PRE-DEVELOPMENT RUNOFF & FLOW DRAINAGE NOTES:

CALCULATIONS WERE DONE USING RATIONAL METHOD Q = C * I * A

WHERE:

Q = RUNOFF IN ft^3/s
C = RUNOFF COEFFICIENT
I = RAINFALL INTENSITY IN in/hr
A = AREA IN ac.

A 5-YEAR STORM WAS USED TO CALCULATE THE PRE-DEVELOPMENT (ALLOWABLE) RUNOFF RATE USING THE CITY OF WINNIPEG 5-YEAR IDF CURVE AND A TIME OF CONCENTRATION OF 10 min. THE CITY OF WINNIPEG SUPPLIED A RUNOFF COEFFICIENT OF 0.5 WHICH WAS USED THROUGHOUT THE SITE.

PRE-DEVELOPMENT STORMWATER CALCULATIONS:

- I_{5yr} = 4.311 in/hr
- TOTAL AREA = 5050 m^2 (1.248 ac.)
- RUNOFF COEFFICIENT 'C' VALUE = 0.5 (FROM CITY OF WINNIPEG)
- $Q_{ALLOWABLE}$ = 0.5 * 4.311 * 1.248 = 2.690 ft^3/s (0.07617 m^3/s)

POST-DEVELOPMENT UNRESTRICTED STORMWATER CALCULATIONS:

THE TOTAL UNRESTRICTED AREA IS THE SUM OF THE AREA IN SUBCATCHMENT 1, 5, 8, 10. AND 12, AS SHOWN IN DETAIL 1 ON THIS SHEET.

A 25-YEAR STORM WAS USED TO CALCULATE THE POST-DEVELOPMENT RUNOFF RATE USING THE CITY OF WINNIPEG 25-YEAR IDF CURVE AND A TIME OF CONCENTRATION OF 10 MIN.

- I_{25yr} = 6.076 IN/HR
- IMPERVIOUS AREA = 490 m^2 (0.121 ac.)
- PERVIOUS AREA = 332 m^2 (0.082 ac.)
- TOTAL AREA = 822 m^2 (0.206 ac.)
- WEIGHTED RUNOFF COEFFICIENT 'C' VALUE = [(0.9 * 490 m^2) + (0.15 * 332 m^2)] / (822 m^2)
- WEIGHTED RUNOFF COEFFICIENT 'C' VALUE= 0.597
- $Q_{UNRESTRICTED}$ = 0.597 * 6.076 * 0.203 = 0.737 ft^3/s (0.02087 m^3/s)

SUBCATCHMENT 7 (NEW CB 3) STORMWATER MANAGEMENT CALCULATIONS:

- IMPERVIOUS AREA = 820 m^2 (0.203 ac.)
- PERVIOUS AREA = 91 m^2 (0.004 ac.)
- TOTAL AREA = 911 m^2 (0.207 ac.)
- PONDING DEPTH, h = 231.700 - 230.71 - 0.25/2 = 0.865 m
- ORIFICE DIAMETER, D = 0.0621 m (2.445 in)
- $Q_{SUBCATCHMENT\ 7}$ = D^2 * sqrt(h) / 0.479 = 0.00749 m^3/s (0.265 ft^3/s)

A 25-YEAR STORM WAS USED TO CALCULATE THE TOTAL REQUIRED STORAGE.

- REQUIRED STORAGE = 24.27 m^3 (857.16 ft^3)
- PROVIDED STORAGE = 25.97 m^3 (917.12 ft^3)

A FLOW CONTROL DEVICE (ORIFICE PIPE INSERT) WILL BE ADDED TO NEW CB 3 IN ORDER TO MITIGATE A NET INCREASE OF COMBINED FLOWS LEAVING THE OVERALL SITE. A 62Ø ORIFICE INSERT (AS PER DETAIL SHEET C003) IS REQUIRED, RESULTING IN A MAXIMUM OF 0.240 m OF PONDING DURING A 25 YEAR STORM.

SUBCATCHMENT 13 (ROOF STORAGE) STORMWATER MANAGEMENT CALCULATIONS:

- I_{5yr} = 4.311 IN/HR
- IMPERVIOUS AREA = 1060 m^2 (0.262 ac.)
- PERVIOUS AREA = 0 m^2 (0 ac.)
- $Q_{SUB\text{-}CATCHMENT\ 4}$ = 0.201 ft^3/s (0.00569 m^3/s) FROM MECHANICAL

A 25-YEAR STORM WAS USED TO CALCULATE THE TOTAL REQUIRED STORAGE.

- REQUIRED STORAGE = 35.09 m^3 (33.1 mm AVERAGE)

REMAINING RESTRICTED AREAS STORMWATER MANAGEMENT CALCULATIONS:

THE REMAINING RESTRICTED AREA IS THE SUM OF THE AREA IN SUBCATCHMENT 2, 3, 4, 6, 9, 11, 14, AND 15 AS SHOWN IN DETAIL 1 ON THIS SHEET.

- IMPERVIOUS AREA = 1990m^2 (0.492 ac.)
- PERVIOUS AREA = 267 m^2 (0.066 ac.)
- $Q_{RESTRICTED}$ = $Q_{ALLOWABLE}$ - $Q_{UNRESTRICTED}$ - $Q_{SUBCATCHMENT\ 7}$ - $Q_{SUBCATCHMENT\ 13}$
  = 0.07617 m^3/s - 0.02087 m^3/s - 0.00749 m^3/s - 0.00569 m^3/s
  = 0.04211 m^3/s (1.487 ft^3/s)
- REQUIRED STORAGE = 31.77 m^3 (1121.76 ft^3)

STORMWATER STORAGE TANK DETAILS:

- TANK DEPTH, h = 1.5 m
- ORIFICE DIAMETER, D = 0.1274 m (5.016 in)
- Q_{TANK} = D^2 * sqrt(h) / 0.479 = 0.04150 m^3/s (1.466 ft^3/s)
- REQUIRED STORAGE = 32.30 m^3 (1140.76 ft^3)

TANK TO OVERFLOW FREELY AFTER REQUIRED STORAGE CAPACITY.

PRE-DEVELOPMENT WASTEWATER CALCULATIONS:

PRE-DEVELOPMENT NON-RESIDENTIAL WASTEWATER FLOW:
- FIRE STATION 15:
  - FLOW RATE FOR BED AT NON-HOSPITAL INSTITUTION = 285 L/cap/day
  - NUMBER OF BEDS = 6
  - FLOW RATE FOR EMPLOYEE AT NON-HOSPITAL INSTITUTION = 28 L/cap/day
  - NUMBER OF EMPLOYEES = 12
- LIBRARY:
  - FLOW RATE FOR EMPLOYEE AT OFFICE = 38 L/cap/day
  - NUMBER OF EMPLOYEES = 3
  - FLOW RATE FOR PUBLIC LAVATORY USER = 12 L/cap/day
  - NUMBER OF USERS = 32
- ADWF = [(285 * 6) + (28 * 12) + (38 * 3) + (12 * 32)] = 2544 L/day
- HARMON'S PEAKING FACTOR = 1+(14/(4+((53 PERSONS/1000)^0.5)) = 4.310
- PDWF = (2544 L/day) * (4.310) / (86,400 s/day) = 0.12689 L/s

PRE-DEVELOPMENT EXTRANEOUS WASTEWATER FLOW:
- CATCHMENT AREA = 0.5242 ha
- GROUNDWATER INFIL. = (2200 L/ha/day * 0.5242 ha) / (86,400 s/day) = 0.01335 L/s
- NUMBER OF WWS MANHOLES = 0
- TOTAL EXTRANEOUS FLOW = 0.01335 L/s

PRE-DEVELOPMENT TOTAL WASTEWATER FLOW:
- $PWWF_{PRE}$ = (0.12689 L/s + (0.01335 L/s) = 0.14024 L/s (0.00495 ft^3/s)

POST-DEVELOPMENT WASTEWATER CALCULATIONS:

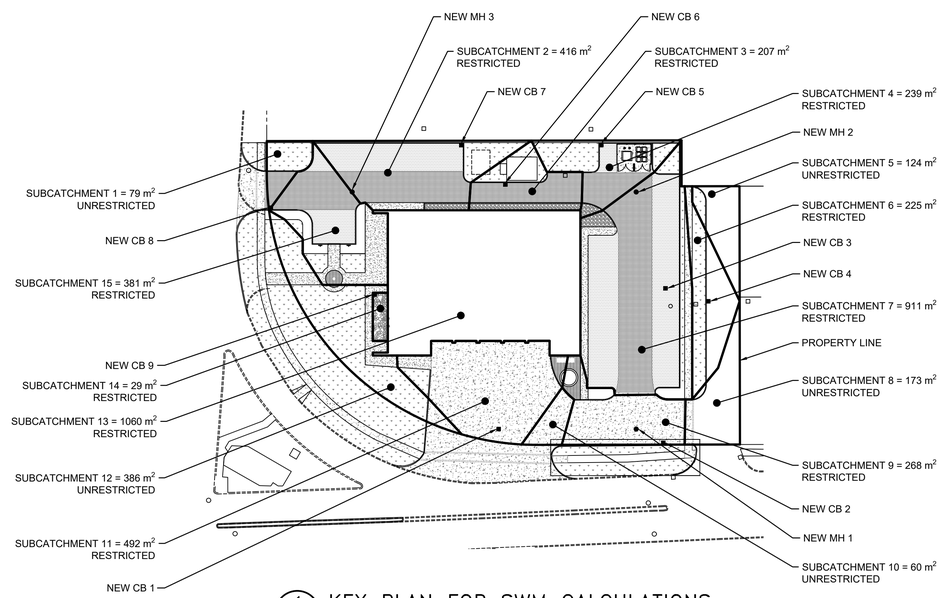
POST-DEVELOPMENT NON-RESIDENTIAL WASTEWATER FLOW:
- FIRE STATION 9
  - FLOW RATE FOR BED AT NON-HOSPITAL INSTITUTION = 285 L/cap/day
  - NUMBER OF BEDS = 10
  - FLOW RATE FOR EMPLOYEE AT NON-HOSPITAL INSTITUTION = 28 L/cap/day
  - NUMBER OF EMPLOYEES = 30
- ADWF = [(285 * 10) + (28 * 30)] = 3690 L/day
- HARMON'S PEAKING FACTOR = 1+(14/(4+((40 PERSONS/1000)^0.5)) = 4.333
- PDWF = (3690 L/day) * (4.333) / (86,400 s/day) = 0.18507 L/s

POST-DEVELOPMENT EXTRANEOUS WASTEWATER FLOW:
- CATCHMENT AREA = 0.5242 ha
- GROUNDWATER INFIL. = (2200 L/ha/day * 0.5242 ha) / (86,400 s/day) = 0.01335 L/s
- NUMBER OF WWS MANHOLES = 0
- TOTAL EXTRANEOUS FLOW = 0.01335 L/s

POST-DEVELOPMENT TOTAL WASTEWATER FLOW:
$PWWF_{POST}$ = (0.18507 LPS) + (0.01335 L/s) = 0.19857 L/s (0.00701 ft^3/s)

TABLE: SUMMARY OF ESTIMATED PWWF AND STORM FLOWS WITHIN PROJECT AREA

DESCRIPTION	PRE-DEVELOPMENT (5 yr)	POST-DEVELOPMENT (25 yr)
WASTEWATER (PWWF)	0.00014 m^3/s	0.00020 m^3/s
STORM FLOW (PEAK)	0.07617 m^3/s	0.07555 m^3/s (0.05468 m^3/s RESTRICTED + 0.02087 m^3/s UNRESTRICTED)



1 C004 KEY PLAN FOR SWM CALCULATIONS
SCALE: NTS

Cibinel Architecture Ltd
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ARCHITECT

KGS GROUP

ENGINEERS GEOSCIENTISTS MANITOBA
Certificate of Authorization
KGS Group
No. 245

NO.	DATE	REVISION / ISSUANCE
01	2023.02.03	RE-ISSUED FOR CONSTRUCTION
00	2023.01.27	ISSUED FOR CONSTRUCTION

Seal

PROVINCE OF MANITOBA
J.M. MINKEVICH
Member
22769
2023.02.03
REGISTERED PROFESSIONAL ENGINEER

Project
WFPS STATION 9
1083 AUTUMNWOOD DRIVE

Sheet Title
CIVIL
STORMWATER MANAGEMENT

Project No. 2150
Sheet C004

METRIC
WHOLE NUMBERS INDICATE MILLIMETRES
DECIMALIZED NUMBERS INDICATE METRES

PROPERTY LIMITS DELINEATION
DELINEATION OF PROPERTY LIMITS AS SHOWN ON THIS DWG DOES NOT REPRESENT A "LEGAL SURVEY". KGS GROUP MAKES NO REPRESENTATION OR WARRANTY AS TO THE ACCURACY OF PROPERTY LIMITS DELINEATED ON THIS DWG, NOR ON THE DIMENSIONAL ACCURACY OF DWG FEATURES RELATIVE TO THOSE PROPERTY LIMITS.

WARNING
1. NOTIFY THE GAS COMPANY OF THE PROPOSED LOCATION OF EXCAVATION.
2. TAKE PRECAUTION TO AVOID DAMAGE TO GAS COMPANY INSTALLATIONS.
3. SEE PROVINCIAL REGULATION 140/92 FOR DETAILS.

NOTE:
LOCATION OF UNDERGROUND STRUCTURES AS SHOWN ARE BASED ON THE BEST INFORMATION AVAILABLE BUT NO GUARANTEE IS GIVEN THAT ALL EXISTING UTILITIES ARE SHOWN OR THAT THE GIVEN LOCATIONS ARE EXACT. CONFIRMATION OF EXISTENCE AND EXACT LOCATION OF ALL SERVICES MUST BE OBTAINED FROM THE INDIVIDUAL UTILITIES BEFORE PROCEEDING WITH CONSTRUCTION.