

SOUTH BASIN DRAINAGE INVESTIGATION
ENGINEERING ASSESSMENT OF DRAINAGE CONDITIONS
- REPORT OF FINDINGS AND RECOMMENDATIONS -

EXECUTIVE SUMMARY

The unprecedented flooding that occurred on July 24, 2010, caused extensive damage and raised concerns over the operating condition and capability of the municipal sewer system within the South Basin region of the Village of La Grange. As a result, a special investigation was authorized to examine the flooding circumstances, and make recommendations for remedies and actions. The findings of this investigation, which are detailed in the various sections of the report, have been summarized in the following.

1. The report finds that the flooding occurred as a result of a rare and significant rainfall event, exhibiting characteristics of a 1% annual chance rainfall event (100-year), which overloaded the various sewer systems that serve the South Basin drainage area. While these systems have been generally adequate for conveying the more common low intensity storm events, it is the infrequent storms of long duration and high intensity that generate runoff rates which can exceed their abilities.
2. The report finds that the flooding circumstance was not due to pipe defects within the neighborhood which might have obstructed sewer flow. Televised inspection of key sewer segments, conducted following the rain event, verified that the structural condition of the sewer system was generally good and free of defects that would create significant drainage restrictions.
3. The report finds that the combination sewer system does not have the capability to fully contain and convey the runoff volumes at the rates generated by large storm events. The ability of the sewer system to fully contain and convey the tributary storm water runoff, was found to be limited to relatively small rainfall events. Larger events will cause most parts of the sewer system to surcharge or fill above the pipe within manhole structures. Due to limited system containment volume, the elevation of such drainage surcharges will then rise and fill building service laterals, and the vulnerable connected building spaces, before overflowing and filling low-lying surface areas.
4. The report finds that the storm sewer system serving portions of the South Basin region also does not have the capacity to service the full extent of its tributary area. The sewer system regularly surcharges to achieve conveyance capacity when subjected to large rainfall events, and overflows into low areas as a result of conveyance limitations. While such flooding is typically limited in area and duration, the more severe rainfall events causes more extensive flooding as demonstrated in 2010.

5. The report finds that the surface runoff conveyed along the watercourse crossing through the La Grange Country Club exceeded the capacity of the outlet storm sewer in 51st Street, and consequently overtopped and flooded the pavement surface of Brainard Avenue with a depth of about 24 inches. As the accumulating drainage filled the lowest portion of roadway extending north of the 51st Street intersection, the flood area expanded easterly as flow paths were established between residences and along 51st Street. In this process the drainage flowed northeasterly through residential properties, following the historical path of the regional drainage outlet which remains defined by the developed topography. The overland flow overwhelmed the capacity of the combination sewer system in its path, and further expanded the area and severity of the flooding circumstances.
6. The report finds that past development practices failed to maintain or create pathways necessary to manage drainage during large storm events, thereby creating conditions where drainage becomes trapped and overland flows occur. The comprehensive grading and land planning required to assume control over such drainage circumstance, was not a consideration of planners during the early part of the twentieth century when the land plan was formed. This was due to the nature of established planning practice of the era as well as technological limitations. In particular, the necessity for such work was not recognized since the needs and practices were largely shaped by past experience and perspectives drawn from the rural social and natural environment. As a result, localized topographic depressions were inadvertently created which became entirely dependent on the combination sewer system, and which were thereby at risk of flooding. The severity of flooding increased as the development density increased placing more property at risk.
7. The report finds that the historical drainage outlet for the South Basin region of the Village, extended east through lands later occupied by railroad, quarry excavations, and industrial developments. The course of this waterway was either eradicated or reconfigured to suit the interests of the particular land use. In this process, the drainage conveyed by the original water course was altered to flow through a drainage ditch extending east along 47th Street. The drainage ditch was later replaced by a storm sewer, which due to limited capacity causes the surface flooding experienced along the East Avenue and 47th Street corridors.
8. The report finds that there are two drainage outlets generally available to the South Basin region, the deep tunnel system of the Metropolitan Water Reclamation District of Greater Chicago (MWRD) and the surface watercourse known as the McCook Ditch. The Village utilizes both outlets for disposal of storm water drainage. The contaminated wet weather flows conveyed by the combination sewer system are routed to the deep tunnel access shaft located at 47th Street and East Avenue. The storm sewer system extending along 51st Street, discharges to the storm sewer in East Avenue, which conveys drainage north to the 47th Street outlet to reach McCook Ditch. A secondary outlet in East Avenue routes some of the drainage south to a storm sewer in 55th Street which also discharges to the McCook Ditch.

9. The report finds that in addition to the inherent capacity limitations defined by pipe size, elevation, and gradient, the operation of the local sewer systems is also constrained by the limitations of its constructed outlets. The deep tunnel system is constrained by the lack of storage capacity, and therefore can fill and overflow when subjected to large regional rainfalls. While generally isolated by elevation from such overflow conditions, the Village connections could be affected by high tunnel storage elevations resulting from large storm events. Such storage elevations can impede discharge into the tunnel system and cause backwater conditions in the tributary combination sewer system. The outlet storm sewer systems connecting to the McCook Ditch are constrained by poor conditions. The condition of the storm sewer crossing beneath the IHBRR and along 47th Street is poor, which increases the reliance on the sewer extending to 55th Street during large storm events.
10. During the July 2010 storm event the deep tunnel system was reported to have temporarily filled causing a backwater condition within the Village combination sewer system. Under this condition the combination sewer system was no longer conveying drainage, thereby contributing to the flooding of the isolated low areas within its service basin.
11. The report finds that the McCook Ditch outlet receives drainage from the Village by way of the storm sewer segments extending along East Avenue and 47th Street. Due to limited gradients and pipe size constraints, the capacity of these critical storm sewer segments was exceeded, resulting in the surface flooding that was in evidence along both 47th Street and East Avenue. The limited outlet conveyance affects the capacity of the tributary storm sewer extending along 51st Street, and contributed to the diversion of flow into the low areas served by the combination sewer system.
12. The report finds that the prevention of future flooding events that result from large rainfall events will require (1) a reduction of drainage volume entering the residential area from the region located west of Brainard Avenue, (2) the increase of the drainage system capacity within flood prone portions of the residential neighborhood, and (3) the increase in drainage outlet capacity allowing a less restricted disposal of surface runoff.
13. The report recommends that a flood wall be installed along a critical portion of the Brainard Avenue corridor generally located between 51st Street and 50th Street, to prevent the movement of flood waters into the adjacent residential neighborhood. The overflow point of the barrier is specified to be installed with a ridge elevation of 657, which is about two feet higher than the lowest part of the Brainard Avenue roadway. The flood wall would be constructed along the west right-of-way using an interlocking driven sheet-pile system to minimize cost and disruption along the roadway corridor. The cost for this construction has been estimated to total about \$716,135, including construction contingency and professional services.

14. The report recommends the construction of a storm relief sewer system along 51st Street, between Ashland Avenue and 12th Avenue, along 12th Avenue, between 51st Street and 50th Street, along 50th Street, between 12th Avenue and the east right-of-way line of East Avenue, where it would discharge into the quarry. Depending on location, the construction would either supplement or replace existing storm sewer. The project would involve the creation of a new larger outlet into the quarry, replacing the existing outlet located between 50th Street and 51st Street. The cost for this construction has been estimated to total about \$5,303,679 including construction contingency and professional services.
15. The report recommends the construction of a combination relief sewer system to supplement the capacity of the existing combination sewer system. The relief combination sewer would be configured with a main outlet segment and two main branch segments. The large diameter outlet sewer segment would begin with a connection to the ten foot diameter connection structure for the MWRD deep tunnel system located at 47th street and East Avenue. The sewer would be constructed south from the tunnel connection to 49th Street, and then east along 49th Street to Kensington Avenue. At Kensington Avenue and 49th Street one main branch segment would extend south to 50th Street and then west to Brainard Avenue to collect drainage from sewers within the low flood prone region crossed by 50th Street. At Kensington Avenue and 49th Street a second main branch sewer would extend north along Kensington Avenue to 48th Street then west along 48th Street to Sunset Avenue to collect drainage from the sewer system serving the flood prone region north of the La Grange Country Club. The cost for this construction has been estimated to total about \$16,178,192, including construction contingency and professional services.
16. The report recommends that the rights-of-access be examined to establish a legal basis for discharging storm water into the quarry. The Village constructed and maintained a 54 inch sewer across the property now occupied by the quarry between 1926 and 1992, when a long length of sewer was removed during a quarry expansion project. The sewer was constructed along this route in 1926 under an agreement for easement made between the Village and the Indiana Harbor Belt Railroad. Efforts undertaken by the Village Attorney in 1992 to prevent the demolition of the Village sewers were unsuccessful. The continued easterly discharge of drainage from the Village is essential to the operation of the sewer system. The use of the quarry for this purpose is also regarded as essential as other drainage outlets are inadequate for meeting the needs of the Village of La Grange.
17. The report recommends that the Village of La Grange assist the Cook County Department of Highways in its development of a drainage plan for Plainfield Road. The County is presently evaluating options for the installation of a storm sewer system along Plainfield Road, and recognizes that suitable local drainage outlets are not available. Regional outlets have also been determined to be inadequate in elevation and capacity. The construction route for a new storm water outlet is obstructed by established land use, including in particular large quarry excavations. In that the findings of the *South Basin Drainage Investigation* has independently verified the severity of this problem, and has identified this circumstance as contributory to drainage system failure during large rainfall events, it is recommended that the Village of La Grange participate in future technical committee meetings organized to adopt a regional solution to the problem.

18. The report recommends that a local flood hazard map be prepared to identify the neighborhood regions which are at risk of flooding. The map should be based upon established topography and drainage analysis prepared for the 100-year storm event. A detailed study of each flood hazard area should be undertaken to delineate the specific boundaries of risk. Subject to the findings of this study, a specific risk assessment should be undertaken for each parcel. In addressing the nature of drainage risk, existing building ordinances should be reviewed to ensure that established practices and policy do not compromise the needed drainage functionality. In this respect drainage pathways should be established and obstruction prohibited by written regulation. Dedicated drainage easements should be required and defined along each side-yard and rear-yard of each parcel. In keeping with accepted practice elevation standards for structures located in flood risk zones should be adopted to reduce the likelihood of future flood damage.

19. The report recommends that an ordinance be developed to outline storm water management practices and requirements that would be applicable to the portions of the community served by combination sewers as well as separate storm and sanitary sewers. The ordinance should be prepared to complement the requirements of the Watershed Management Ordinance being considered for future adoption by the Metropolitan Water Reclamation District.