

SECTION 2 – LEXINGTON GREEN Storm Water Drainage and Flooding Concerns

BACKGROUND

Based on concerns and complaints of residents living in the vicinity of the southern-most private Lexington Green detention basin and the Pheasant Hills wetland pond, the Oakland County Water Resources Commissioners (OCWRC) Office conducted a study in 2012 to evaluate the causes of rear-yard flooding and overland flow between the ponds, and potential improvements to alleviate the problems. The report, prepared by Applied Science, Inc. dated May 21, 2012, thoroughly reviewed the contributing factors to the flooding and proposed potential improvement options to reduce flooding in the area.



In the 2012 report, an analysis of the Lexington Green basin, the outlet sewer to the Pheasant Hills wetland pond, and the outlet to the Randolph Street Drain was performed. The conclusions were that the private Lexington Green basin is undersized for the 10-year design storm, the outlet sewer is undersized, the storage volume of the Pheasant Hills wetland is reduced due to sedimentation, and the outlet culvert under Mill Pond Court required cleaning (cleaned in September 2013). Any of these issues individually could cause the overland flow and flooding observed by residents, and in combination, they result in problems with a greater frequency than may otherwise be expected.

The five potential improvements recommended in the 2012 report focus on increasing the capacity of the outlet from the Pheasant Hills wetland to the Randolph Street Drain, increasing the capacity of the outlet from the private Lexington Green basin to the wetland, and grading around the wetland to contain what is currently an overflow condition. All recommended improvements involve impacts adjacent to or within the Pheasant Hills wetland, which is located in the City of Northville, not the City of Novi.

The 2012 report concludes by stating that other potential options not investigated include storing storm water within the storm sewer prior to it reaching the private Lexington Green Basin, as well as redirecting flow from the basin to a different receiving water other than the Pheasant Hills wetland. The focus of this report is to evaluate what would be required to implement the options suggested but not detailed in the 2012 report.



FIELD INVESTIGATION

In October 2013, Spalding DeDecker Associates (SDA) met on-site with the City of Novi Department of Public Services (DPS) staff for a review of the private Lexington Green basin, Pheasant Hills wetland pond, overland flow / flood-prone areas, and outlets from the basin and pond.



Lexington Green Detention Basin Outlet

The basin inlet and outlets were located and appear to be in fair condition, without excessive sedimentation or other restrictions. The route that overland flow water takes when the pond banks are overtopped was walked, and crosses behind several homes along Galway Drive.

The Pheasant Ridge wetland pond and outlet to the Randolph Street Drain were examined, and sediment was observed at the upstream invert.



Pheasant Ridge Wetland Pond – heavy sedimentation



REVIEW OF ADDITIONAL OPTIONS

Additional Detention Upstream of Lexington Green Basin

Two primary options were reviewed for additional detention of storm water prior to it reaching the private basin – storage within existing or proposed underground piping, and construction of an additional basin.

As presented the 2012 report, the capacity of the existing private basin is 15,500 cubic-feet. In order to retain the existing outlet sewer to the Pheasant Hills wetland and contain a 10-year design storm, the basin should have a capacity of 89,000 cubic-feet, 73,500 cubic-feet more than the basin's current capacity. Any storage available or created upstream of the basin could be utilized to increase the effective capacity of the basin and potentially reduce overflow events.

Options for Storing Storm Water Upstream of the Basin

1. Existing storm sewer - The existing storm sewer system upstream of the private detention basin in Lexington Green Subdivision has a storage capacity of approximately 5,100 cubic-feet of in-pipe storage, which could be utilized by restricting the outlet to the basin with a small diameter pipe. This would yield approximately 7% of the deficient storage volume at a relatively small initial cost; however, frequent routine cleaning would be required to prevent the build-up of sediments, and may accelerate the deterioration of subdivision roads if the existing underdrain system is not allowed to drain freely.
2. Replacement storm sewer - This option is similar to the first option, but would involve replacing the existing storm sewer in its current location with larger pipe sizes, and restricting the flow to the basin, providing additional storage within the system. By

upsizing the 1,500 feet of existing storm sewer to 36-inch diameter pipes, the system could store approximately 10,500 cubic-feet upstream of the basin. This option would yield about 14% of the shortfall in storage volume of the existing basin, at an estimated cost of \$294,000.

3. Underground Detention – Underground detention provides additional storage utilizing large diameter pipes and structures, specifically designed to accept large flows quickly and release the stored volume over time. A system could theoretically be installed either within the existing storm sewer easements, or within the existing right-of-way and common areas of Lexington Green Subdivision. One area where this may fit is the circle drive, just east of the existing easement to the detention basin access. A detailed system layout was not attempted, but for planning purposes a unit cost of \$3/cubic-foot was used which assumes there are no land acquisition costs. The estimated total cost associated with the construction of an underground detention system which could accommodate the full deficient design storm volume of 76,500 cubic-feet is \$370,000.

Additional Detention Basin

4. Aerial and property boundary of the Lexington Green Subdivision were reviewed for potential new locations for additional detention basins to make up part or all of the deficiency in the existing basin. Based upon this review, there are no ideal locations for an additional basin within the Lexington Green Subdivision.



Redirecting Basin Outlet Flow Away from Receiving Wetland Pond

5. The potential to redirect flow from the private Lexington Green detention basin to a different receiving water other than the Pheasant Hill wetland pond was also examined. If storm sewer was installed from the private basin at the south edge of the subdivision to the Lexington Green Regional Detention Basin to the north (south of Nine Mile, just west of Taft), a significant amount of flow would be removed from the Pheasant Hill wetland, and overland flows could be reduced. However, to reroute this flow, approximately 3,150 feet of 30-inch storm sewer pipe would be required, of which approximately 500 feet would require easements to cross through six affected parcels. It was also estimated that approximately 500 feet of the storm sewer pipe would have to be directional drilled/bored to avoid disturbing private property along Taft Road. The cost associated with the redirecting of the storm flow to the Lexington Green Regional Detention Basin, including the construction incidentals, is estimated at approximately \$705,000, which does not include the costs of permanent easement or right-of-way acquisitions which would be required (estimated at \$120,000). However, this scenario is not a viable alternative due to the topographic limitations in that area. Due to the constraints caused by the existing topography and the proximity of the adjacent properties, to maintain an adequate cover depth over the new pipe it would enter the basin approximately one-foot below the bottom of the basin. Therefore, the proposed storm sewer cannot be routed to the regional detention basin. This means the redirected flow from the private Lexington Green Basin would bypass all detention and outlet directly into Thornton Creek, which discharges into the Walled Lake Branch of the Middle Rouge. Since all storm waters must be detained or retained, per the Oakland County Water Resource Commissioner's Office *Design Standards for Storm Water*



Facilities, prior to discharging into the drainage network (including Thornton Creek) as regulated by the U.S. Environmental Protection Agency (EPA) per the National Pollutant Discharge Elimination System (NPDES) Phase II requirements, this would not be a feasible option.

Redirecting Tributary Area 1 Flow Away from Private Basin

5a. An abbreviated version of the above option was also explored to determine if flow from one area identified as “off-site” in the 2012 report could be removed from the area tributary to the private Lexington Green Detention Basin to provide an incremental benefit in terms of reducing flooding. Specifically, Area 1 (which is depicted on Figure 1 of the 2012 report, encompasses Taft Road right-of-way from Bradburn Court in the City of Northville to Byrne Drive in Novi, plus a portion of Connemara Hills subdivision east of Taft Road) contributes flow from 12.1 acres of the basin’s 36-acre total contributing area. According to the 2012 report, for a 10-year, 24-hour storm event, redirecting flow from Area 1 to a different receiving water would remove 8.9 cfs of the total 24.7 cfs that would otherwise discharge to the private basin, or an approximate 36% reduction in flow volume. However, the same topographical limitations would be experienced in this scenario as previously discussed in option 5. Therefore, without the ability to meet the Oakland County Water Resources Commissioner’s requirements and the EPA’s NPDES Phase II regulations, this would not be a feasible option.



PRELIMINARY ESTIMATES

Planning cost estimates for the options are presented in the following tables.

Option 2. Storing Storm Flow Upstream (Upsize Existing Sewer In-Place)

Item Description	Unit	Unit Price	Quantity	Item Cost
Mobilization	LSum	\$23,500	1	\$23,500
36-inch Storm Sewer	Feet	\$80	1500	\$120,000
36-inch Storm Sewer Directional Bore	Feet	\$500	100	\$50,000
Restoration	LSum	\$18,000	1	\$18,000
Traffic Control	LSum	\$23,500	1	\$23,500
<i>Contingency (25%)</i>				\$59,000
Estimate =				\$294,000

Option 3. Storing Storm Flow Upstream (Underground Detention)

Item Description	Unit	Unit Price	Quantity	Item Cost
Mobilization	LSum	\$30,000	1	\$30,000
Underground Detention	Cft	\$3.00	73,500	\$220,500
Restoration (0.5 acres)	LSum	\$20,000	1	\$20,000
Traffic Control	LSum	\$25,000	1	\$25,000
<i>Contingency (25%)</i>				\$74,000
Estimate =				\$369,500

Option 5. Redirecting Basin Outlet Flow Away from Receiving Wetland Pond

Item Description	Unit	Unit Price	Quantity	Item Cost
Mobilization	LSum	\$50,000	1	\$50,000
30-inch Storm Sewer	Feet	\$75	2600	\$195,000
30-inch Storm Sewer Directional Bore	Feet	\$500	550	\$275,000
Restoration	LSum	\$25,000	1	\$25,000
Traffic Control	LSum	\$40,000	1	\$40,000
Easement Acquisition	Sft	\$12	10,000	\$120,000
<i>Contingency (25%)</i>				\$145,000
Estimate =				\$850,000

Option 5a. Redirecting Tributary Area 1 Flow Away from Private Basin

Item Description	Unit	Unit Price	Quantity	Item Cost
Mobilization	LSum	\$14,000	1	\$14,000
30-inch Storm Sewer	Feet	\$75	1000	\$75,000
30-inch Storm Sewer Directional Bore	Feet	\$500	50	\$25,000
Storm Catch Basin	Each	\$1,750	5	\$8,750
Restoration	LSum	\$15,000	1	\$15,000
Traffic Control	LSum	\$20,000	1	\$20,000
<i>Contingency (25%)</i>				\$39,500
Estimate =				\$197,250



Please note that the contingency is each of these estimates includes permitting costs, soil erosion control measures, and miscellaneous work items to complete the improvement. The costs do not include any engineering services.

CONCLUSIONS

All of these options involve disturbance within the Lexington Green Subdivision or City of Novi property only, and not in the City of Northville (like those presented in the 2012 report). However, other than the least effective option (Option 1), the feasible options all require significant retrofit of the detention system within the fully developed subdivision at extremely high costs. Therefore, none of the options evaluated are regarded as reasonable given the extent of the disturbance, costs, and limited improvement. The options presented in the 2012 study may be more reasonable when considering cost, relative ease of construction, and benefit.