands owned by Valecraft / Metcalfe, to a proposed SWM facility located adjacent to March Valley Road that will outlet to the main branch of Shirley's Brook.

The reach of Shirley's Brook adjacent to the proposed SWMF is located within the March Valley Road right-of-way. The roadway embankment along this reach is steep and prone to washout during periods of high flow, and has been reinforced with gabion baskets and riprap. Further downstream, the watercourse resumes a more natural flow path outside of the right-of-way and flows northeast through the DND lands towards Shirley's Bay and the Ottawa River.

Post-development runoff from the KNUEA lands will be controlled to pre-development levels, but the volume of water entering Shirley's Brook will increase. The reach of Shirley's Brook within the March Valley Road right-of-way is at the downstream end of a large urban watershed and the additional flow contribution from the KNUEA lands will be relatively small. However, it is recognized that any increase in runoff could potentially lead to more frequent washouts of the roadway embankment.

To address this issue, three alternatives for the KNUEA storm outlet at March Valley Road have been developed:

1. The roadside ditch on the west side of March Valley Road can be re-graded to provide a storm outlet to Shirley's Brook further downstream where the watercourse leaves the right-of-way.
2. Improvements can be made to Shirley's Brook within the March Valley Road right-of-way to stabilize the banks and improve the channel morphology.
3. The reach of Shirley's Brook within the right-of-way can be re-located.

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Option 1: Re-grade the roadside ditch on the east side of March Valley Road

The east side of March Valley Road does not currently have a well-defined roadside ditch. Runoff from the agricultural fields and wooded areas to the east flow overland to the right-of-way, then outlet to Shirley's Brook through a pair of CSP culverts crossing March Valley Road near the northeast corner of the Valecraft property.

The existing cross-culverts would be removed and the ditch would be re-graded to convey runoff further north to a new culvert that would outlet to Shirley's Brook just downstream of where it leaves the March Valley Road ROW. The proposed scope of work associated with this option is shown on **Figure OPT 1**.

Pros:

- Provides a storm outlet for the KNUEA lands downstream of the reach of Shirley's Brook within the March Valley Road ROW.

Cons:

- Requires removal of existing trees in and adjacent to the right-of-way.
- Proposed ditch would be very flat (approximately 0.15% grade).
- Requires work at a private entrance not owned by the developers (larger culvert, ditch re-grading).
- May require grading work outside the right-of-way limits on property not owned by the developers.
- While this option will ensure no adverse impacts to Shirley's Brook, it does not address existing operational issues.

Option 2: Improvements to Shirley's Brook within March Valley Road ROW

Parish Geomorphic have indicated that improvements could be made to Shirley's Brook to improve the stability of the banks and channel along the March Valley Road ROW. The storm outlet for the KNUEA lands would discharge to the existing watercourse in the locations shown on **Figure OPT 2**. This option would require a permit from MVCA (alterations to watercourses).

Pros:

- Provides a storm outlet to Shirley's Brook for the KNUEA lands.
- The required work would be limited to the March Valley Road right-of-way.
- Proposed improvements should reduce the frequency of maintenance and repair to the road embankment.

Cons:

- Would require removal of some existing trees on the east bank of Shirley's Brook.
- May not fully address ongoing maintenance and operational issues, as the extent and type of improvements would be limited by the space available within the right-of-way.

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Option 3: Relocate Shirley's Brook outside of March Valley Road ROW

The construction of March Valley Road required the re-alignment of Shirley's Brook resulting in a straightened channel that runs parallel to the right-of-way for approximately 450m. There is an opportunity to relocate this reach of the watercourse outside of the right-of-way using natural channel design techniques.

The proposed channel would be located on federal lands (DND gun range) managed by NCC. The storm outlet for the KNUEA lands would discharge to the re-aligned watercourse in the locations shown on **Figure OPT 3**. This option would require a permit from MVCA (alterations to watercourses).

Pros:

- Provides a storm outlet to Shirley's Brook for the KNUEA lands.
- The proposed work would significantly improve this reach of Shirley's Brook.
- The March Valley Road right-of-way could be re-designed with a much smaller ditch, providing the opportunity for future improvements to the road (widening, etc.) within the existing right-of-way.
- The proposed alignment would run through an open area and would require minimal removal of existing trees.

Cons:

- Requires approval from NCC / DND.
- Longest timeline for approvals and co-ordination.

Conclusions and Recommendations

Option 1 (re-grade existing ditch) is not recommended. There are a number of design issues that would need to be addressed: There are a significant number of trees located in or near the right-of-way that would need to be removed. The proposed ditch would likely have standing water due to the flat grade of the ditch and the proximity to the water table. A new culvert would need to be installed under the driveway to the north of the Valecraft property. This driveway is in a low, wet area with no clearly defined ditch and it may be necessary to remove trees and place fill outside of the right-of-way, which would need to be agreed upon by the landowner.

Option 2 (channel stabilization) is viable, but the opportunities for channel improvement will be limited by the space available within the right-of-way. Channel stabilization techniques will ensure that the increase in runoff from the KNUEA lands will not increase the probability of bank failure and/or washouts, but there will still be some risk as the channel will still be located within the right-of-way.

Option 3 (channel relocation) is the preferred option from a technical perspective and represents the best long-term solution, but is contingent on obtaining approval from NCC. The estimated cost of the proposed works is comparable to Option 2, and there may be opportunity for cost-sharing between the City, the NCC, and the developer that could offset the total cost. This option also opens up the opportunity for future improvements to March Valley Road by relocating Shirley's Brook outside the right-of-way.

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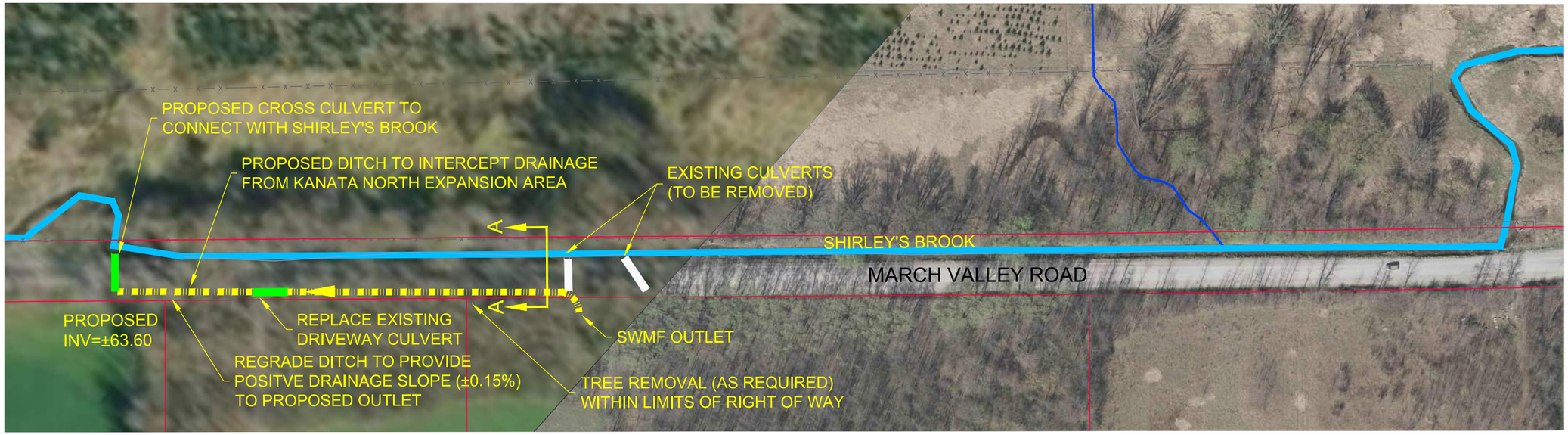

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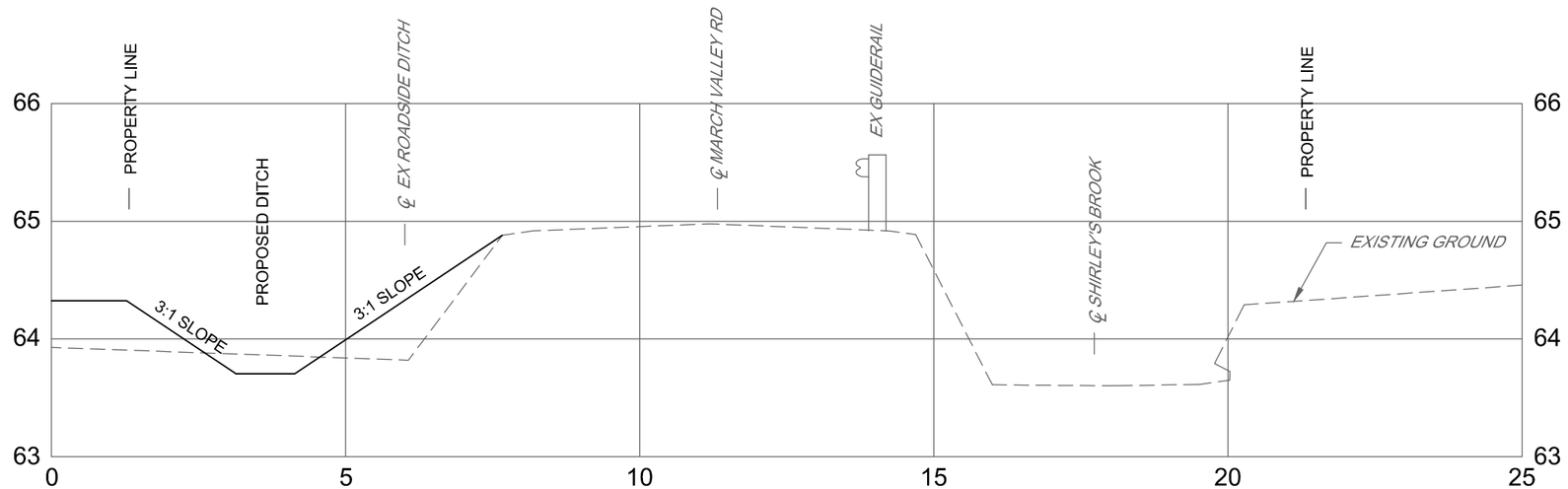

SECTION A-A
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CITY OF OTTAWA
KANATA NORTH URBAN EXPANSION AREA STUDY

EAST STORM OUTLET
OPTION 1

SCALE: AS NOTED
DATE: AUG 2015 | JOB: 112117 | FIGURE: OPT 1

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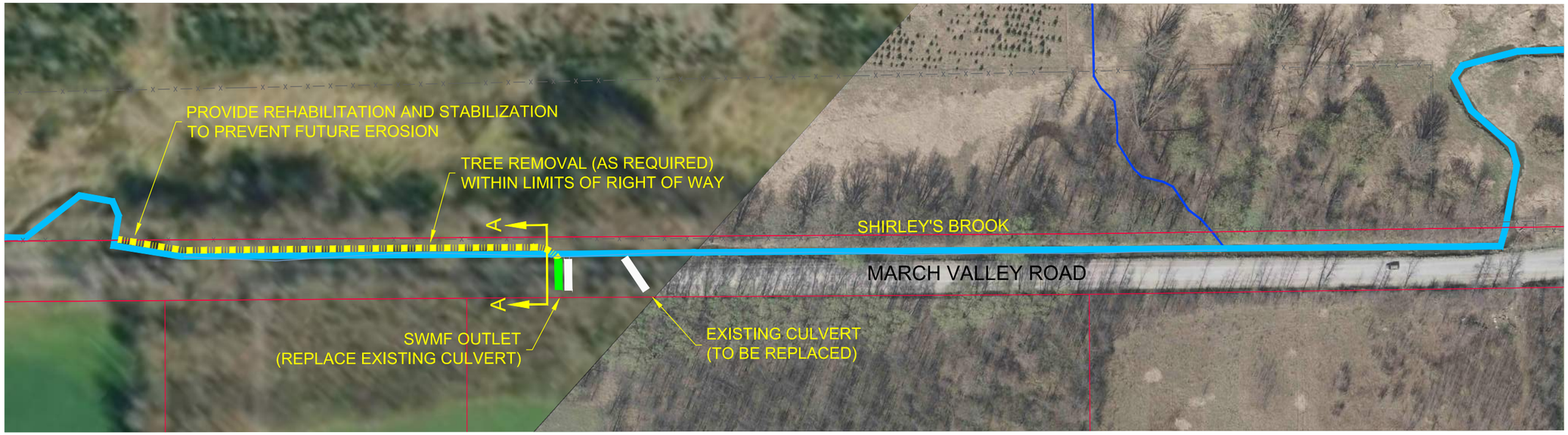

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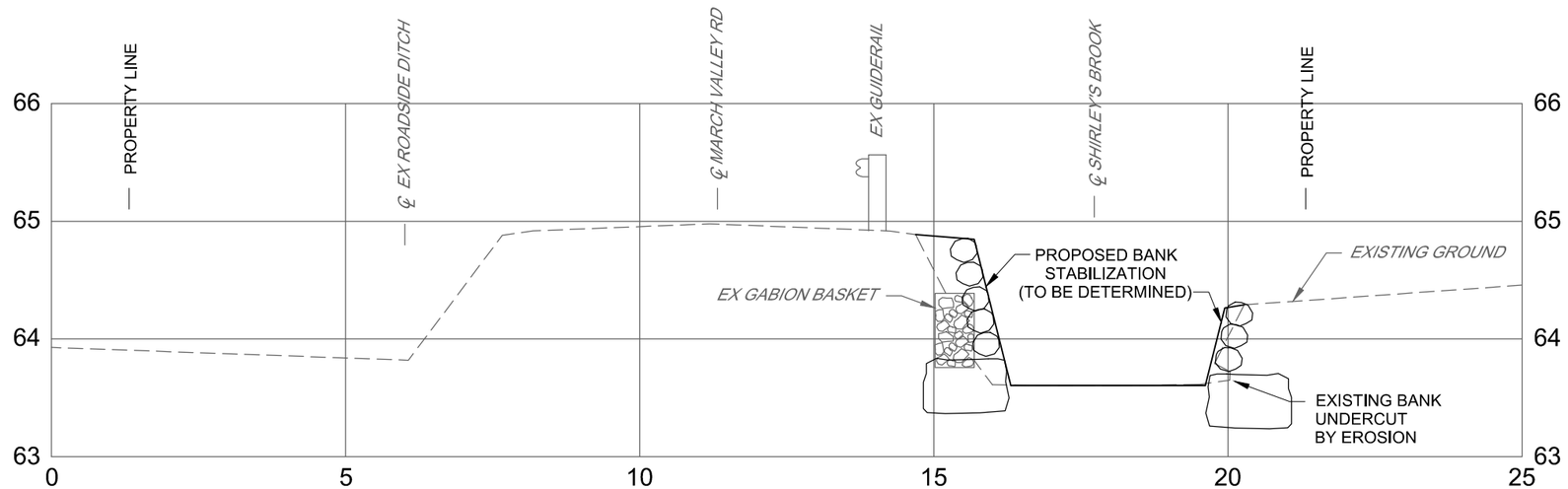

SECTION A-A
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CITY OF OTTAWA
KANATA NORTH URBAN EXPANSION AREA STUDY

EAST STORM OUTLET
OPTION 2

SCALE: AS NOTED
DATE: AUG 2015 | JOB: 112117 | FIGURE: OPT 2

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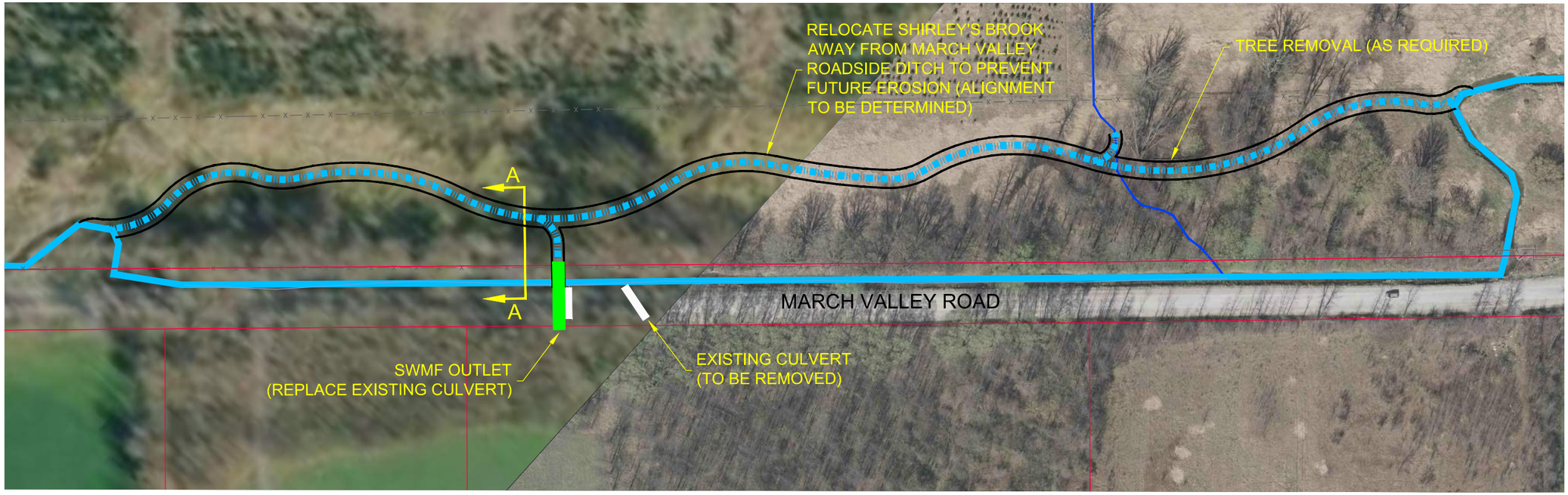

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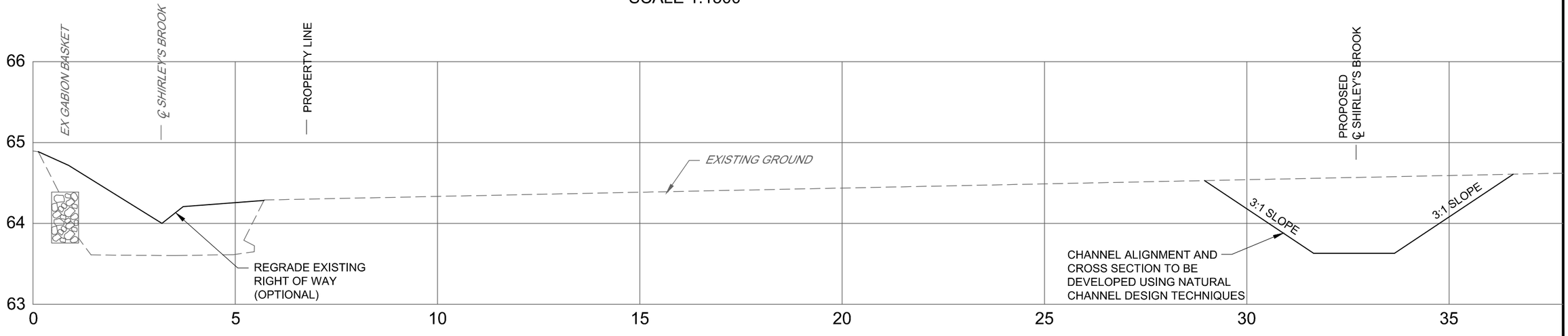

SECTION A-A
SCALE H 1:100
V 1:50

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CITY OF OTTAWA
KANATA NORTH URBAN EXPANSION AREA STUDY

SHIRLEY'S BROOK REALIGNMENT

SCALE		
AS NOTED		
DATE	JOB	FIGURE
AUG 2015	112117	OPT 3

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M E M O R A N D U M

DATE: **JULY 30, 2015**

TO: **KNUEA TAC**

FROM: **K.AULD / M.PETEPIECE**

RE: **RECOMMENDED SWM STRATEGY FOR KNUEA LANDS**

FILE NO.: **112117**

CC: **FILE**

The recommended SWM strategy for the KNUEA lands is summarized below and illustrated by the attached figures:

- **FIG-1**: Overall Pond Layout & Drainage Areas

LANDS WEST OF MARCH ROAD

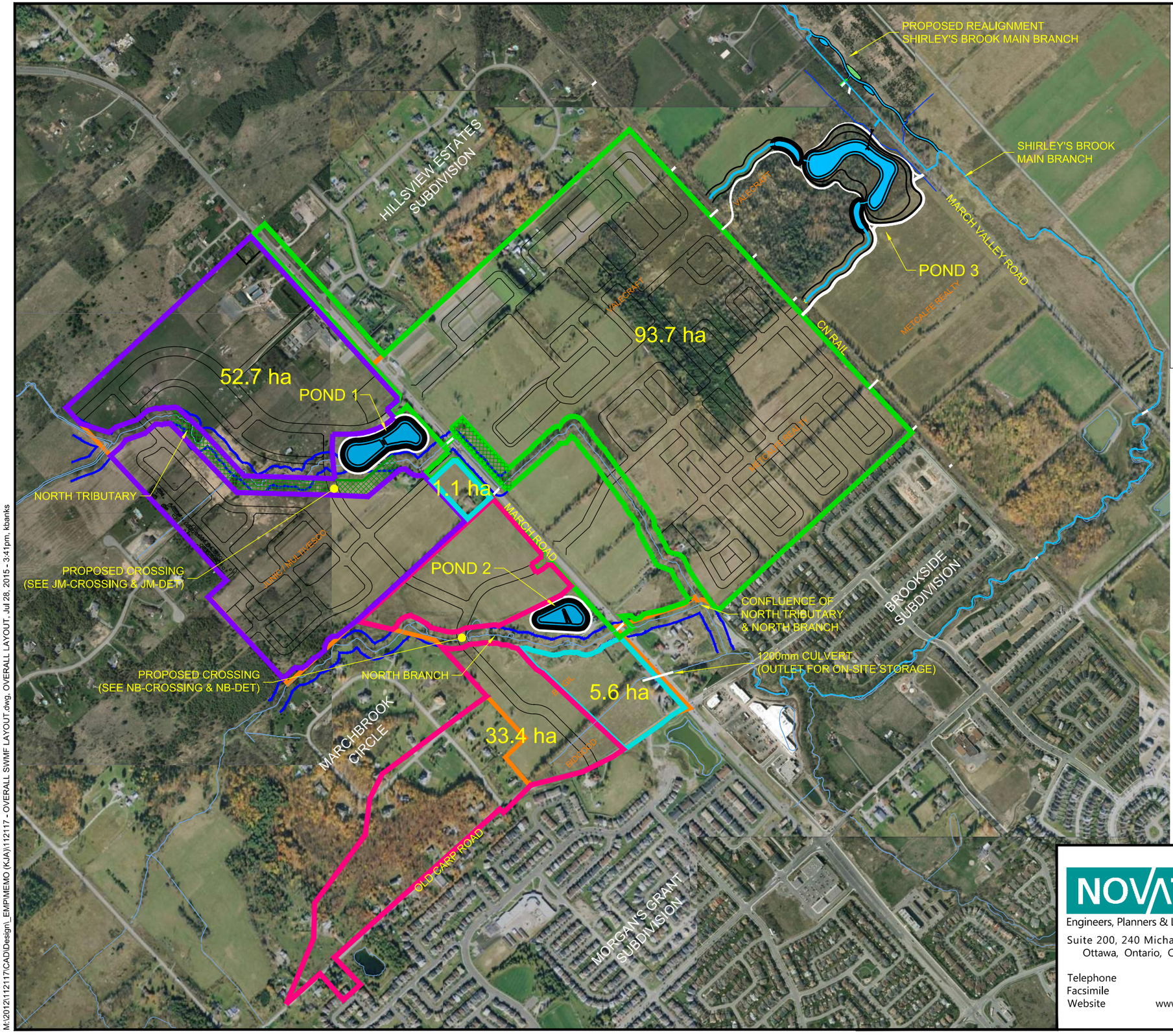
- **POND 1:** Junic / Multivesco SWM Facility
- **POND 2:** Brigil SWM Facility
- **NB-CROSSING:** Proposed STM crossing under Shirley's Brook Tributary
- **NB-DET:** Cross-sections of proposed STM crossing
- **JM-CROSSING:** Proposed STM crossing under Northwest Branch of Shirley's Brook
- **JM-DET:** Cross-sections of proposed STM crossing

Note: On-Site SWM controls are proposed for two areas adjacent to March Road. The proposed land uses are suitable for on-site quality and quantity control.

LANDS EAST OF MARCH ROAD

- **POND 3:** Metcalfe / Valecraft SWM Faciltiy
- **POND 3-PR:** Metcalfe / Valecraft SWMF Cross-Sections
- **SB-R2:** Proposed realignment of Shirley's Brook adjacent to March Valley Road.

Suite 200, 240 Michael Cowpland Drive, Ottawa ON K2M 1P6 Tel: 613.254.9643 Fax: 613.254.5867 www.novatech-eng.com



M:\2012\112117\CAD\Design_EMP\MEMO (KJA)\112117 - OVERALL SWMF LAYOUT.dwg, OVERALL LAYOUT, Jul 28, 2015 - 3:41pm, kbanks

NOVATECH
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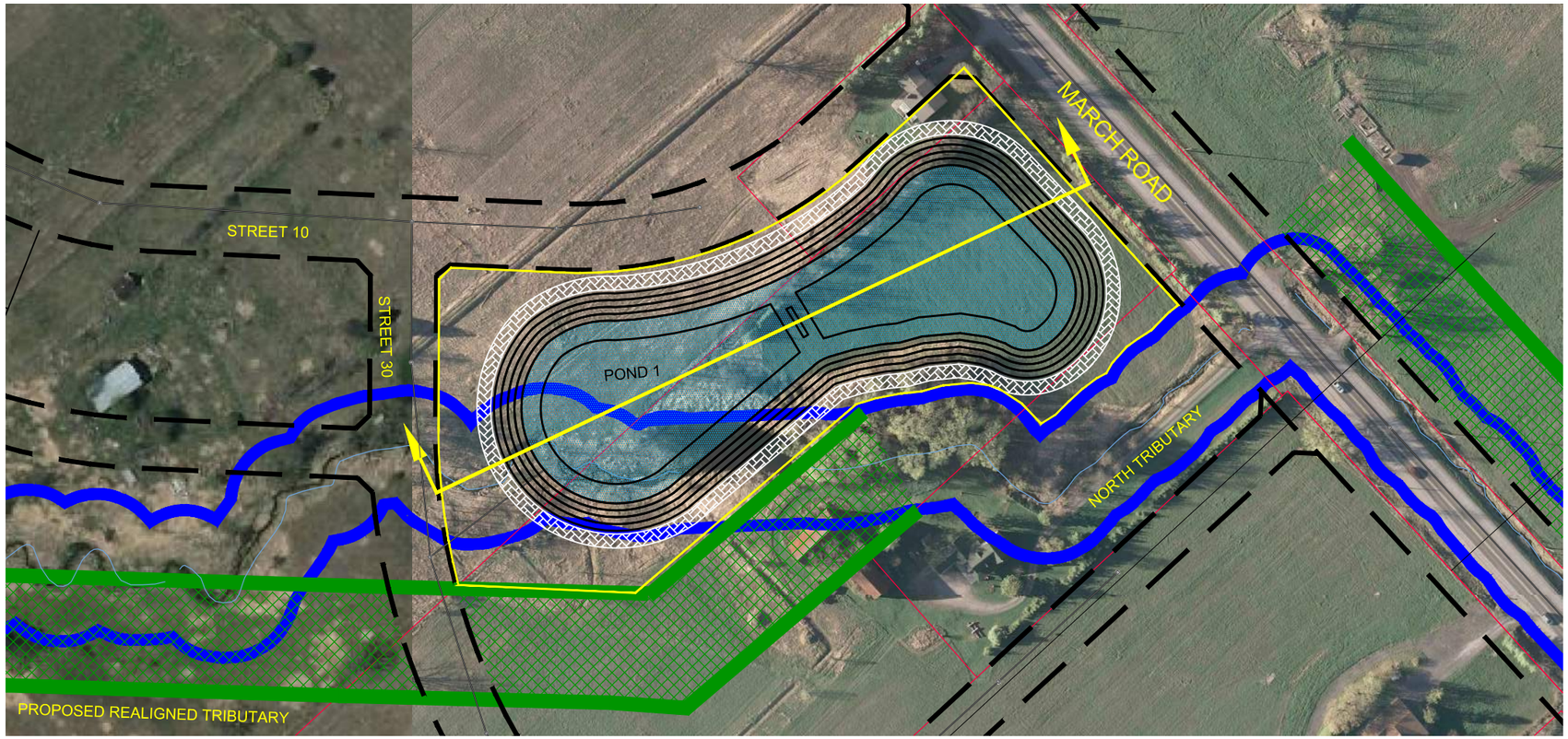
CITY OF OTTAWA KANATA NORTH
URBAN EXPANSION AREA STUDY

OVERALL POND LAYOUT

SCALE 1 : 10,000 (0, 100, 200, 300, 400)

DATE JULY 2015 | JOB 112117 | FIGURE FIG-1

SHT11X17.DWG 279mmX432mm

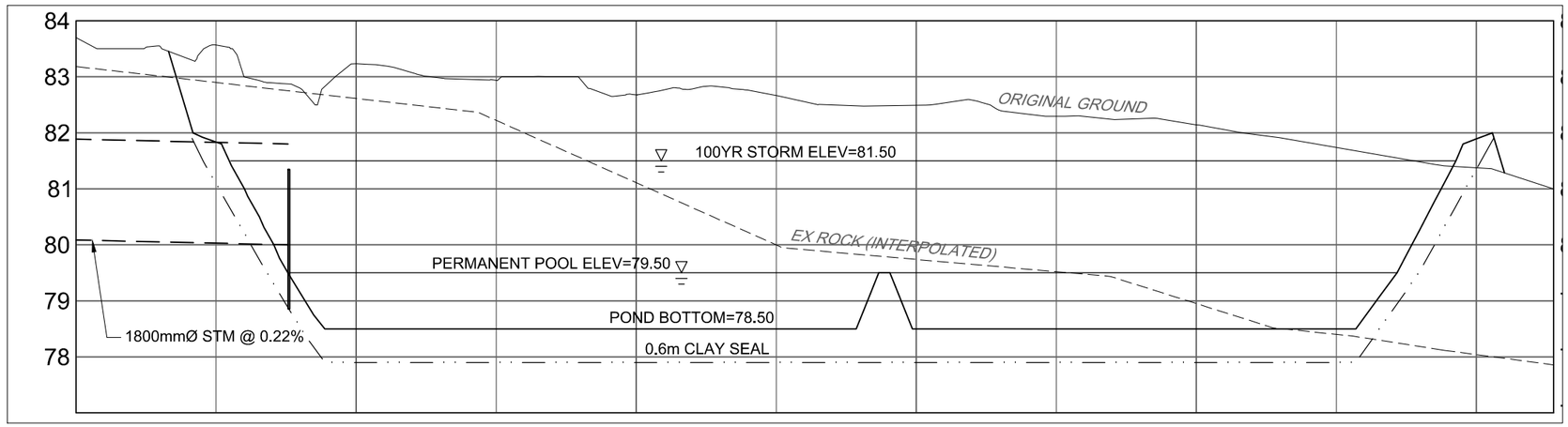


LEGEND

- Proposed Development Area
- Existing Property Lines
- Existing Shirley's Brook 30m Buffer
- SWMF Footprint (approx.)
- Future ROW
- Pathway Linkage
- Area of North Tributary to be Realigned

N

PLAN VIEW
SCALE: 1:2000



POND 1 SECTION
SCALE: H 1:1000
V 1:200

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CITY OF OTTAWA KANATA NORTH URBAN EXPANSION AREA STUDY

POND 1

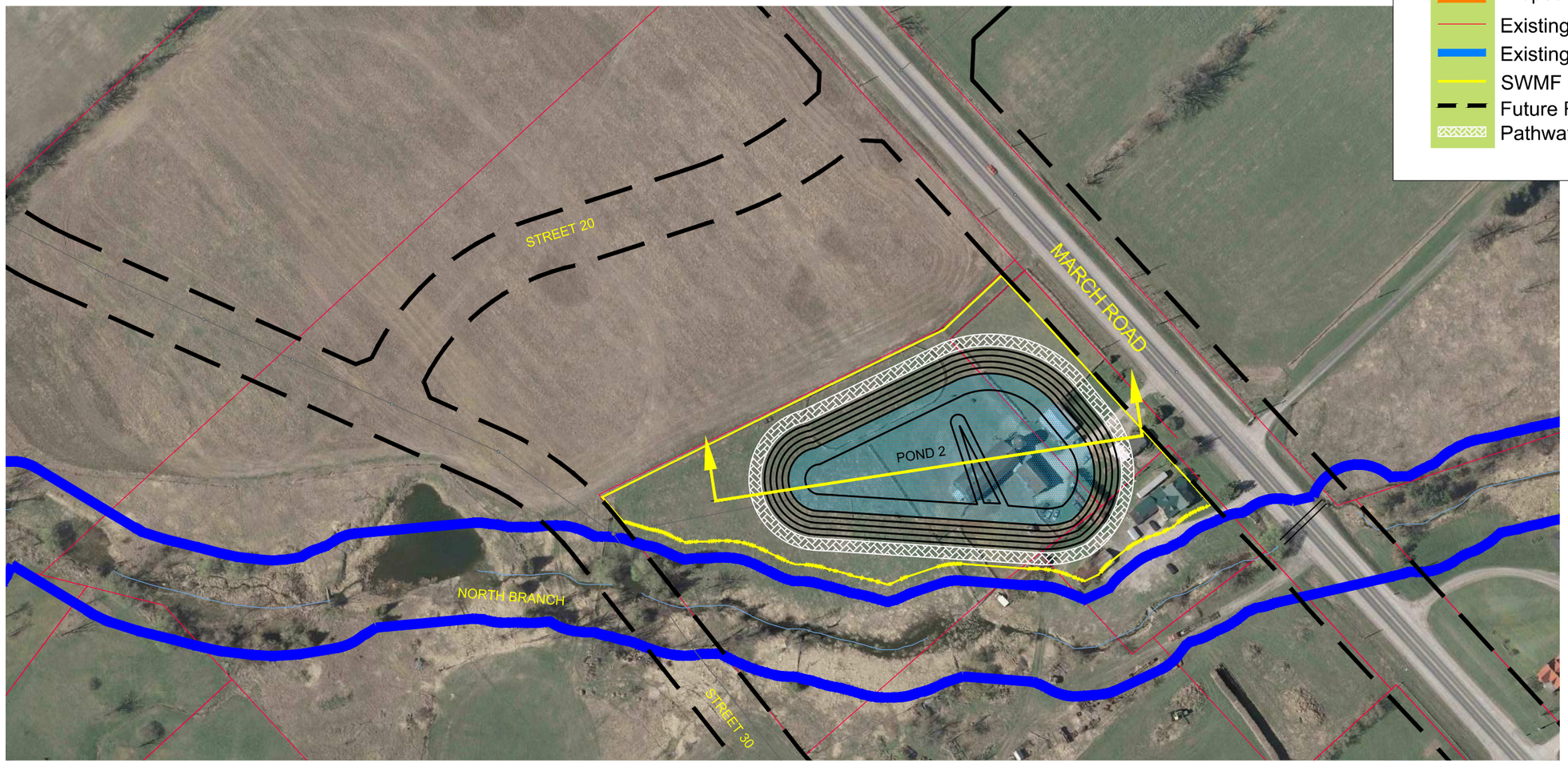
SCALE 1 : 2000 (0 20 40 60 80)
DATE JULY 2015 | JOB 112117 | FIGURE POND 1

SHT11X17 DWG - 279mm X 432mm

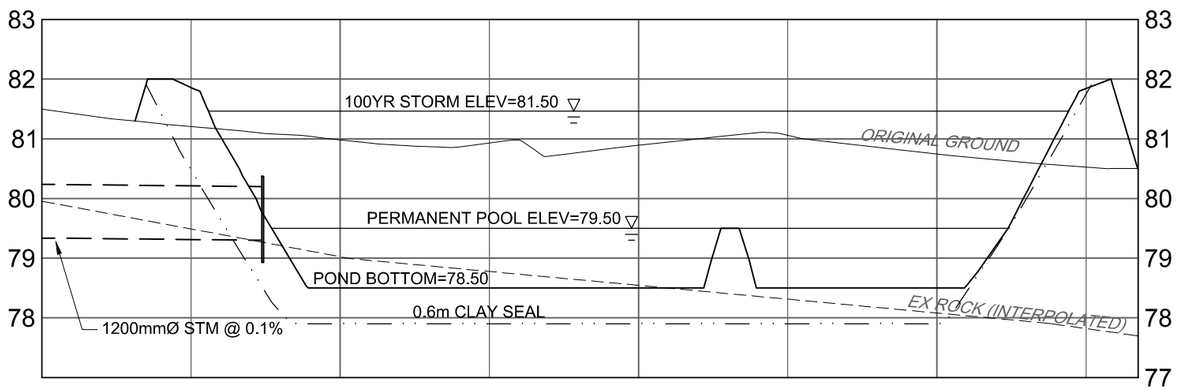
M:\2012\112117\CAD\Design_EMP\MEMO (KJA)\112117 - JM SWMF.dwg, JM-POND, Jul 28, 2015 - 4:02pm, kbanks

LEGEND

- Proposed Development Area
- Existing Property Lines
- Existing Shirley's Brook 30m Buffer
- SWMF Footprint (approx.)
- Future ROW
- Pathway Linkage



PLAN VIEW
SCALE: 1:2000



POND 2 SECTION
SCALE: H 1:1000
V 1:100

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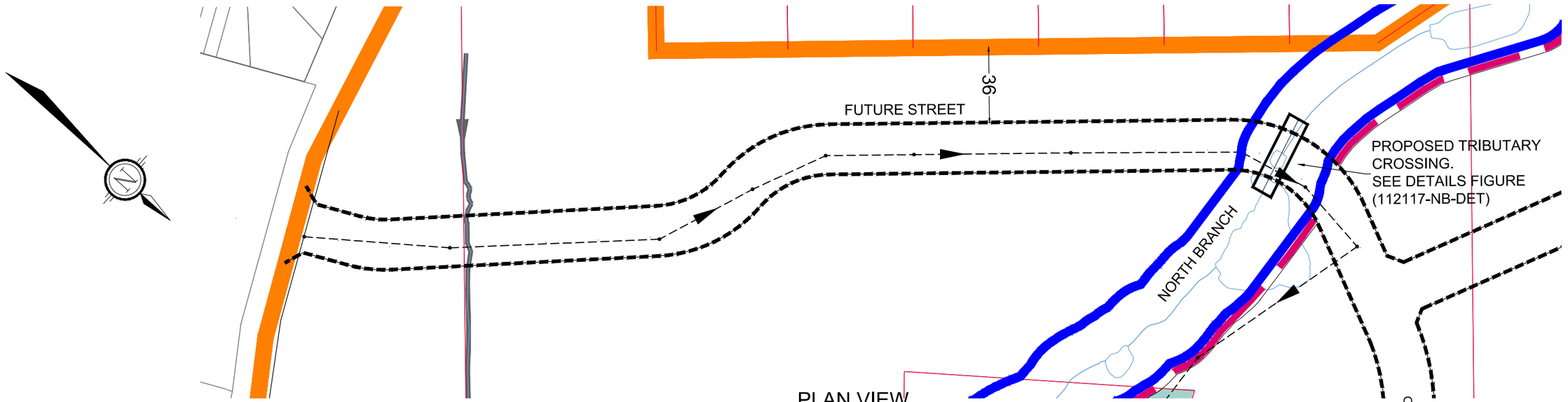
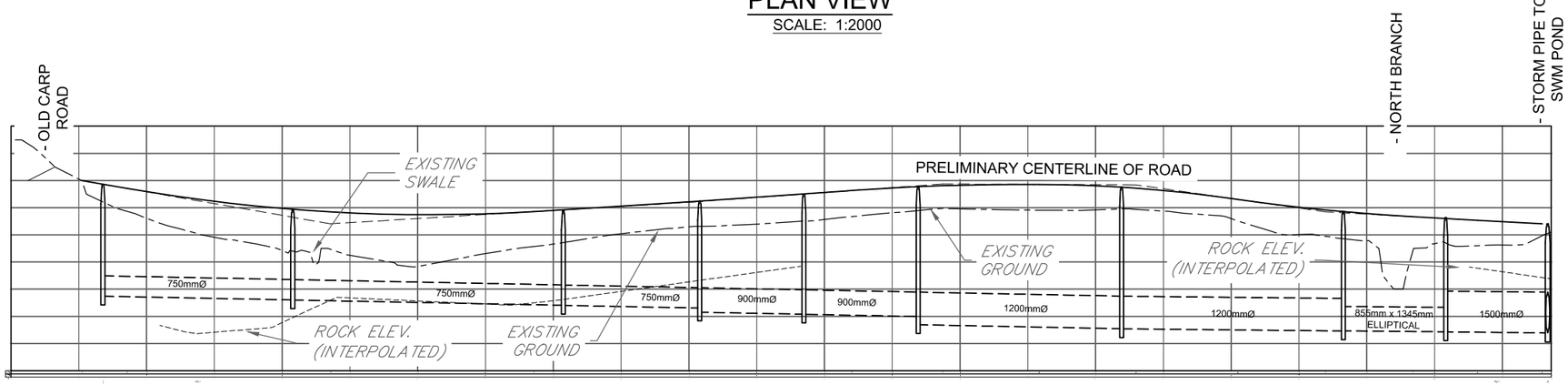
CITY OF OTTAWA KANATA NORTH URBAN EXPANSION AREA STUDY

POND 2

SCALE 1 : 2000 (0 20 40 60 80)
DATE JULY 2015
JOB 112117
FIGURE POND 2



PLAN VIEW
SCALE: 1:2000



FUTURE STREET PROFILE
SCALE: H 1:2000
V 1:200

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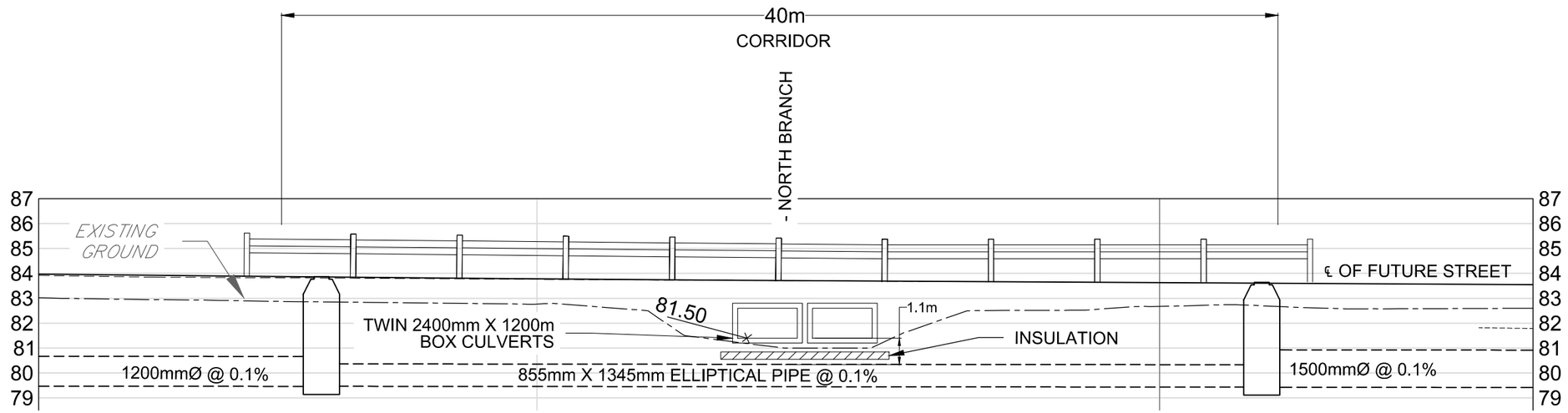
CITY OF OTTAWA
KANATA NORTH COMMUNITY DESIGN PLAN

NORTH BRANCH CROSSING - PLAN & PROFILE

SCALE (AS NOTED)
DATE JULY 2015
JOB 112117
FIGURE NB-CROSSING

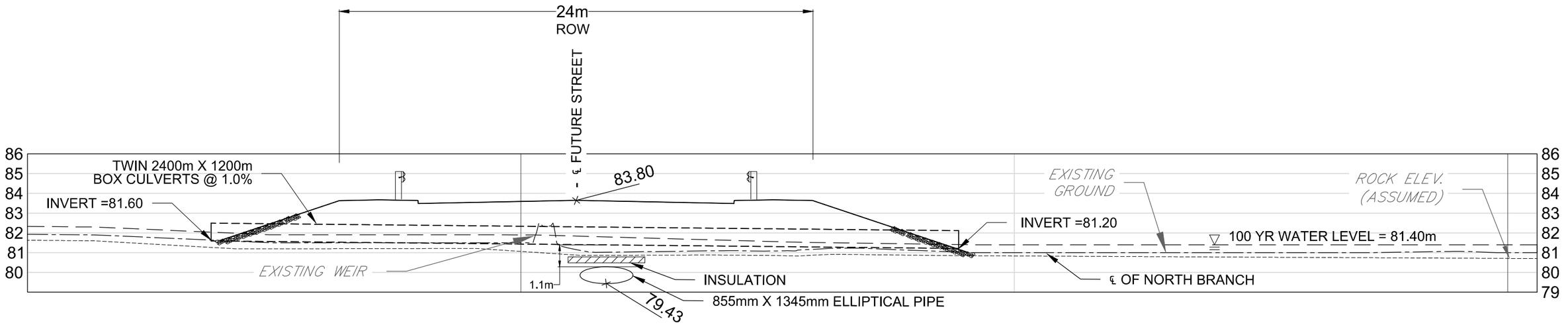
SHT11X17.DWG - 279mm X 432mm

M:\2012\112117\CAD\Design_EMP\112117 - TRIB 3 CROSSING.dwg, TRIB 3 CROSSING, Jul 30, 2015 - 9:17am, kbanks



NORTH BRANCH CROSSING DETAIL

SCALE: 1:200



NORTH BRANCH CULVERT DETAIL

SCALE: 1:200

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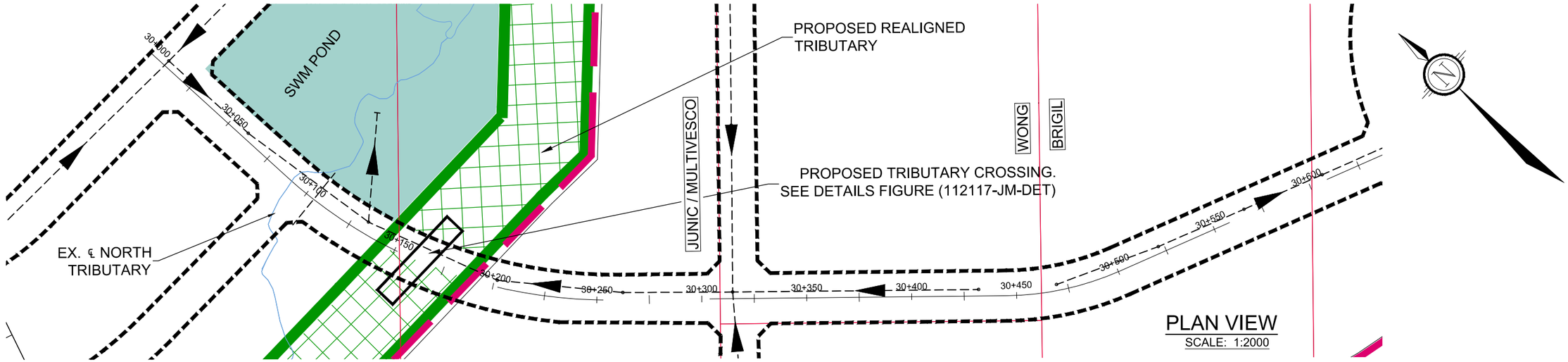
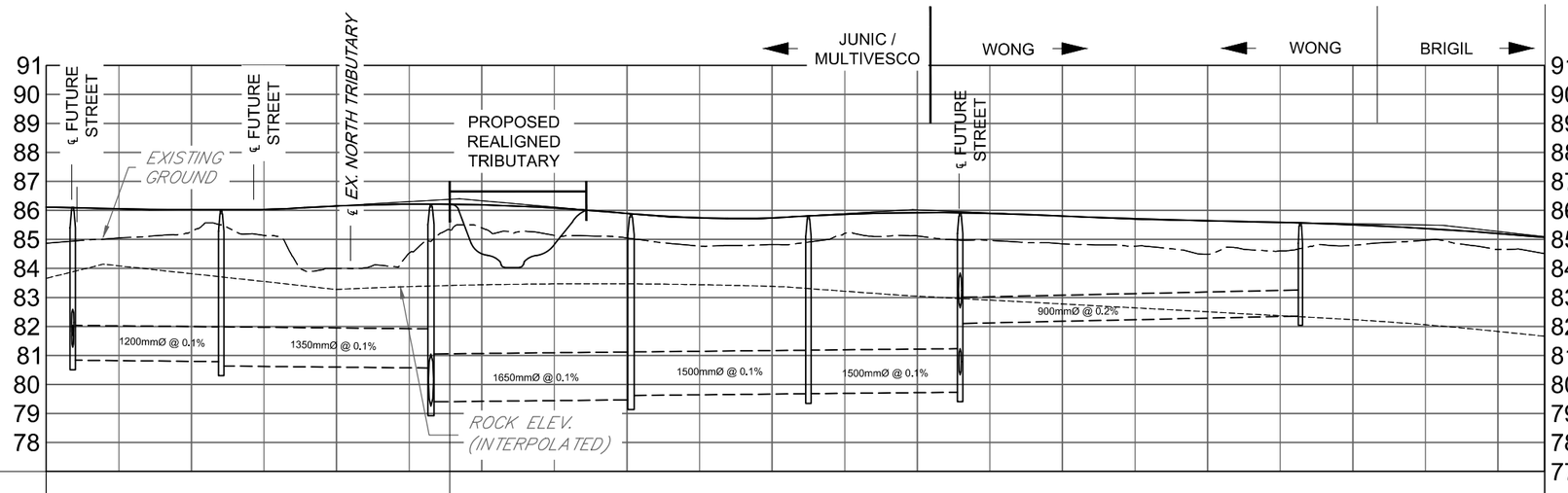
CITY OF OTTAWA
KANATA NORTH COMMUNITY DESIGN PLAN

NORTH BRANCH CROSSING - DETAILS

SCALE			
(AS NOTED)			
DATE	JOB	FIGURE	
JULY 2015	112117	NB-DET	



PLAN VIEW
SCALE: 1:2000



CHAINAGE	PROPOSED ELEVATION	EXISTING ELEVATION
30+000	86.11	84.87
30+025	86.05	85.05
30+050	86.04	85.27
30+075	86.03	85.13
30+100	86.03	84.00
30+125	86.04	84.53
30+150	86.09	85.40
30+175	86.15	85.13
30+200	86.21	85.05
30+225	86.21	84.77
30+250	86.19	84.82
30+275	86.08	85.21
30+300	85.89	85.12
30+325	85.79	84.97
30+350	85.75	84.84
30+375	**85.72**	84.77
30+400	85.73	84.48
30+425	85.74	84.61
30+450	85.78	84.79
30+475	85.87	84.97
30+500	85.92	84.65
30+516	85.90	84.51
	85.84	
	85.80	
	85.70	
	85.64	
	85.61	
	85.59	
	85.51	
	85.38	
	85.34	
	85.20	
	85.07	

FUTURE STREET PROFILE
SCALE: H 1:2000
V 1:200

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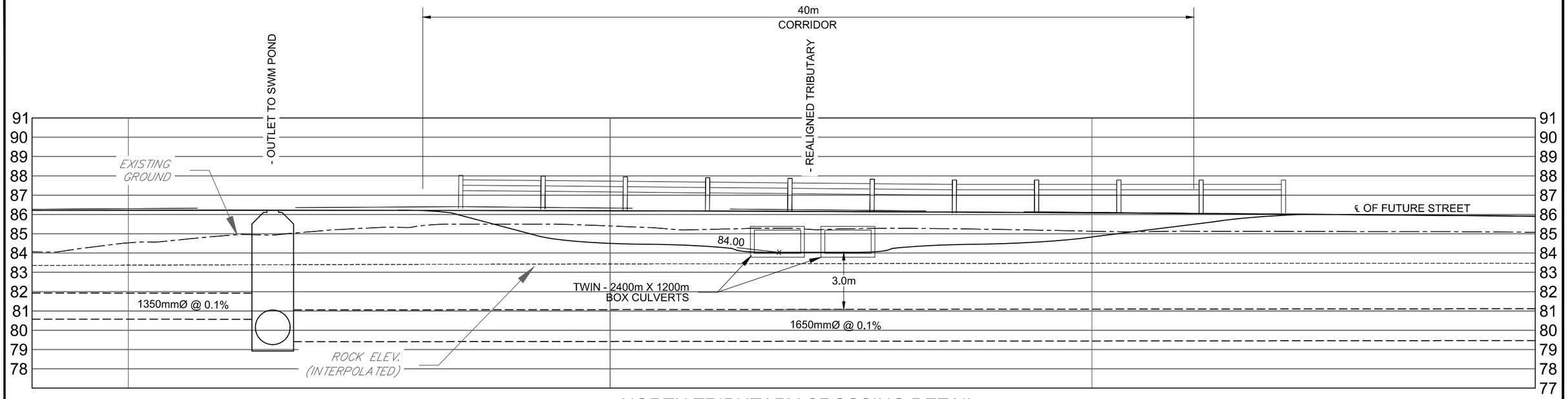
CITY OF OTTAWA
KANATA NORTH COMMUNITY DESIGN PLAN

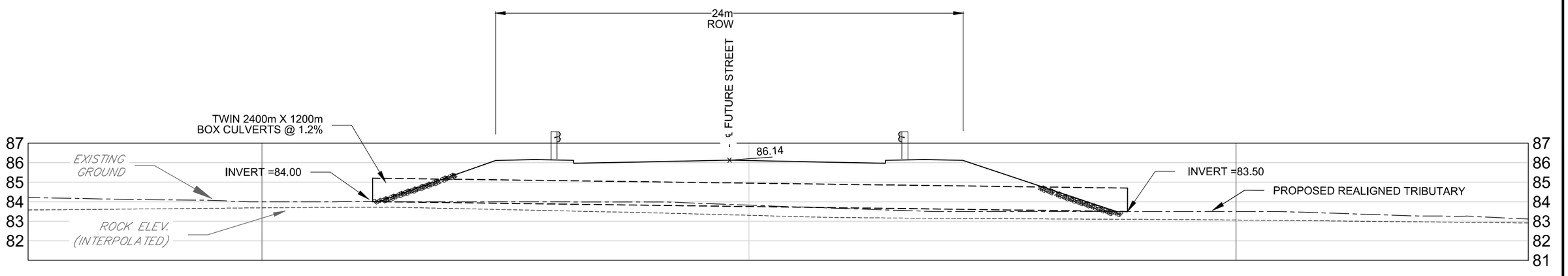
NORTH TRIBUTARY CROSSING - PLAN & PROFILE

SCALE: (AS NOTED)
DATE: JULY 2015 | JOB: 112117 | FIGURE: JM-CROSSING



NORTH TRIBUTARY CROSSING DETAIL

SCALE: 1:200



NORTH TRIBUTARY CULVERT DETAIL

SCALE: 1:200

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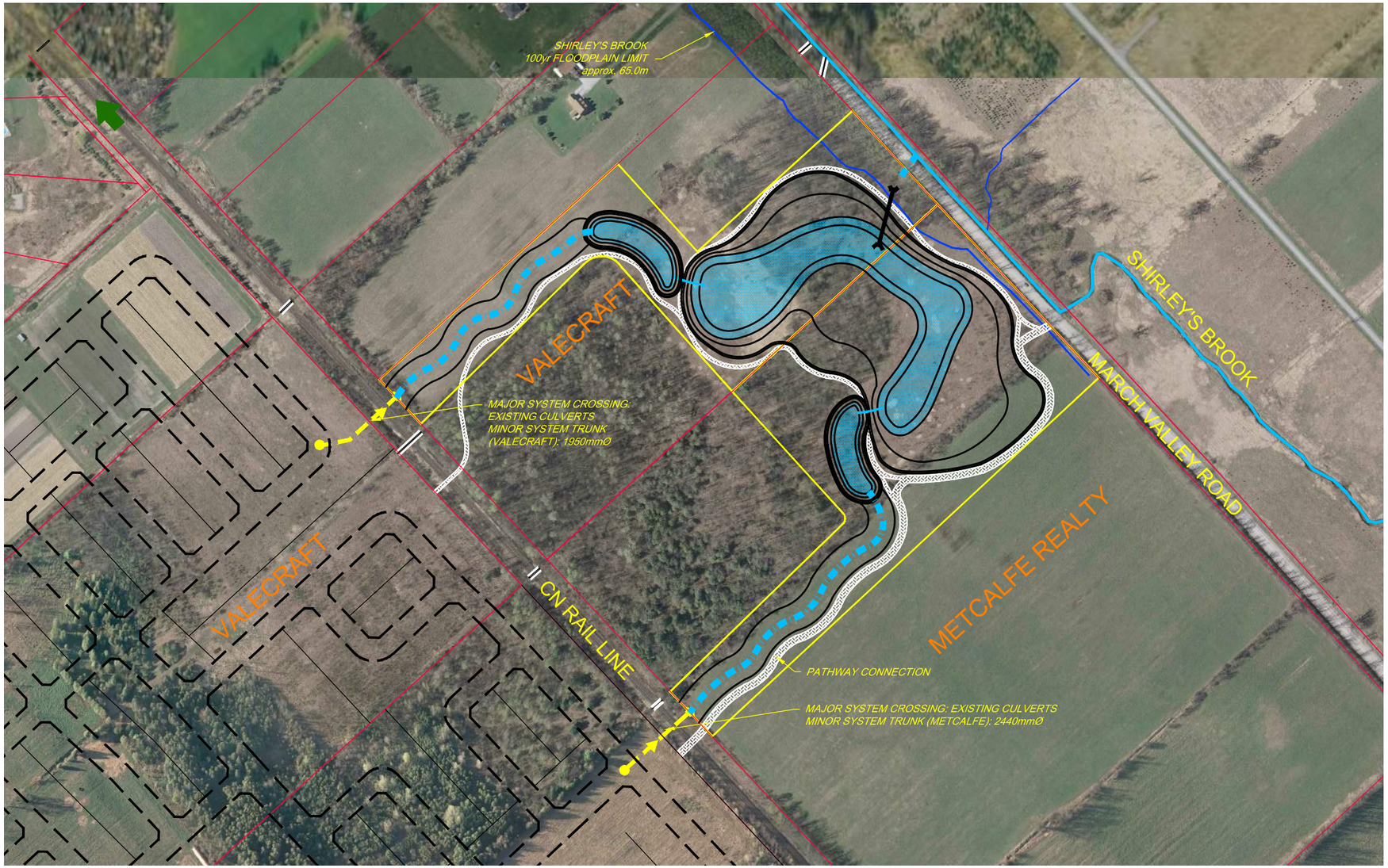
CITY OF OTTAWA
KANATA NORTH COMMUNITY DESIGN PLAN

NORTH TRIBUTARY CROSSING - DETAILS

SCALE		
(AS NOTED)		
DATE	JOB	FIGURE
JULY 2015	112117	JM-DET



LEGEND

- Proposed Development Area
- Existing Property Lines
- SWMF Footprint (approx.)
- Future ROW
- Storm Trunk / Railway Crossing
- Ditching
- Pathway Linkage
- Existing Culverts

N

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CITY OF OTTAWA
KANATA NORTH URBAN EXPANSION AREA STUDY

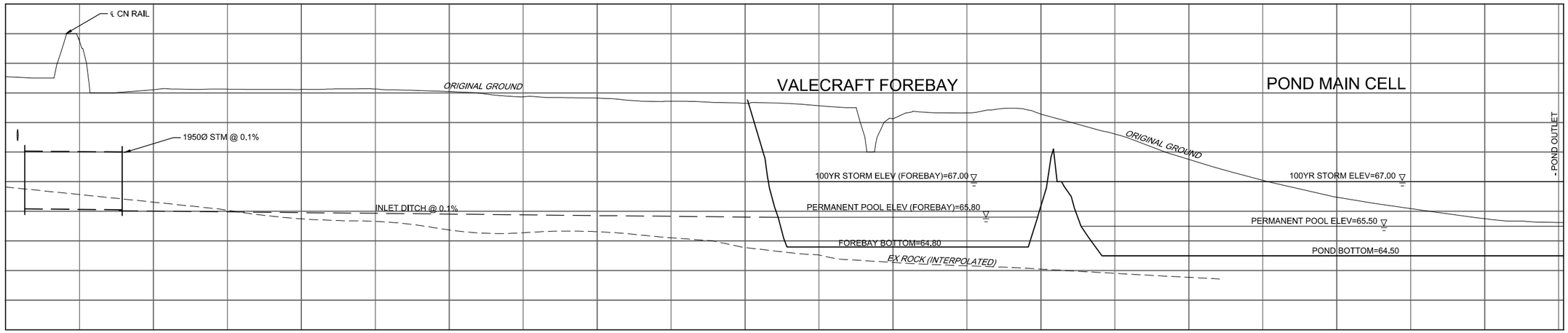
POND 3

SCALE 1:4000 (0, 40, 80, 120, 160)

DATE JULY2015 | JOB 112117 | FIGURE POND 3

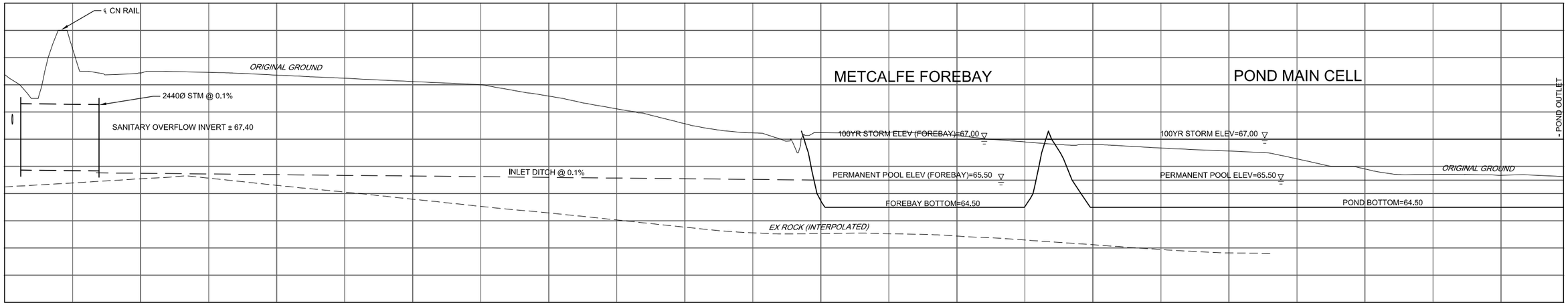
SHT11X17.DWG - 279mmX432mm

M:\2012\112117\CADD\Design_EMP\MEMO (KJA)\112117-MET-VALE - SWMF.dwg, E-SWMF6-FULL (small), Jul 28, 2015 - 4:15pm, kbanks



POND 3 SECTION (NORTH WEST)

SCALE 1:1500



POND 3 SECTION (SOUTH EAST)

SCALE 1:1500

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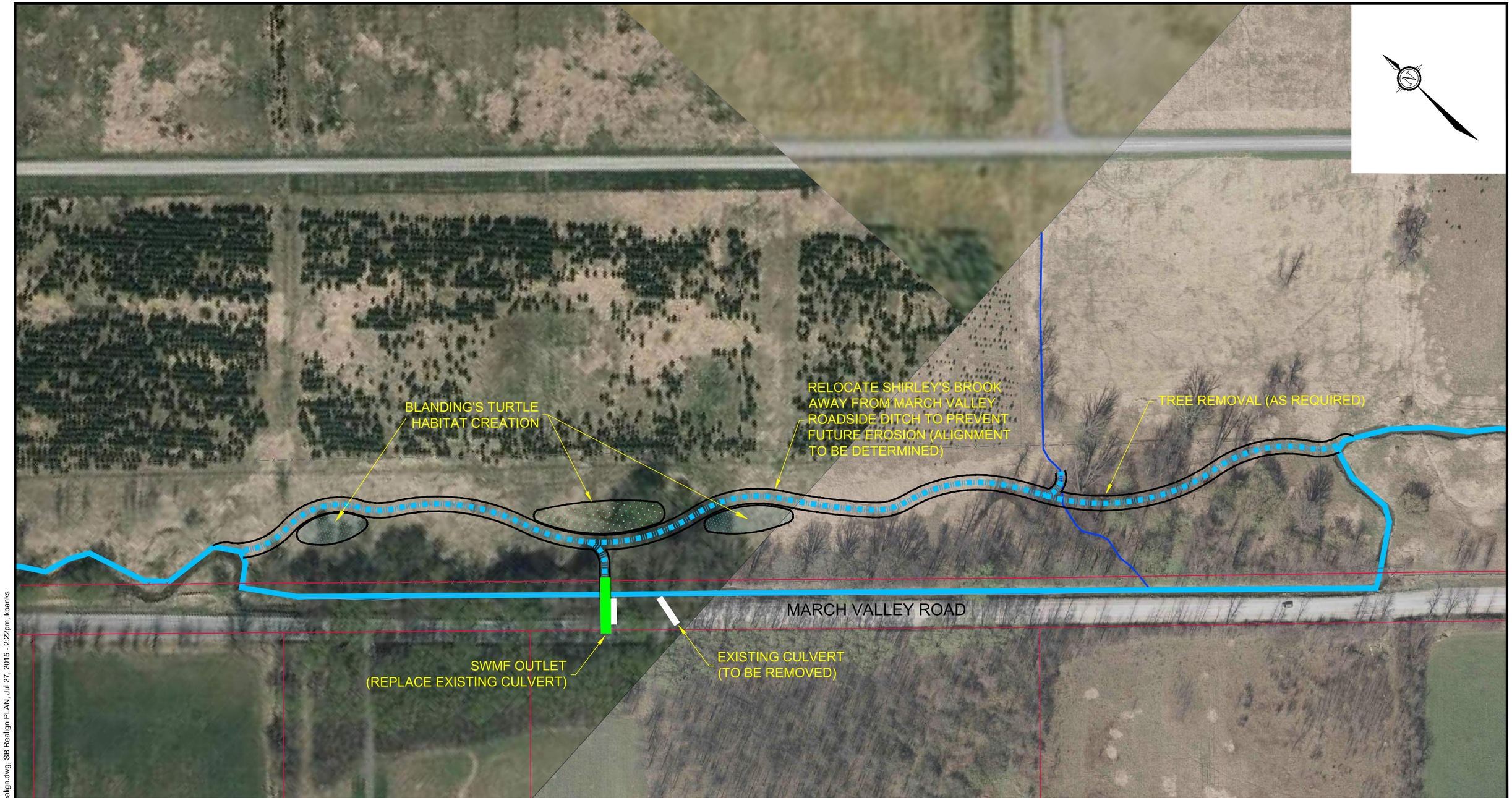
CITY OF OTTAWA
KANATA NORTH URBAN EXPANSION AREA STUDY

POND 3 PROFILES

SCALE 1 : 1500 (0, 15, 30, 45, 60)

DATE JULY 2015 | JOB 112117 | FIGURE POND 3-PR

SHT11X17.DWG 279mmX432mm



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CITY OF OTTAWA
KANATA NORTH URBAN EXPANSION AREA STUDY

SHIRLEY'S BROOK
REALIGNMENT

SCALE		
1:1500		
DATE	JOB	FIGURE
JULY 2015	112117	SB-R2

SHT11X17.DWG - 279mmX432mm

M:\2012\112117\CAD\Design_EMP\112117-SB_Realign.dwg, SB Realign PLAN, Jul 27, 2015 - 2:22pm, kbanks

Nicholas Stow
Senior Planner, Land Use and Natural Systems
Planning and Growth Management, City of Ottawa
110 Laurier Avenue West
Ottawa, Ontario
K1P 1J1

June 2, 2015

Murray Chown
Senior Project Manager
Novatech Engineers, Planners and Landscape Architects
240 Michael Cowpland Drive, Suite 200
Ottawa, Ontario
K2M 1P6

Dear Mr. Chown

Re: Status of Woodlots S20 and S12 in the Kanata North Urban Expansion Study Area

As you are aware, the City of Ottawa and Novatech (on behalf of its clients) have been in discussions since 2014 regarding the application of the Provincial criteria for *significant woodlands* to woodlots S20 and S12 in the Kanata North urban expansion study area. Under the City's policies for urban expansion study areas (Section 3.11 of the Official Plan), any natural heritage feature identified in an urban expansion area must be conveyed to the City of Ottawa for $1 as part of the Financial Implementation Plan for the development.

Woodlot S20

The City of Ottawa and Novatech have applied the Provincial criteria for significant woodlands, as outlined in the Natural Heritage Reference Manual 2010 (NHRM 2010), to woodlot S20. The only outstanding criteria under which S20 might have qualified as significant were as habitat of an endangered or threatened species and/or a sensitive headwater feature. Both of these criteria were dependent upon the woodlot providing habitat for Blanding's turtle, as determined by the Ontario Ministry of Natural Resources and Forestry (MNRF).

City staff has reviewed the recent correspondence from the MNRF that you submitted regarding the question of whether or not Woodlot S20 provides or lies adjacent to habitat of Blanding's turtle. We understand the MNRF letter to state that the Province

does not consider the vegetation communities within and adjacent to Woodlot S20 to provide such habitat.

Having established that woodlot S20 does not meet any of the NHRM 2010 criteria for significant woodlands, the City does not consider the woodlot to be a natural heritage system feature. The City is still asking for completion of a headwater assessment to establish management recommendations for the watercourses within and adjacent to woodlot S20. We will also seek protection of trees through the Tree Conservation Report, as part of the normal planning process and requirements. However, we will not seek conveyance of the full woodlot to the City under the policies of Section 3.11 of the Official Plan.

Woodlot S12

We appreciate and thank you for the submission of an Environmental Impact Statement for woodlot S12. Given the policies of Section 3.11 of the Official Plan with respect to the natural heritage system, the City regards the purpose of an EIS in that context to be the determination of whether or not a feature is a part of the system and, consequently, whether or not it must be conveyed to the City. It is not to determine whether or not development would have a negative impact on that feature.

Nonetheless, in reviewing the description of woodlot S12 against the criteria for significant woodlands in the NHRM 2010, staff noted that Section 7.3.2 of the manual provides direction on the delineation of significant woodlands. One of the considerations in delineating woodlands is “minimum patch width”, which provides guidance on the average width that a treed area should have to be included in a significant woodland. Essentially, the minimum patch width, “is intended to exclude relatively narrow, linear treed areas such as hedgerows.”

In applying this criterion to woodlot S12, staff concluded that it is questionable if the treed area connected to the larger woodland by the hedgerow along the south boundary of the development area should have been included within the significant woodland. Consequently, we are asking that only the portion of S12 on the west side of the urban expansion study area – a small overlap of woodlot S12 into the development area – be conveyed to the City as part of the natural heritage system.

Staff has discussed the request by Novatech that this remaining section of S12 within the development area be protected in a conservation easement on residential lots, rather than conveyed to the City as a separate parcel. In the City’s experience, such easements have a poor record of success. Furthermore, the City is unwilling to establish a precedent which might then be applied to other urban expansion areas and features. Consequently, we are still requiring that the portion of S12 within the urban expansion area be conveyed to the City as *per* the Official Plan policies.

Conclusion

In summary, the City staff does not consider woodlot S20 to be a part of the natural heritage system within the Kanata North urban expansion study area. Consequently,

the City will not require conveyance of woodlot S20 to the City under the policies of Section 3.11 of the Official Plan.

City staff still considers woodlot S12 to meet the Provincial criteria for significance under the NHRM 2010. However, City staff does not believe that the treed area along the south boundary of the urban expansion study area meets the minimum patch width necessary for inclusion within the woodlot. In contrast, the treed area on the west side of the urban expansion area appears contiguous with, and forms part of the larger woodlot. The City will only require conveyance of the western treed area under the policies of Section 3.11 of the Official Plan.

If you have any questions regarding this letter and the City's conclusions, please do not hesitate to contact me at 613-58-2424 ext. 13000 or at nick.stow@ottawa.ca.

Sincerely,

Nick Stow

cc: Wendy Tse, Dana Collings, Martha Copestake, John Smit, Marica Clarke, Lee Ann Snedden

October 14, 2015

NOVATECH Engineers, Planners & Landscape Architects
240 Michael Cowpland Drive, Suite 200
Ottawa, ON, K2M 1P6

Dear Mr. Greg Winters,

Re: Kanata North Urban Expansion Area

As a member of the City of Ottawa's Technical Advisory Group, the NCC received the August 10, 2015 memorandum that deseribed three alternatives for the Kanata North Urban Expansion Area (KNUEA) storm outlets at March Valley Road, situated in the Shirley's Brook subwatershed. The purpose of this letter is to share the National Capital Commission's (NCC) outlet preference and provide information on the Federal Land Use and Review Approval Process (FLUDA).

Although the location of the outlets are not located on NCC federal lands, it is understood that a portion of KNUEA lands east of March Road will outlet directly to the main Branch of Shirleys Brook at Mareh Valley Road, flowing onto NCC Greenbelt lands, ineluding lands held by the Department of National Defence, Connaught Range. From an exclusively natural resources management perspective, the NCC finds Option 3: Relocate Shirley's Brook outside of March Valley Road ROW as the preferred storm outlet option. In speaking with Major Justin Sehmidt-Clever, Department of National Defence, Connaught Range, both federal agencies share a similar preference in principle for Option 3. It is the conclusion of both the NCC and DND that Option 3 is expected to result in an overall net aquatic restoration benefit to a portion of Shirleys Brook located on NCC and DND lands.

The NCC's FLUDA process is required when there is a defined project taking place on federal lands. A pre-application consultation is recommended to allow your team to meet with NCC staff, DND representatives, and other external agencies, if required, to review associated plans and studies required to support the proposal. Next, a FLUDA application is submitted by a proponent and a NCC planner will be assigned to the project. For more information on the FLUDA process, please refer to the following link, http://www.ncc-ccn.gc.ca/property-management/how-to-use-federal-lands/federal-land-use-design-transaction-approval-process.

Thank you for your continued effort to keep the NCC informed of this land use proposal situated on municipal lands neighboring Greenbelt federal lands.

Sincerely,

E. Katic

Eva Katic
Manager, Natural Resources and Land Use
Capital Stewardship Branch, Greenbelt
National Capital Commission

Cc. Commandant, Connaught Range and Primary Training Center Headquarters Major-General Sir Alexander Bertram CB VD.

Major Justin Schmidt-Clever, Canadian Armed Forces, Connaught Ranges

Sandra Candow, National Capital Commission

Bina Chakraburtty, National Capital Commission

Fred Gasper, National Capital Commission

Kallie Auld

From: Stow, Nick <Nick.Stow@ottawa.ca>
Sent: March-22-16 2:18 PM
To: Lee, Scott (MNRF); Tse, Wendy; MacPherson, Amy; Murray Chown; McKinley Environmental; Lewis, Chris (MNRF); Dillon, Mary (MNRF); 'Seabert, Erin (MNRF)'; Greg Winters
Cc: Marc, Timothy C; 'plehman@mvc.on.ca'; 'cyee@mvc.on.ca'
Subject: Kanata North CDP/EMP -- ESA 2007 and OPA

Hello Everyone:

Thank you for meeting yesterday to discuss the implications of the Endangered Species Act 2007 for approval of the proposed Kanata North OPA under the Planning Act and the Official Plan.

The purpose of the meeting was to determine if the proposed City-initiated, Official Plan Amendment (OPA) to re-designate Kanata North (Urban Expansion Study Area 1) as general urban land would be consistent with the Provincial Policy Statement 2014 and Official Plan policies for protection of habitat of endangered and threatened species. This information is necessary for City staff to determine if the OPA should proceed, and under what conditions.

At the meeting, it was agreed that the proposed urban development within Kanata North would likely require an Overall Benefit Permit under the Endangered Species Act 2007, in particular for disturbance and/or destruction of habitat for Blanding's turtle. However, the proposed OPA, itself, does not involve physical activities that would trigger the requirement for an Overall Benefit Permit Application. Consequently, the Kemptville District Office of the MNRF cannot provide any formal recommendations or advice regarding the avoidance, mitigation and/or compensation actions that would be required under the conditions of a permit. To do so prior to an application for an Overall Benefit Permit would undermine the public process and the authority of the Minister in this regard.

Nonetheless, the following points were confirmed at the meeting:

- the consultants for the landowners and the Ministry of Natural Resources and Forestry (MNRF) have had substantive discussions regarding the probable requirements of an Overall Benefit Permit[s] to allow the disturbance and/or destruction of habitat for Blanding's turtle in the proposed development area;
- the focus of the discussions has shifted from the mitigation requirements that might be required within the proposed development area to the additional compensation (i.e. overall benefit) requirements that might be required off-site;
- there is a reasonable prospect of agreement between the MNRF and the landowners on the required off-site compensation;
- the currently proposed mitigation and compensation activities would occur on property owned by the landowners, the City of Ottawa, and the Department of National Defence (all of whom have indicated agreement in principle to allow mitigation and compensation activities).

In summary, conditional upon the off-site compensation being sufficient to provide an overall benefit, it is reasonable for the City and the landowners to assume that the current CDP will be able to proceed under the ESA 2007.

On the basis of this discussion, the Natural Systems team is prepared to advise Planning Committee and Council that the proposed OPA application is consistent with the PPS 2014 and Official Plan policies for protection of habitat of endangered and threatened species.

Regards,

Nick Stow
Senior Planner, Natural Systems
Planning and Growth Management
Urbaniste, Systemes naturels
Urbanisme et Gestion de la croissance

City of Ottawa | Ville d'Ottawa
613.580.2424 ext./poste 13000
ottawa.ca/planning / ottawa.ca/urbanisme

"I bequeath myself to the dirt to grow from the grass I love,
If you want me again look for me under your boot-soles."

- Walt Whitman, Song of Myself

Review of April 2016 Kanata North MSS and EMP - Key Stormwater Issues

Synopsis of issues to be reviewed with Novatech prior to finalizing comments on Kanata North EMP and MSS:

1) Development and evaluation of storm drainage options that could avoid the need (or minimize the extent/depth) of trunk storm sewers and SWM ponds being constructed in bedrock (to minimize rock blasting requirements, impacts to groundwater and risks to existing wells in the area); see below: Description of Alternative Drainage Options for Consideration;

2) MSS should include tables summarizing the cost of constructing the alternative storm trunk servicing options (similar to the cost summary tables prepared for sanitary sewer options 1 – 5B included in Appendix C of the MSS, i.e., that document rock removal costs with each option);

3) A benefit vs. cost assessment of the alternative storm sewer servicing strategies should be completed to determine if there may be interim approaches to stormwater management that could prove advantageous and avoid the need for construction of trunk storm sewers in bedrock and crossings under Tributaries 2 and 3; [*p.103 of the EMP notes, "As demonstrated in the Master Servicing Plan, Transportation Master Plan and the Environmental Master Plan, development can generally proceed from any location within the Study Area. Development is expected to begin close to March Road and spread out to the east and west."* Given this flexibility, it appears that phasing requirements may not preclude consideration of the alternative options.]

4) There appear to be a number of locations within the March Road corridor where details of the major and minor storm drainage system requirements appear to be incomplete / insufficient to guide implementation of the MSS in subsequent planning approval stages;

5) Storm drainage servicing requirements for the entirety of lands located south of Tributary 3, west of March Road should be completed in sufficient detail to streamline future development approvals. This should include an evaluation of an alternate drainage strategy described below.

Changes in storm servicing to be investigated:

1. Minor System:

- Storm servicing of lands immediately west of March Road (and runoff from March Road): the MSS indicates runoff in this area is to be directed to SWM Ponds 1 and 2 – into sewers that are to drain against grade and require deep excavation into rock. Is it feasible to direct drainage from this area to SWM Pond 3 instead, to avoid or minimize rock removal requirements?
- Servicing of St. Isadore area (NW-2 Catchment) by SWM Pond 1 forces a deep storm sewer constructed in bedrock. Can an alternative major-minor system design be investigated in this area, i.e., directing runoff from this area to SWM Pond 3?

2. SWM Ponds 1 and 2

During the evaluation of the alternative CDP Concepts, the following considerations were to be factored into the selection of the preferred CDP concept plan:

The depth of excavation should be considered when selecting the location of any future SWM facilities:

- *Deep excavations can result in potential issues with groundwater inflow;*

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- *Deep excavations require a larger pond footprint to tie back into the surrounding grade and can be more difficult to integrate as a feature into the community.*

Based on information included in Appendix 2 of the MSS, the recommended storm servicing strategy will require 42,000 m^3 of rock removal to construct Pond 1, and 7,500 m^3 of rock removal to construct Pond 2. From a review of the MSS, it appears that much of the requirement for rock removal is created by the choice to construct 1800mm and 1350mm storm sewers ***under*** Tributaries 1 and 2, rather than to employ a conventional drainage strategy in which storm drainage is designed to follow the existing topography (rock removal volumes noted do not include the rock removal required to construct storm services below bedrock, just the ponds). Concerns were previously raised about these under-crossings in September 2015: " *Why not drain southern portion of Pond 1 catchment to Pond 2 (and avoid undercrossing)*?

Given the extent of rock removal, are there other alternatives available that can avoid the substantial rock removal requirements associated with the current MSS/EMP (i.e., by investigating the feasibility of expanding the capture area of SWM Pond 3 to include a portion of lands west of March Road, and if necessary, construction of temporary SWM controls until SWM Pond 3 is in operation?)

Description of Alternative Drainage Options for Consideration:

1 – Alternative option for drainage west of March Road

The City requests alternatives be developed that would implement the conceptual catchment areas of SWM Ponds 1 and 2 and revised outlet for the lands south of Tributary 3 and the lands to the west of March Road as illustrated in the figure that follows below (the boundary to the west of March Road is conceptual, and needs refinement based on a review of grading and servicing plans in the area).
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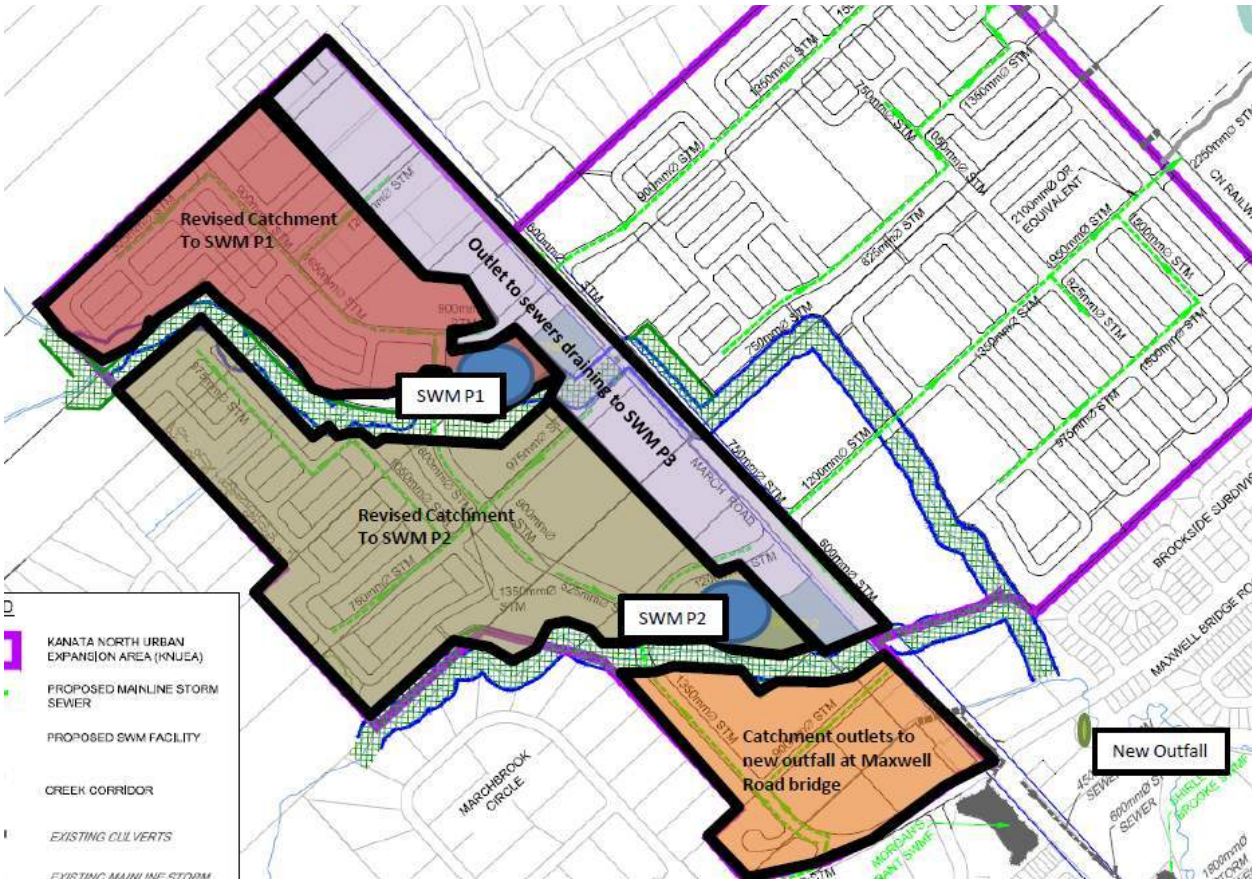
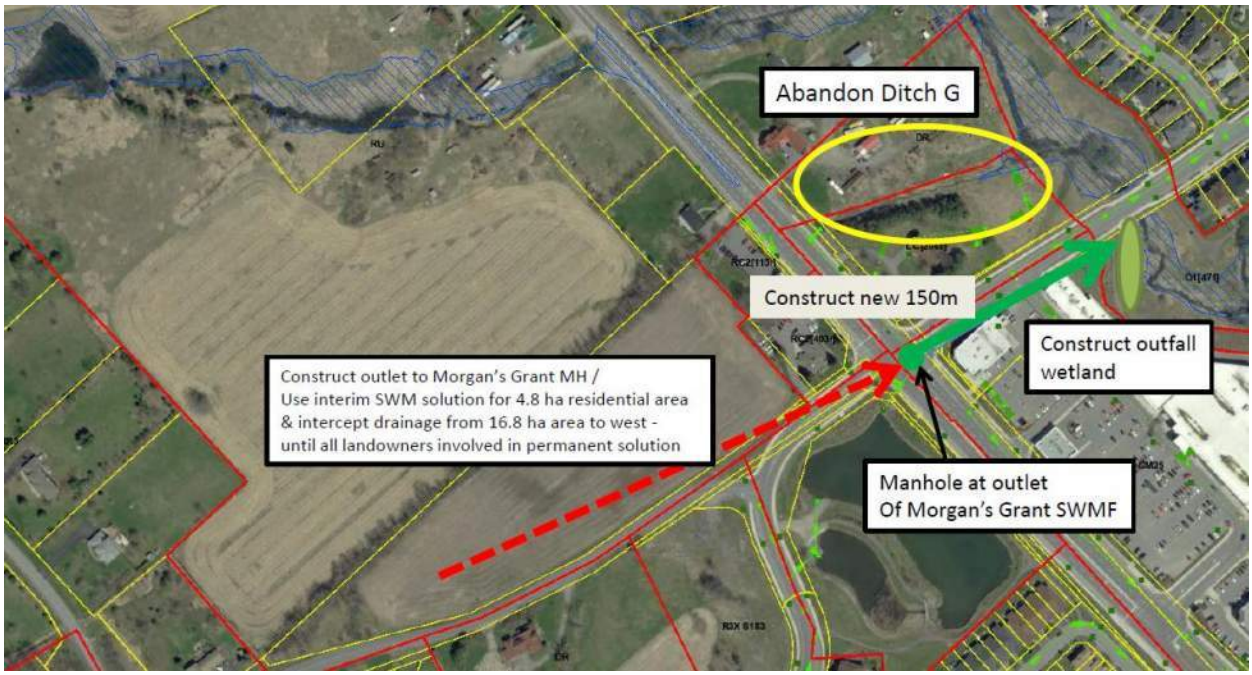


2 – Alternative option for drainage south of Tributary 3

The existing drainage patterns in the Southwest Quadrant – and at a broader scale - in the area west of Shirley's Brook north of Maxwell Bridge Road, have long been interrupted by the construction of March Road. This has necessitated the construction of a number of ad hoc drainage solutions, including the outfall sewer from the Morgan's Grant SWMF which discharges into Ditch G, to which the City has no apparent maintenance access.

The preferred solution identified in the April 2016 EMP proposes construction of a lengthy interceptor sewer to collect drainage from the 16.8 ha area that includes the Marchbrook Circle subdivision, and construction of a storm sewer under tributary 3 to provide an outlet to SWM Pond 2 for the relatively small 4.8 ha residential area located south of tributary 3.

An alternative solution that warrants evaluation involves construction of a new outfall to the branch of Shirley's Brook on the southwest side of the Maxwell Bridge Road crossing. The alternative presented in the figure below would avoid the need to construct the lengthy interceptor sewer and sewer under tributary 3, and would provide an opportunity for improved maintenance access for the City to the Morgan's Grant outfall. Introducing the necessary infrastructure to intercept local drainage along March Road that outlets to Ditch G (while constructing the sanitary sewer and other infrastructure in this area) would allow for the eventual abandonment of Ditch G, with mitigation being provided at the storm outfall at the new Maxwell Bridge outfall.



A storm servicing / management system would need to be developed for the area south of Tributary 3 that would allow interim development to proceed, until all property owners become active in advancing development of their land, at which time a permanent solution would be required. If lands along March Road north of Tributary 3 can be successfully re-directed to the catchment area of SWM Pond 3 (hence removing some drainage from the branch of Shirley's Brook), there may be an opportunity to relax standard quantity control requirements that the lands south of Tributary 3 may otherwise need to provide. Quality control in this relatively small catchment area could likely achieved through the use of oil-grit separators and it would have to be confirmed that this approach did not exacerbate erosion.

NOVATECH
Engineers, Planners & Landscape Architects

May 10, 2016

Wendy Tse
City of Ottawa
110 Laurier Street West
4th Floor Infrastructure Approvals Division
Ottawa, Ontario K1P 1J1

Attention:

Dear Ms. Tse:

Reference: Kanata North CDP Environmental Management Plan
April 2016 Kanata North MSS and EMP - Key Stormwater Issues
Response to Comments
Our File No. 112117

This letter is provided in response to the "Key Stormwater Issues" provided by the City on May 2, 2016, based on their review of the final drafts of the Kanata North CDP EMP and MSS reports.

Responses to comments are provided in red.

Synopsis of issues to be reviewed with Novatech prior to finalizing comments on Kanata North EMP and MSS:

1) Development and evaluation of storm drainage options that could avoid the need (or minimize the extent/depth) of trunk storm sewers and SWM ponds being constructed in bedrock (to minimize rock blasting requirements, impacts to groundwater and risks to existing wells in the area); see below: Description of Alternative Drainage Options for Consideration;

2) MSS should include tables summarizing the cost of constructing the alternative storm trunk servicing options (similar to the cost summary tables prepared for sanitary sewer options 1 – 5B included in Appendix C of the MSS, i.e., that document rock removal costs with each option);

3) A benefit vs. cost assessment of the alternative storm sewer servicing strategies should be completed to determine if there may be interim approaches to stormwater management that could prove advantageous and avoid the need for construction of trunk storm sewers in bedrock and crossings under Tributaries 2 and 3; [*p.103 of the EMP notes, "As demonstrated in the Master Servicing Plan, Transportation Master Plan and the Environmental Master Plan, development can generally proceed from any location within the Study Area. Development is expected to begin close to March Road and spread out to the east and west."* Given this flexibility, it appears that phasing requirements may not preclude consideration of the alternative options.]

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4) There appear to be a number of locations within the March Road corridor where details of the major and minor storm drainage system requirements appear to be incomplete / insufficient to guide implementation of the MSS in subsequent planning approval stages;

5) Storm drainage servicing requirements for the entirety of lands located south of Tributary 3, west of March Road should be completed in sufficient detail to streamline future development approvals. This should include an evaluation of an alternate drainage strategy described below.

Changes in storm servicing to be investigated:

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2. **SWM Ponds 1 and 2**

During the evaluation of the alternative CDP Concepts, the following considerations were to be factored into the selection of the preferred CDP concept plan:

The depth of excavation should be considered when selecting the location of any future SWM facilities:

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Given the extent of rock removal, are there other alternatives available that can avoid the substantial rock removal requirements associated with the current MSS/EMP (i.e., by investigating the feasibility of expanding the capture area of SWM Pond 3 to include a portion of lands west of March Road, and if necessary, construction of temporary SWM controls until SWM Pond 3 is in operation?)

Description of Alternative Drainage Options for Consideration:

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The City requests alternatives be developed that would implement the conceptual catchment areas of SWM Ponds 1 and 2 and revised outlet for the lands south of Tributary 3 and the lands to the west of March Road as illustrated in the figure that follows below (the boundary to the west of March Road is conceptual, and needs refinement based on a review of grading and servicing plans in the area).

To facilitate implementation of the alternative servicing strategy, the cost of employing interim stormwater drainage systems / controls (until the outlet to SWM Pond 3 becomes available) should be compared against the cost of constructing deep trunk sewers through bedrock on the west side of March Road that would be required if the April 2016 stormwater strategy was to be implemented.

Response:

The above comments appear to be primarily focused on quantity of rock removal. It should be noted that the estimated rock quantities noted above have been taken from an earlier draft of the MSS (February 2016). The April 4, 2016 Draft MSS, as circulated for review, has lower estimated quantities of rock excavation (37,000m^3 and 2,000m^3 respectively for Ponds 1 and 2).

Consideration was given to minimize rock but as the site is located in Kanata, rock is close to the surface in many areas. The rock excavation required for the ponds is a direct function of the pond location (low points adjacent to tributaries) and size (based on drainage areas). During the detailed design, alternate servicing options and detailed pond grading could be considered to minimize rock excavation.

The impacts of rock excavation within the proposed development have been extensively studied and presented in the Paterson Report (provided in Volume 3 of the EMP). The conclusion is that construction techniques, precautions, and mitigation measures can be applied to minimize the risks associated with rock removal on the groundwater in this area.

The following key considerations were made with respect to the location and elevations of Ponds 1 and 2.

1. The recommended locations for Ponds 1 and 2 and the proposed tributary crossings will allow the post development drainage areas to closely follow pre-development drainage patterns.
    - The proposed sewer crossings have some influence on the depth of the proposed

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storm sewers, but do not significantly impact the proposed pond elevations or volume of rock excavation required.

- The proposed crossings will only influence the depth of the sewers between the crossings and the SWM facilities, which are relatively short runs in comparison to the overall length of the storm sewer system.
- With respect to the proposed crossings, Tributary 2 will be realigned and construction of sewers and water will be coordinated with the proposed realignment to minimize the amount of in-water work. Both Tributaries 2 and 3 are ephemeral and construction can be timed to proceed during periods of no flow.

2. The Normal Water Levels in Ponds 1 and 2 have been set at the 2-year water levels of their receiving watercourses, as per City and MOECC recommendations. The proposed storm sewer elevations have been set to ensure the upstream sewers will not be submerged under normal conditions.
   - The recommended pond locations are at the lowest points of their respective drainage areas. The recommended locations also represent the areas with the lowest rock elevations west of March Road.
   - Given the shallow nature of the rock for this development (typically 1-3m below grade west of March Road), rock removal is to be expected.
   - Moving the ponds further west, away from March Road will require increasing the operating levels in the ponds and raising all of the upstream sewers by a corresponding amount.
   - The topography of the site is quite varied and the elevations climb rapidly west of March Road. As the rock elevation follows the ground surface, the amount of rock excavation would remain relatively the same, if not greater – **see attached sketches**.
3. March Road represents a logical drainage boundary between the east and west portion of the KNUEA for a variety of reasons. The pond locations adjacent to March Road will allow the ponds to service as much of the KNUEA lands to the west as possible.
   - The proposed pond locations will allow almost all major drainage for the areas west of March Road to be routed to the ponds.
   - Moving the ponds further west will either require major drainage crossings of March Road, or for major drainage to be routed uncontrolled into Tributaries 2 and 3.
   - Since the quantity control objective is to match pre-development flows for all storms up to and including the 100-year event, directing the major system flows to the tributaries would require the ponds to be oversized to offset the uncontrolled flows.
   - The proposed drainage areas to Ponds 1 and 2, provides the most flexibility for phasing of future development without the need for interim SWM solutions. As noted in the MSS, the SWM ponds would be constructed prior to any development in their respective drainage areas.
4. The proposed alternative solution would substantially reduce the onsite area draining to Tributary 2 and substantially increase the onsite area draining to Tributary 3. This would require increasing the size of Pond 2 to meet the quantity control objectives and require

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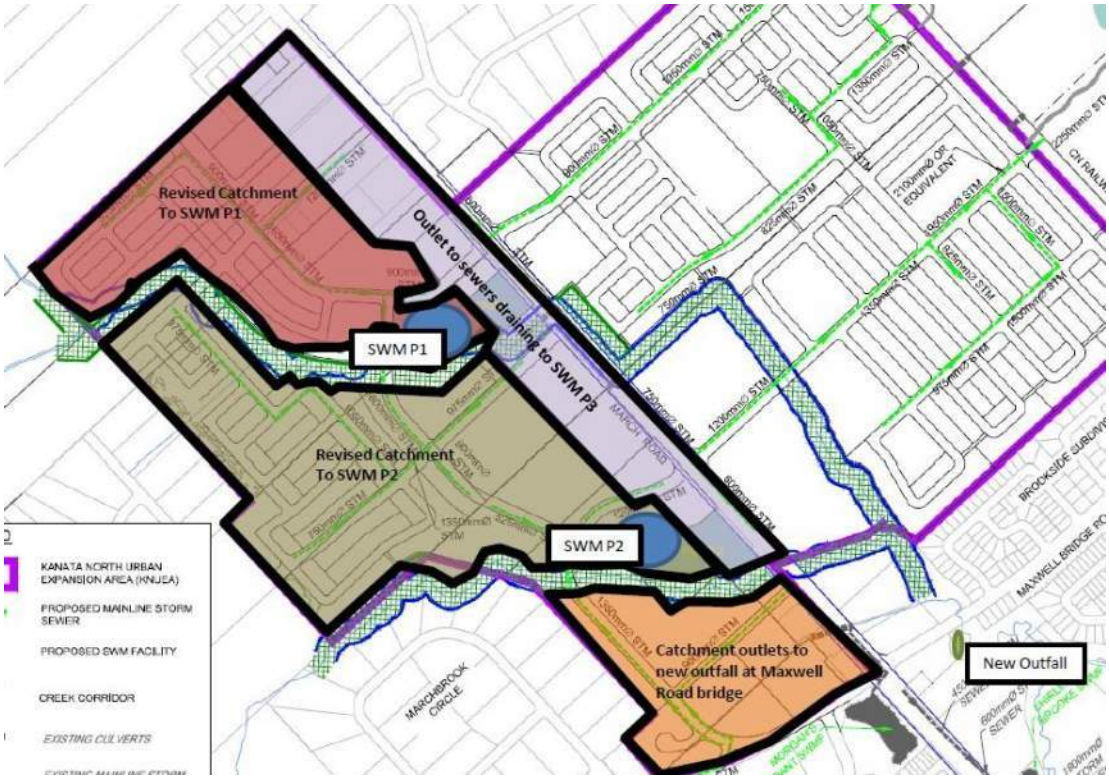
considerable revision to the conceptual land use plan potentially resulting in the relocation of a school and/or park block and the location of the collector road.

5. Any increase in drainage area to March Road, as proposed by the City, would have substantial implications from a phasing and infrastructure cost perspective. The proposed alternative solution would require upsizing of approximately 1800m of storm sewer between March Road and Pond 3 to accommodate the additional areas west of March Road.
6. With respect to servicing the St. Isadore area, an alternative solution would be to route the storm sewers to Pond 2 within the March Road right-of-way. This approach would result in two storm sewer systems in rock vs. our preferred solution of one deep storm sewer in rock. The MSS is intended to demonstrate the feasibility of servicing the KNUEA, and alternative sewer routes can be considered at the detailed design stage. The MSS will be revised to include a statement to this effect.



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drainage solutions, including the outfall sewer from the Morgan's Grant SWMF which discharges into Ditch G, to which the City has no apparent maintenance access.

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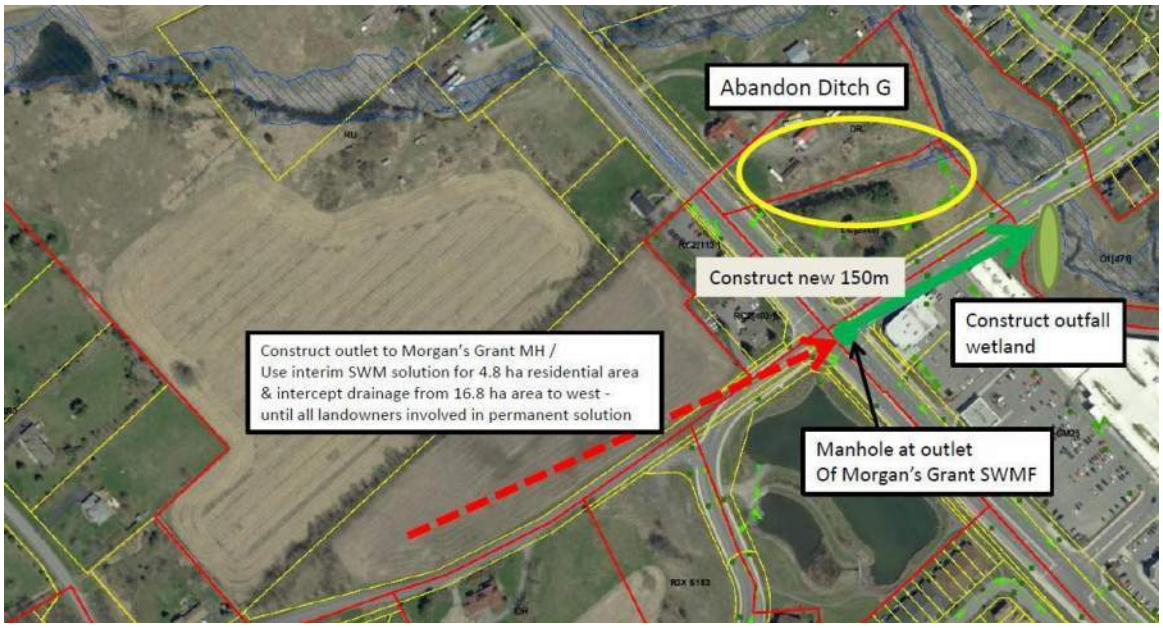

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Response:

The following key considerations were made with respect to the recommended SWM solution for the southwest quadrant as documented in the Draft EMP.

1. The total drainage area south of Tributary 3, west of March Road is approximately 30.5ha, including approximately 16.8 ha of upstream drainage from Marchbrook Circle and Old Carp Road.
    - The recommended SWM solution from the Draft EMP will direct all runoff from this area to Tributary 3. No drainage from the KNUEA will be directed to Ditch G under post-development conditions.
2. The recommended SWM solution for the southwest quadrant from the Draft EMP includes an undercrossing of Tributary 3 to convey runoff from the proposed single family homes on Street 'A' adjacent to the Marchbrook Circle subdivision to Pond 2 for water quality and quantity control.
    - Runoff from the single family residential area could potentially be treated using an oil-grit separator in the right-of-way, but it is feasible to route the flows from this area to Pond 2 via the proposed undercrossing of Tributary 3 without significantly increasing rock excavation requirements.
    - The proposed crossing under Tributary 3 will minimize the area requiring an independent SWM solution. The land uses in the remaining areas are compatible with privately maintained oil-grit separators.
    - By maximizing the drainage area to Pond 2, it minimizes on-site the quantity control requirements for the remaining areas. Based on the results of the hydrologic analysis, areas with on-site SWM controls would be allowed to release the 5-year post-development peak flows uncontrolled without increasing peak flows in Tributary 3.
3. The comments provided by the City indicate that the recommended SWM solution from the Draft EMP will require a lengthy interceptor sewer to convey runoff from the upstream rural areas through the KNUEA. This is not correct - upstream flows in Ditch G would be captured by a ditch inlet catchbasin and routed through the proposed storm sewers to Tributary 3.
    - The recommended alternative would only require a short distance (approximately 50m) of parallel storm sewers along Street 'A'.
    - Runoff from the upstream rural area should not require water quality treatment. The runoff from the KNUEA lands tributary to this sewer would be treated using private oil-grit separators.
    - The alternative solution proposed by the City would require the construction of an additional 300m of large diameter storm sewer within existing right-of-ways (along Halton Terrace, across March Road and down Maxwell Bridge). This alternative would require replacing existing sewers which have not been sized to accommodate the additional flows from this area, and the construction of a wetland treatment area on privately owned lands outside the limits of the KNUEA.

Conclusion

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Based on the foregoing, we are confident that the recommended SWM strategy as outlined in the EMP represents the best alternative for servicing the KNUEA.

Yours truly,

NOVATECH

Michael Petepiece, P.Eng
Project Manager

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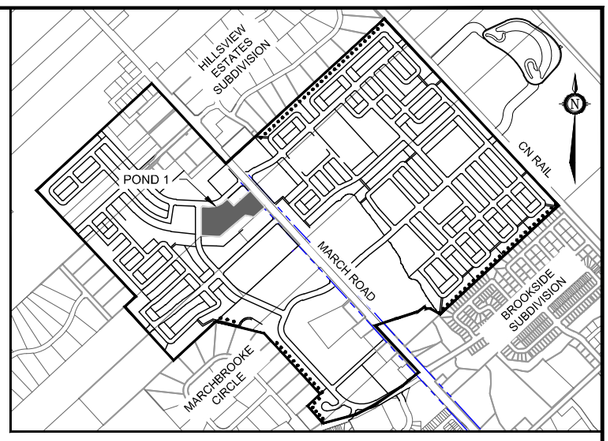

KEY PLAN
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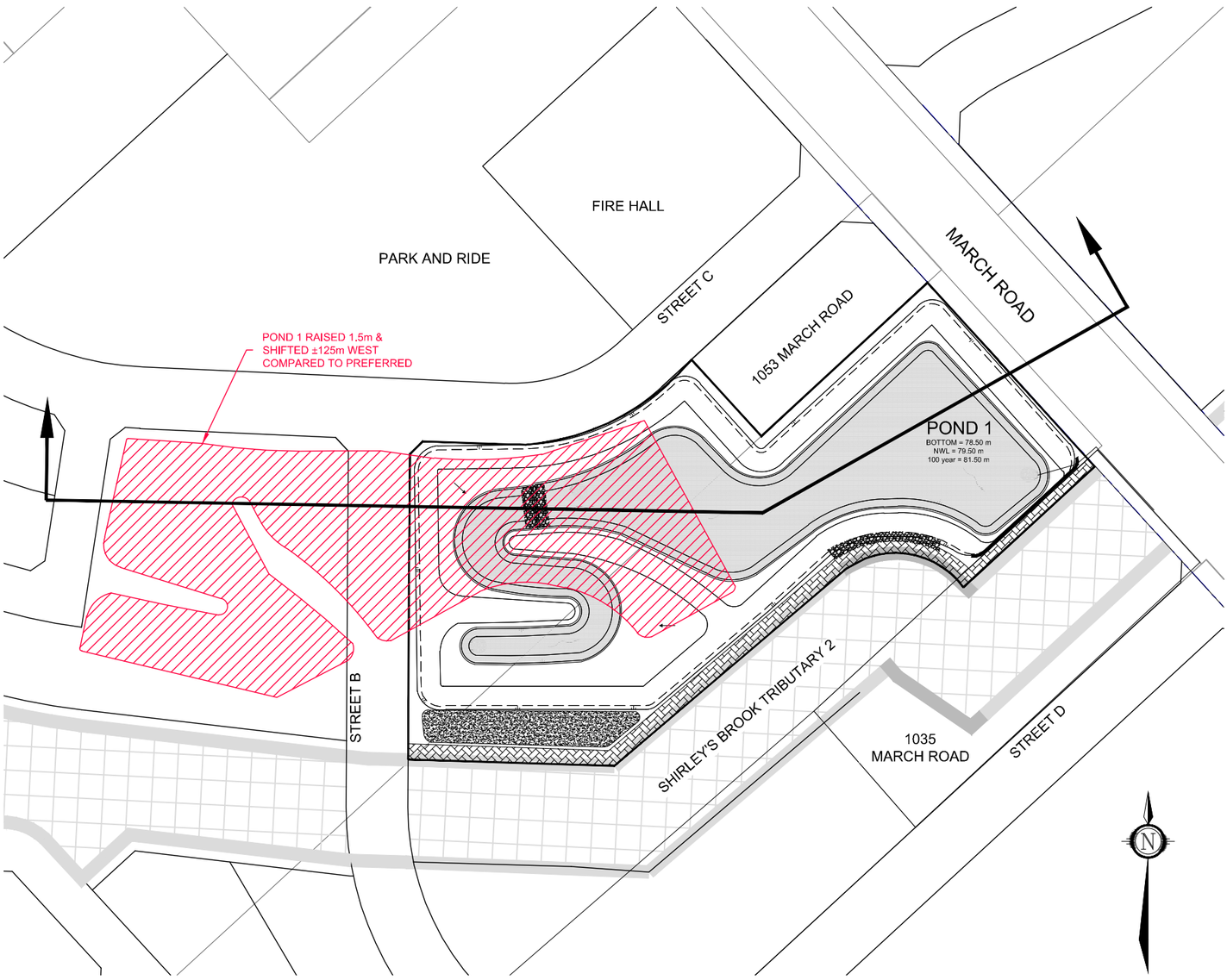

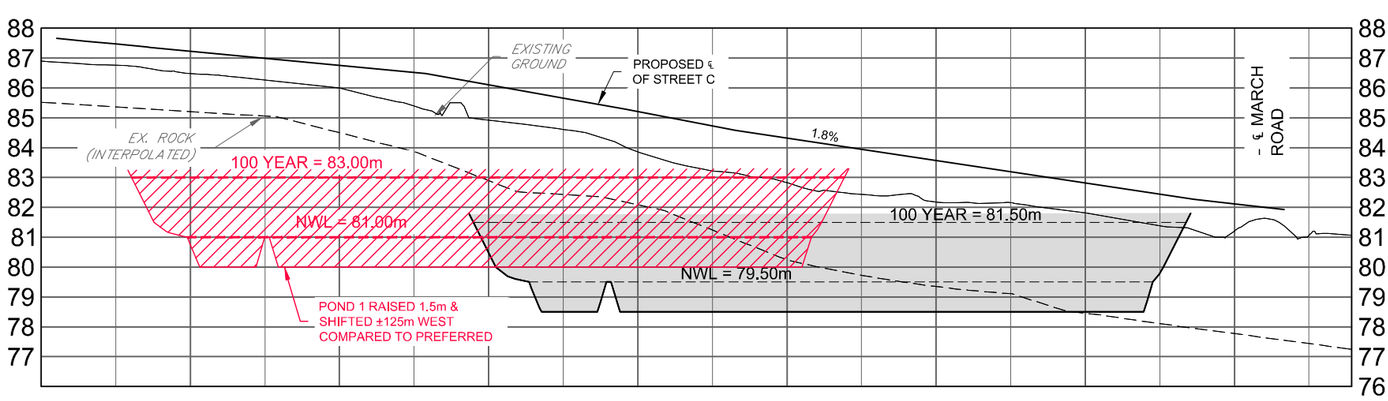

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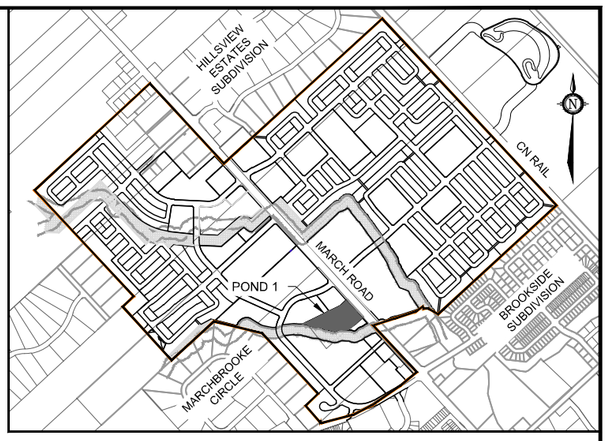
KANATA NORTH URBAN EXPANSION AREA

POND 1 SECTION

SCALE 1 : 2000 (0, 20, 40, 60, 80)
DATE MAY 2016
JOB 112117
FIGURE CSK-1A

SHT11X17.DWG - 279mmX432mm

M:\2012\112117\CAD\Design_EMP\MEMO (KJA)\Figure 9.1 Pond 1 Functional.dwg, POND1 - MSS SKETCH, May 09, 2016 - 3:29pm, tbrooks



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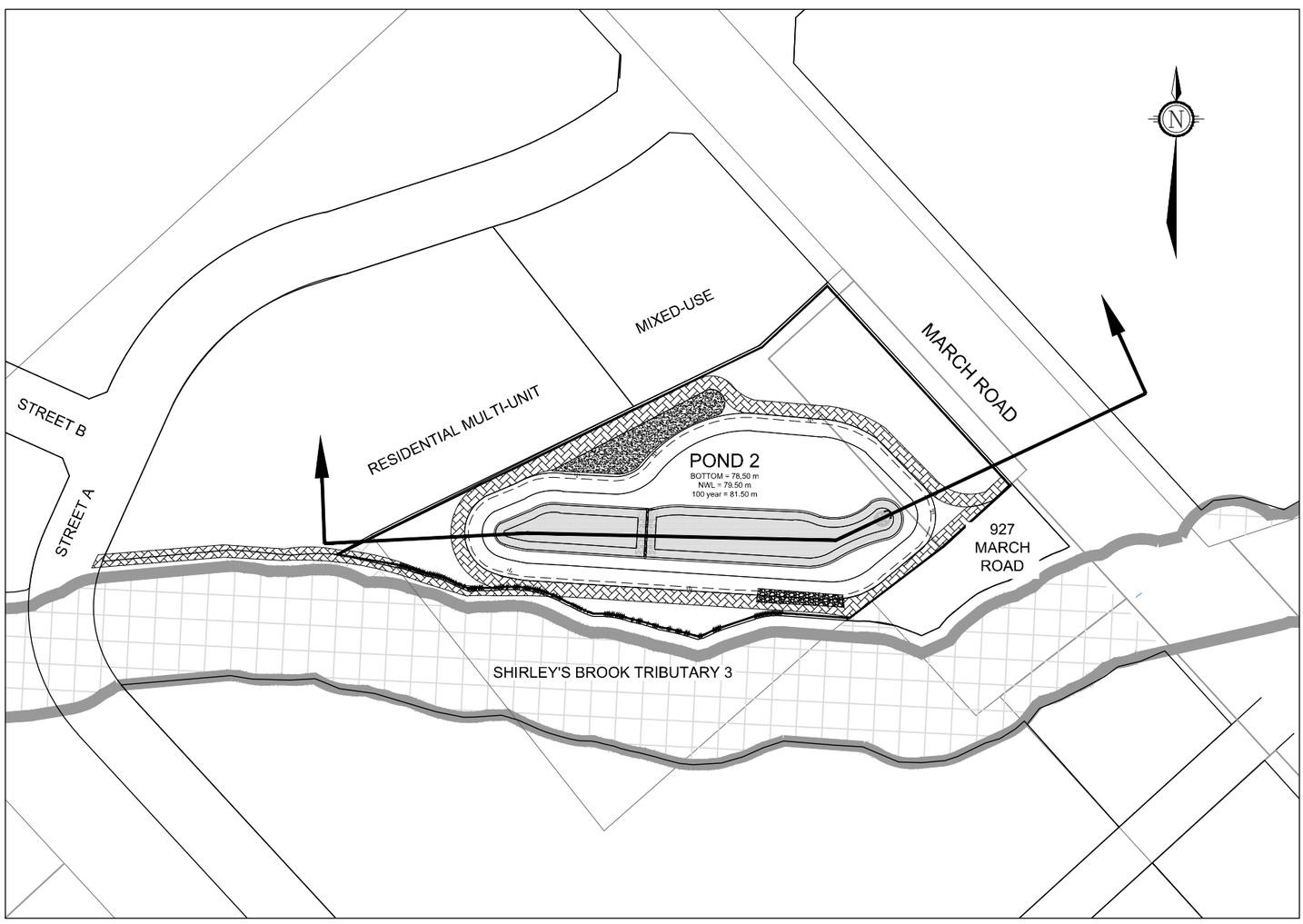

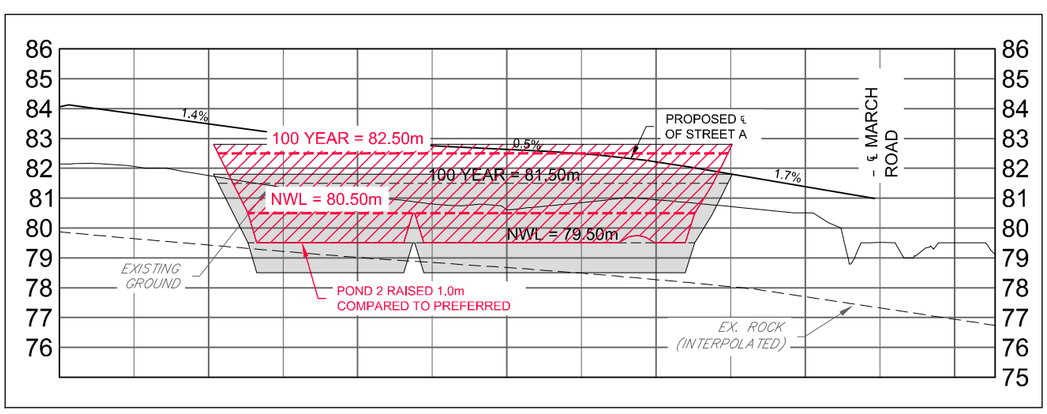

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KANATA NORTH URBAN EXPANSION AREA

POND 2 SECTION

SCALE 1 : 2000 (0 20 40 60 80)
DATE MAY 2016 | JOB 112117 | FIGURE CSK-1B

SHT11X17.DWG - 279mmX432mm

M:\2012\112117\CAD\Design_EMP\MEMO (KJA)\Figure 9.2 Pond 2 Functional.dwg, POND2 MSS SKETCH, May 09, 2016 - 2:36pm, tbrooks

MEMO / NOTE DE SERVICE

To / Destinataire	Wendy Tse	File/N° de fichier:
From / Expéditeur	Ted Cooper, P. Eng. Darlene Conway, P. Eng.	
Subject / Objet	Kanata North Community Design Plan EMP and MSS Final Drafts (Novatech, April 4, 2016)	Date: May 2, 2016

These comments are provided in conjunction with "Key SWM Issues for Discussion," a summary of alternative drainage options to be reviewed with Novatech during the week of May 2nd, 2016.

A. Environmental Management Plan (Novatech, April 4, 2016):

3.10 Storm Drainage and Hydrology (pre-development):

1. Table 3.6 – Please identify location of peak flow, i.e., immediately upstream of confluence? Is this the same location at which the post-development peak flow is compared (Table 7.1)? Please also reference the pre-development peak flows just upstream of the confluence with the main branch of Shirley's Brook and include the post-value at this location in Table 7.1.

2. Table 3.7 – Please document peak flows corresponding to water levels.

3. Please clarify the differences in drainage areas for Tributary 2 (465.80 ha) and Tributary 3 (253.67 ha) differ from the areas identified in the Shirley's Brook & Watt's Creek Phase 2 Stormwater Management Study of 444.63 ha and 285.53 ha, respectively.

4. Please identify and label the drainage channels in the Pre-Development Figure 3.15, similar to the Post-Development Drainage Area Plan Figure 7.1.

5. Please clarify Section 3.10.5 where it is noted that the 100 year SCS 12-hour storm distribution generates the highest peak flows. From the model it appears that the 100 year SCS 24-hour storm distribution governs?

6. The pre-development peak values for Tributary 2 differ significantly from the pre-development values from the Shirley's Brook Phase 2 Study (2.55 m^3/s vs 1.2 m^3/s, respectively). Please justify the difference or revise as required.

7. Table 4.4: Standard Initial Abstraction (Ia) values is missing from the report. Please also identify how the Ia values were assigned and why they differ from the Shirley's Brook Phase 2 Study values.

8. Please append the '20150911 – Shirley's Brook Modeling Parameters.xlxs' file referenced in the model and the pre- and post- modeling schematics.

3.11 Floodplain Mapping:

9. The limits of the floodplain should be shown on an appropriate base (the "approximate" limit shown on Figure 3.17 is not sufficient).

3.12 Fluvial Geomorphology:

10. Table 3.11:

- the critical discharges noted are greater than the respective 2yr peak flows and the bankfull discharges also significantly exceed the 2yr peak flows - please document these comparisons and comment
- erosion threshold parameters should be provided for a sufficient distance on the main branch so that it can be demonstrated additional erosion will not occur as a result of the urbanization of the north tributary watershed.

11. Dwgs 112117-ENV and 112117-EMP: Why are meander belt widths not shown on one (or both) of these drawings?

5.0 SWM Criteria:

12. Watercourse Crossings (culverts): provide further direction, typical examples with respect to designing in accordance with geomorphic principles, "any additional requirements for aquatic habitat," etc.

13. p.53 – Low Impact Development:
"Thorough planning and investigation of subsurface conditions, coordination with proposed land use plans, and thorough consideration of long-term operation and maintenance requirements are all critical to the long-term success of LID designs. As such, it is premature to recommend LID as a primary means for stormwater management at the CDP / EMP scale. Instead, the EMP will provide general guidance for areas where LID techniques could be considered at the plan of subdivision / site plan stage."
Please revise the above paragraph as it indicates that it would be premature to recommend LID at the master planning stage of development, when in fact this is the preferred time to do so. However, as the previous paragraph notes, given the City's limited experience with LID, the locations where it is being implemented for the next few years will be limited in order to "learn by doing." That being the case, it is anticipated that LID approaches may become a requirement before this plan is built out so wording and direction to that effect should be provided.

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Please revise or delete this statement as it disregards the presence of locations with medium coarse sand/loamy sand as indicated on Figure 3.5. While in some locations the shallow overburden may preclude LIDs, the presence of non-sandy soils does not.

6.4 Recommended SWM Strategy

15. Section 6.4.4 and Table 6.5 – Further discussion in the main text is required regarding the selection of relocating Shirley's Brook away from March Valley Road (similar to what was previously provided in the memo to NCC of August 10, 2015). For example, although option 1 is indicated as the lowest cost option, it was not recommended for various reasons (regardless of the lowest cost) – there is no indication of this in Table 6.5. Further, with respect to the relocation of Shirley's Brook, it is indicated as the highest cost option, however this option's estimate also includes March Valley roadside ditch improvements which should not be required if the outflow from the pond is conveyed directly to Shirley's Brook? If this item is not included, the relocation becomes lower or comparable in cost to option 2. Please clarify and provide further details (including cost estimates) in the main text supporting the selected option.

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being very flat and requiring work if the pond was to discharge to it (but also eliminated as an option)? Please identify what is required to convey the pond outflow directly to the relocated Shirley's Brook.

7.0 Post-Development Storm Drainage Conditions

17. Please identify what the parameter 'CLI' represents and document the assumptions for this value.

18. Please identify the location of channel route 310 in Figure 7.1.

19. Please provide a table and explanation justifying imperviousness for the developed locations as well as the established low density areas within the report.

20. Please show the imperviousness in Figure 7.1.

7.3 Continuous Modeling

21. Table 7.2 – Please provide commentary on the results, e.g., why, in the post-development condition, is the average flow so significantly reduced on Tributary 3 and the peak flow is larger?; likewise, the peak flow at the confluence is significantly reduced?

22. Table 7.3 – Please provide commentary – why are the hours of exceedance so significantly reduced in the post-condition at Location 3?

9.0 Conceptual SWM Design:

23. Figure 9.3: The conceptual layout drawing of alternative pond 2A appears to show an overflow spillway that would discharge to March Road while also indicating a major system outlet from March Road (same location) into the pond. Why is it necessary to discharge the pond spillway to March Road when it appears the spillway could be directed to Tributary 3?

24. Pond 3:

- Provide the reference for the 2 yr water elevation on Shirley's Brook (source, water level, HEC-RAS section no., etc.).
- p.77 – The report notes: *"The existing culverts crossing the CN Rail line would be used to convey major system flow.* Has it been confirmed that these culverts have sufficient capacity for this? Who currently owns the rail line? Are any agency approvals required for future crossings, etc.?
- The existing catchment area upstream of the pond includes drainage through a number of culverts under the railway embankment and is directed via a combination of several swales and overland flow. Please identify the full scope of work (at a functional design level) required to collect and safely convey the future drainage from upstream of the CNR to the pond including supporting calculations, preliminary sizing of swales, culverts, etc.
- p.77 – *"Pond 3 will outlet to the Main Branch of Shirley's Brook. Ideally, outflows from Pond 3 would be directed to the roadside ditch on the west side of March Valley Road and through the existing culverts crossing March Valley Road immediately north of Pond 3. This outlet configuration would eliminate the need for a new connection to Shirley's Brook, thereby avoiding any in-water works. The conceptual outlet design will need to be confirmed during detail design. If the existing culverts are deemed unsuitable, a new crossing can be provided."*
  This rationale is inconsistent with the characterization of the existing ditch on the west side of March Road provided in the memo of August 15, 2015, i.e., that it is very flat, would be subject to standing water, would require regrading/tree removal, possible filling outside the ROW, etc. Further, where the pre-development condition consists of several outlets to the ditch, the post- condition will concentrate the flow at one outlet and consist of a much higher volume that will compound existing poor drainage conditions. Accordingly,

please provide a functional design that demonstrates the outflow from pond 3 can be conveyed to the relocated Shirley's Brook, in particular details of its compatibility with existing drainage along March Valley Road, a dedicated outlet channel/crossing of March Valley Road, etc.

- Figure 9.4 – Why is the southern ditch as it exits the CNR corridor located outside the pond block? Please clarify and/or revise the extent of the pond block.
- The pond outlet should be located to maximize flow length from both inlets – that does not appear to be the case on Figure 9.4. Please clarify or revise as required.
- The pond footprint should be provided with an air photo background with property boundaries and the limit of the woodlot to be dedicated to the City. Clear limits of grading for the pond and inlet ditches are to be shown to demonstrate no impacts to the woodlot (provide typical sections of ditching, capacity calculations, etc., to confirm this).
- Please address the following comments previously provided in September 2015:
    - Should the southerly pathway along outflow channel not be located adjacent to the woodlot?
    - Northerly pathway – why does this cut through the NW corner of the woodlot?
    - Figure 9.4 – correct the references to other figures (9.4.1, not 10.4.1, etc.).
    - Identify minimum setback for grading disturbance to avoid impacts to wooded area to remain and incorporate this in the pond block sizing, i.e., have ditches been located sufficient distance from the woodlot?
    - Complete cross-sections through the pond (one end to the other) must be provided; what is the extent of berming required on the east side of the pond/at March Valley Road?; provide sufficient grading detail to clearly demonstrate no encroachment into the floodplain.
    - Figures 9.4.1 and 9.4.2: provide cross-sections of ditch with elevations (as per longitudinal sections).

25. A relaxation of the quantity control criterion for pond 3 should be assessed given the location of the outlet (at the bottom of the Shirley's Brook watershed) and provided that a direct connection to the relocated Shirley's Brook via a crossing of March Valley can be established. Given the significant difference in times to peak, it may be sufficient to compare hydrographs from pond 3 (uncontrolled or less than 100yr control) with the hydrograph of Shirley's Brook where the pond will outlet. If no change in peak flows on Shirley's Brook can be demonstrated, this could reduce the footprint requirements of the pond and lessen the impact on existing features within the area currently slated for the pond block. It will also be necessary to confirm what level of control for more frequent events may still be required to avoid erosion impacts on the relocated brook.

9.7 External Drainage Areas

26. p.79 – Text indicates that Nadia Lane existing drainage will be collected by a rear yard ditch and conveyed to Tributary 3 while MSS drawing 112117-STM1 indicates capture into the storm sewer going south? (or at least no separate outlet to the trib is identified on STM1?). Please clarify. Has the required grading for the rear yard ditch (presumably to be located within the park block) been accounted for in the park block?

9.9 Shirley's Brook Realignment

27. Per comments on earlier sections, please confirm the feasibility of discharging directly to Shirley's Brook by conveying outflows under a new culvert at the pond 3 outlet rather than first discharging to the ditch on the west side of March Road.

28. Figure 9.6 – Provide additional proposed sections (only one (A-A) is provided) and indicate both existing and proposed grades on the sections. Approximate extent of anticipated tree removal should also be indicated. Per comment above, show extent of grading required for pond 3 on this figure also.

Section 10.0 Floodplain Evaluation

29. As per comments on the existing condition, the future condition floodplain should be identified on a plan that confirms containment within the proposed corridor widths on the basis of existing/proposed grades, etc.

11.10 Compensation by Quadrant

30. Northeast/Southeast Quadrants: Text notes that, *"Rear-yard flows from properties along eastern boundary should be directed to culverts crossing the abandoned CN rail corridor to maintain flows in channel 'B.'"* However, will not channel B be intercepted/eliminated by pond 3 (see Figure 9.4)? Please clarify.

12.1 Shirley's Brook Main Branch Realignment

31. p.96 – The text notes, *"Realignment of the watercourse will benefit multiple landowners, and could be completed by way of drainage area development charges, or through cost-sharing between landowners, the NCC, DND, and the City of Ottawa."*

Responsibility for implementing the realignment must be identified as this is an integral component of the drainage system for the northeast/southeast quadrants. The City has made no commitment to cost-sharing and foresees no such commitment. If NCC/DND has provided any such commitment, please document this. As commented above, while the alternatives evaluation identified the relocation of Shirley's Brook as the highest cost option, this option's estimate includes March Valley roadside ditch improvements which should not be required if the outflow from the pond is conveyed directly to Shirley's Brook. Without this item, the relocation becomes lower or comparable in cost to option 2. This provides a rationale for this work being the responsibility of the proponents to implement.

13.0 Project Listing

32. The text notes, *"Class EA documents will be advertised through a **Notice of Completion** and there will be an opportunity to appeal to the Ontario Municipal Board (OMB)."*

This statement should be corrected per the amendment to the integration provision – refer to the MEA website: http://www.municipalclassea.ca/Amendments/Approved.aspx . Per this amendment, regardless of the process followed, the public can appeal to the Minister, per the following excerpt:

> *If a project has been appealed to the OMB, the requirements of the integrated approach have not been met until the OMB renders a decision allowing the project to proceed. As outlined in section 2.8.1 of this Class EA, a Part II Order (PIIO) request may also be made to the Minister of the Environment or delegate. However, the purpose of the integration provisions is to coordinate requirements under the Planning Act with this Class EA. When reviewing a PIIO request, the Minister of the Environment or delegate will consider the purpose and intent of the integration provisions.*

B. Master Servicing Study – Storm Servicing

1. Major/minor system flows, velocities, depths and hydraulic gradelines have been simulated using the Autodesk Storm and Sanitary Analysis (SSA) model. On previous occasions, the City has brought to Novatech's attention the need for additional information requirements should this software be used:

- *Please note that Autodesk SSA is not available to City staff and only the output files from the submission can be used for the review. Therefore, please provide the following additional information:*
  - *Description of the model (e.g., runoff calculation method, dynamic wave routing method, and other fundamental principles.); please also describe any specific user inputs such as downstream restricting conditions;*
  - *A print-out of the cross sections used to model the major system flows;*
  - *Supporting documentation for the entrance and exit losses;*
  - *A summary of the rainfall volume and maximum intensities for each storm event used;*
  - *For future submissions, please note that prior to proceeding with any modeling approach, the choice of model should be confirmed with the City (see OSDG, Section 3.5.4).*
- In addition to the above, please provide documentation that summarizes peak flow, depth of flow, and storage being provided along the major system (all road sections) for the 100year event.

2. Further details should be provided that demonstrate the proposed rear yard grading at the east limit of the plan (immediately adjacent to the rail line) can adequately convey the major system flows directed to this area/does not impact minimum lot sizes, etc. Depending on the quantity of flow to be conveyed, a separate block or easement may be required to ensure the City has access to this should it be subject to filling by future homeowners, etc.

Ted Cooper, P. Eng.
Project Manager

Darlene Conway, P. Eng.
Senior Project Manager

cc.
Joe Zagorski, P. Eng.
Michel Kearney, P. Eng.
Chris Rogers, P. Eng.
Tim Newton, P. Eng.
Amy MacPherson

NOVATECH
Engineers, Planners & Landscape Architects

May 10, 2016

Wendy Tse
City of Ottawa
110 Laurier Street West
4th Floor Infrastructure Approvals Division
Ottawa, Ontario K1P 1J1

Attention:

Dear Ms. Tse:

Reference: Kanata North CDP - EMP and MSS Final Drafts
Response to Comments
Our File No. 112117

This letter is provided in response to comments provided by the City on May 2, 2016, based on final drafts of the Kanata North CDP EMP and MSS reports.

Responses to comments are provided in red.

Environmental Management Plan (Novatech, April 4, 2016)

3.10 Storm Drainage and Hydrology (pre-development):

1. Table 3.6 – Please identify location of peak flow, i.e., immediately upstream of confluence? Is this the same location at which the post-development peak flow is compared (Table 7.1)? Please also reference the pre- development peak flows just upstream of the confluence with the main branch of Shirley's Brook and include the post-value at this location in Table 7.1.
   - Location of flow to be added to table 3.6
   - Yes the flows are 'measured' at the same locations both pre & post
   - Pre-development and post-development peak flows listed in Table 3.6 are measured approximately 140 m (Tributary 2) and 160 m (Tributary 3) upstream of the confluence. Flows at the confluence are listed in Table 3.6.
   - Flows in Table 7.1 are taken from the same location as those in Table 3.6. Location has also been added to the table.

2. Table 3.7 – Please document peak flows corresponding to water levels.
   - Peak flows have been added to Table 3.7

3. Please clarify the differences in drainage areas for Tributary 2 (465.80 ha) and Tributary 3 (253.67 ha) differ from the areas identified in the Shirley's Brook & Watt's Creek Phase 2 Stormwater Management Study of 444.63 ha and 285.53 ha, respectively.
   - Our record drawings from the SBWC Phase 2 Study (Draft - March 2013) indicate drainage areas of approximately 441 ha (Tributary 2) and 289 ha (Tributary 3) for a total area of 730 ha.

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As a part of the detailed hydrologic analysis for the KNUEA, the drainage areas from the SBWC Ph2 Study were re-assessed based on more detailed topographic mapping. The total pre-development drainage area for Tributaries 2 and 3 is still 730 ha, although the catchment boundaries between the tributaries have shifted slightly to reflect the topographic contours.

4. Please identify and label the drainage channels in the Pre-Development Figure 3.15, similar to the Post- Development Drainage Area Plan Figure 7.1.

   - The drainage channels have been identified and labeled on the revised pre-development drainage area plan.

5. Please clarify Section 3.10.5 where it is noted that the 100 year SCS 12-hour storm distribution generates the highest peak flows. From the model it appears that the 100 year SCS 24-hour storm distribution governs?

   - The 24-hour SCS storm distribution does govern and the report has been revised accordingly. This correction does not change any of the model results or the pond sizing calculations, as each of the ponds was sized such that flows in the receiving watercourses are controlled to pre-development levels for all return periods and storm distributions.

6. The pre-development peak values for Tributary 2 differ significantly from the pre-development values from the Shirley's Brook Phase 2 Study (2.55 m^3/s vs 1.2 m^3/s, respectively). Please justify the difference or revise as required.

   - As a part of the SWMHYMO model development, the SBWC Phase 2 model was reviewed to verify its accuracy in simulating the existing conditions within the Shirley's Brook Northwest Branch subwatershed.
     - The AECOM SWMHYMO model (Draft – December 2013) discretized the Northwest Branch into 3 large subcatchment areas.
     - As part of the KNUEA hydrologic analysis, the Northwest Branch catchments were further discretized to reflect the different land uses, using appropriate SCS curve numbers for each. The headwater areas consist primarily of wetlands and heavily wooded areas, while the lower portions of the catchment (KNUEA lands) are primarily agricultural. This approach was necessary to separate the KNUEA lands from the upstream areas for the post-development model.
     - Where appropriate, the KNUEA model uses the hydrologic parameters from the AECOM model. Other parameters were revised to reflect the hydrologic characteristics of the more discretized catchments. This approach results in lower flows from the headwater areas, but higher peak flows from the agricultural areas within the KNUEA, and generates slightly higher overall peak flows when compared to the AECOM model.
   - Model calibration efforts were undertaken as part of a flow monitoring program undertaken by Novatech in 2014:
     - Preliminary analysis indicated significantly larger times to peak (approximately 10 hours) than the AECOM SWMHYMO model (approximately 3 hours). The peak flows were lower, but the significant difference in timing between the upstream areas and the KNUEA lands meant that no significant modifications were required to the required storage volumes in the SWM ponds.
     - Rather than preparing a calibrated model that was significantly different than the

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AECOM, we opted to use the AECOM model as a starting point and adjust the model parameters where appropriate using industry standard methodologies for calculating Curve Numbers and Times to Peak.

- It should be noted that the higher peak flows in the KNUEA model are still relatively low when compared with the bankfull and critical (erosion threshold) flow values established as part of the geomorphic analysis (see Comment # 10). The lower flows from the AECOM study represent an even greater difference from the threshold flows established by the geomorphic study. As such, we feel the KNUEA model provides a more accurate representation of the Northwest Branch than the AECOM model.
- Lastly, the release rates used in the conceptual designs for the proposed SWMFs are very low, and the controlled-post development outflows from the KNUEA will have minimal impact on the overall peak flows in Tributaries 2 and 3 regardless of the peak flow from the upstream area.
    - Pond 1 100yr Release Rate: 276 L/s
    - Pond 2 100yr Release Rate: 58 L/s

7. Table 4.4: Standard Initial Abstraction (Ia) values is missing from the report. Please also identify how the Ia values were assigned and why they differ from the Shirley's Brook Phase 2 Study values.
    - The Final Draft of the EMP (April 4, 2016) does not include a 'Table 4.4'. Standard Initial Abstraction values and supporting text is provided in the *KNUEA Existing Conditions Report – Storm Drainage and Hydrology* (Table 4.1), which can be found in EMP Volume 3, Appendix A. Initial Abstraction values are also listed in the Pre-Development Model Parameters table in EMP Volume 2, Appendix H. The EMP has been revised to include the appropriate references in section 3.10.4.

8. Please append the '20150911 – Shirley's Brook Modeling Parameters.xlxs' file referenced in the model and the pre- and post- modeling schematics.
    - This file was provided in Appendix H – Hydrologic Calculations & Modeling Files. A reference to the location of the parameters has been added to the report in section 3.10.4.

3.11 Floodplain Mapping:

9. The limits of the floodplain should be shown on an appropriate base (the "approximate" limit shown on Figure 3.17 is not sufficient).
    - Additional figures with the appropriate base mapping will be included in the final report.

3.12 Fluvial Geomorphology:

10. Table 3.11:
    a) the critical discharges noted are greater than the respective 2yr peak flows and the bankfull discharges also significantly exceed the 2yr peak flows - please document these comparisons and comment
    - A response will be provided under separate cover.
    b) Erosion threshold parameters should be provided for a sufficient distance on the main

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branch so that it can be demonstrated additional erosion will not occur as a result of the urbanization of the north tributary watershed.

- A response will be provided under separate cover.

11. Dwgs 112117-ENV and 112117-EMP: Why are meander belt widths not shown on one (or both) of these drawings?

- The meander belt widths are not shown on either of these drawings, as they will be fully confined within the proposed 40m corridors inside the KNUEA boundary.

5.0 SWM Criteria:

12. Watercourse Crossings (culverts): provide further direction, typical examples with respect to designing in accordance with geomorphic principles, "any additional requirements for aquatic habitat," etc.

- This section provides an overview of the criteria used to develop the recommended SWM strategy for the KNUEA. Watercourse crossings are discussed in greater detail in Section 9.8 of the EMP, including preliminary sizing calculations (which will be refined at the detailed design stage for each crossing).

13. p.53 – Low Impact Development:

"Thorough planning and investigation of subsurface conditions, coordination with proposed land use plans, and thorough consideration of long-term operation and maintenance requirements are all critical to the long-term success of LID designs. As such, it is premature to recommend LID as a primary means for stormwater management at the CDP / EMP scale. Instead, the EMP will provide general guidance for areas where LID techniques could be considered at the plan of subdivision / site plan stage."

Please revise the above paragraph as it indicates that it would be premature to recommend LID at the master planning stage of development, when in fact this is the preferred time to do so. However, as the previous paragraph notes, given the City's limited experience with LID, the locations where it is being implemented for the next few years will be limited in order to "learn by doing." That being the case, it is anticipated that LID approaches may become a requirement before this plan is built out so wording and direction to that effect should be provided.

- The paragraph outlining the use of LIDs within the KUNEA will be revised as follows:

  Thorough planning and investigation of subsurface conditions, coordination with proposed land use plans, and thorough consideration of long-term operation and maintenance requirements are all critical to the long-term success of LID designs. Given the City of Ottawa's limited experience with LID to-date, implementation of green stormwater infrastructure over the next few years will be limited as the City gains practical knowledge through the monitoring and evaluation of pilot projects.

  Low impact development and other practices that better mimic the pre-development hydrologic cycle are expected to be incorporated into the MOECC Environmental Compliance Approval (ECA) process in the near future. The MOECC have stated that it is critical to consider options and opportunities for the incorporation of LID practices during the watershed and subwatershed planning process, and early in the development planning process, and not left to the preparation of the detailed stormwater management plan

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submission. As such, the EMP has been developed to provide general guidance for areas and opportunities where LID techniques could be considered at the plan of subdivision / site plan stage.

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Please revise or delete this statement as it disregards the presence of locations with medium coarse sand/loamy sand as indicated on Figure 3.5. While in some locations the shallow overburden may preclude LIDs, the presence of non-sandy soils does not.

- This statement will be deleted as part of the revised response to Comment #13.

6.4 Recommended SWM Strategy

15. Section 6.4.4 and Table 6.5 – Further discussion in the main text is required regarding the selection of relocating Shirley's Brook away from March Valley Road (similar to what was previously provided in the memo to NCC of August 10, 2015). For example, although option 1 is indicated as the lowest cost option, it was not recommended for various reasons (regardless of the lowest cost) – there is no indication of this in Table 6.5. Further, with respect to the relocation of Shirley's Brook, it is indicated as the highest cost option, however this option's estimate also includes March Valley roadside ditch improvements which should not be required if the outflow from the pond is conveyed directly to Shirley's Brook? If this item is not included, the relocation becomes lower or comparable in cost to option 2. Please clarify and provide further details (including cost estimates) in the main text supporting the selected option.

- March Valley roadside ditch improvements were added to this cost estimate, as some improvements will be required as a portion of the ditch will remain as an outlet for Pond 3 (See Section 9.9 and Figure 9.6 for reference.)
- Additional details on the selected option will be included in the final EMP (report text and Table 6.5).

16. Figure no. 6.5 – Option 3: What is the intent of the note: "divert flow to relocated ditch?" Presumably once relocated, the new brook will be disconnected from the roadside ditch? Also, why is the outlet of the SWM pond shown to discharge to the existing ditch on the west side of March Valley given this was previously identified as being very flat and requiring work if the pond was to discharge to it (but also eliminated as an option)? Please identify what is required to convey the pond outflow directly to the relocated Shirley's Brook.

- Flows in Shirley's Brook would be diverted into the proposed realigned channel, and the existing reach adjacent to March Valley Road will only convey runoff from the right-of-way and adjacent areas. The existing channel can also serve as the outlet for the proposed SWM pond via the existing culverts. This would eliminate the need to construct a new crossing on March Valley Road.
- The existing ditch on the west side is flat, but it does drain to the existing culverts. It is not feasible to re-grade this ditch to convey flows further north to a new crossing that would tie back into Shirley's Brook where it moves away from March Valley Road.

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7.0 Post-Development Storm Drainage Conditions

17. Please identify what the parameter 'CLI' represents and document the assumptions for this value.

- "CLI" is a parameter within SWMHYMO used to approximate the impervious length of a given area. The "DESIGN STANDHYD" subroutine uses CLI in the equation L=(Area/CLI)^.5 to approximate the average length of the impervious flow path. It is roughly analogous to the 'equivalent width' parameter in other SWMM models (PCSWMM, etc.).

18. Please identify the location of channel route 310 in Figure 7.1.

- Figure 7.1 has been updated.

19. Please provide a table and explanation justifying imperviousness for the developed locations as well as the established low density areas within the report.

- This has been added to the report.

20. Please show the imperviousness in Figure 7.1.

- Figure 7.1 has been updated.

7.3 Continuous Modeling

21. Table 7.2 – Please provide commentary on the results, e.g., why, in the post-development condition, is the average flow so significantly reduced on Tributary 3 and the peak flow is larger?; likewise, the peak flow at the confluence is significantly reduced?

- An error was discovered in the post-development continuous model, in which the incorrect hydrographs were being added (the event-based SWMHYMO model did not contain this error). The error in the continuous model has been corrected and the peak flows and average flows have been updated as follows. Additional discussion of the continuous modeling results will be provided in the final EMP report.

Location	Model Run	Peak Flow (m^3/s)	Average Flow (m^3/s)
Shirley's Brook Northwest Branch			
Tributary 2	*Pre*	1.461	0.021
	Post	1.242	0.018
Tributary 3	*Pre*	0.699	0.014
	Post	0.779	0.016
Confluence of Tributaries 2&3	*Pre*	2.461	0.037
	Post	2.014	0.034
KNUEA Lands to Main Branch of Shirley's Brook at March Valley Road			
Flows from East Pond (to Shirley's Brook Main Branch)	*Pre*	0.857	0.009
	Post	0.120	0.008

22. Table 7.3 – Please provide commentary – why are the hours of exceedance so significantly

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reduced in the post- condition at Location 3?

- The post-development continuous model has been updated to correct an error in the model (refer to Comment # 21). Peak flows and average flows have been updated as follows. Additional discussion of the erosion analysis will be provided in the final EMP.

Location	Reach ID	Critical Discharge (m^3/s)	Bankfull Discharge (m^3/s)	Hours of Exceedance (hrs)		Peak Flow (m^3/s)		Average Flow (m^3/s)	
				Pre	Post	Pre	Post	Pre	Post
1	SBT-4	0.730	2.11	11.0	8.5	1.461	1.242	0.021	0.018
2	SBT-5	0.570	4.54	5.5	10.0	0.699	0.799	0.014	0.016
3	SBT-7B	0.570	4.33	72.5	50.5	2.575	2.014	0.037	0.034

9.0 Conceptual SWM Design:

23. Figure 9.3: The conceptual layout drawing of alternative pond 2A appears to show an overflow spillway that would discharge to March Road while also indicating a major system outlet from March Road (same location) into the pond. Why is it necessary to discharge the pond spillway to March Road when it appears the spillway could be directed to Tributary 3?

- The location of the overflow spillway for alternative pond 2A has been revised to the southeast corner of the pond, closer to Tributary 3. Overflows cannot be conveyed directly to Tributary 3 due to the topographic constraints. The overflow spillway for Pond 2A will be directed to the March Road right-of-way and not onto the 941 March Road property.

24. Pond 3:

a) Provide the reference for the 2 yr water elevation on Shirley's Brook (source, water level, HEC-RAS section no., etc.)

- The water elevations in the main branch of Shirley's Brook are taken from the AECOM report. A reference has been added to Section 9.5 of the EMP.

b) p.77 – The report notes: "The existing culverts crossing the CN Rail line would be used to convey major system flow. Has it been confirmed that these culverts have sufficient capacity for this? Who currently owns the rail line? Are any agency approvals required for future crossings, etc.?

- The culvert capacity calculations are included in Appendix B of the Master Servicing Study.
- While the rail corridor has been formally abandoned, CN Rail is still the current owner of the corridor, and will have to provide approval for future crossings.

c) The existing catchment area upstream of the pond includes drainage through a number of culverts under the railway embankment and is directed via a combination of several swales and overland flow. Please identify the full scope of work (at a functional design level) required to collect and safely convey the future drainage from upstream of the CNR to the pond including supporting calculations, preliminary sizing of swales, culverts, etc.

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- The design of the minor & major system network to convey flows from the development upstream of the CN Rail line to the Pond 3 inlet swales has been completed as a part of the MSS. Please refer to the MSS for detailed information.
- The dimensions of the proposed Pond 3 inlet swales are shown on Figure 9.4.1 and 9.4.2 in the EMP. Supporting design calculations for these swales have been added to Appendix F – Pond Design Spreadsheets.

d) p.77 – "Pond 3 will outlet to the Main Branch of Shirley's Brook. Ideally, outflows from Pond 3 would be directed to the roadside ditch on the west side of March Valley Road and through the existing culverts crossing March Valley Road immediately north of Pond 3. This outlet configuration would eliminate the need for a new connection to Shirley's Brook, thereby avoiding any in-water works. The conceptual outlet design will need to be confirmed during detail design. If the existing culverts are deemed unsuitable, a new crossing can be provided." This rationale is inconsistent with the characterization of the existing ditch on the west side of March Road provided in the memo of August 15, 2015, i.e., that it is very flat, would be subject to standing water, would require regrading/tree removal, possible filling outside the ROW, etc. Further, where the pre-development condition consists of several outlets to the ditch, the post- condition will concentrate the flow at one outlet and consist of a much higher volume that will compound existing poor drainage conditions. Accordingly, please provide a functional design that demonstrates the outflow from pond 3 can be conveyed to the relocated Shirley's Brook, in particular details of its compatibility with existing drainage along March Valley Road, a dedicated outlet channel/crossing of March Valley Road, etc.

- The ditch on the west side of March Valley Road was characterized as being too flat to convey outflows from Pond 3 to the location where Shirley's Brook veers away from March Valley Road. Re-grading of the existing ditch would require works on private property not owned by participating landowners, as well as extensive tree removal.
- The preferred outlet configuration was selected after reviewing several outlet options. The existing culverts crossing March Valley Road have sufficient capacity to convey outflows from Pond 3 to the existing channel on the east side, which will no longer be the main branch of Shirley's Brook, eliminating the need to construct a new crossing – refer to response to Comment # 16.

e) Figure 9.4 – Why is the southern ditch as it exits the CNR corridor located outside the pond block? Please clarify and/or revise the extent of the pond block.

- This has been revised. Figure 9.4 has been updated.

f) The pond outlet should be located to maximize flow length from both inlets – that does not appear to be the case on Figure 9.4. Please clarify or revise as required.

- The pond outlet location has been revised. Figure 9.4 has been updated.

g) The pond footprint should be provided with an air photo background with property boundaries and the limit of the woodlot to be dedicated to the City. Clear limits of grading for the pond and inlet ditches are to be shown to demonstrate no impacts to the woodlot (provide typical sections of ditching, capacity calculations, etc., to confirm this).

- The Pond Concept Plan provides a general outline of the land required for the pond and appurtenances. The detailed design of Pond 3 will establish the limits of the pond block.

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h) Please address the following comments previously provided in September 2015:

i) Should the southerly pathway along outflow channel not be located adjacent to the woodlot?

- The current design has the pathway connection south of the outflow channel, as this provides a better alignment with the proposed ROW block shown on the demonstration plan. This pathway can be located on either side of the outflow channel, and can be confirmed at the detailed design stage.

ii) Northerly pathway – why does this cut through the NW corner of the woodlot?

- The northern pond pathway cuts through the woodlot to provide a perpendicular connection to the proposed pathway block across the CN rail corridor as shown on the demonstration plan.

iii) Figure 9.4 – correct the references to other figures (9.4.1, not 10.4.1, etc.).

- The references on Figure 9.4 will be corrected in the final EMP.

iv) Identify minimum setback for grading disturbance to avoid impacts to wooded area to remain and incorporate this in the pond block sizing, i.e., have ditches been located sufficient distance from the woodlot?

- At this stage, exact setbacks have not been determined. From site surveys, it has been shown that there are butternut trees along the boundary of the wooded area. At the detailed design stage, detailed tree surveys will be required and an exact setback distance or compensation can be determined. Furthermore the detailed design will confirm the exact size and layout of the pond, the remaining land within the block will form the woodlot block.

v) Complete cross-sections through the pond (one end to the other) must be provided; what is the extent of berming required on the east side of the pond/at March Valley Road? Provide sufficient grading detail to clearly demonstrate no encroachment into the floodplain.

- This has been completed for all pond options, and figures will be included in the final EMP.

vi) Figures 9.4.1 and 9.4.2: provide cross-sections of ditch with elevations (as per longitudinal sections).

- Ditch cross-sections have been added to Figures 9.4.1 and 9.4.2.

25. A relaxation of the quantity control criterion for pond 3 should be assessed given the location of the outlet (at the bottom of the Shirley's Brook watershed) and provided that a direct connection to the relocated Shirley's Brook via a crossing of March Valley can be established. Given the significant difference in times to peak, it may be sufficient to compare hydrographs from pond 3 (uncontrolled or less than 100yr control) with the hydrograph of Shirley's Brook where the pond will outlet. If no change in peak flows on Shirley's Brook can be demonstrated, this could reduce the footprint requirements of the pond and lessen the impact on existing features within the area currently slated for the pond block. It will also be necessary to confirm what level of control for more frequent events may still be required to avoid erosion impacts on the relocated brook.

- The final EMP will be revised to include discussion of this approach, which could be considered at the detailed design stage. Relaxation of the quantity control criterion would require acceptance by NCC as well.

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- For the purposes of the EMP, this level of analysis was not deemed necessary – even if the required pond footprint can be reduced, both the pond block and the balance of the remaining woodlot area will be conveyed to the City.

9.7 External Drainage Areas

26. p.79 – Text indicates that Nadia Lane existing drainage will be collected by a rear yard ditch and conveyed to Tributary 3 while MSS drawing 112117-STM1 indicates capture into the storm sewer going south? (or at least no separate outlet to the tributary is identified on STM1?). Please clarify. Has the required grading for the rear yard ditch (presumably to be located within the park block) been accounted for in the park block?

- Text has been revised as follows: "Under post-development conditions, runoff from Nadia Lane will be collected by a DICB at the KNUEA property boundary and piped directly to Tributary 2." This is stated in other points through the report.
- This is shown on 112117-EMP, as well as on Figure 5.7.1 in the MSS.

9.9 Shirley's Brook Realignment

27. Per comments on earlier sections, please confirm the feasibility of discharging directly to Shirley's Brook by conveying outflows under a new culvert at the pond 3 outlet rather than first discharging to the ditch on the west side of March Road.

- Refer to responses to Comments #16 and 24 above.

28. Figure 9.6 – Provide additional proposed sections (only one (A-A) is provided) and indicate both existing and proposed grades on the sections. Approximate extent of anticipated tree removal should also be indicated. Per comment above, show extent of grading required for pond 3 on this figure also.

- An additional cross section will be added. Extent of anticipated tree removal will be dealt with at the time of detailed design.

Section 10.0 Floodplain Evaluation

29. As per comments on the existing condition, the future condition floodplain should be identified on a plan that confirms containment within the proposed corridor widths on the basis of existing/proposed grades, etc.

- Additional figures for the proposed floodplain will be provided in the final EMP.

11.10 Compensation by Quadrant

30. Northeast/Southeast Quadrants: Text notes that, *"Rear-yard flows from properties along eastern boundary should be directed to culverts crossing the abandoned CN rail corridor to maintain flows in channel 'B.'"* However, will not channel B be intercepted/eliminated by pond 3 (see Figure 9.4)? Please clarify.

- Channel B will be intercepted by Pond 3 (Figure 9.4 has been updated to reflect this), but will still provide some ecological headwater functions to Woodlot S23.

12.1 Shirley's Brook Main Branch Realignment

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31. p.96 – The text notes, *"Realignment of the watercourse will benefit multiple landowners, and could be completed by way of drainage area development charges, or through cost-sharing between landowners, the NCC, DND, and the City of Ottawa."*

Responsibility for implementing the realignment must be identified, as this is an integral component of the drainage system for the northeast/southeast quadrants. The City has made no commitment to cost-sharing and foresees no such commitment. If NCC/DND has provided any such commitment, please document this. As commented above, while the alternatives evaluation identified the relocation of Shirley's Brook as the highest cost option, this option's estimate includes March Valley roadside ditch improvements which should not be required if the outflow from the pond is conveyed directly to Shirley's Brook. Without this item, the relocation becomes lower or comparable in cost to option 2. This provides a rationale for this work being the responsibility of the proponents to implement.

- This work is the developer's responsibility. The developers may pursue cost sharing opportunities at the detailed design stage.
- March Valley roadside ditch improvements were added to this cost estimate, as some improvements will be required as a portion of the ditch will remain as an outlet for Pond 3 (See Section 9.9 and Figure 9.6 for reference.)

13.0 Project Listing

32. The text notes, *"Class EA documents will be advertised through a **Notice of Completion** and there will be an opportunity to appeal to the Ontario Municipal Board (OMB)."*

This statement should be corrected per the amendment to the integration provision – refer to the MEA website: http://www.municipalclassea.ca/Amendments/Approved.html. Per this amendment, regardless of the process followed, the public can appeal to the Minister, per the following excerpt:

"If a project has been appealed to the OMB, the requirements of the integrated approach have not been met until the OMB renders a decision allowing the project to proceed. As outlined in section 2.8.1 of this Class EA, a Part II Order (PIIO) request may also be made to the Minister of the Environment or delegate.

However, the purpose of the integration provisions is to coordinate requirements under the Planning Act with this Class EA. When reviewing a PIIO request, the Minister of the Environment or delegate will consider the purpose and intent of the integration provisions."

- The KNUEA reports will be revised to include the appropriate information.

Master Servicing Study – Storm Servicing

1. Major/minor system flows, velocities, depths and hydraulic gradelines have been simulated using the Autodesk Storm and Sanitary Analysis (SSA) model. On previous occasions, the City has brought to Novatech's attention the need for additional information requirements should this software be used:

    - *Please note that Autodesk SSA is not available to City staff and only the output files from the submission can be used for the review. Therefore, please provide the following additional information:*
        - *Description of the model (e.g., runoff calculation method, dynamic wave routing method, and other fundamental principles.); please also describe any specific user inputs such as downstream restricting conditions;*

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- *A print-out of the cross sections used to model the major system flows;*
- *Supporting documentation for the entrance and exit losses;*
- *A summary of the rainfall volume and maximum intensities for each storm event used;*
- *For future submissions, please note that prior to proceeding with any modeling approach, the choice of model should be confirmed with the City (see OSDG, Section 3.5.4).*

Autodesk SSA was used to model the pipe network for preliminary sizing of the trunk storm sewer network. The model was developed in conformance with the City of Ottawa standards for the above noted items. The Autodesk SSA model has been converted to PCSWMM and the results are essentially identical.

Future model submissions to the City will be provided in PCSWMM format to allow the City to open and review the model.

- In addition to the above, please provide documentation that summarizes peak flow, depth of flow, and storage being provided along the major system (all road sections) for the 100year event.

The major system flows were determined using an empirical approach as detailed in Section 5.4.3. The calculated flows are recorded on drawing 112117-STM2, and in a table (now indicated as Table B-2) in the MSS Appendix B along with the depths which were calculated using Manning's. As the method is empirical, no specific storage values are used which can be reported.

2. Further details should be provided that demonstrate the proposed rear yard grading at the east limit of the plan (immediately adjacent to the rail line) can adequately convey the major system flows directed to this area/does not impact minimum lot sizes, etc. Depending on the quantity of flow to be conveyed, a separate block or easement may be required to ensure the City has access to this should it be subject to filling by future homeowners, etc.

The intent, as indicated Section 5.4.1 of the MSS and Section 11.7.3 of the EMP, is to allow primarily vegetated areas, including rear yards, to surface drain to existing drainage channels where possible. The rear yard drainage along the abandoned CN Rail Corridor is intended to drain directly to the existing ditch along the rail corridor; therefore no additional rear yard swales would be required. Major overland flows to this area were evaluated during the functional design process and have been added to Appendix B in Tables B-3a to B-3d, with a supporting Figure 112117-Rail-XS. The major overland flows in this area will be contained within the existing ditches and conveyed across the rail corridor via the existing culverts, and any new culverts as determined during the detailed design process.

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Based on the response to the City's questions presented above, we are confident we have demonstrated the feasibility of the proposed stormwater system.

Yours truly,

Michael Petepiece, P.Eng.
Project Manager

cc.
Ted Cooper, P. Eng. Project Manager
Darlene Conway, P. Eng. Senior Project Manager
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Chris Rogers, P. Eng.
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Amy MacPherson

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MEMO / NOTE DE SERVICE

To / Destinataire	Wendy Tse	File/N° de fichier:
From / Expéditeur	Ted Cooper, P. Eng. Darlene Conway, P. Eng.	
Subject / Objet	Additional Comments: Kanata North Community Design Plan EMP and MSS Final Drafts (Novatech, April 4, 2016)	Date: May 10, 2016

Further to previous comments dated May 2, 2016, the following additional comments are provided related to apparent inconsistencies between the conceptual design of SWM Ponds 1, 2, and 2A (Figures 9.1, 9.2, and 9.3 of the April 2016 EMP) and grading details presented in the Preliminary Grading Plan and Plan and Profile Drawings provided in the April 2016 MSS. Please refer also to the attached figures derived from the April 2016 EMP/MSS.

1. Pond 1:

- The proposed grades at the perimeter of the pond are up to 5m higher than the grade identified in the SWM Block (e.g., 86.48m vs. 81.50m); subject to confirmation of the proposed grades, please note the City will not accept retaining walls within the pond block (or ROW);
- Given the comparatively steep road grade, please demonstrate how major system flows will be fully captured by SWM Pond 1 and not continue on to March Road;
- Maintenance access is required around the entire SWM pond – not just on lands abutting the Shirley's Brook tributary;
- Additional detail is required to demonstrate construction of SWM Pond 1 will not impact existing development at 1053 March Road.

2. Pond 2:

- The SWM Block must be expanded to include the land required for the major and minor system outlets/maintenance access to the pond; provide conceptual details/grading for major and minor system inlets/outlets to pond to confirm required block requirements.
- Per the Preliminary Grading Plan, please demonstrate how major system flows are to be conveyed to Pond 2 through the Residential Multi-unit and the Mixed use blocks and identify any land requirements for this purpose.

3. Pond 2A:

- Given the comparatively steep road grade, please demonstrate how major system flows will be fully captured and not continue on to March Road;
- The direction of major system flow at March Road and the Collector Road illustrated on Figure 9.3 is inconsistent with Plan and Profile drawing PP3. Please clarify and/or revise as required.

4. All Ponds: As requested in comments provided in September 2015, please provide X-sections that indicate side slopes and show adjacent constraints where appropriate (property/ROW limits, setback limits, edge of woods, etc.).

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Project Manager

Darlene Conway, P. Eng.
Senior Project Manager

cc.
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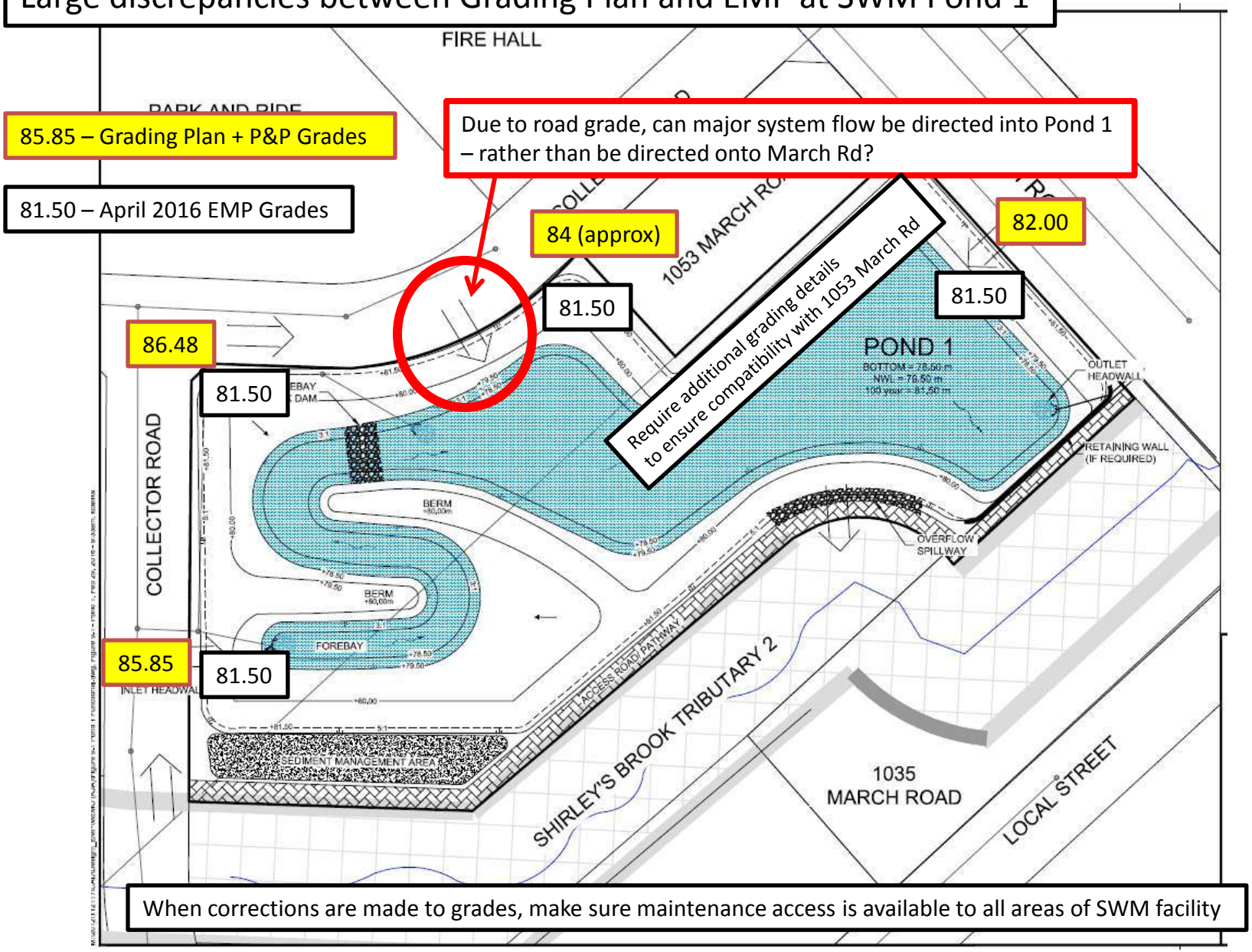
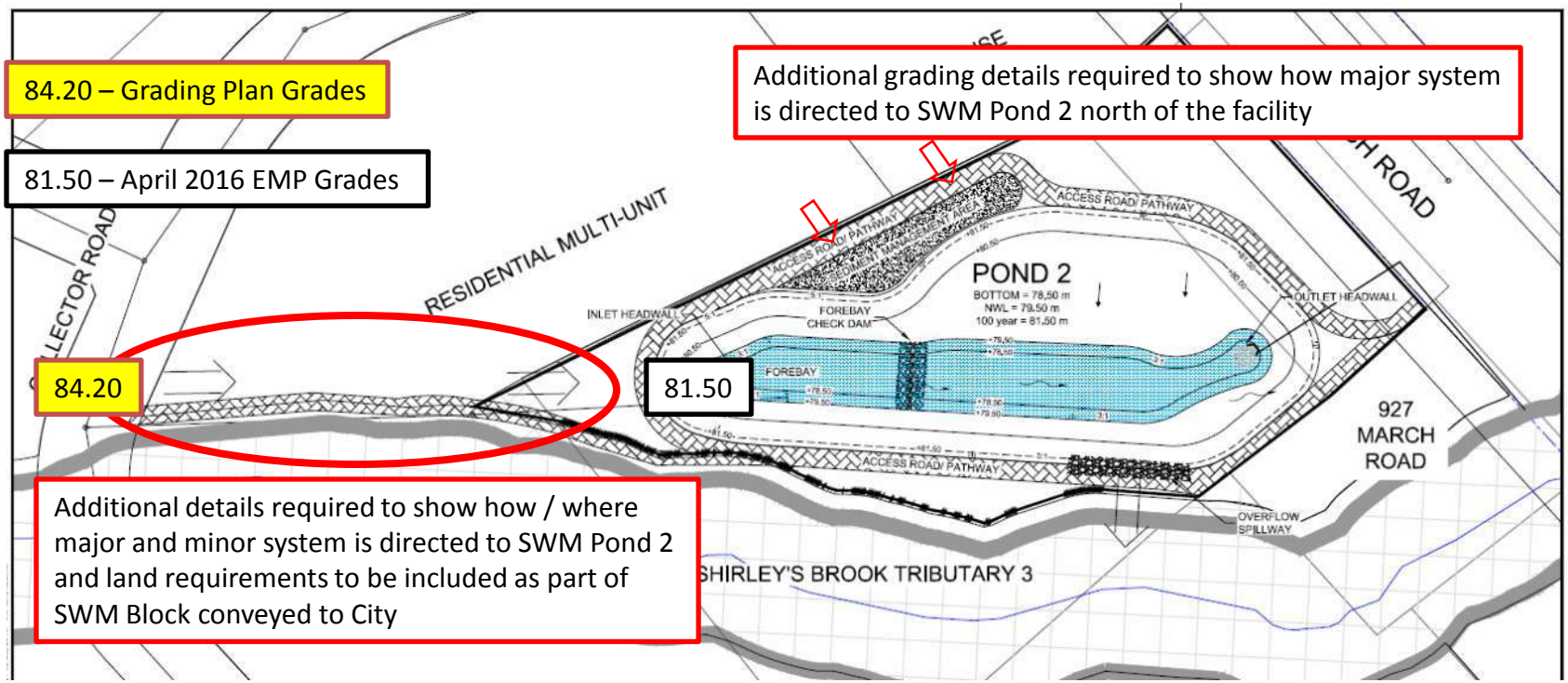
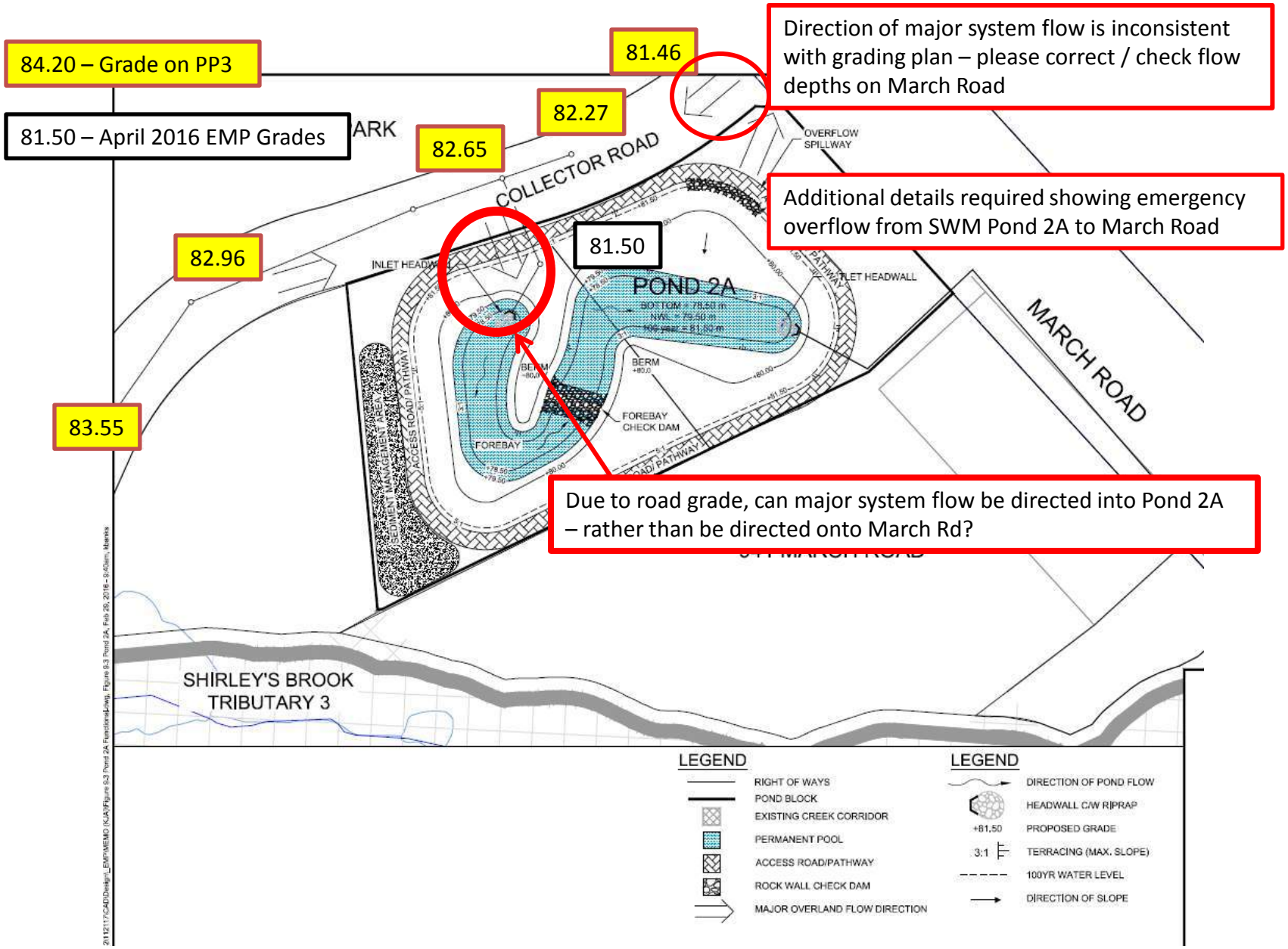
Michel Kearney, P. Eng.
Chris Rogers, P. Eng.
Tim Newton, P. Eng.
Amy MacPherson

Large discrepancies between Grading Plan and EMP at SWM Pond 1




84.20 – Grading Plan Grades
81.50 – April 2016 EMP Grades
Additional grading details required to show how major system is directed to SWM Pond 2 north of the facility
RESIDENTIAL MULTI-UNIT
POND 2
BOTTOM = 78.50 m
NWL = 79.50 m
100 year = 81.50 m
INLET HEADWALL
FOREBAY
CHECK DAM
OUTLET HEADWALL
ACCESS ROAD/ PATHWAY
84.20
81.50
927
MARCH
ROAD
OVERFLOW
SPILLWAY
Additional details required to show how / where major and minor system is directed to SWM Pond 2 and land requirements to be included as part of SWM Block conveyed to City
SHIRLEY'S BROOK TRIBUTARY 3


84.20 – Grade on PP3
81.50 – April 2016 EMP Grades
81.46
82.27
82.65
82.96
81.50
83.55
Direction of major system flow is inconsistent with grading plan – please correct / check flow depths on March Road
Additional details required showing emergency overflow from SWM Pond 2A to March Road
Due to road grade, can major system flow be directed into Pond 2A – rather than be directed onto March Rd?
COLLECTOR ROAD
MARCH ROAD
POND 2A
OVERFLOW SPILLWAY
INLET HEADWALL
BERM
FOREBAY
FOREBAY CHECK DAM
ACCESS ROAD/PATHWAY
SHIRLEY'S BROOK TRIBUTARY 3
LEGEND
RIGHT OF WAYS
POND BLOCK
EXISTING CREEK CORRIDOR
PERMANENT POOL
ACCESS ROAD/PATHWAY
ROCK WALL CHECK DAM
MAJOR OVERLAND FLOW DIRECTION
LEGEND
DIRECTION OF POND FLOW
HEADWALL C/W RIPRAP
+81.50
PROPOSED GRADE
3:1
TERRACING (MAX. SLOPE)
100YR WATER LEVEL
DIRECTION OF SLOPE