



June 9, 2017

Ms. Anne C. Lamitola, PE
Director of Public Works
City of Ladue
9345 Clayton Road
Ladue, Missouri 63124

Re: Storm Water Management Program
Phase II: Master Plan/Conceptual Engineering
Ladue, Saint Louis County, Missouri
2016 STORM WATER MASTER PLAN

Dear Ms. Lamitola:

In conformance with the City of Ladue ~ HR Green, Inc. Professional Services Agreement attachment "D", please find enclosed herewith the following:

- Technical Memorandum: 2016 Storm Water Master Plan.
- Table 1: Recommended Project List Sorted by Project Number.
- Table 2: List of Alternative Projects Sorted by Project Number.
- Table 3: Recommended Project List Sorted by BCR.
- Table 4: Recommended Neighborhood Project List Sorted by BCR.
- Table 5: Recommended Channel, Pipe & Culvert Project List Sorted by BCR.
- Project Documentation including figures.
- Compact Disk w/ master plan electronic files.

The master plan transmitted herewith is revised to reflect additions, deletions and corrections provided by City staff at the meeting held on 6Apr17; from the Storm Water Advisory Committee at the meeting held on 13Apr17; from the City Council at the workshop meeting held on 25Apr17; from the public at open houses held on 25Apr17, 2May17 and 4May17; and at subsequent stakeholder meetings/field reconnaissance conducted after the public open houses. The Metropolitan St. Louis Sewer District (MSD) weighed in regarding their expectations related to water quality requirements and downstream impacts.

The changes made to project scopes of work from the input received from the various sources resulted in an increase in the program's Engineer's Opinion of Probable Construction Cost (EOPC) by approximately 20%.

Significant changes to project Benefit to Cost Ratios (BCR) is largely attributed to the recognition that basements are habitable spaces. The original calculations followed MSD's premise that basements are considered to be non-habitable resulting in the use of a 1.05 problem category multiplier on the "Ladue Score Card". Recognition that basements are habitable spaces, as are the majority of them in Ladue, brings the multiplier up to 1.15. Application of the higher multiplier in the calculations better recognizes projects with basement flooding.

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Specific changes include:

- For project #1601.01 Deerfield/Wakefield the EOPC increased by approximately \$5-million. We found that public stakeholders in Ladue are vocal about problem specifics, and in this case how much more extensive the problem is. The collection system is extended onto Lindworth Drive, Wild Rose Drive, Ellsworth Lane, and Deer Creek Drive to alleviate north to south sheet flow, and better capture runoff before it overwhelms the catchment at the vicinity of #39 Lindworth Drive. In addition, based on public stakeholder input, sewer alignments were revised to avoid disruption of existing property improvements. A drainage way erosion problem between #51 and #52 Woodcrest Drive requiring stabilization was identified.
- For project #1613.01 Prado Storm Trunk Improvements the EOPC increased by approximately \$6-million with the extension of collection systems north along Granada Way and Rio Vista Drive. Public stakeholder input showed that the original plan did not address chronic roadway flooding at those locations. A positive result is the elimination of two projects, #1613.02A and B, whose scope of work is now incorporated into #1613.01. In addition, based on public stakeholder input, sewer alignments were revised to avoid disruption of existing property improvements.
- For project #1604.02 Conway Road #1033 Bank Stabilization the EOPC increased by approximately \$1.4-million with the extension of bank stabilization from Conway Road to Deer Creek. Public stakeholders brought the severity of the problem in that reach to our attention.
- Project #1604.03 Conway Lane Storm Sewer is added to the list with EOPC of approximately \$1.5-million. Public stakeholder input identified chronic sheet flow/roadway flooding at that location warranting a project.
- For project #1610 Log Cabin Drive the EOPC increased by approximately \$1-million with the extension of the collection system. Public stakeholder input identified chronic sheet flow/roadway flooding at areas not addressed previously.
- For project #1614A Willow Hill – Reroute Along Road the EOPC increased by approximately \$1.2-million with the extension of the collection system. Public stakeholder input identified chronic sheet flow/roadway flooding at areas not addressed previously.
- For project #1615.03 Briarcliff North Storm Sewer Improvements the EOPC decreased by approximately \$140,000. A key property owner indicated refusal to allow the proposed improvements to be constructed on his property. The extent of the collection system was curtailed to accommodate his wishes.
- For project #1618 Robin Hill Lane/McKnight Lane Bank Stabilization the EOPC increased by approximately \$1-million with the extension of bank stabilization and a culvert replacement upstream of the original project limit. Public stakeholders brought the severity of the problem in that reach to our attention.

- Project #1633 Vista Brook Lane #6 Bank stabilization is eliminated reducing the EOPC by approximately \$600,000. Recently the property owner completed bank stabilization at that location on his own.
- Project #1643 Burroughs Lane Drainage Improvements is added to the list with EOPC of approximately \$700,000. Public stakeholder input identified chronic creek bank erosion and mass wasting at that location warranting a project.
- Pipe conveyance projects are required to include facilities for “Water Quality [Storage/Treatment] Volume”, and for “Channel Protection Storage Volume” as required by MSD’s Rules and Regulations. The minimum volume to be stored is based on the area disturbed by the project. The requirement source is MSD, and it added cost to the EOPC of the majority of pipe conveyance projects. In the case of #1601.01 and #1613.01, approximately \$500,000 is added to the respective EOPC.

Refer to the attached table for a summary of changes to project BCRs and EOPCs with respect to the values presented in the draft master plan document (13Apr17). Refer to master plan Table 3: Recommended Project List Sorted by BCR for current project priorities and individual EOPCs.

We appreciate the opportunity to provide master planning services to the City of Ladue. Thank you!

Please direct any questions and/or comments regarding the above to the undersigned at 636-812-4210 by voice or at pmerten@hrgreen.com by electronic mail.

Sincerely,

HR GREEN, INC



Peter M. Merten, PE, Project Manager

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Attachments



COUNT	PROJECT #	PROJECT NAME	04-12-2017 Benefit Cost Ratio (BCR)	06-06-2017 Benefit Cost Ratio (BCR)	Change	04-12-2017 Engineer's Opinion of Probable Construction Cost (EOPC)	06-06-2017 Engineer's Opinion of Probable Construction Cost (EOPC)	Change	% Change	Notes
1	1601.01	Deerfield/Wakefield	0.670	1.010	0.340	\$5,257,050.33	\$10,154,016.33	\$4,896,966.00	93.2%	Collection system extension/realignment.
2	1601.02	Litzinger Lane/Tilles Park	0.340	0.170	(0.170)	\$3,303,159.10	\$3,985,912.75	\$682,753.65	20.7%	Collection system extension/realignment.
3	1602	Babler Lane	1.070	0.980	(0.090)	\$1,485,192.86	\$1,703,334.26	\$218,141.40	14.7%	Cost refinement.
4	1603.01	Overbrook Drive Street Flooding	0.003	0.370	0.367	\$1,508,732.02	\$739,472.49	(\$769,259.53)	-51.0%	Switch fr: pipe to swale;relocted/rearranged improvements
5	1603.02	Overbrook Drive Bridge Replacement	0.120	0.500	0.380	\$1,422,962.41	\$1,412,185.77	(\$10,776.64)	-0.8%	Cost refinement.
6	1604.01	Conway Road #10134 Storm Sewer	0.049	0.040	(0.009)	\$285,934.89	\$312,606.49	\$26,671.60	9.3%	Cost refinement.
7	1604.02	Conway Road #10033 Bank Stabilization	0.680	0.500	(0.180)	\$1,398,102.88	\$2,844,247.70	\$1,446,144.82	103.4%	Added stabilization from Conway Rd to Deer Creek.
8	1604.03	Conway Lane Storm Sewer	0.000	0.320	0.320	\$0.00	\$1,495,155.13	\$1,495,155.13	100%	New project identified by the public.
9	1605	South Tealbrook Drive	1.110	0.870	(0.240)	\$357,234.26	\$419,623.98	\$62,389.72	17.5%	Collection system extension; added berming.
10	1606.01	Foxboro Structure Flooding	0.310	0.440	0.130	\$5,735,323.94	\$5,851,966.18	\$116,642.24	2.0%	Cost refinement.
11	1606.02	Foxboro Roadway Flooding	0.460	0.430	(0.030)	\$496,888.00	\$542,054.87	\$45,166.87	9.1%	Cost refinement.
12	1607B	Park Lane - Buyout	0.205	0.210	0.005	\$1,431,146.39	\$1,417,530.63	(\$13,615.76)	-1.0%	Cost refinement.
13	1608.01A	Clermont West - Curb	0.190	0.200	0.010	\$1,079,440.62	\$1,312,669.62	\$233,229.00	21.6%	Collection system extension/realignment.
14	1608.02A	Clermont East/Dogwood - Curb	0.170	0.150	(0.020)	\$1,160,911.87	\$1,351,005.31	\$190,093.44	16.4%	Collection system extension/realignment.
15	1608.03	Clerbrook	0.800	0.720	(0.080)	\$180,667.73	\$198,820.84	\$18,153.11	10.0%	Cost refinement.
16	1609B	Godwin Lane - East Alignment	0.180	0.165	(0.015)	\$1,242,743.43	\$1,455,768.93	\$213,025.50	17.1%	Collection system extension/realignment; added berming.
17	1610	Log Cabin Drive	0.100	0.620	0.520	\$1,894,456.93	\$2,859,209.57	\$964,752.64	50.9%	Collection system extension/realignment.
18	1611.01	Briarwood Drive	0.820	0.860	0.040	\$2,006,296.70	\$2,047,000.33	\$40,703.63	2.0%	Cost refinement.
19	1611.02	Winwood Drive	0.130	0.110	(0.020)	\$934,127.67	\$1,108,790.00	\$174,662.33	18.7%	Cost refinement.
20	1612B	Upper Ladue Road - In-Line Storage	0.150	0.280	0.130	\$1,169,028.81	\$1,212,424.02	\$43,395.21	3.7%	Cost refinement.
21	1613.01	Prado Storm Trunk Improvements	0.160	0.730	0.570	\$9,387,341.96	\$15,317,485.30	\$5,930,143.34	63.2%	Collection system extension/realignment.
22	1613.02	Granada Way/Rio Vista Drive Storm Sewer West	0.430	0.000	(0.430)	\$893,567.23	\$0.00	(\$893,567.23)	-100.0%	Project deleted; SOW added to 1613.01
23	1613.03	The Prado #4 Storm Sewer	0.130	0.120	(0.010)	\$233,444.45	\$254,778.24	\$21,333.79	9.1%	Cost refinement.
24	1614A	Willow Hill - Reroute Along Road	0.420	1.280	0.860	\$1,497,974.06	\$2,732,178.50	\$1,234,204.44	82.4%	Collection system extension/realignment.
25	1615.01	Briarcliff Channel Improvements	0.300	0.330	0.030	\$2,757,188.02	\$2,917,708.37	\$160,520.35	5.8%	Cost refinement.
26	1615.02	Glen Eagles #42/Ladue Road Drainage	0.230	0.210	(0.020)	\$783,795.28	\$858,689.32	\$74,894.04	9.6%	Cost refinement.
27	1615.03	Briarcliff North Storm Sewer Improvements	0.440	0.540	0.100	\$3,417,279.13	\$3,282,400.88	(\$134,878.25)	-3.9%	Collection system retraction/realignment.
28	1615.04	Briarcliff #27 Storm Sewer Improvements	0.140	0.140	0.000	\$1,139,988.70	\$1,172,757.96	\$32,769.26	2.9%	Cost refinement.
29	1615.05	Ladue/Briarcliff #19 Storm Sewer Improvements	0.270	0.280	0.010	\$1,015,761.33	\$1,029,109.18	\$13,347.85	1.3%	Cost refinement.
30	1616.01	Wenneker Drive North Bank Stabilization	0.570	0.570	0.000	\$2,908,218.68	\$2,921,741.13	\$13,522.45	0.5%	Cost refinement.
31	1616.02	Louwen Drive/St. Mary's Knoll	0.110	0.270	0.160	\$404,118.83	\$787,919.24	\$383,800.41	95.0%	Collection system extension.
32	1616.03	Louwen Drive #825	0.059	0.140	0.081	\$204,184.67	\$220,685.20	\$16,500.53	8.1%	Cost refinement.
33	1617	Sunny Meade Street	0.096	0.100	0.004	\$905,285.89	\$951,271.55	\$45,985.66	5.1%	Cost refinement.
34	1618	Robin Hill Lane/McKnight Lane Bank Stabilization	0.600	1.020	0.420	\$601,556.27	\$1,618,576.69	\$1,017,020.42	169.1%	Bank stabilization extension + culvert replacement.
35	1619	Wenneker Drive South Bank Stabilization	0.290	0.500	0.210	\$3,877,223.11	\$4,069,661.76	\$192,438.65	5.0%	Cost refinement.
36	1620	Black Creek Lane #2-6 Bank Stabilization	0.250	0.250	0.000	\$234,923.78	\$236,353.31	\$1,429.53	0.6%	Cost refinement.
37	1621	Ladue Forest Lane #6 Bank Stabilization	0.790	0.270	(0.520)	\$238,996.52	\$491,140.55	\$252,144.03	105.5%	Bank stabilization extension.
38	1622	Larkdale-Robindale Bank Stabilization	0.610	0.610	0.000	\$1,085,554.39	\$1,090,566.66	\$5,012.27	0.5%	Cost refinement.
39	1623	Clayton Road Bank Stabilization	0.360	0.360	0.000	\$4,663,962.18	\$4,676,013.23	\$12,051.05	0.3%	Cost refinement.

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40	1624	Pebble Creek South Bank Stabilization	0.370	0.370	0.000	\$1,651,872.86	\$1,657,208.52	\$5,335.66	0.3%	Cost refinement.
41	1625.01	Pebble Creek at Clermont Lane Bank Stabilization	0.220	0.220	0.000	\$1,324,717.84	\$1,338,280.53	\$13,562.69	1.0%	Cost refinement.
42	1625.02	Pebble Creek at Warson Road Bank Stabilization	0.840	0.840	0.000	\$497,939.21	\$500,819.89	\$2,880.68	0.6%	Cost refinement.
43	1625.03	Woodcliffe Road #1-36 Bank Stabilization	0.570	0.570	0.000	\$967,692.91	\$975,978.05	\$8,285.14	0.9%	Cost refinement.
44	1625.04	Glenview-Woodcliffe West Channel and Culvert	0.270	0.360	0.090	\$1,835,129.97	\$1,960,538.22	\$125,408.25	6.8%	Cost refinement.
45	1625.05	Glenview-Woodcliffe East Bank Stabilization	0.350	0.350	0.000	\$1,312,641.30	\$1,325,115.57	\$12,474.27	1.0%	Cost refinement.
46	1626	Sebago Creek at Old Warson Bank Stabilization	0.400	0.390	(0.010)	\$1,546,587.89	\$1,558,882.60	\$12,294.71	0.8%	Cost refinement.
47	1627	Tributary 4 Bank Stabilization	0.250	0.230	(0.020)	\$4,390,932.47	\$4,006,899.37	(\$384,033.10)	-8.7%	Cost refinement.
48	1628	Fordyce-Oakleigh Bank Stabilization	0.290	0.280	(0.010)	\$695,614.15	\$702,688.17	\$7,074.01	1.0%	Cost refinement.
49	1629	Tributary 5 South Bank Stabilization	0.500	0.500	0.000	\$4,037,740.42	\$4,049,801.14	\$12,060.72	0.3%	Cost refinement.
50	1630	Tributary 5 West Bank Stabilization	0.370	0.400	0.030	\$1,984,045.81	\$2,265,041.60	\$280,995.79	14.2%	Bank stabilization extension.
51	1631	Tributary 5 East Bank Stabilization	0.380	0.380	0.000	\$838,049.46	\$845,329.56	\$7,280.10	0.9%	Cost refinement.
52	1632	Sorrel Lane Bank Stabilization	0.390	0.380	(0.010)	\$1,637,509.21	\$1,651,958.42	\$14,449.21	0.9%	Cost refinement.
53	1633	Vista Brook Lane #6 Bank Stabilization	0.470	0.000	(0.470)	\$601,836.77	\$0.00	(\$601,836.77)	-100.0%	Project completed by property owner.
54	1634	Tributary 6 Bank Stabilization	0.530	0.530	0.000	\$1,433,417.48	\$1,430,413.17	(\$3,004.31)	-0.2%	Cost refinement.
55	1636	Brookside Lane at Country Club Creek	0.180	0.130	(0.050)	\$664,201.21	\$1,231,492.79	\$567,291.58	85.4%	Collection system extension/realignment.
56	1642	Tributary 6 Storm Sewer Improvements	0.310	0.330	0.020	\$325,725.02	\$307,838.62	(\$17,886.40)	-5.5%	Cost refinement.
57	1643	Burroughs Lane Drainage Improvements	0.000	0.740	0.740	\$0.00	\$666,010.39	\$666,010.39	100%	New project identified by the public.
						\$94,345,419.30	\$113,527,128.86	\$19,181,709.56	20.3%	