Item 5:

Proposed Project Antidegradation Analysis

USACE - BUFFALO DISTRICT

DISCHARGES OF DREDGED MATERIAL ASSOCIATED WITH
2015 MAINTENANCE DREDGING OF TOLEDO HARBOR, OHIO

Application for Ohio Environmental Protection Agency (OEPA) Section 401 State Water Quality Certification

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Section 1: Antidegradaton Analysis

1.1 Project Description

The project will entail the maintenance dredging of sediments from the authorized Federal navigation channels of Toledo Harbor, Lucas County, Ohio. The channels will be dredged to the authorized depth (Figure 1 in Item 6). Up to one additional foot of material may be removed to ensure authorized depths are obtained and account for inaccuracies in the dredging process. Approximately 1,100,000 cubic yards of sediments will be dredged from the harbor in 2015 (minimum degradation alternative). Dredged material placement will occur in the existing two-square mile open-lake placement area in the Basin, located three and one-half miles from the Toledo Harbor light at an azimuth of 033°00' (Figure 2 in Item 6). The dredging is scheduled to occur between 1 July 2015 and 15 March 2016. The project will be accomplished by a contractor of the Federal government.

The purpose of the project is to maintain sufficient water depths for commercial navigation in Toledo Harbor. This project was congressionally authorized by the 1875, 1886, 1888, 1896, 1899, 1902, 1907, 1910, 1916, 1917, 1935, 1937, 1945, 1958, 1960 and 1962 River and Harbor Acts, 1976 and 1986 Water Resources Development Acts, 1985 Supplemental Appropriations Act and 1988 Energy and Water Appropriations Act. If the Federal navigation channels are not dredged to authorized depth, commercial navigation will eventually be adversely affected.

The environmental effects of the dredging operation are documented in the ***Final Environmental Impact Statement, Operation and Maintenance (O&M), Toledo Harbor, Ohio (1976); Environmental Assessment (EA) and Section 404(b)(1) Evaluation, O&M, Toledo Harbor, Ohio (1989); and EA and Section 404(b)(1) Evaluation, O&M, Dredging and Placement of Dredged Material, Toledo Harbor, Ohio (2009).*** These documents, and supplemental documentation, have been submitted to USEPA. Copies are available for examination at the Buffalo District office.

The material to be dredged from Toledo Harbor consists primarily of silts and clays. In 2014, an estimated total of 1,100,000 cubic yards (CY) of material will be dredged from the Federal navigation project. The quality of the material has been evaluated using 2004, 2006 and 2010 sediment data in accordance with the protocols and guidelines contained in the U.S. Environmental Protection Agency (USEPA)/USACE 1998 Great Lakes Dredged Material Testing

and Evaluation Manual. This evaluation specifically addresses the potential contaminant-related risks to aquatic life associated with placing the dredged material in open-lake waters. Based on this evaluation, material in the lower end of the River Channel and Lake Approach Channel [River Mile 0.75 (Station 360+00) to the lakeward end of the channel] and the upper River Channel [River Mile 5 (Station 138+00) to the upstream limit of the channel (River Mile 6.75 / Station 33+36.61)] was toxicologically comparable to sediments at open-lake areas in the Western Basin of Lake Erie. Therefore, it has been determined that the dredged material meets Federal "contaminant determination" guidelines (40 CFR 210.11[d]) for open-lake placement. This dredged material will be placed at the existing two-square mile open-lake placement area in the Basin, located three and one-half miles from the Toledo Harbor light at an azimuth of 033°00' (Figure 2). This site has been previously used by the USACE for the placement of Toledo Harbor dredged material. Because the northeast half of this area has become too shallow for dredged material placement, placement will occur within the southwest half.

1.1.1 Preferred Design Alternative

This alternative would entail the dredging of an estimated 1,500,000 cubic yards of material in 2015, with the placement of the dredged material at the existing authorized open-lake placement area in Lake Erie. A contractor of the Federal government would accomplish the project. Mechanical equipment (e.g., clamshell bucket dredges with scow) would be used to complete the maintenance dredging operation. The project would take about 180 to 220 days to complete (Figure 3, Item 6).

1.1.2 Minimum Degradation Alternative

This alternative would entail the dredging of an estimated 1,100,000 cubic yards of dredged material from the Federal navigation channels in 2015, with the placement of the dredged material at the existing authorized open-lake placement area in Lake Erie. This is the minimum amount of dredging required in order to maintain a passable channel for deep draft commercial shipping. A contractor of the Federal government would accomplish the project. Mechanical equipment (e.g., clamshell bucket dredges with scow) would be used to complete the maintenance dredging operation. This project would take about 130 to 170 days to complete (Figure 4, Item 6).

Note that the Minimum Degradation Alternative estimates dredging 400,000 cubic yards less than the Preferred Design Alternative. It is estimated that dredging activities specified in the Minimum Degradation Alternative will impact an estimated 172 acres less of channel bottom/habitat than what would be impacted under the Preferred Design Alternative. The estimated length of stream to be dredged under the Preferred Design and Minimum Degradation Alternatives are 59,000 and 44,000 linear feet, respectively. Note that the actual shoal thickness cannot be determined until just before the dredging begins. In addition, shoal thickness will vary throughout the harbor and greatly depend on weather conditions.

Therefore, the above quantities are merely estimates regarding the acreage of Federal navigation channel to be dredged/impacted under either alternative.

1.2 Avoidance

The "No Action" alternative was considered but dismissed since it would not address the navigation needs of the harbor and substantial effects on commercial navigation and associated industries would occur as a result of this alternative. The overall value of the harbor as a water resource to commercial navigation would progressively deteriorate to a point at which deep-draft commercial vessels would no longer be able to navigate the harbor due to inadequate depths. The large industrial base that depends on the harbor to transport commodities would no longer be able to do so cost-effectively. The harbor would no longer be a viable alternative for the transportation of goods. This would negatively impact Toledo Harbor. The harbor is the 51st leading port in the United States and is ranked 7th among Great Lakes Ports with a five year average (2006-2010) of over 11 million tons of material shipped or received. The harbor generates $381M annually in direct revenue while supporting 6,971 jobs that generate over $558M per year in personal income. The loss of between two and three feet of channel depth would result in increased transportation costs of between $964,000 and $2,585,000 annually. If the harbor was closed to commercial traffic, commodities would have to be transported by rail and truck. This is predicted to increase annual emission rates by over 69,568 tons of harmful particulate matter and increase costs by $4,775,000 due to increased railroad related accidents, and $971,000 due to increased trucking related accidents.

Several beneficial use of dredged material studies have been evaluated and are in various phases of study through the USACE Regional Sediment Management (RSM) Program. However, at this time none of these studies have progressed to the point that they are ready for implementation. There is currently no placement area outside the aquatic ecosystem available to the USACE that is accessible, economically feasible, and can accommodate the quantity of dredged material necessary to maintain the federal navigation channels at Toledo Harbor on an annual basis and at a reasonable federal cost.

For any USACE civil works O&M dredging project, federal regulations require USACE to select the leastcost, environmentally acceptable dredged material management alternative that is engineeringly feasible. This is commonly referred to as the "Federal Standard." "Environmentally acceptable" within this definition means compliance with NEPA and Clean Water Act Section 404(b)(1) Guidelines (if there is a discharge of dredged material into a water of the United States). One objective of the Federal Standard is to ensure that federal dredging funds across states are spent in an equitable manner and in a way that does not favor any particular state policy relating to dredged material management. The USACE is responsible for determining compliance with the Clean Water Act Section 404(b)(1) Guidelines and for complying with NEPA. While beneficial use of the dredged material is often the preferred and most popular option, the actual implementation of such alternatives usually requires non-federal sponsorship and significant non-federal cost-sharing. Typically, when the discharge of dredged material is determined to meet Clean Water Act Section 404(b)(1) Guidelines, which

includes compliance with applicable state water quality standards (WQSs), open-lake placement is often the least costly alternative which meets the Federal Standard as is the CDF placement of dredged material that has not been determined to be suitable for open-lake placement. State requirements beyond compliance with Clean Water Act Section 404(b)(1) Guidelines exceed the Federal Standard and, if costly, require non-federal sponsorship and cost-sharing for implementation.

1.3 Minimization

The Minimum Degradation Alternative estimates dredging 400,000 cubic yards less than the Preferred Design Alternative. It is estimated that dredging activities specified in the Minimum Degradation Alternative will impact an estimated 172 acres less of channel bottom/habitat than what would be impacted under the Preferred Design Alternative. The estimated length of stream to be dredged under the Preferred Design and Minimum Degradation Alternatives are 59,000 and 44,000 linear feet, respectively. Note that the actual shoal thickness cannot be determined until just before the dredging begins. In addition, shoal thickness will vary throughout the harbor and greatly depend on weather conditions. Therefore, the above quantities are merely estimates regarding the acreage of Federal navigation channel to be dredged/impacted under either alternative.

1.4 Magnitude of the Proposed Lowering of Water Quality

This alternative would result in a short-term, negligible lowering of ambient water quality, less than that which occurs during Lake Erie storm events. The main water quality impacts would be the generation of turbidity and variation of dissolved oxygen levels in the water column.

The material that would be dredged under this alternative consists of sediments that have deposited in the Federal navigation channels since the last maintenance dredging effort. These types of sediments are homogenous and residually contaminated with pollutants that are ubiquitous throughout the Great Lakes. A characterization of the Toledo Harbor material is documented in the *Evaluation of Toledo Harbor Federal Navigation Channel Sediments With Respect to their Suitability for Open-lake Placement* provided to OEPA in 2010 and 2011. This evaluation concluded that material in the lower end of the River Channel and Lake Approach Channel [River Mile 0.75 (Station 360+00) to the lakeward end of the channel] and the upper River Channel [River Mile 5 (Station 138+00) to the upstream limit of the channel (River Mile 6.75 / Station 33+36.61)] was toxicologically comparable to sediments at open-lake areas in the Western Basin of Lake Erie and therefore meet Clean Water Act Section 404(b)(1) guidelines for open-lake placement. This evaluation also contains 2010 data on the ambient concentrations of contaminants, such as metals, nutrients, polycyclic aromatic hydrocarbons (PAHs), polychlorinated biphenyls (PCBs) and pesticides in Basin water. Standard elutriate test (SET) data on the dredged material indicate that discharge of this dredged material at the existing open-lake placement area in the Western Basin of Lake Erie complies with applicable Ohio State Water Quality Standards for the Protection of Aquatic Life. For the general effects of this alternative's lowering of water quality on aquatic life, refer to the 2009 EA/FONSI and Section

404(b)(1) Evaluation. This EA/FONSI documents that the placement of the dredged material at the authorized area in the Western Basin of Lake Erie would not culminate in significant, adverse environmental impacts.

Open-lake placement of Toledo Harbor dredged material constitutes internal loading and does not result in a net increase of sediments into the aquatic system. With respect to turbidity, the Basin is a naturally shallow and turbid aquatic ecosystem impacted by urbanization, point and non-point source pollution. Cultural eutrophication has been a chronic problem in the Basin due to nutrient loads that derive primarily from agricultural land use. These anthropogenic activities ultimately increase sediment load and turbidity in the Basin. Turbidity created by the mix of natural and anthropogenic activities within the Basin is enormous compared to that associated with the placement of Toledo Harbor dredged material. The amount of dredged material annually relocated in the lacustrine system (for this exercise, the amount used is 1,250,000 cubic yards [estimated 1,450,000 metric tons {MT}]) should be viewed within the framework of the amount of sediments within the system and entering the Basin from other sources. For example, the Maumee River at Waterville annually contributes an estimated 1,500,000 cubic yards of sediments to the lower river and Basin. When compared to a very conservative estimate of 150,000,000 MT per year (the upper estimate is 300,000,000 MT) that are normally resuspended, the placement of dredged material from the Basin is an extremely small fraction (i.e., less than 0.96 percent of the resuspended sediment load). Therefore, the open-lake placement of Toledo Harbor dredged material results in short-term turbidity, and does not induce widespread and/or substantially increased background turbidity in the Basin. With respect to long-term movement of open-lake placement area sediments, 2010 studies and modeling show that bottom sediments in the area migrate in a net northeasterly to southeasterly direction, and do not reach City of Toledo and City of Oregon potable water intakes (PWIs) situated along the south shore of Maumee Bay east of the river mouth.

Concerning short-term turbidity-related impacts, the results of a preliminary field investigation in August 2005 on turbidity plumes relating to the placement of Toledo Harbor dredged material at the existing open-lake area indicated that plume migration was in a net northeasterly direction and decayed to near background (30 mg/L total suspended solids [TSS]) at 870 feet (0.17 miles) such that the maximum plume length observed was 1,115 feet (0.21 miles). The entire footprint of the plume remained within the boundaries of the existing open-lake placement area. A subsequent modeling effort predominantly showed that only 1.5% of the sediment that is open-lake placed would remain in suspension after four hours, and less than 1% would be expected to remain in suspension after 24 hours. The TSS concentration associated with open-lake placement would be less than 12 mg/L and 1 mg/L above background after four and 24 hours, respectively. Therefore, turbidity plumes associated with the placement of dredged material at the open-lake area are small in spatial extent and magnitude. Toledo Harbor dredged material is typically released from a barge into the water column, and it therefore settles very rapidly as a mass that is similar to flocculent settling. Because it settles as a mass, very little turbidity is generated via a plume before the material reaches the lake bottom.

Based on this and other relevant scientific information, turbidity resulting from the placement of Toledo Harbor dredged material in the Basin is short-term and spatially limited.

Toledo Harbor sediment data from 2004 and 2006 show that the total phosphorus (P) concentrations in the sediments proposed for open-lake placement range from 328 to 1,010 mg/kg, and average 630 mg/kg. These concentrations are comparable to those at the open-lake reference area (range = 457 to 585 mg/kg; average = 554 mg/kg). Sediment P is subject to resuspension in the Basin, whether it is in-place within the Channel or discharged at the open-lake placement area. Without considering availability or sedimentation, total P added to the Basin water column by open-lake placement (630 mg/kg suspended solids x 1.45 million MT suspended solids/year = 913 MT/year) is less than 10% of the total added annually by external loads (about 7,000 MT/year) or introduced into the water column by wind-driven resuspension (about 6,100 MT/year). This load, however, is truly a redistribution of total P and already counted as part of the external load.

A very small fraction of total P is released via open-lake placement of Toledo Harbor dredged material; the dredged material which then settles on the bottom behaves much like the surrounding lake bottom sediments. SET data on the dredged material are consistent with low P availability during placement, and resuspended bottom sediments from the Basin have higher bioavailable phosphorus when compared to Lake Erie tributary suspended solids or the dredged material itself. External tributary and point source loads and wind-induced resuspension of bottom sediments release far greater amounts of phosphorus into the water column than open-lake placed dredged material and have a much greater potential than dredged material to contribute to excessive growth of algae, including harmful algal blooms (HABs), in the Basin.

There has been public concern that the open-lake placement of dredged sediment causes or intensifies harmful algal blooms (HABs) in Lake Erie. To address this concern, USACE sought an externally conducted study in 2013 to answer the question: “What is the Potential for Placement of Toledo Harbor Dredged Material in the Western Lake Erie Basin to Influence Harmful Algal Blooms?” A coordinated field sampling, laboratory testing and modeling program was initiated to monitor physical, chemical, and biological parameters before, during, and after sediment placement and assess the relative influence of sediment placement activities as an internal source of solids/nutrients. Extensive water quality monitoring conducted throughout the 2013 dredging operation indicated that the bulk of the placed sediment (and associated phosphorus content) immediately deposits on the lake bottom, with minimal interaction with the water column. Immediately after placement, only approximately 2.5 percent of the total amount of sediment placed remains in the water column as suspended solids. This small fraction of sediment and associated phosphorus that is released to the water column undergoes exponential decline within the placement area, returning to near background levels within an hour through settling and dispersion. Assessed across the entire dredging season, open-lake placement contributions of total phosphorus and soluble reactive phosphorus represented only a fraction of one percent of the total annual phosphorus loading to western Lake Erie in 2013. These releases are insufficient to stimulate any additional significant growth of algae or significantly impact water quality in the Basin. Once deposited to the lake bottom,

phosphorus release from the placed sediment is the same or less than the surrounding lake sediments and would not represent any additional contribution to the aquatic ecosystem. Additionally, sediment from the placement area resuspend at the same rate as other areas of similar depth in the Basin. As the deposited sediment does not erode at a high or accelerated rate, sediment has accumulated within the placement area as a mound over several years of placement activities. The size of this mound is controlled primarily by consolidation of the placed sediment and underlying lake bottom. The overall conclusion of the 2013 study is that the open-lake placement of dredged sediment from Toledo Harbor does not contribute to the development of HABs in the Basin. A copy of this study is available at:

http://www.lrb.usace.army.mil/Portals/45/docs/PublicReview/R-WLEB-Final-Report.pdf

Dredging and dredged material placement activities would result in the excavation, and some smothering and mortality of benthic macroinvertebrates, and the temporary avoidance of work areas by fish and wildlife species (i.e., mostly gulls and waterfowl). However, following dredging operations, the benthic communities would recolonize the impacted areas. A 2003 benthic community investigation on the open-lake placement area concluded that the diversity and abundance of macroinvertebrates within the area were similar to other reference areas in the Western Basin of Lake Erie. This study also showed that there was no association among sampling areas in relation to their proximity to the placement area, indicating that the placement of dredged material had no measurable long-term effect on the benthic community within or outside the area.

Regarding impacts to fish, the open-lake placement area was situated to avoid fish spawning grounds. During dredged material placement operations, the modes of impact indicate that adverse impacts to fish are minor and short-term. The increase in suspended sediments and turbidity resulting from the open-lake placement of Toledo Harbor dredged material is very small in comparison to ambient conditions, and is therefore unlikely to trigger any significant adverse effects to fish. Indigenous fish are naturally exposed and have likely adapted to naturally occurring and much more extended elevated suspended sediment events (such as during storm or high runoff events) relative to episodic open-lake placement events. At the open-lake placement area, discharge activities place mud on mud-bottom habitat; therefore, there is no resulting significant change to bottom substrate. The material settles within a few hours and becomes subject to the same resuspension forces typically affecting the surrounding lake bottom. Impacts on fish over the full range of possible effects include either an avoidance or attraction to the area by fish, or no noticeable effect. Some fishes have been observed to be attracted to open-lake placement operations because they have a tendency to feed on the benthic macroinvertebrates contained and released from the dredged material. Many fishes have a wide tolerance for turbidity, and fish behavior in response to a dredged material placement event depends on the species. The placement of dredged material at the open-lake area may result in some mortality to demersal fish eggs (e.g., from broadcast spawning species) existing on the lake bottom in very close proximity to the actual placement of dredged material due to suffocation from burial or siltation, and/or oxygen deficiency at the sediment-water interface. Studies and modeling show that short- and long-term turbidity impacts associated

with the open-lake placement of Toledo Harbor dredged material are negligible to minor. Therefore, it would not result in any measureable reduction of light penetration into the water column, or adversely affect phytoplankton and aquatic plant production and fish. Given the dredging period, limited spatial area of impact and natural population variations of these types of species, this type of impact would not culminate in any long-term, adverse impacts to any fish population. The open-lake placement of Toledo Harbor dredged material has a very low likelihood of causing turbidity-related adverse effects on fish, including commercially and recreationally important species such as walleye (*Sander vitreum*) and yellow perch (*Perca flavescens*). Successive 2012 and 2013 laboratory studies found that suspended sediment exposures to walleye eggs, walleye larvae and fingerlings mimicking sediment resuspension during dredging did not result in significantly reduced hatch success or fingerling survival, or evidence any sublethal effects through general gross morphological observation including an examination for gill lamellae abnormalities. The studies concluded that walleye eggs and fingerlings are relatively tolerant of suspended sediment concentrations likely to be encountered during dredging (and open-lake placement of dredged material) in the Great Lakes region.

Regarding impacts of open-lake placement of the dredged material on aquatic community structure and function, the aquatic ecosystem in the open-lake placement area, both before and after dredged material placement, is a profundal area within the Basin. It can be appropriately described as silt-bottom, warmwater, eutrophic habitat which supports a variety of benthic and pelagic organisms. Placement of dredged material at the open-lake area creates a mound, which results in some local bottom surface relief. This mound is subject to settling and lake currents in the Basin, which tend to flatten the mound over time following the cessation of dredged material placement operations. Available relevant evidence indicate that the aquatic ecosystem at the open-lake placement area is resilient, and that the periodic disturbance created by open-lake placement of dredged material is absorbed or accommodated by the ecosystem because its structure and function has not fundamentally changed to a different state. Ecosystem resilience signifies ecosystem health (gauged by species diversity) and ecosystem stability (the probability that all species persist).

Unlike other discharges regulated under the Clean Water Act as external sources of pollutants (i.e., point source wastewater discharges), the origin of this dredged material is within the aquatic ecosystem and therefore the material would be an internal source both prior to dredging and after being placed in the open-lake. In other words, it is not new to the aquatic system. Under existing formal USEPA/USACE guidelines and guidance under Section 404 of the Clean Water Act, the material is thoroughly sampled and tested to demonstrate that it presents no significant increased risk to aquatic life or human health in comparison to the lake bottom sediments on which it is being placed. In a mechanical dredging operation, the material is excavated from the channel using a clamshell bucket, put into a scow and transported to the designated open-lake area where it is then discharged from a scow and released to the lake environs. The dredged material falls as a cohesive mass through the water column coming to rest on the lake bottom, typically as a mound with a mild slope. Generally, more than 95 percent of the material remains in the cohesive mass while less than 5 percent

of it is suspended in the water. This suspended sediment results in short-term, localized turbidity which rapidly dissipates in the water column due to dispersion and settling. The turbidity fades to background conditions within about an hour time period. This temporary increase in turbidity is limited in spatial extent and typically remains within close vicinity of the point of discharge, well within the boundaries of the open-lake placement area. The material is thoroughly sampled and tested to ensure that contaminants are not released with the suspended sediments at concentrations that could be harmful to aquatic life and human health. After settling, the dredged material remains in-place along with the surrounding lake bottom sediments. While the newly deposited sediment is subject to lake bottom currents and waves, open-lake placement areas are selected to be relatively low-energy environments with low current velocities and low wave shear forces, offering little potential for erosion and resuspension. If the dredged material placed on the lake bottom is resuspended, it would still behave the same as the surrounding lake bottom sediments. This qualitative description of open-lake placement, based on extensive existing information and USACE experience in dredged material handling and management, challenges the perception that open-lake placement of dredged material is a discharge that is "toxic" or results in widespread, long-term turbidity or migration of sediments.

1.5 Technical Feasibility and Cost Effectiveness

This alternative is technically feasible, as it involves routine maintenance dredging and dredged material placement procedures. Equipment is readily available to accomplish this type of work. The most recent benefit to cost (B/C) ratio for this alternative with respect to commercial navigation in the harbor is greater than or equal to 3.09. Costs of this project have ranged from $4.00 to $5.00 per cubic yard of dredged material over the past five years.

1.6 Economic Considerations

A large industrial base depends on the harbor to receive commercial goods and ship them off-site for a reasonable cost. As such, maintaining depth within the harbor would allow for the cost-effective transport of commodities through the local community. The harbor is the 51st leading port in the United States and is ranked 7th among Great Lakes Ports with a five year average (2006-2010) of over 11 million tons of material shipped or received.The major products shipped through Toledo Harbor include coal, iron ore, grains, petroleum, limestone, sand and gravel and iron and steel products. This commerce has a substantial positive impact on the local economy by providing jobs that support the transportation, processing and production of these commodities, as well as by maintaining competitive price levels on commercial goods. The harbor generates $381M annually in direct revenue while supporting 6,971 jobs that generate over $558M per year in personal income. This industrial base generates substantial tax revenues for local governments. The estimated annual rate savings provided by Toledo Harbor (savings compared to the costs of alternative modes of transportation, such as rail or truck) is $338 million. Construction of the project itself would support about 10-20 blue-collar jobs in the dredging industry for a period of about three to five months. In addition, social and

economic benefits associated with recreational navigation would accrue with harbor maintenance.

Substantial effects on commercial navigation and associated industries would occur as a result of not maintaining the harbor. The overall value of the harbor as a water resource to commercial navigation would progressively deteriorate to a point at which deep-draft commercial vessels would no longer be able to navigate the harbor due to inadequate depths. The large industrial base that depends on the harbor to transport commodities would no longer be able to do so cost-effectively. The harbor would no longer be a viable alternative for the transportation of goods. The loss of between two and three feet of channel depth would result in increased transportation costs of between $964,000 and $2,585,000 annually. If the harbor was closed to commercial traffic, commodities would have to be transported by rail and truck. This is predicted to increase annual emission rates by over 69,568 tons of harmful particulate matter and increase costs by $4,775,000 due to increased railroad related accidents, and $971,000 due to increased trucking related accidents.

1.7 Cumulative Impact

The overall cumulative impact of the proposed project is considered to be socially and economically beneficial. The most substantial cumulative effect resulting from this project would be to facilitate continued unrestricted navigation which would benefit the associated upland industries within Toledo Harbor. Implementation of the proposed project would work toward sustaining the integrity of Toledo Harbor from economic and social perspectives. Dredged material management through the open-lake placement would have minor, localized adverse short-term affects, most of which are related to water quality and the benthic community. The ability to properly manage dredged material through open-lake placement would enable the continued maintenance of the Federal navigation channels which would facilitate the continued use of Toledo Harbor and the associated community facilities and activities that it benefits. In this way, it would substantially benefit community and regional sustenance and growth needs. The long-term socioeconomic benefits of this dredging on the region's socio-economic condition would far outweigh the temporary, localized minor adverse effects.

With respect to open-lake placement of dredged material, this alternative would result in a short-term, minor reduction of water quality in the receiving waters. Testing and evaluation indicates that placement of the dredged material at the open-lake area would not significantly impact aquatic life. The main water quality impacts would be the generation of turbidity and variation of dissolved oxygen levels in the water column. These impacts would be short-term and spatially limited. Turbidity would not increase to an extent that it would result in any significant reduction of light penetration into the water column, or adversely affect phytoplankton and aquatic plant production, and fish. Discharge of the dredged material at open-lake area would have insignificant potential to influence HABs. Dredging and dredged material placement activities would result in the excavation, smothering and mortality of benthic macroinvertebrates. Following dredging operations, benthic communities are expected

to recolonize the impacted areas. The open-lake placement areas are located to avoid any significant fish spawning areas. The fish community is generally adapted to natural levels of turbidity in the lake and open-lake placement of the dredged material would not significantly increase ambient turbidity levels over the long-term. Fishes may avoid or be attracted to open-lake placement events, or may not show any noticeable effect, and would return following the completion of dredging operations. The aquatic ecosystems at the open-lake placement areas are resilient. The periodic disturbance created by open-lake placement of dredged material is absorbed or accommodated by the ecosystem because its structure and function would not fundamentally change to a different state. Wildlife species (i.e., mostly gulls and waterfowl) would temporary avoid work areas and would return following the completion of dredging operations. No effects to any listed Threatened or Endangered species would occur.

1.8 Indirect Impacts

The potential impacts from open-lake placement of the dredged material to the quality of water at the Toledo and Oregon potable water intakes (PWIs) was investigated. Placement of the dredged material at the open-lake area would not result in a release of dissolved contaminants that would present any significant risk to human health based on National Primary Drinking Water Regulation Maximum Contaminant Levels (MCLs) and Drinking Water Standards for Ohio Public Water Systems. Additionally, predominant lake currents at the placement area direct total suspended solids (TSS) away from the PWIs during dredged material placement.

There has been public concern that the open-lake placement of dredged sediment causes or intensifies harmful algal blooms (HABs) in Lake Erie. To address this concern, USACE sought an externally conducted study in 2013 to answer the question: “What is the Potential for Placement of Toledo Harbor Dredged Material in the Western Lake Erie Basin to Influence Harmful Algal Blooms?” A coordinated field sampling, laboratory testing and modeling program was initiated to monitor physical, chemical, and biological parameters before, during, and after sediment placement and assess the relative influence of sediment placement activities as an internal source of solids/nutrients. Extensive water quality monitoring conducted throughout the 2013 dredging operation indicated that the bulk of the placed sediment (and associated phosphorus content) immediately deposits on the lake bottom, with minimal interaction with the water column. Immediately after placement, only approximately 2.5 percent of the total amount of sediment placed remains in the water column as suspended solids. This small fraction of sediment and associated phosphorus that is released to the water column undergoes exponential decline within the placement area, returning to near background levels within an hour through settling and dispersion. Assessed across the entire dredging season, open-lake placement contributions of total phosphorus and soluble reactive phosphorus represented only a fraction of one percent of the total annual phosphorus loading to western Lake Erie in 2013. These releases are insufficient to stimulate any additional significant growth of algae or significantly impact water quality in the Basin. Once deposited to the lake bottom, phosphorus release from the placed sediment is the same or less than the surrounding lake sediments and would not represent any additional contribution to the aquatic ecosystem.

Additionally, sediment from the placement area resuspend at the same rate as other areas of similar depth in the Basin. As the deposited sediment does not erode at a high or accelerated rate, sediment has accumulated within the placement area as a mound over several years of placement activities. The size of this mound is controlled primarily by consolidation of the placed sediment and underlying lake bottom. The overall conclusion of the 2013 study is that the open-lake placement of dredged sediment from Toledo Harbor does not contribute to the development of HABs in the Basin.

1.9 Construction Storm Water Management Plans

N/A

1.10 Post-Construction Storm Water Management Plans

N/A