

City of Barrie - Hewitt's Secondary Plan Area Environment Assessment (EA)

Drainage and Stormwater Management Study

Appendix D: Storm Sewer Sizing

| Design Storm | | IDF Co | eff | |
|---------------------|------|--------|------|------|
| Design Storm | Year | Α | В | С |
| Return Period Storm | 5 | 853.61 | 4.70 | 0.77 |

| Sewer Characteristics | Input Value |
|-----------------------|-------------|
| Inlet Time [min] | 10 |
| Manning's "n" | 0.013 |

| | | MH Location | | | ROAD ROW | , | | Adjacent | Runoff Ca Catchment | lculations | I | | | | | D | esigned Pipe | Characterist | cs | |
|-------------|-----------------|-----------------------------|-----------------|----------------|----------|----------------|----------------|----------------|------------------------|----------------|----------------|----------------|------------------|----------------|------------------|--------------|-----------------|-----------------|--------------------|--------------|
| Descrption | From | То | Distance [m] | A [ha] | с | AxC | DI# | A [ha] | С | AxC | Total AxC | Tin [min] | i [mm/hr] | Q [cms] | Diameter [mm] | Slope [%] | Q_Full [cms] | V_Full [cms] | Pipe Time [min] | Capacity [%] |
| | 16994 | 16997 | 51.8 | 0.263 | 0.62 | 0.163 | 16995 16993 | 0.555 0.144 | 0.420 0.420 | 0.233 0.060 | 0.456 | 10.00 | 108.922 | 0.138 | 375 | 0.65 | 0.141 | 1.281 | 0.674 | 98% |
| Sewershed 1 | 16997 | Tie-in to Yonge St Sewer | 98.9 | 0.153 | 0.79 | 0.121 | 10993 | 0.144 | 0.420 | 0.060 | 0.577 | 10.67 | 105.246 | 0.169 | 375 | 1.17 | 0.190 | 1.719 | 0.959 | 89% |
| | 17535 | 17536 | 13.4 | 0.021 | 0.94 | 0.020 | 17531 | 0.206 | 0.420 | 0.087 | 0.533 | 10.00 | 108.922 | 0.161 | 675 | 0.95 | 0.820 | 2.292 | 0.097 | 20% |
| | | | | | | | 17533 | 0.337 | 0.420 | 0.141 | | | | | | | | | | |
| | | | | | | | 17293 | 0.680 | 0.420 | 0.286 | | | | | | | | | | |
| | 17536 | Junction (19838) | 39.88 | 0.164 | 0.92 | 0.151 | | | | | 0.684 | 10.10 | 108.372 | 0.206 | 750 | 3.55 | 2.100 | 4.753 | 0.140 | 10% |
| | Junction (19838 | 3 17537 | 57.22 | 0.131 | 0.87 | 0.114 | 19839 | 0.122 | 0.950 | 0.116 | 0.914 | 10.24 | 107.594 | 0.273 | 750 | 3.55 | 2.100 | 4.753 | 0.201 | 13% |
| | | | | | | | | | | | | | | | | | | | | |
| | 17533 | 17548 | 86.315 | 0.045 | 0.95 | 0.043 | | | | | 0.043 | 10.00 | 108.922 | 0.013 | 300 | 0.98 | 0.096 | 1.356 | 1.061 | 14% |
| | 17548 | 17543 | 91 | 0.114 | 0.95 | 0.108 | St. Pauls Cre | s Sewer tie ir | to Maplevie | w STM Sewer | 0.151 | 11.06 | 103.259 | 0.043 | 300 | 1.05 | 0.099 | 1.403 | 1.081 | 44% |
| | 17543 | 17540 | 29 | 0.143 | 0.95 | 0.136 | | at Mi | 17537 | | 0.287 | 12.14 | 98.143 | 0.078 | 300 | 1.48 | 0.118 | 1.666 | 0.290 | 66% |
| Sewershed 2 | 17540 | 17537 | 31.5 | 0.070 | 0.95 | 0.067 | | | | | 0.353 | 12.43 | 96.868 | 0.095 | 450 | 1.56 | 0.356 | 2.241 | 0.234 | 27% |
| | 17537 | 17529 | 88.4 | 0.166 | 0.83 | 0.138 | 17580 17530 | 0.570 0.052 | 0.950 0.950 | 0.542 0.050 | 1.997 | 12.43 | 96.868 | 0.537 | 825 | 1.7 | 1.873 | 3.505 | 0.420 | 29% |
| | 17529 | 17525 | 116.6 | 0.239 | 0.78 | 0.185 | 17528 | 0.380 | 0.350 | 0.133 | 2.315 | 12.85 | 95.085 | 0.611 | 825 | 3.4 | 2.649 | 4.956 | 0.392 | 23% |
| | 17525 | 17521 | 117.6 | 0.306 | 0.74 | 0.226 | | | | | 2.541 | 13.24 | 93.490 | 0.660 | 825 | 2.73 | 2.374 | 4.441 | 0.441 | 28% |
| | 17521 17517 | 17517 17516 | 101.1 48 | 0.312 0.214 | 0.72 | 0.225 | | | | | 2.766 2.929 | 13.69 14.11 | 91.766 90.178 | 0.705 0.734 | 900 975 | 1.95 0.98 | 2.531 | 3.978 2.974 | 0.424 | 28% 33% |
| | 17517 | 17516 | 92 | 0.214 | 0.76 | 0.163 | | | | | 3.016 | 14.11 | 89.203 | 0.734 | 975 | 1 | 2.243 | 3.005 | 0.269 | 33% |
| | 17513 | OGS(17509) | 100.9 | 0.238 | 0.72 | 0.172 | | | | | 3.188 | 14.89 | 87.417 | 0.774 | 1050 | 0.56 | 2.046 | 2.362 | 0.712 | 38% |
| | OGS(17509) | Outfall1 | 18.5 | 0.256 | 0.72 | 0.185 | | | | | 3.373 | 15.60 | 85.059 | 0.797 | 1050 | 0.7 | 2.287 | 2.641 | 0.117 | 35% |
| | | | | | | | | | | | | | | | | | | | | |
| | 17468 | 17471 | 116 | | | | 17466 17467 | 6.329 2.040 | 0.470 0.420 | 2.975 0.857 | 3.831 | 51.40 | 39.044 | 0.416 | 750 | 0.66 | 0.905 | 2.049 | 0.943 | 46% |
| | 17471 | 19477 | 123.2 | 0.321 | 0.70 | 0.225 | 1/40/ | 2.040 | 0.420 | 0.037 | 4.056 | 52.34 | 38.549 | 0.434 | 825 | 0.54 | 1.056 | 1.975 | 1.040 | 41% |
| | 19477 | 17476 | 118.7 | 0.323 | 0.72 | 0.234 | | | | | 4.290 | 53.38 | 38.019 | 0.453 | 825 | 0.83 | 1.309 | 2.449 | 0.808 | 35% |
| | 17476 | 17479 | 124 | 0.318 | 0.73 | 0.234 | 19842 | 3.637 | 0.550 | 2.000 | 6.524 | 54.19 | 37.619 | 0.682 | 825 | 0.81 | 1.293 | 2.419 | 0.854 | 53% |
| | 17479 | 17482 | 116.1 | 0.319 | 0.72 | 0.230 | | | | | 6.754 | 55.05 | 37.206 | 0.698 | 825 | 0.78 | 1.269 | 2.374 | 0.815 | 55% |
| Sewershed 3 | 17482 | 17486 | 95.6 | 0.312 | 0.76 | 0.236 | | | | | 6.990 | 55.86 | 36.822 | 0.715 | 900 | 0.63 | 1.438 | 2.261 | 0.705 | 50% |
| | 17486 | 17490 | 90.1 | 0.233 | 0.75 | 0.175 | 17400 | 0.100 | 0.200 | 0.054 | 7.165 | 56.56 | 36.497 | 0.726 | 900 | 1.08 | 1.883 | 2.960 | 0.507 | 39% |
| | 17490 17493 | 17493 17499 | 97.6 95.9 | 0.227 | 0.75 | 0.171 0.178 | 17488 | 0.180 | 0.300 | 0.054 | 7.390 7.569 | 57.07 57.55 | 36.267 36.052 | 0.745 0.758 | 900 900 | 1.4 1.28 | 2.144 | 3.370 3.223 | 0.483 0.496 | 35% 37% |
| | 17493 | 17499 | 64.3 | 0.240 | 0.74 | 0.178 | | | | | 7.743 | 58.05 | 35.833 | 0.758 | 900 | 1.38 | 2.129 | 3.346 | 0.496 | 36% |
| | 17501 | OGS(17508) | 122.1 | 0.165 | 0.78 | 0.129 | | | | | 7.872 | 58.37 | 35.694 | 0.771 | 1050 | 0.55 | 2.027 | 2.341 | 0.869 | 38% |
| | OGS(17508) | Outfall2 | 15.8 | 0.305 | 0.76 | 0.233 | | | | | 8.104 | 59.24 | 35.322 | 0.795 | 1050 | 0.61 | 2.135 | 2.466 | 0.107 | 37% |

Proposed Preliminary Storm Sewer Sizing Hewitts Secondary Plan Area (SPA) EA

| Design Storm | | IDF Co | eff | |
|---------------------|------|--------|------|------|
| Design Storm | Year | Α | В | С |
| Return Period Storm | 5 | 853.61 | 4.70 | 0.77 |

| Sewer Characteristics | Input Value |
|-----------------------|-------------|
| Inlet Time [min] | 10 |
| Manning's "n" | 0.013 |

| Junction (19838 17533 17548 17548 17543 17540 17537 17529 17525 17521 17511 17516 17513 OGS(17509) 17468 17471 19477 17476 17479 Sewershed 3 17482 17486 17493 | To 16997 Tile-in to Yonge \$t Sewer 17536 Junction (19838) 17537 17548 17543 17540 17537 17529 17525 17521 17516 17516 17513 0GS(17509) Outfall1 | 51.8 98.9 13.4 39.88 57.22 86.315 91 29 31.5 88.4 116.6 117.6 101.1 48 92 100.9 18.5 | 0.218 0.415 0.021 0.164 0.131 0.045 0.114 0.143 0.070 0.166 0.239 0.306 0.312 0.214 0.120 0.238 | 0.62 0.79 0.94 0.92 0.87 0.95 0.95 0.95 0.95 0.95 0.72 0.72 0.72 0.72 | 0.135 0.328 0.020 0.151 0.114 0.043 0.136 0.067 0.138 0.185 0.226 0.225 0.023 | 16995 16993 17531 17533 17293 19839 St. Pauls Cn 17580 17530 17528 | 0.555 0.144 0.206 0.337 0.680 | 0.420 0.420 0.420 0.420 0.420 0.420 0.420 0.950 0.950 0.950 0.950 0.350 | 0.233 0.060 0.087 0.141 0.286 0.116 w STM Sewer 0.542 0.050 0.133 | 0.428 0.756 0.533 0.684 0.914 0.043 0.151 0.287 0.353 1.997 2.315 2.541 2.766 2.929 | Tin [min] 10.00 10.67 10.00 10.10 10.24 10.00 11.06 12.14 12.43 12.43 12.85 13.24 13.69 14.11 | i [mm/hr] 108.922 105.246 108.922 108.922 107.594 108.922 103.259 98.143 96.868 96.868 95.085 93.490 91.766 90.178 | Q [cms] 0.130 0.221 0.161 0.206 0.273 0.013 0.043 0.043 0.078 0.095 0.537 0.611 0.660 0.705 0.734 | Diameter [mm] 375 450 675 750 750 300 300 300 450 825 825 825 825 825 825 825 825 825 8 | 3.55 0.98 1.05 1.48 1.56 1.7 3.4 2.73 1.95 0.98 | Q_Full [cms] 0.141 0.309 0.820 2.100 2.100 0.096 0.099 0.118 0.356 1.873 2.649 2.374 2.531 2.221 | V_Full [cms] 1.281 1.941 2.292 4.753 4.753 4.753 1.356 1.403 1.666 2.241 3.505 4.956 4.441 3.978 2.974 | Pipe Time [min] 0.674 0.849 0.097 0.140 0.201 1.061 1.081 0.290 0.234 0.420 0.392 0.441 0.424 0.269 | 20% 20% 20% 10% 13% 14% 44% 66% 27% 29% 28% 28% 28% 33% |
|---|---|---|---|--|---|---|---|--|--|--|---|--|--|---|--|--|---|--|--|
| Sewershed 1 16997 17535 17536 Junction (19838 17533 17543 17543 17540 17537 17529 17525 17521 17517 17516 17513 OGS(17509) 17468 17471 19477 17476 17479 Sewershed 3 17482 17480 17493 | Tie-in to Yonge \$1 Sewer 17536 Junction (19838) 17537 17548 17540 17537 17529 17529 17521 17517 17516 17513 OGS(17509) Outfall1 | 98.9 13.4 39.88 57.22 86.315 91 29 31.5 88.4 116.6 101.1 48 92 100.9 | 0.415 0.021 0.164 0.131 0.045 0.114 0.143 0.070 0.166 0.239 0.306 0.312 0.214 0.120 0.238 | 0.79 0.94 0.92 0.87 0.95 0.95 0.95 0.95 0.78 0.74 0.72 0.76 0.73 | 0.328 0.020 0.151 0.114 0.043 0.108 0.136 0.067 0.138 0.185 0.226 0.225 0.163 | 16993 17531 17533 17293 19839 St. Pauls Cn 17580 17530 | 0.144 0.206 0.337 0.680 0.122 es Sewer tie i at M | 0.420 0.420 0.420 0.420 0.950 1 to Maplevier 117537 | 0.060 0.087 0.141 0.286 0.116 w STM Sewer 0.542 0.050 | 0.756 0.533 0.684 0.914 0.043 0.151 0.287 0.353 1.997 2.315 2.541 2.766 | 10.67 10.00 10.10 10.24 10.00 11.106 12.14 12.43 12.43 12.85 13.24 13.69 | 105.246 108.922 108.372 107.594 108.922 103.259 98.143 96.868 96.868 95.085 93.490 91.766 | 0.221 0.161 0.206 0.273 0.013 0.043 0.078 0.095 0.537 0.611 0.660 0.705 0.734 | 450 675 750 750 300 300 300 450 825 825 825 825 825 825 900 975 | 1.17 0.95 3.55 3.55 0.98 1.05 1.48 1.56 1.7 3.4 2.73 1.95 0.98 | 0.309 2.100 2.100 2.100 0.096 0.099 0.118 0.356 1.873 2.649 2.374 2.531 2.221 | 1.941 2.292 4.753 4.753 1.356 1.403 1.666 2.241 3.505 4.956 4.441 3.978 2.974 | 0.849 0.097 0.140 0.201 1.061 1.081 0.290 0.234 0.420 0.392 0.441 0.424 | 72% 20% 10% 13% 14% 44% 66% 27% 29% 23% 28% 28% |
| 16997 17535 17536 Junction (19838 17533 17543 17543 17540 17537 17529 17525 17521 17517 17516 17513 OGS(17509) 17468 17471 19477 17476 17479 Sewershed 3 17482 17486 17490 17493 | 17536 Junction (19838) 17537 17548 17543 17540 17537 17529 17529 17521 17517 17516 17513 OGS(17509) Outfall1 | 13.4 39.88 57.22 86.315 91 29 31.5 88.4 116.6 101.1 48 92 100.9 | 0.021 0.164 0.131 0.045 0.114 0.143 0.070 0.166 0.239 0.306 0.312 0.214 0.120 0.238 | 0.94 0.92 0.87 0.95 0.95 0.95 0.95 0.95 0.74 0.74 0.72 0.76 0.73 | 0.020 0.151 0.114 0.043 0.108 0.136 0.067 0.138 0.185 0.226 0.225 0.163 0.087 | 17531 17533 17293 19839 St. Pauls Cn 17580 17530 | 0.206 0.337 0.680 0.122 es Sewer tie i at M | 0.420 0.420 0.420 0.950 0.950 1 to Maplevier 417537 | 0.087 0.141 0.286 0.116 w STM Sewer | 0.533 0.684 0.914 0.043 0.151 0.287 0.353 1.997 2.315 2.541 2.766 | 10.00 10.10 10.24 10.00 11.06 12.14 12.43 12.43 12.85 13.24 13.69 | 108.922 108.372 107.594 108.922 103.259 98.143 96.868 96.868 95.885 93.490 91.766 | 0.161 0.206 0.273 0.013 0.043 0.078 0.095 0.537 0.611 0.660 0.705 0.734 | 750 750 750 300 300 300 450 825 825 825 900 975 | 0.95 3.55 3.55 0.98 1.05 1.48 1.56 1.7 3.4 2.73 1.95 0.98 | 0.820 2.100 2.100 0.096 0.099 0.118 0.356 1.873 2.649 2.374 2.531 2.221 | 2.292 4.753 4.753 1.356 1.403 1.666 2.241 3.505 4.956 4.441 3.978 2.974 | 0.097 0.140 0.201 1.061 1.081 0.290 0.234 0.420 0.392 0.441 0.424 | 20% 10% 13% 14% 44% 66% 27% 29% 23% 28% 28% |
| 17536 Junction (19838 17533 17548 17543 17540 17537 17529 17525 17521 17516 17513 0GS(17509) 17468 17471 19477 17476 17479 Sewershed 3 17482 17486 17490 17493 | Junction (19838) 17537 17548 17543 17540 17537 17529 17525 17521 17516 17513 OGS(17509) Outfall1 | 39.88 57.22 86.315 91 29 31.5 88.4 116.6 101.1 48 92 100.9 | 0.164 0.131 0.045 0.114 0.143 0.070 0.166 0.239 0.306 0.312 0.214 0.120 0.238 | 0.92 0.87 0.95 0.95 0.95 0.95 0.83 0.78 0.74 0.72 0.76 | 0.151 0.114 0.043 0.108 0.136 0.067 0.138 0.185 0.226 0.225 0.163 0.087 | 17533 17293 19839 St. Pauls Cri 17580 17530 | 0.337 0.680 0.122 es Sewer tie i at M 0.570 0.052 | 0.420 0.420 0.950 1 to Maplevier 117537 | 0.141 0.286 0.116 w STM Sewer 0.542 0.050 | 0.684 0.914 0.043 0.151 0.287 0.353 1.997 2.315 2.541 2.766 | 10.10 10.24 10.00 11.06 12.14 12.43 12.43 12.85 13.24 13.69 | 108.372 107.594 108.922 103.259 98.143 96.868 96.868 95.085 93.490 91.766 | 0.206 0.273 0.013 0.043 0.078 0.095 0.537 0.611 0.660 0.705 0.734 | 750 750 300 300 300 450 825 825 825 825 900 975 | 3.55 3.55 0.98 1.05 1.48 1.56 1.7 3.4 2.73 1.95 0.98 | 2.100 2.100 0.096 0.099 0.118 0.356 1.873 2.649 2.374 2.531 2.221 | 4.753 4.753 1.356 1.403 1.666 2.241 3.505 4.956 4.441 3.978 2.974 | 0.140 0.201 1.061 1.081 0.290 0.234 0.420 0.392 0.441 0.424 | 10% 13% 14% 44% 66% 27% 29% 23% 28% 28% |
| 17536 Junction (19838 17533 17548 17543 17540 17537 17529 17525 17521 17516 17513 0GS(17509) 17468 17471 19477 17476 17479 Sewershed 3 17482 17486 17490 17493 | Junction (19838) 17537 17548 17543 17540 17537 17529 17525 17521 17516 17513 OGS(17509) Outfall1 | 39.88 57.22 86.315 91 29 31.5 88.4 116.6 101.1 48 92 100.9 | 0.164 0.131 0.045 0.114 0.143 0.070 0.166 0.239 0.306 0.312 0.214 0.120 0.238 | 0.92 0.87 0.95 0.95 0.95 0.95 0.83 0.78 0.74 0.72 0.76 | 0.151 0.114 0.043 0.108 0.136 0.067 0.138 0.185 0.226 0.225 0.163 0.087 | 17533 17293 19839 St. Pauls Cri 17580 17530 | 0.337 0.680 0.122 es Sewer tie i at M 0.570 0.052 | 0.420 0.420 0.950 1 to Maplevier 117537 | 0.141 0.286 0.116 w STM Sewer 0.542 0.050 | 0.684 0.914 0.043 0.151 0.287 0.353 1.997 2.315 2.541 2.766 | 10.10 10.24 10.00 11.06 12.14 12.43 12.43 12.85 13.24 13.69 | 108.372 107.594 108.922 103.259 98.143 96.868 96.868 95.085 93.490 91.766 | 0.206 0.273 0.013 0.043 0.078 0.095 0.537 0.611 0.660 0.705 0.734 | 750 750 300 300 300 450 825 825 825 825 900 975 | 3.55 3.55 0.98 1.05 1.48 1.56 1.7 3.4 2.73 1.95 0.98 | 2.100 2.100 0.096 0.099 0.118 0.356 1.873 2.649 2.374 2.531 2.221 | 4.753 4.753 1.356 1.403 1.666 2.241 3.505 4.956 4.441 3.978 2.974 | 0.140 0.201 1.061 1.081 0.290 0.234 0.420 0.392 0.441 0.424 | 10% 13% 14% 44% 66% 27% 29% 23% 28% 28% |
| Junction (19838 17533 17548 17548 17543 17540 17537 17529 17525 17521 17516 17513 OGS(17509) 17468 17471 19477 17476 17479 Sewershed 3 17482 17486 17490 17493 | 17537 17548 17543 17540 17537 17529 17529 17525 17521 17517 17516 17513 OGS(17509) Outfall1 | 86.315 91 29 31.5 88.4 116.6 117.6 101.1 48 92 100.9 | 0.131 0.045 0.114 0.143 0.070 0.166 0.239 0.306 0.312 0.214 0.120 0.238 | 0.87 0.95 0.95 0.95 0.95 0.83 0.78 0.74 0.72 0.76 0.73 | 0.114 0.043 0.108 0.136 0.067 0.138 0.185 0.226 0.225 0.163 0.087 | St. Pauls Cro 17580 17530 | es Sewer tie i at M 0.570 0.052 | 0.950 0.950 | v STM Sewer 0.542 0.050 | 0.914 0.043 0.151 0.287 0.353 1.997 2.315 2.541 2.766 | 10.24 10.00 11.06 12.14 12.43 12.43 12.85 13.24 13.69 | 107.594 108.922 103.259 98.143 96.868 96.868 95.885 93.490 91.766 | 0.273 0.013 0.043 0.078 0.095 0.537 0.611 0.660 0.705 0.734 | 750 300 300 300 450 825 825 825 900 975 | 3.55 0.98 1.05 1.48 1.56 1.7 3.4 2.73 1.95 0.98 | 2.100 0.096 0.099 0.118 0.356 1.873 2.649 2.374 2.531 2.221 | 4.753 1.356 1.403 1.666 2.241 3.505 4.956 4.441 3.978 2.974 | 0.201 1.061 1.081 0.290 0.234 0.420 0.392 0.441 0.424 | 13% 14% 44% 66% 27% 29% 23% 28% 28% |
| 17533 17548 17543 17540 17537 17529 17525 17521 17517 17516 17513 0GS(17509) 17468 17471 19477 17476 17479 Sewershed 3 17482 17486 17490 17490 | 17548 17543 17540 17537 17529 17525 17521 17517 17516 17513 OSS(17509) Outfall1 | 86.315 91 29 31.5 88.4 116.6 117.6 101.1 48 92 100.9 | 0.045 0.114 0.143 0.070 0.166 0.239 0.306 0.312 0.214 0.120 | 0.95 0.95 0.95 0.95 0.83 0.78 0.74 0.72 0.76 0.73 | 0.043 0.108 0.136 0.067 0.138 0.185 0.226 0.225 0.163 0.087 | St. Pauls Cro 17580 17530 | es Sewer tie i at M 0.570 0.052 | 0.950 0.950 | v STM Sewer 0.542 0.050 | 0.043 0.151 0.287 0.353 1.997 2.315 2.541 2.766 | 10.00 11.06 12.14 12.43 12.43 12.85 13.24 13.69 | 108.922 103.259 98.143 96.868 96.868 95.085 93.490 91.766 | 0.013 0.043 0.078 0.095 0.537 0.611 0.660 0.705 0.734 | 300 300 300 450 825 825 825 900 975 | 0.98 1.05 1.48 1.56 1.7 3.4 2.73 1.95 0.98 | 0.096 0.099 0.118 0.356 1.873 2.649 2.374 2.531 2.221 | 1.356 1.403 1.666 2.241 3.505 4.956 4.441 3.978 2.974 | 1.061 1.081 0.290 0.234 0.420 0.392 0.441 0.424 | 14% 44% 66% 27% 29% 23% 28% 28% |
| 17548 17543 17540 17537 17529 17525 17521 17517 17516 17513 0GS(17509) 17468 17471 19477 17476 17479 Sewershed 3 17482 17486 17490 17493 | 17543 17540 17537 17529 17525 17521 17517 17516 17513 OGS(17509) Outfall1 | 91 29 31.5 88.4 116.6 117.6 101.1 48 92 100.9 | 0.114 0.143 0.070 0.166 0.239 0.306 0.312 0.214 0.120 | 0.95 0.95 0.95 0.83 0.78 0.74 0.72 0.76 0.73 | 0.108 0.136 0.067 0.138 0.185 0.226 0.225 0.163 0.087 | 17580 17530 | 0.570 0.052 | 0.950 0.950 | 0.542 0.050 | 0.151 0.287 0.353 1.997 2.315 2.541 2.766 | 11.06 12.14 12.43 12.43 12.85 13.24 13.69 | 103.259 98.143 96.868 96.868 95.085 93.490 91.766 | 0.043 0.078 0.095 0.537 0.611 0.660 0.705 0.734 | 300 300 450 825 825 825 900 975 | 1.05 1.48 1.56 1.7 3.4 2.73 1.95 0.98 | 0.099 0.118 0.356 1.873 2.649 2.374 2.531 2.221 | 1.403 1.666 2.241 3.505 4.956 4.441 3.978 2.974 | 1.081 0.290 0.234 0.420 0.392 0.441 0.424 | 44% 66% 27% 29% 23% 28% 28% |
| 17548 17543 17540 17537 17529 17525 17521 17516 17513 0GS(17509) 17468 17471 19477 17476 17479 Sewershed 3 17482 17486 17490 17493 | 17543 17540 17537 17529 17525 17521 17517 17516 17513 OGS(17509) Outfall1 | 91 29 31.5 88.4 116.6 117.6 101.1 48 92 100.9 | 0.114 0.143 0.070 0.166 0.239 0.306 0.312 0.214 0.120 | 0.95 0.95 0.95 0.83 0.78 0.74 0.72 0.76 0.73 | 0.108 0.136 0.067 0.138 0.185 0.226 0.225 0.163 0.087 | 17580 17530 | 0.570 0.052 | 0.950 0.950 | 0.542 0.050 | 0.151 0.287 0.353 1.997 2.315 2.541 2.766 | 11.06 12.14 12.43 12.43 12.85 13.24 13.69 | 103.259 98.143 96.868 96.868 95.085 93.490 91.766 | 0.043 0.078 0.095 0.537 0.611 0.660 0.705 0.734 | 300 300 450 825 825 825 900 975 | 1.05 1.48 1.56 1.7 3.4 2.73 1.95 0.98 | 0.099 0.118 0.356 1.873 2.649 2.374 2.531 2.221 | 1.403 1.666 2.241 3.505 4.956 4.441 3.978 2.974 | 1.081 0.290 0.234 0.420 0.392 0.441 0.424 | 44% 66% 27% 29% 23% 28% 28% |
| \$\frac{17543}{17540}\$ \$\frac{17540}{17537}\$ \$\frac{17529}{17525}\$ \$\frac{17525}{17521}\$ \$\frac{17517}{17516}\$ \$\frac{17513}{17513}\$ \$\frac{0GS(17509)}{0GS(17509)}\$ \$\frac{17468}{17471}\$ \$\frac{19477}{17476}\$ \$\frac{17479}{17476}\$ \$\frac{17479}{17486}\$ \$\frac{17480}{17490}\$ \$\frac{17490}{17493}\$ | 17540 17537 17529 17525 17521 17517 17516 17513 OGS(17509) Outfall1 | 29 31.5 88.4 116.6 117.6 101.1 48 92 100.9 | 0.143 0.070 0.166 0.239 0.306 0.312 0.214 0.120 0.238 | 0.95 0.95 0.83 0.78 0.74 0.72 0.76 0.73 | 0.136 0.067 0.138 0.185 0.226 0.225 0.163 0.087 | 17580 17530 | 0.570 0.052 | 0.950 0.950 | 0.542 0.050 | 0.287 0.353 1.997 2.315 2.541 2.766 | 12.14 12.43 12.43 12.85 13.24 13.69 | 98.143 96.868 96.868 95.085 93.490 91.766 | 0.078 0.095 0.537 0.611 0.660 0.705 0.734 | 300 450 825 825 825 900 975 | 1.48 1.56 1.7 3.4 2.73 1.95 0.98 | 0.118 0.356 1.873 2.649 2.374 2.531 2.221 | 1.666 2.241 3.505 4.956 4.441 3.978 2.974 | 0.290 0.234 0.420 0.392 0.441 0.424 | 29% 23% 28% 28% |
| Sewershed 2 17540 17537 17529 17525 17521 17517 17516 17513 0GS(17509) 17468 17471 19477 17476 17479 Sewershed 3 17482 17486 17490 17493 | 17529 17529 17525 17521 17517 17516 17513 OGS(17509) Outfall1 | 31.5 88.4 116.6 117.6 101.1 48 92 100.9 | 0.070 0.166 0.239 0.306 0.312 0.214 0.120 0.238 | 0.95 0.83 0.78 0.74 0.72 0.76 0.73 | 0.067 0.138 0.185 0.226 0.225 0.163 0.087 | 17530 | 0.052 | 0.950 | 0.050 | 0.353 1.997 2.315 2.541 2.766 | 12.43 12.43 12.85 13.24 13.69 | 96.868 96.868 95.085 93.490 91.766 | 0.095 0.537 0.611 0.660 0.705 0.734 | 825 825 825 825 900 975 | 1.56 1.7 3.4 2.73 1.95 0.98 | 0.356 1.873 2.649 2.374 2.531 2.221 | 2.241 3.505 4.956 4.441 3.978 2.974 | 0.234 0.420 0.392 0.441 0.424 | 27% 29% 23% 28% 28% |
| 17529 17525 17521 17517 17516 17513 065(17509) 17468 17471 19477 17476 17479 Sewershed 3 17482 17486 17490 17493 | 17525 17521 17517 17516 17513 OGS(17509) Outfall1 | 116.6 117.6 101.1 48 92 100.9 | 0.239 0.306 0.312 0.214 0.120 0.238 | 0.78 0.74 0.72 0.76 0.73 | 0.185 0.226 0.225 0.163 0.087 | 17530 | 0.052 | 0.950 | 0.050 | 2.315 2.541 2.766 | 12.85 13.24 13.69 | 95.085 93.490 91.766 | 0.611 0.660 0.705 0.734 | 825 825 900 975 | 3.4 2.73 1.95 0.98 | 2.649 2.374 2.531 2.221 | 4.956 4.441 3.978 2.974 | 0.392 0.441 0.424 | 23% 28% 28% |
| 17525 17521 17521 17517 17516 17513 OGS(17509) 17468 17471 19477 17476 17479 Sewershed 3 17482 17486 17490 17493 | 17521 17517 17516 17513 OGS(17509) Outfall1 | 117.6 101.1 48 92 100.9 | 0.306 0.312 0.214 0.120 0.238 | 0.74 0.72 0.76 0.73 | 0.226 0.225 0.163 0.087 | | | | | 2.541 2.766 | 13.24 13.69 | 93.490 91.766 | 0.660 0.705 0.734 | 825 900 975 | 2.73 1.95 0.98 | 2.374 2.531 2.221 | 4.441 3.978 2.974 | 0.441 0.424 | 28% 28% |
| 17525 17521 17521 17517 17516 17513 0GS(17509) 17468 17471 19477 17476 17479 Sewershed 3 17482 17486 17490 17493 | 17521 17517 17516 17513 OGS(17509) Outfall1 | 117.6 101.1 48 92 100.9 | 0.306 0.312 0.214 0.120 0.238 | 0.74 0.72 0.76 0.73 | 0.226 0.225 0.163 0.087 | | - | | | 2.541 2.766 | 13.24 13.69 | 93.490 91.766 | 0.660 0.705 0.734 | 825 900 975 | 2.73 1.95 0.98 | 2.374 2.531 2.221 | 4.441 3.978 2.974 | 0.441 0.424 | 28% 28% |
| 17521 17517 17516 17518 17518 0GS(17509) 17468 17471 19477 17476 17479 Sewershed 3 17482 17486 17490 17493 | 17517 17516 17513 OGS(17509) Outfall1 | 101.1 48 92 100.9 | 0.214 0.120 0.238 | 0.76 0.73 | 0.163 0.087 | | | | | | | | 0.734 | 900 975 | 1.95 0.98 | 2.531 2.221 | 2.974 | | 28% |
| 17517 17516 17513 OGS(17509) 17468 17471 19477 17476 17479 Sewershed 3 17482 17486 17490 17490 | 17516 17513 OGS(17509) Outfall1 | 48 92 100.9 | 0.120 0.238 | 0.76 0.73 | 0.087 | | | | | 2.929 | 14.11 | 90.178 | 0.734 | 975 | 0.98 | 2.221 | | | |
| 17516 17513 OGS(17509) 17468 17471 19477 17476 17479 Sewershed 3 17482 17486 17490 | 17513 OGS(17509) Outfall1 | 92 100.9 | 0.120 0.238 | 0.73 | 0.087 | | | | | | | | | | | | | | |
| OGS(17509) 17468 17471 19477 17476 17479 Sewershed 3 17482 17486 17490 17493 | Outfall1 | | | 0.72 | | | | | | 3.016 | 14.38 | 89.203 | 0.747 | 975 | | 2.243 | 3.005 | 0.510 | 33% |
| 17468 17471 19477 17476 17476 17479 Sewershed 3 17482 17486 17490 17493 | | 18.5 | 0.256 | | 0.172 | | | | | 3.188 | 14.89 | 87.417 | 0.774 | 1050 | 0.56 | 2.046 | 2.362 | 0.712 | 38% |
| 17471 19477 17476 17479 Sewershed 3 17482 17486 17490 17493 | 17471 | | 0.256 | 0.72 | 0.185 | | | | | 3.373 | 15.60 | 85.059 | 0.797 | 1050 | 0.7 | 2.287 | 2.641 | 0.117 | 35% |
| 19477 17476 17479 Sewershed 3 17482 17486 17490 17493 | 11411 | 116 | | | | 17466 | 6.329 | 0.470 | 2.975 | 3.831 | 51.40 | 39.044 | 0.416 | 750 | 0.66 | 0.905 | 2.049 | 0.943 | 46% |
| 19477 17476 17479 Sewershed 3 17482 17486 17490 17493 | 19477 | 123.2 | 0.321 | 0.70 | 0.225 | 17467 | 2.040 | 0.420 | 0.857 | 4.056 | 52.34 | 38.549 | 0.434 | 025 | 0.54 | 1.056 | 1.975 | 1.040 | 41% |
| 17476 17479 Sewershed 3 17482 17486 17490 17493 | 17476 | 123.2 | 0.321 | 0.70 0.72 | 0.225 | | | | | 4.056 | 53.38 | 38.549 | 0.454 | 825 825 | 0.54 | 1.056 | 2.449 | 1.040 0.808 | 41% 35% |
| 17479 Sewershed 3 17482 17482 17486 17490 17493 | 17479 | 124 | 0.323 | 0.72 | 0.234 | 19842 | 3,637 | 0.550 | 2.000 | 6.524 | 54.19 | 37.619 | 0.453 | 825 | 0.83 | 1.293 | 2.449 | 0.854 | 53% |
| Sewershed 3 17482 17486 17490 17493 | 17479 | 116.1 | 0.319 | 0.73 | 0.234 | 13042 | 3.037 | 0.550 | 2.000 | 6.754 | 55.05 | 37.206 | 0.698 | 825 | 0.78 | 1.269 | 2.419 | 0.815 | 55% |
| 17486 17490 17493 | 17486 | 95.6 | 0.313 | 0.72 | 0.236 | | | | | 6.990 | 55.86 | 36.822 | 0.715 | 900 | 0.63 | 1.438 | 2.261 | 0.705 | 50% |
| 17490 17493 | 17490 | 90.1 | 0.233 | 0.75 | 0.175 | | | | | 7.165 | 56.56 | 36.497 | 0.726 | 900 | 1.08 | 1.883 | 2.960 | 0.507 | 39% |
| | 17493 | 97.6 | 0.227 | 0.75 | 0.171 | 17488 | 0.180 | 0.300 | 0.054 | 7.390 | 57.07 | 36.267 | 0.745 | 900 | 1.4 | 2.144 | 3.370 | 0.483 | 35% |
| | 17499 | 95.9 | 0.240 | 0.74 | 0.178 | | | | | 7.569 | 57.55 | 36.052 | 0.758 | 900 | 1.28 | 2.050 | 3.223 | 0.496 | 37% |
| 17499 | 17501 | 64.3 | 0.233 | 0.75 | 0.174 | | | | | 7.743 | 58.05 | 35.833 | 0.771 | 900 | 1.38 | 2.129 | 3.346 | 0.320 | 36% |
| 17501 | OGS(17508) | 122.1 | 0.165 | 0.78 | 0.129 | | | | | 7.872 | 58.37 | 35.694 | 0.780 | 1050 | 0.55 | 2.027 | 2.341 | 0.869 | 38% |
| OGS(17508) | Outfall2 | 15.8 | 0.305 | 0.76 | 0.233 | | | | | 8.104 | 59.24 | 35.322 | 0.795 | 1050 | 0.61 | 2.135 | 2.466 | 0.107 | 37% |
| 1 | 2 | 100 | 0.462 | 0.84 | 0.388 | | | | | 0.388 | 10.00 | 108.922 | 0.117 | 375 | 1.9 | 0.242 | 2.190 | 0.761 | 49% |
| 2 | 3 | 100 | 0.454 | 0.84 | 0.381 | | | | | 0.769 | 10.76 | 104.792 | 0.224 | 450 | 1.9 | 0.393 | 2.473 | 0.674 | 57% |
| Sewershed 4 | 4 | 100 | 0.420 | 0.84 | 0.353 | | | | | 1.122 | 12.00 | 98.782 | 0.308 | 450 | 1.9 | 0.393 | 2.473 | 0.674 | 78% |
| (MD.R-01) 4 | 5 | 100 | 0.420 | 0.84 | 0.353 | | | | | 1.475 | 13.00 | 94.478 | 0.387 | 525 | 1.9 | 0.593 | 2.741 | 0.608 | 65% |
| 5 | 6 | 100 | 0.420 | 0.84 | 0.353 | | | | | 1.828 | 14.00 | 90.583 | 0.460 | 525 | 1.9 | 0.593 | 2.741 | 0.608 | 77% |
| 6 | 04 | 75 | 0.315 | 0.84 | 0.265 | | | | | 2.092 | 15.00 | 87.039 | 0.506 | 600 | 1.9 | 0.847 | 2.996 | 0.417 | 60% |
| | | | 2.491 | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | |

| | | | | | | | | | Runoff Cal | culations | | | | | | | | | | |
|--------------------------|----------|-------------|--------------|----------------|--------------|----------------|-----|------------|------------|-----------|----------------|----------------|--------------------|----------------|------------------|--------------|-----------------|-----------------|--------------------|--------------|
| | | MH Location | | | ROAD ROW | | | Adjacent C | | culations | | | | | | C | esigned Pipe | Characteristi | cs | |
| Descrption | From | То | Distance [m] | A [ha] | С | AxC | DI# | A [ha] | С | AxC | Total AxC | Tin [min] | i [mm/hr] | Q [cms] | Diameter [mm] | Slope [%] | Q_Full [cms] | V_Full [cms] | Pipe Time [min] | Capacity [%] |
| | 6 | 7 | 100 | 0.420 | 0.84 | 0.353 | | | | | 0.353 | 10.00 | 108.922 | 0.107 | 300 | 2 | 0.137 | 1.937 | 0.861 | 78% |
| | 7 8 | 8 | 100 100 | 0.420 0.420 | 0.84 | 0.353 | | | | | 0.706 1.058 | 10.86 12.00 | 104.277 98.782 | 0.204 | 375 450 | 2 | 0.248 | 2.247 2.538 | 0.742 | 82% 72% |
| | 9 | 10 | 100 | 0.420 | 0.84 | 0.353 | | | | | 1.411 | 13.00 | 94.478 | 0.290 | 525 | 2 | 0.609 | 2.556 | 0.593 | 61% |
| | 10 | 11 | 100 | 0.420 | 0.84 | 0.353 | | | | | 1.764 | 14.00 | 90.583 | 0.444 | 525 | 2 | 0.609 | 2.812 | 0.593 | 73% |
| | 11 | 12 | 100 | 0.420 | 0.84 | 0.353 | | | | | 2.117 | 15.00 | 87.039 | 0.512 | 600 | 2 | 0.869 | 3.074 | 0.542 | 59% |
| | 12 | 13 | 100 | 0.420 | 0.84 | 0.353 | | | | | 2.470 | 16.00 | 83.799 | 0.575 | 600 | 2 | 0.869 | 3.074 | 0.542 | 66% |
| Sewershed 5 (MD.R-02) | 13 | 14 | 100 | 0.420 | 0.84 | 0.353 | | | | | 2.822 | 17.00 | 80.825 | 0.634 | 600 | 2 | 0.869 | 3.074 | 0.542 | 73% |
| (MD.R-02) | 14 | 15 | 100 | 0.420 | 0.84 | 0.353 | | | | | 3.175 | 18.00 | 78.083 | 0.689 | 600 | 2 | 0.869 | 3.074 | 0.542 | 79% |
| | 15 16 | 16 17 | 100 100 | 0.420 0.420 | 0.84 | 0.353 0.353 | | | | | 3.528 3.881 | 19.00 20.00 | 75.547 73.192 | 0.740 0.789 | 675 675 | 2 | 1.190 1.190 | 3.325 3.325 | 0.501 0.501 | 62% 66% |
| | 17 | 18 | 100 | 0.420 | 0.84 | 0.353 | | | | | 4.234 | 21.00 | 73.192 | 0.789 | 675 | 2 | 1.190 | 3.325 | 0.501 | 70% |
| | 18 | 19 | 100 | 0.420 | 0.84 | 0.353 | | | | | 4.586 | 22.00 | 68.955 | 0.878 | 675 | 2 | 1.190 | 3.325 | 0.501 | 74% |
| | 19 | 20 | 100 | 0.286 | 0.84 | 0.240 | | | | | 4.826 | 23.00 | 67.040 | 0.899 | 675 | 2 | 1.190 | 3.325 | 0.501 | 76% |
| | 20 | 05 | 67 1467 | 0.281 6.027 | 0.84 | 0.236 | | | | | 5.063 | 24.00 | 65.243 | 0.918 | 675 | 2 | 1.190 | 3.325 | 0.336 | 77% |
| | 20 | 21 | 100 | 0.420 | 0.84 | 0.353 | | | | | 0.353 | 10.00 | 108.922 | 0.107 | 375 | 1.06 | 0.181 | 1.636 | 1.019 | 59% |
| Sewershed 6 | 21 22 | 22 23 | 100 | 0.420 | 0.84 0.84 | 0.353 | | | | | 0.706 1.058 | 11.02 | 103.472 98.782 | 0.203 0.290 | 450 | 1.06 1.06 | 0.294 0.443 | 1.847 2.047 | 0.902 | 69% 66% |
| (MD.R-03) | 22 | 23 06 | 100 76 | 0.420 0.084 | 0.84 | 0.353 0.071 | | | | | 1.058 | 12.00 13.00 | 94.478 | 0.290 | 525 525 | 1.06 | 0.443 | 2.047 | 0.814 0.619 | 67% |
| (| | | 376 | 1.344 | | | | | | | | | | | | | | | | |
| | | 24 | | | 0.04 | 0.200 | | | | | 0.260 | 40.00 | 400.022 | 0.004 | 275 | 0.6 | 0.426 | 4 224 | 4.254 | 500/ |
| Community 4.7 | 23 24 | 24 25 | 100 100 | 0.320 0.320 | 0.84 | 0.269 0.269 | | | | | 0.269 0.538 | 10.00 11.35 | 108.922 101.813 | 0.081 0.152 | 375 450 | 0.6 0.6 | 0.136 0.221 | 1.231 1.390 | 1.354 1.199 | 60% 69% |
| Sewershed 7 (MD.R-04) | 25 | 07 | 81 | 0.340 | 0.84 | 0.286 | | | | | 0.823 | 12.00 | 98.782 | 0.226 | 525 | 0.6 | 0.333 | 1.540 | 0.876 | 68% |
| (| | | 281 | 0.980 | | | | | | | | | | | | | | | | |
| | 25 | 26 | 100 | 0.270 | 0.84 | 0.227 | | | | | 0.227 | 10.00 | 108.922 | 0.069 | 375 | 0.66 | 0.143 | 1.291 | 1.291 | 48% |
| | 26 27 | 27 28 | 100 100 | 0.270 0.270 | 0.84 0.84 | 0.227 0.227 | | | | | 0.454 0.680 | 11.29 12.00 | 102.120 98.782 | 0.129 0.187 | 450 450 | 0.66 0.66 | 0.232 0.232 | 1.458 1.458 | 1.143 1.143 | 55% 81% |
| | 28 | 29 | 100 | 0.270 | 0.84 | 0.227 | | | | | 0.907 | 13.00 | 94.478 | 0.238 | 525 | 0.66 | 0.350 | 1.616 | 1.032 | 68% |
| Sewershed 8 | 29 | 30 | 100 | 0.270 | 0.84 | 0.227 | | | | | 1.134 | 14.00 | 90.583 | 0.285 | 525 | 0.66 | 0.350 | 1.616 | 1.032 | 82% |
| (MD.R-07) | 30 31 | 31 32 | 100 100 | 0.270 0.270 | 0.84 0.84 | 0.227 0.227 | | | | | 1.361 1.588 | 15.00 16.00 | 87.039 83.799 | 0.329 0.370 | 600 600 | 0.66 0.66 | 0.499 0.499 | 1.766 1.766 | 0.944 0.944 | 66% 74% |
| | 32 | 08 | 56 | 0.130 | 0.84 | 0.109 | | | | | 1.696 | 17.00 | 80.825 | 0.381 | 600 | 0.66 | 0.499 | 1.766 | 0.528 | 76% |
| | | | 756 | 2.020 | | | | | | | | | | | | | | | | |
| | 32 | 33 | 100 | 0.340 | 0.84 | 0.286 | | | | | 0.286 | 10.00 | 108.922 | 0.086 | 300 | 2.62 | 0.157 | 2.217 | 0.752 | 55% |
| Sewershed 9 | 33 34 | 34 09 | 100 90 | 0.340 0.306 | 0.84 | 0.286 0.257 | | | | | 0.571 0.828 | 10.75 12.00 | 104.838 98.782 | 0.166 0.227 | 375 375 | 2.62 2.62 | 0.284 0.284 | 2.572 2.572 | 0.648 0.583 | 59% 80% |
| (LR.R-01) | 34 | 03 | | | 0.84 | 0.237 | | | | | 0.828 | 12.00 | 30.762 | 0.227 | 3/3 | 2.02 | 0.284 | 2.372 | 0.363 | 80% |
| | <u> </u> | | 290 | 0.986 | | | | | | | | | | | | | | | | |
| | 34 35 | 35 36 | 110 110 | 0.374 0.374 | 0.84 0.84 | 0.314 0.314 | | | | | 0.314 0.628 | 10.00 10.95 | 108.922 103.837 | 0.095 0.181 | 300 375 | 2 2 | 0.137 0.248 | 1.937 2.247 | 0.947 0.816 | 69% 73% |
| | 36 | 37 | 110 | 0.374 | 0.84 | 0.314 | | | | | 0.942 | 12.00 | 98.782 | 0.259 | 450 | 2 | 0.404 | 2.538 | 0.722 | 64% |
| | 37 38 | 38 39 | 100 100 | 0.340 0.340 | 0.84 0.84 | 0.286 0.286 | | | | | 1.228 1.514 | 13.00 14.00 | 94.478 90.583 | 0.322 0.381 | 450 525 | 2 2 | 0.404 0.609 | 2.538 2.812 | 0.657 0.593 | 80% 63% |
| Sewershed 10 | 39 | 40 | 100 | 0.340 | 0.84 | 0.286 | | | | | 1.799 | 15.00 | 87.039 | 0.435 | 525 | 2 | 0.609 | 2.812 | 0.593 | 71% |
| (LR.R-02) | 40 | 41 | 100 | 0.340 | 0.84 | 0.286 | | | | | 2.085 | 16.00 | 83.799 | 0.485 | 525 | 2 | 0.609 | 2.812 | 0.593 | 80% |
| | 41 42 | 42 43 | 100 100 | 0.340 0.340 | 0.84 | 0.286 0.286 | | | | | 2.370 2.656 | 17.00 18.00 | 80.825 78.083 | 0.532 0.576 | 600 600 | 2 | 0.869 0.869 | 3.074 3.074 | 0.542 0.542 | 61% 66% |
| | 43 | 010 | 100 | 0.340 | 0.84 | 0.286 | | | | | 2.942 | 19.00 | 75.547 | 0.617 | 600 | 2 | 0.869 | 3.074 | 0.542 | 71% |
| | | | 1030 | 3,502 | | | | | | | | | | | | | | | | |
| | | | 1030 | 3.302 | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | |

| | | MH Location | | | ROAD ROW | , | | Adjacent | | lculations | | | | | | | esigned Pipe | Characteristi | cs | |
|---------------------------|--|---|--|--|--|---|-----|-----------|---|------------|--|---|---|--|--|--|--|---|--|---|
| Descrption | From | То | Distance [m] | A [ha] | С | AxC | DI# | A [ha] | с | AxC | Total AxC | Tin [min] | i [mm/hr] | Q [cms] | Diameter [mm] | Slope [%] | Q_Full [cms] | V_Full [cms] | Pipe Time [min] | Capacity [%] |
| Sewershed 11 (LR.R-03) | 36 37 38 39 40 41 42 | 37 38 39 40 41 42 O11 | 100 100 100 100 100 100 100 35 | 0.340 0.340 0.340 0.340 0.340 0.340 0.119 | 0.84 0.84 0.84 0.84 0.84 0.84 | 0.286 0.286 0.286 0.286 0.286 0.286 0.286 0.100 | | | | | 0.286 0.571 0.857 1.142 1.428 1.714 1.814 | 10.00 10.73 12.00 13.00 14.00 15.00 16.00 | 108.922 104.973 98.782 94.478 90.583 87.039 83.799 | 0.086 0.167 0.235 0.300 0.359 0.414 0.422 | 300 375 375 450 450 450 450 | 2.81 2.81 2.81 2.81 2.81 2.81 2.81 | 0.162 0.294 0.294 0.478 0.478 0.478 | 2.296 2.664 2.664 3.008 3.008 3.008 3.008 | 0.726 0.626 0.626 0.554 0.554 0.554 0.194 | 53% 57% 80% 63% 75% 87% 88% |
| | | | 635 | 2.159 | | | | | | | | | | | | | | | | |
| Sewershed 12 (LR.R-04) | 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 | 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 O12 | 100 100 100 100 100 100 100 100 100 100 | 0.420 0.420 0.420 0.420 0.420 0.340 0. | 0.84 0.84 0.84 0.84 0.84 0.84 0.84 0.84 0.84 0.84 0.84 0.84 0.84 0.84 0.84 | 0.353 0.353 0.353 0.353 0.353 0.286 0.286 0.286 0.286 0.286 0.286 0.286 0.286 | | | | | 0.353 0.706 1.058 1.411 1.764 2.117 2.402 2.688 2.974 3.259 3.545 3.830 4.116 4.402 4.687 4.927 | 10.00 10.89 11.67 12.38 13.09 13.74 14.38 15.03 15.63 16.23 16.83 17.43 17.99 18.54 19.10 | 108.922 104.144 100.297 97.095 94.119 91.575 89.183 86.931 84.962 83.093 81.316 79.624 78.119 76.677 75.295 73.969 | 0.107 0.204 0.295 0.381 0.461 0.538 0.595 0.649 0.702 0.752 0.801 0.847 0.893 0.980 | 375 450 525 525 525 600 600 675 675 675 675 750 750 750 | 1.4 1.4 1.4 1.4 1.4 1.4 1.4 1.4 1.4 1.4 | 0.208 0.338 0.509 0.509 0.727 0.727 0.996 0.996 0.996 1.319 1.319 1.319 | 1.880 2.123 2.353 2.353 2.572 2.572 2.572 2.782 2.782 2.782 2.985 2.985 2.985 | 0.886 0.788 0.708 0.708 0.648 0.648 0.599 0.599 0.599 0.599 0.558 0.558 | 51% 60% 58% 75% 63% 74% 82% 65% 70% 76% 80% 64% 68% 71% 74% |
| Sewershed 13 (LR.R-05) | 57 58 59 60 61 62 63 | 58 59 60 61 62 63 013 | 100 100 100 80 80 80 5 | 0.270 0.270 0.270 0.216 0.216 0.216 0.014 | 0.84 0.84 0.84 0.84 0.84 0.84 | 0.227 0.227 0.227 0.181 0.181 0.181 0.011 | | | | | 0.227 0.454 0.680 0.862 1.043 1.225 1.236 | 10.00 10.70 11.41 12.01 12.50 12.92 13.35 | 108.922 105.095 101.564 98.733 96.595 94.788 93.058 | 0.069 0.132 0.192 0.236 0.280 0.322 0.320 | 300 300 375 375 450 450 | 3 3 3 3 3 3 | 0.168 0.168 0.304 0.304 0.494 0.494 | 2.372 2.372 2.752 2.752 3.108 3.108 3.108 | 0.703 0.703 0.606 0.484 0.429 0.429 0.027 | 41% 79% 63% 78% 57% 65% 65% |
| Sewershed 14 (LR.R-06) | 63 64 65 66 67 68 | 64 65 66 67 68 O14 | 100 100 100 100 100 98 | 0.340 0.340 0.340 0.340 0.340 0.333 | 0.84 0.84 0.84 0.84 0.84 0.84 | 0.286 0.286 0.286 0.286 0.286 0.286 | | | | | 0.286 0.571 0.857 1.142 1.428 1.708 | 10.00 11.17 12.21 13.15 14.09 14.94 | 108.922 102.703 97.836 93.877 90.268 87.235 | 0.086 0.163 0.233 0.298 0.358 0.414 | 375 450 525 525 600 600 | 0.8 0.8 0.8 0.8 0.8 | 0.157 0.255 0.385 0.385 0.550 0.550 | 1.421 1.605 1.779 1.779 1.944 1.944 | 1.173 1.038 0.937 0.937 0.857 0.840 | 55% 64% 60% 77% 65% 75% |
| Sewershed 15 (LR.R-06) | 68 69 70 71 72 73 | 69 70 71 72 73 015 | 100 100 100 100 100 70 | 0.340 0.340 0.340 0.340 0.340 0.238 | 0.84 0.84 0.84 0.84 0.84 | 0.286 0.286 0.286 0.286 0.286 0.200 | | | | | 0.286 0.571 0.857 1.142 1.428 1.628 | 10.00 11.17 12.21 13.15 14.09 14.94 | 108.922 102.703 97.836 93.877 90.268 87.235 | 0.086 0.163 0.233 0.298 0.358 0.394 | 375 450 525 525 600 600 | 0.8 0.8 0.8 0.8 0.8 | 0.157 0.255 0.385 0.385 0.550 0.550 | 1.421 1.605 1.779 1.779 1.944 1.944 | 1.173 1.038 0.937 0.937 0.857 0.600 | 55% 64% 60% 77% 65% 72% |
| Sewershed 16 (YS.R-01) | 73 74 75 | 74 75 016 | 100 100 90 | 0.340 0.340 0.306 | 0.84 0.84 0.84 | 0.286 0.286 0.257 | | | | | 0.286 0.571 0.828 | 10.00 10.99 11.85 | 108.922 103.598 99.467 | 0.086 0.164 0.229 | 300 375 450 | 1.5 1.5 1.5 | 0.119 0.215 0.350 | 1.677 1.946 2.198 | 0.994 0.856 0.683 | 73% 76% 65% |
| | | | 290 | 0.986 | | | | | | | | | | | | | | | | |

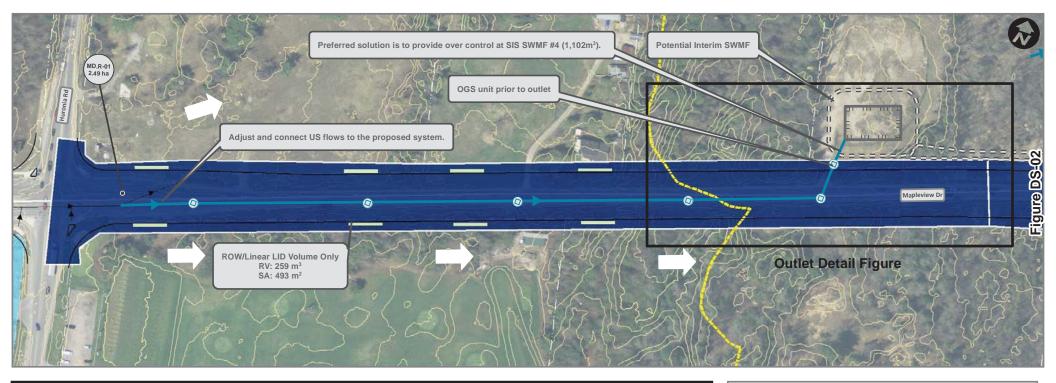
| | | MH Location | | | ROAD ROW | | | Adjacent C | | alculations | | | | | | ı | Designed Pipe | Characteristi | cs | |
|----------------------------|----------------|-----------------|-------------------|-------------------------|----------------------|-------------------------|-----|------------|---|-------------|-------------------------|-------------------------|------------------------------|-------------------------|-------------------|----------------------|-------------------------|-------------------------|-------------------------|-------------------|
| Descrption | From | То | Distance [m] | A [ha] | с | AxC | DI# | A [ha] | с | AxC | Total AxC | Tin [min] | i [mm/hr] | Q [cms] | Diameter [mm] | Slope [%] | Q_Full [cms] | V_Full [cms] | Pipe Time [min] | Capacity [%] |
| Sewershed 17 (YS.R-02) | 75 76 77 | 76 77 017 | 100 100 90 | 0.340 0.340 0.340 | 0.84 0.84 0.84 | 0.286 0.286 0.286 | | | | | 0.286 0.571 0.857 | 10.00 11.13 12.13 | 108.922 102.910 98.186 | 0.086 0.163 0.234 | 375 450 450 | 0.86 0.86 0.86 | 0.163 0.265 0.265 | 1.474 1.664 1.664 | 1.131 1.002 0.901 | 53% 62% 88% |
| | | | 290 | 1.020 | | | | | | | | | | | | | | | | |
| Sewershed 18 | 77 78 79 | 78 79 80 | 100 100 100 | 0.340 0.340 0.340 | 0.84 0.84 0.84 | 0.286 0.286 0.286 | | | | | 0.286 0.571 0.857 | 10.00 11.22 12.27 | 108.922 102.483 97.594 | 0.086 0.163 0.232 | 300 375 450 | 1 1 | 0.097 0.176 0.285 | 1.369 1.589 1.794 | 1.217 1.049 0.929 | 89% 93% 81% |
| (BBP.R-01) | 80 | 018 | 30 | 0.102 | 0.84 | 0.086 | | | | | 0.942 | 13.19 | 93.689 | 0.245 | 450 | 1 | 0.285 | 1.794 | 0.279 | 86% |
| | 80 | 81 | 105 | 0.357 | 0.84 | 0.300 | | | | | 0.300 | 10.00 | 108.922 | 0.091 | 300 | 2.1 | 0.140 | 1.984 | 0.882 | 65% |
| | 81 82 | 82 83 | 105 105 102 | 0.357 0.357 0.347 | 0.84 | 0.300 0.300 0.291 | | | | | 0.600 0.891 | 10.88 12.00 | 104.168 98.782 | 0.174 0.245 | 375 450 | 2.1 2.1 2.1 | 0.254 0.414 | 2.303 | 0.760 0.654 | 68% 59% |
| Sewershed 19 (BBP.R-02) | 83 84 85 | 84 85 O19 | 100 100 100 | 0.340 0.340 0.340 | 0.84 0.84 0.84 | 0.286 0.286 0.286 | | | | | 1.177 1.462 1.748 | 13.00 14.00 15.00 | 94.478 90.583 87.039 | 0.309 0.368 0.423 | 450 525 525 | 2.1 2.1 2.1 | 0.414 0.624 0.624 | 2.600 2.882 2.882 | 0.641 0.578 0.578 | 75% 59% 68% |
| | 83 | 013 | 612 | 2.081 | 0.04 | 0.200 | | | | | 1.,40 | 13.00 | 07.033 | 0.423 | 323 | 2.1 | 0.024 | 2.502 | 0.570 | 5570 |

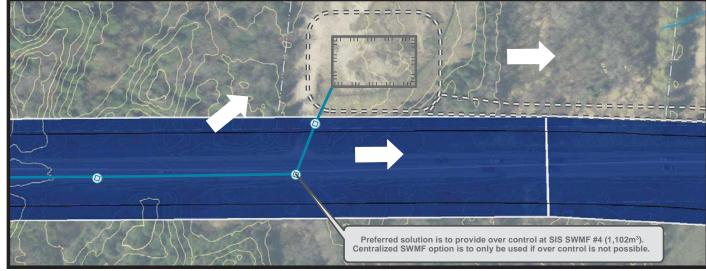


City of Barrie - Hewitt's Secondary Plan Area Environment Assessment (EA)

Drainage and Stormwater Management Study

Appendix E: SWM Figures

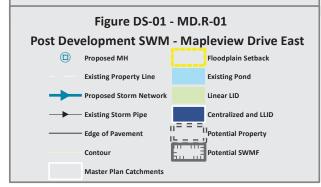


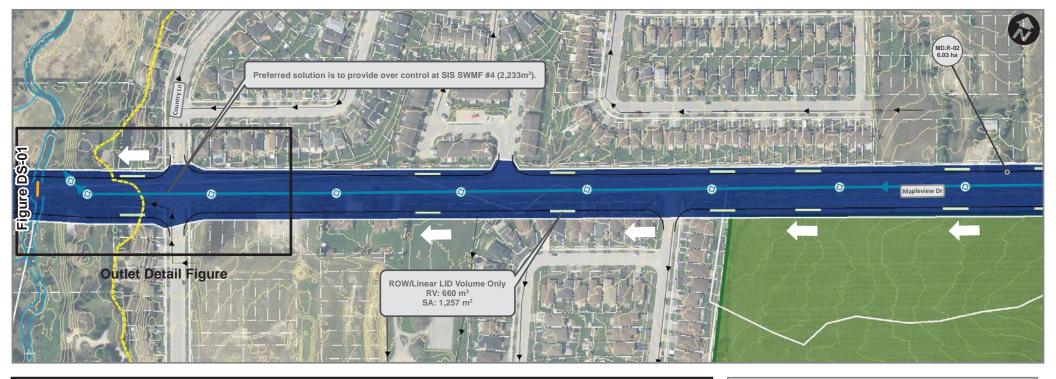


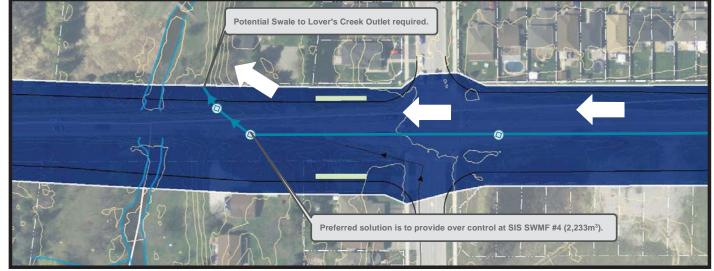
Outlet Detail Figure

Notes:

- Minor system conveyance via storm sewer network with OGS treatment at the outlet to Lovers Creek.
- Major system flow along Mapleview Drive, overflow to the east towards Lovers Creek. Provide over control for Water Quantity and Quality Volumes at SIS SWMF #4.
- Potential Locations for Linear LIDs have been allocated and are to be confirmed in Detailed Design.







Outlet Detail Figure

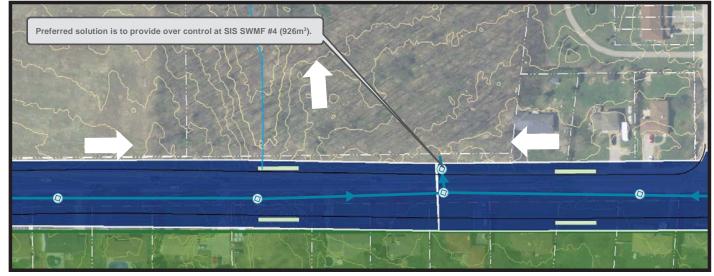
Notes:

- Minor system treatment via storm sewer network with OGS treatment at outlet Lover's Creek.
- Major system and quantity control flow to Lover's Creek treated via over control at SIS SWMF# 4.
- Potential Locations for Linear LIDs have been allocated and are to be confirmed in Detailed Design.

Figure DS-02 - MD.R-02 Post Development SWM - Mapleview Drive East





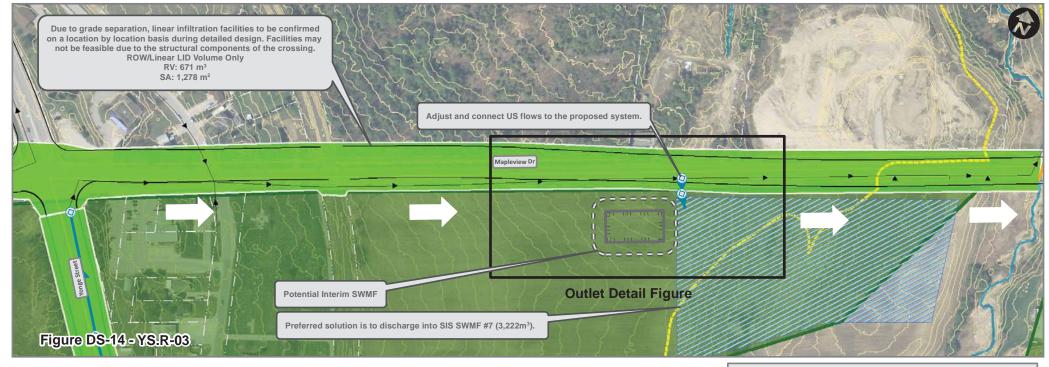


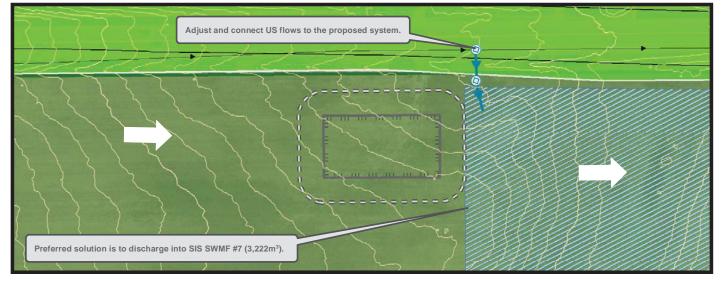
Notes:

- Minor system treatment via storm sewer network with OGS treatment of both MD.R-03 and MD.R-04.
- Major system flow to the woodlot between Dean Ave and Goodwin Dr. Provide over control at SIS SWMF #4.
- Potential Locations for Centralized LIDs have been allocated and are to be confirmed in Detailed Design.

Figure DS-03 - MD.R-03 & MD.R-04 Post Development SWM - Mapleview Drive East



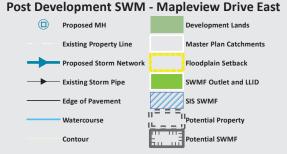


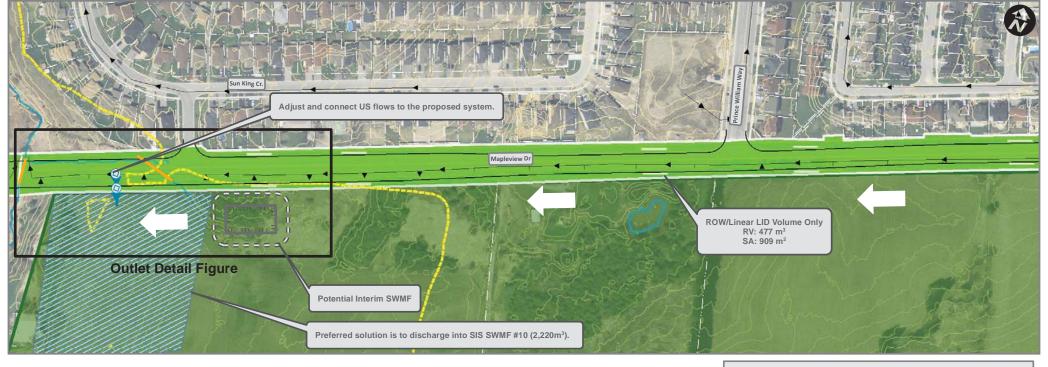


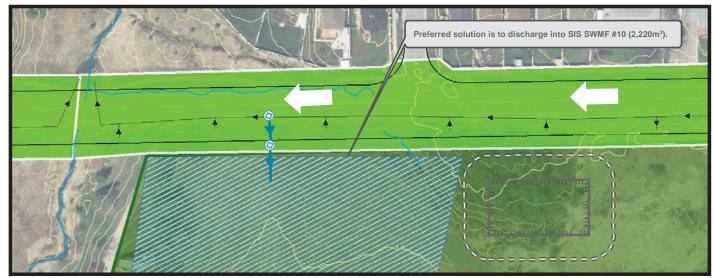
Note

- Minor system treatment via storm sewer network with OGS treatment at outlet to the SIS SWMF #7.
- Major system flow to the SIS SWMF #7, overflow to the east towards Hewitts Creek.
- Potential Locations for SIS SWMF have been allocated and are to be confirmed in Detailed Design.

Figure DS-04 - MD.R-05 elopment SWM - Mapleview Drive East





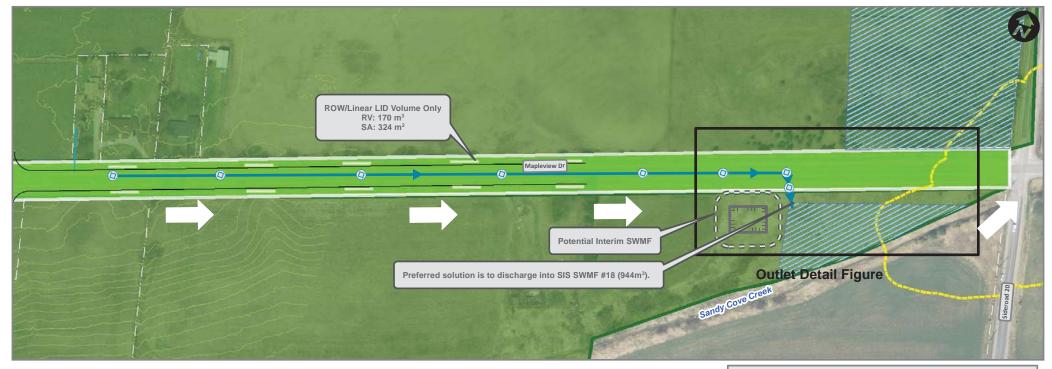


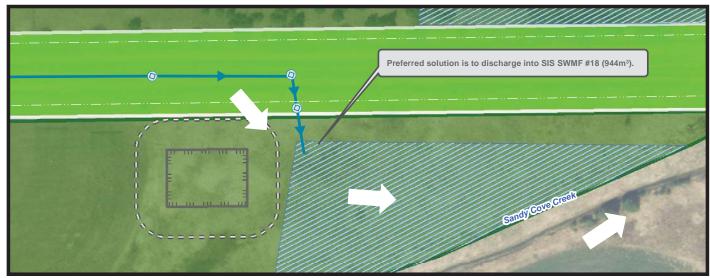
Notes

- Minor system conveyance via storm sewer network with OGS treatment at the outlet to SIS SWMF #10.
- Major system flow to SIS SWMF #10, overflow to the west towards Hewitt's Creek.
- Potential Locations for SIS SWMF have been allocated and are to be confirmed in Detailed Design.

Figure DS-05 - MD.R-06 elopment SWM - Mapleview Drive East





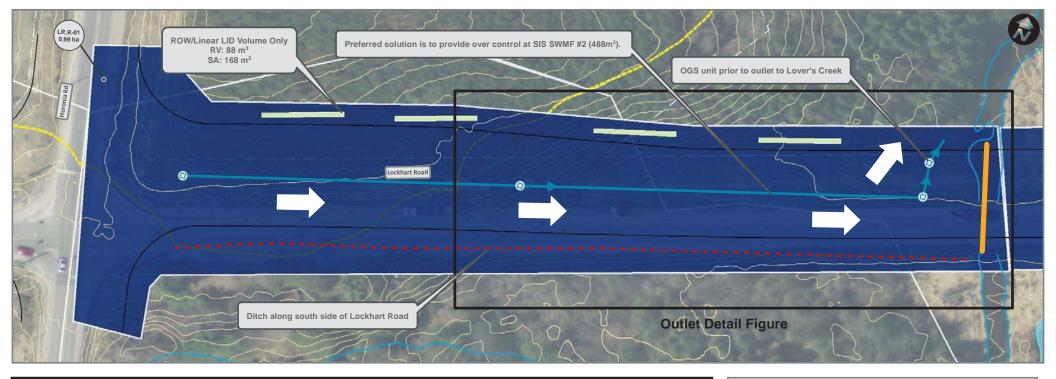


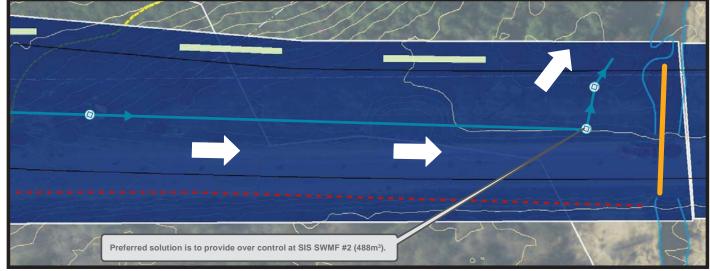
Notes:

- Minor system conveyance via storm sewer network with OGS treatment at the outlet to SIS SWMF #18.
- Major system flow to SIS SWMF #18, overflow to the east towards Sandy Cove Creek.
- Potential Locations for SIS SWMF connections have been allocated and are to be confirmed in Detailed Design.

Figure DS-06 - MD.R-07

Proposed MH Existing Property Line Proposed Storm Network Edge of Pavement Watercourse Contour Proposed Storm Network Development Lands Proposed Storm Network SWMF Outlet and LLID Property Potential SWMF Potential SWMF

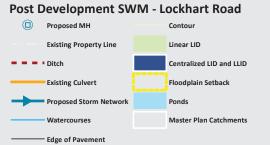


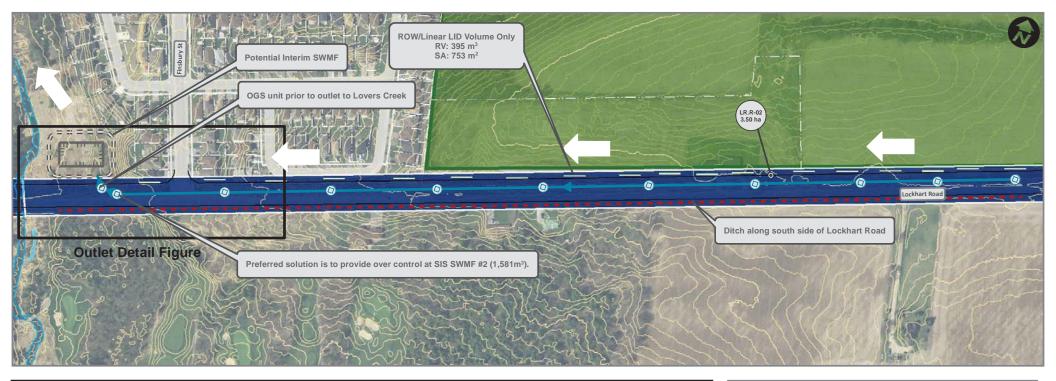


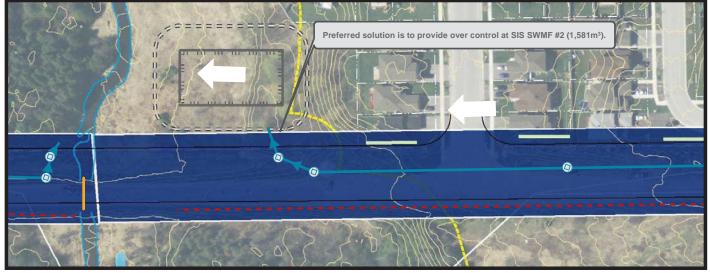
Notes

- Minor system treatment via storm sewer network with OGS treatment at outlet Lovers Creek.
- Major system flows along Lockhart Road to Lovers Creek. Provide over control for Water Quantity and Quality Volumes at SIS SWMF #2.
- Potential Locations for Linear LIDs have been allocated and are to be confirmed in Detailed Design.

Figure DS-07 - LR.R-01 Development SWM - Lockhart Road







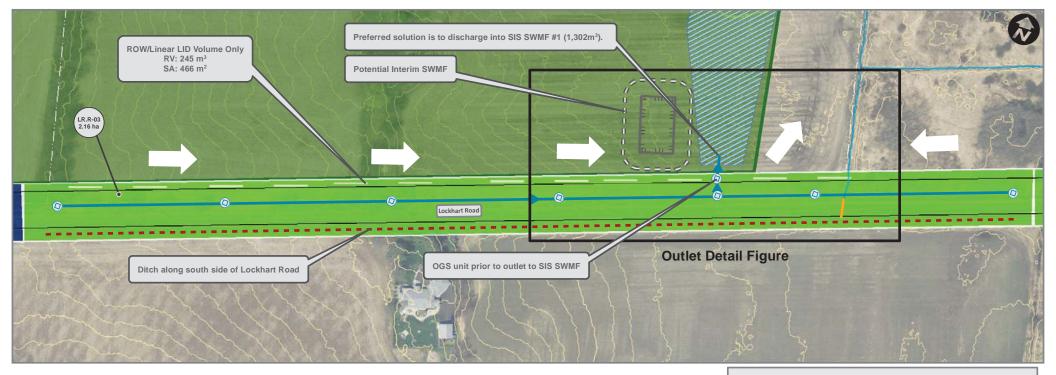
Outlet Detail Figure

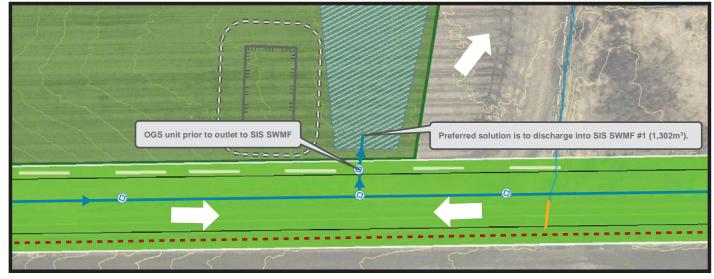
Notes

- Minor system conveyance via storm sewer network with OGS treatment at the outlet to Lovers Creek.
- Major system flows along Lockhart Road to Lovers Creek. Provide over control for Water Quantity and Quality Volumes at SIS SWMF #2.
- Potential Locations for Linear LIDs have been allocated and are to be confirmed in Detailed Design.

Figure DS-08 - LR.R-02 Post Development SWM - Lockhart Road





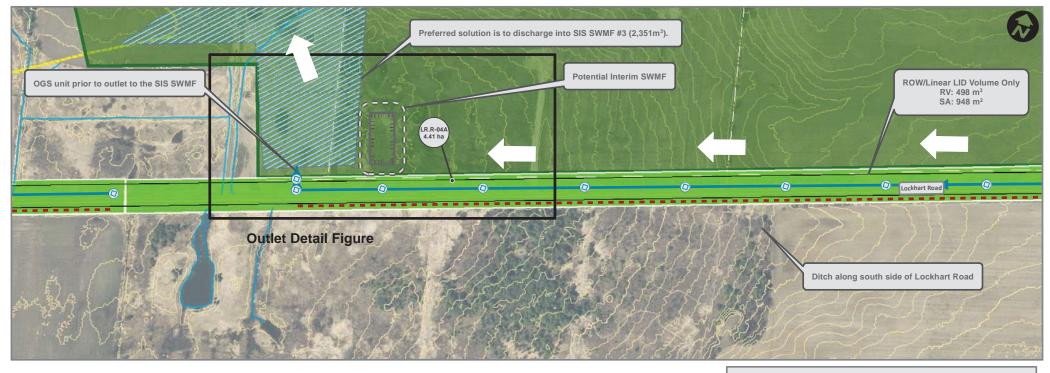


Outlet Detail Figure

Notes

- Minor system conveyance via storm sewer network with OGS treatment at the outlet to SIS SWMF #1.
- Major system flow to the SIS SWMF #1, overflow to the east towards the Lovers Creek Tributary.
- Potential Locations for the SIS SWMF have been allocated and are to be confirmed in Detailed Design.







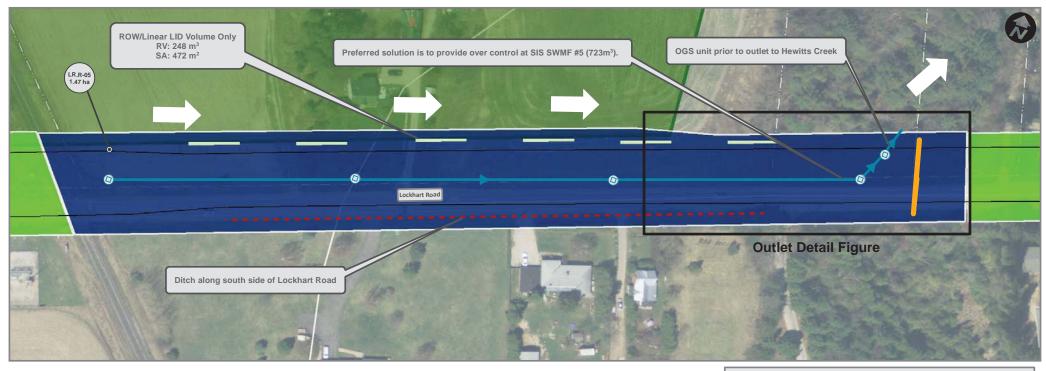
Outlet Detail Figure

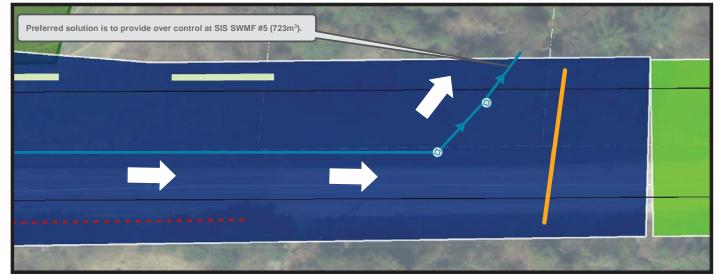
Note

- Minor system conveyance via storm sewer network with OGS treatment at the outlet to SIS SWMF #3.
- Major system flow to the SIS SWMF #3, overflow to the west towards the Lovers Creek Tributary.
- Potential Locations for the SIS SWMF have been allocated and are to be confirmed in Detailed Design.

Figure DS-10 - LR.R-04

Post Development SWM - Lockhart Road Proposed MH Linear LID **Existing Property Line** SIS SWM Facility SWMF and LLID Existing Culvert Development Lands Proposed Storm Network Floodplain Setback Watercourses Master Plan Catchments II = = = II_{Potential Property} Edge of Pavement Potential SWMF Contour





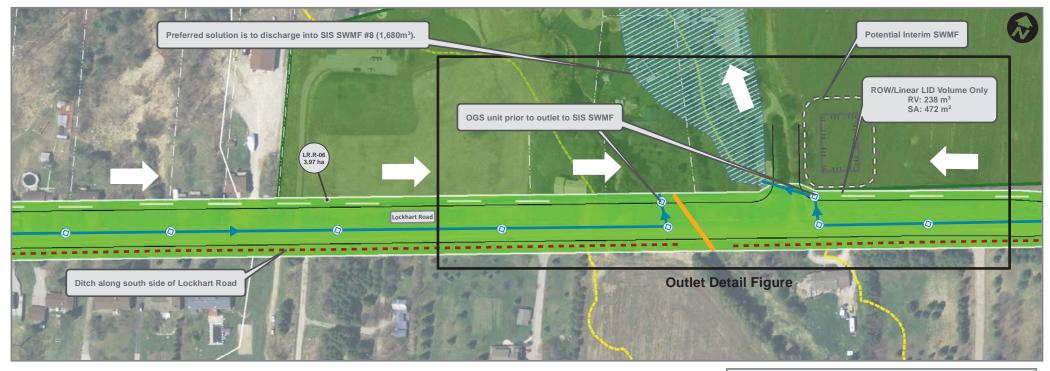
Notes

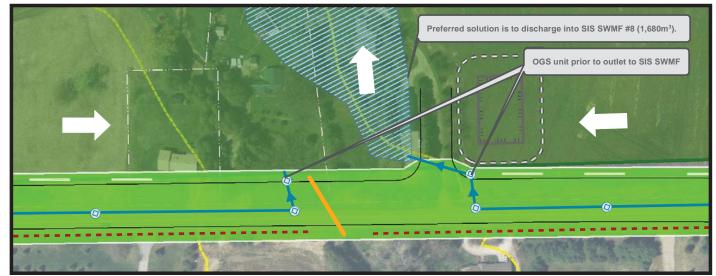
- Minor system conveyance via storm sewer network with OGS treatment at the outlet to Hewitts Creek.
- Major system and quantity control flow to Hewitts Creek.Provide over control for Water Quantity and Quality Volumes at SIS SWMF #5.
- Potential Locations for Linear LIDs have been allocated and are to be confirmed in Detailed Design.

Figure DS- 11 - LR.R-05

Post Development SWM - Lockhart Road





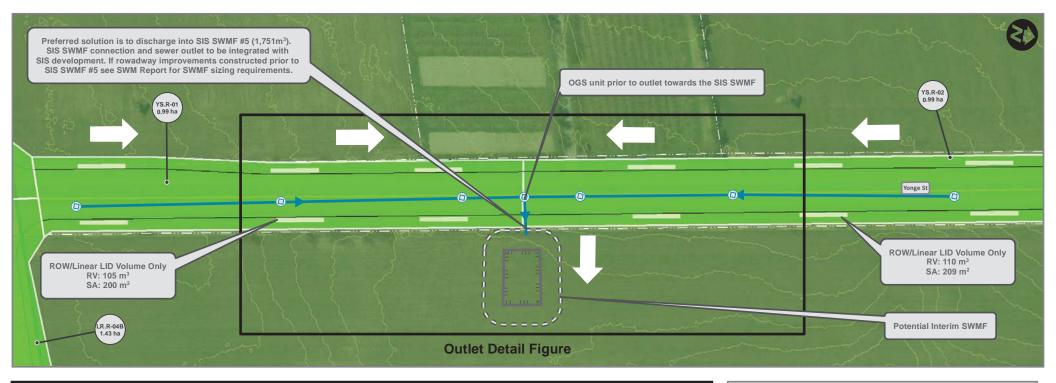


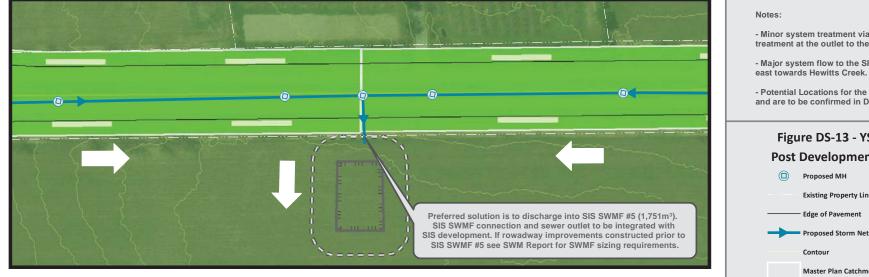
Notes:

- Minor system treatment via storm sewer network with OGS treatment at outlet to the SIS SWMF #8.
- Major system flow to the SIS SWMF #8, overflow to the west towards Hewitts Creek. West drainage system to be overcontrolled within SIS SWMF #8.
- Potential Locations for the SIS SWMF have been allocated and are to be confirmed in Detailed Design.

Figure DS-12 - LR.R-06
Post Development SWM - Lockhart Road





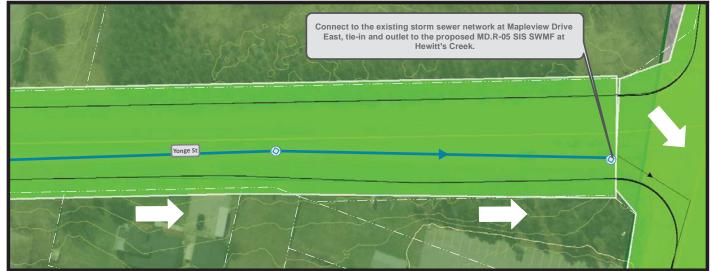


- Minor system treatment via storm sewer network with OGS treatment at the outlet to the SIS SWMF #5.
- Major system flow to the SIS SWMF #5, overflow to the
- Potential Locations for the SIS SWMF have been allocated and are to be confirmed in Detailed Design.

Figure DS-13 - YS.R-01 and YS.R-02 **Post Development SWM - Yonge Street**



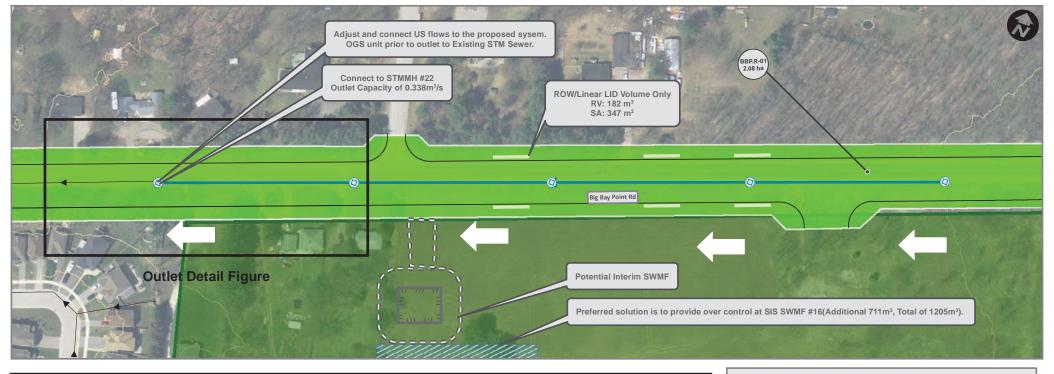




- Minor system conveyance via storm sewer network with OGS treatment at the outlet to an SIS SWMF. - Major system flow to the MD.R-05 SIS SWMF, overflow to the east towards Hewitts Creek. - Potential Locations for Linear LIDs have been allocated and are to be confirmed in Detailed Design. Figure - DS-14 - YS.R-03 Post Development SWM - Yonge Street Proposed MH Contour **Existing Property Line Development Lands** Master Plan Catchments **Edge of Pavement** Proposed Storm Network Linear LID SWMF Outlet and LLID Existing Storm Pipe

Notes:

Outlet Detail Figure



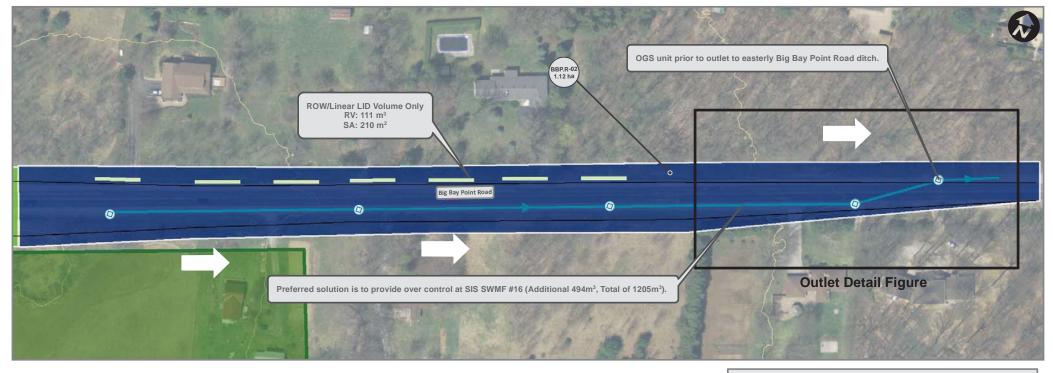


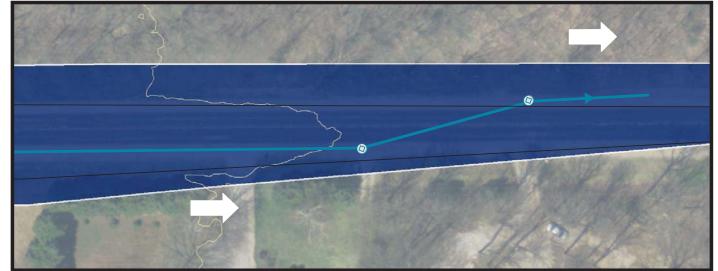
Notes:

- Minor system conveyance via storm sewer network with OGS treatment at the outlet towards Hewitts Creek.
- Major system flow towards Hewitts Creek. Provide over control for Water Quantity and Quality Volumes at SIS SWMF #16.
- Potential Locations for Linear LIDs have been allocated and are to be confirmed in Detailed Design.

Figure DS-15 - BBP.R-01
Post Development SWM - Big Bay Point Road





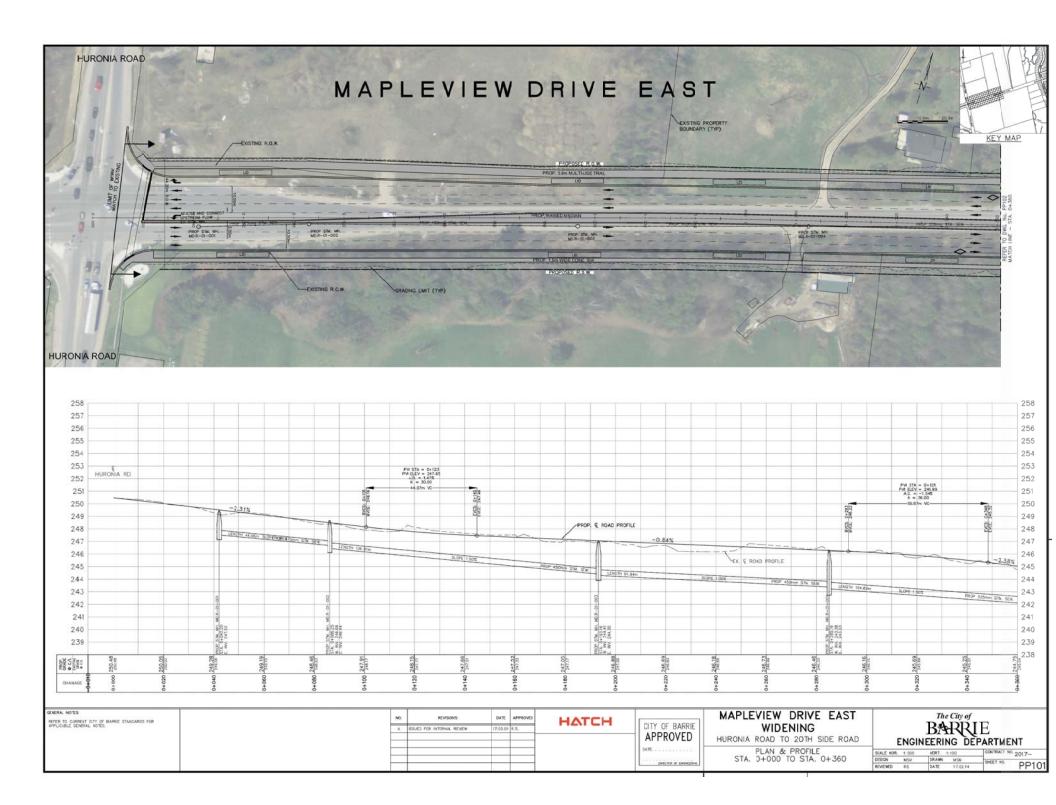


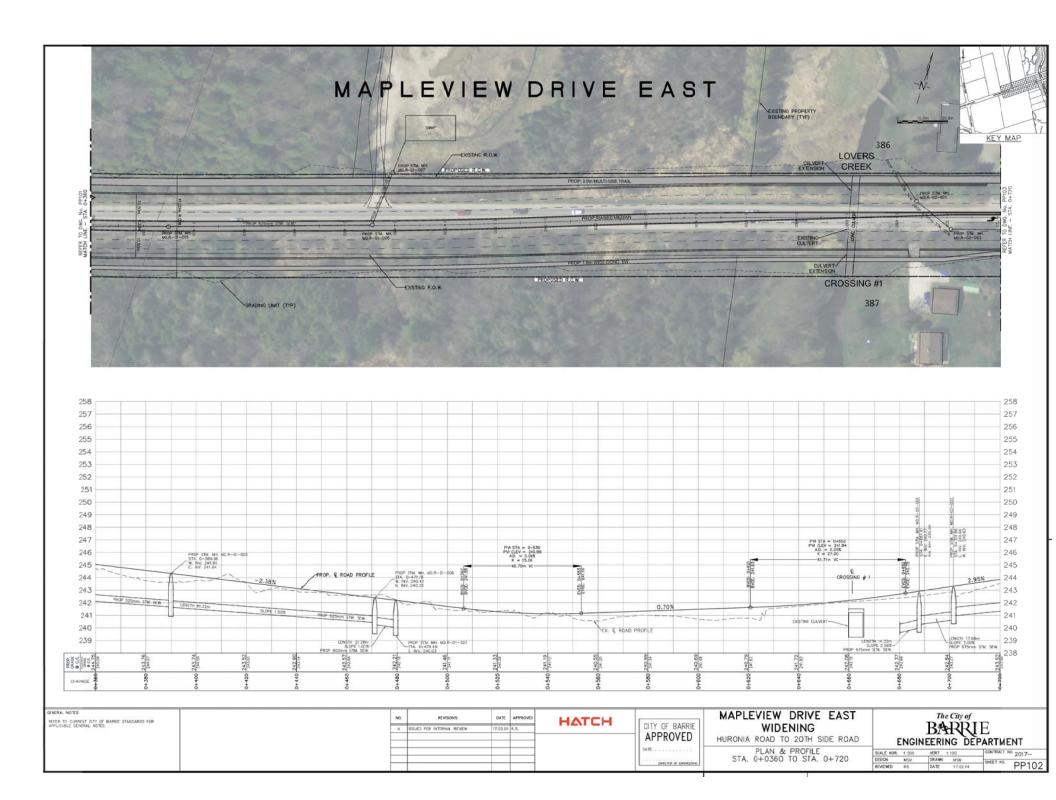
Notes:

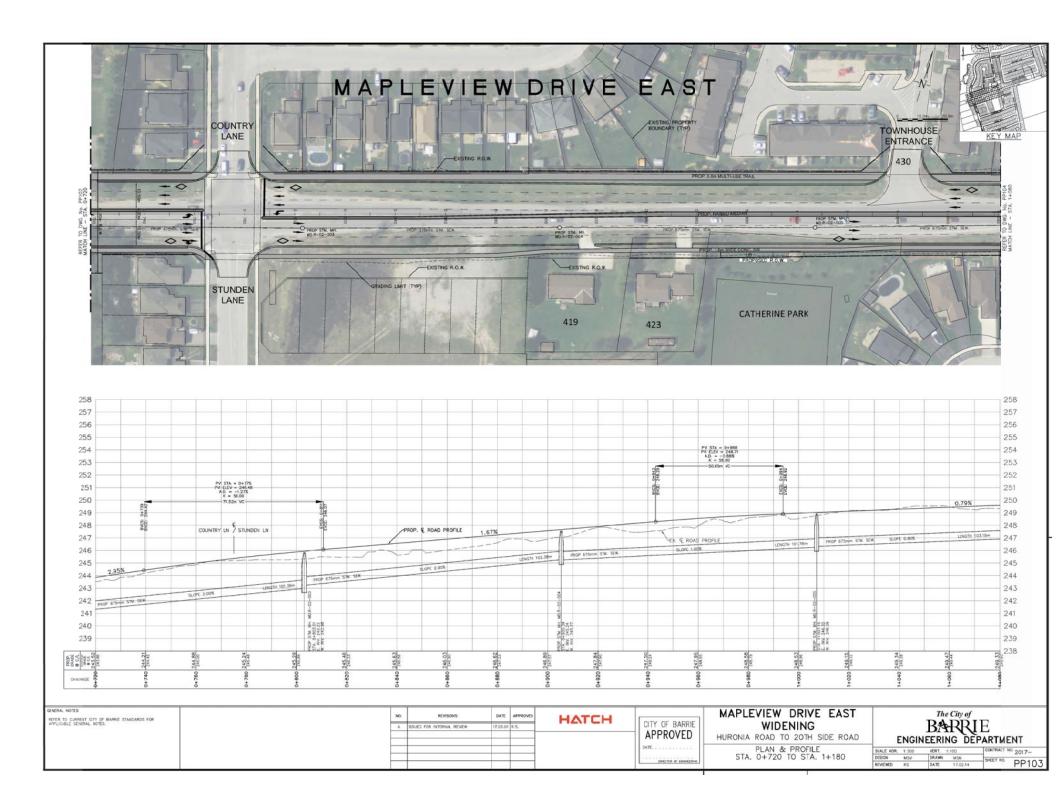
- Minor system conveyance via storm sewer network with OGS treatment at the outlet towards Sandy Cove Creek.
- Major system flow towards Sandy Cove Creek. Provide over control for Water Quantity and Quality Volumes at SIS SWMF #16.
- Potential Locations for Linear LIDs have been allocated and are to be confirmed in Detailed Design.

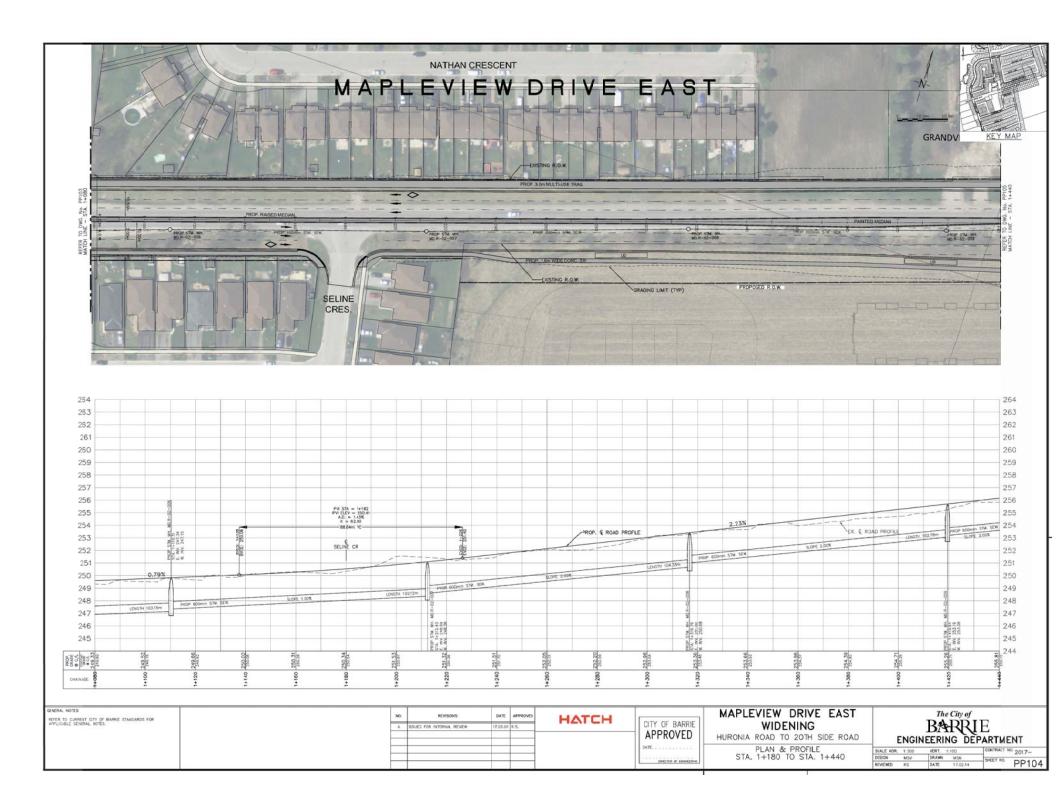
Figure DS-16 - BBP.R-02 Post Development SWM - Big Bay Point Road

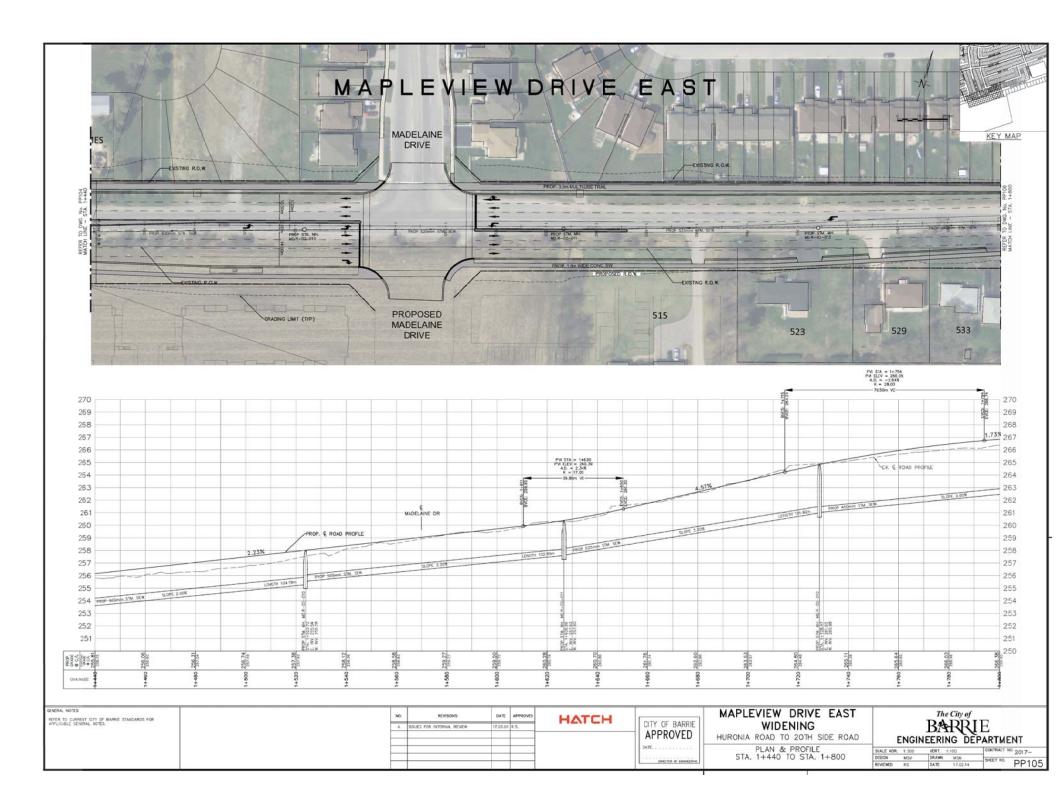


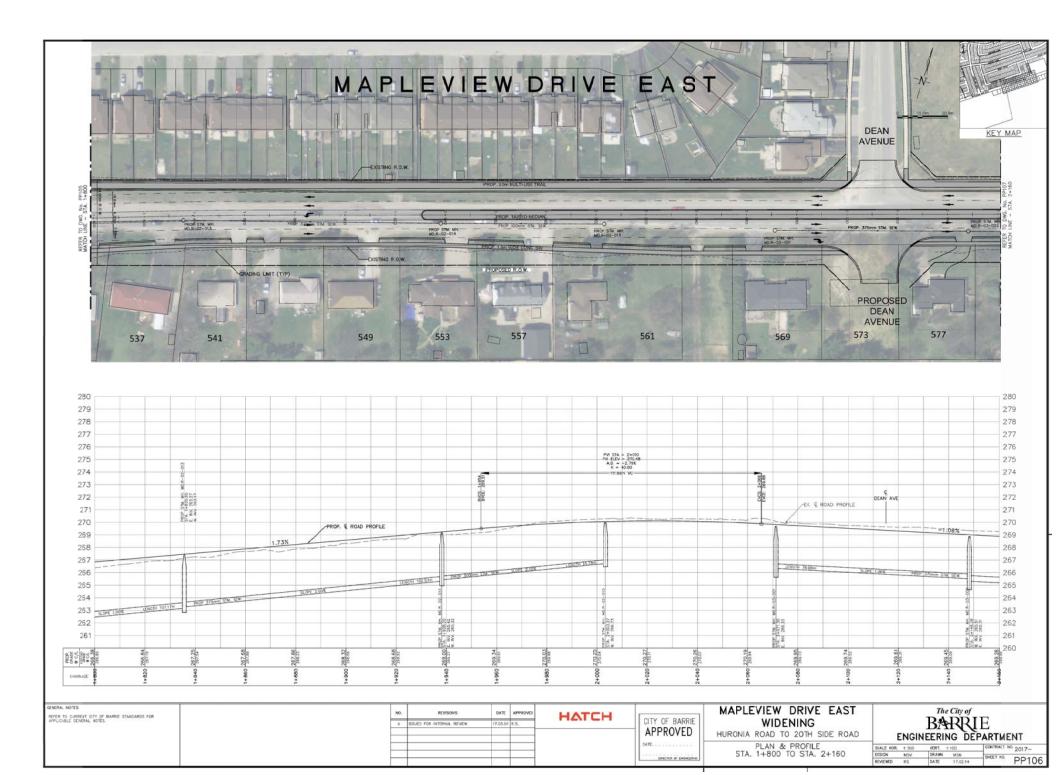




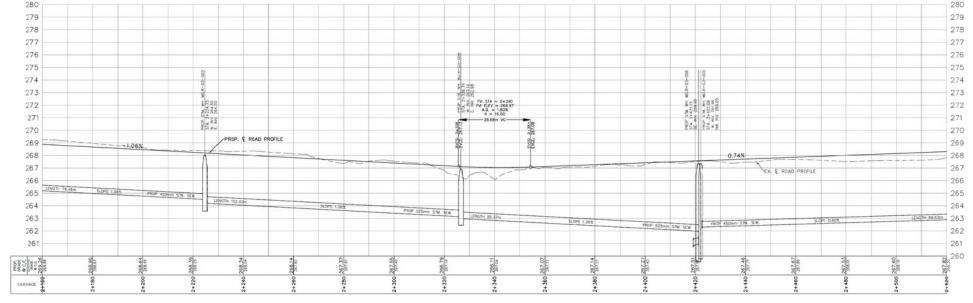












GENERAL NOTES

REFER TO CURRENT CITY OF BIARRIE STANDARDS FOR APPLICABLE GENERAL WOTES.

| NO. | REVISIONS | DATE | APPROVED | HATCH |
|-----|----------------------------|----------|----------|------------|
| A | ISSUED FOR INTERNAL REVIEW | 17,03.01 | R.S. | 1 1231 121 |
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CITY OF BARRIE
APPROVED
DATE.

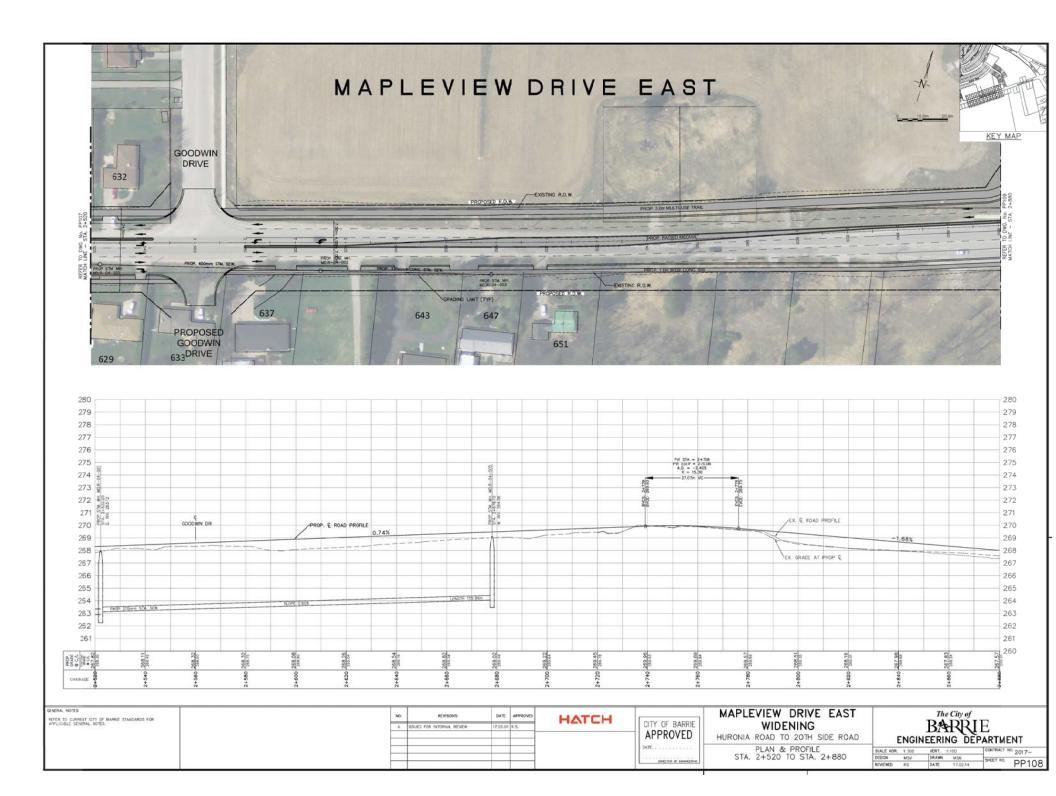
MAPLEVIEW DRIVE EAST WIDENING

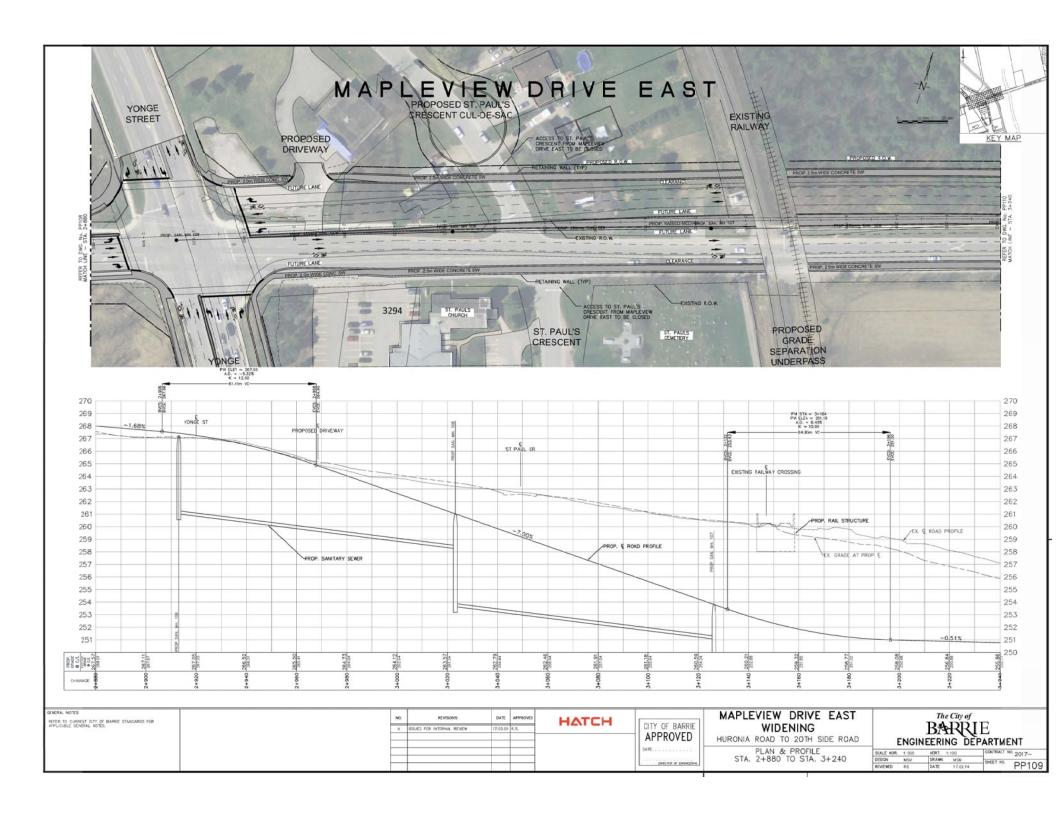
HURONIA ROAD TO 20TH SIDE ROAD

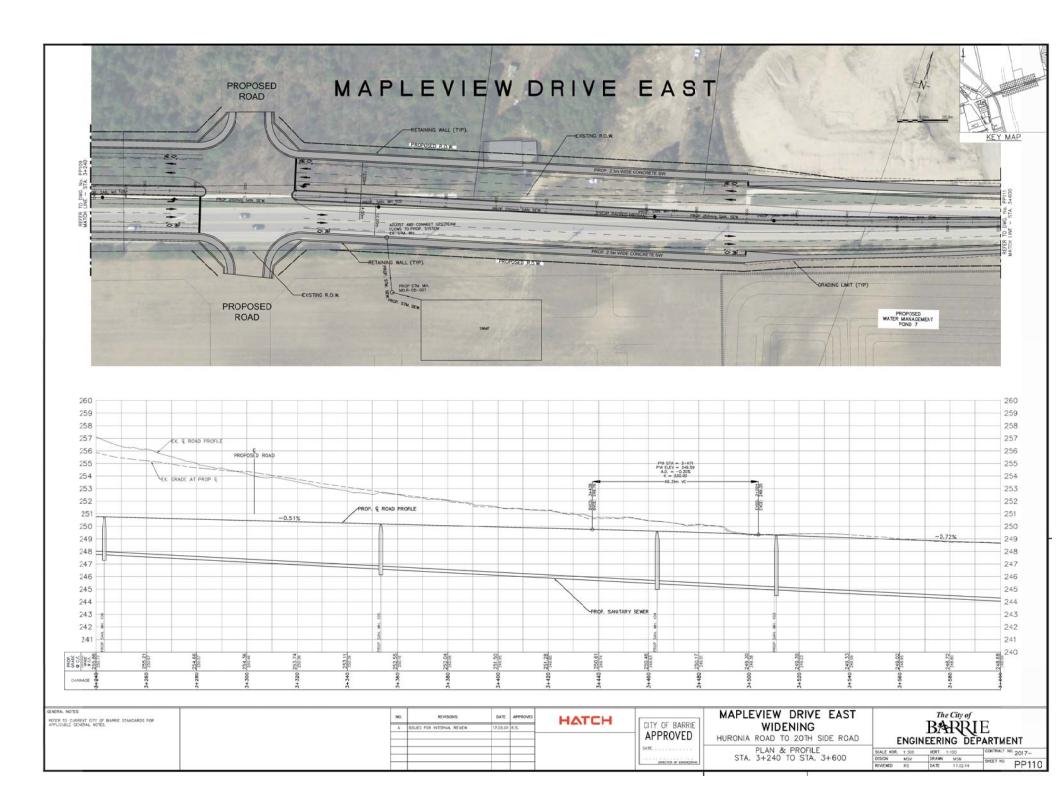
PLAN & PROFILE
STA. 2+160 TO STA. 2+520

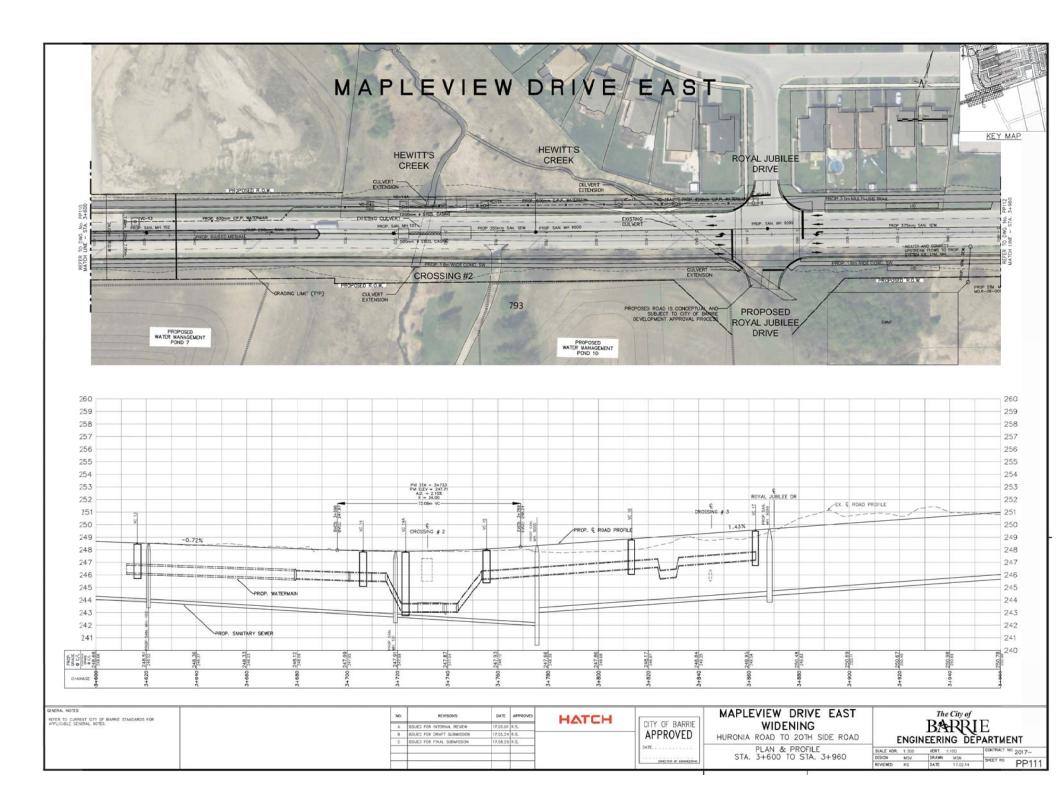
| The City of | |
|------------------------|--|
| BARRIE | |
| | |
| ENGINEERING DEPARTMENT | |

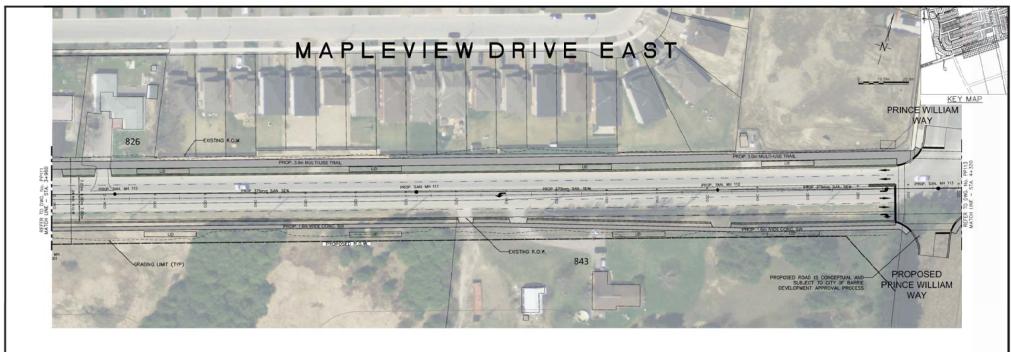
| SCAL | E HOR. 1:50 | O VERT. | 1:100 | CONTRACT N | 0. 2017- |
|-------|-------------|---------|----------|-------------|----------|
| DESIG | N MSV | | WSW | SHEET NO. | |
| REVIE | WED RS | DATE | 17.02.14 | SPICE I FO. | PP107 |

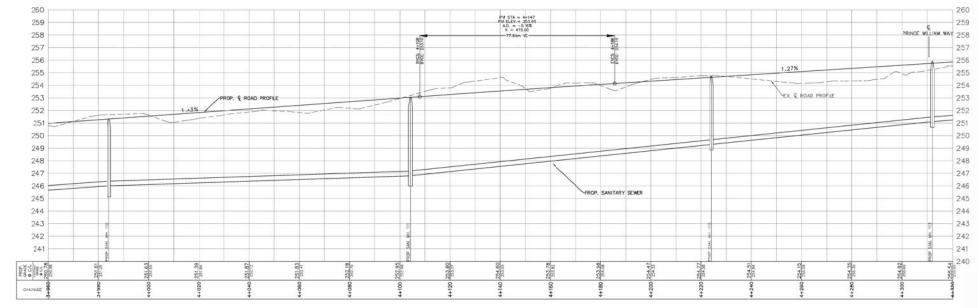












GENERAL NOTES
REFER TO CURRENT CITY OF BASHIE STANDARDS FOR APPLICUREE GENERAL NOTES.

| NO. | REVISIONS | DATE | AFFROVED | |
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| . A | ISSUED FOR INTERNAL REVIEW | 17.03.01 | R.S. | |
| В | ISSUED FOR DRAFT SUBMISSION | 17:05.24 | R.S. | |
| C | ISSUED FOR FINAL SUBMISSION | 17,08,25 | R.S. | |
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CITY OF BARRIE APPROVED

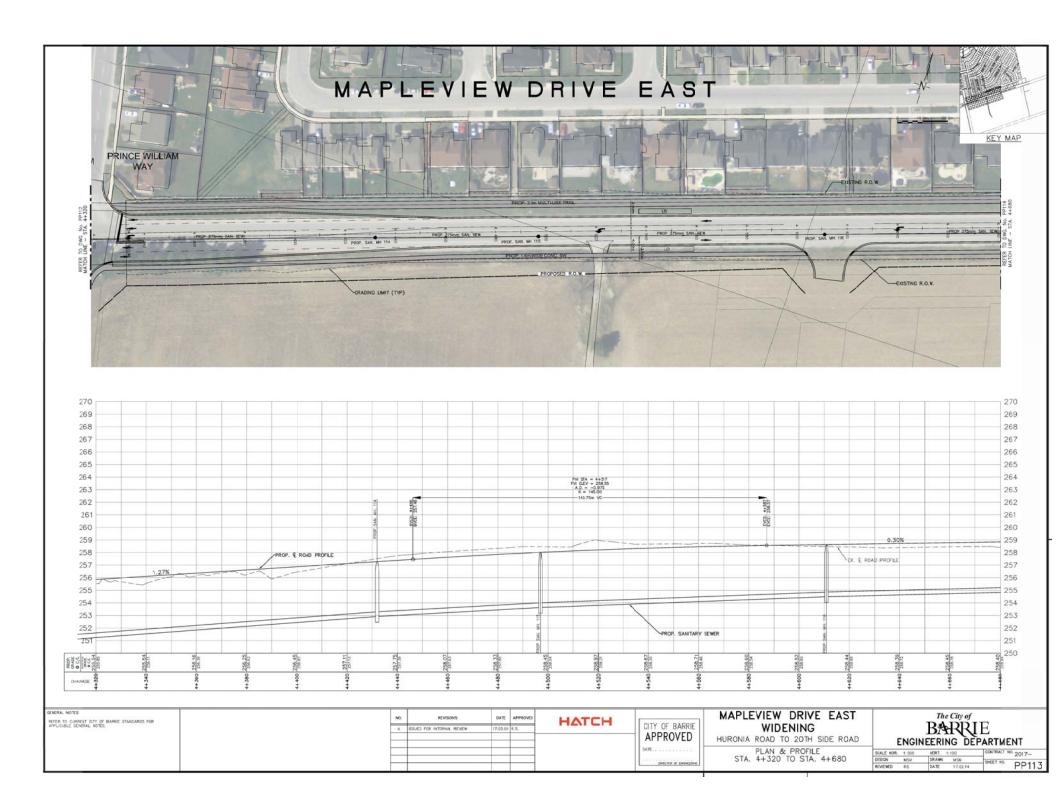
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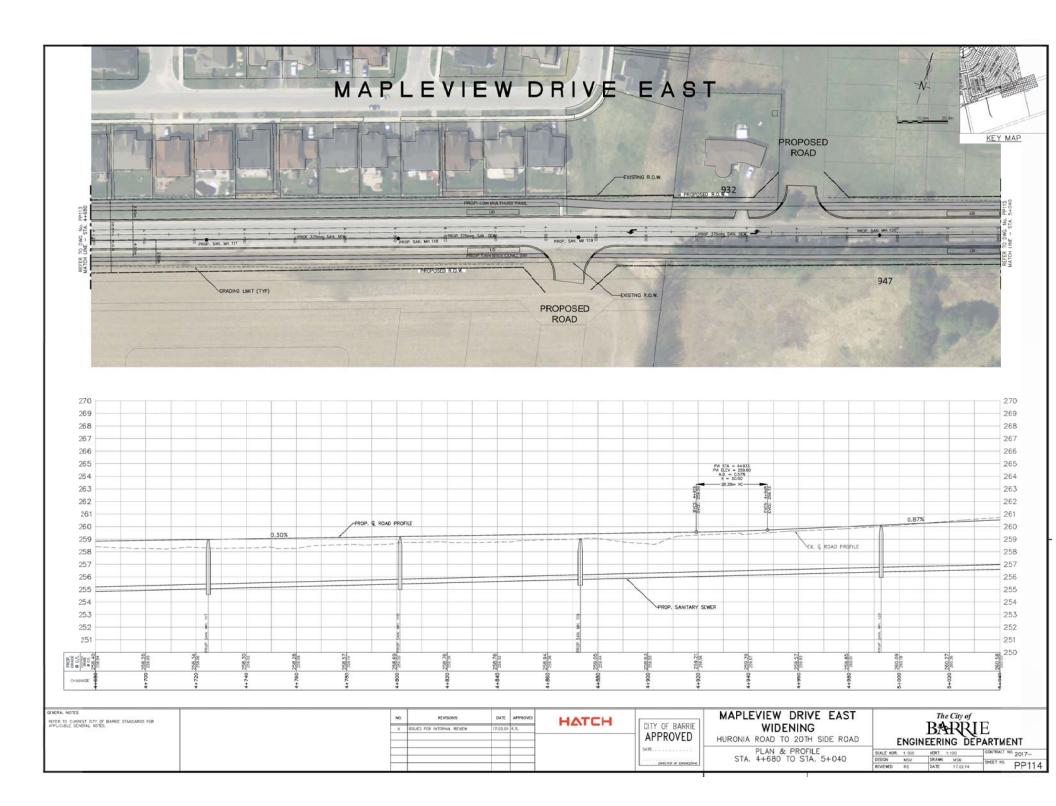
HURONIA ROAD TO 20TH SIDE ROAD

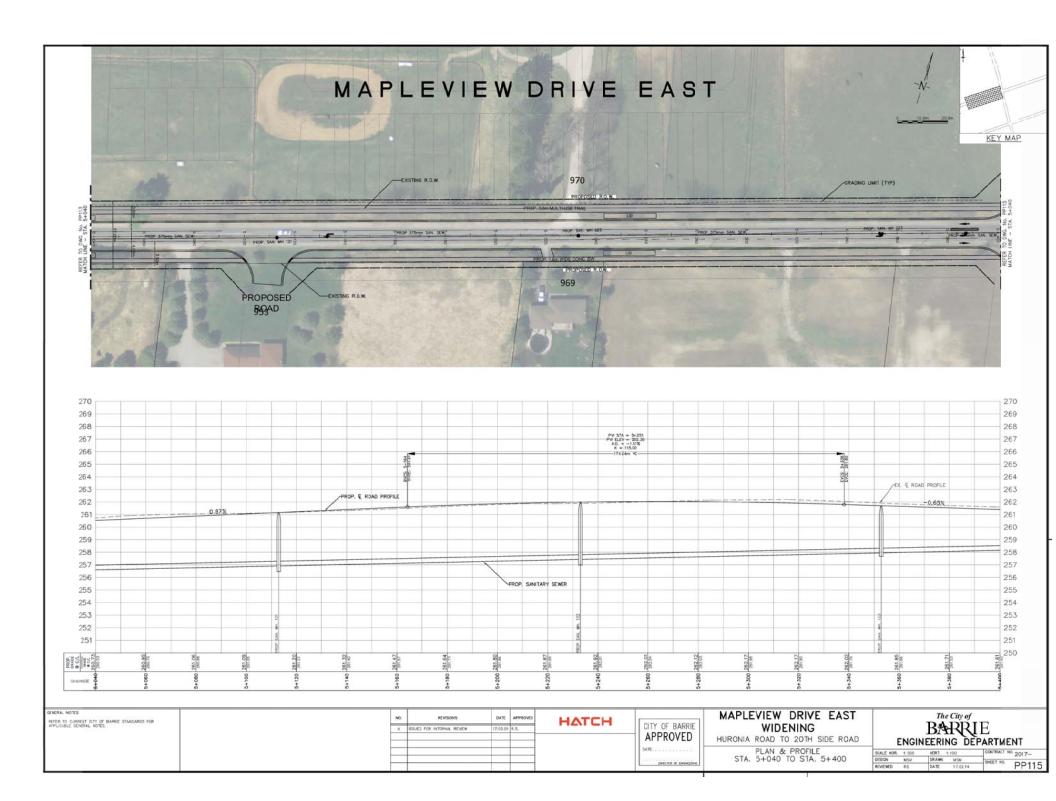
PLAN & PROFILE
STA. 3+960 TO STA. 4+320

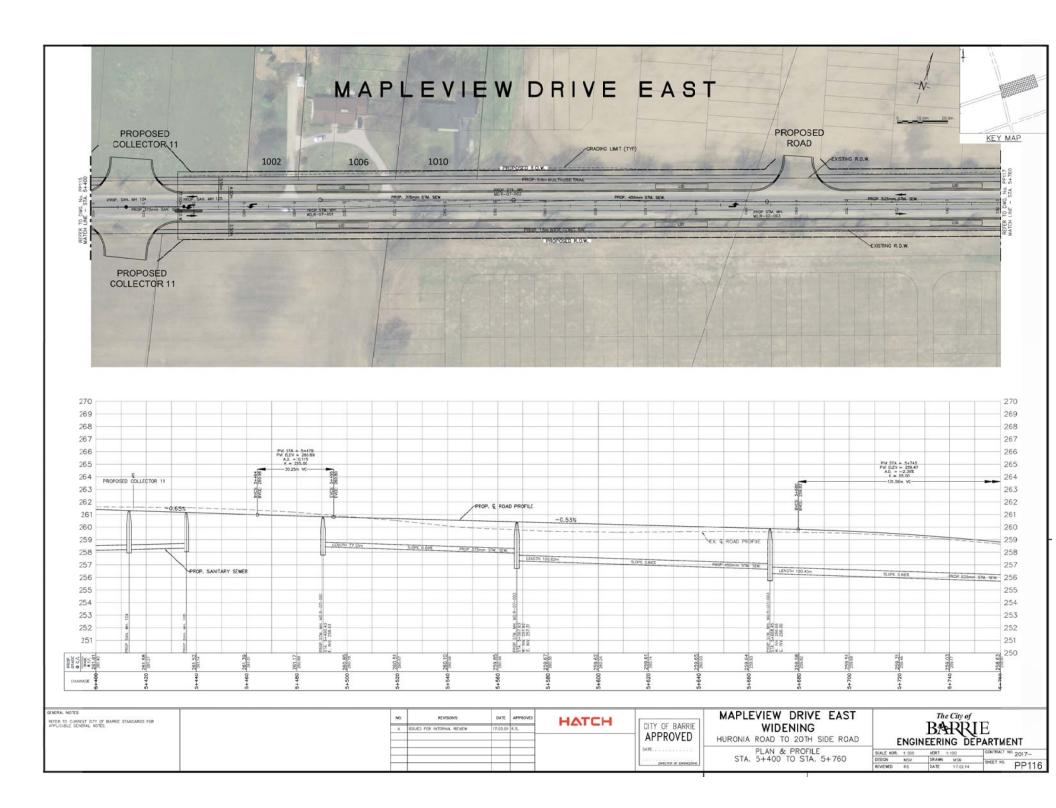
| The City of |
|------------------------|
| BARRIE |
| |
| ENGINEERING DEPARTMENT |

| SCALE HOR. | 1:500 | VERT. 1 | 100 | CONTRACT N | 0.2017- |
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| REVIEWED | RS | DATE | | | |

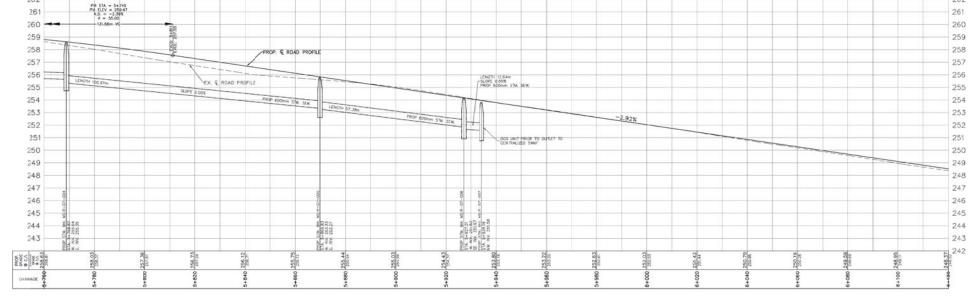












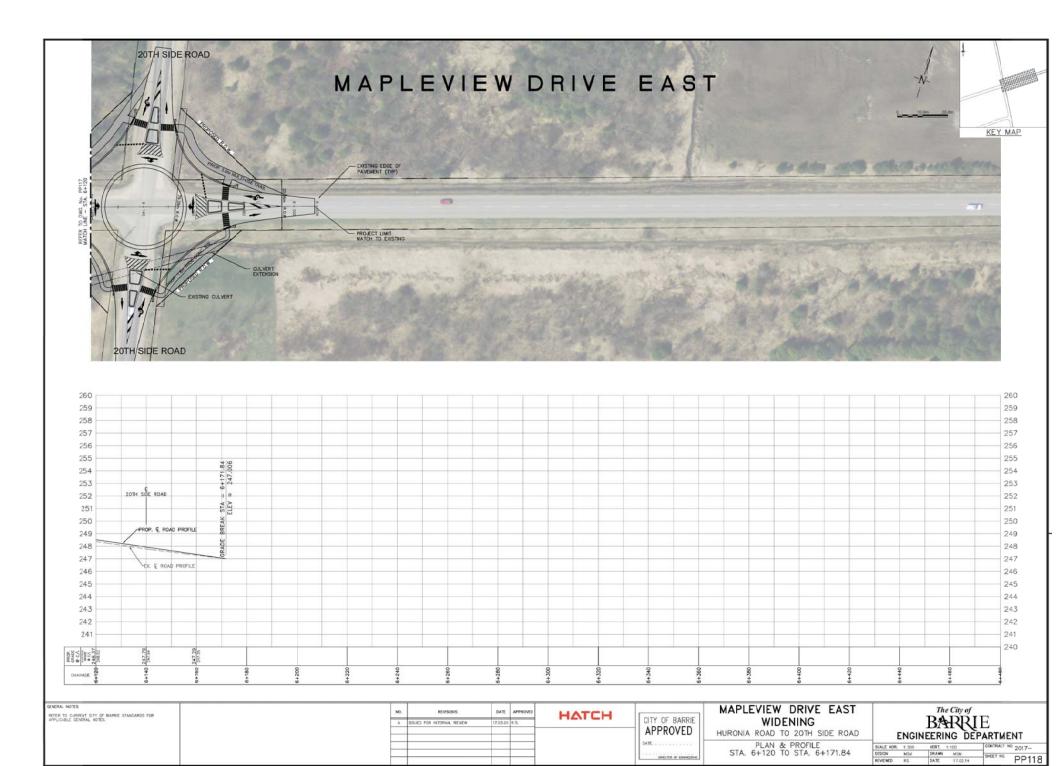
CONTRACT NO. 2017-

PP117

The City of
BARRIE
ENGINEERING DEPARTMENT MAPLEVIEW DRIVE EAST DATE APPROVE HATCH REFER TO CURRENT CITY OF BARRIE STANDARDS FOR APPLICABLE GENERAL NOTES. CITY OF BARRIE WIDENING APPROVED HURONIA ROAD TO 20TH SIDE ROAD PLAN & PROFILE STA. 5+760 TO STA. 6+120
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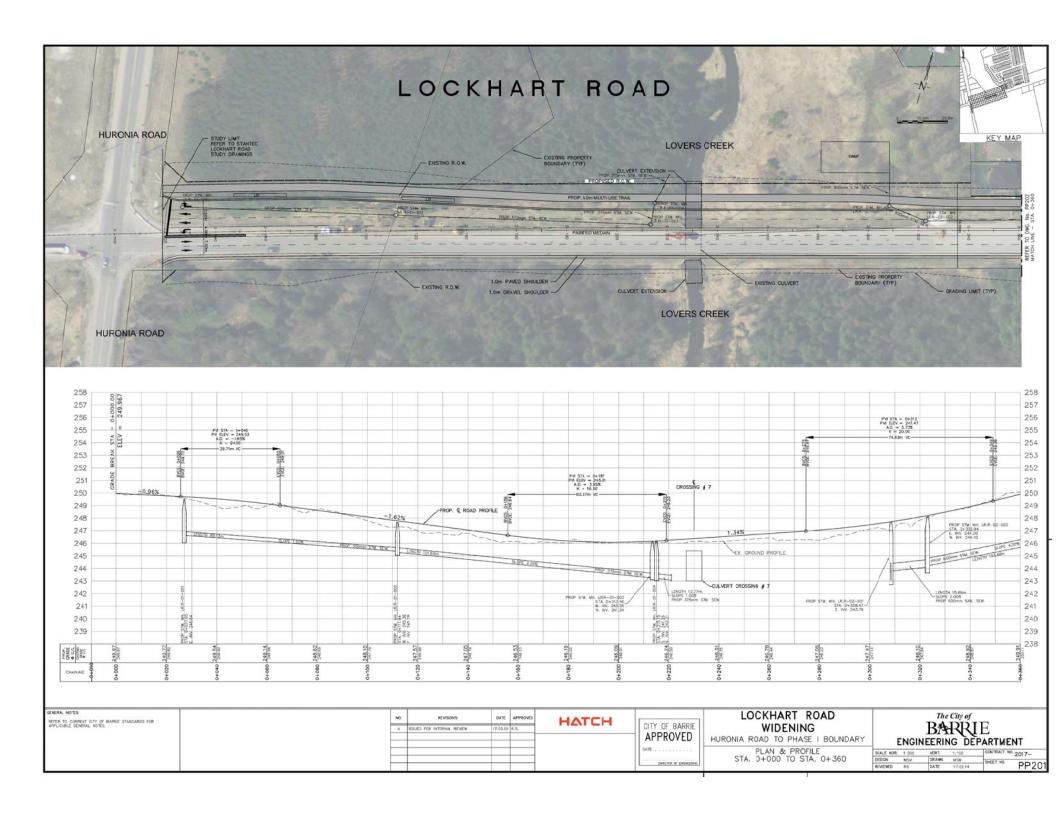
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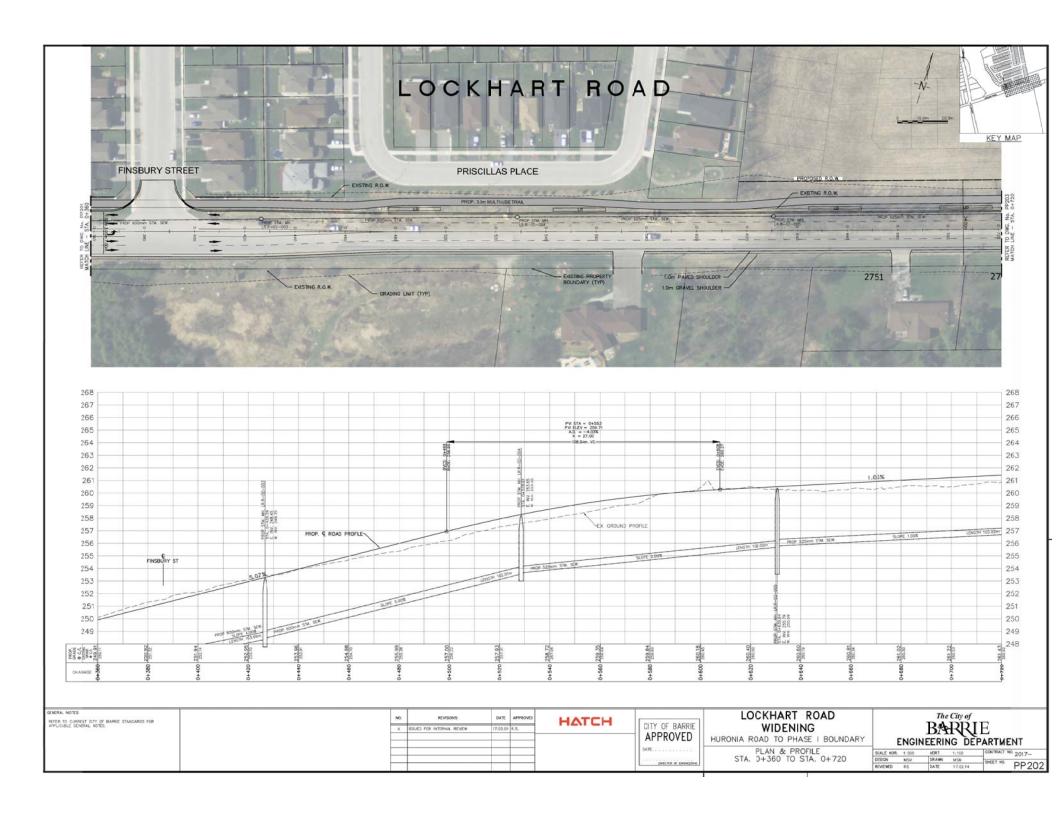
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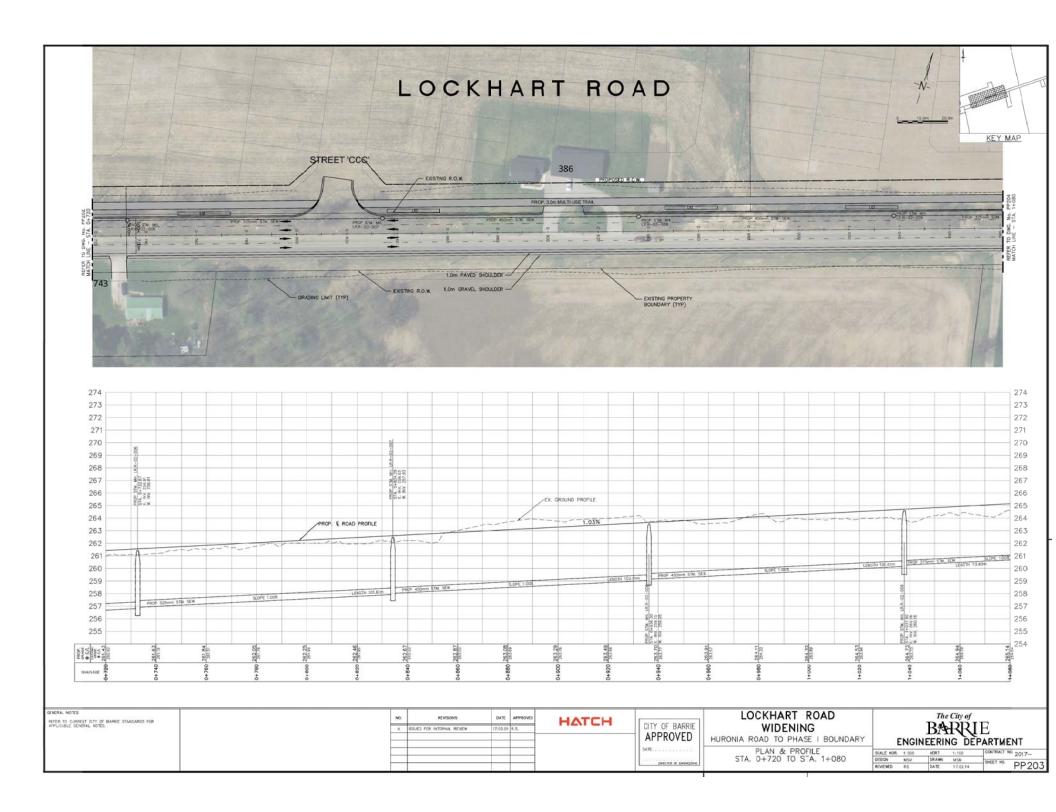


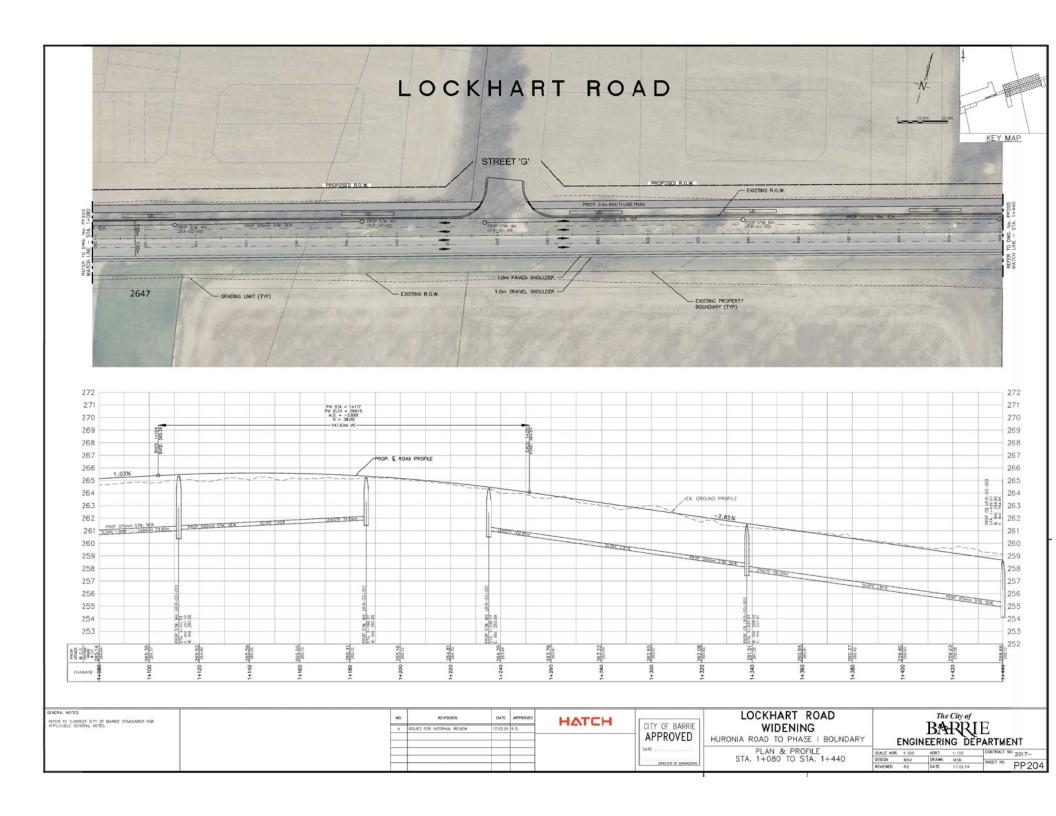
DIRECTOR OF ENGNEERING

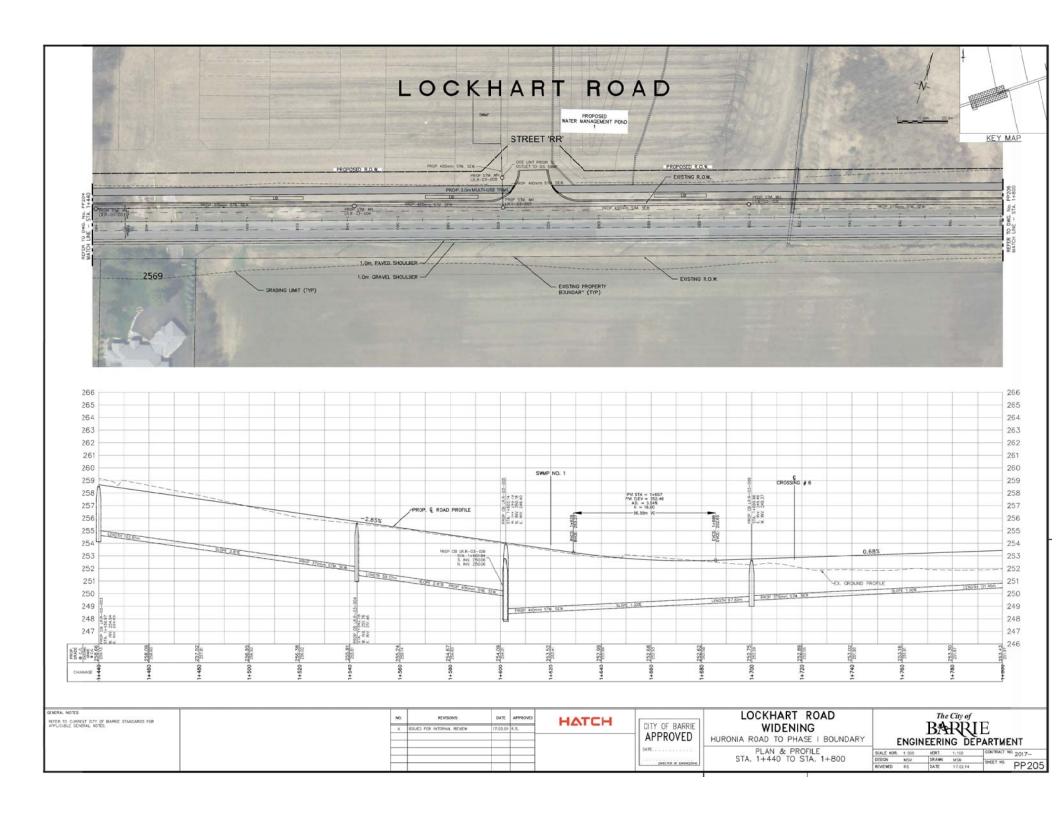
PP118

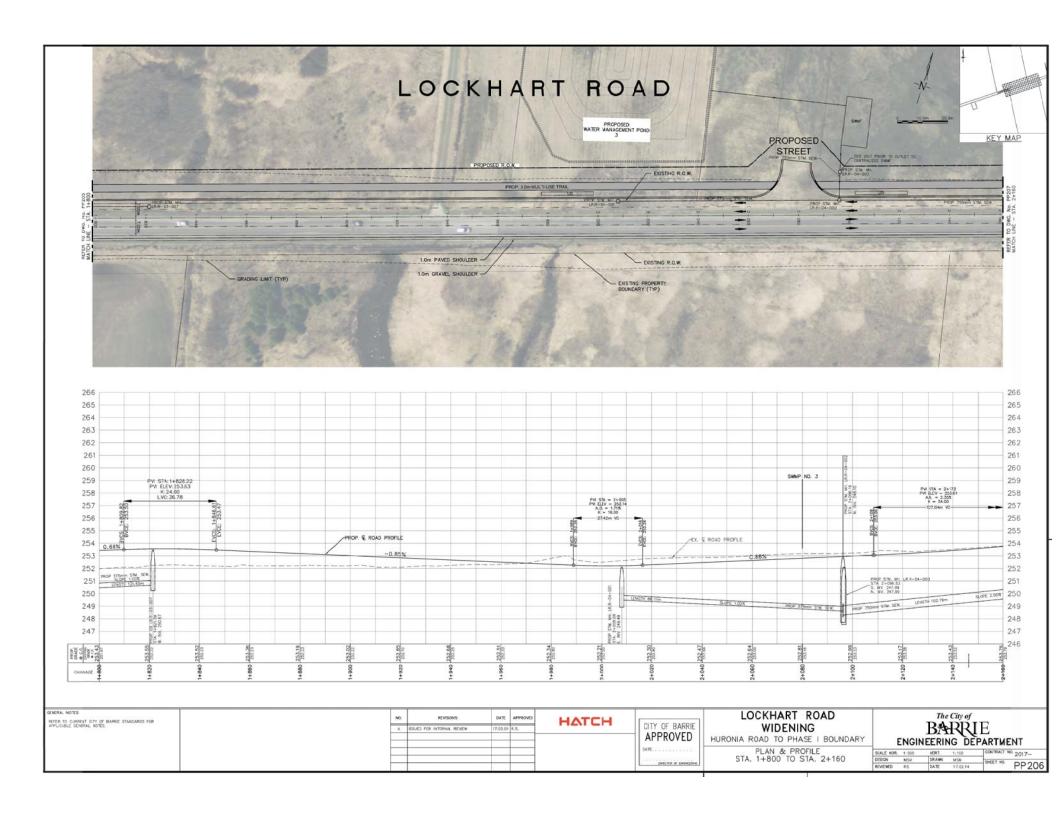


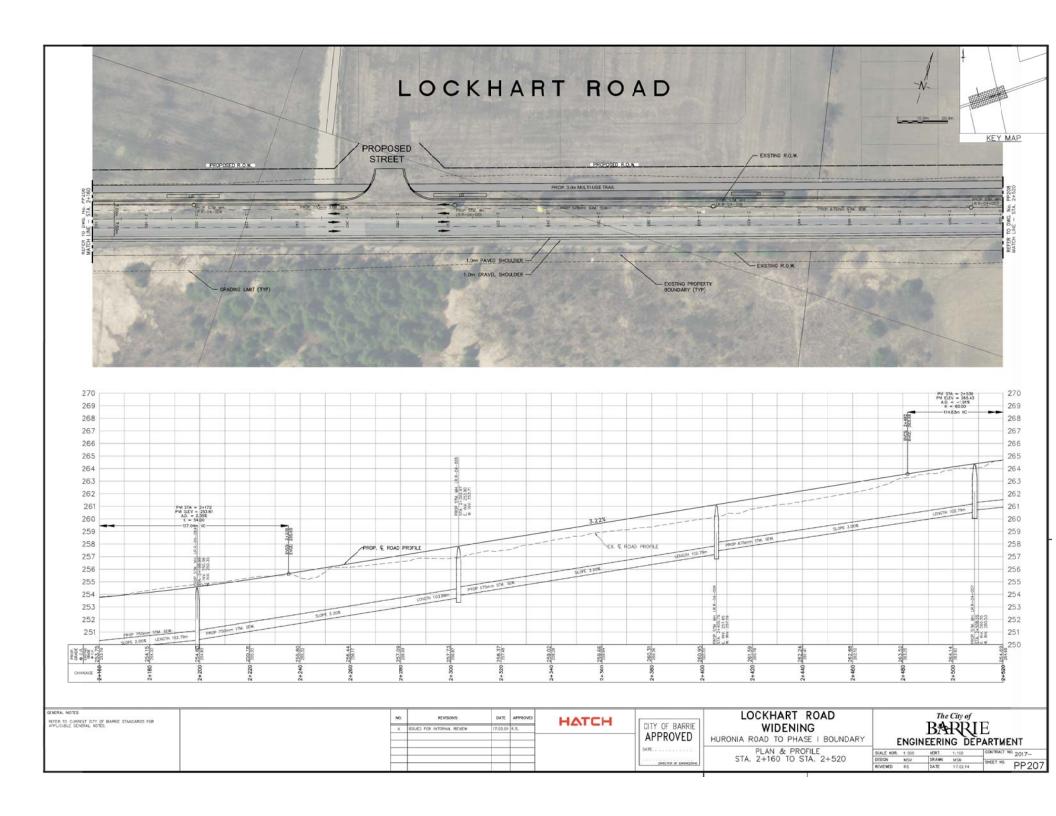


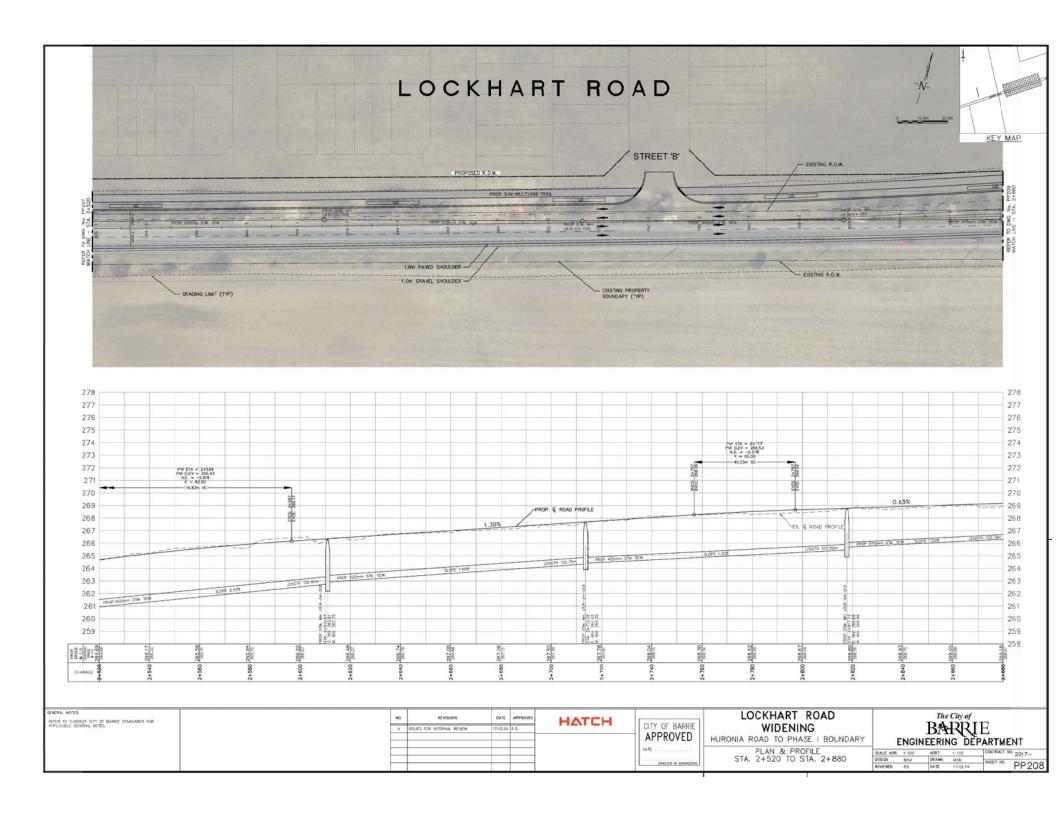


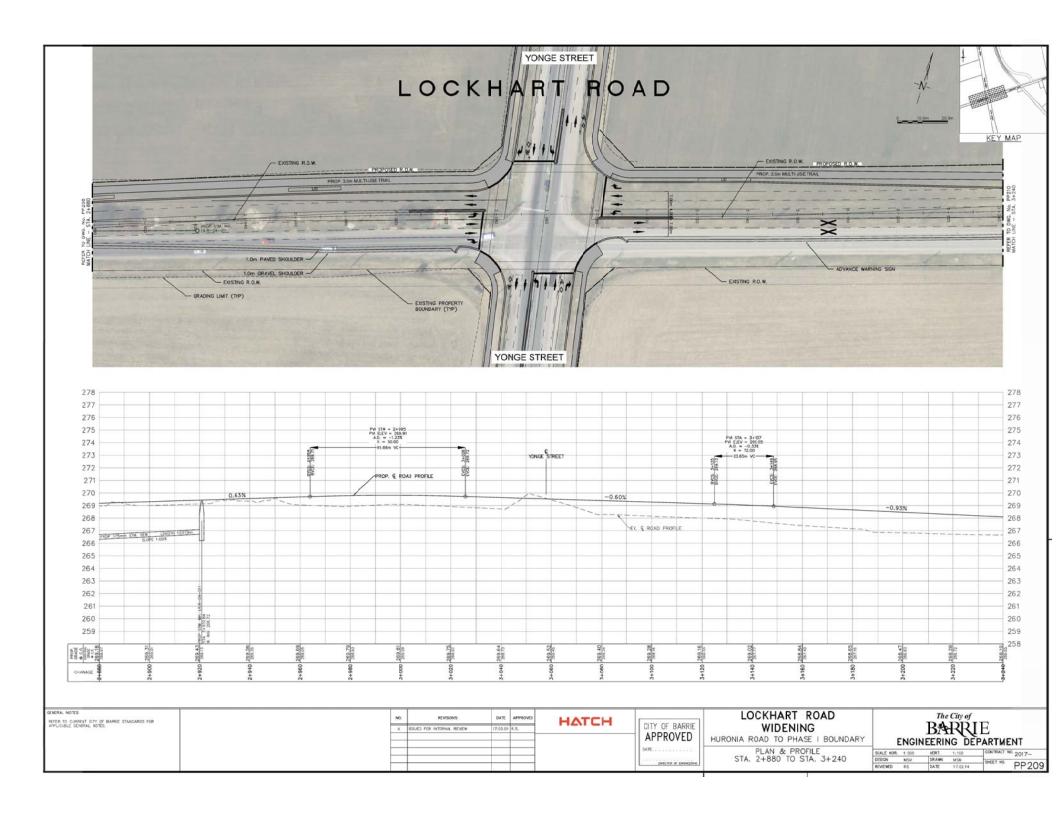


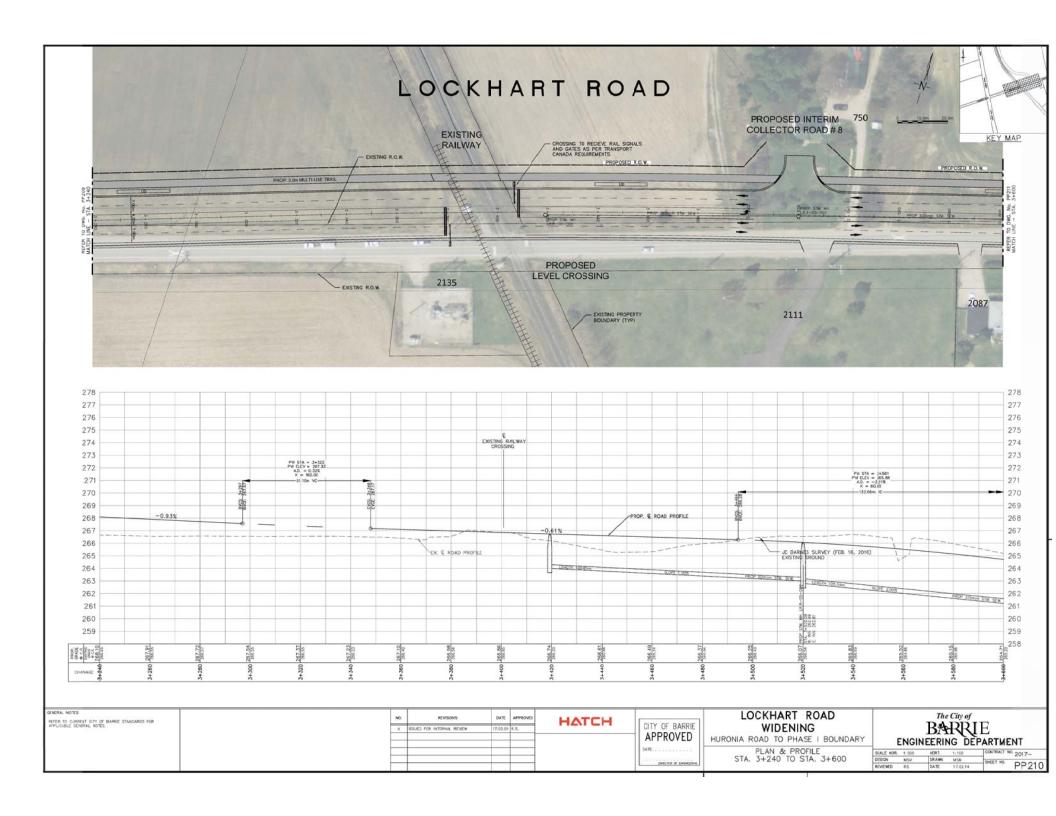


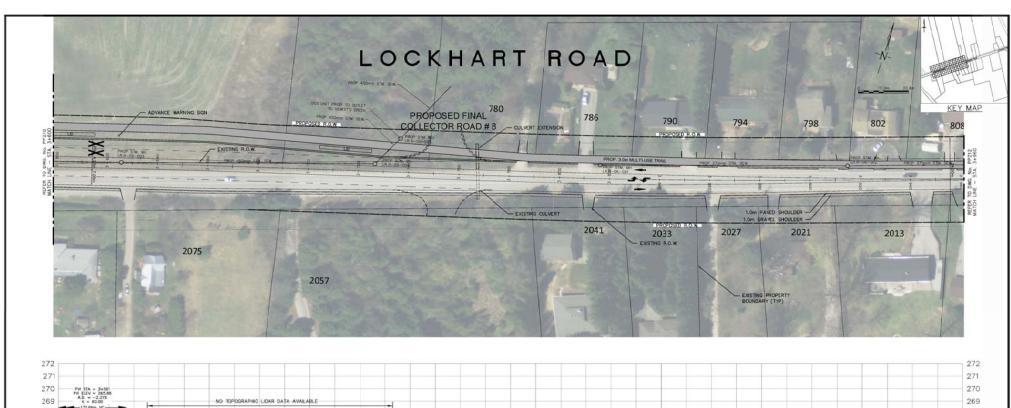


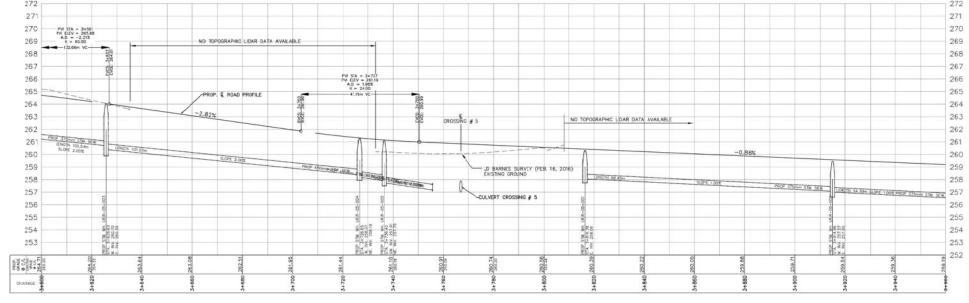




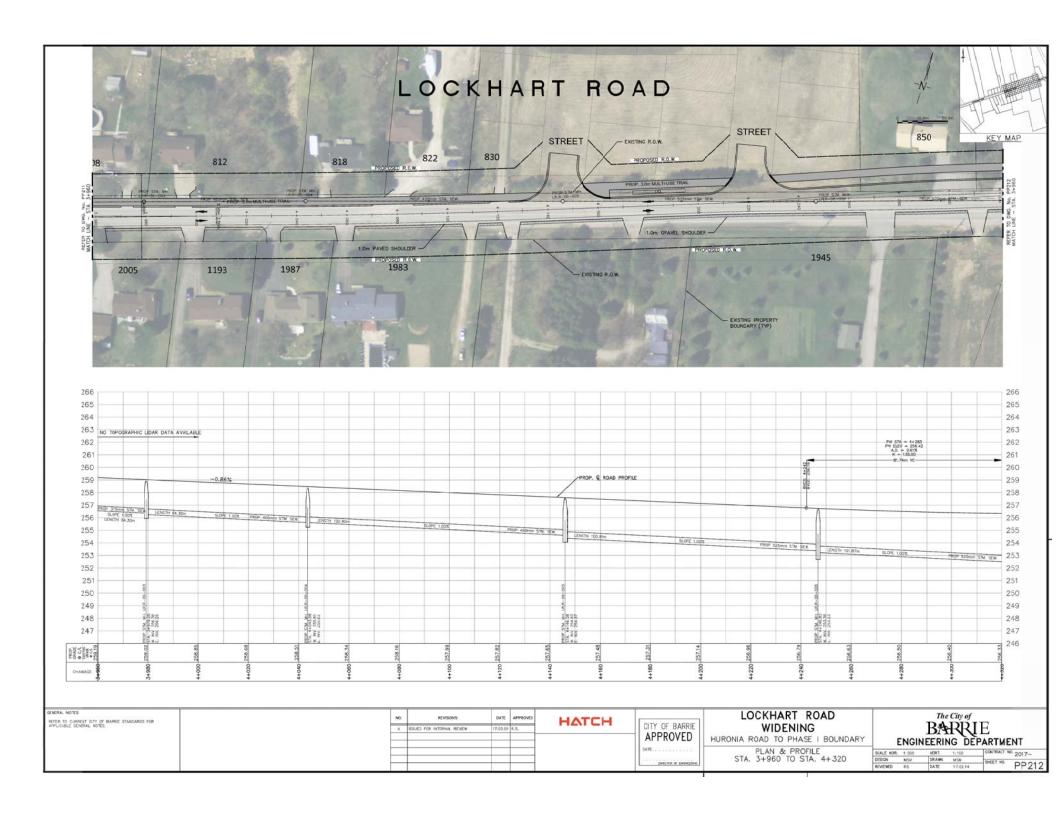


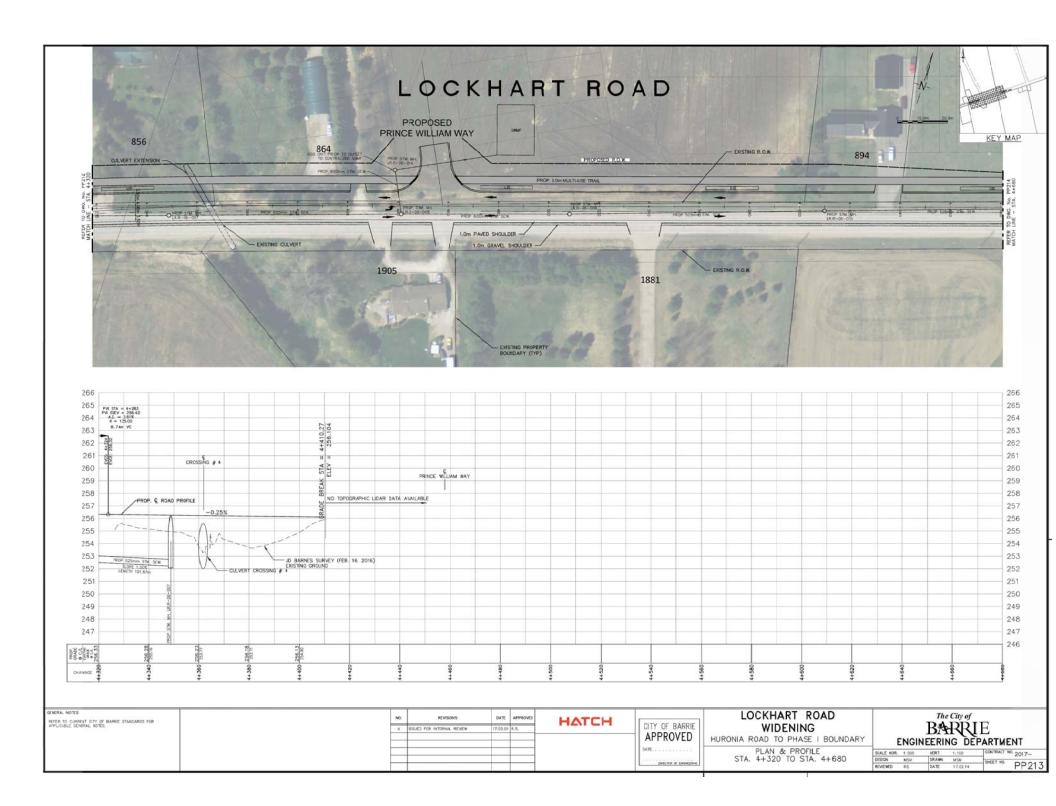


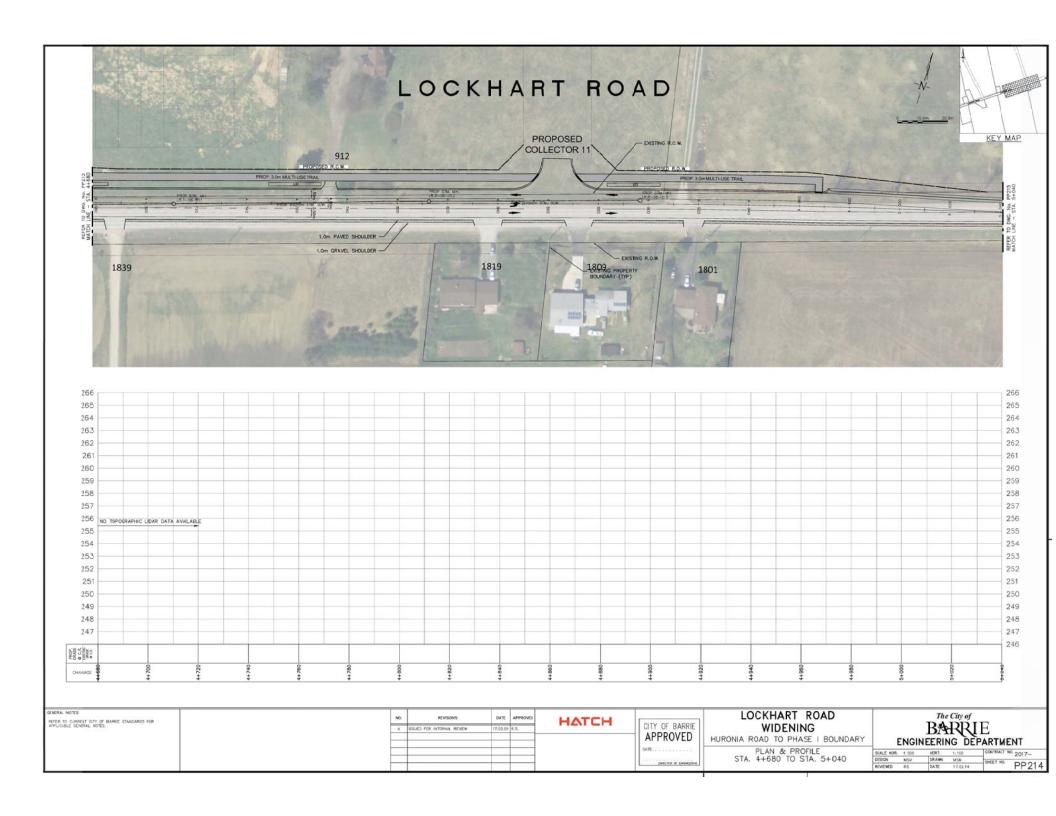


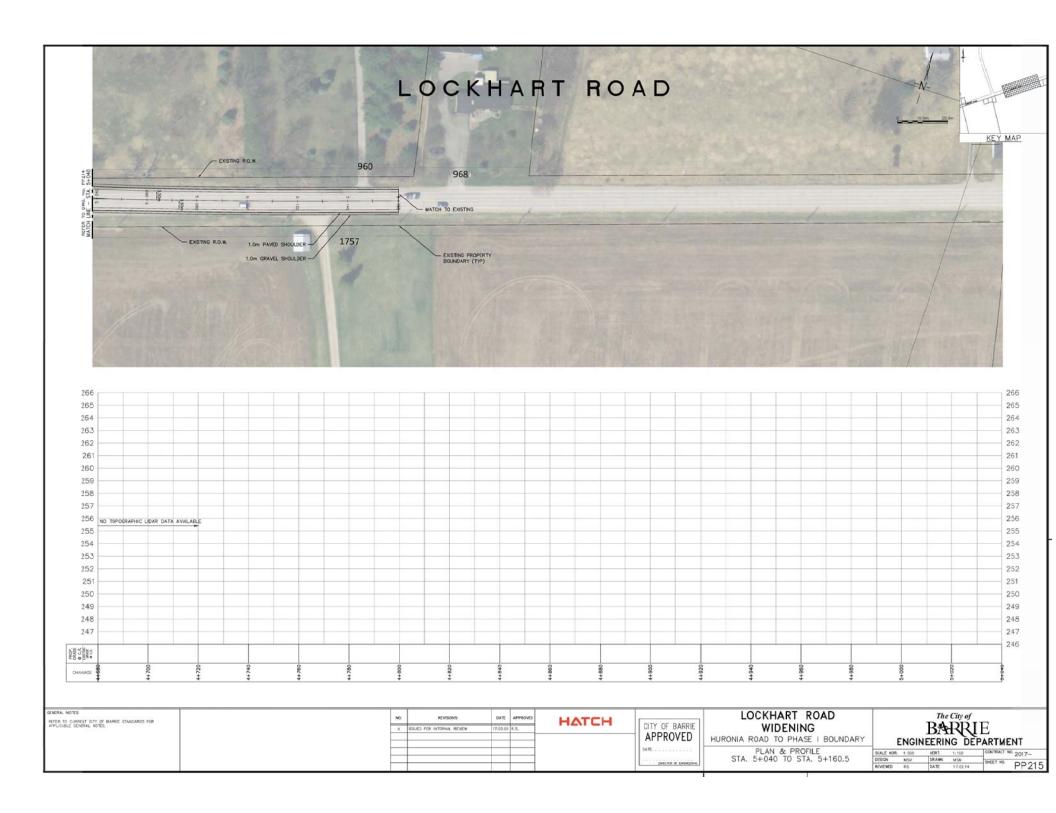


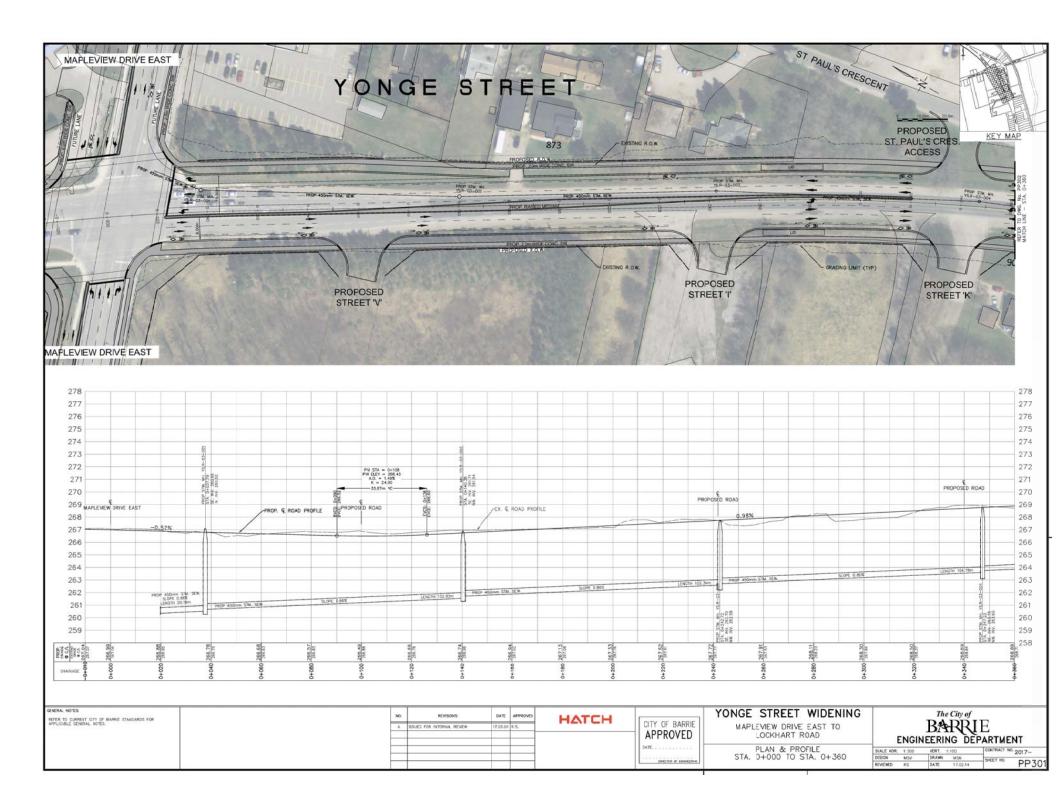
| GENERAL NOTES REFER TO CURRENT CITY OF BASRIE STANDARDS FOR APPLICABLE GENERAL, NOTES. | NO. | N. | REVISIONS | DATE | APPROVED | HATCH | [| LOCKHART ROAD | | - | | City of | _ | |
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| APPLICABLE GENERAL NOTES. | A | 650 | UED FOR INTERNAL REVEW | 17.03.01 | R.S. | 11201 | APPROVED | WIDENING HURONIA ROAD TO PHASE I BOUNDARY | | | PIC | ₽ŖĮ | E | |
| | | | | | | | DATE | ENGINEERING DEPA | | CONTRACT | | | | |
| | | | | | | | DIRECTOR OF ENGNEERING | STA. 3+600 TO STA. 3+960 | | rsw. | DRAWN | MSN 17.02.14 | SHEET NO. | PP211 |

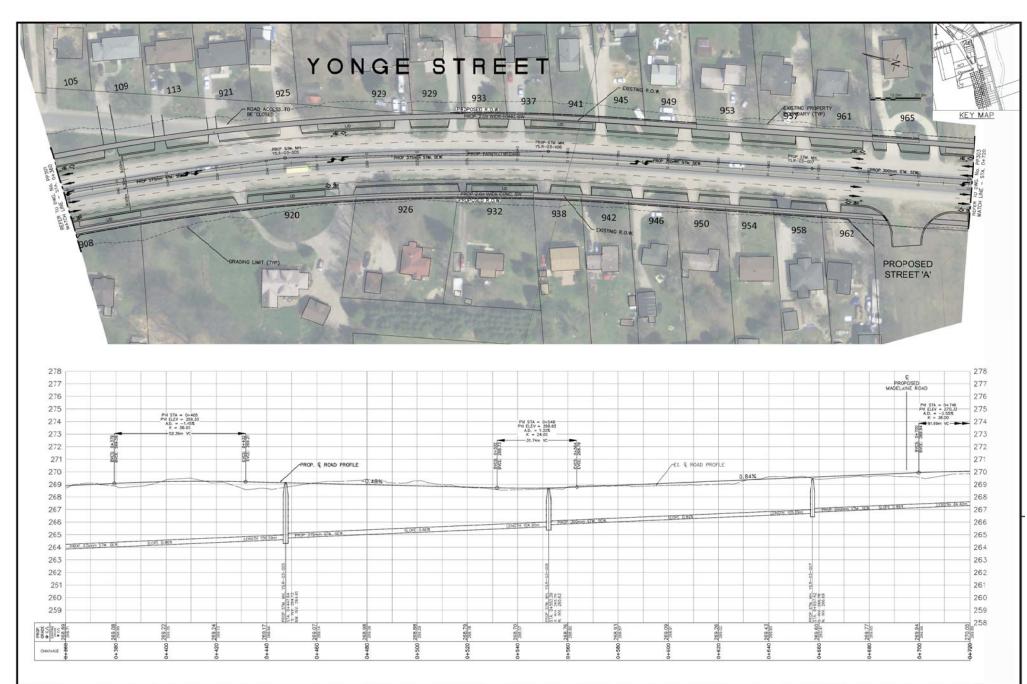












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CITY OF BARRIE APPROVED

YONGE STREET WIDENING

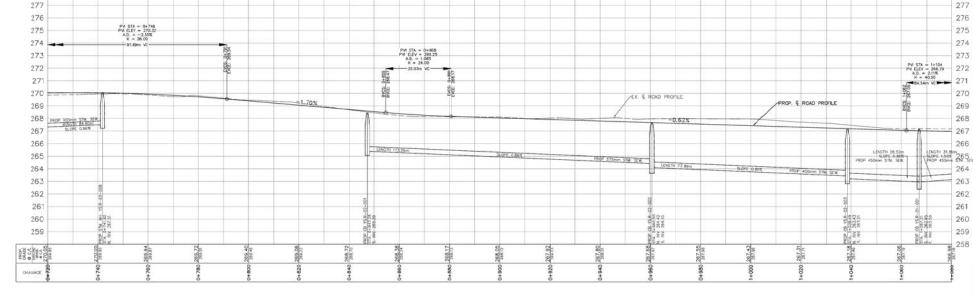
MAPLEVIEW DRIVE EAST TO LOCKHART ROAD

PLAN & PROFILE STA. D+360 TO STA. 0+720

| The City of |
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| BARRIE |
| ENGINEERING DEPARTMENT |
| LINGINGERING DELAKIMENT |

| | 1:100 | CONTRACT NO | |
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| REVIEWED RS DATE | 17.02.14 | 3,000 | PP30 |





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CITY OF BARRIE APPROVED
DATE.

PLAN & PROFILE
STA. 0+720 TO STA. 1+080

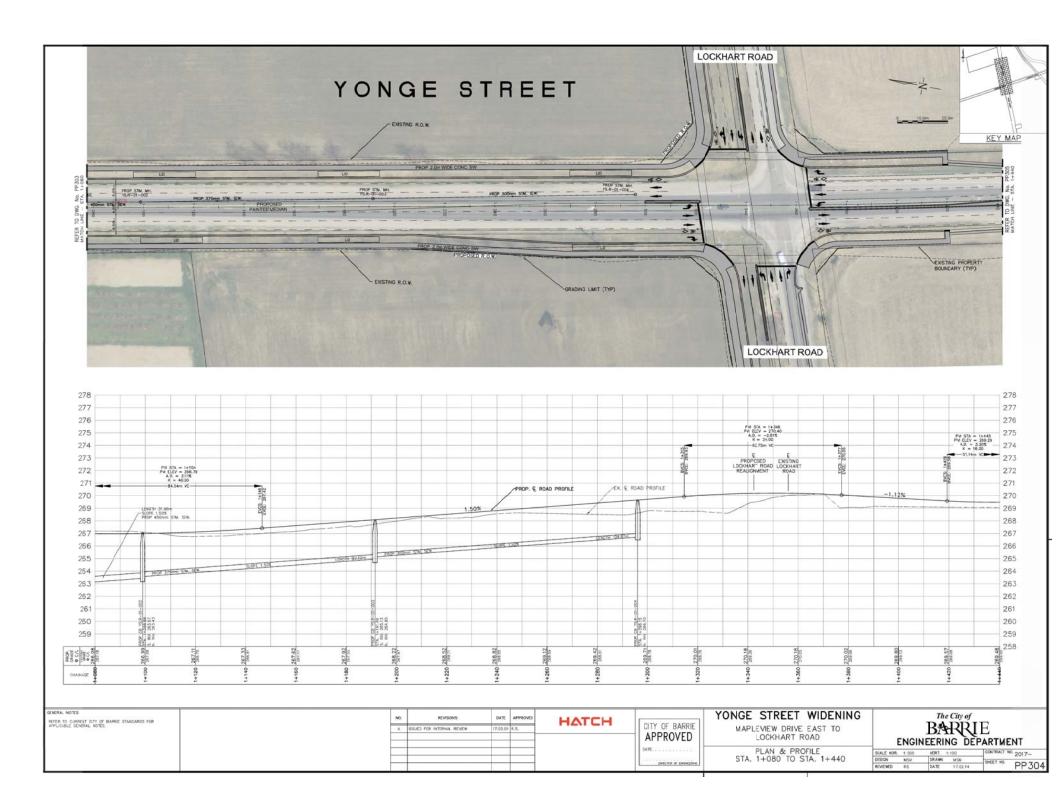
The City of BARRIE DATE OF BARRIE APPROVED
DATE.

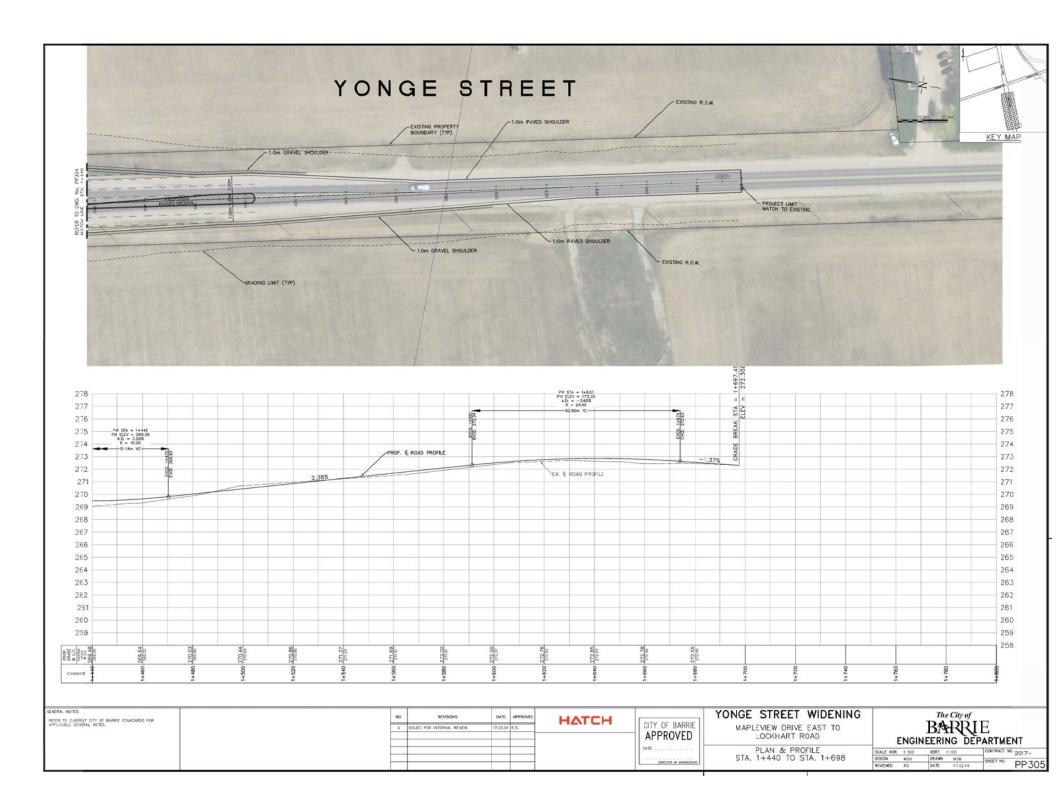
STA. 0+720 TO STA. 1+080

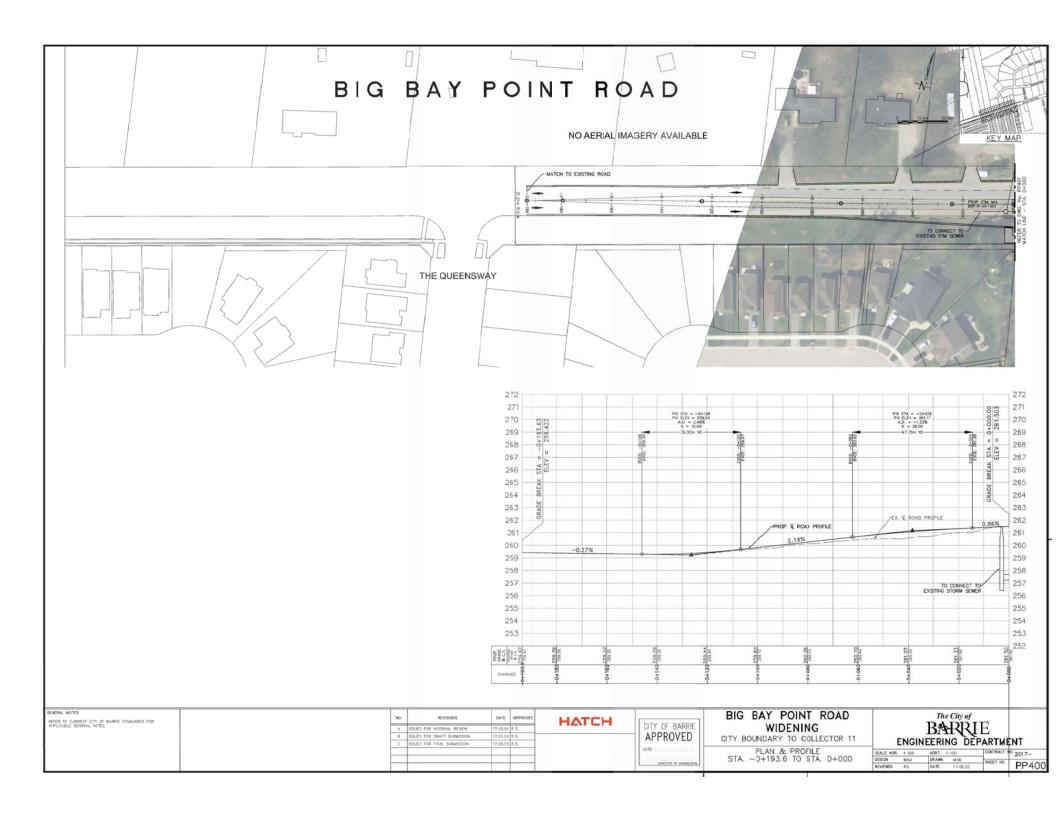
THE CITY OF BARRIE DATE OF BARRIE APPROVED
DATE.

STA. 0+720 TO STA. 1+080

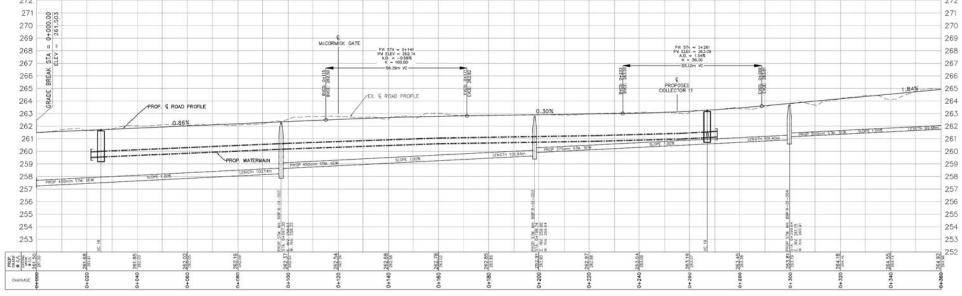
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| REFER TO CURRENT CITY OF APPLICABLE GENERAL NOTES. | |
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| A | ISSUED FOR INTERNAL REVIEW | 17.03.01 | R.S. |
| В | ISSUED FOR DRAFT SUBMISSION | 17:05:24 | R.S. |
| C | ISSUED FOR FINAL SUBMISSION | 17.08.25 | R.S. |
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CITY OF BARRIE APPROVED

BIG BAY POINT ROAD WIDENING

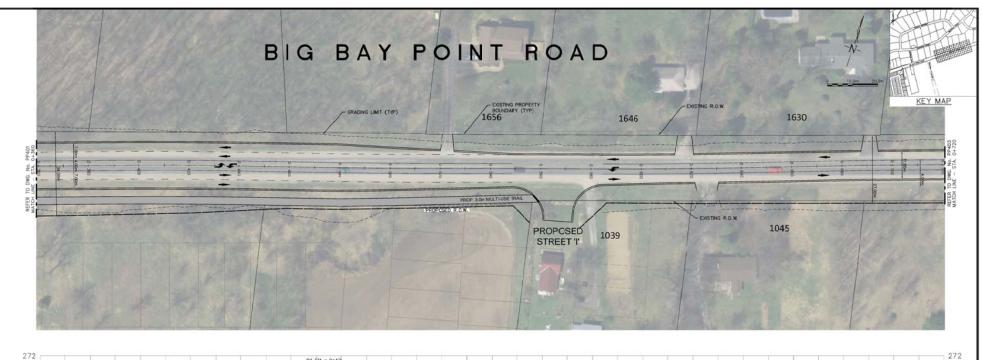
CITY BOUNDARY TO COLLECTOR 11

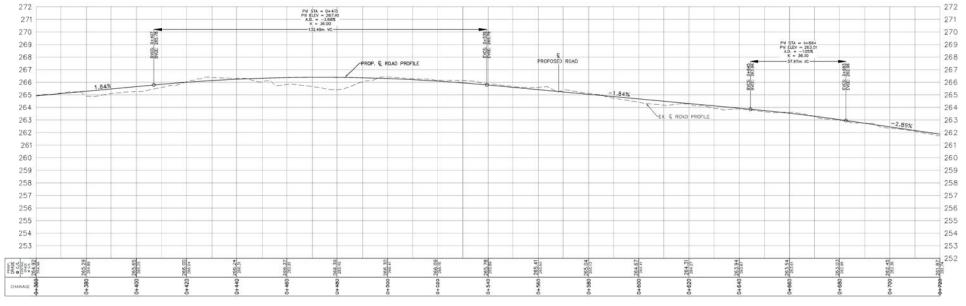
PLAN & PROFILE

STA. 0+000 TO STA, 0+360

| The City of |
|------------------------|
| BARRIE |
| |
| ENGINEERING DEPARTMENT |

| SCALE HOR. | 1:500 | VERT. 1 | 100 | CONTRACT N | 0.2017- |
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| DESIGN | MSV | DRAWN | WSW | SHEET NO. | |
| REVIEWED | RS | DATE | 17.02.14 | SHEET HO. | PP401 |





GENERAL MOTES
REFER TO CURRENT CITY OF BIASRIE STANDARDS FOR APPLICABLE GENERAL MOTES.

| NO. | REVISIONS | DATE | APPROVED | HATCH |
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CITY OF BARRIE
APPROVED
DATE.

BIG BAY POINT ROAD
WIDENING

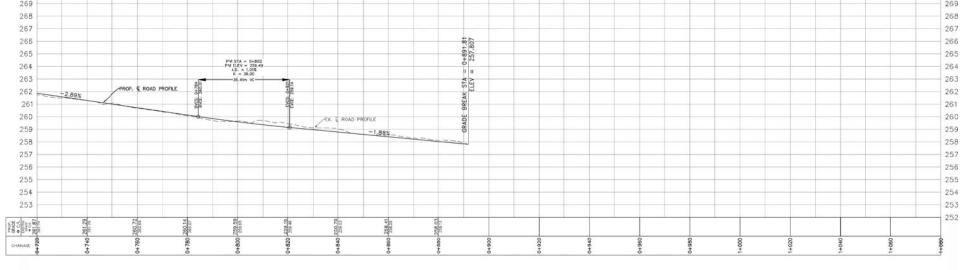
CITY BOUNDARY TO COLLECTOR 11

PLAN & PROFILE
STA. 0+360 TO STA. 0+720

| The City of |
|------------------------|
| |
| BARRIE |
| ENGINEERING DEPARTMENT |

| SCALE HOR. | 1:500 | VERT. 1:100 | | CONTRACT N | 0.2017- |
|------------|-------|-------------|----------|------------|---------|
| DESIGN | MSV | DRAWN | WSW | SHEET NO. | |
| REVIEWED | RS | DATE | 17.02.14 | 3,661,101 | PP40: |





GENERAL NOTES
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| A | ISSUED FOR INTERNAL REVIEW | 17,03.01 | R.S. | | | | |
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CITY OF BARRIE
APPROVED
DATE.

BIG BAY POINT ROAD
WIDENING

CITY BOUNDARY TO COLLECTOR 11

PLAN & PROFILE
STA. 0+720 TO STA. 0+892

| The City of | |
|------------------------|--|
| BARRIE | |
| | |
| ENGINEERING DEPARTMENT | |

| SCALE HOR. 1:500 | | VERT. | :100 | CONTRACT NO. 2017- | | | | | |
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| DESIGN | MSV | DRAWN | WSW | | | | | | |
| REVIEWED | RS | DATE | 17.02.14 | SPECE NO. | PP403 | | | | |



City of Barrie - Hewitt's Secondary Plan Area Environment Assessment (EA)

Drainage and Stormwater Management Study

Appendix F: LID Design

Stormwater Management Evaluation Matrix Assumptions

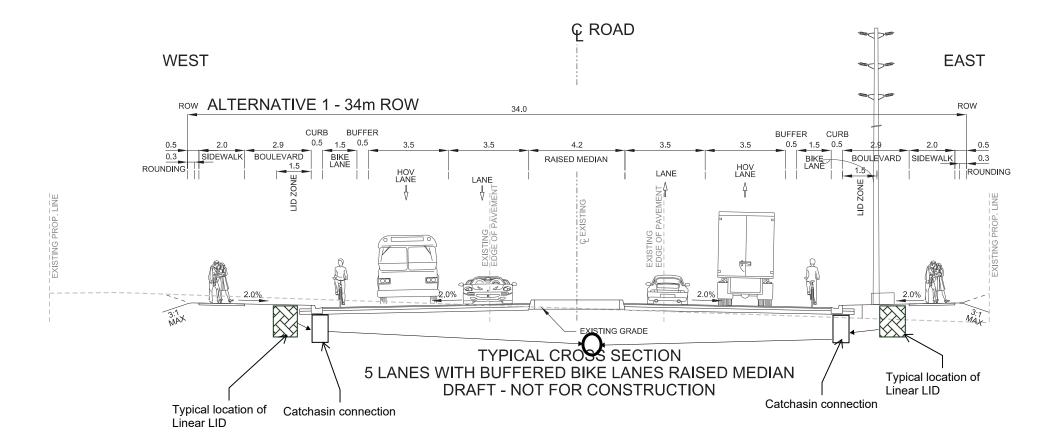
| ī | |
|-------------------|--|
| (\$) | 270 |
| (\$) | 50 |
| (%) | 2.50 |
| (%) | 1.00 |
| (%) | 1.50 |
| (years) | 50 |
| (ha) | 1.50 |
| (m) | 34 |
| (m) | 440 |
| (%) | 80% |
| (ha) | 1.20 |
| (m ³) | 150 |
| (m ²) | 800 |
| (m ²) | 1,200 |
| (m ²) | 800 |
| (m) | 374 |
| (m) | 374 |
| (m ²) | 3,520 |
| (m ³) | 250 |
| (m) | 185 |
| (m ²) | 2,992 |
| (m ³) | 305 |
| (m ²) | 2,992 |
| | (\$) (%) (%) (%) (%) (years) (ha) (m) (m) (%) (ha) (m³) (m²) (m²) (m) (m) (m) (m²) (m) (m²) (m³) |

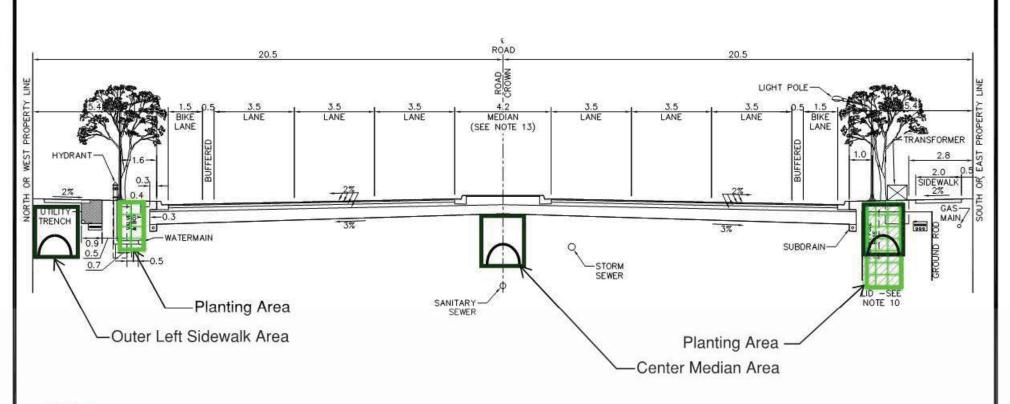
Stormwater Management Evaluation Matrix

| | How Criteria is Being Assessed | | ention | Infiltratio | on Trench | Perforated | Infiltration (Storm | | Enhanced | Grass Swale | Stormceptor | Mechanical Filtration | Oversized | Dry Pond | Wet Pond (for | Landowner |
|---|---|--------------------|---|-------------------|----------------|---------------------|------------------------|----------------|-----------------|----------------|--|-----------------------------|---------------------------------------|-----------------------|---|------------------------|
| | | Centralized | Linear | Centralized | Pipe Linear | | Centralized | Linear | Rural Urban | | (Jellyfish | | | | Road only) | Ponds |
| Water Quality Evaluation | | | | | | | | | | | | | | | | |
| Total Suspended Solids | Ability to achieve 80% TSS removal | | | N/# | | N/A | | | • | | | | N/A | | | |
| Phosphorus | Ability to achieve 80% P removal | | | - | | N/A | 4 | | | | | | N/A | | | • |
| Volume Reduction Evaluation | • | | | | | | | | | | | | | | | |
| Infiltration Volume | Ability to infiltrate 12.5 mm (assumes good soil) | | | | | | | | | | N/A | N/A | N/A | | N/A | N/A |
| Groundwater Level | Works in areas of high groundwater | | | | | | | | | | N/A | N/A | N/A | | N/A | N/A |
| Water Quantity Evaluation (R | rate) | | | | | | | | | | | | | | | |
| Quantity Control | Ability to match post to pre flows | N, | /A | N | /A | N/A | N/ | Ά | N | /A | N/A | N/A | | | | |
| Operation and Maintenance | | | | | | | | | | | | | | | | |
| Inspection Frequency (per year | ır) | 2 | x | 1, | '5x | 1/5x | 1: | c | : | Lx | 1x | 1x | 1/5x | 1x | 1x | 1x |
| Maintenance Frequency (per | year) | 1 | х | 1 | x | 1/5x | 1/5 | 5x | 1/ | 10x | 1x | 1/5x | 1/5x | 1/10x | 1/10x | 1/10x |
| Property Requirements | | • | | • | | | | | | | | | | • | | |
| Property | Ability to fit within proposed ROW without additional land acquisition | 1 | | | | | | | | | | | | | | 0 |
| Score | · · · · · · · · · · · · · · · · · · · | | • | • | • | | | | | | | | | • | | |
| Evaluation score based on ran | king identified below | 34 | 40 | 30 | 36 | 19 | 32 | 38 | 40 | 32 | 23 | 27 | 18 | 38 | 27 | 31 |
| Economic Evaluation | | | | | | | | | | | | | | | | |
| Evaluation is based on a 1.5 h | a drainage area with a 80% imperviousness (| 440 m road with | a 34m ROW) | | | | | | | | | | | | | |
| Property Cost | (A) | \$324,000 | \$0 | \$100,980 | \$0 | \$0 | \$100,980 | \$0 | \$0 | \$950,400 | \$0 | \$0 | \$0 | \$807,840 | \$807,840 | DC Credits |
| Capital Cost | (B) | \$315,237 | \$255,237 | \$16 | | \$86,918 \$4,682 | \$143 | | | 1,727 | \$40,000 \$2,500 | Unknown | \$512,050 | \$92,950 | \$109,725 | \$109,725 |
| Annual Maintenance Cost | (C) | | \$5,858 | | \$4,682 \$0 | | | \$4,359 \$0 | | \$2,200 \$0 | | Unknown | \$0 | \$500 | \$500 | \$500 |
| Rehabilitation Cost ² Life Span Cost = A + B + C x 50 | (D) | \$46, \$978,338 | \$255,237 | \$502,055 | \$401,075 | \$0 \$321,034 | \$462,897 | \$361,917 | \$190,727 | \$1,141,127 | \$0 \$165,000 | Unknown | \$0 \$512,050 | \$30,000 \$955,790 | \$240,000 \$1,182,565 | \$240,000 \$374,725 |
| | Maintenance and Rehabilitation Cost ³ | \$236,871 | \$236,871 | \$163,880 | \$163,880 | \$163,880 | \$152,547 | \$152,547 | \$76,999 | \$1,141,127 | \$87,499 | UNKNOWN | \$512,050 | \$81,130 | \$526,545 | \$526,545 |
| Present Value of Lifespan cost | | \$876,108 | \$492,108 | \$431,818 | \$330,838 | \$250,798 | \$397,517 | \$296,537 | \$157,726 | \$1,027,399 | \$127,499 | | \$512,050 | \$981,920 | \$1,444,110 | \$636,270 |
| | | | | | ,, | 1, | | | | | | L | | | | |
| $\overline{}$ | Greatest | Negativ | e Impact | | - 1- | ast | Neutral | Impact | Least - | | | Positive | e Impact | | Greatest | |
| | Greatest | • | |) | | ndSL | |) | | dst | | | | | Grea | itest |
| | | | | | | | Rank for Scor | | 1 | | | | · · · · · · · · · · · · · · · · · · · | | 1 | |
| Total Suspended Solids | Does not provide TSS removal | 2 | | 3 | | 4 | 5 | | Provides some T | SS Removal | Provides 50% TS | S Removal | Provides 60 - 70 | 8 | Provides 80% or g | |
| | Does not provide Phosphorous | | | | | | | | Provides some P | hosphorous | Provides 50% Ph | osphorous | Provides 60 - 70 | % Phosphorous | TSS Removal Provides 80% or g | |
| Infiltration Volume | Removal Facility can not infiltrate the | | | | | | | | Removal | | Removal Facility can infilti | | Removal | | Phosphorous Ren Facility can infiltr | |
| | 12.5mm volume | | Facility doe not f | unction properly, | | | | | | | the 12.5mm volu Facility can funct | | | | 12.5mm volume | why franct/!- |
| Groundwater Level | Facility does not function in high groundwater levels | | but could be utili groundwater lev | ized in high | | | | | | | abilities in high g levels | | | | Facility can prope high groundwate | r table |
| Quantity Control | | | | | | | | | | | | | | | Provides extende quantity control t 100 year events | |
| | Does not fit in the ROW, additional lands required | | Can partially fit in additional land n | | | | | | | | Fits within the RC underground/sur currently used for (trees, utility, etc. | face space r other items | | | Fits within the RC | ow |

- 1 Centralized Bioretention facility require separate detention facilities for the 2- to 100-year events. Detention cannot take place in these facilities.
- 2 Rehabilitation cost for a Bioretention facility includes replacing top layer of amended soil, mulch and vegetation and was applied at year 25. Rehabilitation costs for the Ponds includes cleanout and replacing vegetation and was applied at years 12, 24 and 36.

 3 Present Value = Σ (Annual Maintenance Cost + Rehabilitation Cost when applicable) / (1 + Effective Annual Interest Rate) ^ Year. The Effective Annual Interest Rate Inflation





NOTES:

- ROADWAY CROWN IS SHOWN IN THE CENTRE OF PAVEMENT. THERE MAY BE INSTANCES WHERE IT IS
 PREFERRED TO LOCATE THE CROWN COINCIDENT WITH THE CENTERLINE SEPARATING OPPOSING TRAFFIC.
- 2. COVER ON STORM, SANITARY AND WATERMAIN AS PER CITY OF BARRIE DESIGN CRITERIA.
- REFER TO TRANSPORTATION POLICIES AND DESIGN GUIDELINES FOR PAVEMENT DESIGN METHODOLOGY.
- TREES TO BE PLACED IN LOCATIONS APPROVED BY THE PARKS, PLANNING, AND DEVELOPMENT BRANCH. (SEE BSD-1315)
- ALL BOULEVARÓS TO BE ACTIVELY GROWING NURSERY SOD TO BE LAID ON 200mm OF TOPSOIL GRADED AND ROLLED IN ACCORDANCE WITH CITY OF BARRIE LOT GRADING AND DRAINAGE STANDARDS AND DESIGN MANUAL.
- 6. SUBDRAINS TO BE INSTALLED AS PER GENERAL NOTE BSD-N2 "E" AND BSD-314.
- ALL SERVICE LOCATIONS SHOWN ARE FOR GUIDELINE PURPOSES ONLY AND MAY DEVIATE AS PER THE DIRECTION OF THE CITY ENGINEERING DEPARTMENT WHEN STANDARD LOCATION CANNOT BE ACHIEVED.
- 8. ALL DIMENSIONS ARE IN METRES UNLESS OTHERWISE SHOWN.

- 9. FOR COMMON UTILITY TRENCH DESIGN AND CLEARANCE DETAILS REFER TO BSD-315.
- 10. RIGHT-OF-WAY SHALL BE DESIGNED TO INCORPORATE LOW IMPACT DEVELOPMENT (LID) FACILITIES AS NEEDED. MAXIMUM AVAILABLE WIDTH FOR LID IN BOULEVARD IS SHOWN. LID SYSTEMS TO BE DESIGNED IN CONFORMANCE WITH THE CITY OF BARRIE STORM DRAINAGE AND STORMWATER MANAGEMENT POLICIES AND DESIGN GUIDELINES.
- THE CLEARANCE FROM THE SIDEWALK TO THE TRANSFORMER IS MINIMIZED TO 0.3 m TO MAXIMIZE THE CLEARANCE ON THE OTHER SIDE (FROM THE TRANSFORMER TO THE CURB).
- FOR DETAILS ON LIGHT STANDARD AND POLE BASE LOCATION AND DEPTH REFER TO CITY OF BARRIE ROADWAY ILLUMINATION POLICIES AND DESIGN GUIDELINES AND ASSOCIATED DRAWINGS.
- AT AN INTERSECTION, THE 4.2 METRE MEDIAN BECOMES A 3.0 METRE LEFT-TURN LANE WITH 1.2 METRE RAISED MEDIAN.

| CITY OF BARRIE STANDARD | | | | | APR'D: | DATE: 16.07.11 |
|--|-----|----------------------|-------|------|--------|----------------|
| 29.2 m ASPHALT 41.0m ROAD ALLOWANCE | | DRAFT 95% SUBMISSION | | | DRAWN: | SCALE: N.T.S |
| 41.0111 ROAD ALLOWANCE | NO. | REVISION | INIT. | DATE | E | 3SD-311 |

SWM Volume Treatment Requirements

A. Facility Requirements

Typical SWM Facility Requirements

| | | Length to Width Ratio | Depth [m] | |
|---|----------|-----------------------------|-----------|--|
| ſ | Facility | 4 | 2 | |

B. Design Depth Requirements

For each catchment develop the required treatment volume

| | | | | | | LE | MMARY TAB | ACILITY SUI | 1 MWS | | | | | |
|--------------------------------|-------------------------|------------------------------------|------------------------------------|---|---|--------------------------------------|--|---------------------------------------|---|---|---|--|--------------------------------------|---|
| | Facility Design | | | Proposed Dimensions | | | Proposed Bottom Design [m] | | | uirements | Catchment Description Treatment Requirement | | | |
| Comment | Net Volume [m3] | Total Volume [m3] | Top Area [m2] | Length | Width | Depth | Length | Width | Total Volume (m3) | LID Control Volume (m3) | Quality Control Volume (m3) | Quantity Control Volume (m3) | Total Drainage Area [ha] | # |
| | | | | | | | | | | | | | Drive East | Mapleview |
| SIS Over Cont SIS Over Cont | 12 1 | 1114 2234 | 945 1 705 | 42.00 62.00 | 22.50 27.50 | 2.00 2.00 | 26.00 46.00 | 6.50 11.50 | 1102.00 2233.00 | 258.75 660.15 | 605.00 1465.00 | 497.00 768.00 | 2.49 6.03 | MD.R-01 MD.R-02 |
| SIS Over Cont SIS Over Cont | 2 9 | 543 394 | 511 385 | 27.20 22.00 | 18.80 17.50 | 2.00 2.00 | 11.20 6.00 | 2.80 1.50 | 541.00 385.00 | 122.20 80.79 | 321.00 238.00 | 220.00 147.00 | 1.32 0.98 | MD.R-03 MD.R-04 |
| | 12 13 2 | 938 2104 3224 | 817 1620 | 38.00 60.00 | 21.50 27.00 30.90 | 2.00 | 22.00 44.00 59.60 | 5.50 11.00 14.90 | 926.00 2090.80 | 202.99 670.80 960.68 | 559.00 945.00 | 367.00 475.00 | 2.30 3.89 6.41 | 3 + 4 MD.R-05 5+YS3 |
| | 14 45 | 2234 989 | 2336 1705 855 | 75.60 62.00 39.20 | 27.50 21.80 | 2.00 2.00 2.00 | 46.00 23.20 | 11.50 5.80 | 3221.68 2220.25 944.10 | 477.25 170.10 | 1207.00 491.00 | 704.00 536.00 283.00 | 4.97 2.02 | MD.R-06 MD.R-07 |
| - | 43 | 303 | 655 | 33.20 | 21.00 | 2.00 | 23.20 | 3.00 | 344.10 | 170.10 | 431.00 | 203.00 | | Lockhart Ro |
| SIS Over Cont SIS Over Cont | 6 21 4 17 4 | 494 1602 1306 2368 748 | 471 1285 1081 1792 674 | 25.60 51.60 46.00 64.00 33.20 | 18.40 24.90 23.50 28.00 20.30 | 2.00 2.00 2.00 2.00 2.00 | 9.60 35.60 30.00 48.00 17.20 | 2.40 8.90 7.50 12.00 4.30 | 488.00 1581.00 1301.80 2350.60 744.00 | 88.00 395.20 244.80 497.60 136.00 | 241.00 850.00 525.00 1071.00 347.00 | 247.00 731.00 532.00 782.00 261.00 | 0.99 3.50 2.16 4.41 1.43 | LR.R-01 LR.R-02 LR.R-03 LR.R-04A LR.R-04B |
| SIS Over Cont | 10 12 | 733 1692 | 663 1346 | 32.80 53.20 | 20.20 25.30 | 2.00 2.00 2.00 | 16.80 37.20 | 4.20 9.30 | 723.00 1680.40 | 247.60 238.40 | 357.00 964.00 | 366.00 478.00 | 1.43 1.47 3.97 | LR.R-05 LR.R-06 |
| | | | | | | | | | | | | | t | Yonge Stree |
| | 1 5 | 506 506 | 481 481 | 26.00 26.00 | 18.50 18.50 | 2.00 2.00 | 10.00 10.00 | 2.50 2.50 | 505.00 501.50 | 105.00 109.50 | 241.00 241.00 | 159.00 151.00 | 0.99 0.99 | YS.R-01 YS.R-02 |
| | 11 | 1761 | 1393 | 54.40 | 25.60 | 2.00 | 38.40 | 9.60 | 1750.50 | 350.50 | 829.00 | 571.00 | 3.41 | 5+YS3+LR. R-04B |
| | 2 | 1132 | 958 | 42.40 | 22.60 | 2.00 | 26.40 | 6.60 | 1130.88 | 289.88 | 612.00 | 229.00 | 2.52 | YS.R-03 |
| | | | | | | | | | | | | | oad | Bay Point R |
| SIS Over Cont SIS Over Cont | 0 7 | 494 718 | 471 651 | 25.60 32.40 | 18.40 20.10 | 2.00 | 9.60 16.40 | 2.40 4.10 | 494.00 711.00 | 182.00 110.50 | 311.00 463.00 | 183.00 248.00 ontrol (Quantit | 2.08 1.12 | BBPR.R-01 BBPR.R-02 |

SIS Over Control (Quantity and Quality Volume Only)

| | Input | | | | | | | | |
|-----------|--------|------------|---------------------------------|--|--|--|--|--|--|
| Catchment | Area | Impervious | Enhanced Storage Volume (m3/ha) | | | | | | |
| MD.R-01 | 2.49 | 80 | 242.94 | | | | | | |
| MD.R-02 | 6.03 | 80 | 242.94 | | | | | | |
| MD.R-03 | 1.32 | 80 | 242.94 | | | | | | |
| MD.R-04 | 0.98 | 80 | 242.94 | | | | | | |
| MD.R-05 | 3.89 | 80 | 242.94 | | | | | | |
| MD.R-06 | 4.97 | 80 | 242.94 | | | | | | |
| MD.R-07 | 2.02 | 80 | 242.94 | | | | | | |
| LR.R-01 | 0.99 | 80 | 242.94 | | | | | | |
| LR.R-02 | 3.5 | 80 | 242.94 | | | | | | |
| LR.R-03 | 2.16 | 80 | 242.94 | | | | | | |
| LR.R-04A | 4.41 | 80 | 242.94 | | | | | | |
| LR.R-04B | 1.43 | 80 | 242.94 | | | | | | |
| LR.R-05 | 1.47 | 80 | 242.94 | | | | | | |
| LR.R-06 | 3.97 | 80 | 242.94 | | | | | | |
| YS.R-01 | 0.99 | 80 | 242.94 | | | | | | |
| YS.R-02 | 0.9928 | 80 | 242.94 | | | | | | |
| YS.R-03 | 2.52 | 80 | 242.94 | | | | | | |
| BBPR.R-02 | 1.28 | 80 | 242.94 | | | | | | |
| BBPR.R-01 | 1.904 | 80 | 242.94 | | | | | | |

| | Calculation | | | | | | | | | |
|-----------|-------------|----------|------|--|--|--|--|--|--|--|
| Catchment | | Enhanced | Unit | | | | | | | |
| MD.R-01 | = | 605 | m3 | | | | | | | |
| MD.R-02 | = | 1465 | m3 | | | | | | | |
| MD.R-03 | = | 321 | m3 | | | | | | | |
| MD.R-04 | = | 238 | m3 | | | | | | | |
| MD.R-05 | = | 945 | m3 | | | | | | | |
| MD.R-06 | = | 1207 | m3 | | | | | | | |
| MD.R-07 | = | 491 | m3 | | | | | | | |
| LR.R-01 | = | 241 | m3 | | | | | | | |
| LR.R-02 | = | 850 | m3 | | | | | | | |
| LR.R-03 | = | 525 | m3 | | | | | | | |
| LR.R-04A | = | 1071 | m3 | | | | | | | |
| LR.R-04B | = | 347 | m4 | | | | | | | |
| LR.R-05 | = | 357 | m3 | | | | | | | |
| LR.R-06 | = | 964 | m3 | | | | | | | |
| YS.R-01 | = | 241 | m3 | | | | | | | |
| YS.R-02 | = | 241 | m3 | | | | | | | |
| YS.R-03 | = | 612 | m3 | | | | | | | |
| BBPR.R-02 | = | 311 | m3 | | | | | | | |
| BBPR.R-01 | = | 463 | m3 | | | | | | | |



