Item 6Cii.
BCWMC 5-21-20

Feasibility Report for Mount Olivet Stream Stabilization and Parkers Lake Drainage Improvement Projects

Plymouth, Minnesota

Prepared for
Bassett Creek Watershed Management Commission

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Appendices

Appendix A

2019 Stream Erosion Site Photos

Mt. Olivet Lutheran Church Site – Erosion Example Photos

Figure 1 – Mt. Olivet, Reach 1, undercut bank erosion

Figure 2 – Mt. Olivet, Reach 1, bank erosion

Figure 3 – Mt. Olivet, Reach 2, bank scarp erosion

Figure 4 – Mt. Olivet, Reach 2, undercut bank and bank erosion cause by debris in stream channel

Figure 5 – Mt. Olivet, Reach 2, undercut bank and bank erosion caused by debris in channel (zoomed in location of previous figure)

Figure 6 – Mt. Olivet, Reach 2, bank scarp erosion

Figure 7 – Mt. Olivet, Reach 2, bank and channel erosion

Figure 8 – Mt. Olivet, Reach 2, bank erosion and natural debris

Figure 9 – Mt. Olivet, Reach 2, undercut bank and bank erosion cause by debris in channel

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Figure 11 – Mt. Olivet, Reach 2, slope erosion from parking lot down to the stream (view from above)

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Figure 45 – Parkers Lake, Reach 2, undercut bank and bank erosion

Figure 46 – Parkers Lake, Reach 2, undercut bank

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Figure 48 – Parkers Lake, Reach 2, undercut bank and scarp bank erosion

Figure 49 – Parkers Lake, Reach 2, bank erosion

Figure 50 – Parkers Lake, Reach 2, bank erosion and head cut and bank erosion

Appendix B

Tree Survey Results

MT. OLIVET LUTHERAN CHURCH - TREE SURVEY				
	Diameter		Hennepin County (feet)	
Species Name	(inches)	Condition	X-Coordinate	Y-Coordinate
Cherry (Black)	14		186460.98	486721.241
Cherry (Black)	11		186473.511	486721.801
Box elder	13		186506.051	486685.482
Box elder	10		186511.221	486686.232
Box elder	9		186509.196	486693.052
Box elder	16		186524.2	486706.782
Spruce (Norway)	11		186515.359	486693.231
Box elder	16		186518.303	486692.741
Box elder	8	Dead/Dying	186511.593	486727.807
Box elder	8	Dead/Dying	186504.969	486723.733
Box elder	7		186496.627	486725.855
Box elder	16		186497.746	486726.232
Elm (American)	4		186449.54	486763.782
Box elder	13		186441.269	486762.599
Cherry (Black)	14		186390.146	486784.813
Elm (Siberian)	10		186391.86	486775.686
Elm (Siberian)	9		186381.124	486785.337
Elm (Siberian)	6		186377.244	486787.256
Elm (Siberian)	16		186432.626	486749.526
Cherry (Black)	6		186437.593	486743.134
Elm (Siberian)	6		186410.351	486750.49
Elm (Siberian)	11		186410.085	486746.684
Elm (Siberian)	6		186399.474	486745.541
Elm (Siberian)	4		186396.403	486755.301
Ash (Green)	15		186390.534	486748.92
Hackberry	9		186386.571	486753.124
Elm (Siberian)	6		186362.607	486758.184
Elm (Siberian)	10		186360.199	486767.627
Cherry (Black)	10		186326.621	486775.84
Cherry (Black)	7		186325.977	486783.196
Hackberry	7		186324.54	486779.857
Cherry (Black)	12		186320.391	486787.194
Beech	4		186332.183	486787.166
Black walnut	25		186314.437	486784.699
Black walnut	8		186301.618	486779.894
Elm (American)	8		186296.861	486787.62
Black walnut	5		186292.034	486779.123
Black walnut	32		186292.144	486767.594
Ash (Green)	13		186294.064	486799.724
Black walnut	13		186294.057	486800.279
Black walnut	4		186297.645	486801.592
Elm (Siberian)	13		186285.967	486792.722
Cherry (Black)	13		186280.191	486790.699
Elm (Siberian)	10		186271.261	486790.897

MT. OLIVET LUTHERAN CHURCH - TREE SURVEY				
	Diameter		Hennepin County (feet)	
Species Name	(inches)	Condition	X-Coordinate	Y-Coordinate
Hawthorn	4		186258.444	486783.658
Hawthorn	4		186258.813	486792.713
Ash (Green)	8		186251.288	486769.58
Elm (American)	17		186226.264	486770.528
Cherry (Black)	7		186227.889	486779.04
Beech	4		186234.901	486775.388
Beech	5		186236.77	486779.735
Cherry (Black)	9		186231.972	486784.086
Eastern Cottonwood	28		186226.304	486786.19
Box elder	5		186212.958	486765.293
Box elder	10		186482.114	486767.044
Box elder	15		186479.514	486762.744
Box elder	10		186481.714	486764.803
Buckthorn	5		186420.614	486784.794
Buckthorn	5		186405.414	486774.294
Cherry (Black)	7		186362.614	486787.499
Elm (Siberian)	12		186371.114	486784.944
Buckthorn	10		186369.014	486796.535
Elm (Siberian)	8		186339.614	486812.304
Elm (Siberian)	5		186351.814	486815.003
Elm (Siberian)	10		186347.914	486824.344
Elm (Siberian)	10		186348.214	486823.98
Elm (Siberian)	4		186360.714	486813.88
Elm (Siberian)	5		186359.214	486813.66
Ash (Green)	6		186365.614	486816.562
Ash (Green)	5		186335.314	486836.26
Ash (Green)	5		186335.814	486834.16
Ash (Green)	6		186338.614	486832.962
Ash (Green)	15		186327.814	486819.401
Elm (Siberian)	10		186322.014	486817.351
Elm (Siberian)	8		186307.914	486830.811
Box elder	15		186301.414	486818.9
American basswood	17		186264.714	486823.854
American basswood	8		186267.314	486824.714
Hackberry	4		186255.014	486805.289
American basswood	15		186243.514	486801.362
Eastern Cottonwood	20		186225.814	486796.162
American basswood	15		186236.614	486793.721
Eastern Cottonwood	13		186229.114	486802.162
Box elder	15		186212.314	486799.744
Eastern Cottonwood	20		186224.214	486797.017
Eastern Cottonwood	20		186223.714	486797.917
American basswood	22		186230.914	486793.517
Eastern Cottonwood	18		186226.614	486790.417

MT. OLIVET LUTHERAN CHURCH - TREE SURVEY				
	Diameter		Hennepin County (feet)	
Species Name	(inches)	Condition	X-Coordinate	Y-Coordinate
Maple (Red)	5		186201.114	486791.903
Eastern hophornbeam / Ironwood	4		186212.714	486790.023
Buckthorn	6		186208.514	486789.706
Eastern hophornbeam / Ironwood	5		186202.114	486786.399
Eastern hophornbeam / Ironwood	7		186196.814	486785.606
Maple (Red)	5		186201.314	486786.803
Buckthorn	6		186206.914	486793.997
Buckthorn	5		186194.814	486797.714
Buckthorn	5		186195.614	486803.494
Hackberry	5		186129.414	486787.803
Buckthorn	5		186162.914	486808.294
Box elder	13		186125.614	486802.654
Box elder	14		186121.414	486803.154
Box elder	11		186117.014	486804.554
Box elder	11		186116.614	486804.254
Box elder	6		186107.414	486812.416
Buckthorn	4		186097.514	486816.323
Box elder	10		186095.214	486799.054
Box elder	16		186093.914	486798.054
Cherry (Black)	4		186074.214	486789.523
Cherry (Black)	4		186077.714	486785.823
Cherry (Black)	9		186072.414	486803.903
Box elder	13		186076.114	486810.951
Buckthorn	5		186066.414	486799.903
Cherry (Black)	17		186052.214	486788.844
Hackberry	14		186049.814	486793.144
Buckthorn	8		186030.714	486800.804
Box elder	9		186023.414	486789.613
Box elder	10		186015.714	486780.154
Buckthorn	4		186005.114	486771.723
Buckthorn	4		185998.714	486764.323
Hackberry	9		185979.514	486765.103
Hackberry	19		185980.014	486768.351
Buckthorn	4		185983.414	486774.723
Elm (American)	14		185977.514	486765.033
Cherry (Black)	8		185967.014	486774.304
Apple	7		185950.314	486764.399
Hackberry	9		185945.714	486754.003
Hackberry	10		185947.314	486757.944
Box elder	10		185943.814	486749.754
Box elder	10		185942.414	486749.354
Hackberry	5		185939.414	486747.213
Buckthorn	4		185944.113	486743.214
Buckthorn	5		185954.014	486744.365

MT. OLIVET LUTHERAN CHURCH - TREE SURVEY				
	Diameter		Hennepin County (feet)	
Species Name	(inches)	Condition	X-Coordinate	Y-Coordinate
Box elder	13		185935.514	486754.344
Hackberry	7		185934.814	486746.599
Hackberry	7		185929.514	486746.999
Hackberry	13		185921.114	486745.344
Box elder	6		185922.414	486734.216
Box elder	13		185920.113	486739.614
Buckthorn	5		185914.013	486746.394
Box elder	8		185904.914	486747.516
Box elder	8		185904.714	486748.514
Elm (Siberian)	14		185898.014	486735.044
Cherry (Black)	8		186179.814	486788.204
Cherry (Black)	6		186174.914	486778.106
Cherry (Black)	8		186174.414	486774.004
Cherry (Black)	5		186163.614	486773.603
Cherry (Black)	12		186158.314	486775.344
Cherry (Black)	4		186152.414	486765.023
Cherry (Black)	7		186155.314	486766.199
Cherry (Black)	6		186154.314	486757.223
Cherry (Black)	6		186150.914	486757.223
Box elder	9	Dead/Dying	186146.714	486776.113
Elm (Siberian)	8		186143.114	486781.803
Cherry (Black)	9		186126.614	486777.804
Maple (Red)	4		186127.914	486767.923
Elm (Siberian)	8		186132.514	486766.204
Maple (Red)	4		186128.314	486765.506
Cherry (Black)	10		186124.414	486769.944
Elm (Siberian)	6		186114.914	486767.806
Elm (Siberian)	6		186115.014	486765.104
Maple (Red)	4		186105.514	486765.603
Hackberry	6		186083.414	486764.206
Hackberry	6		186069.714	486760.006
Oak (Bur)	9		186053.113	486765.404
Buckthorn	6		186033.714	486746.806
Maple (Red)	4		186106.614	486775.923
Cherry (Black)	11		186103.614	486784.844
Maple (Red)	4		186102.614	486775.623
Box elder	8	Dead/Dying	186048.214	486774.634
Buckthorn	10		186039.714	486766.144
Box elder	6		186036.414	486767.823
Box elder	10		186016.014	486760.854
Box elder	10		186017.614	486759.506
Cherry (Black)	4		186005.214	486751.623
Cherry (Black)	6		186005.714	486751.623
Box elder	7		186002.214	486742.606

MT. OLIVET LUTHERAN CHURCH - TREE SURVEY				
	Diameter		Hennepin County (feet)	
Species Name	(inches)	Condition	X-Coordinate	Y-Coordinate
Cherry (Black)	14		185990.314	486738.644
Hackberry	8		185987.214	486739.904
Hackberry	10		185980.614	486738.644
Cherry (Black)	4		185975.214	486741.454
Buckthorn	5		185965.814	486741.103
Hackberry	8		185967.514	486740.704
Hackberry	11		185951.914	486728.644
Hackberry	9		185953.314	486729.503
Box elder	11		185943.614	486731.354
Buckthorn	7		185941.914	486728.599
Box elder	5	Dead/Dying	185901.814	486720.206
Box elder	5	Dead/Dying	185901.014	486721.203
Box elder	6	Dead/Dying	185898.614	486720.806
Box elder	5	Dead/Dying	185892.314	486718.303
Box elder	5	Dead/Dying	185894.314	486723.123
Box elder	4	Dead/Dying	185888.014	486723.323
Buckthorn	4		185864.613	486766.714
Buckthorn	4		185864.813	486778.514
Elm (American)	6		185820.014	486815.254
Box elder	4		185822.814	486815.733
Cherry (Black)	6		185820.414	486815.806
Box elder	14		185818.714	486831.954
Box elder	10		185818.414	486819.654
Box elder	11		185813.314	486832.354
Box elder	17		185809.414	486831.154
Cherry (Pin)	5		185806.614	486835.803
Eastern hophornbeam / Ironwood	8		185808.114	486841.904
Hackberry	4		185831.314	486844.823
Box elder	21		185799.414	486857.31
Buckthorn	4		185804.014	486865.123
Cherry (Pin)	4		185798.014	486861.223
Box elder	15		185796.214	486866.954
Buckthorn	5		185801.714	486876.903
Buckthorn	6		185795.614	486882.006
Box elder	12	Dead/Dying	185785.314	486880.774
Elm (Siberian)	5		185773.614	486875.503
Buckthorn	6		185764.814	486879.723
Buckthorn	6		185764.914	486880.406
Box elder	4	Dead/Dying	185771.114	486869.153
Cherry (Black)	14		185705.214	487003.551
Elm (American)	10		185719.914	487000.944
Box elder	7		185724.514	487007.399
Oak (Bur)	40		185707.813	487015.612
Box elder	5		185717.214	487022.403

MT. OLIVET LUTHERAN CHURCH - TREE SURVEY				
	Diameter		Hennepin County (feet)	
Species Name	(inches)	Condition	X-Coordinate	Y-Coordinate
Box elder	5		185712.114	487019.303
Box elder	5		185692.613	487032.041
Box elder	5		185693.914	487034.413
Box elder	7		185673.814	487036.809
Box elder	6		185685.014	487037.306
Box elder	7		185681.114	487039.809
Box elder	7		185679.214	487038.109
Box elder	9		185685.614	487028.213
Box elder	8		185718.814	486986.714
Box elder	8		185715.314	486986.414
Elm (Siberian)	4		185721.514	486981.423
Eastern Cottonwood	22		185730.613	486997.317
Eastern Cottonwood	21		185723.313	486986.117
Eastern Cottonwood	16		185741.013	486984.362
Eastern Cottonwood	16		185726.813	486990.162
Eastern Cottonwood	39		185724.414	486997.108
Maple (Amur)	4		185738.514	486974.923
Eastern Cottonwood	6		185719.913	486973.024
Elm (American)	21		185706.213	486975.5
Elm (Siberian)	5		185694.614	486968.503
Elm (Siberian)	8		185727.114	486963.104
Elm (Siberian)	7		185732.614	486946.899
Box elder	8	Dead/Dying	185724.614	486940.134
Box elder	8		185753.114	486923.704
Box elder	6	Dead/Dying	185751.014	486923.014
Box elder	6	Dead/Dying	185752.614	486918.514
Elm (Siberian)	7		185765.913	486907.517
Elm (Siberian)	7		185765.314	486903.606
Box elder	17		185772.114	486906.738
Box elder	8		185785.114	486918.604
Box elder	5	Dead/Dying	185756.514	486889.211
Buckthorn	4		185769.313	486886.19
Buckthorn	4		185770.813	486888.914
Elm (Siberian)	5		185773.014	486885.803
Box elder	12	Dead/Dying	185785.014	486883.774
Cherry (Black)	5		185793.214	486835.103
Box elder	19		185803.413	486822.562
Box elder	15	Dead/Dying	185799.414	486823.074
Box elder	17		185803.814	486813.544
Cherry (Black)	4		185809.114	486807.923
Box elder	20		185822.413	486793.917
Buckthorn	4		185824.814	486790.323
Bigtooth aspen	30		186069.526	486816.659
Cherry (Black)	12	Dead/Dying	186002.887	486776.202

MT. OLIVET LUTHERAN CHURCH - TREE SURVEY				
	Diameter		Hennepin County (feet)	
Species Name	(inches)	Condition	X-Coordinate	Y-Coordinate
Box elder	11		185946.374	486773.876
Hackberry	8		185928.166	486747.785
Box elder	6		185896.882	486764.92
Box elder	8		185898.024	486767.891
Box elder	11		185898.529	486768.246
Box elder	9		185899.619	486769.955
Box elder	12		185903.28	486773.816
Ash (Green)	7		185750.772	486947.374
Elm (American)	10		185701.803	486922.935
Maple (Red)	18		185699.233	486919.091
Elm (American)	7		185692.461	486924.371
Elm (American)	13		185702	486879.947
Black willow	33		185743.072	486860.38
Box elder	16		186452.815	486731.583
Eastern hophornbeam / Ironwood	10		186536.461	486704.28
Box elder	14		186545.434	486741.602
Box elder	9		186539.44	486744.527
Box elder	12		186538.494	486742.343
Box elder	22		186534.849	486749.855
Northern white cedar	18		186586.475	486776.174
Elm (Siberian)	6		186578.974	486776.333
Maple (Norway)	25		186579.744	486791.747
Box elder	16		186592.963	486795.377
Box elder	15		186631.938	486824.609
Northern white cedar	11		186632.385	486824.832
Northern white cedar	8		186646.899	486832.233
Northern white cedar	9		186650.082	486832.308
Box elder	12		186655.627	486829.569
Box elder	18		186670.443	486825.441
Ash (Green)	8		186707.954	486829.959
Box elder	21		186698.685	486817.281
Box elder	18		186686.517	486813.51
Box elder	10		186680.189	486812.568
Eastern hophornbeam / Ironwood	5		186667.18	486814.47
Cherry (Black)	10		186353.156	486788.589

PARKERS LAKE PLAYFIELDS - TREE SURVEY				
	Diameter		Hennepin County (feet)	
Species Name	(inches)	Condition	X-Coordinate	Y-Coordinate
Eastern Cottonwood	29		476944.847	175279.0407
Eastern Cottonwood	6		476941.2342	175290.2183
Eastern Cottonwood	13		476936.4762	175295.4969
Box Elder	9		476934.7191	175312.6311
Box Elder	6		476934.5419	175315.1437
Box Elder	11		476925.639	175303.5829
Box Elder	14		476924.9029	175301.1937
Box Elder	14		476932.6818	175296.6349
Box Elder	8		476919.5958	175306.599
Eastern Cottonwood	28		476914.7925	175314.0074
Eastern Cottonwood	28		476913.6027	175314.2573
Box Elder	8		476894.6268	175325.77
Box Elder	13		476893.4265	175324.2687
Eastern Cottonwood	16		476890.1991	175324.2782
Box Elder	4		476850.7605	175347.9593
Box Elder	12		476838.9233	175359.6366
Green Ash	11		476832.46	175369.2224
Box Elder	12		476825.3608	175370.0713
Box Elder	7		476823.7405	175373.7624
Green Ash	10		476827.7153	175383.5433
Green Ash	11		476720.7939	175370.8173
Green Ash	9		476724.5548	175364.9761
Green Ash	8		476713.6497	175366.9612
Green Ash	6	Dead	476713.3998	175366.0623
Box Elder	7		476705.2096	175365.4427
Siberian Elm	17		476651.8439	175350.6019
Siberian Elm	13		476631.4931	175347.2248
Siberian Elm	12	Dead	476635.3364	175345.1104
Siberian Elm	6		476636.2019	175344.9632
Siberian Elm	7		476640.738	175336.7334
Siberian Elm	16		476643.0784	175330.2693
Red Maple	5		476689.4292	175349.5192
Green Ash	9	Dead	476711.3753	175348.3504
Cedar	5		476734.4135	175341.2299
Box Elder	4		476739.909	175342.8123
Box Elder	6		476749.2436	175343.6239
Box Elder	12		476765.6113	175357.6784
Green Ash	11		476777.494	175347.4009
Green Ash	14		476787.1949	175336.4754
Box Elder	16		476829.9089	175342.8654
Apple	10		476855.8423	175314.6267
Box Elder	11		476875.5662	175306.1668
Box Elder	13		476883.7924	175300.7059
Box Elder	4		476888.5493	175300.3354
Box Elder	12		476891.5018	175297.382

PARKERS LAKE PLAYFIELDS - TREE SURVEY				
	Diameter		Hennepin County (feet)	
Species Name	(inches)	Condition	X-Coordinate	Y-Coordinate
Box Elder	10		476913.7263	175288.0541
Box Elder	6		476925.1692	175287.0574
Box Elder	9		476926.1368	175276.0025
Box Elder	32		476930.636	175277.7978
Box Elder	7		476936.5219	175278.8256
Siberian Elm	14		476545.81	175619.7335
Siberian Elm	9		476544.0328	175630.708
Box Elder	17		476551.2317	175636.9518
Box Elder	7		476540.7064	175645.2228
Box Elder	7		476541.281	175650.4158
Box Elder	11		476542.2365	175650.7106
Black Willow	15		476528.5518	175665.6712
Black Willow	15		476527.3916	175667.6268
Black Willow	10		476528.7824	175674.0471
Black Willow	7		476525.4838	175750.7528
Black Willow	10		476524.7003	175750.9551
Black Willow	10		476523.1426	175751.3447
Box Elder	5		476524.0565	175754.1517
Box Elder	8		476521.5469	175760.4918
Box Elder	17		476518.0321	175760.5001
Box Elder	5		476516.2351	175764.9259
Box Elder	24		476520.3651	175771.2723
Green Ash	5		476536.3358	175772.1139
Box Elder	14		476530.3265	175786.8686
Box Elder	8		476525.4433	175810.5535
Siberian Elm	8		476501.271	175832.1195
Box Elder	12		476500.6085	175842.3457
Box Elder	10		476492.161	175849.7409
Box Elder	11		476483.4222	175853.0742
Box Elder	9		476473.7122	175863.4145
Green Ash	11		476466.2404	175872.9625
Box Elder	9		476464.0734	175867.6293
Box Elder	13		476319.9969	175986.9335
Box Elder	15		476316.6451	175979.4127
Box Elder	15		476331.1895	175957.172
Box Elder	12		476445.852	175895.2618
Box Elder	15	Dead	476461.7034	175895.6798
Black Willow	14		476349.6102	175967.7677
Black Willow	13		476365.3329	175966.6623
Black Willow	12		476368.2021	175965.8715
Box Elder	10		476372.2642	175940.3988
Box Elder	8		476374.7961	175938.8217
Box Elder	8		476370.76	175937.7842
Box Elder	12		476372.1794	175935.7906
Box Elder	7		476372.9742	175935.7392
Box Elder	6		476377.2697	175935.678
Box Elder	7		476385.1227	175931.4779
Box Elder	9		476385.7323	175930.5828

PARKERS LAKE PLAYFIELDS - TREE SURVEY				
	Diameter		Hennepin County (feet)	
Species Name	(inches)	Condition	X-Coordinate	Y-Coordinate
Hackberry	20		476383.2625	175929.3518
Box Elder	14		476406.4629	175926.6117
Box Elder	13		476422.7429	175911.04
Box Elder	20		476429.7378	175898.4256
Box Elder	12		476422.7973	175911.223
Box Elder	8		476441.2881	175902.0217
Box Elder	13		476445.9046	175895.9806
Box Elder	9		476449.8708	175908.4317
Box Elder	10	Dead	476448.1561	175908.9257
Box Elder	10	Dead	476462.2872	175897.3242
Box Elder	12		476465.5504	175892.51
Box Elder	20		476353.1617	175992.1666
Box Elder	15		476387.5111	175951.0595
Box Elder	11		476387.6885	175947.8067
Box Elder	5		476388.8539	175944.9791
Box Elder	14		476395.8591	175947.6067
Box Elder	12		476398.0379	175945.015
Box Elder	14		476400.9455	175944.6843
Box Elder	13	Dead	476408.7795	175945.0871
Box Elder	13		476424.6181	175938.5452
Box Elder	11		476426.6006	175937.8346
Box Elder	19		476444.5713	175925.0569
Box Elder	11		476448.9609	175936.9875
Box Elder	21		476477.7079	175896.2205
Box Elder	30		476493.3529	175886.2361
American Elm	15		476502.1748	175881.0542
American Elm	20		476507.1787	175877.127
American Elm	15		476504.4587	175883.0284
Box Elder	10		476520.9772	175850.3637
Box Elder	4		476521.7679	175850.3698
Green Ash	17		476526.5623	175838.3968
Green Ash	6		476525.2341	175834.7816
Green Ash	8		476526.0123	175835.9353
Green Ash	15		476538.7746	175815.7102
Green Ash	6		476538.0837	175813.1987
Green Ash	11		476538.4871	175803.2176
Green Ash	6		476538.7427	175759.2038
Green Ash	6		476534.0937	175745.4515
Green Ash	9		476541.8498	175744.7249
Green Ash	10		476547.9126	175726.3261
Basswood	5		476542.5126	175725.4625

Appendix C

Wetland Delineation and Notice of Decision

BOARD OF WATER AND SOIL RESOURCES

Minnesota Wetland Conservation Act
Notice of Decision

Local Government Unit: City of Plymouth	**County:** Hennepin
Applicant Name: Bassett Creek Watershed Management Commission **Applicant Representative:** Barr Engineering	
Project Name: Mt. Olivet and Parkers Lake Stabilization Project **LGU Project No. (if any):** 2019-17	
Date Complete Application Received by LGU: 10/29/2019	
Date of LGU Decision: 12/10/2019	
Date this Notice was Sent: 12/10/2019	

WCA Decision Type - check all that apply

☒ Wetland Boundary/Type ☐ Sequencing ☐ Replacement Plan ☐ Bank Plan (not credit purchase)
☐ No-Loss (8420.0415) ☐ Exemption (8420.0420)
Part: ☐ A ☐ B ☐ C ☐ D ☐ E ☐ F ☐ G ☐ H Subpart: ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐ 9

Replacement Plan Impacts (replacement plan decisions only)

Total WCA Wetland Impact Area:
Wetland Replacement Type: ☐ Project Specific Credits: ☐ Bank Credits:
Bank Account Number(s):

Technical Evaluation Panel Findings and Recommendations (attach if any)

☒ Approve ☐ Approve w/Conditions ☐ Deny ☐ No TEP Recommendation

LGU Decision

☐ Approved with Conditions (specify below)[1] ☒ Approved[1] ☐ Denied
List Conditions:

Decision-Maker for this Application: ☒ Staff ☐ Governing Board/Council ☐ Other:

Decision is valid for: ☒ 5 years (default) ☐ Other (specify):

[1] *Wetland Replacement Plan approval is not valid until BWSR confirms the withdrawal of any required wetland bank credits. For project-specific replacement a financial assurance per MN Rule 8420.0522, Subp. 9 and evidence that all required forms have been recorded on the title of the property on which the replacement wetland is located must be provided to the LGU for the approval to be valid.*

LGU Findings – Attach document(s) and/or insert narrative providing the basis for the LGU decision[1].

☒ Attachment(s) (specify):
☒ Summary: **The TEP met on site November 7th, to review the boundary. The TEP agreed on the submitted boundary and did not have any adjustments. The delineation report is attached**

[1] *Findings must consider any TEP recommendations.*

Attached Project Documents

☒ Site Location Map
☒ Project Plan(s)/Descriptions/Reports (specify): **Wetland Delineation Report – Mt. Olivet and Parker Lake Stabilization**

Appeals of LGU Decisions

If you wish to appeal this decision, you must provide a written request within 30 calendar days of the date you received the notice. All appeals must be submitted to the Board of Water and Soil Resources Executive Director along with a check payable to BWSR for $500 *unless* the LGU has adopted a local appeal process as identified below. The check must be sent by mail and the written request to appeal can be submitted by mail or e-mail. The appeal should include a copy of this notice, name and contact information of appellant(s) and their representatives (if applicable), a statement clarifying the intent to appeal and supporting information as to why the decision is in error. Send to:

Appeals & Regulatory Compliance Coordinator
Minnesota Board of Water & Soils Resources
520 Lafayette Road North
St. Paul, MN 55155
travis.germundson@state.mn.us

Does the LGU have a local appeal process applicable to this decision?

☒ Yes[1] ☐ No

[1]*If yes, all appeals must first be considered via the local appeals process.*

Local Appeals Submittal Requirements (LGU must describe how to appeal, submittal requirements, fees, etc. as applicable)

Notice Distribution (include name)

Required on all notices:

☒ SWCD TEP Member: **Ms. Stacey Lijewski, HCA, 701 Fourth Avenue South, Suite 700, Minneapolis, MN 55415-1600** ☒ BWSR TEP Member: **Ben Carlson, BWSR, 520 Lafayette Road North, St. Paul, MN 55401**
☒ LGU TEP Member (if different than LGU contact): **Ben Scharenbroich, 3400 Plymouth Blvd, Plymouth MN 55447**
☒ DNR Representative: **Leslie Parris, MnDNR, 1200 Warner Road, St. Paul, MN 55106** **Jason Spiegel, MnDNR, 1200 Warner Road, St. Paul, MN 55106**
☒ Watershed District or Watershed Mgmt. Org.: BCWMC, c/o Laura Jester, 16145 Hillcrest Lane, Eden Prairie, MN 55346
☐ Applicant: ☒ Agent/Consultant: **Tyler Conley, Barr Engineering, 4300 MarketPointe Drive, #200, Minneapolis, MN 55435** **Karen Chandler, P.E., Barr Engineering, 4300 MarketPointe Drive, #200, Minneapolis, MN 55435**

Optional or As Applicable:

☒ Corps of Engineers:	
☐ BWSR Wetland Mitigation Coordinator (required for bank plan applications only):	
☐ Members of the Public (notice only):	☐ Other:

Signature: BSL	**Date:** 12/10/2019

This notice and accompanying application materials may be sent electronically or by mail. The LGU may opt to send a summary of the application to members of the public upon request per 8420.0255, Subp. 3.

Wetland Delineation Report

Mt. Olivet and Parker Lake Stabilization

Prepared for
City of Plymouth

September 2019

Draft Wetland Delineation Report

Mt. Olivet and Parker Lake Stabilization

Prepared for
City of Plymouth

September 2019

4300 MarketPointe Drive, Suite 200
Minneapolis, MN 55435
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Wetland Delineation Report

September 2019

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1.0 Introduction

The City of Plymouth is submitting a Wetland Delineation Report in preparation of the restoration of two unnamed streams. The project area is split between two locations centered along two unnamed streams in Plymouth, Minnesota. The southernmost Project area (Parkers Lake) encompasses 2.02 acres and is within Section 28 of Township 118 North, Range 22 West. The northernmost Project area (Mt. Olivet) encompasses 2.47 acres and is within Section 14 of Township 118 North, Range 22 West (**Figure 1**).

A field wetland delineation was conducted in the Project area on August 29, 2019, by Barr Engineering Co. Wetlands within the Project area could potentially be directly impacted by the stream restoration project. Two wetlands were delineated within the Project area as described further below.

This Wetland Delineation Report has been prepared in accordance with the U.S. Army Corps of Engineers 1987 Wetland Delineation Manual ("1987 Manual", USACE, 1987), the Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Midwest Region (USACE, 2010) and the requirements of the Minnesota Wetland Conservation Act (WCA) of 1991.

This report includes general environmental information (Section 2.0), descriptions of the delineated wetlands (Section 3.0), and a discussion of regulations and the administering authorities (Section 4.0). The Tables section includes antecedent precipitation data. The Figures section includes the Project Location Map, Topography Map, National Wetland Inventory (NWI), Public Waters Inventory (PWI), Hydric Soils Map and the Wetland Boundary Map. **Appendix A** includes Wetland Data Forms and **Appendix B** includes site photographs.

2.0 General Environmental Setting

2.1 Site Description

The Project area is located in a heavily developed setting. The Parkers Lake project area is located with the Parkers Lake Park and adjacent to the Lakeview commons apartments. This area is also bordered by 18th Ave North and County Road 6. The Mt. Olivet Project area is located between the Mt. Olivet Lutheran Church of Plymouth and the Parkside Apartments just north of Medicine Lake. The greater surrounding area consists mainly of single-family and multifamily residential buildings with some commercial development and several transportation corridors (**Figure 1**). Both of the Project areas are located on parks and utilized for recreational purposes.

2.2 Topography

The Project areas are located in an urban setting where the natural topography has been altered due to construction of residential neighborhoods and roadways. Generally, the Project areas consists of gentle slopes with a south facing aspect. Both areas drain to the south into Medicine Lake and Parkers Lake. The surrounding upland areas gradually slope towards the Project areas (**Figure 2 and Figure 3**).

2.3 Precipitation

Recent precipitation data was compared to historic precipitation data to evaluate monthly deviations from normal conditions. Precipitation data was obtained from the Minnesota Climatology Working Group, Wetland Delineation Precipitation Data Retrieval from a Gridded Database (Minnesota Climatology Office, 2019) for wetlands in Hennepin County, Township 118 North, Range 22 West, Section 28.

In 2019, antecedent moisture conditions were within the normal range according to precipitation data from the three months prior to the August 29, 2019 site visit (**Table 1**). The months of July and May received higher than average precipitation. While the month of June was drier than normal. The water year has varied between dry and wet for the past nine years but fell mostly into the wet range from 2010 through 2019 (**Table 2**).

2.4 National Wetland Inventory

The National Wetland Inventory (NWI) data identified one wetland type within the Project area near Parker Lake. This wetland was classified as a palustrine wetland with an aquatic bed that is permanently flooded and has been previously excavated (PABHx; **Figure 4**).

2.5 Water Resources

The Minnesota Department of Natural Resources (MnDNR) Public Waters Inventory (PWI) was queried for any PWIs located within or adjacent to the Project areas (**Figure 5**). No PWI basins or watercourse were identified in the Project areas. The nearest PWI is an unnamed basin located just southeast of the Project areas.

2.6 Soil Resources

Soil information for the wetland delineation area was obtained from the Soil Survey of Hennepin County, Minnesota (USDA, 1974). The following soil types are mapped within the Project areas (**Figure 6)**:

Mount Olivet

- Map Unit L42B, Kingsley-Gotham complex
- Map Unit L42C, Kingsley-Gotham complex
- Map Unit L42D, Kingsley-Gotham complex
- Map Unit L59A, Forestcity-Lundlake depressional complex
- Map Unit L22C2, Lester loam

Parkers Lake

- Map Unit L44A, Nessel loam
- Map Unit L36A, Hamel overwash-Hamel complex
- Map Unit L22D2, Lester loam
- Map Unit L16A, Muskego, Blue earth, and Houghton soils

Of these mapped soils, two are classified as hydric soils; Forestcity-Lundlake depressional complex and Muskego, Blue earth, and Houghton soils. The Hammel overwash-Hamel complex is classified as partially Hydric (**Figure 5**).

3.0 Wetland Delineation

3.1 Wetland Delineation and Classification Methods

The wetland delineation was completed according to the Routine On-Site Determination Method specified in the U.S. Army Corps of Engineers Wetlands Delineation Manual (1987 Edition) and the *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Midwest Region* (USACE, 2010) and the requirements of the Minnesota Wetland Conservation Act (WCA) of 1991.

The delineated wetland boundaries and associated sample points were surveyed using a Global Positioning System (GPS) with sub-meter accuracy. Wetlands were classified using the U.S. Fish and Wildlife Service (USFWS) Cowardin System (Cowardin et al., 1979), the USFWS Circular 39 system (Shaw and Fredine, 1956), and the Eggers and Reed Wetland Classification System (Eggers and Reed, 1977).

Representative soil samples were examined for the presence of hydric soil indicators using the Natural Resources Conservation Service (NRCS) hydric soil indicators (Version 8.1). Soil colors were determined using a Munsell® soil color chart and noted on the Wetland Data Forms **Appendix A**.

Hydrologic conditions were evaluated at each soil boring, and this information was also noted on the Wetland Data Forms. The dominant plant species were identified, and the corresponding wetland indicator status of each plant species was determined and noted on the Wetland Data Forms (**Appendix A**). Photographs taken at the time of the site visits are provided in **Appendix B**.

3.2 Wetland Delineation

Three wetlands totaling 0.25 acres were delineated within the Project areas in addition to two streams (**Table 3**) . Wetland 1 was delineated on the southern end of the Mt. Olivet project area adjacent to stream 1, Wetlands 2 and 3 are located in the Parker Lake project area adjacent to stream 2. Descriptions and assessments of the wetland areas are provided below, with representative photographs in **Appendix C**.

Table 3, Delineated Wetlands

Wetland Number	Sample Point Number	Circular 39	Cowardin Classification	Eggers and Reed	Wetland Size (Acres)
Wetland 1	SP 1-1	Type 2	PEMB	Fresh (Wet) Meadow	0.04
Wetland 2	SP 2-1	Type 3	PEMC	Shallow Marsh	0.02
Wetland 3	SP 3-1	Type 4	PABHx	Deep Marsh	0.19
Total:					0.25

Stream 1, and stream 2 had defined bed and banks with flowing water during the time of the field survey. Channel width for both streams varied depending on location but ranged between three to eight feet. The

substrate of stream 1 consisted of a mainly a silt/clay/mud with some cobbles. The substrate of stream 2 mainly consisted of cobbles with some silt/clay/mud.

3.2.1 Wetland 1

Wetland 1 encompasses approximately 0.04 acres and is located on the southern end of the Mt. Olivet Project area and includes one wetland community throughout the entire wetland: Fresh (wet) meadow, Type 2, palustrine wetland with emergent vegetation and is temporarily flooded (PEMB; **Figure 7**). Most of the periphery of Wetland 1 is located outside of the project area. The wetland area receives hydrology from the unnamed stream which flows towards the wetland basin to the south. The vegetation located at sample point (SP) 1 is dominated by green ash (*Fraxinus pennsylvanica;* FACW) and common buckthorn (*Rhamnus cathartica*; FAC) with an understory of reed canary grass (*Phalaris arundinacea;* FACW) and giant goldenrod (*Solidago gigantea*; FACW).

At the time of the field survey majority of the wetland area was saturated. Sample point one, two primary hydrology indicators, saturation (A3) and inundation visible on aerial imagery (B7) noted at the soil surface, were observed at SP 1. Secondary indicators of hydrology included saturation visible on aerial imagery (C9), geomorphic position (D2) and FAC-neutral test.

Soils mapped at SP 1 were identified as Kingsley-Gotham complex (L42B). Sampled soils were dark gray with a clay loam texture down to 5 inches and transitioned to dark gray mixed with a lighter brown gray down to 7 inches where it then transitions to predominately a light brown/gray color with 4 percent redoximorphic concentrations down to 22 inches. The soils at SP 1 met the redox dark surface F6) hydric soil indicator (F1).

The transition to upland was defined by the lack of hydrology and hydric soil indicators. The vegetation in upland area consisted of a mix of hydrophytic and upland vegetation such as; green ash (*Fraxinus pennsylvanica*; FACW), common buckthorn, reed canary grass, and giant goldenrod. The upland area is located adjacent to an apartment complex and is regularly mowed.

3.2.2 Wetland 2

Wetland 2 encompasses approximately 0.02 acres and is located on the southern end of the Parker Lake Project area. This wetland is located near Stream 2 but is not connected through surface flows. Wetland 2 is a storm water pond and was classified as a Type 3, shallow marsh that has emergent vegetation and is seasonally flooded (PEMC; **Figure 7**). The wetland is surrounded by woody vegetation such as American elm (*Ulmus americana*; FACW), smooth sumac (*Rhus glabra*; UPL), and red osier dogwood (*Cornus alba*: FACW). The wetland was dominated by water smartweed (*Persicaria amphibia*; OBL), hybrid cattail (*Typha x gluaca*; OBL) and jewel weed (*Impatiens capensis*; FACW).

At the time of the field survey the wetland was saturated throughout the wetland area, but no standing water was present. Two primary indicators of hydrology were observed at SP 2-1: saturation (A3) observed at six inches from the soil surface and inundation visible on aerial imagery (B7). Secondary indicators included saturation visible on aerial imagery (C9) and FAC-neutral test (D5).

According to NRCS data the soils mapped at SP 2-1 were identified as Muskego, Blue earth, and Houghton soils. The soil sampled at SP 2-1 were very dark with five percent redoximorphic concentrations and 5 percent depletions in the matrix, and had clay loam soil texture in the upper 6 inches. Between 6 and 10 inches, the soil changed to a dark matrix color with 10 percent gley depletions and two percent redoximorphic concentrations with a clay loam soil texture. From 10 to 17 inches, the matrix changed to a predominantly gley soil color. The sampled soils met the Loamy gleyed matrix (F2) hydric soil indicator.

The transition to upland consisted mainly of manicured park property and paved parking surfaces. No hydrology or hydric soil indicators were observed at SP 2-2. The dominant vegetation in upland areas consisted of yellow foxtail (*Setaria pumila*; FAC) and Kentucky bluegrass (*Poa pratensis*; FAC), and butter and eggs (*Linaria vulgaris*; UPL).

3.2.3 Wetland 3

Wetland 3 encompasses approximately 0.19 acres and is located in the central part of the Parker Lake Project area. This wetland is connected to the unnamed stream through a culvert to the north and drains through a culvert to the south under the park access road. The wetland area is a storm water pond and was classified as a Type 4, deep marsh palustrine wetland with an aquatic bed that has been previously excavated and is permanently flooded (PABHx; **Figure 7**). The perimeter of the wetland was dominated by broadleaf arrowhead (*Sagittaria latifolia*; OBL), Joe pye weed (*Eutrochium maculatum*; OBL), common boneset (*Eupatorium perfoliatum*; OBL) and sneezeweed (*Helenium autumnale*; FACW). The center of the wetland was open water and contained no vegetation.

At the time of the field survey wetland contained standing water throughout 90 percent of the wetland area. The side slopes of the basin that were not inundated and contained a mix of hydrophytic vegetation. Three primary indicators of hydrology were observed at SP 3-1: saturation (A3), algal mat or crust (B4) and inundation visible on aerial imagery (B7). Secondary hydrology indicators included geomorphic potion (D2) and FAC-neutral test (D5).

According to NRCS data, the soils at SP 3-1 are Hamel overwash-Hamel complex. The sampled soils were very dark with a clay soil texture in the upper eight inches. Between eight and 16 inches, the soil transitioned to a dark black color with four percent prominent redoximorphic concentrations. The redoximorphic concentrations were more prominent between 16 and 20 inches and accounted for 8 percent of the soil matrix. The sampled soils meet the redox dark surface (F6) hydric soil indicator.

The transition to upland consisted mainly of manicured park property and paved parking surfaces. No hydrology or hydric soil indicators were observed at SP 3-2. The dominant vegetation in upland areas consisted of yellow foxtail (*Setaria pumila*;FAC), Kentucky bluegrass (*Poa pratensis*; FAC), and prairie cordgrass (*Spartina pectinata*; FACW). Vegetation at this sample point was heavily disturbed from frequent mowing.

4.0 Regulatory Overview

The U.S. Army Corps of Engineers (USACE) regulates the dredge or placement of fill materials into wetlands that are located adjacent to or are hydrologically connected to interstate or navigable waters under the authority of Section 404 of the Clean Water Act. If the USACE has jurisdiction over any portion of a project, they may also review impacts to wetlands under the authority of the National Environmental Policy Act.

Filling, excavating, and draining wetlands are also regulated by the Minnesota Wetland Conservation Act (WCA), which is administered by the City of Plymouth. The City of Plymouth and the USACE, should be contacted before altering any wetlands in the Project area. Delineated wetland boundaries may be reviewed, if needed, by a Technical Evaluation Panel (TEP) consisting of representatives from the Minnesota Board of Water and Soil Resources, City of Plymouth, and Hennepin County, along with the USACE.

5.0 References

Cowardin, L.M., V. Carter, F.C. Golet, and R.T. LaRoe. 1979. *Classification of Wetlands and Deepwater Habitats of the United States.* U.S. Fish and Wildlife Service, FWS/OBS079/31, 103 pp.

Eggers, S.D. and Reed, D.M. 1997. *Wetland Plants and Plant Communities of Minnesota and Wisconsin.* U.S. Army Corps of Engineers, St. Paul District. St. Paul, Minnesota.

Minnesota State Climatology Office. 2019. Wetland Delineation Precipitation Data Retrieval from a Gridded Database. Accessed from: http://climateapps.dnr.state.mn.us/gridded_data/precip/wetland/wetland.asp

U.S. Department of Agriculture, Natural Resources Conservation Service. 1974. *Soil Survey of Hennepin County, Minnesota*. Washington, D.C.

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U.S. Army Corps of Engineers. *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Midwest Region*. August 2010. Wetlands Regulatory Assistance Program.

U.S. Army Corps of Engineers. 1987. *1987 U.S. Army Corps of Engineers Wetland Delineation Manual*. Wetlands Research Program Technical Report Y-87-1 (on-line edition). Waterways Experiment Station, Vicksburg, Mississippi.

U.S. Fish and Wildlife Service. 1956. *Wetlands of the United States Circular 39*. U.S. Government Printing Office, Washington, D.C.

Tables

Table 1
Antecedent Moisture Conditions Prior to August 29, 2019 Site Visit
Mt. Olivet/Perkins Lake Wetland Delineation
Hennepin County, MN

Precipitation Worksheet Using Gridded Database

Precipitation data for target wetland location:
County: Hennepin **Township Number**: 118N
Township Name: Plymouth **Range Number**: 22W
Nearest Community: Plymouth **Section Number**: 28

Aerial photograph or site visit date:
Thursday, August 29, 2019

Score using 1981-2010 normal period

(value are in inches)	first prior month: **July 2019**	second prior month: **June 2019**	third prior month: **May 2019**
estimated precipitation total for this location:	7.54R	2.47R	7.91R
there is a 30% chance this location will have less than:	2.47	3.24	2.71
there is a 30% chance this location will have more than:	4.25	5.26	4.09
type of month: **dry** **normal** **wet**	**wet**	**dry**	**wet**
monthly score	3 * **3** = 9	2 * **1** = 2	1 * **3** = 3
multi-month score: 6 to 9 (**dry**) 10 to 14 (**normal**) 15 to 18 (**wet**)	**14 (Normal)**		

Table 2
Precipitation in Comparison to WETS Data
West Vadnais Wetland Delineation
Ramsey County, MN

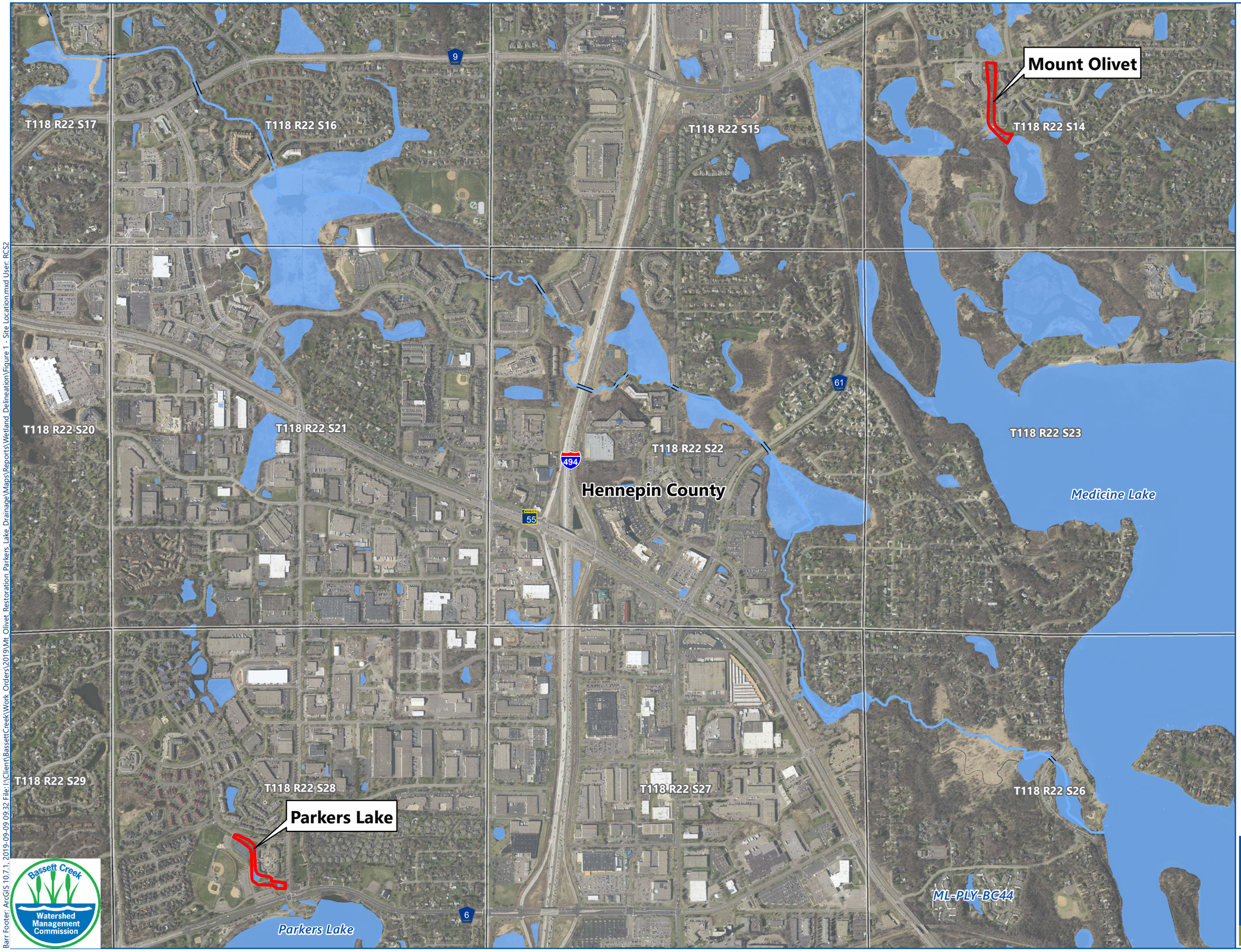
Precipitation data for target wetland location:

County: Hennepin **Township Number**: 118N
Township Name: Plymouth **Range Number**: 22W
Nearest Community: Plymouth **Section Number**: 28

Precipitation Totals are in Inches	
Color Key	**Multi-month Totals**:
total is in lowest 30th percentile of the period-of-record distribution	**WARM** = warm season (May thru September)
total is => 30th and <= 70th percentile	**ANN** = calendar year (January thru December)
total is in highest 30th percentile of the period-of-record distribution	**WAT** = water year (Oct. previous year thru Sep. present year)

Period-of-Record Summary Statistics															
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	WARM	ANN	WAT
30%	0.53	0.54	1.15	1.64	2.60	3.13	2.46	2.96	1.91	1.19	0.75	0.61	16.27	26.54	26.05
70%	1.08	1.24	1.95	2.84	4.35	5.50	4.62	4.51	3.80	2.73	1.94	1.34	20.93	32.84	32.11
mean	0.90	0.94	1.64	2.42	3.72	4.46	3.86	3.69	3.09	2.22	1.53	1.05	18.78	29.44	29.48
1981-2010 Summary Statistics															
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	WARM	ANN	WAT
30%	0.53	0.39	1.28	2.05	2.71	3.24	2.47	3.13	2.41	1.28	1.06	0.72	17.06	28.62	26.77
70%	1.10	0.92	1.99	2.77	4.09	5.26	4.25	4.73	3.85	3.38	2.00	1.45	21.94	34.15	34.37
mean	0.84	0.82	1.83	2.64	3.56	4.43	4.16	4.16	3.40	2.45	1.74	1.19	19.71	31.22	31.03
Year-to-Year Data															
Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	WARM	ANN	WAT
2019	0.51	2.16	2.19	3.53	7.91R	2.47R	7.54R								
2018	0.93	1.31	1.22	2.28	2.46	4.34	3.78	3.13	5.92	3.29	1.25	1.52	19.63	31.43	31.63
2017	0.68	0.70	0.69	3.40	6.18	3.82	3.86	7.22	1.90	5.08	0.38	0.80	22.98	34.71	35.72
2016	0.32	0.90	1.33	3.51	2.23	2.95	6.06	9.69	7.06	3.24	2.20	1.83	27.99	41.32	42.88
2015	0.39	0.34	0.69	1.84	4.39	3.67	7.14	3.47	3.78	2.77	4.33	1.73	22.45	34.54	28.95
2014	1.36	1.47	0.73	7.48	4.62	11.03	3.15	2.96	1.97	1.12	1.13	0.99	23.73	38.01	41.26
2013	0.66	1.16	1.86	4.14	4.98	7.69	4.99	1.63	1.45	4.33	0.57	1.59	20.74	35.05	32.45
2012	0.46	2.14	1.21	2.97	9.81	4.21	4.41	1.44	0.53	1.48	0.85	1.56	20.40	31.07	29.04
2011	0.93	0.99	1.56	3.00	6.21	4.04	6.26	3.50	0.53	0.93	0.19	0.74	20.54	28.88	34.06
2010	0.58	0.80	0.97	1.87	3.00	5.94	3.66	5.86	6.18	2.03	1.95	3.06	24.64	35.90	37.16
2009	0.45	0.92	1.94	1.15	0.47	3.74	0.92	6.68	0.89	5.52	0.61	2.17	12.70	25.46	21.34
2008	0.16	0.52	2.02	3.65	2.54	4.52	2.42	3.04	2.55	1.48	1.25	1.45	15.07	25.60	28.33
2007	0.70	1.30	3.39	2.38	3.29	1.26	2.23	7.30	4.92	5.12	0.10	1.69	19.00	33.68	31.25
2006	0.61	0.40	1.50	2.90	3.49	4.00	1.73	4.67	3.20	0.69	1.14	2.65	17.09	26.98	30.10
2005	1.29	0.87	1.22	2.50	3.55	6.26	2.55	3.12	6.57	4.68	1.56	1.36	22.05	35.53	33.06
2004	0.45	1.35	2.21	2.63	6.39	5.64	4.15	1.42	5.02	3.63	1.07	0.43	22.62	34.39	32.13
2003	0.23	0.93	1.62	2.71	4.85	6.65	2.33	0.48	2.47	0.91	1.16	0.80	16.78	25.14	26.22
2002	0.55	0.56	1.83	3.76	3.76	8.01	6.11	7.17	4.22	3.61	0.07	0.27	29.27	39.92	40.31
2001	1.27	1.28	0.92	7.81	5.34	5.09	2.45	3.02	3.49	0.84	2.90	0.60	19.39	35.01	36.02
2000	0.90	1.14	1.01	1.31	3.59	3.26	5.95	3.12	2.08	0.83	3.34	1.18	18.00	27.71	24.19

Figures



Project Areas

Streams and Tunnels

Open Channel

Culvert or Bridge

Ponds and Wetlands

Public Land Survey Sections

N

0 1,250 2,500

Feet

SITE LOCATION

Wetland Delineation

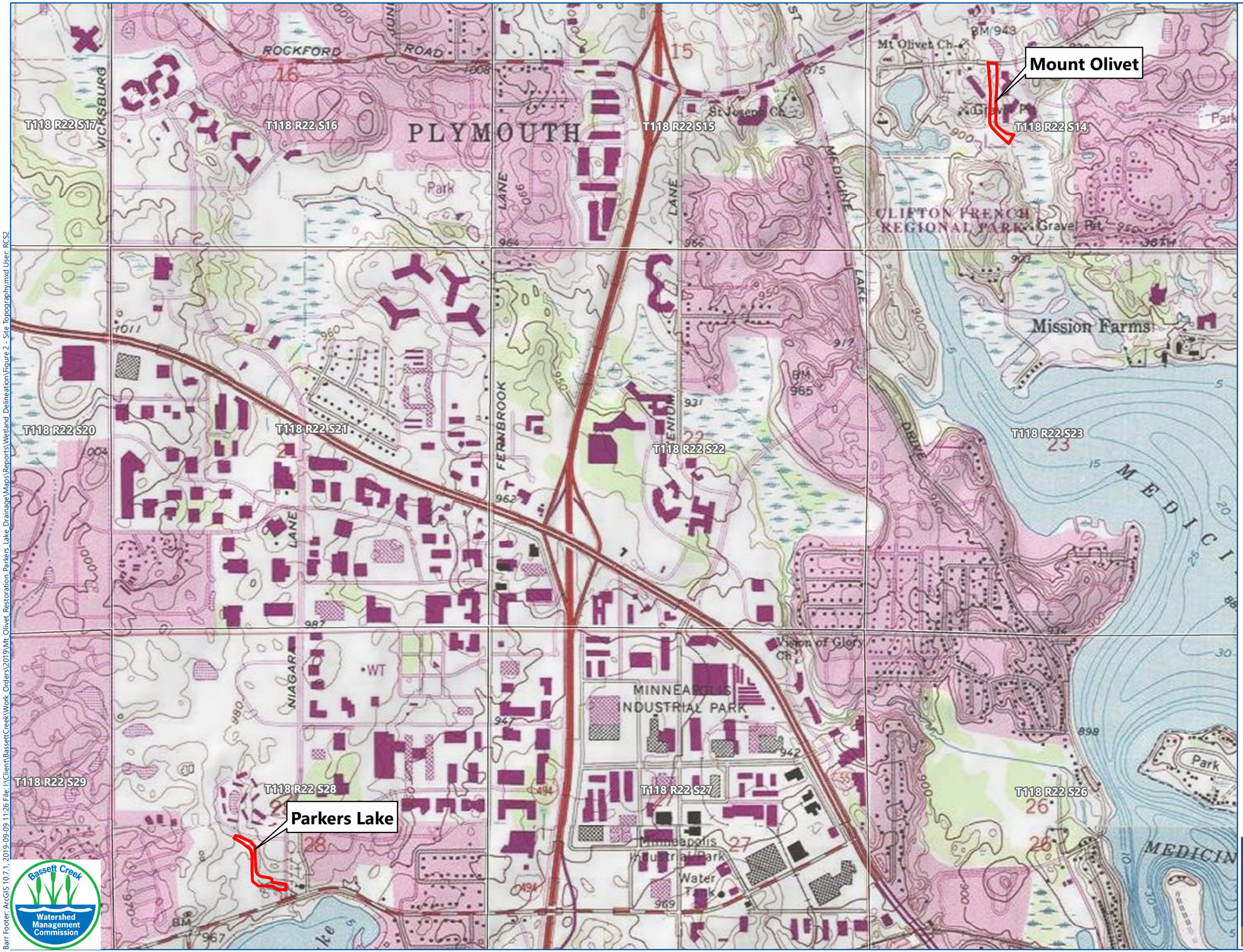
Mt. Olivet/Parkers Lake

Plymouth, Minnesota

FIGURE 1

Bassett Creek Watershed Management Commission

Barr Footer: ArcGIS 10.7.1, 2019-09-09 09:32 File: I:\Client\BassettCreek\Work_Orders\2019\Mt_Olivet_Restoration_Parkers_Lake_Drainage\Maps\Reports\Wetland_Delineation\Figure 1 - Site Location.mxd User: RCS2



Project Areas

Public Land Survey Sections

N

0 1,250 2,500

Feet

SITE TOPOGRAPHY

Wetland Delineation

Mt. Olivet/Parkers Lake

Plymouth, Minnesota

FIGURE 2

Bassett Creek Watershed Management Commission

Barr Footer: ArcGIS 10.7.1, 2019-09-09 11:26 File: I:\Client\BassettCreek\Work_Orders\2019\Mt_Olivet_Restoration_Parkers_Lake_Drainage\Maps\Reports\Wetland_Delineation\Figure 2 - Site Topography.mxd User: RCS2

Old Rockford Rd

Larch La

Ives La

Ives La

Hennepin County

Mount Olivet

T118 R22 S14

41st Ave

Nearmap Imagery 4/20/2019

Project Areas

Public Land Survey Sections

Contours

10-Foot Contour

2-Foot Contour

N

0 125 250

Feet

LiDAR 2 Foot Contours

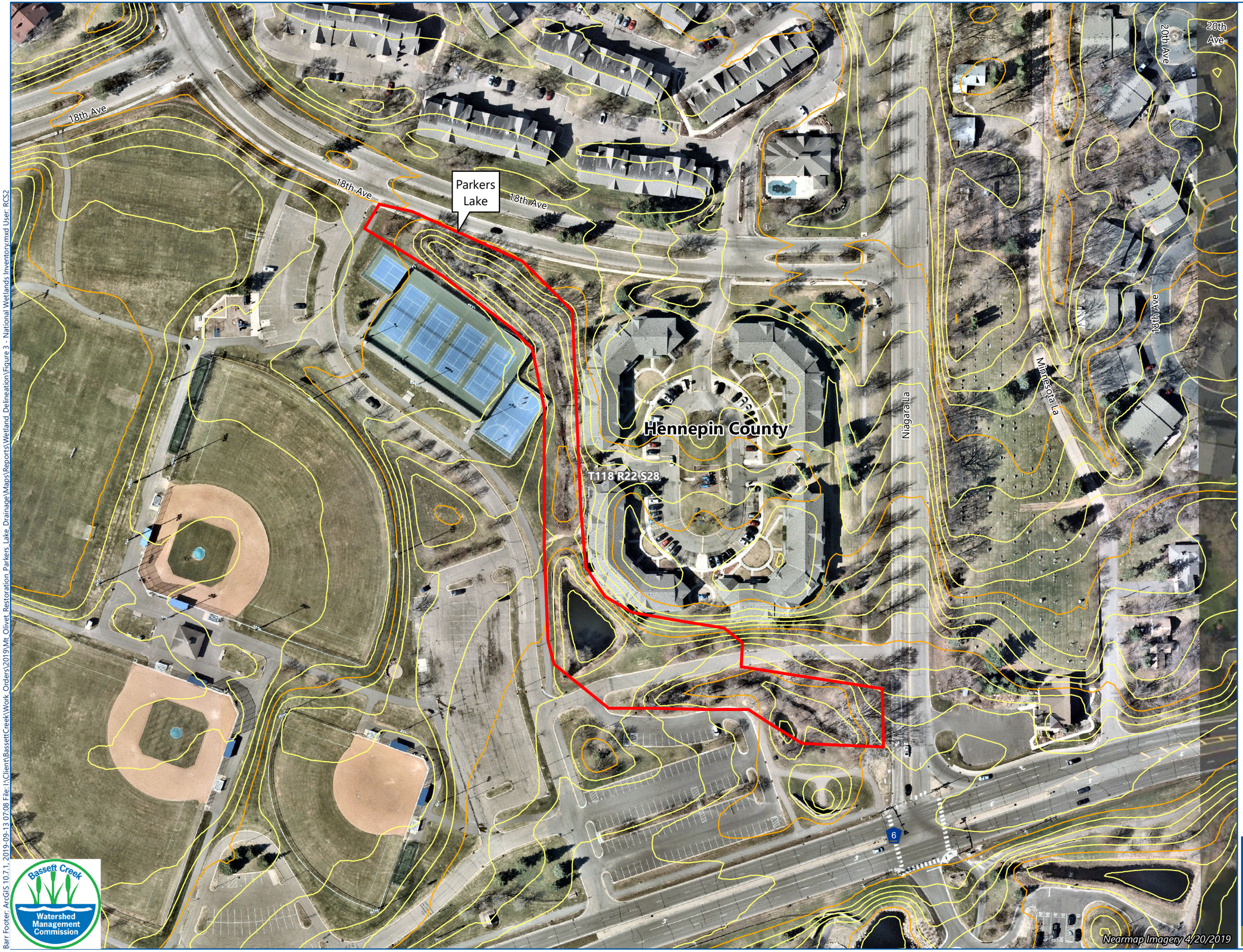
Wetland Delineation Mt. Olivet/Parkers Lake

Plymouth, Minnesota

FIGURE 3

Bassett Creek Watershed Management Commission

Barr Footer: ArcGIS 10.7.1, 2019-09-13 07:08 File: I:\Client\BassettCreek\Work_Orders\2019\Mt_Olivet_Restoration_Parkers_Lake_Drainage\Maps\Reports\Wetland_Delineation\Figure 3 - National Wetlands Inventory.mxd User: RCS2



Project Areas

Public Land Survey Sections

Contours

10-Foot Contour

2-Foot Contour

N

0 125 250

Feet

LiDAR 2 Foot Contours
Wetland Delineation Mt. Olivet/Parkers Lake
Plymouth, Minnesota

FIGURE 3

Nearmap Imagery 4/20/2019

Bassett Creek Watershed Management Commission

Barr Footer: ArcGIS 10.7.1, 2019-09-13 07:08 File: I:\Client\BassettCreek\Work_Orders\2019\Mt_Olivet_Restoration_Parkers_Lake_Drainage\Maps\Reports\Wetland_Delineation\Figure 3 - National Wetlands Inventory.mxd User: RCS2

Project Areas

NWI Wetlands

- Aquatic Bed/Nonpersistent Emergent
- Emergent
- Forested
- Unconsolidated Bottom (Open Water)

Public Land Survey Sections

0 125 250

Feet

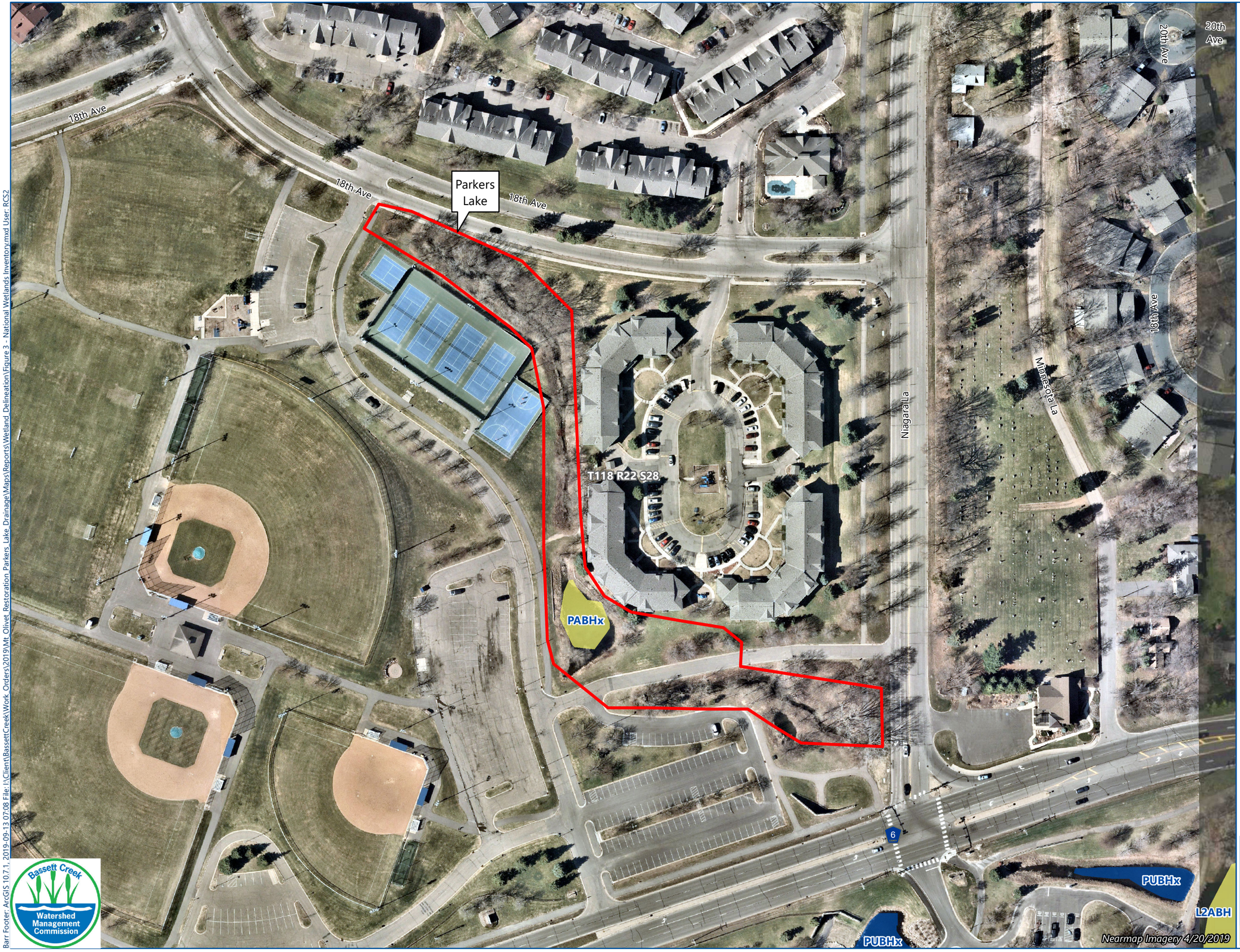
NATIONAL WETLANDS INVENTORY

Wetland Delineation
Mt. Olivet/Parkers Lake
Plymouth, Minnesota

FIGURE 4

Bassett Creek Watershed Management Commission

Barr Footer: ArcGIS 10.7.1, 2019-09-13 07:08 File: i:\Client\BassettCreek\Work_Orders\2019\Mt_Olivet_Restoration_Parkers_Lake_Drainage\Maps\Reports\Wetland_Delineation\Figure 3 - National Wetlands Inventory.mxd User: RCS2



Project Areas

NWI Wetlands

- Aquatic Bed/Nonpersistent Emergent
- Unconsolidated Bottom (Open Water)
- Public Land Survey Sections

N

0 125 250

Feet

NATIONAL WETLANDS INVENTORY

Wetland Delineation
Mt. Olivet/Parkers Lake
Plymouth, Minnesota

FIGURE 4

Bassett Creek Watershed Management Commission

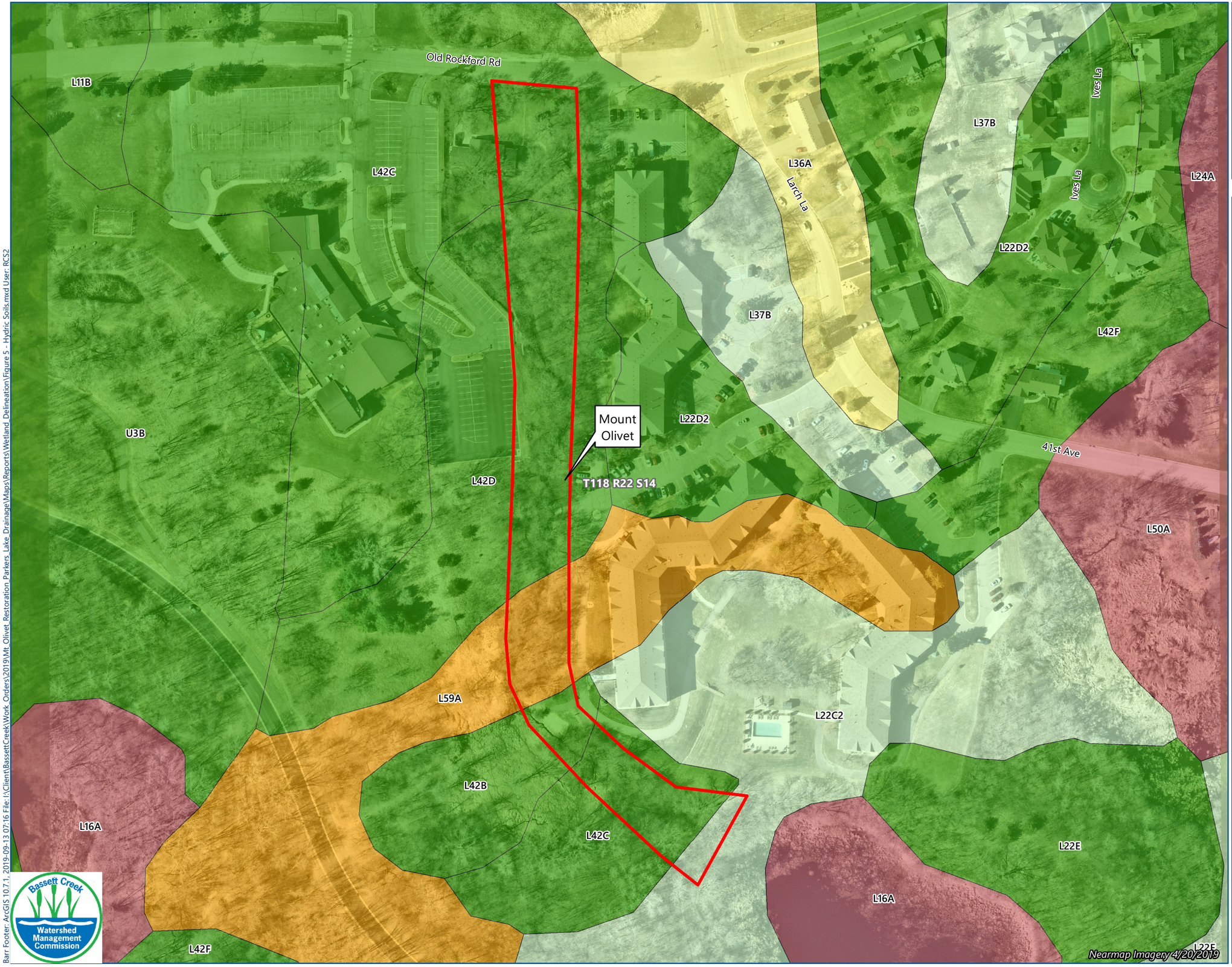

Project Areas
Public Water Inventory Basins
Public Land Survey Sections
Unnamed
Unnamed
Unnamed
Unnamed
Medicine
Mount Olivet
T118 R22 S15
T118 R22 S14
Rockford Rd
Rockford Rd
42nd Pl
Oakview La
Pineview La
Magnolia La
Magnolia La
42nd Ave
Larch La
Old Rockford Rd
Hemlock La
Goldenrod La
42nd Ct
Deerwood La
Evergreen La
Forestview La N
Mission Oaks La
42nd Ave
Ives La
Ives La
41st Ave
Evergreen La
Forestview La
40th Ave
40th Pl
Goldenrod La
39th Ave
Deerwood La
38th Ave
38th Ave
38th Ave
Evergreen La
37th Pl
37th
Nearmap Imagery 4/20/2019
0
125
250
Feet
PUBLIC
WATERS INVENTORY
Wetland Delineation
Mt. Olivet/Parkers Lake
Plymouth, Minnesota
FIGURE 5
Bassett Creek
Watershed
Management
Commission
Barr Footer: ArcGIS 10.7.1, 2019-09-13 07:11 File: I:\Client\BassettCreek\Work_Orders\2019\Mt_Olivet_Restoration_Parkers_Lake_Drainage\Maps\Reports\Wetland_Delineation\Figure 4 - Public Waters Inventory.mxd User: RCS2

Project Areas
Public Water Inventory Basins
Public Land Survey Sections

0 125 250
Feet

PUBLIC WATERS INVENTORY
Wetland Delineation
Mt. Olivet/Parkers Lake
Plymouth, Minnesota
FIGURE 5

Barr Footer: ArcGIS 10.7.1, 2019-09-13 07:11 File: i:\Client\BassettCreek\Work_Orders\2019\Mt_Olivet_Restoration_Parkers_Lake_Drainage\Maps\Reports\Wetland_Delineation\Figure 4 - Public Waters Inventory.mxd User: RCS2



Project Areas

Hydric Soil Classification

- All Hydric (100%)
- Predominantly Hydric (66% to 99%)
- Partially Hydric (33% to 65%)
- Predominantly Non-Hydric (1% to 32%)
- Not Hydric (0%)
- Public Land Survey Sections

N

0 125 250

Feet

HYDRIC SOILS

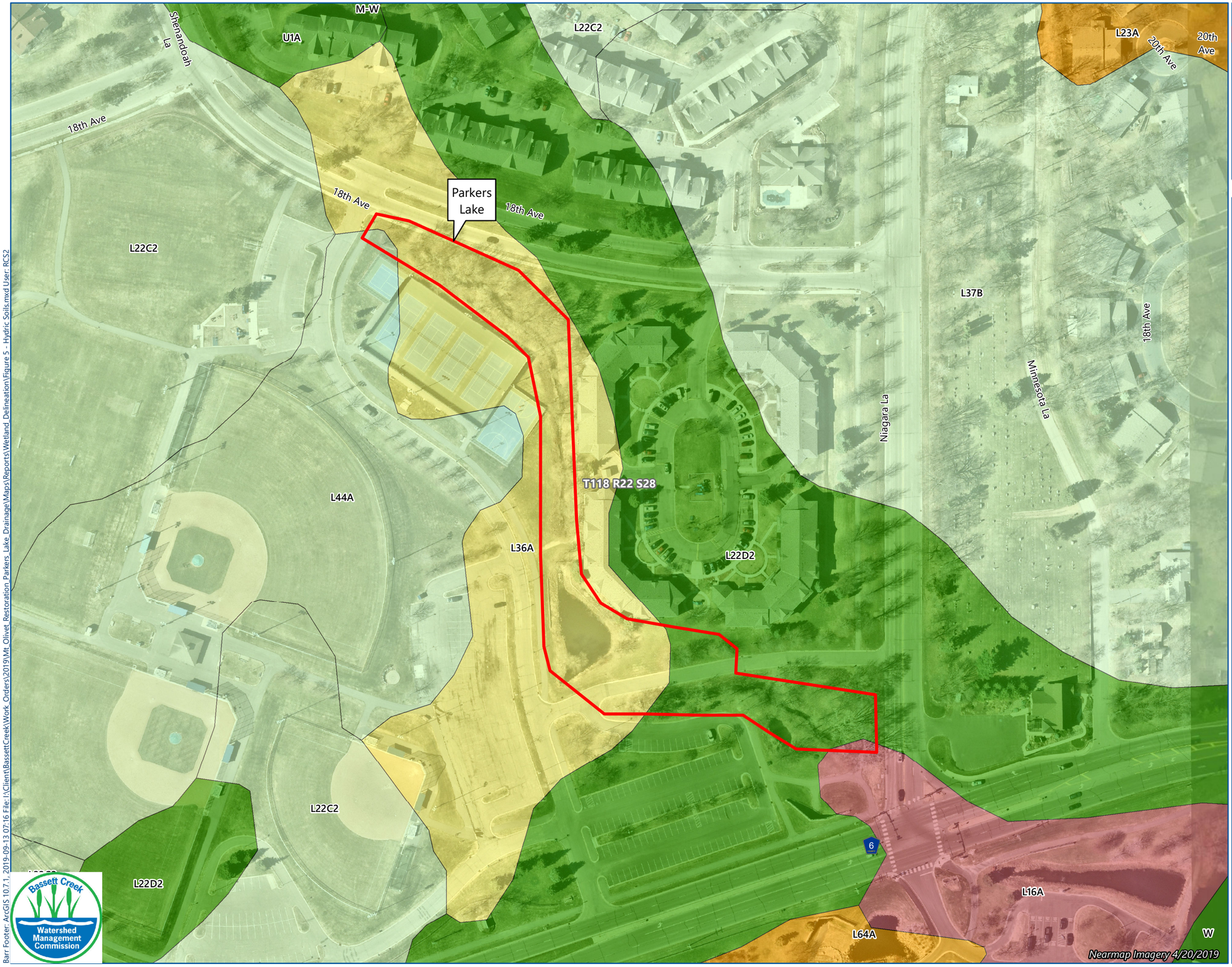
Wetland Delineation

Mt. Olivet/Parkers Lake

Plymouth, Minnesota

FIGURE 6

Barr Footer: ArcGIS 10.7.1, 2019-09-13 07:16 File: I:\Client\BassettCreek\Work_Orders\2019\Mt_Olivet_Restoration_Parkers_Lake_Drainage\Maps\Reports\Wetland_Delineation\Figure 5 - Hydric_Soils.mxd User: RCS2



Project Areas

Hydric Soil Classification

- All Hydric (100%)
- Predominantly Hydric (66% to 99%)
- Partially Hydric (33% to 65%)
- Predominantly Non-Hydric (1% to 32%)
- Not Hydric (0%)

Public Land Survey Sections

N

0 125 250

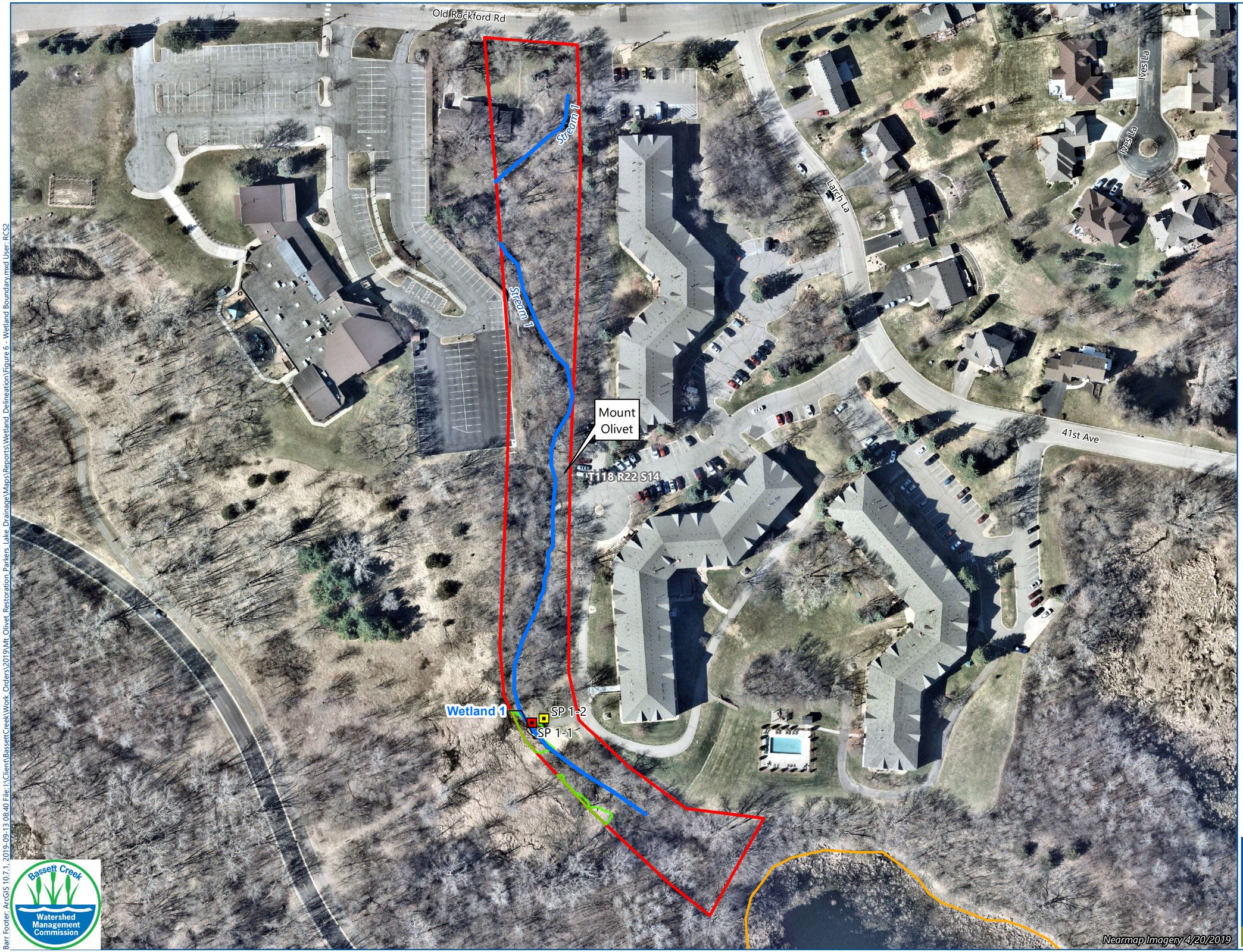
Feet

HYDRIC SOILS
Wetland Delineation
Mt. Olivet/Parkers Lake
Plymouth, Minnesota

FIGURE 6

Bassett Creek Watershed Management Commission

Barr Footer: ArcGIS 10.7.1, 2019-09-13 07:16 File: I:\Client\BassettCreek\Work_Orders\2019\Mt_Olivet_Restoration_Parkers_Lake_Drainage\Maps\Reports\Wetland_Delineation\Figure 5 - Hydric Soils.mxd User: RCS2



Wetland Sample Points
- Upland
- Wetland
- Stream Boundary

Delineated Wetlands
- Type 2
- Project Areas
- Public Land Survey Sections
- Adjacent Wetland

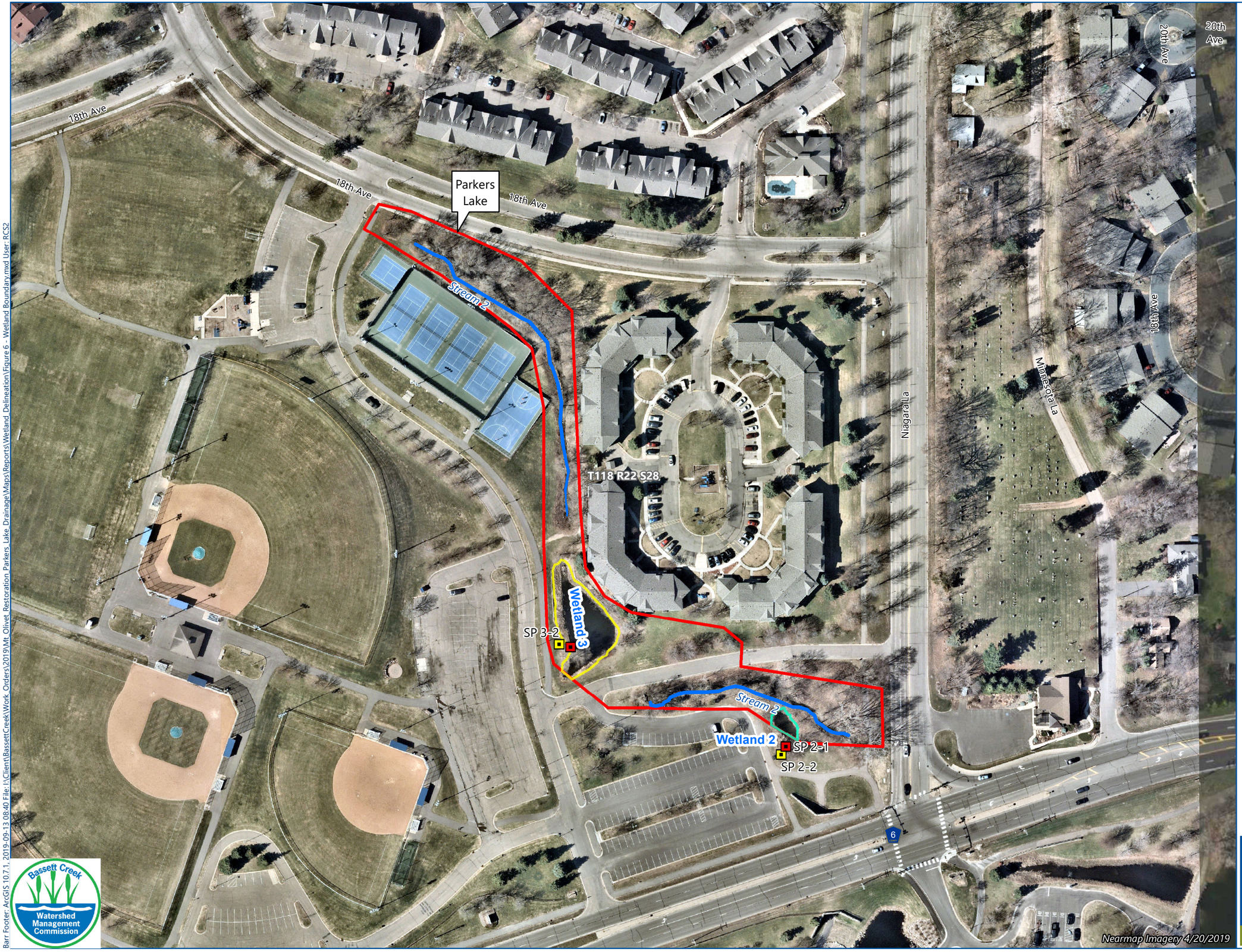
0 125 250
Feet

WETLAND BOUNDARY
Wetland Delineation
Mt. Olivet/Parkers Lake
Plymouth, Minnesota

FIGURE 7

Bassett Creek Watershed Management Commission

Barr Footer: ArcGIS 10.7.1, 2019-09-13 08:40 File: i:\Client\BassettCreek\Work_Orders\2019\Mt_Olivet_Restoration_Parkers_Lake_Drainage\Maps\Reports\Wetland_Delineation\Figure 6 - Wetland Boundary.mxd User: RCS2



Wetland Sample Points

- Upland
- Wetland
- Stream Boundary

Delineated Wetlands

- Type 3
- Type 4
- Project Areas
- Public Land Survey Sections

N

0 125 250

Feet

WETLAND BOUNDARY

Wetland Delineation
Mt. Olivet/Parkers Lake
Plymouth, Minnesota

FIGURE 7

Bassett Creek Watershed Management Commission

Appendix A
Wetland Delineation Datasheets

WETLAND DETERMINATION DATA FORM - Midwest Region

Project/Site: Mt. Olivet | Applicant/Owner: City of Plymouth | City/County: Plymouth | State: MN | Sampling Date: 08/29/19

Investigator(s): TAC | Section: 14 | Township: 118 | Range: 22 | Sampling Point: SP 1-1

Land Form: Hillslope | Local Relief: Concave | Slope %: 2 | Soil Map Unit Name: Kingsley-Gotham complex

Subregion (LRR): M | Latitude: 45.026610 | Longitude: -93.434528 | Datum: NAD 1983

Cowardin Classification: PEME | Circular 39 Classification: Type 2 | Mapped NWI Classification: None

Are climatic/hydrologic conditions on the site typical for this time of year? Yes (If no, explain in remarks) | Eggers & Reed (primary): Fresh (Wet) Meadow

Are vegetation No Soil No Hydrology No significantly disturbed? | Are "normal circumstances" present? Yes | Eggers & Reed (secondary):

Are vegetation No Soil No Hydrology No naturally problematic? | Eggers & Reed (tertiary):

Eggers & Reed (quaternary):

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic vegetation present? Yes
Hydric soil present? Yes
Indicators of wetland hydrology present? Yes
Is the sampled area within a wetland? Yes

General Remarks (explain any answers if needed):

If yes, optional Wetland Site ID: Wetland 1

VEGETATION

Tree Stratum (Plot Size: 30 ft)

		Absolute % Cover	Dominant Species?	Indicator Status
1.	Fraxinus pennsylvanica	20	Yes	FACW
2.		0		
3.		0		
4.		0		
	Total Cover:	20		

Sapling/Shrub Stratum (Plot Size: 15 ft)

1.	Rhamnus cathartica	50	Yes	FAC
2.		0		
3.		0		
4.		0		
5.		0		
	Total Cover:	50		

Herb Stratum (Plot Size: 5 ft)

1.	Phalaris arundinacea	75	Yes	FACW
2.	Solidago gigantea	15	No	FACW
3.	Impatiens capensis	5	No	FACW
4.	Urtica dioica	5	No	FACW
5.		0		
6.		0		
7.		0		
8.		0		
	Total Cover:	100		

Woody Vine Stratum (Plot Size: 30 ft)

1.		0		
2.		0		
	Total Cover:	0		

% Bare Ground in Herb Stratum: | % Sphagnum Moss Cover:

Vegetation Remarks: (include photo numbers here or on a separate sheet)

50/20 Thresholds:	20%	50%
Tree Stratum	4	10
Sapling/Shrub Stratum	10	25
Herb Stratum	20	50
Woody Vine Stratum	0	0

Dominance Test Worksheet:

Number of Dominant Species That Are OBL, FACW or FAC: 3 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW or FAC: 100.00% (A/B)

Prevalence Index Worksheet:

Total % Cover of:		Multiply by:	
OBL Species	0	X 1	0
FACW Species	120	X 2	240
FAC Species	50	X 3	150
FACU Species	0	X 4	0
UPL Species	0	X 5	0
Column Totals:	170 (A)		390 (B)

Prevalence Index = B/A = 2.29

Hydrophytic Vegetation Indicators:

- Yes — Rapid Test for Hydrophytic Vegetation
- Yes — Dominance Test is >50%
- Yes — Prevalence Index ≤ 3.0 [1]
- No — Morphological Adaptations [1] (provide supporting data in vegetation remarks or on a separate sheet)
- No — Problematic Hydrophytic Vegetation [1] (Explain)

[1] Indicators of hydric soil & wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic vegetation present? Yes

Vegetation is partially mowed by the apartment building to the east.

WETLAND DETERMINATION DATA FORM - Midwest Region

SOIL

Sampling Point: SP 1-1

Profile Description: (Describe to the depth needed to document the indicator or confirm the abscence of indicators).

	Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Redox Features Type [1]	Redox Features Loc [2]	Texture	Remarks
1.	0 - 5	10YR 3/2	100					Clay loam	
2.	5 - 7	10YR 3/2	50					Clay loam	
3.	-	10YR 4/2	50					Clay loam	
4.	7 - 22	10YR 4/2	96	7.5YR4/6	4	C	M	Clay loam	
5.	-								
6.	-								

[1] Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains [2] Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (applicable to all LRRs, unless otherwise noted)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5)
- ☐ 2 cm Muck (A10)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ 5 cm Mucky Peat or Peat (S3)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☑ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)

Indicators for Problematic Hydric Soils [3]:

- ☐ Coast Prairie Redox (A16)
- ☐ Dark Surface (S7)
- ☐ Iron-Manganese Masses (F12)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (explain in soil remarks)

[3] Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present): *Type:* _____ *Depth (inches):* _____ **Hydric soil present?** Yes

Soil Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☑ Saturation (A3)
- ☐ Water Marks (B1)
- ☐ Sediment Deposits (B2)
- ☐ Drift Deposits (B3)
- ☐ Algal Mat or Crust (B4)
- ☐ Iron Deposits (B5)
- ☑ Inundation Visible on Aerial Imagery (B7)
- ☐ Sparsely Vegetated Concave Surface (B8)
- ☐ Water-Stained Leaves (B9)
- ☐ Aquatic Fauna (B13)
- ☐ True Aquatic Plants (B14)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres on Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Tilled Soils (C6)
- ☐ Thin Muck Surface (C7)
- ☐ Gauge or Well Data (D9)
- ☐ Other (explain in remarks)

Secondary Indicators (minimum of two required)

- ☐ Surface Soil Cracks (B6)
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Crayfish Burrows (C8)
- ☑ Saturation Visible on Aerial Imagery (C9)
- ☐ Stunted or Stressed Plants (D1)
- ☑ Geomorphic Position (D2)
- ☑ FAC-Neutral Test (D5)

Field Observations:

Surface water present? ☐ **Surface Water Depth (inches):** _____

Water table present? ☐ **Water Table Depth (inches):** _____

Saturation present? (includes capillary fringe) ☑ **Saturation Depth (inches):** 1

Indicators of wetland hydrology present? Yes

Describe Recorded Data:

Recorded Data: ☐ Aerial Photo ☐ Monitoring Well ☐ Stream Gauge ☐ Previous Inspections

Hydrology Remarks:

9/18/2019 1:52:12 PM

WETLAND DETERMINATION DATA FORM - Midwest Region

Project/Site: Mt. Olivet | Applicant/Owner: City of Plymouth | City/County: Plymouth | State: MN | Sampling Date: 08/29/19

Investigator(s): TAC | Section: 14 | Township: 118 | Range: 22 | Sampling Point: SP 1-2

Land Form: Hillslope | Local Relief: Concave | Slope %: 2 | Soil Map Unit Name: Kingsley-Gotham complex

Subregion (LRR): M | Latitude: 45.026624 | Longitude: -93.434470 | Datum: NAD 1983

Cowardin Classification: Upland | Circular 39 Classification: Upland | Mapped NWI Classification: Upland

Are climatic/hydrologic conditions on the site typical for this time of year? Yes (If no, explain in remarks) | Eggers & Reed (primary): Upland

Are vegetation No | Soil No | Hydrology No | significantly disturbed? | Are "normal circumstances" present? Yes | Eggers & Reed (secondary):

Are vegetation No | Soil No | Hydrology No | naturally problematic? | Eggers & Reed (tertiary):

Eggers & Reed (quaternary):

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic vegetation present? No

Hydric soil present? No

Indicators of wetland hydrology present? No

Is the sampled area within a wetland? No

General Remarks (explain any answers if needed):

If yes, optional Wetland Site ID:

VEGETATION

Tree Stratum (Plot Size: 30 ft)

		Absolute % Cover	Dominant Species?	Indicator Status
1.	Fraxinus pennsylvanica	45	Yes	FACW
2.		0		
3.		0		
4.		0		
	Total Cover:	45		

Sapling/Shrub Stratum (Plot Size: 15 ft)

1.	Rhamnus cathartica	40	Yes	FAC
2.		0		
3.		0		
4.		0		
5.		0		
	Total Cover:	40		

Herb Stratum (Plot Size: 5 ft)

1.	Phalaris arundinacea	65	Yes	FACW
2.	Solidago gigantea	15	No	FACW
3.	Parthenocissus quinquefolia	5	No	FACU
4.	Poa pratensis	10	No	FAC
5.	Rumex crispus	5	No	FAC
6.		0		
7.		0		
8.		0		
	Total Cover:	100		

Woody Vine Stratum (Plot Size: 30 ft)

1.		0		
2.		0		
	Total Cover:	0		

% Bare Ground in Herb Stratum: | % Sphagnum Moss Cover:

Vegetation Remarks: (include photo numbers here or on a separate sheet)

50/20 Thresholds:

	20%	50%
Tree Stratum	9	22.5
Sapling/Shrub Stratum	8	20
Herb Stratum	20	50
Woody Vine Stratum	0	0

Dominance Test Worksheet:

Number of Dominant Species That Are OBL, FACW or FAC: 3 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW or FAC: 100.00% (A/B)

Prevalence Index Worksheet:

Total % Cover of:		Multiply by:		
OBL Species	0	X 1	0	
FACW Species	125	X 2	250	
FAC Species	55	X 3	165	
FACU Species	5	X 4	20	
UPL Species	0	X 5	0	
Column Totals:	185	(A)	435	(B)

Prevalence Index = B/A = 2.35

Hydrophytic Vegetation Indicators:

- No — Rapid Test for Hydrophytic Vegetation
- Yes — Dominance Test is >50%
- Yes — Prevalence Index ≤ 3.0 [1]
- No — Morphological Adaptations [1] (provide supporting data in vegetation remarks or on a separate sheet)
- No — Problematic Hydrophytic Vegetation [1] (Explain)

[1] Indicators of hydric soil & wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic vegetation present? No

WETLAND DETERMINATION DATA FORM - Midwest Region

SOIL

Sampling Point: SP 1-2

Profile Description: (Describe to the depth needed to document the indicator or confirm the abscence of indicators).

	Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Redox Features Type [1]	Redox Features Loc [2]	Texture	Remarks
1.	0 - 5	10YR 3/2	100					Silty clay loam	
2.	5 - 10	10YR 5/3	70					Silty clay loam	
3.	-	10YR 3/2	30					Silty clay loam	
4.	10 - 18	10YR 5/4	90					Silty clay loam	
5.	-	10YR 5/3	10					Silty clay loam	
6.	-								

[1] Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains [2] Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (applicable to all LRRs, unless otherwise noted)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5)
- ☐ 2 cm Muck (A10)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ 5 cm Mucky Peat or Peat (S3)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)

Indicators for Problematic Hydric Soils [3]:

- ☐ Coast Prairie Redox (A16)
- ☐ Dark Surface (S7)
- ☐ Iron-Manganese Masses (F12)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (explain in soil remarks)

[3] Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present): *Type:* _____ *Depth (inches):* _____ **Hydric soil present?** No

Soil Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1)
- ☐ Sediment Deposits (B2)
- ☐ Drift Deposits (B3)
- ☐ Algal Mat or Crust (B4)
- ☐ Iron Deposits (B5)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Sparsely Vegetated Concave Surface (B8)
- ☐ Water-Stained Leaves (B9)
- ☐ Aquatic Fauna (B13)
- ☐ True Aquatic Plants (B14)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres on Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Tilled Soils (C6)
- ☐ Thin Muck Surface (C7)
- ☐ Gauge or Well Data (D9)
- ☐ Other (explain in remarks)

Secondary Indicators (minimum of two required)

- ☐ Surface Soil Cracks (B6)
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Stunted or Stressed Plants (D1)
- ☐ Geomorphic Position (D2)
- ☐ FAC-Neutral Test (D5)

Field Observations:

Surface water present? ☐ **Surface Water Depth (inches):** _____

Water table present? ☐ **Water Table Depth (inches):** _____

Saturation present? (includes capillary fringe) ☐ **Saturation Depth (inches):** _____

Indicators of wetland hydrology present? No

Describe Recorded Data:

Recorded Data: ☐ Aerial Photo ☐ Monitoring Well ☐ Stream Gauge ☐ Previous Inspections

Hydrology Remarks:

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WETLAND DETERMINATION DATA FORM - Midwest Region

Project/Site: Mt. Olivet | Applicant/Owner: City of Plymouth | City/County: Plymouth | State: MN | Sampling Date: 08/29/19

Investigator(s): TAC | Section: 28 | Township: 118 | Range: 22 | Sampling Point: SP 2-1

Land Form: Hillslope | Local Relief: Concave | Slope %: 5 | Soil Map Unit Name: Lester loam

Subregion (LRR): M | Latitude: 44.997536 | Longitude: -93.472868 | Datum: NAD 1983

Cowardin Classification: PEMC | Circular 39 Classification: Type 3 | Mapped NWI Classification:

Are climatic/hydrologic conditions on the site typical for this time of year? Yes (If no, explain in remarks) | Eggers & Reed (primary): Shallow Marsh

Are vegetation No Soil No Hydrology No significantly disturbed? | Are "normal circumstances" present? Yes | Eggers & Reed (secondary):

Are vegetation No Soil No Hydrology No naturally problematic? | Eggers & Reed (tertiary):

Eggers & Reed (quaternary):

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic vegetation present? Yes
Hydric soil present? Yes
Indicators of wetland hydrology present? Yes
Is the sampled area within a wetland? Yes

General Remarks (explain any answers if needed):

If yes, optional Wetland Site ID: 2

VEGETATION

	Tree Stratum (Plot Size: 30 ft)	Absolute % Cover	Dominant Species?	Indicator Status
1.	Ulmus americana	40	Yes	FACW
2.		0		
3.		0		
4.		0		
	Total Cover:	40		

	Sapling/Shrub Stratum (Plot Size: 15 ft)			
1.	Rhus glabra	25	Yes	UPL
2.	Cornus alba	10	Yes	FACW
3.		0		
4.		0		
5.		0		
	Total Cover:	35		

	Herb Stratum (Plot Size: 5 ft)			
1.	Persicaria amphibia	30	Yes	OBL
2.	Typha angustifolia	20	Yes	OBL
3.	Impatiens capensis	10	No	FACW
4.	Lythrum salicaria	5	No	OBL
5.	Glechoma hederacea	5	No	FACU
6.	Lycopus americanus	10	No	OBL
7.		0		
8.		0		
	Total Cover:	80		

	Woody Vine Stratum (Plot Size: 30 ft)			
1.		0		
2.		0		
	Total Cover:	0		

% Bare Ground in Herb Stratum: 20 | % Sphagnum Moss Cover:

Vegetation Remarks: (include photo numbers here or on a separate sheet)

50/20 Thresholds:	20%	50%
Tree Stratum	8	20
Sapling/Shrub Stratum	7	17.5
Herb Stratum	16	40
Woody Vine Stratum	0	0

Dominance Test Worksheet:

Number of Dominant Species That Are OBL, FACW or FAC: 4 (A)

Total Number of Dominant Species Across All Strata: 5 (B)

Percent of Dominant Species That Are OBL, FACW or FAC: 80.00% (A/B)

Prevalence Index Worksheet:

Total % Cover of:		Multiply by:		
OBL Species	65	X 1	65	
FACW Species	60	X 2	120	
FAC Species	0	X 3	0	
FACU Species	5	X 4	20	
UPL Species	25	X 5	125	
Column Totals:	155	(A)	330	(B)

Prevalence Index = B/A = 2.13

Hydrophytic Vegetation Indicators:

- No — Rapid Test for Hydrophytic Vegetation
- Yes — Dominance Test is >50%
- Yes — Prevalence Index ≤ 3.0 [1]
- No — Morphological Adaptations [1] (provide supporting data in vegetation remarks or on a separate sheet)
- No — Problematic Hydrophytic Vegetation [1] (Explain)

[1] Indicators of hydric soil & wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic vegetation present? Yes

WETLAND DETERMINATION DATA FORM - Midwest Region

SOIL

Sampling Point: SP 2-1

Profile Description: (Describe to the depth needed to document the indicator or confirm the abscence of indicators).

	Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Redox Features Type [1]	Redox Features Loc [2]	Texture	Remarks
1.	0 - 6	10YR 3/1	91	10YR 7/1	5	D	M	Clay loam	
2.	-			7.5YR 4/6	4	C	M	Clay loam	
3.	6 - 10	10YR 3/1	88	10Y 5/1	10	D	M	Clay loam	
4.	-			7.5YR 4/6	2	C	M	Clay loam	
5.	10 - 17	10Y 6/1	60					Cay loam	
6.	-	7.5YR 5/8	40					Clay loam	

[1] Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains [2] Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (applicable to all LRRs, unless otherwise noted)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5)
- ☐ 2 cm Muck (A10)
- ☑ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ 5 cm Mucky Peat or Peat (S3)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1)
- ☑ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☑ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)

Indicators for Problematic Hydric Soils [3]:

- ☐ Coast Prairie Redox (A16)
- ☐ Dark Surface (S7)
- ☐ Iron-Manganese Masses (F12)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (explain in soil remarks)

[3] Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present): *Type:* _____ *Depth (inches):* _____ **Hydric soil present?** Yes

Soil Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☑ Saturation (A3)
- ☐ Water Marks (B1)
- ☐ Sediment Deposits (B2)
- ☐ Drift Deposits (B3)
- ☐ Algal Mat or Crust (B4)
- ☐ Iron Deposits (B5)
- ☑ Inundation Visible on Aerial Imagery (B7)
- ☐ Sparsely Vegetated Concave Surface (B8)
- ☐ Water-Stained Leaves (B9)
- ☐ Aquatic Fauna (B13)
- ☐ True Aquatic Plants (B14)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres on Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Tilled Soils (C6)
- ☐ Thin Muck Surface (C7)
- ☐ Gauge or Well Data (D9)
- ☐ Other (explain in remarks)

Secondary Indicators (minimum of two required)

- ☐ Surface Soil Cracks (B6)
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Crayfish Burrows (C8)
- ☑ Saturation Visible on Aerial Imagery (C9)
- ☐ Stunted or Stressed Plants (D1)
- ☐ Geomorphic Position (D2)
- ☑ FAC-Neutral Test (D5)

Field Observations:

Surface water present? ☐ **Surface Water Depth (inches):** _____

Water table present? ☐ **Water Table Depth (inches):** _____

Saturation present? (includes capillary fringe) ☑ **Saturation Depth (inches):** 6

Indicators of wetland hydrology present? Yes

Describe Recorded Data:

Recorded Data: ☐ Aerial Photo ☐ Monitoring Well ☐ Stream Gauge ☐ Previous Inspections

Hydrology Remarks:

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WETLAND DETERMINATION DATA FORM - Midwest Region

Project/Site: Mt. Olivet | Applicant/Owner: City of Plymouth | City/County: Plymouth | State: MN | Sampling Date: 08/29/19

Investigator(s): TAC | Section: 28 | Township: 118 | Range: 22 | Sampling Point: SP 2-2

Land Form: Hillslope | Local Relief: Concave | Slope %: 8 | Soil Map Unit Name: Lester loam

Subregion (LRR): M | Latitude: 44.997506 | Longitude: -93.472894 | Datum: NAD 1983

Cowardin Classification: Upland | Circular 39 Classification: Upland | Mapped NWI Classification: Upland

Are climatic/hydrologic conditions on the site typical for this time of year? Yes (If no, explain in remarks) | Eggers & Reed (primary): Upland

Are vegetation No | Soil No | Hydrology No | significantly disturbed? | Are "normal circumstances" present? Yes | Eggers & Reed (secondary):

Are vegetation No | Soil No | Hydrology No | naturally problematic? | Eggers & Reed (tertiary):

Eggers & Reed (quaternary):

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic vegetation present? Yes
Hydric soil present? No
Indicators of wetland hydrology present? No
Is the sampled area within a wetland? No

General Remarks (explain any answers if needed):

If yes, optional Wetland Site ID:

VEGETATION

	Tree Stratum (Plot Size: 30 ft)	Absolute % Cover	Dominant Species?	Indicator Status
1.	Ulmus americana	60	Yes	FACW
2.		0		
3.		0		
4.		0		
	Total Cover:	60		

	Sapling/Shrub Stratum (Plot Size: 15 ft)			
1.	Rhus glabra	5	Yes	UPL
2.		0		
3.		0		
4.		0		
5.		0		
	Total Cover:	5		

	Herb Stratum (Plot Size: 5 ft)			
1.	Setaria pumila	40	Yes	FAC
2.	Poa pratensis	25	Yes	FAC
3.	Phalaris arundinacea	15	No	FACW
4.	Linaria vulgaris	5	No	UPL
5.		0		
6.		0		
7.		0		
8.		0		
	Total Cover:	85		

	Woody Vine Stratum (Plot Size: 30 ft)			
1.		0		
2.		0		
	Total Cover:	0		

% Bare Ground in Herb Stratum: 15 | % Sphagnum Moss Cover:

Vegetation Remarks: (include photo numbers here or on a separate sheet)

50/20 Thresholds:	20%	50%
Tree Stratum	12	30
Sapling/Shrub Stratum	1	2.5
Herb Stratum	17	42.5
Woody Vine Stratum	0	0

Dominance Test Worksheet:

Number of Dominant Species That Are OBL, FACW or FAC: 3 (A)

Total Number of Dominant Species Across All Strata: 4 (B)

Percent of Dominant Species That Are OBL, FACW or FAC: 75.00% (A/B)

Prevalence Index Worksheet:

Total % Cover of:		Multiply by:	
OBL Species	0	X 1	0
FACW Species	75	X 2	150
FAC Species	65	X 3	195
FACU Species	0	X 4	0
UPL Species	10	X 5	50
Column Totals:	150 (A)		395 (B)

Prevalence Index = B/A = 2.63

Hydrophytic Vegetation Indicators:

- No — Rapid Test for Hydrophytic Vegetation
- Yes — Dominance Test is >50%
- Yes — Prevalence Index ≤ 3.0 [1]
- No — Morphological Adaptations [1] (provide supporting data in vegetation remarks or on a separate sheet)
- No — Problematic Hydrophytic Vegetation [1] (Explain)

[1] Indicators of hydric soil & wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic vegetation present? Yes

WETLAND DETERMINATION DATA FORM - Midwest Region

SOIL

Sampling Point: SP 2-2

Profile Description: (Describe to the depth needed to document the indicator or confirm the abscence of indicators).

	Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Redox Features Type [1]	Redox Features Loc [2]	Texture	Remarks
1.	0 - 6	2.5Y 3/2	100					Sandy loam	
2.	6 - 12	2.5Y 3/2	98					Sandy loam	
3.	-	2.5Y 6/4	2					Sandy loam	
4.	12 - 20	2.5Y 3/2	80					Sandy loam	
5.	-	10YR 5/4	20					Sandy loam	
6.	-								

[1] Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains [2] Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (applicable to all LRRs, unless otherwise noted)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5)
- ☐ 2 cm Muck (A10)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ 5 cm Mucky Peat or Peat (S3)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)

Indicators for Problematic Hydric Soils [3]:

- ☐ Coast Prairie Redox (A16)
- ☐ Dark Surface (S7)
- ☐ Iron-Manganese Masses (F12)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (explain in soil remarks)

[3] Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present): *Type:* _____ *Depth (inches):* _____ **Hydric soil present?** No

Soil Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1)
- ☐ Sediment Deposits (B2)
- ☐ Drift Deposits (B3)
- ☐ Algal Mat or Crust (B4)
- ☐ Iron Deposits (B5)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Sparsely Vegetated Concave Surface (B8)
- ☐ Water-Stained Leaves (B9)
- ☐ Aquatic Fauna (B13)
- ☐ True Aquatic Plants (B14)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres on Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Tilled Soils (C6)
- ☐ Thin Muck Surface (C7)
- ☐ Gauge or Well Data (D9)
- ☐ Other (explain in remarks)

Secondary Indicators (minimum of two required)

- ☐ Surface Soil Cracks (B6)
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Stunted or Stressed Plants (D1)
- ☐ Geomorphic Position (D2)
- ☐ FAC-Neutral Test (D5)

Field Observations:

Surface water present? ☐ **Surface Water Depth (inches):** _____

Water table present? ☐ **Water Table Depth (inches):** _____

Saturation present? (includes capillary fringe) ☐ **Saturation Depth (inches):** _____

Indicators of wetland hydrology present? No

Describe Recorded Data:

Recorded Data: ☐ Aerial Photo ☐ Monitoring Well ☐ Stream Gauge ☐ Previous Inspections

Hydrology Remarks:

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WETLAND DETERMINATION DATA FORM - Midwest Region

Project/Site: Mt. Olivet | Applicant/Owner: City of Plymouth | City/County: Plymouth | State: MN | Sampling Date: 08/29/19

Investigator(s): TAC | Section: 28 | Township: 118 | Range: 22 | Sampling Point: SP 3-1

Land Form: Hillslope | Local Relief: Concave | Slope %: 5 | Soil Map Unit Name: Hamel, overwash-Hamel complex

Subregion (LRR): M | Latitude: 44.997913 | Longitude: -93.474024 | Datum: NAD 1983

Cowardin Classification: PABHx | Circular 39 Classification: Type 4 | Mapped NWI Classification: PABHx

Are climatic/hydrologic conditions on the site typical for this time of year? Yes (If no, explain in remarks) | Eggers & Reed (primary): Deep Marsh

Are vegetation No Soil No Hydrology No significantly disturbed? | Are "normal circumstances" present? Yes | Eggers & Reed (secondary):

Are vegetation No Soil No Hydrology No naturally problematic? | Eggers & Reed (tertiary):

Eggers & Reed (quaternary):

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic vegetation present? Yes
Hydric soil present? Yes
Indicators of wetland hydrology present? Yes
Is the sampled area within a wetland? Yes

General Remarks (explain any answers if needed):

If yes, optional Wetland Site ID: 3

VEGETATION

	Tree Stratum (Plot Size: 30 ft)	Absolute % Cover	Dominant Species?	Indicator Status
1.	Salix nigra	0		OBL
2.		0		
3.		0		
4.		0		
	Total Cover:	0		

	Sapling/Shrub Stratum (Plot Size: 15 ft)			
1.		0		
2.		0		
3.		0		
4.		0		
5.		0		
	Total Cover:	0		

	Herb Stratum (Plot Size: 5 ft)			
1.	Sagittaria latifolia	20	Yes	OBL
2.	Eutrochium maculatum	20	Yes	OBL
3.	Eupatorium perfoliatum	15	Yes	OBL
4.	Helenium autumnale	15	Yes	FACW
5.	Impatiens capensis	10	No	FACW
6.	Schoenoplectus tabernaemontani	5	No	OBL
7.	Iris virginica	5	No	OBL
8.		0		
	Total Cover:	90		

	Woody Vine Stratum (Plot Size: 30 ft)			
1.		0		
2.		0		
	Total Cover:	0		

% Bare Ground in Herb Stratum: 10 | % Sphagnum Moss Cover:

Vegetation Remarks: (include photo numbers here or on a separate sheet)

50/20 Thresholds:	20%	50%
Tree Stratum	0	0
Sapling/Shrub Stratum	0	0
Herb Stratum	18	45
Woody Vine Stratum	0	0

Dominance Test Worksheet:

Number of Dominant Species That Are OBL, FACW or FAC: 4 (A)

Total Number of Dominant Species Across All Strata: 4 (B)

Percent of Dominant Species That Are OBL, FACW or FAC: 100.00% (A/B)

Prevalence Index Worksheet:

Total % Cover of:		Multiply by:		
OBL Species	65	X 1	65	
FACW Species	25	X 2	50	
FAC Species	0	X 3	0	
FACU Species	0	X 4	0	
UPL Species	0	X 5	0	
Column Totals:	90	(A)	115	(B)

Prevalence Index = B/A = 1.28

Hydrophytic Vegetation Indicators:

- No — Rapid Test for Hydrophytic Vegetation
- Yes — Dominance Test is >50%
- Yes — Prevalence Index ≤ 3.0 [1]
- No — Morphological Adaptations [1] (provide supporting data in vegetation remarks or on a separate sheet)
- No — Problematic Hydrophytic Vegetation [1] (Explain)

[1] Indicators of hydric soil & wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic vegetation present? Yes

WETLAND DETERMINATION DATA FORM - Midwest Region

SOIL

Sampling Point: SP 3-1

Profile Description: (Describe to the depth needed to document the indicator or confirm the abscence of indicators).

	Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Redox Features Type [1]	Redox Features Loc [2]	Texture	Remarks
1.	0 - 8	10YR 2/1	100						
2.	8 - 16	10YR 2/1	96	7.5YR 3/4	4	C	M		
3.	16 - 20	10YR 2/1	92	7.5YE 3/4	8	C	M		
4.	-								
5.	-								
6.	-								

[1] Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains [2] Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (applicable to all LRRs, unless otherwise noted)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5)
- ☐ 2 cm Muck (A10)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ 5 cm Mucky Peat or Peat (S3)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☑ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)

Indicators for Problematic Hydric Soils [3]:

- ☐ Coast Prairie Redox (A16)
- ☐ Dark Surface (S7)
- ☐ Iron-Manganese Masses (F12)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (explain in soil remarks)

[3] Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present): *Type:* _____ *Depth (inches):* _____ **Hydric soil present?** Yes

Soil Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☑ Saturation (A3)
- ☐ Water Marks (B1)
- ☐ Sediment Deposits (B2)
- ☐ Drift Deposits (B3)
- ☑ Algal Mat or Crust (B4)
- ☐ Iron Deposits (B5)
- ☑ Inundation Visible on Aerial Imagery (B7)
- ☐ Sparsely Vegetated Concave Surface (B8)
- ☐ Water-Stained Leaves (B9)
- ☐ Aquatic Fauna (B13)
- ☐ True Aquatic Plants (B14)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres on Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Tilled Soils (C6)
- ☐ Thin Muck Surface (C7)
- ☐ Gauge or Well Data (D9)
- ☐ Other (explain in remarks)

Secondary Indicators (minimum of two required)

- ☐ Surface Soil Cracks (B6)
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Stunted or Stressed Plants (D1)
- ☑ Geomorphic Position (D2)
- ☑ FAC-Neutral Test (D5)

Field Observations:

Surface water present? ☐ **Surface Water Depth (inches):** _____

Water table present? ☐ **Water Table Depth (inches):** _____

Saturation present? (includes capillary fringe) ☑ **Saturation Depth (inches):** 6

Indicators of wetland hydrology present? Yes

Describe Recorded Data:

Recorded Data: ☐ Aerial Photo ☐ Monitoring Well ☐ Stream Gauge ☐ Previous Inspections

Hydrology Remarks:

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WETLAND DETERMINATION DATA FORM - Midwest Region

Project/Site: Mt. Olivet | Applicant/Owner: City of Plymouth | City/County: Plymouth | State: MN | Sampling Date: 08/29/19

Investigator(s): TAC | Section: 28 | Township: 118 | Range: 22 | Sampling Point: SP 3-2

Land Form: Hillslope | Local Relief: Concave | Slope %: 3 | Soil Map Unit Name: Hamel, overwash-Hamel complex

Subregion (LRR): M | Latitude: 44.997506 | Longitude: -93.472894 | Datum: NAD 1983

Cowardin Classification: Upland | Circular 39 Classification: Upland | Mapped NWI Classification: Upland

Are climatic/hydrologic conditions on the site typical for this time of year? Yes (If no, explain in remarks) | Eggers & Reed (primary): Upland

Are vegetation No | Soil No | Hydrology No | significantly disturbed? | Are "normal circumstances" present? Yes | Eggers & Reed (secondary):

Are vegetation No | Soil No | Hydrology No | naturally problematic? | Eggers & Reed (tertiary):

Eggers & Reed (quaternary):

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic vegetation present? Yes
Hydric soil present? No
Indicators of wetland hydrology present? No
Is the sampled area within a wetland? No

General Remarks (explain any answers if needed):

If yes, optional Wetland Site ID:

VEGETATION

	Tree Stratum (Plot Size: 30 ft)	Absolute % Cover	Dominant Species?	Indicator Status
1.	Salix nigra	40	Yes	OBL
2.		0		
3.		0		
4.		0		
	Total Cover:	40		
	Sapling/Shrub Stratum (Plot Size: 15 ft)			
1.		0		
2.		0		
3.		0		
4.		0		
5.		0		
	Total Cover:	0		
	Herb Stratum (Plot Size: 5 ft)			
1.	Poa pratensis	40	Yes	FAC
2.	Setaria pumila	25	Yes	FAC
3.	Spartina pectinata	15	No	FACW
4.	Eupatorium perfoliatum	10	No	OBL
5.	Physostegia virginiana	5	No	FACW
6.		0		
7.		0		
8.		0		
	Total Cover:	95		
	Woody Vine Stratum (Plot Size: 30 ft)			
1.		0		
2.		0		
	Total Cover:	0		

% Bare Ground in Herb Stratum: | % Sphagnum Moss Cover:

Vegetation Remarks: (include photo numbers here or on a separate sheet)

50/20 Thresholds:	20%	50%
Tree Stratum	8	20
Sapling/Shrub Stratum	0	0
Herb Stratum	19	47.5
Woody Vine Stratum	0	0

Dominance Test Worksheet:

Number of Dominant Species That Are OBL, FACW or FAC: 3 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW or FAC: 100.00% (A/B)

Prevalence Index Worksheet:

Total % Cover of:		Multiply by:		
OBL Species	50	X 1	50	
FACW Species	20	X 2	40	
FAC Species	65	X 3	195	
FACU Species	0	X 4	0	
UPL Species	0	X 5	0	
Column Totals:	135	(A)	285	(B)

Prevalence Index = B/A = 2.11

Hydrophytic Vegetation Indicators:

- No — Rapid Test for Hydrophytic Vegetation
- Yes — Dominance Test is >50%
- Yes — Prevalence Index ≤ 3.0 [1]
- No — Morphological Adaptations [1] (provide supporting data in vegetation remarks or on a separate sheet)
- No — Problematic Hydrophytic Vegetation [1] (Explain)

[1] Indicators of hydric soil & wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic vegetation present? Yes

Vegetation at this area was partially mowed by the park.

WETLAND DETERMINATION DATA FORM - Midwest Region

SOIL

Sampling Point: SP 3-2

Profile Description: (Describe to the depth needed to document the indicator or confirm the abscence of indicators).

	Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Redox Features Type [1]	Redox Features Loc [2]	Texture	Remarks
1.	0 - 6	10YR 2/1	100					Loamy sand	
2.	6 - 14	10YR 2/1	98					Loamy sand	
3.	-	10YR 3/2	2					Loamy sand	
4.	14 - 20	10YR 2/1	95					Loamy sand	
5.	-	10YR 4/3	5					Sand Loam	
6.	-								

[1] Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains [2] Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (applicable to all LRRs, unless otherwise noted)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5)
- ☐ 2 cm Muck (A10)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ 5 cm Mucky Peat or Peat (S3)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)

Indicators for Problematic Hydric Soils [3]:

- ☐ Coast Prairie Redox (A16)
- ☐ Dark Surface (S7)
- ☐ Iron-Manganese Masses (F12)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (explain in soil remarks)

[3] Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present): *Type:* _____ *Depth (inches):* _____ **Hydric soil present?** No

Soil Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1)
- ☐ Sediment Deposits (B2)
- ☐ Drift Deposits (B3)
- ☐ Algal Mat or Crust (B4)
- ☐ Iron Deposits (B5)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Sparsely Vegetated Concave Surface (B8)
- ☐ Water-Stained Leaves (B9)
- ☐ Aquatic Fauna (B13)
- ☐ True Aquatic Plants (B14)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres on Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Tilled Soils (C6)
- ☐ Thin Muck Surface (C7)
- ☐ Gauge or Well Data (D9)
- ☐ Other (explain in remarks)

Secondary Indicators (minimum of two required)

- ☐ Surface Soil Cracks (B6)
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Stunted or Stressed Plants (D1)
- ☐ Geomorphic Position (D2)
- ☐ FAC-Neutral Test (D5)

Field Observations:

Surface water present? ☐ **Surface Water Depth (inches):** _____

Water table present? ☐ **Water Table Depth (inches):** _____

Saturation present? (includes capillary fringe) ☐ **Saturation Depth (inches):** _____

Indicators of wetland hydrology present? No

Describe Recorded Data:

Recorded Data: ☐ Aerial Photo ☐ Monitoring Well ☐ Stream Gauge ☐ Previous Inspections

Hydrology Remarks:

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Appendix C
Site Photographs

Appendix B
Wetland Delineation Site Photos
Mt. Olivet and parker lake Stabilization
August 29, 2019

Photo 1: Stream 1 channel, view north.

Photo 2: Stream 1 channel, view south.

Photo 3: wetland 1, dominated by reed canary, view southwest.

Photo 4: wetland 1, dominated by reed canary, view west.

Photo 5: overview of wetland 1 from the hillside, view west.

Photo 6: unnmaned public water inventory basin located southwest of the project area.

Appendix B
Wetland Delineation Site Photos
Mt. Olivet and parker lake Stabilization
August 29, 2019

Photo 7: southern end of the project area, forested with no stream channel.

Photo 8: Northern end of the project area with stream 1.

Photo 9: stream 2, on the south western end of the Parkers Lake project area.

Photo 10: wetland 2 dominated by hybrid cattail and surrounded by woody vegetation.

Photo 11: culvert located under the unnamed park access road.

Photo 12: southwest corner of wetland 3.

Appendix B
Wetland Delineation Site Photos
Mt. Olivet and parker lake Stabilization
August 29, 2019

Photo 13: southeast corner of wetland 3.

Photo 14: northeast corner or wetland 3.

Photo 15: stream 2 channel dominated by woody vegetation.

Photo 16: stream 2 channel.

Photo 17: stream 2 channel with rocky sub straight.

Photo 18: culvert located on the northern end of the project area.

Minnesota Wetland Conservation Act
Notice of Application

Local Government Unit (LGU)	Address
City of Plymouth	**3400 Plymouth Blvd** **Plymouth, MN 55447**

1. PROJECT INFORMATION

Applicant Name	Project Name	Date of Application	Application Number
Barr Engineering on behalf of the Bassett Creek Watershed Management Commission & the City of Plymouth	**Mt. Olivet and Parkers Lake Stabilization Project**	**10/29/2019**	**2019-17**

Type of Application (check all that apply):

☒ Wetland Boundary or Type Sequencing ☐ No-Loss ☐ Exemption ☐

☐ Replacement Plan ☐ Banking Plan

Summary and description of proposed project (attach additional sheets as necessary):

The Bassett Creek Watershed Management Commission and the City of Plymouth are working on implementation of two stream restoration projects in the Mt. Olivet and Parkers Lake areas within the City of Plymouth.

The Mt. Olivet project area encompases 2.47 acres and is located in Section 14, Township 118 North, Range 22 West. The project area is located between the Mt. Olivet Lutheran Church of Plymouth and the Parkside Apartments just to the north of Medicine Lake. The greater surrounding area consists mainly of single-family and multi-family residential buildings. The Parkers Lake project area encompasses 2.02 acres and is located in Section 28, Township 118 North, Range 22 West. The project area is located within Parkers Lake Park and is adjacent to the Lakeview Commons apartments. Adjacent roadways are 18th Avenue to the north and Hennepin County Road 6 to the south. A field wetland delineation was conducted in both project areas on August 29th, 2019 by Barr Engineering Co. for the presense and extent of wetlands.

Three wetlands totaling 0.25 acres and two streams were delineated within the project areas. Wetland 1 was delineated on the southern section of the Mt. Olivet project area and Wetlands 2 & 3 were delineated within the Parkers Lake project area.

Wetland 1 encompasses approximately 0.04 acres and is located on the southern end of the Mt. Olivet Project area and included one wetland communited throughout the entire wetland. The wetland was delineated as a Fresh (wet) meadow, Type 2, palustrine wtland with emergent vegetation and is temporarily flooded (PEMB). Most of the periphery of wetland 1 is located outside of the project area. The wetland receives hydrology from the unnamed stream which flows towards the wetland basin to the south. The vegetation within the wetland is dominated by green ash, common buckthorn, reed canary grass and giant goldenrod.

Wetland 2 encompasses approximatly 0.02 acres and is located on the southern end of the Parkers Lake project area. This wetland is located near Stream 2 but is not connected through surface flows. The wetland was classified as a Type 3, shallow marsh that has emergent vegetation and is seasonally

flooded (PEMC). The wetland is surrounded by woody vegetation such as American Elm and red osier dogwood. The vetland was dominated by water smartweed, hybrid cattail and jewel weed.

Wetland 3 encompasses approximatly 0.19 acres and is located in the central part of the Parkers Lake project area. This wetland is connected to the unnamed stream through a culvert on the north and drains through a southern culvert under the park access roadway. The wetland was classified as a Type 4, deep marsh palustrine wetland with an aquatic bed that has been previously excavated and is permanently flooded (PABHx). The perimeter of the wetland was dominated by broadleaf arrowhead, joe pye weed, common boneset and sneezeweed.

The comment period closes on November 21st, 2019.

2. APPLICATION REVIEW AND DECISION

Signing and mailing of this completed form to the appropriate recipients in accordance with 8420.0255, Subp. 3 provides notice that an application was made to the LGU under the Wetland Conservation Act as specified above. A copy of the application is attached. Comments can be submitted to:

Name and Title of LGU Contact Person **Ben Scharenbroich** **Interim Water Resources Manager**	Comments must be received by (minimum 15 business-day comment period): **November 21, 2019**
Address (if different than LGU) **3400 Plymouth Blvd** **Plymouth, MN 55447**	Date, time, and location of decision: **November 22, 2019**
Phone Number and E-mail Address **763-509-5527** **bscharenbroich@plymouthmn.gov**	Decision-maker for this application: ☒ Staff ☐ Governing Board or Council

Signature: _____ **Date:** 10/30/2019

3. LIST OF ADDRESSEES

☒ SWCD TEP member: **Ms. Stacey Lijewski, HCD, 701 Fourth Avenue South, Suite 700, Minneapolis, MN 55415-1600 (sent electronically)**

☒ BWSR TEP member: **Ben Carlson, BWSR 520 Lafayette Road North, St. Paul, MN 55401 (sent electronically)**
☒ LGU TEP member (if different than LGU Contact): **Ben Scharenbroich, City of Plymouth, 3400 Plymouth Blvd, Plymouth, MN 55447 (sent electronically)**
☒ DNR TEP member: **Leslie Parris, MnDNR, 1200 Warner Road, St. Paul, MN 55106 (sent electronically)**
☒ DNR Regional Office (if different than DNR TEP member)
☐ WD or WMO (if applicable): **BCWMC, c/o Laura Jester, 16145 Hillcrest Lane, Eden Prairie, MN 55346 (sent electronically)**
☒ Applicant (notice only) and Landowner (if different)
☒ Members of the public who requested notice (notice only):
Tyler Conley, Barr Engineering, 4300 MarketPointe Drive, #200, Minneapolis, MN 55435
Karen Chandler, P.E., Barr Engineering, 4300 MarketPointe Drive, #200, Minneapolis, MN 55435

☒ Corps of Engineers Project Manager (notice only)
☐ BWSR Wetland Bank Coordinator (wetland bank plan applications only)

4. MAILING INFORMATION

➢For a list of BWSR TEP representatives: www.bwsr.state.mn.us/contact/WCA_areas.pdf

➢For a list of DNR TEP representatives: www.bwsr.state.mn.us/wetlands/wca/DNR_TEP_contacts.pdf

➢Department of Natural Resources Regional Offices:

NW Region:	NE Region:	Central Region:	Southern Region:
Reg. Env. Assess. Ecol. Div. Ecol. Resources 2115 Birchmont Beach Rd. NE Bemidji, MN 56601	Reg. Env. Assess. Ecol. Div. Ecol. Resources 1201 E. Hwy. 2 Grand Rapids, MN 55744	Reg. Env. Assess. Ecol. Div. Ecol. Resources 1200 Warner Road St. Paul, MN 55106	Reg. Env. Assess. Ecol. Div. Ecol. Resources 261 Hwy. 15 South New Ulm, MN 56073

For a map of DNR Administrative Regions, see: http://files.dnr.state.mn.us/aboutdnr/dnr_regions.pdf

➢For a list of Corps of Project Managers: www.mvp.usace.army.mil/regulatory/default.asp?pageid=687
or send to:

➢

US Army Corps of Engineers
St. Paul District, ATTN: OP-R
180 Fifth St. East, Suite 700
St. Paul, MN 55101-1678

➢For Wetland Bank Plan applications, also send a copy of the application to:

Minnesota Board of Water and Soil Resources
Wetland Bank Coordinator
520 Lafayette Road North
St. Paul, MN 55155

5. ATTACHMENTS

In addition to the application, list any other attachments:
☒ **Mt. Olivet and Parkers Lake Stabilization Wetland Delineation Report - September 2019**
☐
☐
☐
☐

Appendix D

Archeological Reconnaissance Survey

Technical Memorandum

To: Jeff Weiss, Barr EngineeringCompany
From: Kailin Hatlestad, Barr Engineering Company
Subject: Phase Ia Cultural Resources Literature Review
Date: October 28, 2019
Project: Mt. Olivet Stream Stabilization
cc: Kallie Doeden, Barr Engineering Company

Barr Engineering completed a Phase Ia cultural resource literature review for the proposed Mt. Olivet Stream Stabilization project area utilizing information received from a Minnesota State Historic Preservation Office (SHPO) data request for cultural resources located within one mile of the proposed project area. SHPO maintains a comprehensive database of all prehistoric and historic archaeological sites as well as historic architectural resources (individual buildings and structures as well as historic districts) and cultural landscapes for the entire state.

The area of potential effect (APE) for this project includes an approximately 2.5 acre area surrounding the improvement area.

This technical memo presents the background research, summary, and recommendations for the cultural resource literature review for the proposed Mt. Olivet Project Stream Stabilization project located in Section 14, Township 118N, Range 22W, Hennepin County, Minnesota.

1.0 Project Description

The proposed Mt. Olivet stream stabilization project would address needed stabilization along a reach starting at Old Rockford Road and continuing downstream for approximately 1,300 feet. The Mt. Olivet drainage area flows into Medicine Lake, which is impaired for total phosphorus. The majority of the land use in the 192-acre watershed is single family detached residential, multi-family residential and park/recreation land; other land uses include institutional and undeveloped.

2.0 Environmental and Cultural Overview

The Mt. Olivet stream stabilization project is located within the Central Lakes Deciduous archaeological region (Region 4) includes, in which the proposed project is located, and covers most of central to east central Minnesota.

The Central Lakes Deciduous archaeological region is defined mostly by undulating ground moraine, till, and outwash plain topography. Major topographic features include the Mississippi River, flowing through the eastern and central parts of the region, and the St. Croix River defines the eastern boundary (Gibbon 2002). The rivers of the west drain into the Red River. There are many lakes in the area, averaging 30 meters (100 feet) deep. Soils consist of medium to coarse textured prairie and forest soils rarely

dominated the Central Lake Deciduous region with many large inclusions of prairie and oak woods. Oak forest was still dominant in the east following European arrival. The northern part of the region was a mixed deciduous-coniferous forest dominated by pine. The numerous water features in the region provided fish, waterfowl and extensive Wild rice beds. Faunal subsistence resources once included bison, white-tailed deer, elk, beaver, bear, and even moose in the north and east (Gibbon 2002).

Regionally, archaeological sites are focused around lakes and major rivers. Yet, early to middle Prehistoric period settlement patterns are poorly known in the Central Lakes Deciduous region, due to limited lithic surface collections. A change in subsistence-settlement pattern and technology occurred in the region during the late Middle Prehistoric period which saw the adoption of ceramics and mound burial, the use of the bow and arrow, and the intensification of wild rice harvesting (Gibbon 2002). This resulted in a dramatic increase in human population leading to larger and more sedentary habitation sites. Large areas of the Central Lakes Deciduous Region were probably now used only for periodic resource procurement forays. In wild rice harvesting areas, villages are located near wild rice beds, such as stream inlets/outlets to lakes (Gibbon 2002).

At European contact, Santee Dakota groups controlled the eastern part of the Central Lakes Deciduous Region. During this period much of the southern portion of the region remained unoccupied. In general, however, historic Indian village locations followed the Late Prehistoric period pattern and are often located near wild rice beds (Gibbon 2002). By the late 1600s, French traders had entered the region and established posts on some major lakes and rivers, a pattern generally followed by later Anglo-American traders. The contact period as defined in this review ends with the establishment of the American settlement at Fort Snelling in 1821.

3.0 Data Summary

A file search at the Minnesota State Historic Preservation Office (SHPO) and the Office of the State Archaeologist WebPortal (OSA) identified five known archaeological sites located within one-mile of the APE; none have been evaluated for inclusion on the National Register of Historic Places (NRHP) (Table 1). Additionally, the file search discovered numerous historical surveys of the area have occurred over the years which identified eighteen historical sites within one mile of the APE (Table 2).

General Land Office plat maps, and aerial photographs, depicting the evaluation area were reviewed, utilizing the Office of the State Archaeologist Portal (OSA Portal) and the Minnesota Department of Natural Resources (DNR) GIS-based Landview system, to assess if the evaluation area has the potential to contain cultural resources that could be considered eligible for the National Register of Historic Places (NRHP).

3.1 Archaeological Resources

No known archaeological resources were identified within the project area from the database search. Five sites are located within one-mile of the project area and will not be affected by the project (Table 1). Of these resources, none have been evaluated for inclusion on the NRHP. Preliminary research indicates that

project area spans *low site potential\well surveyed and high site potential\well* surveyed areas according to MnModel Phase 4 survey implementation model (MM4) (OSA Portal).

Table 1. SHPO and OSA Archaeological Resource Results

Site ID	Site Name	Description	NRHP Status
21HE0230	Mission Farm/Tabernacle	Lithic scatter	Not evaluated
21HE0261	CSAH 61	Single artifact	Not evaluated
21HE0516	Steel Launch Wreck	Shipwreck	Not evaluated
21HE0517	Wooden Outboard Wreck	Shipwreck	Not evaluated
21HE0518	Flat-Bottomed Motor Boat Wreck	Shipwreck	Not evaluated

3.2 Historical Resources

The SHPO data request identified eighteen historic architectural resources within one-mile of the Project. Of these resources, none have been evaluated for inclusion on the NRHP. Indirect, visual impacts to historic structures that could potentially occur as a result of the proposed project are not likely.

Table 2. SHPO Historic Resource Results within one-mile of Project Area

Site ID	Site Name	Description	NRHP Status
HE-PLC-010	13906 Rockford Rd.	farmstead	Not evaluated
HE-PLC-041	4425 Larch Lane	House (razed)	Not evaluated
HE-PLC-054	3719 Medicine Lake Dr. W.	House	Not evaluated
HE-PLC-055	4465 Medicine Lake Dr. W.	House	Not evaluated
HE-PLC-056	4610 Medicine Lake Dr. W.	House (razed)	Not evaluated

Site ID	Site Name	Description	NRHP Status
HE-PLC-087	3510 Xenium Lane	House (razed)	Not evaluated
HE-PLC-088	3650 Xenium Lane	House (razed)	Not evaluated
HE-PLC-089	3800 Xenium Lane	House (razed)	Not evaluated
HE-PLC-090	4600 Zachary Lane	House (razed)	Not evaluated
HE-PLC-102	12000 29th Ave. N.	House	Not evaluated
HE-PLC-104	10610 36th Ave. N.	House (razed)	Not evaluated
HE-PLC-105	10815 36th Ave. N.	House	Not evaluated
HE-PLC-106	11020 36th Ave. N.	House (razed)	Not evaluated
HE-PLC-107	12230 48th Place	House	Not evaluated
HE-PLC-112	11905 Co. Rd. 9	House	Not evaluated
HE-PLC-113	12305 Co. Rd. 9	School House (razed)	Not evaluated
HE-PLC-114	12820 Co. Rd. 9	House (razed)	Not evaluated
HE-PLC-115	13104 Co. Rd. 9	House	Not evaluated

4.0 Summary and Recommendations

The Phase Ia cultural resource literature review for the proposed Project resulted in the identification of five archaeological sites and eighteen historical sites within one mile of the project area. Of these resources, none have been evaluated for inclusion on the NRHP.

The results of the literature review, the scope the project, and the MM4 survey implementation model suggests the proposed Project has a generally low to no potential for intact pre-European contact archaeological resources to be present. Additional investigation is recommended if project boundaries are changed. Additional evaluation may be required under 36 CFR 800.4 to determine project's potential to have direct or indirect effects to Historic Properties.

References

Anfinson, S., 2001 *SHPO Manual for Archaeological Projects in Minnesota.* Revised version. State Historic Preservation Office, St. Paul.

Gibbon, G.E., C.M. Johnson, and E. Hobbs. 2002. *Chapter 3 Minnesota's Environment and Native American Culture History, Mn/Model Final Report Phases 1-3: A Predictive Model of Precontact Archaeological Site Location for the State of Minnesota.* MnDOT Agreement No. 73217. SHPO Reference Number 95-4098. <http://www.dot.state.mn.us/mnmodel/P3FinalReport/final_report.html> Accessed September, 2019.

Hobbs, E. 2019. *Mn/Model Phase 4: Project Summary and Statewide Results.* Minnesota Department of Transportation. <http://www.dot.state.mn.us/mnmodel/phase4-report/predictivemodelsmmp4.pdf> Accessed September 2019.

National Park Service, 1983 *Secretary of the Interior's Standards and Guidelines for Archaeology and Historic Preservation.* Current version available online at http://www.cr.nps.gov/local-law/arch_stnds_0.htm. National Park Service, Department of the Interior, Washington, D.C.

Historical Aerial Photos

Available on Minnesota Department of Natural Resources *Landview* at:
https://www.dnr.state.mn.us/maps/landview/index.html

General Land Office Plat Map

Available on U.S. Department of the Interior Bureau of Land Management General Land Office Records at:
https://glorecords.blm.gov/details/survey/default.aspx?dm_id=111484&sid=y2eevvkk.m1w&surveyDetailsTabIndex=1

Original Survey 1856 MN 118.0N – 022.0WSubdivisional, Meanders, Hennepin County

OSA WebPortal, Minnesota Office of the State Archaeologist

Available on Minnesota Department of Administration Office of the State Archaeologist at:
https://osa.gisdata.mn.gov/OSAportal/

Technical Memorandum

To: Jeff Weiss, Barr Engineering
From: Kailin Hatlestad, Barr Engineering
Subject: Phase Ia Cultural Resources Literature Review
Date: October 28, 2019
Project: Parkers Lake Drainage Improvements
cc: Kallie Doeden, Barr

Barr Engineering completed a Phase Ia cultural resource literature review for the proposed Parker project area utilizing information received from a Minnesota State Historic Preservation Office (SHPO) data request for cultural resources located within one mile of the proposed project area. SHPO maintains a comprehensive database of all prehistoric and historic archaeological sites as well as historic architectural resources (individual buildings and structures as well as historic districts) and cultural landscapes for the entire state.

The area of potential effect (APE) for this project includes an approximately 2.0 acre area surrounding the improvement area.

This technical memo presents the background research, summary, and recommendations for the cultural resource literature review for the Mt. Olivet Project located in Section 28, Township 118N, Range 22W, Hennepin County, Minnesota.

1.0 Project Description

The Parkers Lake drainage improvement project would address needed stabilization and other drainage/stormwater management improvements along a reach beginning at 18th Avenue North and continuing downstream 1,100 feet to just northwest of the intersection of County Road 6 and Niagara Lane North. Three Rivers Park District monitoring (on behalf of the City of Plymouth) found the 150-acre area draining to this reach to be contributing high levels of chlorides to Parkers Lake (Parkers Lake is impaired for chlorides).

2.0 Environmental and Cultural Overview

The Parkers Lake drainage improvement project is located within the Central Lakes Deciduous archaeological region (Region 4) includes, in which the proposed project is located, and covers most of central to east central Minnesota.

The Central Lakes Deciduous archaeological region is defined mostly by undulating ground moraine, till, and outwash plain topography. Major topographic features include the Mississippi River, flowing through the eastern and central parts of the region, and the St. Croix River defines the eastern boundary (Gibbon 2002). The rivers of the west drain into the Red River. There are many lakes in the area, averaging 30

meters (100 feet) deep. Soils consist of medium to coarse textured prairie and forest soils rarely dominated the Central Lake Deciduous region with many large inclusions of prairie and oak woods. Oak forest was still dominant in the east following European arrival. The northern part of the region was a mixed deciduous-coniferous forest dominated by pine. The numerous water features in the region provided fish, waterfowl and extensive Wild rice beds. Faunal subsistence resources once included bison, white-tailed deer, elk, beaver, bear, and even moose in the north and east (Gibbon 2002).

Regionally, archaeological sites are focused around lakes and major rivers. Yet, early to middle Prehistoric period settlement patterns are poorly known in the Central Lakes Deciduous region, due to limited lithic surface collections. A change in subsistence-settlement pattern and technology occurred in the region during the late Middle Prehistoric period which saw the adoption of ceramics and mound burial, the use of the bow and arrow, and the intensification of wild rice harvesting (Gibbon 2002). This resulted in a dramatic increase in human population leading to larger and more sedentary habitation sites. Large areas of the Central Lakes Deciduous Region were probably now used only for periodic resource procurement forays. In wild rice harvesting areas, villages are located near wild rice beds, such as stream inlets/outlets to lakes (Gibbon 2002).

At European contact, Santee Dakota groups controlled the eastern part of the Central Lakes Deciduous Region. During this period much of the southern portion of the region remained unoccupied. In general, however, historic Indian village locations followed the Late Prehistoric period pattern and are often located near wild rice beds (Gibbon 2002). By the late 1600s, French traders had entered the region and established posts on some major lakes and rivers, a pattern generally followed by later Anglo-American traders. The contact period as defined in this review ends with the establishment of the American settlement at Fort Snelling in 1821.

3.0 Data Summary

A file search at the Minnesota State Historic Preservation Office (SHPO) and the Office of the State Archaeologist WebPortal (OSA) identified no known archaeological sites located within one-mile of the APE. Additionally, the file search discovered numerous historical surveys of the area have occurred over the years which identified sixteen sites within one mile of the APE (Table 1).

General Land Office plat maps, and aerial photographs, depicting the evaluation area were also reviewed, utilizing the Office of the State Archaeologist Portal (OSA Portal) and the Minnesota Department of Natural Resources (DNR) GIS-based Landview system, to assess if the evaluation area has the potential to contain cultural resources that could be considered eligible for the National Register of Historic Places (NRHP).

3.1 Archaeological Resources

No known archaeological resources were identified within the project area from the database search; nor were any archaeological sites located within one-mile from the evaluation area. Preliminary research

indicates that the project area spans a *high potential/well surveyed and unknown site potential\poorly surveyed* area according to MnModel Phase 4 survey implementation model (MM4) (OSA Portal).

3.2 Historical Resources

The SHPO data request identified sixteen historic architectural resources within one-mile of the Project. Of these resources, evaluated for inclusion on the NRHP. Indirect, visual impacts to historic structures that could potentially occur as a result of the proposed project are not likely.

Table 1. SHPO Historic Resource Results within one-mile of Project Area

Site ID	Site Name	Description	NRHP Status
HE-PLC-009	1915 Dunkirk Lane	Farmhouse	Not evaluated
HE-PLC-034	700 Harbor Lane	House	Not evaluated
HE-PLC-036	825 Ithaca Lane	House	Not evaluated
HE-PLC-037	925 Ithaca Lane	House	Not evaluated
HE-PLC-063	950 Minnesota	House	Not evaluated
HE-PLC-066	1855 Niagara Lane	House	Not evaluated
HE-PLC-076	430 Vicksburg Lane	House	Not evaluated
HE-PLC-077	625 Vicksburg Lane	House	Not evaluated
HE-PLC-078	815 Vicksburg Lane	House	Not evaluated
HE-PLC-080	840 Vicksburg Lane	House	Not evaluated
HE-PLC-093	14930 9th Ave. N.	House	Not evaluated
HE-PLC-094	15200 9th Ave. N.	House	Not evaluated
HE-PLC-095	15210 9th Ave. N.	House	Not evaluated
HE-PLC-096	15225 9th Ave. N.	House	Not evaluated

Site ID	Site Name	Description	NRHP Status
HE-PLC-108	157xx Co. Rd. 6	Playhouse	Not evaluated
HE-PLC-109	19025 Co. Rd. 6	House	Not evaluated

4.0 Summary and Recommendations

The Phase Ia cultural resource literature review for the proposed Project resulted in the identification of no archaeological sites and sixteen historical sites within one mile of the project area. Of the historical sites, none have been evaluated for inclusion on the NRHP.

The results of the literature review, the scope the project, and the MM4 survey implementation model suggests the proposed Project has a generally low to no potential for intact pre-European contact archaeological resources to be present. Additional investigation is recommended if project boundaries are changed. Additional evaluation may be required under 36 CFR 800.4 to determine project's potential to have direct or indirect effects to Historic Properties.

References

Anfinson, S.

2001 *SHPO Manual for Archaeological Projects in Minnesota.* Revised version. State Historic Preservation Office, St. Paul.

Gibbon, G.E., C.M. Johnson, and E. Hobbs.

2002 *Chapter 3 Minnesota's Environment and Native American Culture History, Mn/Model Final Report Phases 1-3: A Predictive Model of Precontact Archaeological Site Location for the State of Minnesota.* MnDOT Agreement No. 73217. SHPO Reference Number 95-4098. <http://www.dot.state.mn.us/mnmodel/P3FinalReport/final_report.html> Accessed September, 2019.

Hobbs, E.

2019 *MnModel Phase 4: Project Summary and Statewide Results.* Minnesota Department of Transportation. <http://www.dot.state.mn.us/mnmodel/phase4-report/predictivemodelsmmp4.pdf> Accessed September 2019.

National Park Service

1983 *Secretary of the Interior's Standards and Guidelines for Archaeology and Historic Preservation.* Current version available online at http://www.cr.nps.gov/local-law/arch_stnds_0.htm. National Park Service, Department of the Interior, Washington, D.C.

Historical Aerial Photos

Available on Minnesota Department of Natural Resources *Landview* at:
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General Land Office Plat Map

Available on U.S. Department of the Interior Bureau of Land Management General Land Office Records at:
https://glorecords.blm.gov/details/survey/default.aspx?dm_id=111484&sid=y2eevvkk.m1w&surveyDetailsTabIndex=1

Original Survey 1856 MN 118.0N – 022.0W Subdivisional, Meanders, Hennepin County

OSA WebPortal, Minnesota Office of the State Archaeologist

Available on Minnesota Department of Administration Office of the State Archaeologist at: https://osa.gisdata.mn.gov/OSAportal/

Appendix E

Detailed Cost Estimate

Mt. Olivet Lutheran Church Site - Cost Estimate for Alternative 1

Item Description	Unit	Estimated Quantity	Unit Price	Extension
Mobilization	LS	1	$7,812	$7,810
Control of Water	LS	1	$1,460	$1,460
Erosion Control	LS	1	$2,190	$2,190
Clearing and Grubbing	ACRE	0.6	$8,500	$5,090
Select Tree Removal (>4")	EACH	34	$211	$7,170
Debris Removal	LS	1	$1,000	$1,000
48-inch Manhole Structure and Installation	EACH	1	$5,000	$5,000
30-inch RCP and Installation	LF	60	$41	$2,460
Grading	SY	907	$6	$5,440
Fieldstone Riprap	TON	31	$90	$2,800
Granular Filter	TON	10	$62	$610
Clear and Salvage Trees and Install as Root Wad	EACH	5	$715	$3,580
Rock Boulder Vane	LF	80	$70	$5,600
Common Excavation	CY	308	$15	$4,620
Wetland Restoration - Seeding	ACRE	0.2	$3,000	$570
Plant Trees	EACH	39	$250	$9,750
Seeding and Mulch	ACRE	0.6	$8,000	$4,790
Coir Blanket	SY	454	$9	$4,080
Live Stakes	EACH	590	$5	$2,950
Erosion Control Blanket	SY	3,000	$3	$7,500
One-Year Establishment Maintenance Period	LS	1	$1,460	$1,460
			Construction Total	**$ 85,930**
			Construction Total w/ Contingency (20%)	$ 103,116
			Planning, Engineering & Design (20%)	$ 20,623
			Construction Management (10%)	$ 10,312
			Project Total	**$ 134,000**
			Total w/ Construction Lower Bound (-20%), Legal, and Engineering	**$ 107,000**
			Total w/ Construction Upper Bound (+30%), Legal, and Engineering	**$ 174,000**
			Annual Maintenance Cost (2%)	**$ 2,680**

Mt. Olivet Lutheran Church Site - Alternative 1

30-yr and Annualized Cost analysis		**Project Total**
Category:		Bioengineering
Estimated life span (years)		20
Number of major maint. Events		1
Annual maintenance % of original project cost		15%
End of life span % of original project cost		25%
Expected annual maintenance		$ 1,860
End of life span maintenance		$ 33,500
Future Capital Cost		$ 325,300
Future annual maintenance		$ 88,490
Future end of life span cost		$ 60,500
Total Future Worth		**$ 474,000**
Annualized Cost		**$ 10,000**
Annual Maintenance Cost		**$ 2,700**

Mt. Olivet Lutheran Church Site - Cost Estimate for Alternative 1

Item Description	Unit	Estimated Quantity	Unit Price	Extension
Mobilization	LS	1	$6,375	$6,380
Control of Water	LS	1	$947	$950
Erosion Control	LS	1	$1,420	$1,420
Clearing and Grubbing	ACRE	0.6	$8,500	$4,920
Select Tree Removal (>4")	EACH	39	$211	$8,230
Remove Debris	LS	1	$1,000	$1,000
Grading	SY	907	$6	$5,440
Fieldstone Riprap	TON	68	$90	$6,090
Granular Filter	TON	21	$62	$1,330
Rock Boulder Vane	LF	80	$70	$5,600
Common Excavation	CY	23	$15	$350
Plant Trees	EACH	39	$250	$9,750
Seeding and Mulch	ACRE	0.6	$8,000	$4,630
Coir Blanket	SY	454	$9	$4,080
Live Stakes	EACH	590	$5	$2,950
Erosion Control Blanket	SY	2,803	$3	$7,010
One-Year Establishment Maintenance Period	LS	1	$1,129	$1,130
			Construction Total	**$ 71,260**
			Construction Total w/ Contingency (20%)	$ 85,512
			Planning, Engineering & Design (20%)	$ 17,102
			Construction Management (10%)	$ 8,551
			Project Total	**$ 111,000**
			Total w/ Construction Lower Bound (-20%), Legal, and Engineering	**$ 89,000**
			Total w/ Construction Upper Bound (+30%), Legal, and Engineering	**$ 144,000**
			Annual Maintenance Cost (2%)	**$ 2,220**

Mt. Olivet Lutheran Church Site - Alternative 2

30-yr and Annualized Cost analysis		**Project Total**
Category:		Bioengineering
Estimated life span (years)		20
Number of major maint. Events		1
Annual maintenance % of original project cost		15%
End of life span % of original project cost		25%
Expected annual maintenance		$ 1,750
End of life span maintenance		$ 27,750
Future Capital Cost		$ 269,400
Future annual maintenance		$ 83,260
Future end of life span cost		$ 50,120
Total Future Worth		**$ 403,000**
Annualized Cost		**$ 8,000**
Annual Maintenance Cost		**$ 2,200**

Preliminary Cost Estimate for Alternative 3 - Pedestrian/Culvert Crossing Only

Item Description	Unit	Estimated Quantity	Unit Price	Extension
Mobilization	LS	1	$790	$790
Control of Water	LS	1	$127	$130
Erosion Control	LS	1	$191	$190
Clearing and Grubbing	ACRE	0.1	$8,500	$850
Select Tree Removal (>4")	EACH	4	$211	$840
Grading	SY	56	$6	$330
Common Excavation	CY	23	$15	$350
54-inch RCP (for use as culvert)	LF	10	$220	$2,200
Plant Trees	EACH	4	$250	$1,000
Seeding and Mulch	ACRE	0.1	$8,000	$800
Erosion Control Blanket	SY	484	$3	$1,210
One-Year Establishment Maintenance Period	LS	1	$135	$130
			Construction Total	**$ 8,820**
			Construction Total w/ Contingency (20%)	$ 10,584
			Planning, Engineering & Design (20%)	$ 2,117
			Construction Management (10%)	$ 1,058
			Project Total	**$ 14,000**
			Total w/ Construction Lower Bound (-20%), Legal, and Engineering	**$ 11,000**
			Total w/ Construction Upper Bound (+30%), Legal, and Engineering	**$ 18,000**
			Annual Maintenance Cost (2%)	**$ 280**

Mt. Olivet Lutheran Church Site - Alternative 3 (Culvert Only)

30-yr and Annualized Cost analysis		**Project Total**
Category:		Bioengineering
Estimated life span (years)		20
Number of major maint. Events		1
Annual maintenance % of original project cost		15%
End of life span % of original project cost		25%
Expected annual maintenance		$ 270
End of life span maintenance		$ 3,500
Future Capital Cost		$ 34,000
Future annual maintenance		$ 12,850
Future end of life span cost		$ 6,320
Total Future Worth		**$ 53,000**
Annualized Cost		**$ 1,000**
Annual Maintenance Cost		**$ 300**

Parkers Lake Playfields - Cost Estimate for Alternative 1

Item Description	Unit	Estimated Quantity	Unit Price	Extension
Mobilization	LS	1	$12,139	$12,140
Control of Water	LS	1	$2,312	$2,310
Erosion Control	LS	1	$3,468	$3,470
Clearing and Grubbing	ACRE	0.5	$8,500	$4,440
Select Tree Removal (>4")	EACH	16	$211	$3,380
48-inch Manhole Structure and Installation	EACH	9	$5,000	$45,000
30-inch RCP and Installation	LF	852	$41	$34,930
Scarp Stabilization	SY	90	$30	$2,700
Topsoil Import	CY	421	$30	$12,640
Plant Trees	EACH	16	$250	$4,000
Seeding and Mulch	ACRE	0.5	$30	$20
Erosion Control Blanket	SY	2,528	$3	$6,320
One-Year Establishment Maintenance Period	LS	1	$2,180	$2,180
			Construction Total	**$133,530**
			Construction Total w/ Contingency (20%)	$160,236
			Planning, Engineering & Design (20%)	$ 32,047
			Construction Management (10%)	$ 16,024
			Project Total	**$208,000**
			Total w/ Construction Lower Bound (-20%), Legal, and Engineering	**$166,000**
			Total w/ Construction Upper Bound (+30%), Legal, and Engineering	**$270,000**
			Annual Maintenance Cost (2%)	**$ 4,160**

Parkers Lake Playfields Site - Alternative 1

30-yr and Annualized Cost analysis		**Project Total**
Category:		Bioengineering
Estimated life span (years)		30
Number of major maint. Events		0
Annual maintenance % of original project cost		2%
End of life span % of original project cost		25%
Expected annual maintenance		$ 4,160
End of life span maintenance		
Future Capital Cost		$ 504,900
Future annual maintenance		$ 197,910
Future end of life span cost		$ -
Total Future Worth		**$ 703,000**
Annualized Cost		**$ 15,000**

Parkers Lake Playfields - Cost Estimate for Alternative 2

Item Description	Unit	Estimated Quantity	Unit Price	Extension
Mobilization	LS	1	$11,860	$11,860
Control of Water	LS	1	$2,259	$2,260
Erosion Control	LS	1	$3,389	$3,390
Clearing and Grubbing	ACRE	0.6	$8,500	$5,510
Select Tree Removal (>4")	EACH	20	$211	$4,220
Grading	SY	124	$6	$740
Scarp Toe Stabilization	LF	1,638	$42	$68,800
Fieldstone Riprap	TON	83	$90	$7,500
Granular Filter	TON	19	$62	$1,150
Rock Boulder Vane	LF	70	$70	$4,900
Plant Trees	EACH	20	$250	$5,000
Seeding and Mulch	ACRE	0.6	$8,000	$5,180
Erosion Control Blanket	SY	3135	$3	$7,840
One-Year Establishment Maintenance Period	LS	1	$2,107	$2,110
			Construction Total	**$130,460**
			Construction Total w/ Contingency (20%)	$156,552
			Planning, Engineering & Design (20%)	$ 31,310
			Construction Management (10%)	$ 15,655
			Project Total	**$204,000**
			Total w/ Construction Lower Bound (-20%), Legal, and Engineering	**$163,000**
			Total w/ Construction Upper Bound (+30%), Legal, and Engineering	**$265,000**
			Annual Maintenance Cost (2%)	**$ 4,080**

Parkers Lake Playfields Site - Alternative 2

30-yr and Annualized Cost analysis		**Project Total**
Category:		Bioengineering
Estimated life span (years)		30
Number of major maint. Events		0
Annual maintenance % of original project cost		2%
End of life span % of original project cost		25%
Expected annual maintenance		$ 4,080
End of life span maintenance		$ -
Future Capital Cost		$ 495,200
Future annual maintenance		$ 194,110
Future end of life span cost		$ -
Total Future Worth		**$ 689,000**
Annualized Cost		**$ 14,000**

Parkers Lake Playfields - Cost Estimate for Alternative 3

Item Description	Unit	Estimated Quantity	Unit Price	Extension
Mobilization	LS	1	$6,564	$6,560
Control of Water	LS	1	$1,250	$1,250
Erosion Control	LS	1	$1,875	$1,880
Clearing and Grubbing	ACRE	0.7	$8,500	$5,680
Grading	SY	408	$6	$2,450
Fieldstone Riprap	TON	59	$90	$5,340
Granular Filter	TON	13	$62	$820
Clear and Salvage Trees and Install as Root Wad	EACH	14	$715	$10,010
Import trees and Install as Root Wad	EACH	16	$815	$13,040
Rock Boulder Vane	LF	70	$70	$4,900
Seeding and Mulch	ACRE	0.7	$8,000	$5,340
Coir Blanket	SY	204	$9	$1,840
Live Stakes	EACH	780	$5	$3,900
Erosion Control Blanket	SY	3,232	$3	$8,080
One-Year Establishment Maintenance Period	LS	1	$1,114	$1,110
			Construction Total	**$ 72,200**
			Construction Total w/ Contingency (20%)	$ 86,640
			Planning, Engineering & Design (20%)	$ 17,328
			Construction Management (10%)	$ 8,664
			Project Total	**$113,000**
			Total w/ Construction Lower Bound (-20%), Legal, and Engineering	**$ 90,000**
			Total w/ Construction Upper Bound (+30%), Legal, and Engineering	**$147,000**
			Annual Maintenance Cost (2%)	**$ 2,260**

Parkers Lake Playfields Site - Alternative 3

30-yr and Annualized Cost analysis		**Project Total**
Category:		Bioengineering
Estimated life span (years)		20
Number of major maint. Events		1
Annual maintenance % of original project cost		15%
End of life span % of original project cost		25%
Expected annual maintenance		$ 1,660
End of life span maintenance		$ 28,250
Future Capital Cost		$ 274,300
Future annual maintenance		$ 78,980
Future end of life span cost		$ 51,020
Total Future Worth		**$ 404,000**
Annualized Cost		**$ 8,000**

Preliminary Cost Estimate for Parkers Lake Water Quality Alternative 4 Filtration

Item Description	Unit	Estimated Quantity	Unit Price	Extension
Mobilization	LS	1	$11,989	$11,990
Control of Water	LS	1	$2,162	$2,160
Erosion Control	LS	1	$3,429	$3,430
Clearing and Grubbing	ACRE	0.3	$7,000	$1,750
Excavation/Dispose of Soil	CY	323	$30	$9,680
Modify Outlet Structure	EACH	1	$5,000	$5,000
Diversion Manhole & Connections	EACH	1	$20,000	$20,000
12" RCP	LF	215	$75	$16,130
12" FES	EACH	1	$2,000	$2,000
Random Riprap, Class II with Filter	TON	2	$100	$200
Filtration Media (sand, ironfiling,	Tons	294	$105	$30,870
6" Perforated Draintile	LF	300	$5	$1,500
Clean Outs	LS	1	$1,000	$1,000
Pavement Patching	SY	44	$100	$4,440
Restoration and Plantings	SY	1210	$10	$12,100
Erosion Control Blanket	SY	1210	$3	$3,630
Three-Year Establishment Maintenance Period	LS	1	$6,000	$6,000
			Construction Total	**$ 131,880**
			Construction Total w/ Contingency (25%)	$ 164,850
			Planning, Engineering & Design (20%)	$ 32,970
			Construction Management (10%)	$ 16,485
			Project Total	**$ 214,000**
			Total w/ Construction Lower Bound (-20%), Legal, and Engineering	**$ 171,000**
			Total w/ Construction Upper Bound (+30%), Legal, and Engineering	**$ 278,000**
			Annual Maintenance Cost (2%)	**$ 3,297**

Preliminary Cost Estimate for Parkers Lake Water Quality Alternative 5a Retention

Item Description	Unit	Estimated Quantity	Unit Price	Extension
Mobilization	LS	1	$8,093	$8,090
Control of Water	LS	1	$1,587	$1,590
Erosion Control	LS	1	$2,311	$2,310
Clearing and Grubbing	ACRE	0.40	$7,000	$2,800
Excavation/Dispose of Soil	CY	1600	$30	$48,000
Trees	Each	10	$450	$4,500
Restoration and Plantings	SY	1210	$10	$12,100
Erosion Control Blanket	SY	1210	$3	$3,630
Three-Year Establishment Maintenance Period	LS	1	$6,000	$6,000
			Construction Total	**$ 89,020**
			Construction Total w/ Contingency (25%)	$ 111,275
			Planning, Engineering & Design (20%)	$ 22,255
			Construction Management (10%)	$ 11,128
			Project Total	**$ 145,000**
			Total w/ Construction Lower Bound (-20%), Legal, and Engineering	**$ 116,000**
			Total w/ Construction Upper Bound (+30%), Legal, and Engineering	**$ 189,000**
			Annual Maintenance Cost (2%)	**$ 2,226**

Preliminary Cost Estimate for Parkers Lake Water Quality Alternative 5b Retention

Item Description	Unit	Estimated Quantity	Unit Price	Extension
Mobilization	LS	1	$10,747	$10,750
Control of Water	LS	1	$2,107	$2,110
Erosion Control	LS	1	$3,069	$3,070
Clearing and Grubbing	ACRE	0.50	$7,000	$3,500
Excavation/Dispose of Soil	CY	1900	$30	$57,000
Trees	Each	25	$450	$11,250
Restoration and Plantings	SY	1888	$10	$18,880
Erosion Control Blanket	SY	1888	$3	$5,660
Three-Year Establishment Maintenance Period	LS	1	$6,000	$6,000
			Construction Total	**$ 118,220**
			Construction Total w/ Contingency (25%)	$ 147,775
			Planning, Engineering & Design (20%)	$ 29,555
			Construction Management (10%)	$ 14,778
			Project Total	**$ 192,000**
			Total w/ Construction Lower Bound (-20%), Legal, and Engineering	**$ 154,000**
			Total w/ Construction Upper Bound (+30%), Legal, and Engineering	**$ 250,000**
			Annual Maintenance Cost (2%)	**$ 2,956**