Preliminary Summary Report

of the

Eagle Creek Drainage District

Mapping and Benefits Assessment

February 26, 2019

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CIVIL ENGINEERS AND LAND SURVEYORS

INTRODUCTION

The following report was prepared by Nielsen Madsen + Barber (NMB), at the request of the Racine County Board of Drainage Commissioners on behalf of the Eagle Creek Drainage District hereafter referred to as the "District", to analyze the existing mapping and benefits of the District and update it to reflect the proposed annexation. The benefits were calculated using the method approved by the Department of Agriculture, Trade and Consumer Protection (DATCP) which is described in Chapter ATCP 48 of the Wisconsin Administrative Code.

EAGLE CREEK DRAINAGE DISTRICT

The District encompasses parts of three municipalities within Racine County: The Town of Burlington, the Town of Dover and the Village of Rochester. The District contains 9,898 acres of land consisting of 1,606 parcels as well as road right-of-way. The Town of Burlington contains 36 acres and 8 parcels within the District. The Town of Dover contains 9,815 acres and 1,595 parcels within the District. The Village of Rochester contains 47 acres and 3 parcels within the District. The land within the District is predominantly agricultural with areas of low and medium density residential development.

The drainage system within the District includes eight branch tiles and two branch ditches all of which eventually drain to the Eagle Creek Canal. The two branch ditches, and that portion of Eagle Creek Canal that is within the District, add up to a total of 27,830 linear feet (5.27 miles) of drainage way. The eight-branch tiles have a total length of 30,531 linear feet (5.78 miles). It is proposed to add 1.8 miles of existing ditches to the District from STH 75 to Church Road.

The District is obligated, under Section 88.63 of the State Statutes, to maintain and repair District facilities. The cost of maintenance and repair is assessed based upon the benefits each parcel receives per Section 88.23 of the State Statutes. Property owners are assigned, in part, a proportionate "charge" based on the amount of runoff "generated" by their property.

The amount of runoff a property generates depends on the percent of impervious surface, ground cover / condition, topography and soil type. The total impervious area and percentage of the parcel thereof are the most important factors in generating runoff. Impervious surfaces are defined as solid or semi-solid surfaces that prevent rainfall from infiltrating into the ground thus creating excess "runoff". Runoff from lands with a high percentage of impervious surfaces is generally in greater quantities and at higher velocities than undeveloped (i.e. agricultural, forest, swamp) lands and typically includes increased pollutant loading.

While undeveloped properties typically generate a fraction of the runoff as compared to developed properties of comparable size, such undeveloped or agricultural properties contribute to the District-wide storm water runoff that must be managed. The undeveloped property in the District amounts to approximately 66.5% of the total area and is scattered throughout the District.

The District is a separate entity from the three municipalities within its boundary. In accordance with ATCP 48.02(5)(b) the District assesses each municipality (including Racine County) directly for their respective road rights-of-way. The County will be assessed for their rights-of-way. However, in accordance with ATCP 48.02(5)(a), lands owned by the State of Wisconsin cannot be assessed unless the land is being used for agricultural purposes. Therefore, WisDOT will not be assessed for their road rights-of-way within the District.

There are several parcels within the District whose boundary extends to the centerline of the adjacent roadway. These parcel owners will be assessed for their entire parcel area, including what extends into the public roadway.

As with WisDOT, any lands owned by the Wisconsin Department of Natural Resources (WDNR) are exempt from this assessment unless the land is being leased for farming. There no parcels owned by the WDNR that appear to be farmed.

PARCEL DATABASE

A database was created which included all parcels within the District boundary. This database was built upon the existing infrastructure developed and maintained by Racine County.

As part of Racine County's Real Estate Description department, the Real Property Lister Division maintains the real estate tax roll for all municipalities within Racine County except for the City of Racine. The County-maintained data applicable to the District's database includes the owner's name, tax key ID number, parcel size, mailing address, land use classification codes and acreages. The "land use" portion of the data originates from the assessors of the municipalities and is of particular importance to the District's database in that it contains a breakdown (by area) of each land use type for each individual parcel.

There are 12 land use classifications within the District. They are as follows:

(1) High-Density Residential less than 1/3 Acre (G1)
(2) Medium-Density Residential 1/3 Acre to 1 Acre (G1)
(3) Low-Density Residential greater than 1 Acre (G1)
(4) Commercial (G2)
(5) Agricultural (G4)
(6) Swamp Land (G5)
(7) Production Forest Land (G6)
(8) Agricultural – Improved (G7)
(9) State (X2)
(10) County (X3)
(11) Local / Institutional (X4)
(12) Road Right of Way (R/W)

EXISTING BENIFITS ANALYSIS METHODOLOGY

The District has an existing methodology in place to determine the benefits for each parcel. This analysis was based on parcel runoff which is the product of two factors: parcel area (in acres) and the runoff coefficient as a function of underlying soil composition.

PROPOSED BENEFITS ANALYSIS METHODOLOGY

NMB is proposing to use the same basic method as previous assessments, in which benefit points were determined by parcel size and runoff coefficient, for determining the total benefit points for each parcel. For assessment purposes, the individually calculated runoff amounts were used to determine the total "benefit points" for each parcel. The District has historically assigned a minimum number of benefit points for smaller residential and commercial parcels. These parcels typically contain more improvements and run the risk of suffering higher damages should the District system not be properly maintained. To determine the assessment rate for each parcel, the overall District assessment was divided by the total benefit points for all parcels producing a cost per benefit point. This cost was then multiplied by the total benefit points for each parcel, producing the overall assessment. This method can be utilized uniformly for all developed, undeveloped and agricultural parcels. This method also allows for ease of future benefits analysis updating since changes in the runoff coefficient and parcel size are easily calculated.

The runoff coefficient ranges from 0 to 1 and is the ratio of the amount of rainfall that is not absorbed by the surface to the total amount of rainfall during any given storm event. Parcels which have a larger proportion of "impervious" surface (streets, rooftops, sidewalks, patios, parking lots, driveways and other similar surfaces) will have a larger runoff coefficient than parcels which have a larger proportion of "pervious" surface (lawn, landscaping, agricultural lands and other similar surfaces).

NMB believes that the use of runoff coefficients satisfies the consideration requirements of ATCP 48.08(1)(c) through 48.08(1)(f). These considerations are as follows:

- 48.08(1)(c) – Consider the amount of drainage required by, or provided to the assessed land.
- 48.08(1)(d) – Consider the thoroughness and reliability of drainage provided.
- 48.08(1)(e) – Consider the amount and frequency of flooding on the assessed land.
- 48.01(1)(f) – Consider the difficulty of draining the assessed land.

NMB is proposing to use runoff coefficient values as specified by Procedure 13-10-5 of the Wisconsin Department of Transportation's Facilities Development Manual (FDM). The FDM has standard values for runoff coefficients based on land use, hydrologic soil group and land slope range. The vast majority of the land uses fall under one of these standard runoff coefficient values. However, the FDM does not have standard runoff coefficients for forest, agricultural-improved or swamp /

wasteland. NMB used a commonly accepted average coefficient (0.13) for forested land and used the same value for agricultural-improved as residential greater than 1 acre (0.25). Swamp / wasteland was neglected from the assessment and assigned a runoff coefficient of 0.00 per ATCP 48.06(4). The District corridor was neglected from the assessment per ATCP 48.08(3)(a). The FDM presents options for low intensity and high intensity design storm events. Low intensity design storm events have a 2 to 10 year design recurrence. High intensity design storm events have a 25 to 100 year design recurrence. Since the typical design storm for a study of this nature is a 10 year event, the low intensity option was used for the analysis. Current topographic data for the entire District was unavailable for this analysis. Therefore, an average slope range of 2% to 6% was assumed for the entire District.

Runoff coefficients for the remaining land uses within the District were generated based on individual calculations. This method was employed due to the land uses (and individual parcels) containing substantially different characteristics and levels of imperviousness. The land uses for which these individual runoff coefficients were calculated are commercial, institutional, municipal (County) and the properties with common ownership (condominium, common element and outlots). These parcel specific coefficients were calculated based on percentages of pervious and impervious surface, agricultural use, road right-of-way, forest land and water surface. Impervious surfaces were assigned a runoff coefficient of 0.95 and pervious surfaces were assigned a runoff coefficient of 0.17. Water surfaces were treated the same as swamp / wasteland since water bodies accept runoff rather than generate it.

EAGLE LAKE SEWER UTILITY DISTRICT ASSESSMENT ANALYSIS

In addition to the runoff produced by lands within the District, the Eagle Lake Sewer Utility District (ELSUD) has a sanitary sewer treatment plant which discharges its treated effluent into the Eagle Creek Canal. Since ELSUD utilizes District facilities to convey its effluent discharge it is appropriate that they be included in the benefits analysis and receive an appropriate assessment.

In order to calculate an appropriate assessment charge for ELSUD, their annual discharge into District maintained facilities was compared with the overall runoff from the lands within the District. Annual treatment plant influent flows from 2009 through 2018 were provided to NMB by ELSUD via emails dated August 31, 2018 and February 15, 2019. This information can be found in Appendix “B” of this report. The influent data was averaged and resulted in 108.8 million gallons average annual influent for the facility. For the purposes of this report it was assumed that the influent flows match the effluent flows and therefore, the discharge into District facilities.

The average annual precipitation for the District was determined using data from the U.S. Department of Commerce National Oceanic and Atmospheric Administration (NOAA) which maintains climate data including annual precipitation from stations across the country. One of NOAA’s stations is located in the Village of Union Grove, located approximately five miles east of the ELSUD facility. Annual precipitation

data from 1989 to 2018 for the Union Grove station was used to determine an average annual precipitation for the District. The resulting 30-year average annual precipitation was 34.29 inches.

The District contains 9,898 acres with an average runoff coefficient of 0.178. The product of the District area, the annual precipitation and the average runoff coefficient is the total average annual runoff. Per this calculation procedure, the average annual runoff is 1.6404 billion gallons for the Eagle Creek Drainage District. When the average annual runoff is added to the 108.8 million gallons of effluent from ELSUD the total annual flow produced by the District is 1.7492 billion gallons. The average annual effluent from ELSUD is 6.22% of the total average annual flow produced from the District. Therefore, the Eagle Lake Sewer Utility District is responsible for 6.22% of the overall Eagle Creek Drainage District assessment.

APPENDIX A
WISDOT FDM RATIONAL COEFFICIENT TABLE

Detail A - Runoff Coefficients (C), Rational Formula

Land Use	Percent Impervious Area	Hydrologic Soil Group											
		A			B			C			D		
		Slope Range Percent			Slope Range Percent			Slope Range Percent			Slope Range Percent		
		0-2	2-6	6 & over	0-2	2-6	6 & over	0-2	2-6	6 & over	0-2	2-6	6 & over
Industrial	90	0.67 0.85	0.68 0.85	0.68 0.86	0.68 0.85	0.68 0.86	0.69 0.86	0.68 0.86	0.69 0.86	0.69 0.87	0.69 0.86	0.69 0.86	0.70 0.88
Commercial	95	0.71 0.88	0.71 0.89	0.72 0.89	0.71 0.89	0.72 0.89	0.72 0.89	0.72 0.89	0.72 0.89	0.72 0.90	0.72 0.89	0.72 0.89	0.72 0.90
High Density Residential	60	0.47 0.58	0.49 0.60	0.50 0.61	0.48 0.59	0.50 0.61	0.52 0.64	0.49 0.60	0.51 0.62	0.54 0.66	0.51 0.62	0.53 0.64	0.56 0.69
Med. Density Residential	30	0.25 0.33	0.28 0.37	0.31 0.40	0.27 0.35	0.30 0.39	0.35 0.44	0.30 0.38	0.33 0.42	0.38 0.49	0.33 0.41	0.36 0.45	0.42 0.54
Low Density Residential	15	0.14 0.22	0.19 0.26	0.22 0.29	0.17 0.24	0.21 0.28	0.26 0.34	0.20 0.28	0.25 0.32	0.31 0.40	0.24 0.31	0.28 0.35	0.35 0.46
Agriculture	5	0.08 0.14	0.13 0.18	0.16 0.22	0.11 0.16	0.15 0.21	0.21 0.28	0.14 0.20	0.19 0.25	0.26 0.34	0.18 0.24	0.23 0.29	0.31 0.41
Open Space	2	0.05 0.11	0.10 0.16	0.14 0.20	0.08 0.14	0.13 0.19	0.19 0.26	0.12 0.18	0.17 0.23	0.24 0.32	0.16 0.22	0.21 0.27	0.28 0.39
Freeways & Expressways	70	0.57 0.70	0.59 0.71	0.60 0.72	0.58 0.71	0.60 0.72	0.61 0.74	0.59 0.72	0.61 0.73	0.63 0.76	0.60 0.73	0.62 0.75	0.64 0.78

Detail B - Runoff Coefficients for Specific Land Use

Land Use	Hydrologic Soil Group											
	A			B			C			D		
	Slope Range Percent			Slope Range Percent			Slope Range Percent			Slope Range Percent		
	0-2	2-6	6 & over	0-2	2-6	6 & over	0-2	2-6	6 & over	0-2	2-6	6 & over
Row Crops	.08 .22	.16 .30	.22 .38	.12 .26	.20 .34	.27 .44	.15 .30	.24 .37	.33 .50	.19 .34	.28 .41	.38 .56
Median Striptturf	.19 .24	.20 .26	.24 .30	.19 .25	.22 .28	.26 .33	.20 .26	.23 .30	.30 .37	.20 .27	.25 .32	.30 .40
Side Slopeturf			.25 .32			.27 .34			.28 .36			.30 .38
PAVEMENT												
Asphalt	.70 - .95											
Concrete	.80 - .95											
Brick	.70 - .80											
Drives, Walks	.75 - .85											
Roofs	.75 - .95											
Gravel Roads Shoulders	.40 - .60											

NOTE: The lower C values in each range should be used with the relatively low intensities associated with 2 to 10 year design recurrence intervals whereas the higher C values should be used for intensities associated with the longer 25 to 100 year deign recurrence intervals.

APPENDIX B
ANNUAL INFLUENT DATA FOR THE EAGLE LAKE SEWER UTILITY DISTRICT

Month	Influent MGD	Month	Influent MGD	Month	Influent MGD	Month	Influent MGD	Month	Influent MGD
Jan 2009	8.074	Jan 2010	9.552	Jan 2011	5.576	Jan 2012	7.422	Jan 2013	7.450
Feb 2009	11.363	Feb 2010	7.042	Feb 2011	8.673	Feb 2012	7.910	Feb 2013	8.845
Mar 2009	15.337	Mar 2010	14.134	Mar 2011	17.181	Mar 2012	12.530	Mar 2013	12.964
Apr 2009	15.520	Apr 2010	12.296	Apr 2011	14.193	Apr 2012	8.791	Apr 2013	20.565
May 2009	11.317	May 2010	10.643	May 2011	10.071	May 2012	8.182	May 2013	10.916
Jun 2009	10.871	Jun 2010	10.275	Jun 2011	7.343	Jun 2012	5.497	Jun 2013	11.043
Jul 2009	6.753	Jul 2010	9.569	Jul 2011	5.767	Jul 2012	5.541	Jul 2013	10.353
Aug 2009	8.400	Aug 2010	7.393	Aug 2011	4.940	Aug 2012	5.463	Aug 2013	7.120
Sep 2009	5.303	Sep 2010	5.432	Sep 2011	4.920	Sep 2012	4.917	Sep 2013	5.893
Oct 2009	8.400	Oct 2010	4.867	Oct 2011	5.537	Oct 2012	4.767	Oct 2013	5.563
Nov 2009	8.992	Nov 2010	5.007	Nov 2011	6.305	Nov 2012	4.480	Nov 2013	7.168
Dec 2009	11.402	Dec 2010	5.768	Dec 2011	7.205	Dec 2012	5.911	Dec 2013	6.472
Minimum	5.303	Minimum	4.867	Minimum	4.920	Minimum	4.480	Minimum	5.563
Maximum	15.520	Maximum	14.134	Maximum	17.181	Maximum	12.530	Maximum	20.565
Total	121.732	Total	101.978	Total	97.711	Total	81.411	Total	114.352
Average	10.144	Average	8.498	Average	8.143	Average	6.784	Average	9.529

Month	Influent MGD	Month	Influent MGD	Month	Influent MGD	Month	Influent MGD	Month	Influent MGD
Jan 2014	6.882	Jan 2015	6.681	Jan 2016	10.458	Jan 2017	11.682	Jan 2018	6.796
Feb 2014	6.418	Feb 2015	5.136	Feb 2016	9.949	Feb 2017	8.764	Feb 2018	9.519
Mar 2014	12.464	Mar 2015	8.859	Mar 2016	14.139	Mar 2017	13.619	Mar 2018	8.437
Apr 2014	12.645	Apr 2015	11.261	Apr 2016	13.164	Apr 2017	18.035	Apr 2018	11.465
May 2014	14.021	May 2015	8.708	May 2016	9.630	May 2017	13.116	May 2018	16.694
Jun 2014	11.178	Jun 2015	10.030	Jun 2016	6.834	Jun 2017	9.514	Jun 2018	12.184
Jul 2014	10.252	Jul 2015	7.141	Jul 2016	5.715	Jul 2017	18.772	Jul 2018	8.369
Aug 2014	7.248	Aug 2015	5.229	Aug 2016	6.070	Aug 2017	8.092	Aug 2018	6.691
Sep 2014	6.051	Sep 2015	6.654	Sep 2016	6.552	Sep 2017	4.960	Sep 2018	10.703
Oct 2014	6.069	Oct 2015	5.536	Oct 2016	7.376	Oct 2017	6.578	Oct 2018	16.974
Nov 2014	5.973	Nov 2015	9.357	Nov 2016	8.536	Nov 2017	6.996	Nov 2018	10.410
Dec 2014	7.273	Dec 2015	15.431	Dec 2016	9.314	Dec 2017	6.118	Dec 2018	11.976
Minimum	5.973	Minimum	5.136	Minimum	5.715	Minimum	4.960	Minimum	6.691
Maximum	14.021	Maximum	15.431	Maximum	14.139	Maximum	18.772	Maximum	16.974
Total	106.474	Total	100.023	Total	107.737	Total	126.246	Total	130.218
Average	8.873	Average	8.335	Average	8.978	Average	10.521	Average	10.852