

LAKE ERIE SHORES DEVELOPMENT
ANALYSIS OF AN UNNAMED TRIBUTARY OF MCKINLEY CREEK
AND EVALUATION OF THE DETENTION AREAS

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Project Scope

LDC, Inc. was retained by the Lake Erie Shores Home Owner's Association and its' management firm First Realty Property Management in October 2011 to perform flood analysis of the westerly Unnamed Tributary (per Lake County Gazetteer, watershed 130) of the McKinley Creek Watershed, hereafter the be referred to as the "CREEK", to evaluate the water elevations along its floodway during different storm events and to analyze the culvert at Lake Road. LDC was also requested to perform a detailed topographical field survey of the CREEK, the three storm detention /open space areas along the CREEK to determine if there are encroachments within the drainage easement areas; to compare the existing basin storage volumes with the original design volumes; to determine if a difference exists, what effect, if any, it has on the adjoining properties; and to review if removing materials from the drainage basins has any effect on the flooding along the creek areas.

Project Background

This development was initiated in 2001 with engineering plans prepared by Oxbow Engineering of Painesville. The development is a Planned Urban Development or PUD through Painesville Township's Zoning Code. As such, the Township had more involvement with the review than a "normal" subdivision approval, and the developer was allowed greater flexibility in the design of streets, lot sizes, setback distances, and density. The project includes single family residential, condominiums, multistory, multitenant dwellings, dedicated open spaces, and recreational areas. The development was constructed in multiple phases, with the first phase, which included 102 lots on Tradewinds Cove, Pirates Trail, Clipper Cove, and Pebble Beach Cove, beginning in 2002. Dwelling unit construction, within the development, continues at the present time. The PUD spans several watersheds including the Unnamed Tributary (CREEK), McKinley Creek, and directly to Lake Erie.

In response to flooding concerns raised by several individuals along the CREEK and the detention areas, the Lake Erie Shores Home Owners Association (LESHOA) had the original design group Oxbow review the facilities and compose a report in 2007. Some of the issues raised in Oxbow's report were addressed by the LESHOA, some walk out basement owner's took action to reduce flooding by adding walls adjacent to their rear basement doors, while some owner's have taken no action. In 2011, representatives from Lake County Engineer's office and the Lake County Storm Water District also inspected these areas and they presented their finding in at a meeting in late summer 2011. In this meeting and report, statements were made, by the County Engineer's office and the Storm Water District relative to the following issues:

- Storm connections and roof drains are flowing directly to the CREEK and / or basin areas. This was not approved.
- That the basins may contain sedimentation which may need to be removed to restore basin capacity.
- That the culvert under Lake road (not a part of the LES development) was properly sized for the watershed.
- Statements were also made relative to the 2007 Oxbow report stating that some items had been corrected and were receiving continued maintenance.
- The Lake County Storm Water District, in conjunction with the Painesville Township Road Department were to walk the CREEK and remove debris.

Field Investigation and Data Collection

Approved improvement “as-built” plan drawings were obtained from the Lake County Engineer’s office. Copies of the record plat drawings were obtained and downloaded from the Lake County Recorder’s website. Aerial photographs were obtained from the Lake County GIS department. Site plans for various homes in the development were also viewed off the County’s GIS website. The plats from Phases 1, 2A, and 3, which abut the CREEK and the three adjacent detention basins, were digitally reconstructed in AutoDesk Land Desktop 2004 by LDC. During this process, a few minor errors in the mathematics between phases were discovered but LDC was able to resolve these errors. Aerial photographs from 2011 were obtained from the Lake County GIS department in digital format. With these photographs and the digital reconstruction of the plat, LDC was able to create a digital base drawing which along with the existing monuments, would be used for horizontal control in the gathering of field surveying data. Also reviewed were the 1967 contour overlay, the 1973 aerial photo, the 2000 aerial photo and topography, and the aerial photos from 2004, 2007, and 2011.

For vertical control (to compare the Oxbow plans to the current field conditions) LDC utilized the as-built plans from the Lake County Engineer’s office as submitted by Oxbow for Phase 1, 2A, and 3. Comparing field shot elevations by LDC with the elevations shown by Oxbow, discrepancies between the “as-builts” each phase were found. Therefore, LDC adjusted all its field shots to be relative to the published invert elevation of the 24” pipe outlet at the end of Clipper Cove (615.74). As such, some points along the outer edges of the phases of Oxbow’s “as-built” plans did not match exactly, but the LDC topography is correct within itself.

The field topography and locations were gathered by LDC Staff utilizing a Spectra Precision Focus 30 robotic instrument equipped with a TDS Ranger data collection system. The raw data was then downloaded into AutoDesk Land Desktop 2004 and overlaid onto a compilation of the digital plat and scanned copies of Oxbow’s grading plans.

Hydrological Study

Utilizing the Lake County digital 2’ topographic mapping from 2000 (the latest available for the whole watershed), the drainage areas were mapped out to represent predevelopment conditions of the watershed. The culverts within this watershed area were field verified by Frank Chorba, P.E., to determine their actual size and capacity. From this information the overall watershed was broken into several sub areas to determine the corresponding flows relative to different storm events. Several of the upstream culverts were determined to be undersized for the watershed area above them. Because of this, LDC reviewed the topographic mapping to determine elevations where this backed up water would leave the watershed by bypassing through an adjacent low area. In this fashion, LDC was able to determine the maximum flow through each of the upstream culverts that could actually move through the CREEK to the development area. From the old railroad bed to the north side of Lake Road, cross sections of the CREEK were gathered by the surveying crew at specific areas of concern. These cross sections and the calculated storm flows were then input into software developed by the US Army Corps of Engineers to determine the flood plain boundaries (water elevations), for different storm events, along the CREEK.

Findings:

- 1) If the homes, that currently have walkout basements at the end of Clipper and Commodore Coves, were constructed as shown on the approved Oxbow improvement plans (without walkouts) the basements would **NOT** experience **direct** flooding up to and including a 100 year storm event.
- 2) As these walkout homes on Clipper and Commodore Cove are now built, they can experience flooding during a **1 year storm event**.
- 3) The outflow, from the three storm basin areas, **has no net effect** on the elevation of the CREEK, the basins outflows are controlled by the CREEK.
- 4) Three options exist to reduce/eliminate the chance of flooding of the walk out basement homes.
 - a) The effected residents, with the proper permits from the County, need to reconstruct the rear of their units to eliminate the openings by block/bricking them in, waterproofing, and regrading the yards as shown on the original Oxbow Master Grading Plan. If any footer drains are operating by gravity to the CREEK, they need to be changed to operate on check-valved sump pumps and redirected to the storm sewer at the street.
 - b) The effected residents, with the proper permits from the County, could construct a properly designed retaining wall, to an elevation above the 100 yr storm level at their yard to divert water from entering their basement floors
 - c) To reduce the chance of flooding on a 100 year storm event, the culvert at Lake Road needs to be deepened and enlarged to a minimum size of 4' high x 8' wide at a minimum slope of 0.60%. The last 400 feet of the CREEK before this culvert, which is currently flat, needs to be regraded to have a minimum slope of 0.42%. The CREEK needs to be reshaped to have a 6 foot bottom and 2:1 side slopes. An easement will need to be obtained and trees removed. In this case, the 100 year flood elevation is 515.98 at station 15+04, with the lowest finished basement grade of an adjacent home being 616.02.

This option will need to be further “tweaked” during final design for replacement of the culvert, if this option is undertaken. As Lake Road is a Township Road, funding will need to be obtained; detailed plans prepared and approved; the project publicly bid and constructed. Depending on available local funds it could take several years to secure grants or matching funds.

Regardless of the option chosen, the effected homeowner’s should currently carry flood insurance.

A forth possible option involves diverting more water, from the 36” pipe from the west to the CREEK, down Outtrigger Cove. However, the effects of this have not been investigated.

- 5) The approved improvement plans and the approved site plans show some of the sump drains being tied directly to the CREEK, most were to be directed to storm connections provided at the street. Basements that are at or below the elevations of the CREEK during the various rainfall events, are susceptible to back charging, if sump pumps or gravity connections were used without a backflow prevention device.
- 6) The approved site plans (which are online at the County’s website) are specifically stamped “ALL DOWNSPOUTS ARE TO BE SPLASH BLOCKED.” As stated in the County’s report, many have been run underground and directed to the basins or the CREEK. **Those directed to the basins are not having an impact on CREEK flooding.** Based on the time of concentration for the watershed, the downspouts running to the CREEK **are more of a benefit than a problem,** as

this water is moved to the CREEK faster and can exit through the culvert under Lake Road before the peak flow for the watershed reaches the culvert at Lake Road.

- 7) There are currently encroachments to the easement areas and/or property owned by the Home Owner's Association surrounding/containing the basin areas and over storm sewer runs between homes. These encroachments should be removed from these areas at the homeowner's expense.
- 8) The available storage volume for the northerly basin does not correspond with the approved drainage calculations submitted by Oxbow and approved by the County Engineer. The basin illustrated on Oxbow's approved plans shows a much smaller base storage area than represented in their detention calculations. The basin, as it currently exists, is much closer in size to the Oxbow's plan sheets than their calculations. **However, as the CREEK is the control for the overflow, the stored pond volume has no net effect on the flooding of the walk out basements.** Water standing for several days after a storm event, in this basin, is part of the design and corresponds to mandates by OEPA for water quality which were incorporated into this area.
- 9) From our interpretation, Oxbow's detention pond outflow sizing calculations are based on the premise that a post development 100 yr flow is equal to a 100 yr predevelopment development storm. This does not correspond with the County's drainage calculation requirements which state that the designer is to calculate the critical storm comparing 1 yr predevelopment and 1 yr post development flow conditions. Based on the calculation and the % of increase in flow, a critical storm is determined for the watershed. The post development condition is then limited to the 1 yr predevelopment flow for all storms up to and including the critical storm. For the storms above the critical storm, post development = predevelopment.

Example: If the difference in pre to post development flow was 150% increase. This would represent a critical storm of 25 yr. Therefore, for the 1yr, 2yr, 5yr, 10yr and 25yr post development discharge is limited to the 1 yr predevelopment discharge. For the 50yr and 100 yr storms predevelopment can = 50 yr and 100 yr post development flow.

However, as the upstream volume of water controls the CREEK flow which in turn controls the ponds, this has no impact on the flooding issue.

- 10) Future upstream changes in land use, without proper storm water controls, can further impact the CREEK within the Lake Erie Shores development. The upsizing/replacement of the culvert under the RR tracks or the re-grading of the ditch along the south side of the tracks can redirect more water to the CREEK which will result in additional flooding, even if the culvert under Lake Road is upsized as stated above.