

Frenchtown Charter Township Resort District Authority

Drainage and Flood Protection Overview

December 6, 2018

The Resort District Authority (RDA) was created under Act 59 of 1986 for the purpose of improving an area in Frenchtown Charter Township comprised of numerous existing subdivisions with private roads and drainage. The area had limited flood protection, limited to no drainage systems with most of the system undersized, poor road conditions, most of which were gravel surface and in poor condition. The RDA over the past 30 years has dramatically improved the roads, installed new drainage and pumping stations and began a systematic improvement to the flood protection systems along the shores of Lake Erie. In addition, the funding available has allowed the RDA to pay for a portion of the snow removal for each subdivision based upon an equitable funding formula, pay for street lighting, dead or damaged tree removal, new monument style subdivision signage, continued maintenance of the road system, and numerous special projects. The funding for the RDA comes from a mileage assessed each year to the property owners within the RDA designated district boundaries, which includes the DTE Enrico Fermi nuclear power plant. The current mileage has been set at 3.0 mills. The DTE property currently generates approximately 73% of the monies collected each year to fund all the above mentioned improvements.

When the RDA was initially created in 1986 there were numerous meetings with the Monroe County Drain Commissioner's office (MCDC), the Monroe County Road Commission (MCRC), the Monroe County Commissioners and representatives from the beach areas and DTE. It was determined that the drainage systems throughout the RDA were grossly inadequate without a comprehensive drainage design. It was determined that a Chapter 20 Drainage District would be created under the Monroe County Drain Commissioner's (MCDC) office under the Drain Code of 1956. The Chapter 20 Drainage District was analyzed and ultimately a new comprehensive district was established which was comprised of several existing drainage districts including the Stone Crusher Drain, Edgewater Tile Drain, Grand Beach Drain, Woodland Beach Drain, Indian Trails Drain, Walker Drain and the LaBeau Drain/Dewey Drain. Flowing through the district was Sandy Creek and Stony Creek. To finance the improvements under the Chapter 20 Drainage District, bonds were sold through the County of Monroe to be paid through the established millage. The construction involved over 80 miles of storm drains and large pumping stations. The initial bonds were paid off in 2001.

It was well documented that even though there were the existing private dikes along the Lake Erie shore line, severe storms coupled with northeasterly winds caused storm surges resulting in serious flooding and property damage. High lake levels compounded with significant wave heights as observed on December 1, 1986 caused significant flooding over the dikes at Stony Pointe Peninsula, Brest Bay Grove subdivision, Lakeside subdivision, Grand Beach, Woodland Beach, Detroit Beach and State Park subdivisions. It was noted that the dikes were generally inadequate in these areas to protect the project area from flooding. The high lake levels along with storm surge and wave action caused the streams and drains which discharge into Lake Erie to back up. In addition, many areas had flap gates that closed

during these events which then prevented storm water drainage from discharging into the lake. The flooding in December 1986 is well documented with dike overtopping, widespread flooding throughout the beach areas covering the roads and isolating homes due to the depth of the water.

In 1973 and 1974 major flooding occurred. The US Army Corps of Engineers (USACE) constructed 'Operation Foresight' dikes consisting of rock filled cribs as a temporary measure to alleviate the coastal flooding. Then, after more flooding in the early 80's, in 1985 the USACE constructed 'Operation Advanced Measures' in the Detroit Beach area. There was a Presidential Declaration in March 1982 due to the flooding and a declared major disaster. Further, there were Governors Declarations for flooding disasters on March 19, 1982, April 13, 1985 and February 12, 1986. Again, in April 1997 there were record high water levels documented.

In 1976 the USACE completed a feasibility report entitled "Shoreline Flood Protection Study, Monroe County Michigan." The report provided the analysis and feasibility of flood protection measures for portions of the Lake Erie shore line; however, storm water drainage alternatives were not included in the report. In 1978 the Federal Insurance Administration completed a flood insurance study for Frenchtown Charter Township. It was determined that much of the RDA area lies below the 100-year floodplain elevation.

STORM SEWER SYSTEM

The RDA hired an engineering firm (Wade/Trim) to analyze the drainage systems throughout the drainage districts as part of the initial actions of the RDA Board. The analysis included an evaluation of the existing storm drainage sewers, ditches, pump stations (that existed at the time) along with their capacity, the area of each district and the estimated 10-year storm discharge. The 10-year storm event was selected at that time by Frenchtown officials, the MCDC and the engineer to determine the drainage discharge and for sizing of the new district wide storm sewer systems and pumping stations. The 10-year storm event is a typical storm event used for drainage systems in new subdivisions and roadways and is the standard used by the MCDC. The Rational Method ($Q=CIA$) was used to size the storm sewers, which is the typical method employed for design of storm drainage. Various types of drainage systems were evaluated with the enclosed storm sewer system with catch basins ultimately selected. Design requirements were then established for the sizing and types of pipes and materials along with other traditional design criteria.

PUMP STATIONS

The pumping stations were also analyzed with recommendations for renovation or abandonment. It was determined that the pump stations would be designed to handle the runoff resulting from a storm that has a 10% chance of occurrence in any year. Criteria was selected for pump station sizing, cycle length, wet well sizing, number of pumps, size of pumps and pump types. The pump stations were also equipped with an alternate power source, which was determined to be stationary, engine-driven generators which are designed to automatically come on-line during a power outage. In summary, the existing pump stations include:

1. Brest Bay – 2 pumps with each having the capacity to pump 10,550 gal/minute (total 21,000 gal/min)

2. Stony Pointe – 2 pumps with each having the capacity to pump 2,980 gal/min (total 5,960 gal/min)
3. Burke Road – 2 pumps with each having the capacity to pump 1,800 gal/min (total 3,600 gal/min)
4. Nelson Drive – 2 pumps with each having the capacity to pump 800 gal/min (total 1,600 gal/min)
5. Nelson Club House – 2 pumps with each having the capacity to pump 2,500 gal/min (total 5,000 gal/min)
6. Dewey Drain – 4 pumps with each having the capacity to pump 22,000 gal/min (total 88,000 gal/min)
7. State Park – 3 pumps with each having the capacity to pump 15,600 gal/min (total 46,800 gal/min)
8. Woodland Beach – 4 pumps with each having the capacity to pump 25,000 gal/min (total 100,000 gal/min)
9. Detroit Beach – 4 pumps with each having the capacity to pump 20,250 gal/min (total 81,000 gal/min)

The total pumping capacity of all pump stations is 353,060 gal/min.

The MCDC continues to maintain the Chapter 20 Drainage District with revenues generated by the RDA used to finance the maintenance. The annual budget for the maintenance of the Chapter 20 Drainage District is approximately \$160,000.

FLOOD CONTROL DIKES

In 2001 the RDA commissioned their engineer (The Mannik & Smith Group, Inc.) to conduct a study of the elevations of the dike system along Lake Erie within the limits of the RDA. In addition, the condition of the dikes were physically reviewed in the field to determine the structural condition of each dike for each individual property.

In April 2002 MSG provided to the Resort District Authority Board a Dike Study Report. This report was a compilation of the comprehensive investigation that was performed for each dike for each parcel as well as a topographic elevation study to analyze the potential for flood protection and wave overtopping based upon FEMA flood elevations. The condition of each dike was documented and photographed and included in the report.

After the 8.7 mile dike system and 160 individual properties were inspected, surveyed and documented it was concluded that 51 parcels, or 32%, of the dike systems requires repair and 46 parcels, or 29%, of the dike system was below the recognized 100-year flood elevation. Twenty-two (22) of these parcels were deficient in condition as well as elevation.

This is a condition that jeopardizes the safety and well-being of the properties with the RDA. Dikes with structural deficiencies are prone to major breaches or complete failure during flooding events and susceptible to wave action and erosion. **Dikes with elevation deficiencies, even if only a small percentage, can result in inundation of the beach communities during flood events since the storm sewer system and pumping stations are not designed to handle wave overtopping.**

A Work Plan was developed that established a priority for improvements to the dike system, typically broken down by the various subdivisions.

A Flood Control Device Ordinance along with an Engineering Standards Ordinance were developed and approved by the Frenchtown Township Board to set criteria for the continued maintenance, elevation and repair/replacement criteria for the dike system. The RDA and Frenchtown Charter Township Board in conjunction with input from their engineer debated the elevation in which to set the future dikes. The then, current lower lake levels suggested that lower elevations might be acceptable, however, it was decided that based upon the dike elevations set by the USACE when constructing the Operation Foresite and Advance Measures dikes, two (2) elevations were developed within the Ordinance. One elevation was set at 579.0 IGLD datum and the other at 581.0 IGLD datum. The Ordinance stated that "all dikes shall have a minimum elevation of 579.0 IGLD except for Detroit Beach, Pointe Aux Peaux Farms and Longs subdivisions on the easterly side facing Lake Erie, and Stony Pointe Peninsula from #3558 Lakeshore to #4028 Lakeshore, which are to have a minimum elevation of 581.0 IGLD." The higher elevation was based upon the existing dikes that were already constructed at this higher elevation and in areas where it was determined that there was a greater probability of direct wave action on the dike system. Further, many residents at the time did not want to have their dikes raised since it would impact their ability to view the lake.

Approximately 12 years ago the RDA Board questioned long range forecasts for Lake Erie water levels. In fact, there were several requests to remove or lower the elevation of various dikes along the Lake Erie shoreline due to lower lake levels. As a result, the following report excerpt was provided to the RDA Board in September 2006:

"As requested at the Resort Authority Board meeting, our office (Mannik & Smith Group) has made contact and researched available information that forecasts long-range lake levels for Lake Erie. Included in our investigation was research to determine information on river dredging and or island removal from the Detroit River. The following is a summary of the research efforts and information collected to date:

Contacts have been made with the following sources:

Mr. Jeff Oyler, Field Operations Manager Ports of the Great Lakes; U.S. Army Corps of Engineers;
Mr. Thomas E. Croley III, PhD, Research Hydrologist, NOAA Great Lakes Research Laboratory;
Cynthia Sellinger, Deputy Director of the NOAA Great Lakes Research Laboratory;
Mr. Dean Cousino of the Monroe Evening News; NOAA Website and Articles; USACE; IJC

Recently there have been articles published that indicate long range forecasts that project the level Lake Erie will drop over the next 70 years:

- July 24, 2006 Muskegon Chronicle
- August 2, 2006 Detroit News
- August 28, 2006 Monroe Evening News

1. We were advised of a number of studies performed on Lake Erie and it appears the primary report that was published relates to an EPA April 2006 Report "Lake Erie Lakewide Management Plan". Section II pages 7 & 8 of the report states:

- A. "It is natural for Lake Erie's water levels to fluctuate seasonally, annually and over decades. Research documented 30 and 150-year cycles in Lake Erie water levels with the levels fluctuating over a 6 foot range in the past 85 years, from a low level of 568.18 feet in 1936 to a high level of 574.28 feet in 1986."
 - B. "Climate change experts (climate conditions only) predict that Lake Erie water levels may become as much as 33.5" lower over the next 70 years. They further predict that the total amount of precipitation will not change on an annual basis, but storms will become less frequent and more intense." Strong winds will also become more common although the report information did not address storm surge levels that might accompany the strong winds.
 - C. The report did note that other human activities – water diversion, consumptive use of water and lake level regulations- also have the potential to affect lake levels. These issues were not addressed in the report.
 - D. The report and plan are oriented towards environmental issues and planning for environmental changes produced as a result of the change in the lake levels.
2. Mr. Thomas Croley of the NOAA Great Lakes Research Laboratory noted that he has worked on a number of special projects on the Great Lakes in which his agency made lake level investigations. He further noted that their investigation required modeling a number of variables separately and then averaging them together to come up with estimated projections. NOAA feels the variables do not produce firm and accurate data in which to make accurate long-range lake level forecasts. He further noted that his agency directs lake level inquiries to the U.S. Army Corps of Engineers who only provide monthly level forecasts and 6 month long range forecasts. The variables that play in the picture make it impossible to forecast beyond 6 months.
 3. The Monroe Evening News article related to lake level conditions at Harrison Township and noted some interesting information that lake levels began dropping in the late 1990's although the lake levels on Lake Erie and Lake Ontario have recovered to long-term averages. Lake Huron and Michigan were down 18" and Lake Superior was down only 8".
 4. Other reports accessed in our research noted that previous studies were made to determine the feasibility to control the lake levels. These studies found that it was not feasible to control the lake levels. The question remains, if the lakes were to continue to drop as reported in the published articles, would the loss to the shipping industry and potential carry over to commerce and industry for the US and Canada, be a basis to re-open lake level control interest?
 5. An investigation was made to determine if there are any Detroit River dredging projects that might include removal of an island in the river. The current information from the Corps of Engineers indicates typical river dredging as performed in the past. "No project was found to indicate that an island was being removed. It should be noted that the Detroit River outlets into Lake Erie and does not drain water out of the lake. If the channel is enlarged to allow more flow into Lake Erie, (which actually would be limited by the water levels in Lake Erie) the potential affect would be to cause the lake levels to increase. This probability would most likely be minimal although the greater concern would be that the upper Great Lakes levels may drop due to higher discharges through the Detroit River. Many factors affect dredging in the Detroit River and any affects experienced from previous dredging projects should be anticipated by the

current projects.”

Lake level prediction is a complex science that considers the effects of hydrology, climatological fluctuations, and cyclic conditions occurring within a specific region. In addition, other localized factors must be taken into consideration including design water levels, lake level surge or wave height variations for storm year frequencies during long periods of strong winds out of the northeast on Lake Erie, and wave run-up and wave overtopping given the specific azimuth of the wave action on the various types of dikes. Hindcast wave models are used such as the C.O.E. model, referred to as DWAVE, which simulates the growth, propagation, and decay of wave energy as a function of space, time, frequency and direction. Simply stated, it is difficult to predict what combination of events and conditions may occur that cause high water elevations and flooding conditions along the shores of Lake Erie.

As can be seen, as little as 12 years ago various forecasts suggested that Lake Erie levels might continue to be lower, however, recent lake levels have continued to increase to levels seen in the 70's and 80's.

CONCLUSION

Funding for improvements within the RDA including roads, drains, pump stations, lighting, snow plowing, new dike construction and special projects all come from a 3.0 mill levy assessed against properties within the boundary of the RDA. The RDA must be renewed by voters on a regular basis.

The RDA storm sewer system (sizing) was designed for a 10-year storm event, which is the typical criteria for new subdivision development in Monroe County and a part of the standards developed by the Monroe County Drain Commissioner. The 80+ miles of storm sewers drain to pumping stations designed to accommodate the 10-year storm event being discharged through the storm sewer system. The storm sewer system and pumping stations were not designed to accommodate Lake Erie storm surges and lake water over topping the dikes during high water or storm events.

The storm sewer system within the RDA including the pumping stations and appurtenances are a part of a Chapter 20 Drainage District under the jurisdiction of the MCDC. The RDA pays the MCDC for the continued maintenance of the storm sewer system and pump stations. The Chapter 20 Drainage District boundary varies slightly from the RDA boundary.

The dike system is reviewed on a regular basis by the Township and RDA to evaluate the integrity of the dike system and to determine that the property owners are maintaining the dikes in a reasonable state of repair so as to withstand high lake levels and wave action.

The new dikes or those repaired are required to meet the elevation criteria set forth in the Township's Flood Control Device Ordinance. In certain cases this may be a combination of a front dike wall and another wall behind the front wall, often offset from the front wall by a patio or other similar structure. In these cases the combination of the two walls shall meet the elevation criteria. The Engineering Standards Ordinance establishes method and material to be used for the construction of the dike.

The dike system is privately owned by the individual property owners or associations (in the case of park land). The RDA procures temporary construction easements on the private properties in order to construct the new dikes. During the easement procurement, the RDA works with the property owners to develop an agreement for restoration on their property. Once constructed, the temporary agreements are no longer needed and lapse (with the exception of the Detroit Beach dikes where easements are held by the MCDC). The dikes then become part of the private property and the continued maintenance is the responsibility of the property owner just as it was prior to the new

construction.

The RDA is making every effort to continue the construction of the new dikes, based upon a master plan adopted by the Authority. The Master Plan is flexible in order to account for varying conditions of the dike system with deterioration and other factors being considered.

Information and content contained in this report comes from various sources and reports prepared by The Mannik & Smith Group, Inc. (current engineers) and Wade/Trim (original engineers) and various public and/or private entities.