



**Levee 37 Drainage Study**  
**Mount Prospect, IL**

Prepared for

**Village of Mount Prospect, IL**  
50 South Emerson Street  
Mount Prospect, IL 60056

*September 22, 2015*

Prepared by

**Christopher B. Burke Engineering, Ltd.**  
**9575 W. Higgins Road, Suite 600**  
**Rosemont, IL 60018**

CBBEL Project No. 15-0225

## EXECUTIVE SUMMARY

The Levee 37 Tributary Area Drainage Study was initiated by the Village of Mount Prospect (Village) following the April 17-18, 2013 storm event to address residential flooding in areas protected from Des Plaines River (DPR) overbank flooding by the Levee 37 floodwall. The Levee 37 project was designed by the US Army Corps of Engineers-Chicago District (USACOE) to prevent DPR floodwater from entering Village residential areas and City of Prospect Heights areas west of River Road. The Levee 37 project consists of several integrated components including a concrete-capped floodwall, earthen levees, road raising, and internal drainage pump stations.

The majority of the April 2013 storm event rainfall occurred while the DPR water level was rising but prior to it reaching its peak elevation. The rising DPR water level reduced and ultimately prevented outflow from the Village's gravity storm sewers to the DPR. Once the DPR reached an elevation that prevented outflow, the Village's stormwater could only be evacuated by the two (2) Levee 37 pump stations; Pump Stations #1 and #2. These pump stations were constructed concurrently with Levee 37 and were designed to drain residual stormwater in the storm sewer system when the DPR water level was high. According to the USACOE, the pumps **were not** designed to have capacity that equals the existing capacity of the sewer system with free-outfall conditions (when the DPR is at normal elevation). As reported by Village staff, the limited capacity of the pump stations initially resulted in street inundation in low areas, followed by yard flooding and overtopping of sidewalks allowing floodwaters to enter below-grade garages, and also basement seepage during the April 2013 storm event.

The Village retained Christopher B. Burke Engineering, Ltd. (CBBEL) to perform a conceptual level feasibility study that included:

- An analysis of the Village's storm sewer system and the Levee 37 pump stations to identify the condition that lead to the flooding that occurred during the April 2013 storm event.
- Determine the existing level of protection provided by the storm sewer system with the levee and the pump stations in place for the residential area.
- Develop and analyze potential improvement alternatives to raise the level of protection by increasing the pumping rate and through other improvements.

The study determined that the Village's storm sewer system has approximately a 10-year storm event capacity with a free-outflow condition (DPR is low). The study also confirmed Village staff's opinion that the capacity of the existing storm sewer system was degraded during the April 2013 storm event because of the rising DPR water level and the inability of the two (2) Levee 37 pump stations to provide sufficient capacity to discharge Village stormwater at a rate necessary to prevent flooding in the residential area.

Prior to the development of the existing residential subdivision within the study area, the land drained overland directly to the DPR. Once developed and prior to the construction of Levee 37, during periods when the residential subdivision's storm sewers surcharge ponding would initially

occur within low-lying areas until flooding levels filled the streets and stormwater would flow overland down the streets until crossing River Road and into the DPR. Levee 37 blocks overland flow from reaching the DPR. Currently, the Levee 37 pump stations are the only means to convey the overland flow to the DPR. Therefore, to alleviate flooding within the interior of the levee when the DPR is high, the Levee 37 pump stations would need to be upgraded to replicate the historic overland flow to the DPR.

In order to determine an “allowable” pumping rate for the system to replicate historic overland flow values, a few factors were considered:

- First, the existing combined pumping rate of all three pumping stations (Pumping Stations #1, #2, and #3) is approximately 60 cfs.
- A rising DPR degrades the ability of the storm sewers to discharge stormwater.
- Levee 37 protects the interior residential area from overbank flooding for DPR flooding events at or greater than the 10-year event.
- The capacity of the interior area’s storm sewer system under low flow DPR conditions is approximately the 10-year event.
- Prior to the Levee 37 construction, events at and greater than the 10-year flood along the DPR would begin to flood the interior area, accessing floodplain storage that the levee now blocks. However, the interior area had an unobstructed overland flow path to the DPR.
- Hydraulic modeling determined that prior to the construction of the levee the overland flow (generated by the 10-year interior event) reaching the DPR was 240 cfs when the DPR water level is at its 10-year flood level.

Considering these hydraulic conditions, the DPR was always subject to receiving the overland flow from the interior area for up to the 10-year event without the benefit of significant overbank floodplain storage. The construction of Levee 37 blocked this overland flow capacity, but the pumps constructed as part of the levee project did not maintain this flow capacity, reducing the overland flow discharge capacity (via pumping) to only 60 cfs, significantly lower than the pre-levee condition of 240 cfs as described above. This means that the pumping rate can be increased by 180 cfs and still maintain the pre-Levee 37 condition. An operating rule would need to be established for events greater than the 10-year flood to maintain pre-levee downstream conditions.

CBBEL developed nine (9) improvement alternatives to modify the interior drainage system to achieve the allowable pre-Levee 37 overland flow. All nine (9) improvement alternatives provide increased pumping capacity at one of the Levee 37 project pump stations that serve the Village. The increased pumping capacity would be achieved by constructing a new pump station adjacent to the existing pump station. This would allow the existing pump station to continue operating during the construction process. A few of the improvement alternatives also evaluated the use of flood storage to reduce the required pumping capacity. Some improvement alternatives

evaluated storm sewer improvements to increase the efficiency of stormwater flow conveyance to the Levee 37 project pump stations.

A 25-year level-of-protection alternative (Alternative 9) was also developed and evaluated to determine how this level can be achieved. This was done at the request of the Village to be consistent with the Board directive to achieve, where possible, the 25-year level of protection on all new projects. The total pump capacity will be limited to 240 cfs. Two proposed stormwater facilities, providing 18 and 12 acre-feet, are necessary to reduce the flow to the pump stations. Diversion sewers are required to divert stormwater from adjacent main sewer lines. Floodproofing will be necessary for two at-risk homes. The opinion of probable construction cost for the 25-year level of protection without off-site mitigation is \$7.5 million based on 2015 unit costs.

Based on the results of this conceptual feasibility study, CBBEL is recommending two (2) improvements (Alternatives 3 and 6) that provide the 10-year level of protection. These alternatives increase the total pumping rate to 205 cfs, which is lower than the 240 cfs mentioned above. This is due to the addition of stormwater storage within the two school properties that provide a reduction in the flowrate reaching the pumping stations. However, the Village can modify these alternatives to achieve the 240 cfs rate. The Village staff has indicated they will be approaching the USACOE about funding the proposed pump station improvements. The opinion of probable construction cost for recommended Alternatives 3 and 6 are \$3.6 million and \$2.1 million, respectively, based on a 2015 cost estimate.

The following is brief description of the recommended alternatives for a 10-year level of protection:

### **Alternative 3**

- Construct new pump station adjacent to Levee 37 Pump Station #2 with pumping capacity of 105 cfs.
- Proposed 11.6 acre-foot stormwater storage basin located within an existing open space at Robert Frost Elementary School property.

### **Alternative 6**

- Construct new pump station adjacent to Levee 37 Pump Station #1 with pumping capacity of 40 cfs.
- Proposed 7.0 acre-foot stormwater storage basin located within an existing open space at the Indian Grove Elementary School property.