

Preliminary Stormwater Management Study

Lee's Summit Processing Facility
Prepared for KC Dumpster Company
1280 SE Century Drive
Lee's Summit, MO 64081

Lee's Summit Project No.
HG Consult Project No. 21.033

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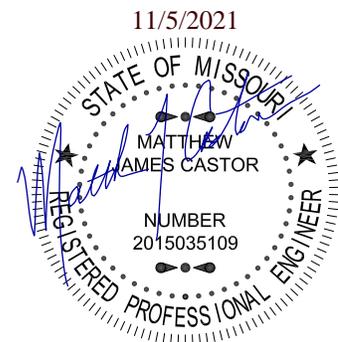


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I. General Information

A. Description of Existing Site, Location, Size, and Proposed Use

The Lee's Summit Processing Facility will consist of the development of a parcel, zoned PI, located at 2101 SE Hamblen Road. The proposed development consists of 38.2 acres. The project is located east of SE Hamblen Road approximately 1.4 miles south of Hwy 50 and 0.9 miles east of Hwy 291. The proposed project, Lee's Summit Processing Facility, will expand on the existing facility as a place for the public to bring construction and demolition materials for sorting and redistribution.

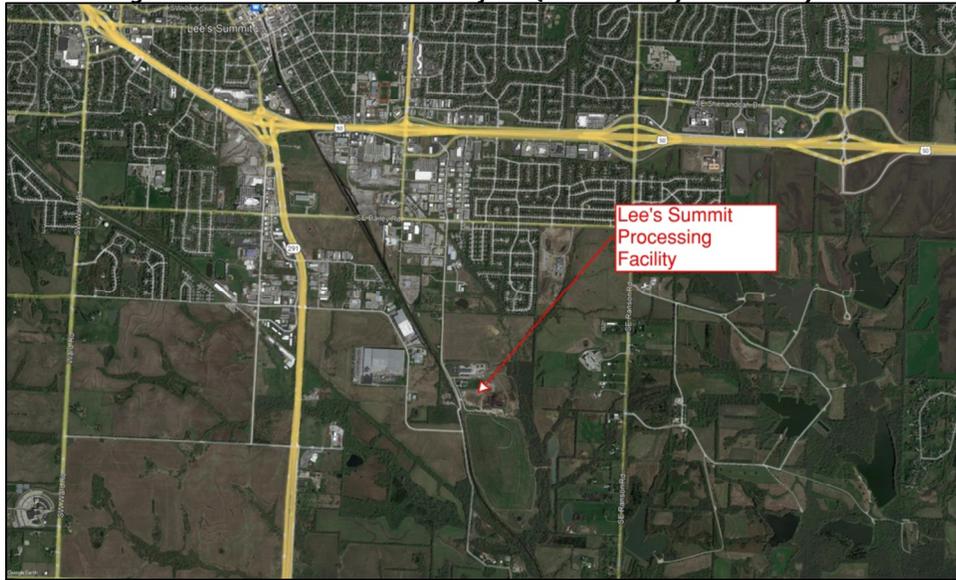
The operation as proposed, will include: a Scale House (1,152 sq. ft) to greet and weigh the customer's vehicle and load, as well as direct them to the on-site locations for item delivery to the new Processing Facility (20,000 sq. ft) where the customer can dump materials and where employees will sort materials. The Processing Facility employees will also be picking and dropping roll-off dumpsters from the existing PDA (Public Disposal Area) and the proposed Recycling Area. When enough materials have been collected for pickup, a truck and trailer will drive through the North side of the Processing Facility for loading and exit the site for delivery. More details can be found in the Lee's Summit Processing Facility Operations Plan.

The site will include a large parking lot area to the West of the facility, partially covered under a Truck Port Canopy. This area will be used for regular employee activity and will be partially screened from the public. The site will include a parking lot for Hazardous Household Waste (HHW) drop-off available by appointment only. The site will include perimeter fences with gates at entry/exit, landscaping, detention ponds, and other paved roads to allow the public to enter/exit the property safely.

Figure I.A.1 – 2021 Aerial Photo of 2101 SE Hamblen Road



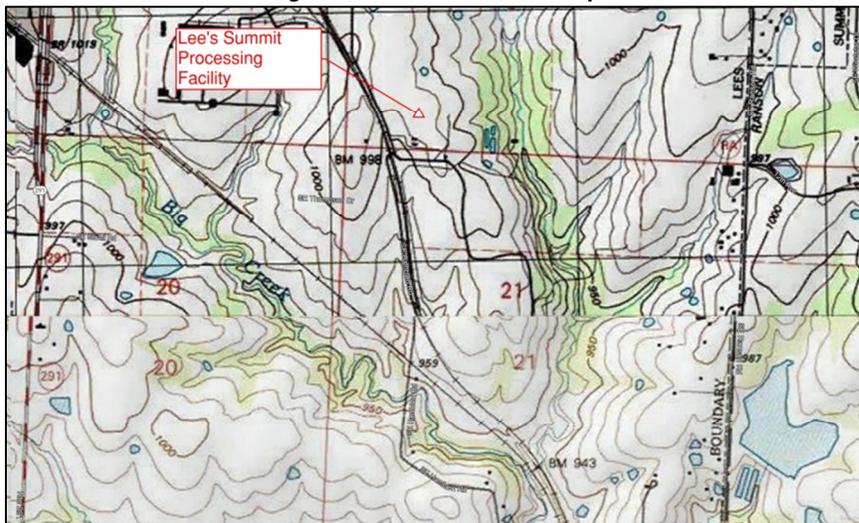
Figure I.A.2 – 2021 Aerial Photo of SE Quadrant Hwy50 and Hwy291



B. General Overview of Drainage Patterns

Generally the site drains E/NE with the exception of a small area in SW corner that drains west toward SE Hamblen Road. Runoff that flows E/NE drains into a tributary about ¼ mile east then flows south approximately 1 mile into Big Creek. Runoff that flows west drains south along SE Hamblen Road for about ¾ mile into Big Creek. See Figure I.B.1 for overview of drainage patterns.

Figure I.B.1 – USGS Quad Map



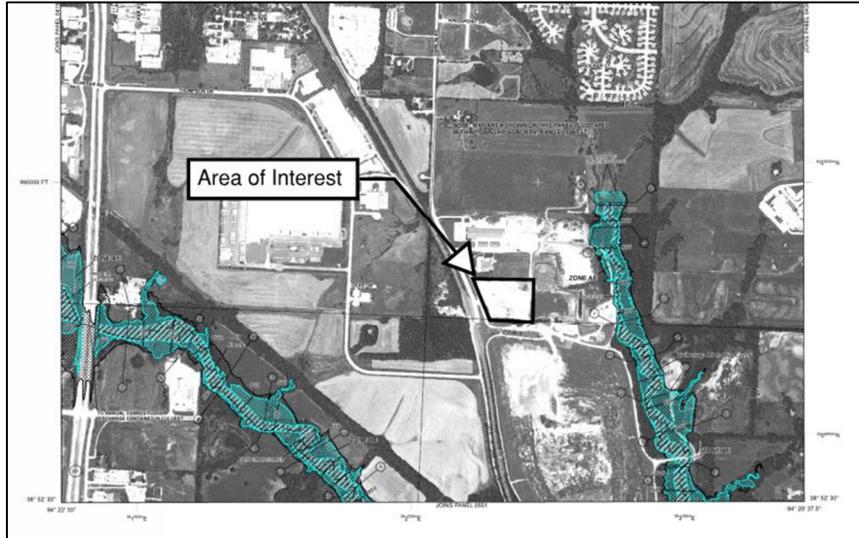
C. FEMA Classification

The Site is located within a Zone X meaning there is minimal risk of flooding and flood insurance is not required. See Figure I.D.1 for Firm Panel.

D. Floodplain Issues (if any)

There are no floodplain boundaries being altered and therefore a Flood Study is not required. See Figure I.D.1 for Firm Panel.

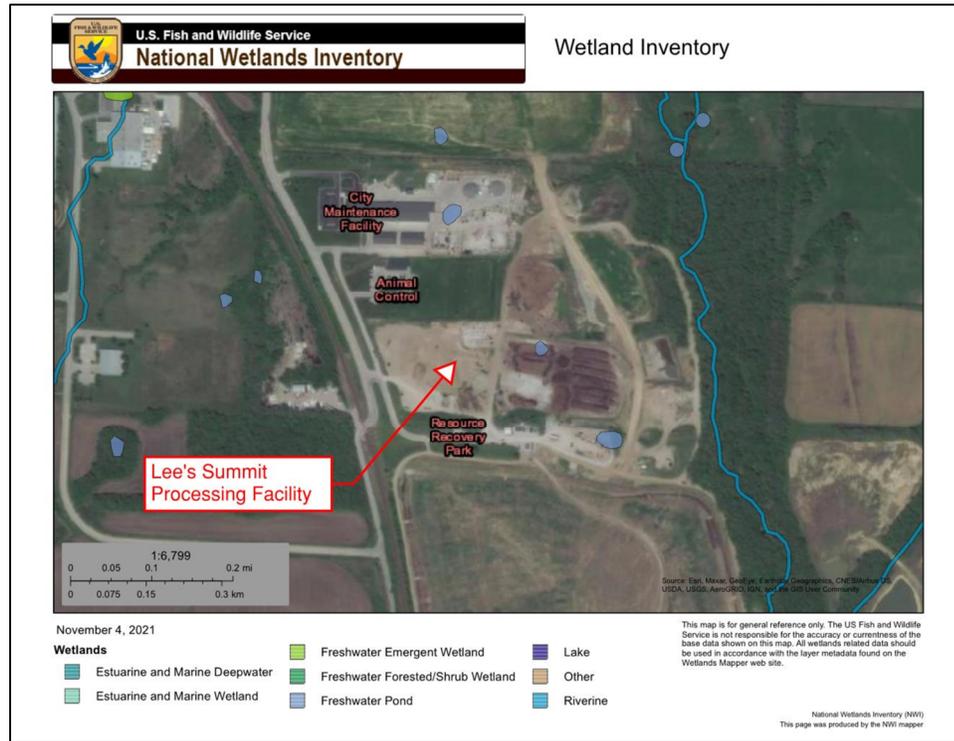
Figure I.C.1 – FEMA FIRM Panel #29095C0438G Eff. 1/20/2017



E. Wetland and USACE (if any)

There are no wetlands or Waters of the US being disturbed by this project therefore no permits are required by the Corps of Engineers for the development of this site. See figure I.E.1 for US Fish and Wildlife Wetland Inventory Map.

Figure I.E.1 – US Fish and Wildlife National Wetland Inventory



F. Soil Classification

NRCS Web Soil Survey categorizes the soils for the Lee's Summit Processing Site below. See appendix for additional information.

Table I.F.1 – Soil Classification

Symbol	Name	Slopes	HSG
10082	Arisburg-Urban land complex	1-5%	C
10116	Sampsel silty clay loam	2-5%	C/D
10117	Sampsel silty clay loam	5-9%	C/D

For this analysis, Soil group C was considered for the Lee's Summit Processing Site. Curve Numbers were used in accordance with the APWA 5600.

II. Methodology

A. Unit Hydrograph Modeling Methods

The method for evaluating Lee's Summit Processing Facility was the use of a PondPack V8i. Both Pre-Development and Post-Development conditions were considered. The unit hydrograph method used was SCS TR-55.

B. Computation Methods for Runoff Determinations

The computation methods used for runoff determinations are as follows:

- AMC II Soil Moisture conditions
- 24-Hour SCS Type II Rainfall Distribution
- SCS Runoff Curve Numbers per APWA 5600 (Table 5602-3)
- Time of Concentration developed per TR-55

C. Design Storm Events Used and Source of Rainfall Data

The design storms that were considered include the 2, 10, 100, and subsequent 100-Year storms. The rainfall data was gathered from NRCS utilizing curves for a Type II-24 hour rainfall.

Table I.2 – Methodology and Rainfall Data

Methods and Rainfall Data	
Pond Routing	Pondpack using SCS Method
Existing CN	76, Group C & D soils
T _c	5 minute
Water Quality, type II, 24-hr	1.4 inch
2-yr rainfall, type II, 24-hr	3.5 inch
10-yr rainfall, type II, 24-hr	5.3 inch
100-yr rainfall, type II, 24-hr	7.7 inch

III. Existing Conditions Analysis

A. Summary of Comprehensive Control Requirements

As mentioned previously the soils on-site consist of Arisburg-Urban land complex and Sampsel silty clay loam with a hydrologic group of C and D, respectively. The site is well disturbed with regular truck traffic with stockpiling and sorting of waste material. Cover is low with grass and no significant trees. The APWA default strategy was used to provide comprehensive protection. This strategy reads as follow:

“Under this strategy, peak runoff control is provided for the 1%, 10% and 50% chance storms and volumetric and/or extended detention control of the 90% mean annual event storm for broad protection of the receiving system, including channel erosion protection and flood peak reductions over a range of return periods. This strategy shall be the default strategy unless otherwise designated or approved by the local authority. Performance standards and sizing criteria are provided in Section 5608.”

B. Existing Drainage Area Maps

See appendix (Pre-Development Drainage Area Map) for all on-site and off-site areas and outfall location Points of Interest (POI) for each drainage area. On-site and off-site areas are figured based on the proposed property lines. See Figure III.B.1 for summary of On-Site/Off-Site Areas.

Table III.B.1 – Pre-Developed Drainage Areas

Drainage Area	Total Area (acres)	On-Site Area	Off-Site Area
DA-1	5.01	4.88	0.13
DA-2	0.42	0.19	0.23
DA-3	1.81	1.63	0.18
DA-4	6.78	6.78	0.00
DA-5	7.40	7.40	0.00

C. Description of Each Drainage Area

DA-1: A small area with slopes ranging from 1-5% located in the NW quadrant consisting of the space (mostly drainage ditch) between SE Hamblen Road and the Loop Road. The small area drains south to the access drive off SE Hamblen where it is captured in an 18" RCP which is routed to the south of the SE Hamblen Road "S" curve east of the railroad track. The water then flows south in drainage ditch for approximately ¾ of a mile to Big Creek.

DA-2: Slopes ranging from 1-5% with the POI (24" CMP) located in the NE quadrant of the "existing" property. The 24" CMP drains a shallow sump area and discharges to the north in a swale along the Animal Control east property line. The water continues to the north to a small pond (area of standing water) behind the Fleet Operations Center. After leaving the small pond the water flows east to a tributary of Big Creek.

DA-3: Slopes ranging from 1-5% with the POI (15" RCP) located in the SW quadrant of the site. This drainage consists of the area located between the loop drive and the access drive through the site. The 15" RCP drains a shallow sump area and discharges to the SW at the same location as the 18" RCP from DA-1. The water then flows south in drainage ditch for approximately ¾ of a mile to Big Creek.

DA-4: A relatively large area with slopes ranging from 5-9% with the POI being a small pipe located in the NE quadrant of the "proposed" property. The water is collected in a small sump area and discharges east into a drain swale approximately 370 feet long routed into a tributary of Big Creek.

DA-5: A relatively large area with slopes ranging from 5-9% with the POI being a pond (w/assumed pipe) located in the SE quadrant of the "proposed" property. The water is collected in a small pond and discharges east approximately 140 feet into a tributary of Big Creek.

D. Table Summarizing Input Data

Table III.D.1 – Pre-Developed Input Area Data

Sub-Area Name	Area	CN	TOC (min)
DA-1	5.01	76	5
DA-2	0.42	88	5
DA-3	1.81	80	5
DA-4	6.78	76	5
DA-5	7.40	76	5



E. Table Summarizing Peak Runoff Rates

Table III.E.1 – Pre-Developed Peak Runoff Rate

Sub-Area Name	Q (cfs)
DA-1	3.50
DA-2	38.23
DA-3	16.88
DA-4	51.72
DA-5	56.47

F. Table Summarizing “Allowable Release Rate”

Table III.F.1 – Pre-Developed Allowable Peak Runoff Rate

Sub-Area Name	2-Year (cfs)	10-Year (cfs)	100-Year
DA-1*	1.09	2.10	3.50
DA-2	10.61(2.50*)	21.95(10.02*)	38.23(15.03*)
DA-3	6.41(0.91*)	10.92(3.63*)	16.88(5.44*)
DA-4*	14.36	29.70	51.72
DA-5*	15.68	32.43	56.47

* Comprehensive values utilizing 0.5 cfs (2-YR), 2 cfs (10-YR), and 3 cfs (100-YR) per site acre

The developed portion of the site consists almost entirely of DA-1, DA-2, and DA-3. DA-1 (small area near loop road) was not routed into a detention pond because of location and grading constraints. This is a very small area that discharges through an 18" pipe, with adequate capacity, and then flows in an open channel ¾ of a mile to Big Creek. Allowable runoff for DA-2 and DA-3 was based on the APWA comprehensive control allowable flow rates (0.5, 2, and 3 cfs per site acre). Because development did not occur on DA-4 or DA-5 we maintained pre-developed rates at their respective outlets.

IV. Proposed Conditions Analysis

A. Proposed Drainage Area Map

See appendix (Post-Development Drainage Area Map) for all on-site and off-site areas and outfall location Points of Interest (POI) for each drainage area. On-site and off-site areas are figured based on the proposed property lines. See table Table IV.A.1 for more detailed information.

Table IV.A.1 – Post-Developed Drainage Areas

Drainage Area	Total Area (acres)	On-Site Area	Off-Site Area
DA-1	0.76	0.54	0.22
DA-2A	3.07	3.01	0.07
DA-2B	2.02	2.02	0.00
DA-3A	1.67	1.67	0.00
DA-3B	0.54	0.36	0.18
DA-4	6.72	6.72	0.00
DA-5	6.44	6.44	0.00



B. Narrative Description of All Proposed Drainage Areas

DA-1: The area of DA-1 increased due to grading and elevation constraints. The CN value also increased from 80 to 89 due to existing impervious surface. The pre-developed area was 0.42 acres drainage toward SE Hamblen and increased to 0.76 acres. This area is undetained and drains to an existing 18" pipe with additional capacity. The peak flow increased from 3.50 cfs to 7.16 cfs for this area. The pipe has a capacity of 15.5 cfs. Beyond the pipe the water is carried overland for ¾ of a mile to Big Creek.

DA-2: This area increased slightly from 5.01 acres to 5.09 acres. The proposed development has two interconnected wet ponds with the control structure being located in North Pond 1. The connection between North Pond 1 and North Pond 2 is an equalization pipe. The CN value increased from 76 to 86 for this area. The ponds were designed to limit the developed flows to the comprehensive value of 0.5, 2, and 3 cfs per acre of drainage (2, 10, & 100-Year values respectively). The ponds also meet the freeboard requirements for APWA.

DA-3: This area increased from 1.81 acres with a CN of 88 to 2.21 acres with a CN of 82. This developed area is divided into two sub-areas. Sub-area DA-3A drains into South pond which comprehensive outlet control. Due to grading and elevation constraints DA-3B is not connected to the wet pond. Both the wet pond and DA-3B discharge into an existing 15" RCP under SE Hamblen Road. Because of the small area undetained DA-3 could not achieve the 0.5, 2, and 3 cfs per acre of drainage but was able to greatly reduce from pre-developed flows.

DA-4: This area remained relatively unchanged with the area decreasing from 6.78 acres to 6.72 acres. Because no-developed is proposed in this area stormwater control was not implemented. The peak flow for DA-4 POI decreased from 51.72 cfs to 51.26 cfs.

DA-5: This area decreased from 7.40 acres to 6.44 acres. Similar to DA-4 because no-developed is proposed in this area stormwater control was not implemented. The flow for this area decreased from 56.47 cfs to 49.18 cfs.

C. Table Summarizing Input Data

Table IV.C.1 – Post-Developed Input Area Data

Sub-Area Name	Area	CN	TOC (min)
DA-1	0.76	89	5
DA-2A	3.07	86	5
DA-2B	2.02	86	5
DA-3A	1.67	85	5
DA-3B	0.54	74	5
DA-4	6.72	76	5
DA-5	6.44	76	5

D. Table Summarizing Peak Runoff Rates

Table IV.D.1 – Post-Developed Peak Runoff Rate

Sub-Area Name	Q (cfs)
DA-1 POI	7.16
DA-2 POI	12.98
DA-2A	12.98*
DA-2B	10.44
DA-3 POI	7.86
DA-3A	4.99
DA-3B	3.95
DA-4 POI	51.26
DA-5 POI	49.18

*Interconnected Ponds

E. Table Summarizing Allowable and Proposed Release Rates

Table IV.3 – Pre-Developed Allowable Peak Runoff Rate

Sub-Area Name	2-Year (cfs)	10-Year (cfs)	100-Year
DA-1 Allowable	1.09	2.10	3.50
DA-1 Proposed	2.78	4.67	7.16
DA-1 Difference	-1.69	-2.57	-3.66
DA-2 Allowable	2.50	10.02	15.03
DA-2 Proposed	2.44	7.42	12.98
DA-2 Difference	0.06	2.60	2.05
DA-3 Allowable	0.91	3.63	5.44
DA-3 Proposed	1.61	4.54	7.86
DA-3 Difference	-0.70	-0.91	-2.42
DA-4 Allowable	14.36	29.70	51.72
DA-4 Proposed	14.23	29.44	51.26
DA-4 Difference	0.13	0.26	0.46
DA-5 Allowable	15.68	32.43	56.47
DA-5 Proposed	13.65	28.24	49.18
DA-5 Difference	2.03	4.19	7.22

F. Table Summarizing Detention/Retention Input Data and Results

Table IV.F.1 – North Pond Input Data

	ELEV
18" Culvert (Upstream Invert)	995.75
4" Orifice (WQ)	995.85
4"x36" Orifice (2-Year)	996.05
0.94'x6' Orifice (10-Year and 100-Year)	996.56
6'x5' Riser (100-Year*)	998.00
Top of Pond	1000.00

*Subsequent 1% storm event

Table IV.F.2 – North Pond Results

	2-Year	10-Year	100-Year	100-Year*
Allowable Discharge (cfs)	2.50	10.02	15.03	
Pond Discharge (cfs)	2.44	7.42	12.98	22.61
Difference	0.06	2.60	2.05	
North Pond 1 WSE	996.56	996.97	997.47	998.65
Top of North Pond 1	1000.00	1000.00	1000.00	1000.00
Freeboard (North Pond 1)	3.44	3.03	2.53	1.35
North Pond 2 WSE	996.86	997.33	997.87	999.10
Top of North Pond 2	1000.00	1000.00	1000.00	1000.00
Freeboard (North Pond 2)	3.14	2.67	2.13	0.90

*Assumes zero flow through primary outlet with subsequent 1% storm event

Table IV.F.3 – South Pond Input Data

	ELEV
18" Culvert (Upstream Invert)	999.80
1"x9" Orifice (WQ)	999.90
4"x12" Orifice (2-Year)	1000.20
5"x48" Orifice (10-Year and 100-Year)	1000.50
4'x3' Riser (100-Year*)	1001.84
Top of Pond	1003.20

*Subsequent 1% storm event

Table IV.F.4 – South Pond Results

	2-Year	10-Year	100-Year	100-Year*
Allowable Discharge (cfs)	0.91	3.63	5.44	
Pond Discharge (cfs)	0.83	3.00	4.99	5.45
DA-3B Discharge	1.03	2.22	3.95	
DA-3 POI	1.61	4.54	7.86	
Difference	-0.70	-0.91	-2.42	
North Pond 1 WSE	1000.50	1000.87	1001.34	1002.10
Top of North Pond 1	1003.20	1003.20	1003.20	1003.20
Freeboard (North Pond 1)	3.44	3.03	2.53	1.10

*Assumes zero flow through primary outlet with subsequent 1% storm event

G. Maximum Water Surface Elevation

See Tables IV.F.2 and IV.F.4 for the maximum water surface elevations within the basins.

H. Undetained Drainage Area

There are four areas within this development which are undetained. Explanations of each are below:

DA-1 is a fringe area with difficult site constraints. Because of grading and elevation this area increased in size from 0.42 acres to 0.76 acres which caused the peak discharge to increase from 3.50 to 7.16 cfs. The receiving culvert was checked for capacity. No other flows drain into this culvert which has a capacity of 15.5 cfs. Beyond the culvert the water is carried overland for $\frac{3}{4}$ of a mile to Big Creek. We would like to request a waiver from DCM for this fringe area.

DA-3 contains a fringe area (DA-3B) which is located south of South Pond. Due to grading and elevation constraints this area was unable to be routed into the pond. Because of this area overdetecting in South Pond is difficult with site constraints and not being able to make the pond larger. The peak discharge was significantly reduced from a pre-developed discharge of 16.88 cfs to a post-developed discharge of 7.86 cfs. However, the comprehensive control of 3 cfs per acre requires a discharge of less than 5.43 cfs. We would like to request a waiver from DCM for this fringe area.

DA-4 and DA-5 are located on the east portion of the property and are not within the developed area. CN values remained unchanged and both areas were reduced in size. Please advise if a waiver needs requested.

I. Water Quality Requirement

The proposed development is providing stormwater treatment per OPMC 16.210.030. As indicated in this study the proposed stormwater treatment is extended dry detention with a 1.37" storm release over a 40 hour period.

J. Water Quality Summary

Figure IV.J.1 – North Pond WQ Results

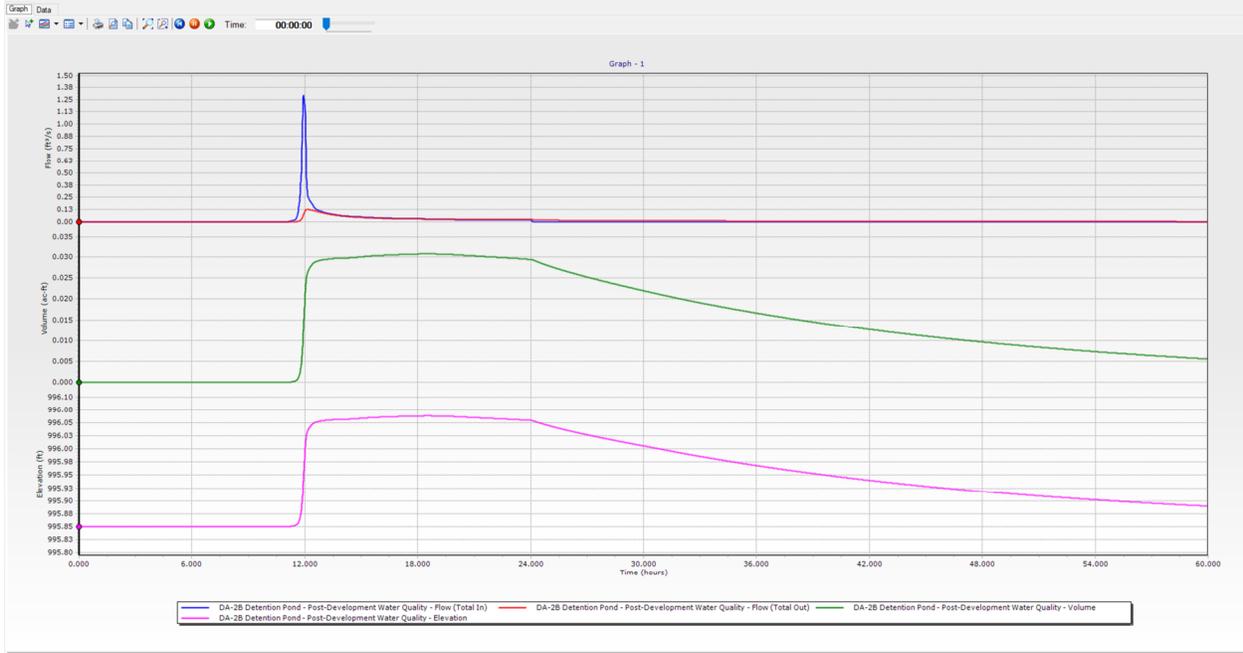
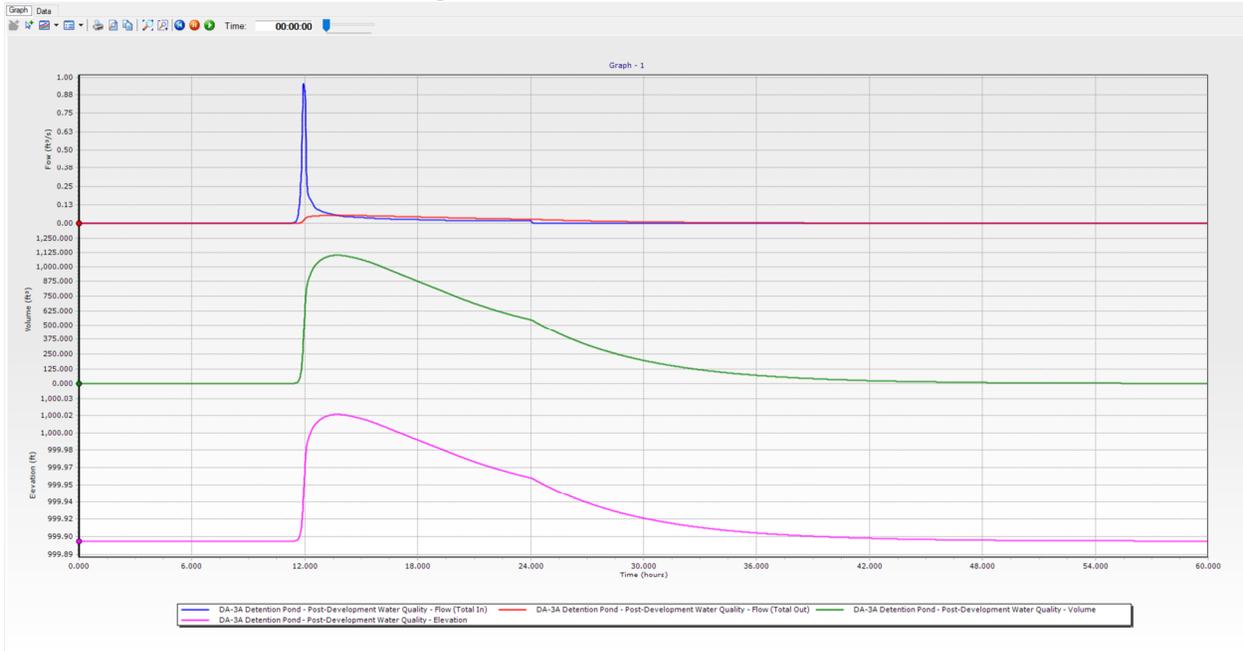


Figure IV.J.2 – South Pond WQ Results



K. Sedimentation Storage

The minimum normal depth of water before the introduction of excess stormwater shall be four feet plus a sedimentation allowance of not less than 5 years accumulation. Sedimentation shall be determined in accordance with the procedures shown in Figure 5608-1.

North Pond 1 shall provide 175 C.F. / Acre / Year. With a drainage area of 3.07 acres North Pond 1 shall provide approximately 2,686 of sediment storage for 5 years. The surface area of the pond in the North Pond 1 is 20,255 S.F. Therefore the depth of sediment will be 0.13 feet deep. In the shallowest section of the pond, the depth after sedimentation will be 4.87 feet deep.

North Pond 2 shall provide 175 C.F. / Acre / Year. With a drainage area of 2.02 acres North Pond 2 shall provide approximately 1,768 CF of sediment storage for 5 years. The surface area of the pond in the North Pond 2 is 6,055 S.F. Therefore the depth of sediment will be 0.29 feet deep. In the shallowest section of the pond, the depth after sedimentation will be 4.71 feet deep.

South Pond shall provide 175 C.F. / Acre / Year. With a drainage area of 1.67 acres South Pond shall provide approximately 1,488 CF of sediment storage for 5 years. The surface area of the pond in the South Pond is 9,313 S.F. Therefore the depth of sediment will be 0.16 feet deep. In the shallowest section of the pond, the depth after sedimentation will be 4.84 feet deep.

V. Future Conditions Analysis (not applicable)

VI. Conclusions and Recommendation

A. Overview of the Report

As indicated in the report the project has 5 POI's, 2 of which are located outside the developed area. Within the developed area there are three wet ponds being proposed to provide comprehensive control on-site. These ponds will treat WQ, 2, 10, 100, and subsequent 100-Year events. There are two fringe areas which pose difficulty in providing comprehensive control. We would like to request a waiver for these two fringe areas. The main area of development located into 2 sub-areas DA-1 is located within a fringe area and discharges are being slightly increased.

B. List of Requested Waivers

DA-1 POI – Waiver for undetained fringe area
DA-3 POI – Waiver for undetained fringe area
DA-4 POI and DA-5 POI – Waiver not assumed

VII. Appendix - Figures / Maps / Exhibits / Supporting Calculations – Additional Documentation Provided in Final Report

Figure A – Pre-Developed Drainage Area Map

Figure B – Post-Developed Drainage Area Map

Figure C – Web Soil Survey

Figure D – Runoff Curve Number Calculations

