Ongoing Screening Summary Report
2014 Inspection Year

Illicit Discharge Detection and Elimination Program

City of Oshkosh

February 23, 2015

OMNNI Project No. N2029C14

ENGINEERING • ARCHITECTURE • ENVIRONMENTAL

OMNNI ASSOCIATES

Illicit Discharge Detection and Elimination

Conducted For

City of Oshkosh

Ongoing Screening Summary Report

2014 Inspection Year

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EXECUTIVE SUMMARY

During the summer of 2014, OMNNI Associates, Inc. (OMNNI) assisted the City of Oshkosh with inspecting the outfalls in the City's municipal separate storm sewer system (MS4) for potential illicit discharges. Following the Illicit Discharge Ongoing Inspection Program that was developed in 2009, OMNNI inspected 42 of the approximately 362 MS4 outfalls identified in the City. The screened outfalls were selected based on evidence of potential illicit discharges in previous screening years. The inspections consisted of a visual screening along with a chemical analysis of any dry-weather flow that was present. The inspections revealed 17 outfalls with evidence of potential illicit discharges.

The 2013 inspection year completed the first four-year cycle that was outlined in the original 2009 Ongoing Screening Program. The 2014 inspection year was used to conduct an additional screening of the outfalls that showed evidence of potential illicit discharges in the previous screening years, to determine if the discharge had been remedied. The City will review and update the Ongoing Screening Program to include the Priority Outfall concept recommended by the Wisconsin Department of Natural Resources (WDNR) in the March 15, 2012 IDDE guidance document. After the updated plan is implemented, annual outfall screenings will resume according to the revised schedule.

BACKGROUND

Purpose

Under Section 2.3.2 of the Wisconsin Pollutant Discharge Elimination System (WPDES) Permit No WI-S050075-2 ("permit"), the City of Oshkosh is required to conduct ongoing dry weather field screening of all outfalls during the term of the permit to detect potential illicit discharges.

Under the MS4 permit, an outfall is defined as "the point at which storm water is discharged to waters of the state or leaves one municipality and enters another." The MS4 is defined as "a conveyance or system of conveyances including roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, constructed channels or storm drains, which meets all of the following criteria:

1. Owned or operated by a municipality.
2. Designed or used for collecting or conveying storm water.
3. Which is not a combined sewer conveying both sanitary and storm water."

When applied to the City of Oshkosh, the MS4 permit requires ongoing screening of the road ditch or storm sewer outfalls where the outfalls discharge to a water of the state (i.e., a navigable or non-navigable stream, lake, or wetland) or where they discharge into an adjacent municipality or to a county or state highway right-of-way.

OMNNI assisted the City of Oshkosh with developing a four-year ongoing screening program in 2009, and completed the ongoing screening program for the first set of outfalls in 2010. The first four-year inspection cycle was completed in 2013. The 2014 screenings were conducted with the purpose of determining if suspected illicit discharges from previous years were ongoing. The City may need to include these results in the annual report required by the MS4 permit due March 31, 2015.

Outfall Identification and Mapping

In 2009, the City of Oshkosh identified major and minor outfalls within the city as part of the MS4 mapping process required by the permit. Outfalls were identified at the locations where the City's MS4 discharged to a water of the state, to an adjacent municipality, or outside the permitted area. Approximately 348 potential outfalls were identified during this process in 2009. (The number has changed since then, due to construction of stormwater detention basins, reconfiguration of the City's storm sewer system, and reevaluation of existing outfalls.)

Topographic information was also used to define approximate drainage basins for each outfall. Based on this information, each outfall was classified as "major" or "minor." A "major outfall," as defined by the MS4 permit, is an MS4 outfall that meets one of the following criteria:

1. A single pipe with an inside diameter of 36 inches or more or equivalent conveyance (cross sectional area of 1,018 square inches) which is associated with a drainage area of more than 50 acres.
2. A municipal separate storm sewer system that receives storm water runoff from lands zoned for industrial activity that is associated with a drainage area of more than 2 acres or from other lands with 2 or more acres of industrial activity, but not land zoned for industrial activity that does not have any industrial activity present.

Outfalls not meeting the definition of a major outfall are considered "minor outfalls." OMNNI has also worked with the WDNR to develop a third class of outfalls – "supplemental" outfalls. Supplemental outfalls are storm sewer outfalls which may not meet the definition of an outfall according to the MS4 general permit, but should be included in an ongoing field screening program. The majority of the supplemental outfalls are detention basin inlets, which do not discharge directly to a water of the state, and therefore are not technically outfalls. However, sampling the detention basin inlets is an important component of the overall screening process, as illicit discharges are more likely to be discovered at the detention basin inlets rather than at the detention basin outfall.

When necessary, field verification was used to determine outfall sizes or drainage patterns. The current outfall map includes 100 major outfalls, 230 minor outfalls, and 32 "supplemental" outfalls. These numbers are updated each year as outfalls are located during the ongoing field screening program and modifications are made to the MS4. A map showing the MS4 outfalls is included in Appendix A.

Initial Screening Program

Per Section 2.3.2 of the MS4 general permit, the City was required to conduct an initial field screening at all major outfalls during dry weather periods. This initial field screening was required to be conducted within 36 months of the date that the permit was issued. The minor and supplemental outfalls should be included in the ongoing field screening to be conducted in future years.

OMNNI conducted the initial field screening for the City of Oshkosh during the summer of 2009. During the initial field screening, 109 major outfalls throughout the City were inspected. (There has been a net decrease of nine major outfalls since the initial field screening due to changes in the storm sewer system and field confirmation of measurements.) The initial field screening revealed 24 major outfalls that showed evidence of a potential illicit discharge. The results of the initial field screening were presented to the City in the ***City of Oshkosh Initial Field Screening Summary Report*** (May 18, 2010).

Development of Ongoing Screening Program

Section 2.3.3 of the MS4 permit requires municipalities to develop an ongoing screening program and submit it to the WDNR within 36 months of the date that the permit was issued. The ongoing screening program was to include provisions to include all outfalls (major, minor and supplemental) at least once during the 5-year permit cycle. In developing the program, consideration was to be given to the hydrological conditions, total drainage area, population density, traffic density, age of the structures or buildings in the area, history of the area, and land use types.

Based on the MS4 permit requirements and other information obtained from WDNR, OMNNI developed a proposed ongoing screening program for the City of Oshkosh. The permitted area was divided into four inspection districts, each with approximately the same number of outfalls. One district would be inspected each year, resulting in a four-year inspection cycle. At the end of the first inspection cycle, the inspection results were to be evaluated to determine if the inspection cycle for each outfall should be adjusted.

The proposed ongoing screening program was presented to the City in the ***City of Oshkosh IDDE Ongoing Field Screening Program*** (May 19, 2010). OMNNI conducted the first round of ongoing screening inspections during the summer of 2010. The first four-year inspection cycle was completed in 2013. Outfalls that had potential illicit discharges identified during the 2010-2013 inspection years were screened during the 2014 ongoing screening program. The outfalls that were included in the 2014 screening program are shown in Appendix A.

Screening Methodology

OMNNI's outfall screening methodology loosely follows the procedures outlined in ***Illicit Discharge Detection and Elimination: A Guidance Manual for Program Development and Technical Assessments*** (Center for Watershed Protection / Robert Pitt, October 2004). The procedures were modified to comply with the MS4 permit requirements, and have evolved after several years of experience and discussions with the WDNR.

Outfalls that have been previously inspected are located with the assistance of GPS. For outfalls that have not been previously inspected, the available MS4 mapping is used to physically locate the outfall, and then the GPS location is recorded to assist with future inspections. The physical properties of the outfall are then recorded – type of outfall, dimensions, material, and discharge location. A photograph of the outfall is taken to show the general location and configuration.

After the physical properties have been recorded, the outfall and surrounding area are screened for indicators of current or past illicit discharges. Sample indicator parameters include floatable material, gross solids, odors, stains, color of water, turbidity, abnormal vegetation and benthic growth. If any of these physical indicators are observed, they are further described and quantified. A close-up photograph is taken of the actual discharge of the outfall, showing any indicator parameters or flow from the outfall. A short video of the flow is also taken to document the magnitude of the flow or the lack of flow at the time of inspection.

The MS4 permit specifies that the outfalls be screened during periods of dry weather. Outfall inspections are typically conducted in the summer months to avoid the effects of snowmelt runoff in the storm sewer system. OMNNI generally waits for a minimum of 72 hours following a runoff-producing rainfall event to conduct the outfall screening. This typically allows sufficient time for the stormwater to discharge through the drainage area and outfall. If, after 72 hours, the outfall still has flow, a sample is collected and screened for chemical indicators of an illicit discharge. While the actual list of chemical parameters is specific to each outfall, most flowing outfalls are screened for the following parameters:

- **pH**
- **Chlorine** (total chlorine and free chlorine)
- **Copper**
- **Detergents**
- **Phenols** (for outfalls in basins with industrial sources)
- Ammonia
- Temperature
- Conductivity

The list of chemical parameters was developed using the parameters that were required for the initial field screening in the MS4 permit (listed in bold), and supplemented with additional parameters that are useful for tracking illicit discharges.

In some cases, outfalls can be either partially or fully submerged. A partially submerged outfall is an outfall where the elevation of the invert is below the water level of the receiving water. A fully submerged outfall is a pipe that is entirely below the water surface. In either condition, the receiving water is “backed up” into the discharging pipe or channel, and is not free-flowing. Under these conditions, if a sample is collected at the outfall point, the sample could consist almost entirely of the receiving water.

In the case of partially or fully submerged outfalls, OMNNI developed a sampling procedure that was approved by WDNR. The submerged outfall is screened for physical indicators. However, the flow sample is collected from the first access point (i.e., manhole, catchbasin, curb inlet) upstream of the outfall. This reduces the influence of the receiving water. Typically, if there is no flow or pooled water at the upstream location, then no sample is collected. For all upstream sampling, a note is made of the distance and land use of the area between the outfall and the upstream area to assess the potential for illicit connections between the outfall and the upstream location.

In the event that the physical or chemical indicators show that there is a potential ongoing illicit discharge, the Illicit Discharge Coordinator of the municipality is contacted. If requested, OMNNI then assists the municipality with attempting to identify the source of the discharge, usually by inspecting and/or sampling additional upstream points to attempt to isolate a particular branch of the MS4 network.

While not explicitly required by the MS4 permit, OMNNI also conducts a physical condition assessment for each outfall. The inspector identifies any graffiti, damage, erosion or deposition present at the outfall and assigns a severity. This information is provided to the municipality to assist with maintenance activities.

A detailed outfall report is generated for each outfall that is inspected. The outfall report includes the general outfall information that was collected, along with detailed inspection results for each inspection conducted at the outfall. This provides a comprehensive history of the inspection results for the outfall as multiple inspections are performed over the life of the outfall.

Detailed inspection reports for each outfall are included in Appendix B. Some general observations from the field screening are noted in the following sections.

RAINFALL AND FLOW

Rainfall

Weather data was obtained from the Weather Underground website. Personal weather station KWIOSHKO16 (“Scott54902Wx”) is located on W 6th Avenue between Sawyer Street and Knapp Street in the City of Oshkosh. The conditions at this weather station were considered representative of the weather in the City of Oshkosh for the 2014 inspection area. The location of the weather station is shown in Figure 1.

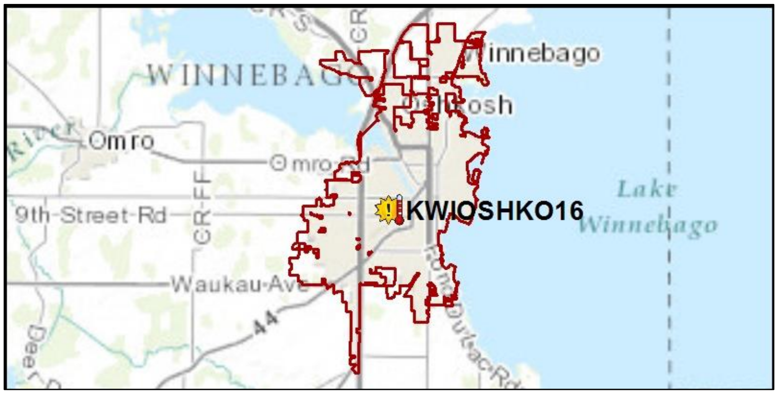


Figure 1 – Location of weather station for weather history

The weather history from August 1 through October 15, 2014 from this weather station is shown in Figure 2.

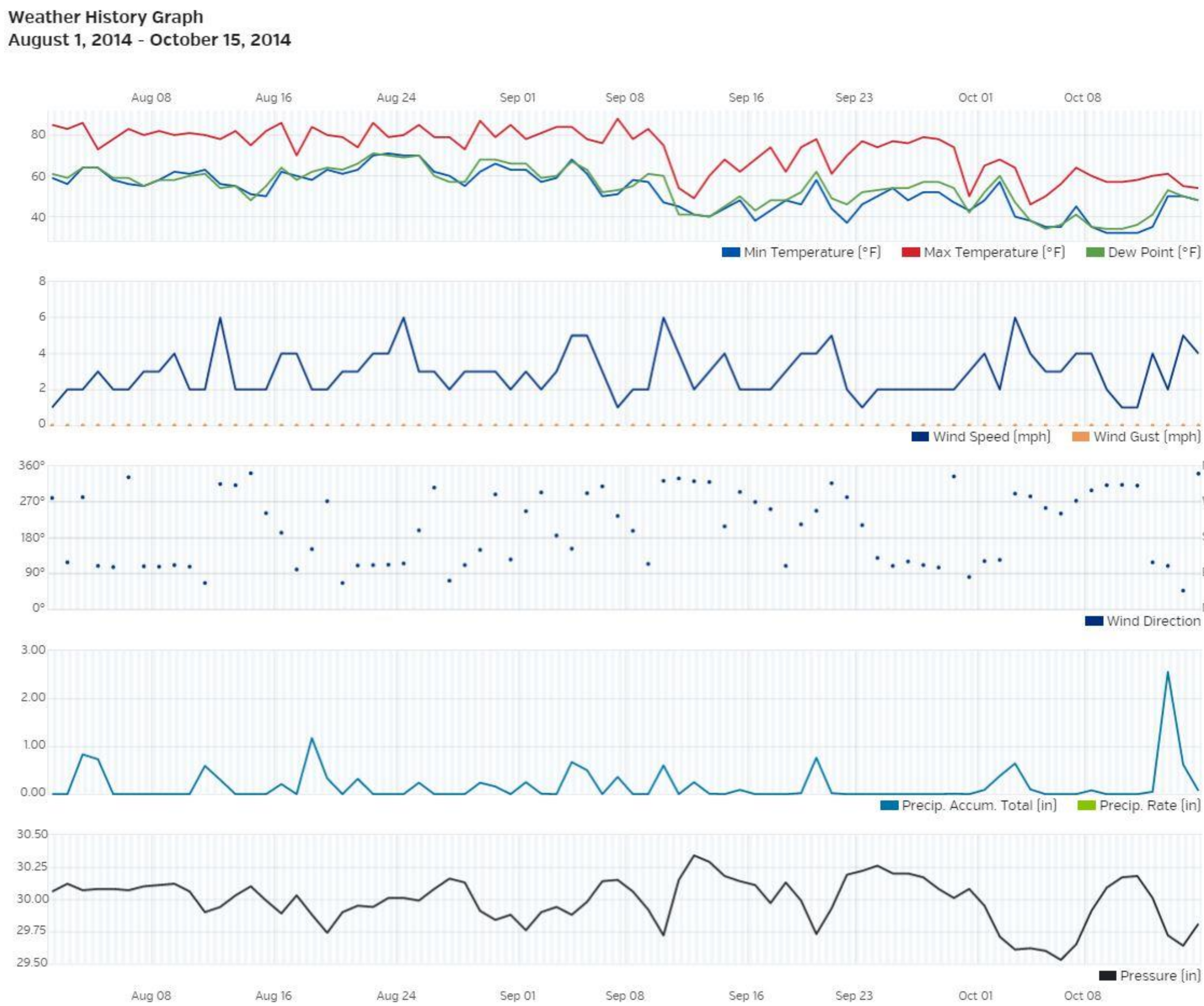


Figure 2 – Summer 2014 weather history (Weather Underground)

Outfall inspections were conducted in the City of Oshkosh on October 7 and 9, 2014. Those inspection dates (red), along with the daily rainfall history (blue), are shown in Figure 3.

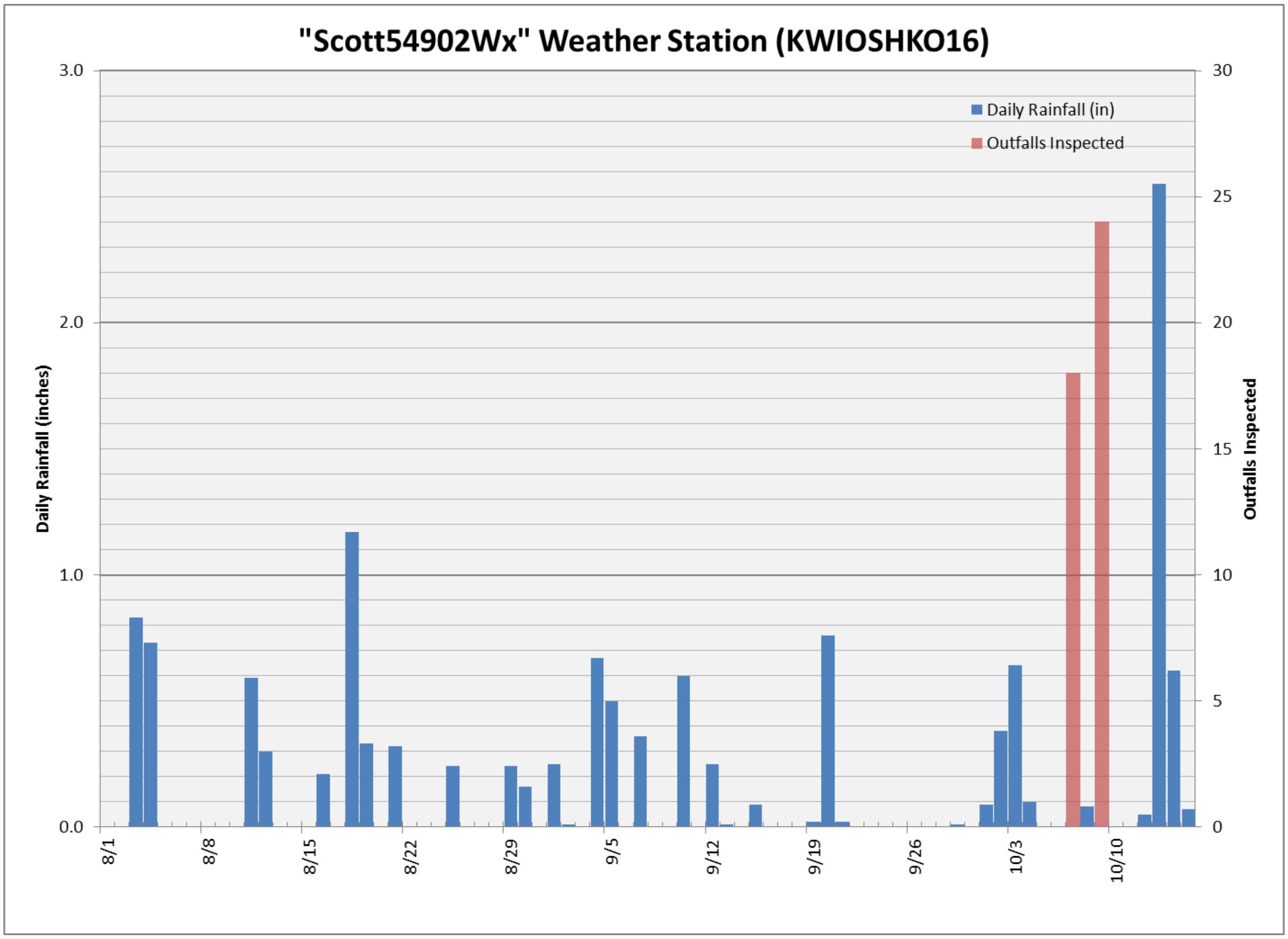


Figure 3 – Rainfall history and outfall inspections

Flow

To meet the requirement of dry weather screening, outfalls were typically screened at least 72 hours after the previous runoff-producing rainfall event. Because the outfalls that were screened in 2014 were primarily submerged outfalls, no flow was observed at any of the outfalls.

Submerged outfalls, along with the observed flow patterns, are described in the next section.

The distribution of the flow intensity of the outfalls is shown in Figure 4.

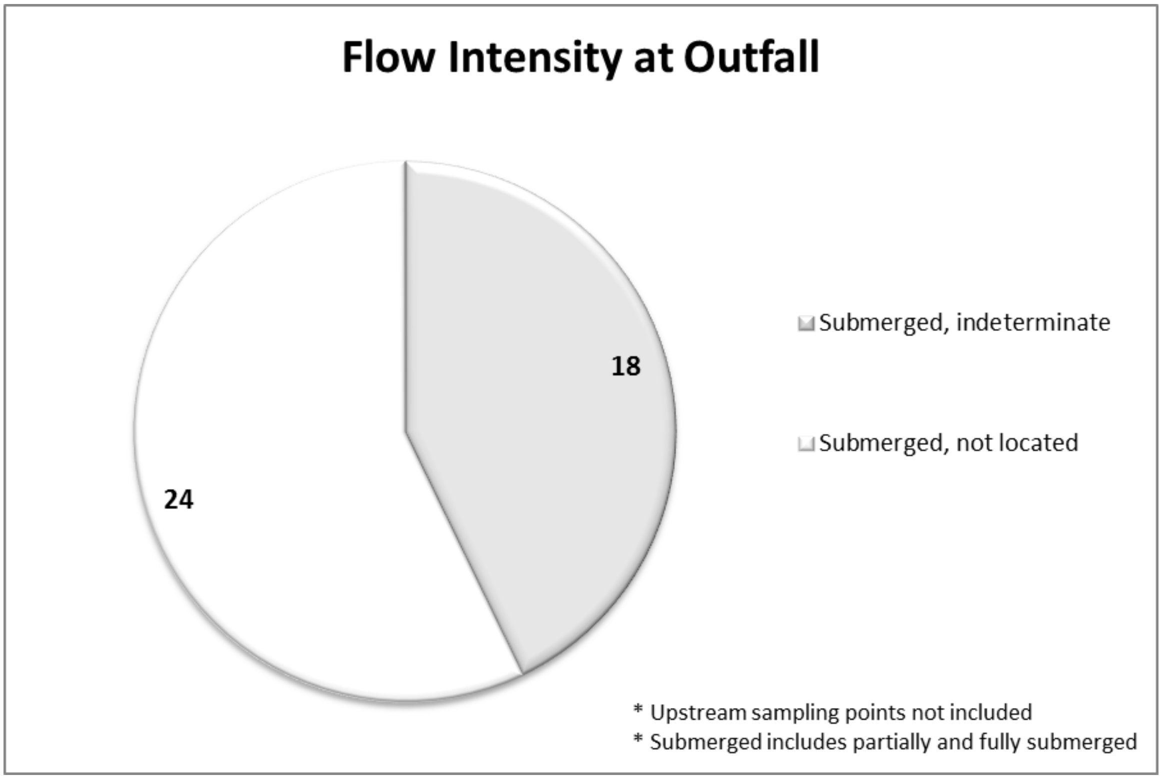


Figure 4 – Flow intensity at outfall

If dry weather flow was found during the field screening, a sample was collected and analyzed for the presence of indicator parameters. The analysis conducted is discussed in a later section.

Not all flow is an indicator of an illicit discharge. Following a significant rainfall event, surface water and groundwater elevations can be higher than normal. Much of the observed flow may originate from sump pump discharges, detention basin discharges, permitted discharges, and infiltration into the storm sewer system.

Submerged Outfalls

Most of the outfalls in the City were located at or below the normal levels of their respective receiving waters. Of the 42 inspected outfalls, 12 were partially submerged, and 30 were fully submerged (Figure 5). Of the 30 fully submerged outfalls, 24 could not be physically located.

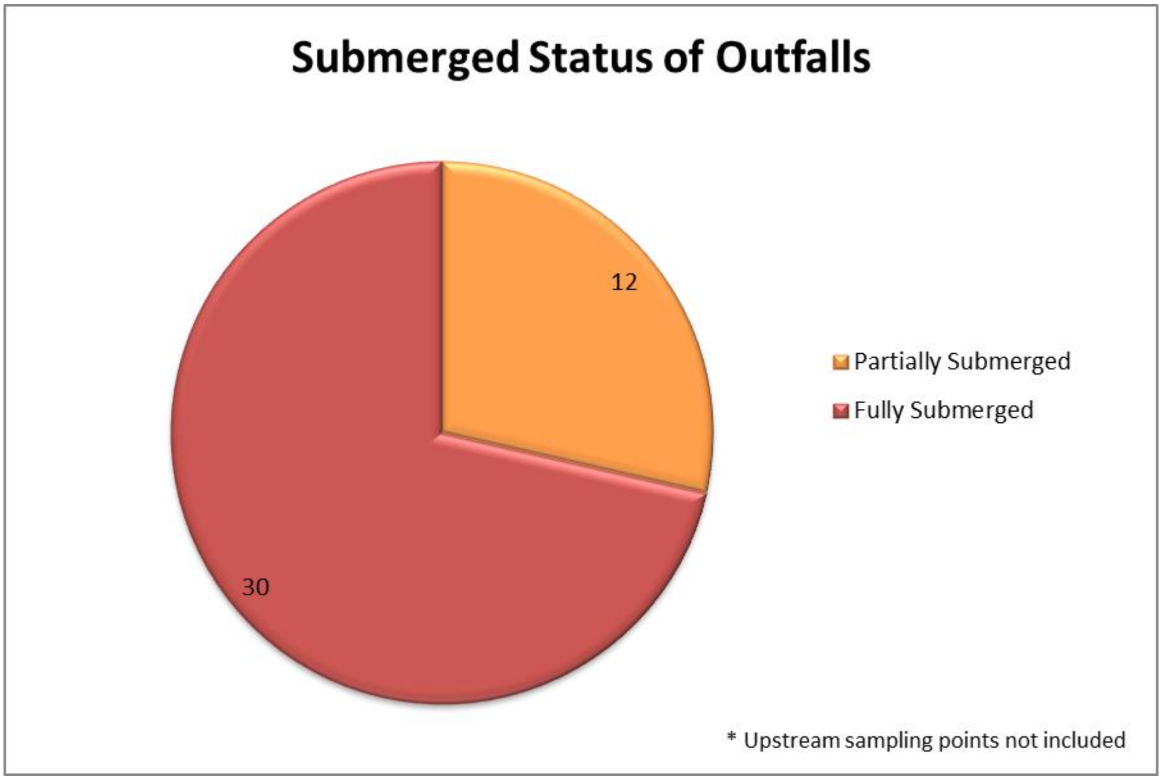


Figure 5 – Submerged status of outfalls

Submerged outfalls were screened at a representative upstream location (i.e., first upstream manhole), if one was available. If flow or a submerged pool was present in the upstream location, a sample was collected. If a representative upstream location was not available, a sample was collected from the submerged pool at the outfall.

PHYSICAL INDICATOR ASSESSMENT

All outfalls, regardless of whether they exhibited dry-weather flow at the time of inspection, underwent an extensive assessment for physical indicators of past or current illicit discharges. The physical indicators are grouped into eight categories, and each category is assigned a severity rating based on the observed conditions, along with a qualitative description, if applicable. The eight categories of physical indicators are described below.

Floatables

Floatables include petroleum sheens, suds, algae, and evidence of raw sewage. These conditions would typically be observed in an area of stagnant water, such as a downstream pool or an upstream manhole, although some may be observed in the actual flow. Some conditions (petroleum sheens and sewage) are almost always the result of an illicit discharge. Other floatables, like suds and algae, can have non-illicit sources, but their presence can also indicate the potential for an illicit discharge, and the source should be traced.

Vegetative debris and solid waste (litter) can also float, but these substances are included in the *Gross Solids* category, and are not considered floatables.

A *slight* severity for floatables indicates isolated occurrences of the substance in the pool or flow. A *moderate* severity indicates a broader coverage, including distinct pockets of the substance. A *severe* classification typically describes total coverage of the water surface.

Odor

Clean stormwater should have no odor. Odors may be caused by the presence of chemicals, which can indicate a potential illicit discharge. The classification of odor is somewhat subjective, and may vary depending on the inspector. Some of the odor classifications are chemical-based, and include petroleum, VOC/solvent, chlorine, and sulfur. Other odor classifications are even more subjective, and include musty, fishy, sewage, and fragrant.

Odor can be difficult to quantify. As a result, the severity is based on the method that it can be detected. A *slight* severity for odor indicates that the odor can be detected in the sample bottle. A *moderate* severity indicates that the odor can be detected in the flow itself. A *severe* classification indicates that the odor can be detected from a distance.

Turbidity

Turbidity is a measure of the clarity of a water sample, reflecting the amount of suspended solids present in the water. As turbidity increases, the water becomes cloudy and eventually opaque. Turbidity has a negative impact on aquatic life, as it prevents sunlight from penetrating the water.

Turbidity is frequently caused by soil erosion that occurs upstream of the outfall. The soil erosion can be accelerated by poor erosion control management practices. Active construction sites and highly eroded areas are common sources of turbidity.

While turbidity can be measured directly using an instrument like a turbidimeter, the relative turbidity of each outfall sample was assessed qualitatively. A *slight* severity for turbidity indicates that the sample appeared slightly cloudy in the sample bottle. A *moderate* severity indicates that the sample exhibits significant cloudiness. A *severe* classification was used for a sample that was opaque in the sample bottle.

Color

Stormwater typically should be clear, with no apparent color. Certain tints and colors can indicate the presence of substances that could be a potential illicit discharge. Some tints can be caused by natural substances, such as tannins in leaves and vegetative debris causing a slight brown tint. High concentrations of suspended solids can cause orange tints (clay), brown tints (loam) or gray-black tints (organic materials). Certain colors (i.e., red, blue and green) are almost never naturally-occurring, and likely indicate an illicit discharge.

Color is most easily assessed in the sample bottle. The sample bottle can be compared to a bottle of deionized water as a standard. The general color of the sample is noted, along with the relative severity. A *slight* severity for color indicates that the color is faint in the sample bottle. A *moderate* severity indicates that the color is easily detected in the sample bottle. A *severe* classification indicates that the color can be observed in the actual flow or pool, outside of the sample bottle.

Vegetation

The health of the vegetation in the area surrounding the outfall can be an indicator of potential illicit discharges from the outfall. Various chemicals in an illicit discharge can inhibit or kill the vegetation in the areas surrounding the outfall. Discharges with high nutrient levels – particularly fertilizer runoff – can significantly increase the amount of vegetation around the outfall.

Because outfalls provide a water source, the vegetation around outfalls is typically more productive than areas farther from the outfall, particularly during dry periods. It is important to distinguish between increased vegetation due to available water and excessive vegetation due to nutrients in the runoff. True vegetation impacts due to chemicals or nutrients appear to be rare compared to other physical indicator parameters.

The “vegetation” indicator parameter does not apply to vegetation growing inside the outfall pipe or on the pipe apron. This condition is evaluated under the “benthic growth” parameter.

Vegetation effects were classified as either “inhibited” or “excessive.” The severity was subjectively assigned based on the extent of the vegetation impact that was observed, ranging from *slight* to *severe*.

Benthic Growth

Due to the presence of nutrients, organic materials and moisture, outfall pipes and aprons can commonly host vegetation that grows on the sides and bottoms of the structures. This is particularly common in concrete pipes, which are more porous, but can occur on nearly all pipe materials. The vegetation encountered is typically algae, moss and lichens.

Some degree of benthic growth is present on nearly all storm sewer outfall pipes, and appears to increase with age. The presence of benthic growth alone is not typically a reason to classify an outfall as a potential illicit discharge. However, severe cases of benthic growth, especially when combined with other indicators, can be used to classify and trace illicit discharges.

The color of the benthic growth is noted on the inspection report. Green benthic growth is most common in outfalls with sunlight. Brown benthic growth is more common in outfalls with limited sunlight. Other colors, such as orange, can sometimes be present.

The severity of the benthic growth is determined by a subjective analysis of the thickness of the vegetation. A *slight* severity for benthic growth indicates a thin layer, usually a film or the dried stains of former growth. A *moderate* severity is used when an actual depth of vegetation can be observed, typically up to one-half inch deep. A *severe* classification is used when the vegetation changes from a short, “fuzzy” layer to longer, more defined plants with stems and leaves.

Stains

Stains inside pipes, aprons, riprap and channels can be good indicators of past illicit discharges. Clean stormwater typically would not cause stains. However, some non-illicit discharges can cause stains, including tannins from vegetation (brown), road salt (white), minerals (various colors) and suspended solids (gray or brown). Most storm sewer pipes will have some degree of staining due to natural causes, and the stains tend to increase with the age of the structure. These stains are typically found at either the normal or the high flowline for the pipe.

Abnormal stains are typically indicators of past illicit discharges. Common types of stains in this category include oil and grease, paint, concrete washout, and iron discharges (rust). It is important to distinguish between actual iron discharges and normal pipe corrosion, which can occur in metal pipes, and is not an illicit discharge. Corrosion typically occurs along the invert of the pipe, where water may collect and corrode the pipe. Rust stains are typically darker streaks, often originating from a lateral or other incoming pipe.

Stains are useful indicators, since they tend to be persistent, and can often be used to trace the flow path upstream to a source, even after the original illicit discharge has ended. By screening outfalls on a regular basis and documenting the stains with photographs, it is possible to compare the severity of the stains to determine if a discharge is ongoing.

Stains are classified according to the type of stain present (i.e., oil, paint, rust, etc.), as well as their relative severity. The severity is subjectively assigned based on the extent of the staining that was observed, ranging from *slight* to *severe*. Because of the subjective nature of this rating, photographs are extremely helpful for documentation.

Gross Solids

The *Center for Watershed Protection* adopted the concept of Gross Solids in regards to illicit discharge detections. Gross solids are materials that are larger than fine solids (silt and clay) and coarse solids (fine sand, fine gravel, and detritus). Gross solids consist primarily of *litter* (human derived trash larger than 4.75 mm), *organic debris* (leaves, branches, seeds, twigs and grass clippings larger than 4.75 mm), and *coarse sediments* (inorganic breakdown products from soils, pavement or building materials greater than 0.075 mm).

The type of gross solid most frequently encountered during outfall inspections appears to be litter (garbage). These materials typically enter the storm sewer from an upstream catchbasin or inlet. Paper, plastic and foam are frequently encountered in manholes, where they can become trapped as they float on the surface. These materials can also travel down storm sewer pipes and swales, ultimately discharging at the outfall.

Vegetative debris, including leaves and grass clippings, can also enter the storm sewer through catchbasins and inlets and travel to the outfall. As with litter, an attempt is made to determine if the vegetative debris traveled through the storm sewer or was deposited at the outfall in another manner.

Coarse sediment is encountered less frequently than litter and vegetative debris. Most of the sediment encountered during outfall inspections is fine sediment that travels through the storm sewer and is deposited at the outfall. This sediment is included in the "Deposition" category of the Physical Condition Assessment on the report, and the sediment depth is recorded. Sediment is typically only considered a Gross Solid physical indicator parameter if it appears that the sediment was illicitly dumped into the storm sewer through a catchbasin, inlet or manhole.

Gross solid severity is similar to the method used for floatables. A *slight* severity for gross solids indicates isolated occurrences of the substance in the pool or flow. A *moderate* severity indicates a broader coverage, including distinct pockets of the substance. A *severe* classification typically describes total coverage of the water surface or manhole.

Observed Conditions

The presence of any physical indicators in the pipe or channel, flow, downstream pool, and surrounding area were recorded at the time of the inspection. Certain physical indicators, such as color and turbidity, can only be evaluated if flow or downstream pools are present. (Because the inspection criteria for physical indicator parameters have evolved over the past several years, some of the parameters included in the current year's inspections may not have been evaluated in previous years, and those parameters may appear as blank or missing data on earlier reports.)

The presence of one or more physical indicator parameters does not necessarily indicate that an illicit discharge is occurring or has occurred in the past. Certain physical indicators, such as the presence of solid waste or oil sheens in the flow, strongly suggest an illicit discharge has recently occurred. Other indicators, such as staining of the pipe or channel, may indicate that an illicit discharge occurred in the past, although the exact time is not known. Still other physical indicators may have natural or non-illicit causes, and the presence of these parameters alone should not be the grounds for assuming an illicit discharge.

Physical indicators can also be valuable aids when tracing a suspected illicit discharge upstream to the source. Certain physical indicators – pipe and channel stains in particular – are persistent and can be used to trace the flow well after the actual flow has stopped.

The physical indicators observed during the outfall inspections are summarized in Figure 6.

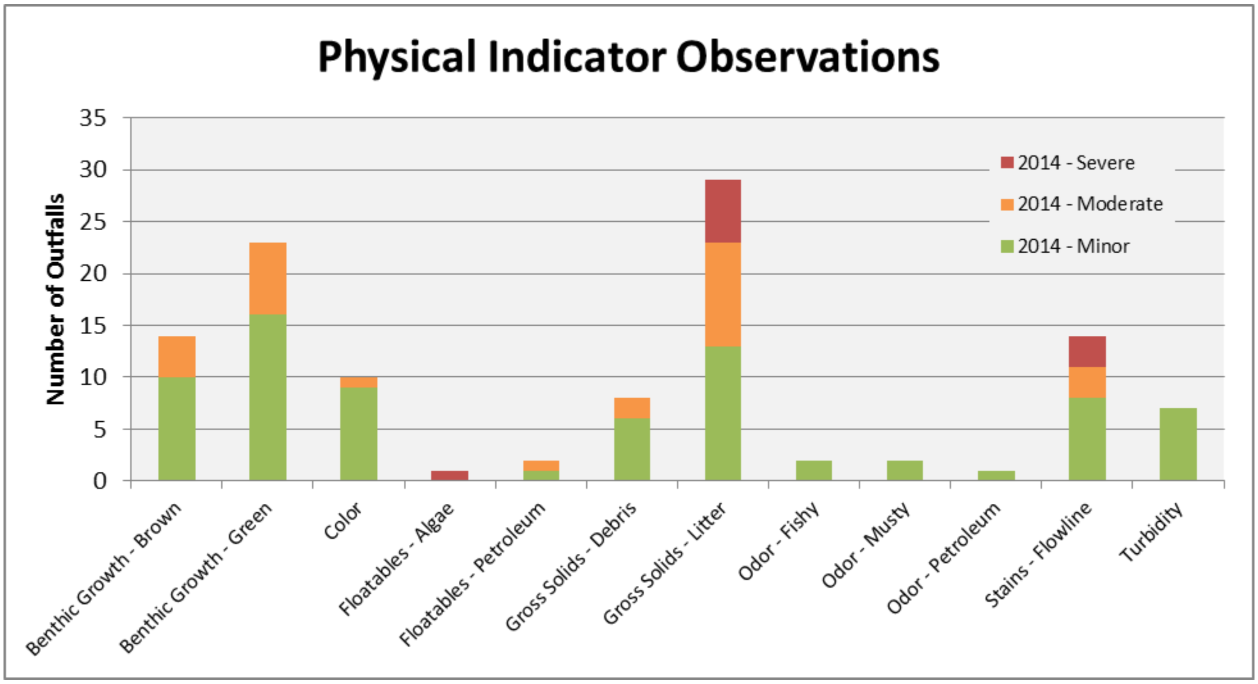


Figure 6 – Physical indicator observations

Benthic growth (green and/or brown) and flowline stains were prevalent at many of the outfalls. These conditions are fairly common, and are not typically considered strong indicators of recurring illicit discharges unless they are particularly severe, or occur in conjunction with other indicators.

In 2014, 14 outfalls were classified as potential illicit discharge because of the presence of gross solids in their upstream manholes. One outfall (03-81) was classified as an obvious illicit discharge because of the observed petroleum sheen and odor. These outfalls are discussed in more detail in the *Potential Illicit Discharges* section of this report. No other outfalls were classified as potential illicit discharge solely due to physical indicators.

CHEMICAL ANALYSIS

When dry-weather flow is present at an outfall or upstream manhole, chemical indicator parameters can provide valuable information about whether the flow is an illicit discharge, as well as providing clues about the potential sources of the flow. Section 2.3.2.2 of the general permit requires that outfalls with dry-weather flow be sampled for pH, total chlorine, total copper, total phenol and detergents for the initial screening of major outfalls, unless detergent, ammonia, potassium and fluoride were used as alternate parameters.

Under section 2.3.3, the ongoing screening of all outfalls could be modified to include other parameters. For the ongoing screening program, OMNNI tested for the following chemical indicators:

- pH
- Temperature
- Conductivity
- Chlorine (total and free)
- Copper
- Ammonia
- Detergents
- Phenols (for drainage basins with industrial areas)

Flow samples were collected at all outfalls that exhibited dry-weather flow at the time of the inspection. For partially-submerged or fully-submerged outfalls, a sample was collected from the flow or submerged pool at the first upstream sampling location, or from the outfall pool if an upstream location was not available. A total of 39 stormwater samples were collected and analyzed as part of the ongoing screening process in 2014 – none were from flow streams, and all were from pools. Depending on the specific conditions for the outfall, not all tests were run for all samples.

The indicator parameters, testing methods, and results are explained in the sections that follow.

pH

Background

The pH of a stormwater sample can be used to detect the presence of illicit substances in the flow. Neutral water has a pH of 7.0. However, unpolluted rainwater commonly has a pH of 5.0 to 6.0, due to the conversion of carbon dioxide in the atmosphere to carbonic acid. The presence of pollutants in the atmosphere can cause the formation of additional hydrochloric and/or nitric acid in the rainwater, which will further lower pH. The pH of the runoff is typically raised as it reacts with carbonates and other alkaline materials in the rocks and soil. Contact with concrete pipes and channels also raises the pH of the runoff.

The typical pH range for stormwater runoff is from 6.0 to 9.0. Samples with a pH lower than 6.0 or higher than 9.0 would be suspect for illicit discharges. Possible sources of high or low pH include industrial discharges and concrete truck washout.

Testing Method

During the ongoing screening program, OMNNI tested the pH of the outfall samples with an *Oakton PC-10* handheld pH/conductivity/temperature meter, which displays the pH reading to 0.01 pH units. The probe was periodically calibrated at 4.01, 7.00 and 10.01 pH values. The pH reading was taken in the sample bottle as soon as possible after the sample was collected from the outfall, as the pH of the sample can change over time.

Results

The pH results for the pH samples are shown in Figure 7.

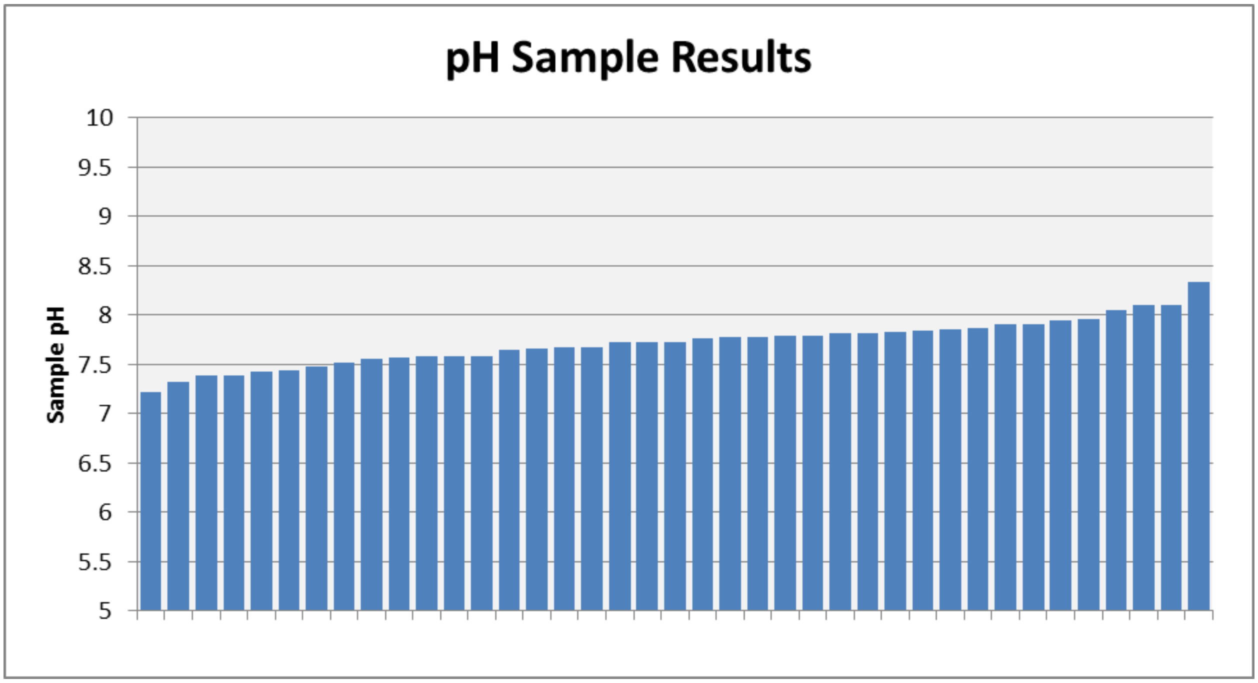


Figure 7 – pH sample results

The pH values ranged from 7.22 to 8.34. None of the samples were outside of the standard 6.0 to 9.0 pH range, so none of the samples were considered suspect due to pH.

Temperature

Background

While not included in the list of parameters required by the general permit, the temperature of a stormwater sample can be useful in determining if the flow is originating from an illicit source. Because most stormwater is conveyed in underground pipes, the temperature of the flow at the outfall is typically expected to be similar to the ground temperature which is often cooler than the ambient temperature in summer. However, stormwater that passes through open channels or ponds upstream of the outfall can be heated directly by the sun, and may be close to ambient temperature or even slightly warmer. Temperature is normally only a consideration when the runoff is significantly lower than the ground temperature or higher than the ambient temperature, which can indicate the presence of an industrial discharge. For example, cooling water or process water is typically significantly warmer than the ambient temperature.

Ground temperatures were typically 55 °F or warmer in summer. As a result, the “normal” temperature range was set at 55 °F to 90 °F. Any samples outside of this range could contain flow other than stormwater runoff.

Testing Method

During the ongoing screening program, OMNNI recorded the temperature of the outfall samples with an *Oakton PC-10* handheld pH/conductivity/temperature meter, which displays the temperature reading to 0.1 °C. The temperature reading was taken in the sample bottle at the same time the pH was tested, as soon as possible after the sample was collected from the outfall, as the temperature of the small volume of the sample container will rapidly change.

Results

The temperature results for the samples are shown in Figure 8.

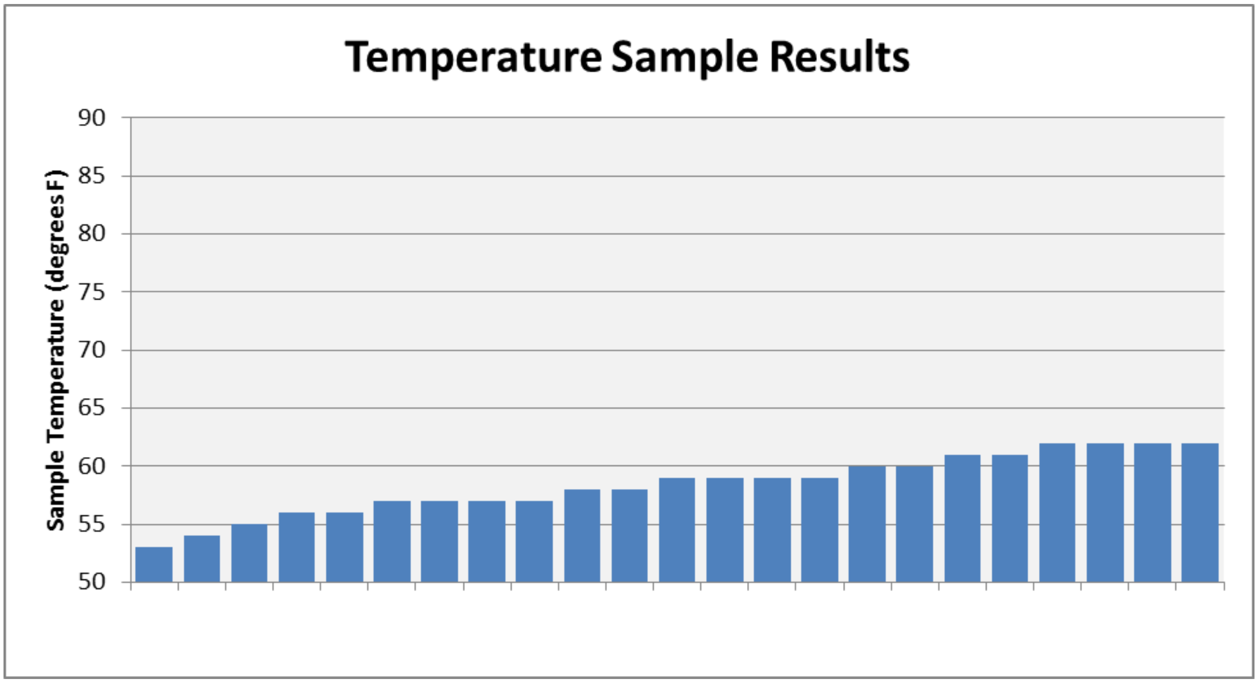


Figure 8 – Temperature sample results

The temperature values ranged from 53 to 62 °F. The samples with the highest temperatures were collected from locations that could be influenced by solar heating, so the upper values were not considered suspect. Due to a malfunction of the field testing equipment, 16 samples could not be analyzed for temperature. None of the samples exhibited abnormal temperatures, so none of the samples were considered suspect due to temperature.

Conductivity

Background

While not included in the list of parameters required by the general permit, the conductivity of a stormwater sample can be useful in determining if the flow is originating from an illicit source, and identifying potential sources of the discharge. Conductivity is a measure of the ability of water to pass an electrical current. The presence of inorganic dissolved solids (chloride, nitrate, sodium, calcium, iron, etc.) can increase the conductivity of a water sample. Organic compounds (oil, alcohol, sugar, etc.) are not good conductors, and therefore have relatively low conductivities.

Conductivity in surface water is influenced by the local geology. Streams that run through granite bedrock tend to have lower conductivity because granite is composed of more inert materials that do not ionize when washed into the water. However, streams that run through areas with clay soils tend to have higher conductivity because of the higher ionizing potential of clay. Sanitary sewage can raise the conductivity due to increased levels of chloride, phosphate and nitrate.

Conductivity is typically measured in siemens, with a typical unit of microsiemens per centimeter (µS/cm). Distilled water has a conductivity in the range of 0.5 to 3 µS/cm, while rivers typically have conductivities ranging from 50 to 1500 µS/cm. Conductivity readings above 2000 µS/cm can sometimes be associated with industrial discharges.[1]

Conductivity values under 2000 µS/cm would be considered to be normal. Samples with conductivities over 2000 µS/cm would be identified as suspicious, but the discharge would not be considered a potential illicit discharge unless other indicator parameters (physical or chemical) were observed.

Testing Method

During the ongoing screening program, OMNNI recorded the conductivity of the outfall samples with an *Oakton PC-10* handheld pH/conductivity/temperature meter, which displays the conductivity reading to 0.01 µS/cm. The conductivity reading was taken in the sample bottle as soon as possible after the sample was collected from the outfall, as the conductivity of the sample can change with temperature.

Results

The conductivity results for the samples are shown in Figure 9.

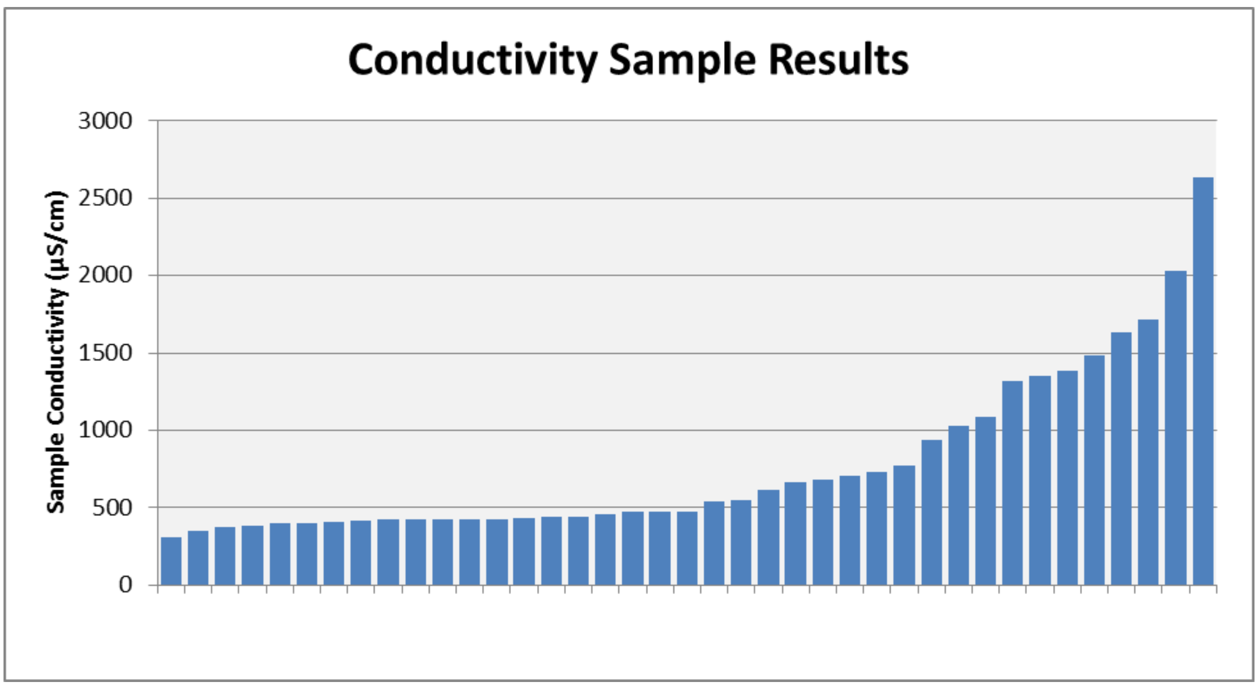


Figure 9 – Conductivity sample results

The conductivity values ranged from 310 to 2,360 µS/cm. Two samples exceeded the 2,000 µS/cm action limit. Based on other factors, those outfalls may or may not have been classified as

[1] USEPA: Water-Monitoring & Assessment – Conductivity (http://water.epa.gov/type/rsl/monitoring/vms59.cfm)

potential illicit discharges. The illicit discharge potential of the outfalls with elevated conductivities are summarized in Table 1.

Table 1 – IDDE potential of outfalls with elevated conductivities

Outfall	Conductivity (µS/cm)	IDDE Potential	Reason
15-1093 US1	2,030	Unlikely	No other significant chemical or physical indicators identified.
15-1095 US1	2,630	Unlikely	No other significant chemical or physical indicators identified.

The outfalls that were considered potential or obvious illicit discharges are discussed in more detail in the *Potential Illicit Discharges* section of this report.

Chlorine

Background

The presence of chlorine in a stormwater sample usually demonstrates the presence of substances other than stormwater runoff. Chlorine is typically an indicator of either potable water (from a chlorinated municipal water supply) or an industrial discharge. It can also be caused by leaking or draining swimming pools. However, chlorine can also be present in non-illicit discharges (as defined by the general permit and the City's illicit discharge ordinance), including residential car washing, lawn irrigation, hydrant flushing, water main breaks, and industrial discharges regulated under a WPDES permit. Therefore, the presence of chlorine in a sample indicates the presence of a non-stormwater source; however, the source should be identified to determine if it is an illicit discharge.

Dissolved chlorine is measured using three different values: free chlorine, combined chlorine, and total chlorine. Free chlorine represents the "unbound" chlorine molecules in solution, which are the most effective for disinfecting. Combined chlorine represents the chlorine molecules that are bound to other organic molecules, such as chloramines, which are also commonly used in drinking water disinfection. Total chlorine represents the sum of the free chlorine and the combined chlorine. The general permit requires sampling for total chlorine.

Action levels were established by OMNNI for most chemical indicators. A test result that exceeds the action level warrants follow-up investigation. In general the action level for total chlorine is set at 0 mg/L. Any detection of chlorine indicates the presence something other than stormwater in the sample. Depending on the source, it may or may not be an illicit discharge.

Testing Method

During the ongoing screening program, OMNNI tested the outfall samples for total chlorine and free chlorine using *Hach Free & Total Chlorine Test Strips, 0-10 mg/L*. These test strips had result steps of 0, 0.5, 1, 2, 4 and 10 mg/L. The chlorine tests were taken in the sample bottle as soon as possible after the sample was collected from the outfall, as chlorine can dissipate over time.

Results

None of the samples tested positive for free chlorine or total chlorine, so none of the samples were considered suspect due to chlorine.

Copper

Background

The presence of copper in stormwater runoff is usually due to discharge from industries that manufacture copper-based products or use copper-containing chemicals in their manufacturing process. In some cases, copper can leach from plumbing systems and enter the water. Copper concentrations as low as 0.1 mg/L can be toxic to aquatic vegetation and wildlife.

The general permit requires sampling for total copper. In general the action level for total copper is set at 0 mg/L. Any detection of copper indicates the presence something other than stormwater in the sample.

Testing Method

During the ongoing screening program, OMNNI tested the outfall samples for total copper using *Hach Copper Test Strips, 0-3 mg/L*. These test strips had result steps of 0, 0.2, 0.5, 1, and 3 ppm. The copper tests were taken in the sample bottle as soon as possible after the sample was collected from the outfall.

Results

None of the samples tested positive for total copper, so none of the samples were considered suspect due to copper.

Ammonia

Background

While not included on the list of required parameters in the general permit, ammonia is a valuable test parameter to identify potential illicit discharges. Besides being present in industrial discharges, ammonia can also be an indicator of wastewater or washwater discharges, which are often indicators of sanitary sewer cross-connections. When tested along with potassium, it is possible to use the ratio of ammonia to potassium to distinguish between wastewater and washwater. However, since both typically originate from sanitary sewer, this determination is not usually required to identify an illicit discharge.

It should be noted that there are also several natural sources of ammonia which do not constitute an illicit discharge. Waste from pets and wildlife can cause ammonia in the runoff, particularly if wildlife frequently inhabit the storm sewer pipes and manholes. Storm sewers connected to stagnant water or wetlands frequently have elevated ammonia levels due to microbial decay of plant and animal proteins. In addition, ammonia may be present in industrial discharges with a WPDES permit. Ammonia is also sometimes present in HVAC condensate, which is allowed to be discharged under the MS4 general permit.

Because of the natural sources of ammonia, the action level for ammonia detections was set at greater than 1 ppm. Samples with ammonia concentrations of 1 ppm or lower were not investigated unless additional chemical or physical indicator parameters were present.

Testing Method

During the ongoing screening program, OMNNI tested the outfall samples for ammonia using *Hach Ammonia (Nitrogen) Test Strips, 0-6.0 ppm*. These test strips had result steps of 0, 0.25, 0.5, 1, 3, and 6 ppm NH_3-N. The ammonia tests were conducted in a separate vial of stormwater taken from the sample bottle as soon as possible after the sample was collected from the outfall, as the ammonia concentration can dissipate over time.

Results

The ammonia results for the samples are shown in Figure 10.

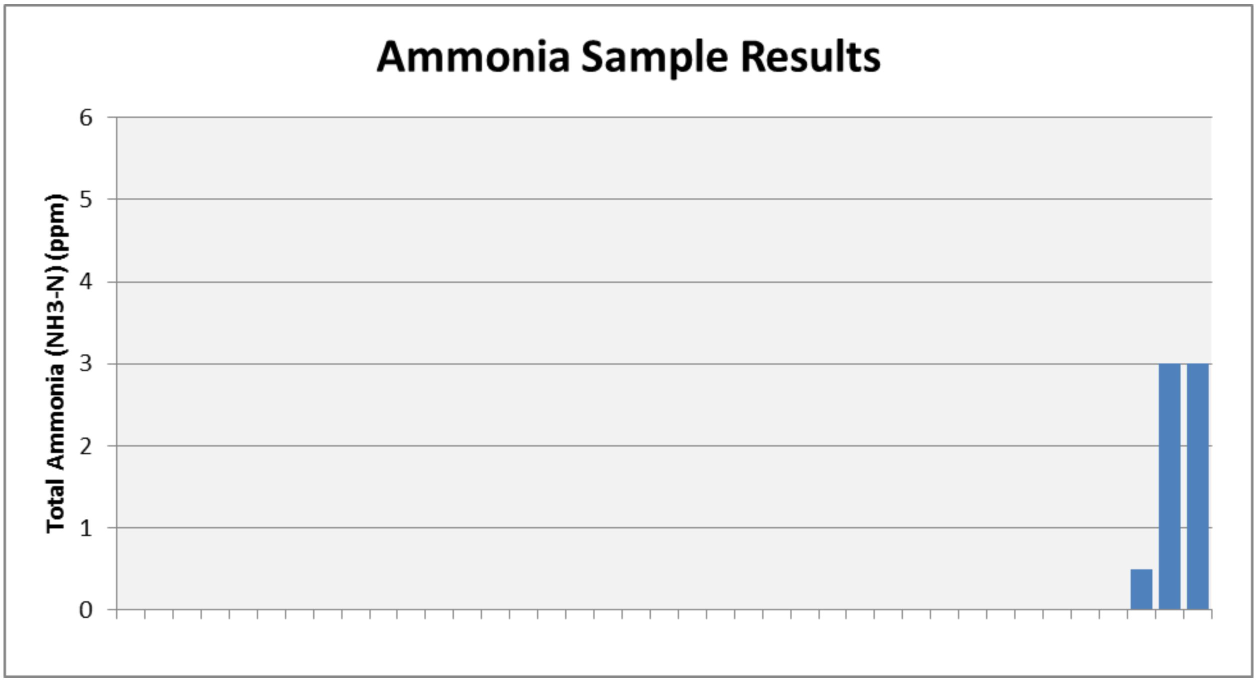


Figure 10 – Ammonia sample results

The ammonia values ranged from 0 to 3 ppm. One sample was at or below the 1 ppm action limit. Based on other factors, those outfalls may or may not have been classified as potential illicit discharges. The illicit discharge potential of the outfalls with ammonia detections are summarized in Table 2.

Table 2 – IDDE potential of outfalls with ammonia detections

Outfall	Ammonia (ppm)	IDDE Potential	Reason
03-81 US1	0.5	Obvious	Petroleum sheen and odor in manhole.
02-184 US1	3	Potential	0.7 mg/L detergent in sample. Past ammonia and detergent detections.
16-1508 US1	3	Potential	Past ammonia detections.

The outfalls that were considered potential or obvious illicit discharges are discussed in more detail in the *Potential Illicit Discharges* section of this report.

Detergents

Background

The presence of detergents in the outfall sample is usually an indication of the presence of wastewater and/or washwater. This is typically the result of a sanitary sewer cross connection or washwater dumped in or near a stormwater inlet. However, detergent can also be present in non-illicit discharges (as defined by the general permit and the municipality's illicit discharge ordinance), including runoff from residential car washing. Therefore, the presence of detergent in a sample indicates the presence of a non-stormwater source; however, the source should be identified to determine if it is an illicit discharge.

There are four main classes of detergents:

- Anionic detergents (negatively charged) – Common in dishwasher detergents, liquid and powdered laundry detergents, carwash detergents, and shampoo. Anionic detergents have excellent cleaning properties and high sudsing potential.
- Cationic detergents (positively charged) – Used for germicides, fabric softeners and emulsifiers. Cationic detergents have poor cleaning properties by themselves, but can help anionic detergents be more effective.
- Nonionic detergents (ionically inert) – Common in hand dishwashing liquids, household cleaners, and laundry detergents (especially in combination with anionic detergents). Nonionic detergents are excellent grease removers.
- Amphoteric detergents (negatively or positively charged, based on pH) – Found in shampoo and cosmetic products due to their mild chemical nature. Amphoteric detergents are also found in hand dishwashing liquids due to their high sudsing potential.

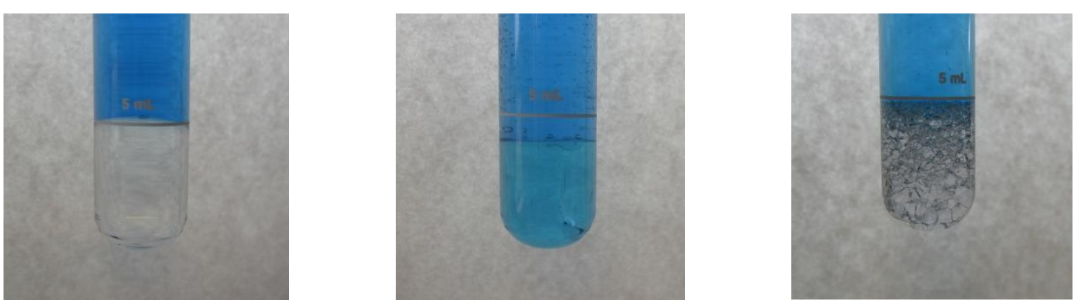
Unfortunately, due to the diverse classes of detergents, there is no single test to detect the presence of all detergents. The most common test – the Methylene Blue Active Substances (MBAS) test – is only effective in identifying the presence of anionic detergents.

The general permit requires sampling for detergents. In general the action level for detergents is set at 0 mg/L. Any detection of detergent indicates the presence something other than stormwater in the sample. Depending on the source, it may or may not be an illicit discharge.

Testing Method

During the ongoing screening program, OMNNI tested the outfall samples for detergents using MBAS method with the equipment and reagents provided in the *Hach Stormwater Test Kit*. This is a colorimetric test method in which the intensity of the color in the reagent can be used to estimate the anionic detergent concentration. In most cases, a clear result indicates no detergent in the sample, and a blue tint indicated a positive detection of detergent.

In some samples with high turbidity, the MBAS test method results in foam or bubbles in the solution. These bubbles have no impact on the overall test result, and if the bubbles and solution are clear, the result is a negative test for detergent.



No Detergent Present | Detergent Present | Turbidity Bubbles, No Detergent Present

Figure 11 – Typical MBAS Detergent Test Results

Because of the equipment and reagents (including chloroform) used in the MBAS test, the detergent test was conducted in the office at the end of the day. OMNNI's experience with samples that have tested positive for detergent show that little dissipation occurs within 48 hours of testing, so same-day testing for detergents was an acceptable approach.

Results

The detergent results for the samples are shown in Figure 12.

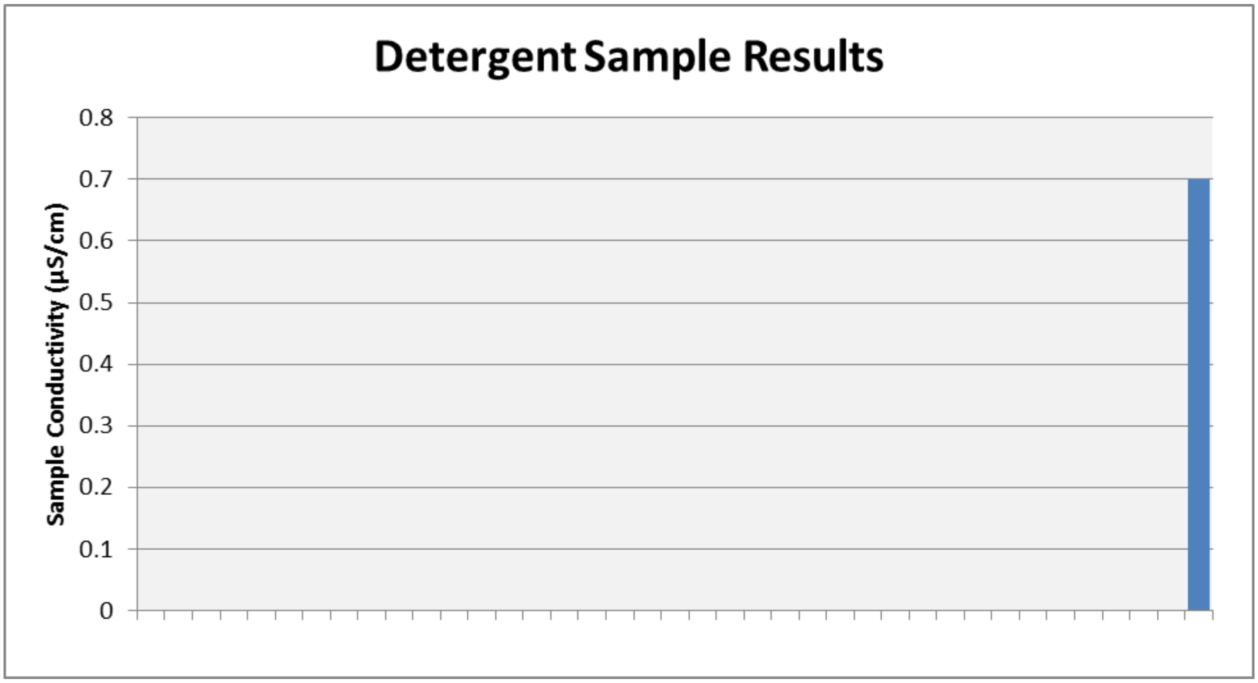


Figure 12 – Detergent sample results

The detergent values ranged from 0 to 0.7 mg/L, with one sample having estimated detergent concentration of 0.7 mg/L. This sample – 02-184 US1 – is located on an old branch of storm sewer on Legion Place. The sample also had an ammonia concentration of 3 ppm, so it was considered a potential illicit discharge. This outfall is discussed in more detail in the *Potential Illicit Discharges* section of this report.

Phenols

Background

The presence of phenol in stormwater runoff is usually due to discharge from industries that use phenol-containing chemicals in their manufacturing process. These industries include chemical, textile, paint, resin, tire, plastic, electronics and pharmaceutical manufacturing. Phenol can also occur naturally in the groundwater in some areas.

The general permit requires sampling for phenol. Because of its limited sources, the Ongoing Screening Program submitted to the WDNR proposed that phenol only be tested for outfalls with industrial sources in the drainage basin. In general the action level for phenol is set at 0 mg/L. Any detection of phenol indicates the presence something other than stormwater in the sample.

Testing Method

During the ongoing screening program, OMNNI tested the outfall samples for phenol using the equipment and reagents provided in the *Hach Stormwater Test Kit*. This is a colorimetric test method in which the intensity of the color in the reagent can be used to estimate the phenol concentration. In most cases, a clear result indicates no phenol in the sample, and an orange tint indicated a positive detection of phenol.

Because of the equipment and reagents used in the phenol test, the phenol test was conducted in the office at the end of the day. No dissipation of the phenol was expected within 24-48 hours of collecting the sample.

Results

None of the samples tested positive for phenol, so none of the samples were considered suspect due to phenol.

POTENTIAL ILLICIT DISCHARGES

After examining the presence of physical indicators at each outfall and any chemical indicators present in the stormwater samples, each outfall was assigned one of the following classifications, in order of increasing likelihood of the presence of current or past illicit discharges:

- Unlikely – no significant physical or chemical evidence of current or past illicit discharge
- Potential – presence of physical and/or chemical indicators, but no strong visible evidence
- Obvious – visible and/or strong chemical evidence of current or past illicit discharge

Of the 42 inspected outfalls, 25 were classified as unlikely, 16 were classified as potential, and one was classified as "obvious." The outfalls that were classified as anything other than "unlikely" are summarized in the table below and discussed in more detail in the following sections. A map showing the locations of these outfalls is included in Appendix C.

Table 3 – Outfalls with elevated illicit discharge classifications

Outfall	Classification	Reason
01-520	Potential	Persistent gross solids in upstream manhole (also present in 2009, 2010, 2011, 2012 and 2013).
02-184	Potential	Detergent and ammonia in upstream manhole (also present in 2012 and 2013). Storm sewer supposedly abandoned.
02-357	Potential	Persistent gross solids in upstream manhole (also present in 2011 and 2012).
03-22	Potential	Persistent gross solids in upstream manhole (also present in 2009, 2010, 2011, 2012 and 2013).
03-173	Potential	Persistent gross solids in upstream manhole (also present in 2010 and 2011).
06-52	Potential	Persistent gross solids in upstream manhole (also present in 2010 and 2011).

Outfall	Classification	Reason
08-284	Potential	Persistent gross solids in upstream manhole (also present in 2010 and 2011).
08-347	Potential	Persistent gross solids in upstream manhole (also present in 2010 and 2011).
11-376	Potential	Persistent gross solids in upstream manhole (also present in 2009 and 2011).
11-512	Potential	Persistent gross solids in upstream manhole (also present in 2011 and 2012).
12-569	Potential	Persistent gross solids in upstream manhole (also present in 2010).
12-576	Potential	Persistent gross solids in upstream manhole (also present in 2009).
13-1758	Potential	Persistent gross solids in upstream manhole (also present in 2013). Former petroleum release.
16-142	Potential	Persistent gross solids in upstream manhole (also present in 2010, 2011 and 2012).
16-533	Potential	Persistent gross solids in upstream manhole (also present in 2010 and 2011).
16-1508	Potential	Ammonia in upstream manhole (also present in 2013).
03-81	Obvious	Petroleum odor and sheen in upstream manhole, with slightly elevated ammonia (also present in 2009).

A chart showing the number of outfalls inspected over the past five years (starting with the initial screening in 2009) and the number of potential or obvious illicit discharges is shown in Figure 13.

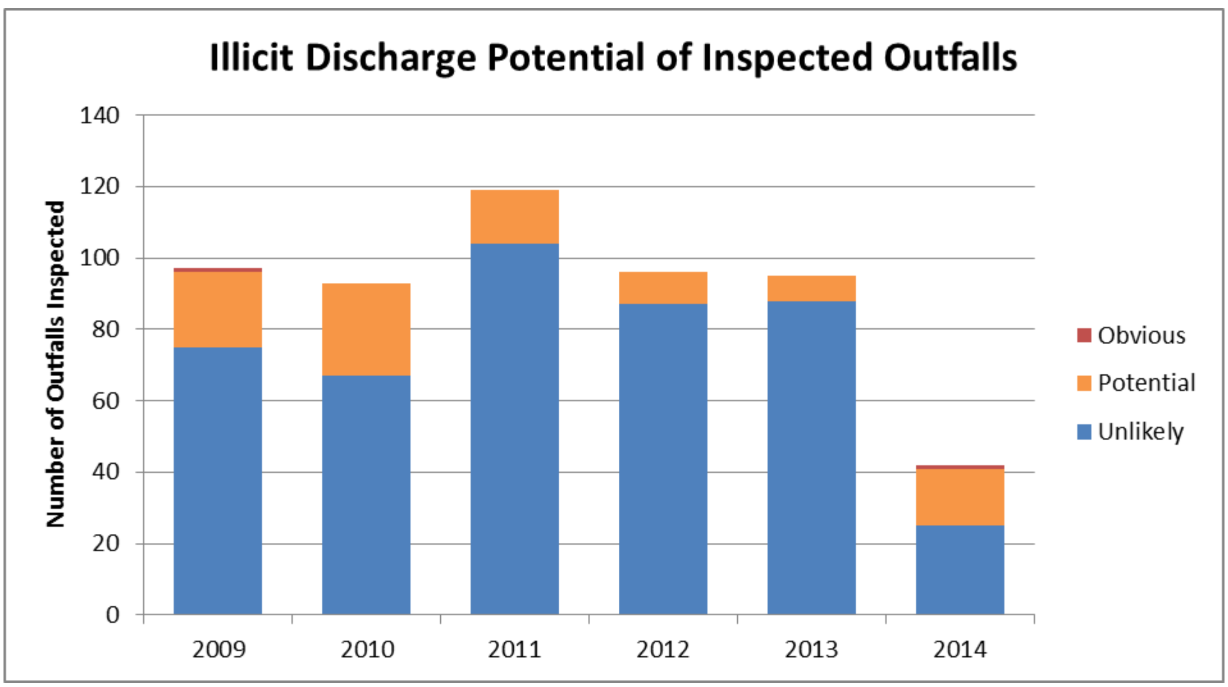


Figure 13 – Illicit discharge potential of inspected outfalls

Upstream Manholes with Significant Floatable Debris

During the 2014 ongoing screening program, 14 upstream manholes contained significant amounts of floatable debris (gross solids), including plastic bottles, foam packaging, and other solid waste, and were classified as potential illicit discharges. This effect was most pronounced at manholes upstream of a fully-submerged outfall, where the storm sewer pipes within the manhole were also fully-submerged. In these cases, any floatable debris traveling along the top of the storm sewer pipe will enter the manhole, and will remain trapped on the surface of the manhole pool, as they are not able to escape through the submerged outlet pipe. In these cases, the submerged manhole acts as a trap for much of the floatable debris.

While some may not consider gross solids a true illicit discharge, it does meet the definition of an illicit discharge, since it is a substance present in the discharge that is not comprised entirely of stormwater. In most cases, there will be one or more access points which allow the debris to enter the MS4. Because of this, the presence of significant floatable debris in upstream manholes caused the illicit discharge potential of the outfall to be raised to "potential." Upstream manholes with isolated solid waste or debris (generally three or fewer pieces) are not included in this list, and were not considered potential illicit discharges.

Note that in some cases, sediment and/or vegetation falls into the manhole when the manhole cover is removed, and those materials also appear in the photos. The severity of the floatable debris is based on the presence of the original debris and solid waste.

Upstream manholes that were classified as "potential" sources of illicit discharge due to significant floatable debris during the 2009-2013 screening programs are shown in the table in Appendix D-1. The 2014 screening results are also shown.

It is recommended that the outfalls with continuing observations of significant floatable debris be classified as priority outfalls in the revised ongoing screening program. This designation will cause them to be screened annually. These manholes should be cleaned several months prior to the scheduled outfall screening. By doing this, it will be possible to determine if the debris is from a prior discharge, or if the problem is ongoing. If it is determined that it is an ongoing problem, upstream inlets, especially those located near dumpsters or other solid waste storage areas, should be closely examined in an attempt to locate the source of the discharge. These areas could then be targeted for public education campaigns.

A map showing the locations of the manholes with floatable debris is included in Appendix D-1.

Outfall 02-184 (Legion Place)

The City contacted OMNNI on December 4, 2012 with a request to investigate a report of suds in Lake Winnebago near outfall 02-184. A concerned citizen contacted the City about suds along the shoreline near Legion Place on November 9, 2012. The resident had stated that the suds were common during the summer of 2011, and that they were again present. The City investigated the report, but no suds were observed during the investigation. The caller was advised to notify the City if the suds reappeared. The resident contacted the City again on November 30, 2012 to report that the suds were present again at that time.

OMNNI investigated the area around the outfall on December 6, 2012. Outfall 02-184 consists of an 8-inch clay pipe that is fully submerged and could not be located. The first upstream manhole

(02-184) is located directly west of the outfall on Legion Place, and has two short segments to the north and south of the manhole. The actual drainage basin only consists of five residential parcels along the shoreline. A separate storm sewer pipe runs parallel to this branch in Legion Place, and discharges at outfall 02-357, north of outfall 02-184.

OMNNI met with the resident that reported the suds to the City. Some suds were present on the shoreline near the outfall. Samples of the suds and lake water were collected near the outfall and at two locations along the shoreline north of the outfall. Because the outfall was submerged, a sample was also collected from the pool in the upstream manhole.

Figure 14 – Suds along shoreline north of outfall 02-184 (2012)

Figure 15 – Pool in upstream manhole 02-184 US1 (2012)

The suds observed on December 6 were consistent with the appearance of the suds that can be formed by natural surfactants in surface water. However, the sample that was collected from the pool in the upstream manhole had a detergent concentration of 0.2 mg/L, and an ammonia concentration of 3-6 ppm. These chemical indicators suggest that sanitary sewage may be present in the storm sewer, which could be causing the suds in the lake.

Based on the sample results, OMNNI recommended that the City televise the entire storm sewer branch to locate any potential sanitary cross connections. An email was sent to the Illicit Discharge Coordinator on December 6 summarizing the results and the recommended action.

After the storm sewer was televised, it appeared that the storm sewer outfall had been abandoned.

The outfall and upstream manhole were re-screened on September 5, 2013. At that time, a strong sewer odor was present in the upstream manhole. In addition, the sample had an ammonia concentration in excess of 6 ppm, and a detergent concentration of 1.3 mg/L. Both of these concentrations were higher than the 2012 screening. An update was provided to the Illicit Discharge Coordinator on September 6, 2013.

Figure 16 – Pool in upstream manhole 02-184 US1 (2013)

Because of the potential illicit discharges in prior years, the outfall was included in the 2014 screening program. During the 2014 screening, it was noted that the manhole appeared to be cleaner, with less sludge at the bottom. The sewage odor that was detected in previous years was not detected.

Figure 17 – Pool in upstream manhole 02-184 US1 (2014)

However, the stormwater sample collected from the manhole pool had an ammonia concentration of 3 ppm, and a detergent concentration of 0.7 mg/L. While these concentrations are approximately half of the 2013 concentrations, they are still significant.

Based on these results, it appears that there may be sanitary sewage in this branch of storm sewer. The City should verify that it is indeed abandoned, and also check for cross-connections from the nearby residences. This outfall will likely be classified as a priority outfall in the revised Ongoing Screening Plan, which will result in annual inspections.

Additional information and maps related to this investigation are included in Appendix D-2.

Outfall 03-81 (Pioneer Drive)

Outfall 03-81 discharges near the railroad trestle at the north end of Pioneer Drive. The outfall is fully-submerged, and the MS4 mapping suggests that the end of the pipe may be 90 feet past the shoreline. As a result, the outfall is screened at the first upstream manhole.

The outfall was first screened in 2009. The first upstream manhole was located on the south side of Pioneer Drive, behind the railroad control shed. When the manhole was opened, a strong smell of diesel fuel was detected inside the manhole. The manhole was also submerged, and had a significant amount of floatable debris, which appeared to be coated with oil and grease.

Figure 18 – Upstream manhole 03-81 US1 (2009)

Figure 19 – Floatable debris and grease in upstream manhole 03-81 US1 (2009)

A sample was collected from upstream manhole 03-81 US1. The sample had a grayish-black color, and had a strong odor of diesel fuel. The sampling equipment and container were coated in grease from penetrating the floatable debris. None of the typical sampling parameters tested positive. Because of the obvious odor of diesel fuel and appearance of grease, no additional VOC or oil/grease tests were run. The railroad track ballast in the area showed no signs of stains or other leaks, so a railroad spill seemed unlikely.

Figure 20 – Sample container from upstream manhole 03-81 US1 (2009)

After receiving authorization from the City to use the contingency funds set aside for the project, additional upstream manholes were screened in an attempt to determine the extent of the contamination and the possible source. The first upstream manhole could not be located, as it was buried under the ballast in the railroad right-of-way. The second upstream manhole was located, also in the railroad right-of-way. This manhole (03-81 US2) also had oil-covered floatables, but the diesel odor was not as significant as in 03-81 US1.

Figure 21 – Floatable debris in upstream manhole 03-81 US2 (2009)

Additional upstream manholes were sampled along E. 10th Avenue. The manholes on 10th Avenue did not have the floatable debris or the diesel odor. However, they did have a reddish-brown tint to the submerged pool, and showed a slight oil sheen. The property on the south side of 10th Avenue is a steel fabrication facility, and the property on the north side is a metal salvage facility. Both could be potential sources of oil and grease.

Figure 22 – Oil sheen in upstream manhole 03-81 US4 (2009)

The drainage area for this storm sewer branch includes the properties along E. 10th Avenue, as well as properties on W. 10th Avenue, west of Main Street. The upstream manholes west of Main Street were also screened, and were found to be dry, with significant amounts of dry sediment inside the manholes. It appeared that the most likely sources of the illicit discharge would be east of Main Street.

The City and OMNNI believed that the illicit discharge evidence for this outfall was not caused by one significant event. Rather, it was likely caused by a gradual buildup of diesel fuel and oil/grease over many years, which became trapped in the downstream manholes. Upon discovering the problem, the City vacuumed the upstream manholes. A follow-up inspection of manhole 03-81 US1 revealed that the manhole was still fully-submerged, but the sample collected from the pool did not have a detectable odor.

The 2010 follow-up screening showed no petroleum sheen or floatable debris, but a slight petroleum odor. No abnormal chemical indicators were noted. The 2011 screening had a slight amount of floatable debris and 0.25 ppm ammonia, but no petroleum sheen or odor. The outfall was not screened in 2012 or 2013.

The outfall was screened on October 9, 2014 as part of the 2014 ongoing screening program due to the past illicit discharge. During this inspection, the manhole once again had moderate floatable debris, a visible petroleum sheen on the water and debris, and a faint petroleum odor. The stormwater sample collected from the manhole also contained an ammonia concentration of 0.5 ppm. The Illicit Discharge Coordinator was contacted on October 9 and notified of the reappearance of the petroleum.

Figure 23 – Oil sheen and debris in manhole 03-81 US1 (2014)

The City vacuumed the debris from the manhole on October 9. The manhole was rescreened on October 22, 2014. There was no debris present in the manhole, but the petroleum sheen and odor was still present.

Figure 24 – Oil sheen and debris in manhole 03-81 US1 after vacuuming (2014)

Based on the 2009 tracking, the suspected source(s) came from E 10th Avenue. The manhole at the east end of E 10th Avenue was opened for a visual inspection. There was a small submerged pool in this manhole, and a slight petroleum sheen and odor were detected. There were also some darker stains above the flowline of the manhole, possibly from petroleum.

Figure 25 – Upstream manhole 03-81 US4 (2014)

Figure 26 – Petroleum sheen in upstream manhole 03-81 US4 (2014)

There appears to be an ongoing intermittent discharge of petroleum from a source on E. 10th Street. OMNNI recommends that the City televise the storm sewer branches along this segment to identify any potential cross connections. It may also be necessary for City inspectors to inspect the areas where the storm sewer crosses private property to check for potential sources of industrial runoff that may enter the storm sewer system.

This outfall will likely be classified as a priority outfall in the revised Ongoing Screening Program, which will result in annual screenings. The annual screenings will assist in identifying these intermittent discharges if no obvious source is found.

Additional information and maps related to this investigation are included in Appendix D-3.

Outfall 16-1508 (N. Westfield Street)

Outfall 16-1508 consists of a 54-inch reinforced concrete pipe that discharges to Sawyer Creek from the south. The outfall is located approximately 60 feet east of the Westfield Street bridge. The outfall was previously named 16-487 before it was reconstructed in 2011.

Figure 27 – Outfall 16-1508 (5/30/2012)

The outfall was initially screened on May 30, 2012 as part of the gross solids prescreening. Because the outfall was partially submerged, the upstream manhole was screened. A sample was collected from the submerged pool in the manhole, and the sample had an ammonia concentration of 1 ppm. The Illicit Discharge Coordinator was informed of the detection on May 30, 2012.

The manhole was resampled on June 6, 2012. The sample collected on this date did not have ammonia. No additional investigation was conducted for this outfall at that time, but it was decided that the outfall should be checked one more time before the end of the year.

The outfall was rescreened on September 27, 2012. At that time, the Sawyer Creek stream channel was under construction. The outfall was still partially submerged, and a sample was collected from the upstream manhole.

Figure 28 – Outfall 16-1508 (9/27/2012)

The sample collected from the upstream manhole had an ammonia concentration of 3 ppm, which was higher than the May 30 sample, and warranted tracing of the source. The various manholes upstream of the outfall were sampled in an attempt to isolate the segment of the storm sewer where the ammonia was being introduced.

After collecting samples from the various upstream manholes, it was determined that the ammonia concentration was 3 ppm at manholes 16-1508 and 16-1504. However, at the next upstream manhole (16-430), no ammonia was detected. It appeared that the ammonia was being introduced between manholes 16-460 and 16-1504.

The land use in this area consists of multifamily residential property on the west side of Westfield Street, and Red Arrow Park on the east side of the street. A building housing the restrooms for the park is located immediately to the east of this segment. Based on the elevated ammonia levels in the segment adjacent to the park restroom building, this was identified as a potential source. Additionally, Red Arrow Park is a former landfill site, and infiltration of groundwater from the site could be another potential source.

Figure 29 – Park restroom building upstream of 16-1504 (2013)

The Illicit Discharge Coordinator was notified of the findings on September 28, 2013. At that time, OMNNI recommended that the storm sewer segment between manholes 16-460 and 16-1504 be televised to inspect for potential leaks or cross connections, particularly in the area of the restroom building.

The outfall was screened on October 7, 2014 as part of the 2014 ongoing screening program due to the past illicit discharge. During this inspection, the upstream manhole once again had an ammonia concentration of 3 ppm. As in 2012, the ammonia was traced back to inlet 16-1504, just downstream of the park restrooms, and there was no ammonia detected in the next upstream inlet (16-430). It was noted that the park restrooms were closed for the season at the time of the inspection, so they are less likely to be the source of the ammonia.

During the tracking, several sanitary sewer manholes were observed in the impacted area. The City may want to televise the storm sewer and/or sanitary sewer lines to determine if there are any leaks or improper connections.

The Illicit Discharge Coordinator was provided an update about the continued presence of the ammonia on October 10.

Because of the continued presence of ammonia in the stormwater samples, this outfall will likely be classified as a priority outfall in the revised Ongoing Screening Program. This will result in annual screenings for the outfall, unless the source of the ammonia can be identified as a non-illicit source.

Additional maps and information related to this investigation are included in Appendix D-4.

OUTFALL CONDITION ASSESSMENTS

While not required for the illicit discharge field screening, OMNNI inspectors noted the presence of any structural damage, significant deposition or erosion, or graffiti at the outfalls. This information can be passed along to the appropriate personnel for any necessary action.

Damage

Three outfalls showed signs of damage that may require attention in the near future. All three cases consisted of various degrees of corrosion on corrugated metal pipes.

The outfall damage that was observed during the ongoing screening program is summarized in Table 4.

Table 4 – Outfalls with damage

Outfall	Severity	Description
08-284	Minor	Corrosion on submerged pipe
12-890	Moderate	Corrosion on sides and bottom of CMP
12-890x	Minor	Minor corrosion of CMP

The outfall damage is shown in the photos that follow. The locations of the damaged outfalls are shown on the map in Appendix C.

Figure 30 – Corroded metal pipe at outfall 08-284 (minor damage)

Figure 31 – Corroded metal pipe at outfall 12-890 (moderate damage)

Figure 32 – Corroded metal pipe at outfall 12-890x (minor damage)

Deposition

A total of 13 outfalls showed minor, moderate or severe deposition at the end of the outfall pipe or channel, or inside the upstream screening location. As deposition increases, flow may become restricted in the pipe or downstream channel. Outfalls with moderate or severe deposition may need to undergo maintenance to remove the deposited sediment and debris and maintain proper flow.

The outfall deposition that was observed during the ongoing screening program is summarized in Table 5.

Table 5 – Outfalls with deposition

Outfall	Severity	Description
02-322 US1	Minor	1" deposition in upstream manhole
03-35 US1	Minor	1" deposition in upstream manhole
03-381 US1	Minor	2" deposition in upstream manhole
03-81 US1	Minor	2" deposition in upstream manhole
06-1694 US1	Moderate	3" deposition in upstream inlet
06-221 US1	Minor	3" deposition in upstream manhole
08-284	Minor	3" deposition in end of submerged pipe
12-890	Minor	3" deposition and stones at end of pipe
13-1758	Moderate	8" deposition in end of submerged pipe
13-3099	Minor	4" deposition/gravel in end of submerged pipe
15-1093 US1	Moderate	3" deposition in upstream manhole
16-119 US1	Minor	1" deposition in upstream inlet
16-142 US1	Minor	1" deposition in upstream inlet

The outfall deposition is shown in the photos that follow. The locations of the outfalls with deposition are shown on the map in Appendix C.

Figure 33 – Minor deposition in manhole 02-322 US1

Figure 34 – Minor deposition in manhole 03-35 US1

Figure 35 – Minor deposition in manhole 03-381 US1

Figure 36 – Minor deposition in manhole 03-81 US1

Figure 37 – Moderate deposition in inlet 06-1694 US1

Figure 38 – Minor deposition in manhole 06-221 US1

Figure 39 – Minor deposition at outfall 08-284

Figure 40 – Minor deposition at outfall 12-890

Figure 41 – Moderate deposition at outfall 13-1758

Figure 42 – Minor deposition at outfall 13-3099

Figure 43 – Moderate deposition in manhole 15-1093 US1

Figure 44 – Minor deposition in inlet 16-119 US1

Figure 45 – Minor deposition in inlet 16-142 US1

Erosion

No erosion was observed near any of the outfalls that were screened under the 2014 screening program.

Graffiti

Graffiti was observed in or around one outfall. The graffiti was relatively minor, but should probably be monitored to make sure that it does not become more severe.

The graffiti that was observed during the ongoing screening program is summarized in Table 6.

Table 6 – Outfalls with graffiti

Outfall	Severity	Description
12-569	Moderate	Graffiti on bridge abutment adjacent to outfall.

The graffiti is shown in the photos that follow. The locations of the outfalls with graffiti are shown on the map in Appendix C.

Figure 46 – Graffiti near outfall 12-569

CONCLUSION

OMNNI assisted the City of Oshkosh with the 2014 ongoing screening of the MS4 outfalls, as required by the MS4 permit. A total of 42 outfalls were screened, along with upstream monitoring locations when necessary. Of those 42 outfalls, 25 exhibited unlikely potential of past illicit discharges, 16 were classified as "potential," and one was classified as "obvious." These results are summarized in Figure 47:

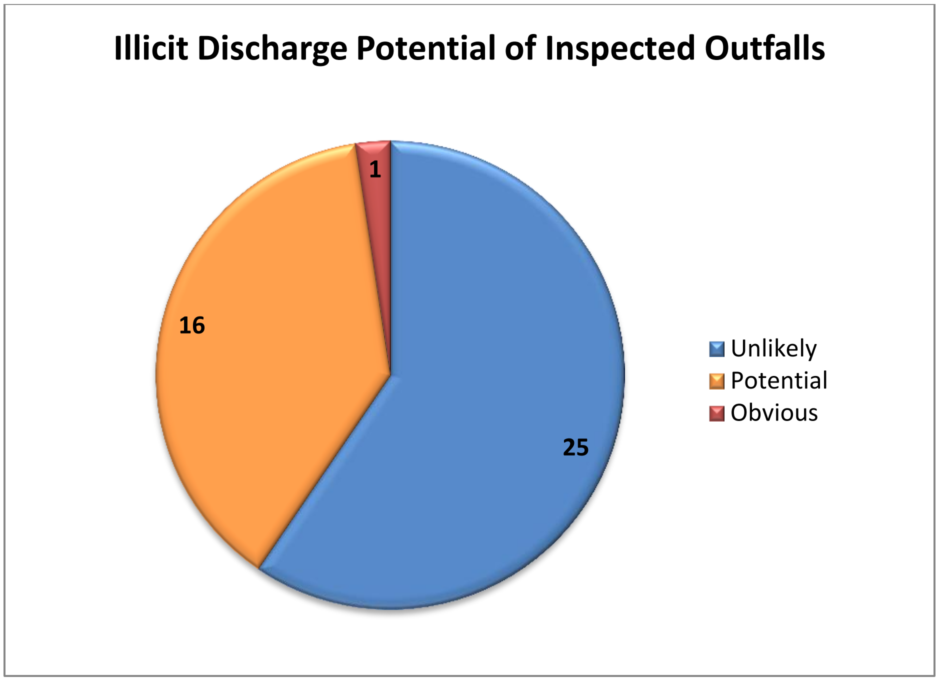


Figure 47 – Illicit discharge potential

Those outfalls classified as "potential" or "obvious" should be given special attention in the ongoing screening program.

The ongoing screening also identified 3 outfalls with structural damage, 13 with deposition, and 1 with graffiti. While none of these posed an immediate danger, the City will likely want to address these issues as part of the regular storm sewer system maintenance.

The City will review and update the Ongoing Screening Program to include the Priority Outfall concept recommended by the WDNR in the March 15, 2012 IDDE guidance document. After the updated plan is implemented, annual outfall screenings would resume according to the revised schedule.

STANDARD OF CARE

The conclusions presented in this report were arrived at using generally accepted engineering practices. The conclusions presented herein represent our professional opinions, based on data collected at the time of the inspections, at the specific inspection locations discussed in this report. Conditions at other locations in the City or at different times may be different than described in this report. The scope of this report is limited to the specific project and the inspection locations described herein.

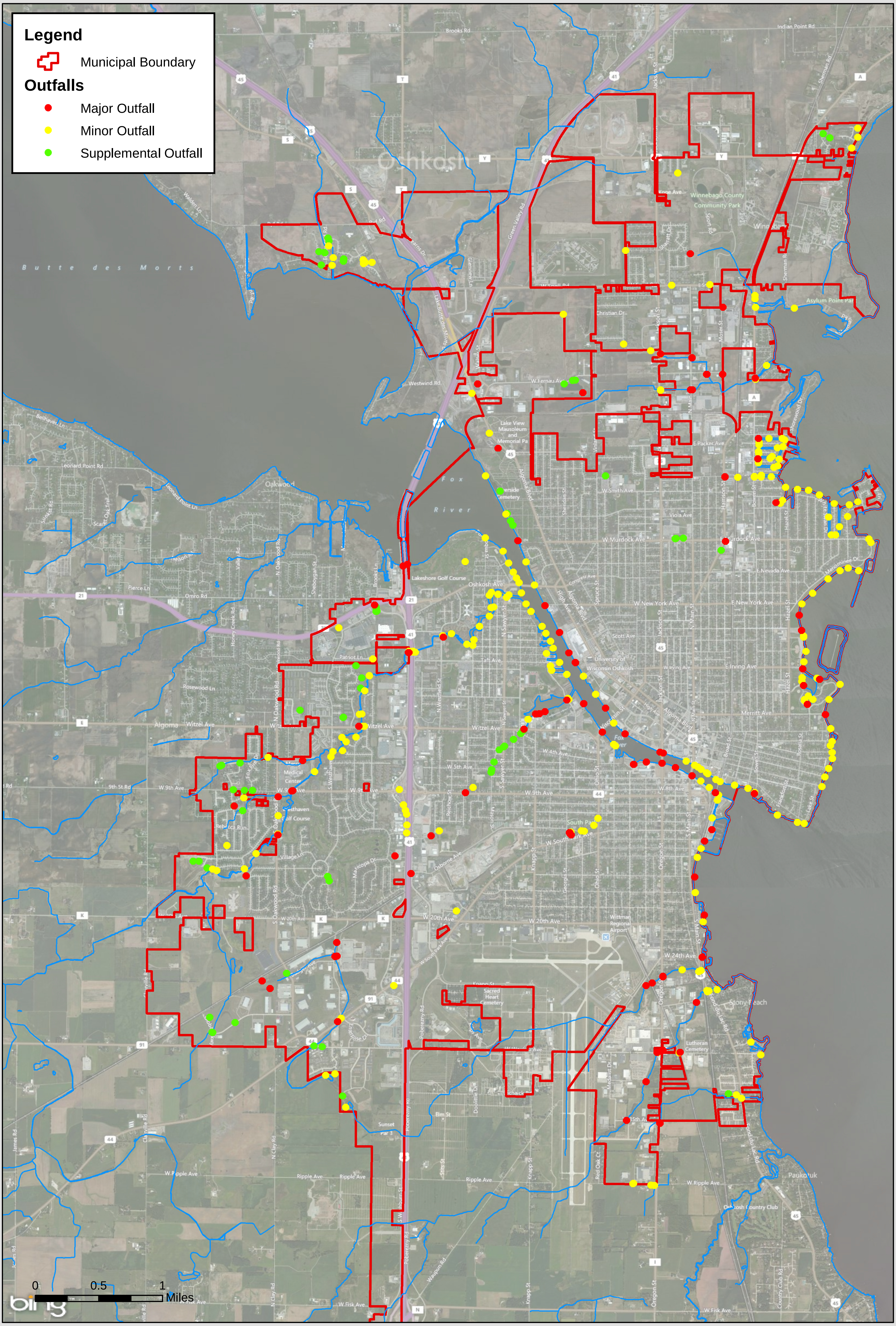
Prepared By: ________________________________

Jason Weis, P.E.
Project Engineer

Reviewed By: ________________________________

Brian D. Wayner, P.E.
Project Manager

Appendix A
MS4 Outfall Maps



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N
W E
S

2014 IDDE ONGOING SCREENING PROGRAM

MS4 OUTFALL MAP

CITY OF OSHKOSH
WINNEBAGO COUNTY, WISCONSIN

Project Manager:	BDW
Project Engineer:	JCW
Drawn By:	JCW
Checked By:	BDW
Date:	12/11/2014

SCALE:
1 " = 3,620 '

PROJECT NO.
N2029C14

FIGURE NO.
A-1

C:\SyncFolders\IDDE_GIS\MS4Map_11x17_Oshkosh.mxd

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APPLETON, WI 54914 FAX (920) 830-6100

N
W E
S

2014 IDDE ONGOING SCREENING PROGRAM

2014 OUTFALL INSPECTION MAP

CITY OF OSHKOSH
WINNEBAGO COUNTY, WISCONSIN

Project Manager:	BDW	SCALE:	1 " = 5,047 '
Project Engineer:	JCW	PROJECT NO.	N2029C14
Drawn By:	JCW		
Checked By:	BDW		
Date:	12/11/2014	FIGURE NO.	A-2

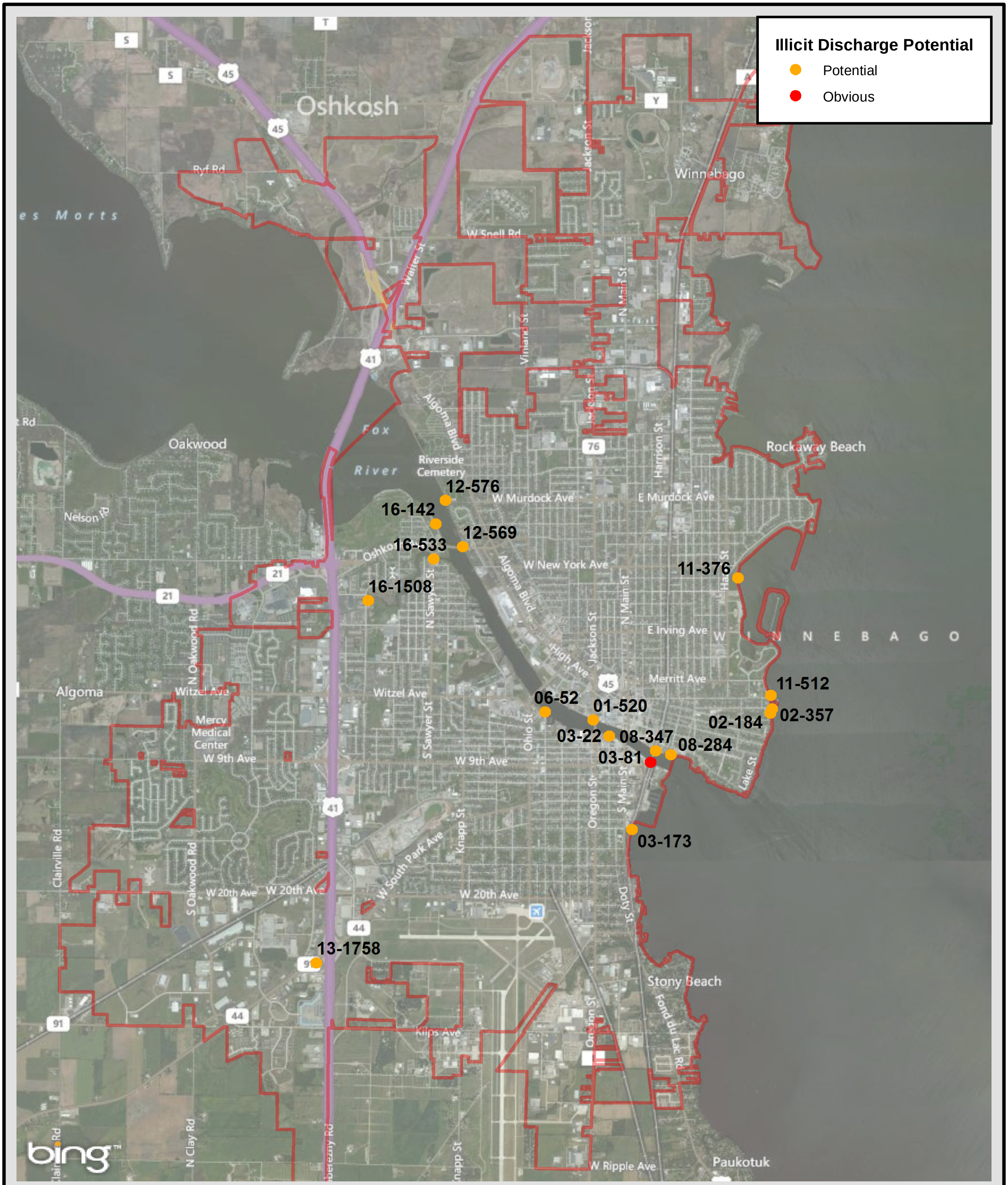
C:\SyncFolders\IDDE_GIS\InspectedOutfalls_Oshkosh.mxd

Appendix B

Outfall Inspection Reports

Appendix C

Outfall Condition Summary Maps



2014 IDDE ONGOING SCREENING PROGRAM

OUTFALLS WITH POTENTIAL ILLICIT DISCHARGES

CITY OF OSHKOSH
WINNEBAGO COUNTY, WISCONSIN

OMNI ASSOCIATES
ONE SYSTEMS DRIVE
APPLETON, WI 54914
PHONE (920) 735-6900
FAX (920) 830-6100

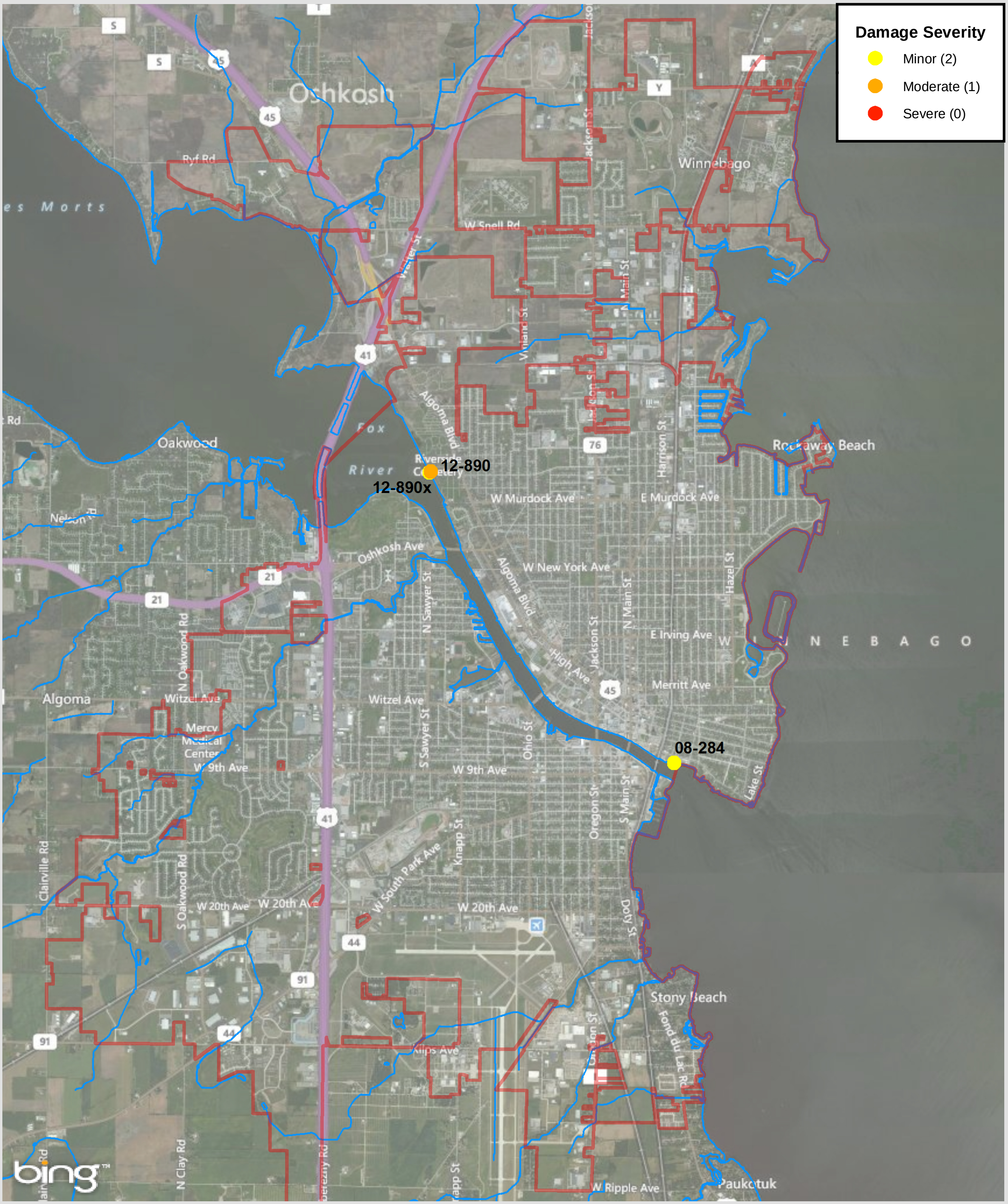
Project Manager:	BDW
Project Engineer:	JCW
Drawn By:	JCW
Checked By:	BDW
Date:	12/11/2014

SCALE: 1 " = 5,047 '

PROJECT NO. N2029C14

FIGURE NO. C-1

C:\SyncFolders\IDDE_GIS\IDDEpot_Oshkosh.mxd



2014 IDDE ONGOING SCREENING PROGRAM

OUTFALLS WITH DAMAGE

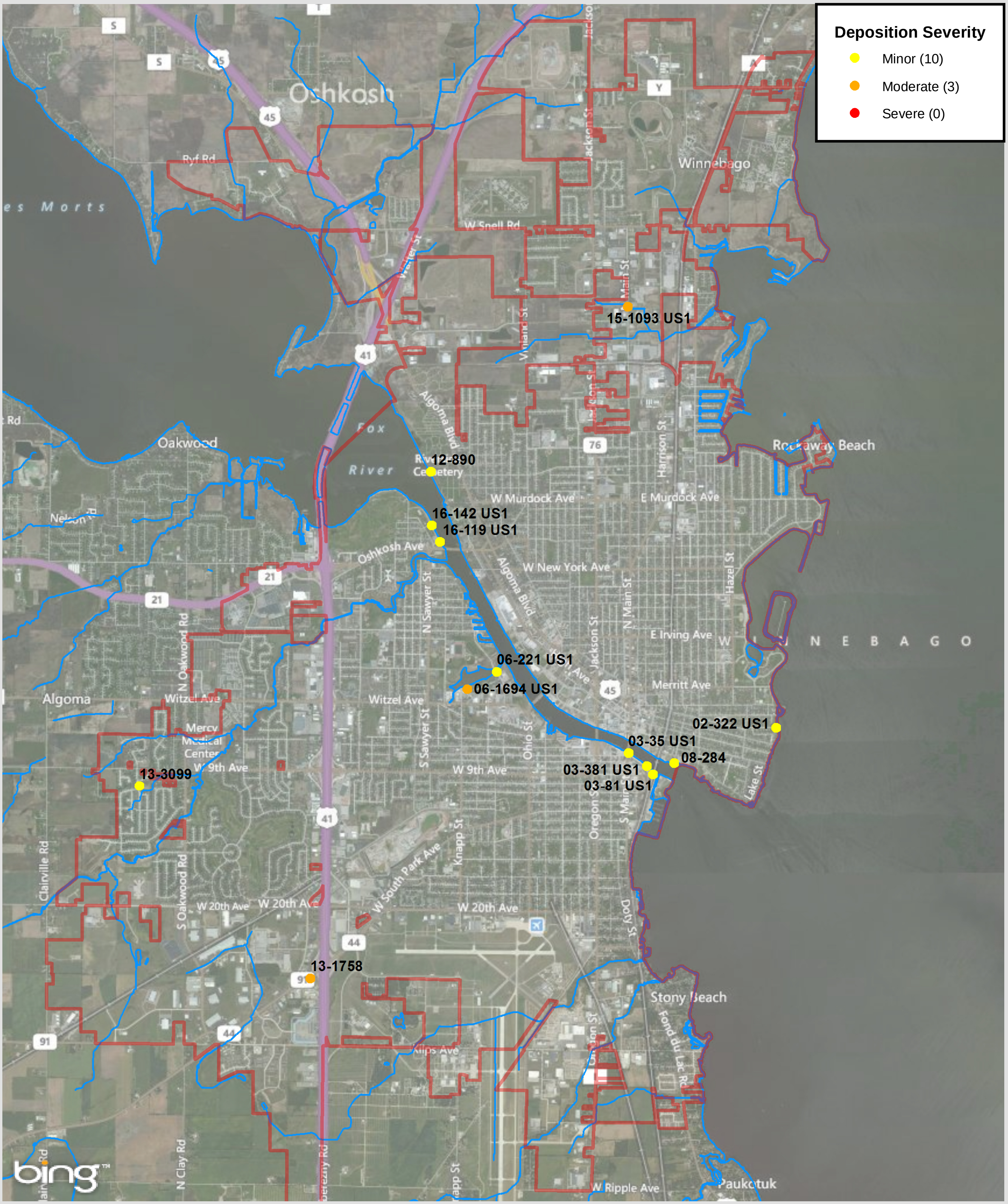
CITY OF OSHKOSH
WINNEBAGO COUNTY, WISCONSIN

OMNNI ASSOCIATES
ONE SYSTEMS DRIVE APPLETON, WI 54914
PHONE (920) 735-6900 FAX (920) 830-6100

Project Manager:	BDW
Project Engineer:	JCW
Drawn By:	JCW
Checked By:	BDW
Date:	11/13/2014

SCALE: 1 " = 7,000 '
PROJECT NO. N2029C14
FIGURE NO. C-2

C:\SyncFolders\IDDE_GIS\Cond_Damage_Oshkosh.mxd



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FAX (920) 830-6100

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2014 IDDE ONGOING SCREENING PROGRAM

OUTFALLS WITH DEPOSITION

CITY OF OSHKOSH
WINNEBAGO COUNTY, WISCONSIN

Project Manager:	BDW
Project Engineer:	JCW
Drawn By:	JCW
Checked By:	BDW
Date:	11/13/2014

SCALE: 1 " = 7,000 '

PROJECT NO. **N2029C14**

FIGURE NO. **C-3**

C:\SyncFolders\IDDE_GIS\Cond_Deposition_Oshkosh.mxd

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PHONE (920) 735-6900 FAX (920) 830-6100

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2014 IDDE ONGOING SCREENING PROGRAM

OUTFALLS WITH EROSION

CITY OF OSHKOSH
WINNEBAGO COUNTY, WISCONSIN

Project Manager:	BDW
Project Engineer:	JCW
Drawn By:	JCW
Checked By:	BDW
Date:	11/12/2014

SCALE: 1 " = 7,000 '

PROJECT NO. **N2029C14**

FIGURE NO. **C-4**

C:\SyncFolders\IDDE_GIS\Cond_Erosion_Oshkosh.mxd

2014 IDDE ONGOING SCREENING PROGRAM

OUTFALLS WITH GRAFFITI

CITY OF OSHKOSH
WINNEBAGO COUNTY, WISCONSIN

OMNI ASSOCIATES
ONE SYSTEMS DRIVE APPLETON, WI 54914
PHONE (920) 735-6900
FAX (920) 830-6100

N W E S

Project Manager:	BDW
Project Engineer:	JCW
Drawn By:	JCW
Checked By:	BDW
Date:	11/12/2014

SCALE: 1 " = 7,000 '

PROJECT NO. **N2029C14**

FIGURE NO. **C-5**

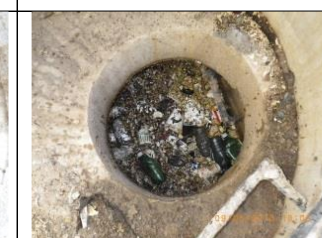
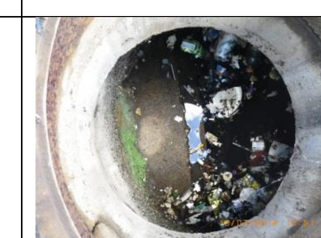
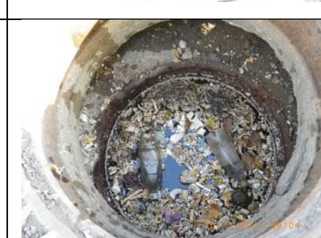
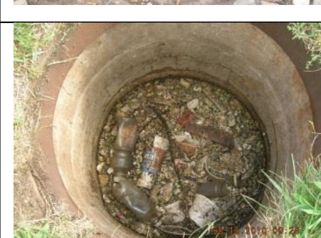
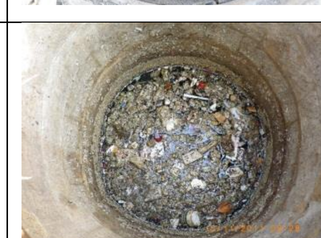
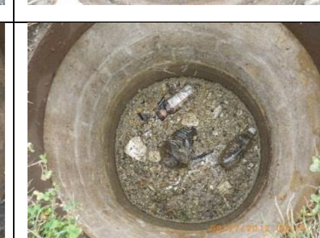
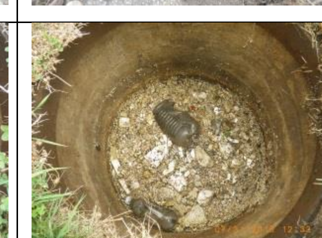
C:\SyncFolders\IDDE_GIS\Cond_Graffiti_Oshkosh.mxd

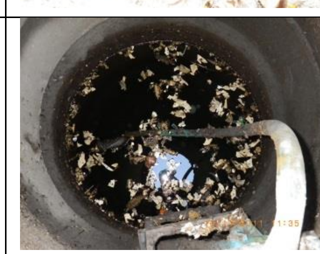
Appendix D
Illicit Discharge Investigation Reports

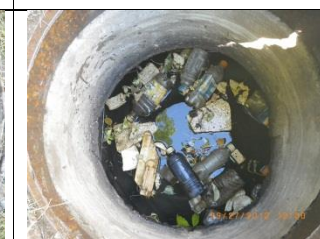
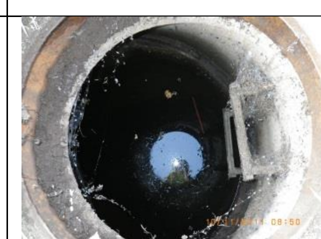
D-1 Upstream Manholes with Significant Floatable Debris
D-2 02-184 (Legion Place) Investigation
D-3 03-81 (Pioneer Drive) Investigation
D-4 16-1508 (N. Westfield Street) Investigation

APPENDIX D-1
Upstream Manholes with Significant Floatable Debris

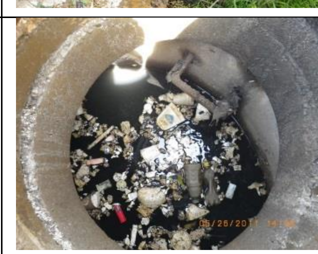
Table 1 - History of manholes with significant gross solids

Manhole (*City ID)*	2009 Initial Screening (September 2009)	2010 Ongoing Screening (October 2010)	2011 Manhole Prescreening (May 2011)	2011 Ongoing Screening (October 2011)	2012 Ongoing Screening (June 2012)	2012 Repeat Screening (September 2012)	2013 Ongoing Screening (July 2013)	2014 Ongoing Screening (July 2013)	2014 IDDE Potential
01-132 US1 *(01-132)*			Not screened due to traffic				Not screened due to traffic	Not screened due to traffic	N/A
01-520 US1 *(01-520)*									Potential
02-357 US1 *(02-357)*									Potential
03-173 US2 *(03-170)*									Potential
03-22 US1 *(03-22)*									Potential
03-35 US1 *(03-35)*									Unlikely

Manhole (*City ID)*	2009 Initial Screening (September 2009)	2010 Ongoing Screening (October 2010)	2011 Manhole Prescreening (May 2011)	2011 Ongoing Screening (October 2011)	2012 Ongoing Screening (June 2012)	2012 Repeat Screening (September 2012)	2013 Ongoing Screening (July 2013)	2014 Ongoing Screening (July 2013)	2014 IDDE Potential
03-381 US1 *(03-381)*									Unlikely
03-81 US1 *(03-81)*									Obvious*
05-264 US1 *(05-264)*									Unlikely
06-1694 US1									Unlikely
06-221 US1 *(06-221)*									Unlikely
06-52 US1 *(06-52)*									Potential

Manhole (*City ID*)	2009 Initial Screening (September 2009)	2010 Ongoing Screening (October 2010)	2011 Manhole Prescreening (May 2011)	2011 Ongoing Screening (October 2011)	2012 Ongoing Screening (June 2012)	2012 Repeat Screening (September 2012)	2013 Ongoing Screening (July 2013)	2014 Ongoing Screening (July 2013)	2014 IDDE Potential
06-560 US1 *(06-560)*		(outfall removed and replaced with outfall 06-2241)							N/A
06-829 US1 *(06-831)*									Unlikely
08-284 US1 *(08-284)*									Potential
08-347 US1 *(08-347)*									Potential
09-101c US1 *(09-47)*			Not screened due to traffic						Unlikely
11-376 US1 *(11-376)*									Potential

Manhole (*City ID)*	2009 Initial Screening (September 2009)	2010 Ongoing Screening (October 2010)	2011 Manhole Prescreening (May 2011)	2011 Ongoing Screening (October 2011)	2012 Ongoing Screening (June 2012)	2012 Repeat Screening (September 2012)	2013 Ongoing Screening (July 2013)	2014 Ongoing Screening (July 2013)	2014 IDDE Potential
11-465 US1 *(11-465)*		(outfall removed and replaced with pump station/outfall 11-465a)							N/A
11-512 US1 *(11-512)*									Potential
12-569 US1 *(12-569)*									Potential
12-576 US1 *(12-576)*									Potential
14-1075 US1 *(14-1075)*									Unlikely
16-142 US1									Potential

Manhole (*City ID)*	2009 Initial Screening (September 2009)	2010 Ongoing Screening (October 2010)	2011 Manhole Prescreening (May 2011)	2011 Ongoing Screening (October 2011)	2012 Ongoing Screening (June 2012)	2012 Repeat Screening (September 2012)	2013 Ongoing Screening (July 2013)	2014 Ongoing Screening (July 2013)	2014 IDDE Potential
16-201 US1									Unlikely
16-396 US1 *(16-396)*								(Behind locked fence – manhole not screened)	N/A
16-436 US1 *(16-436)*								(Behind locked fence – manhole not screened)	N/A
16-463 US1									Unlikely
16-533 US1 *(16-533)*									Potential
16-551 US1 *(16-551)*									Unlikely

OMNI ASSOCIATES

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2014 IDDE ONGOING SCREENING PROGRAM

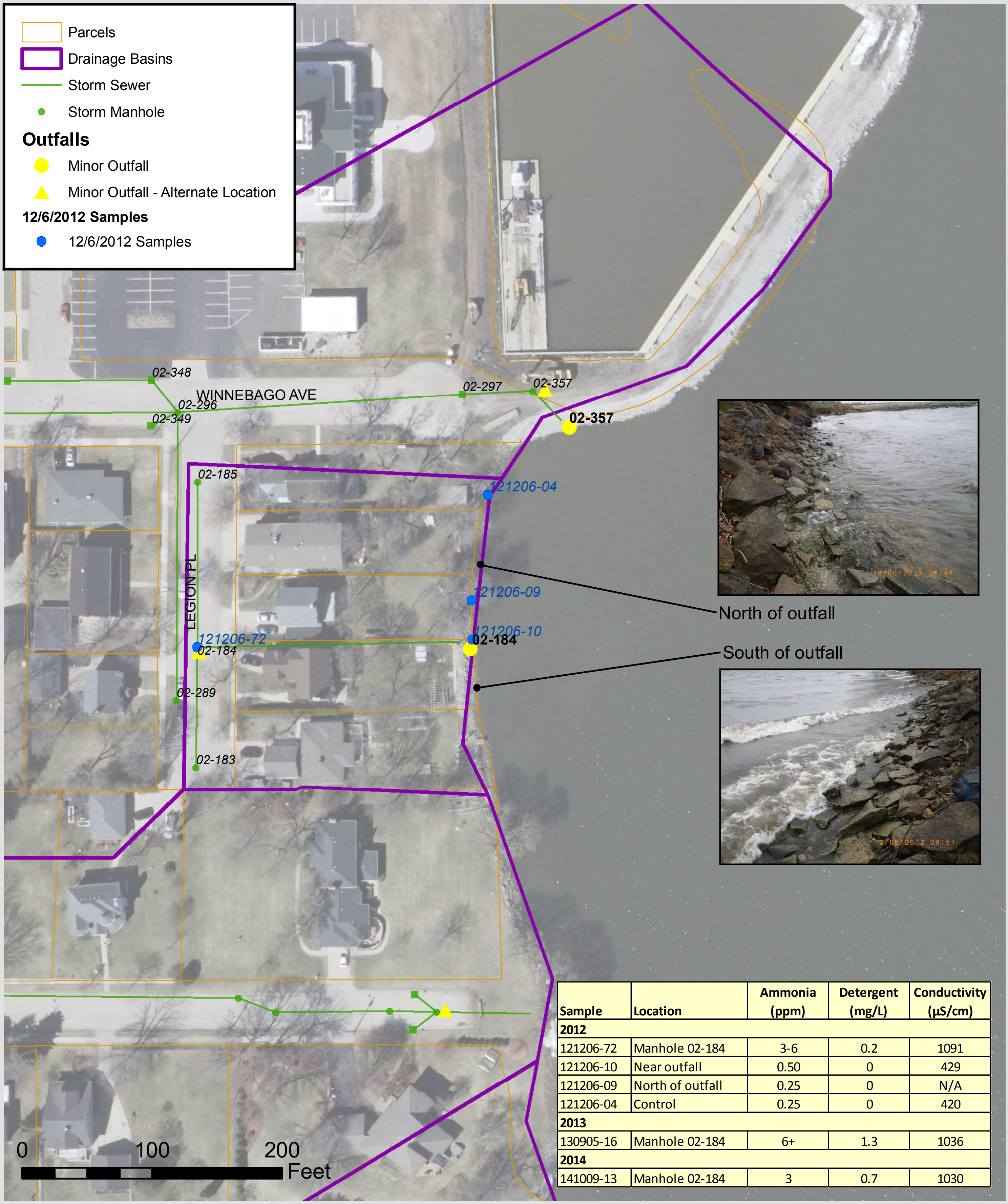
MANHOLES WITH FLOATABLE GROSS SOLIDS

CITY OF OSHKOSH
WINNEBAGO COUNTY, WISCONSIN

Project Manager:	BDW	SCALE:	1 " = 5,047 '
Project Engineer:	JCW	PROJECT NO.	N2029C14
Drawn By:	JCW		
Checked By:	BDW		
Date:	11/12/2014	FIGURE NO.	D-1

C:\SyncFolders\IDDE_GIS\Floatables_Oshkosh.mxd

APPENDIX D-2
02-184 (Legion Place) Investigation



Sample	Location	Ammonia (ppm)	Detergent (mg/L)	Conductivity (µS/cm)
2012				
121206-72	Manhole 02-184	3-6	0.2	1091
121206-10	Near outfall	0.50	0	429
121206-09	North of outfall	0.25	0	N/A
121206-04	Control	0.25	0	420
2013				
130905-16	Manhole 02-184	6+	1.3	1036
2014				
141009-13	Manhole 02-184	3	0.7	1030

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FAX (920) 830-6100

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OSHKOSH 2014 IDDE ONGOING SCREENING

OUTFALL 02-184 (LEGION PL) INVESTIGATION (12/6/2012)

CITY OF OSHKOSH
WINNEBAGO COUNTY, WISCONSIN

Project Manager: BDW
Project Engineer: JCW
Drawn By: JCW
Checked By: BDW

Date: 12/15/2014

SCALE: 1 " = 100 '

PROJECT NO. **N2029C14**

FIGURE NO. **D-2**

F:\ENVIRO\N2029C14 (Oshkosh IDDE 2014)\GIS\Legion.mxd

Jason Weis

From: Jason Weis
Sent: Friday, October 10, 2014 11:31 AM
To: James Rabe (jrabe@ci.oshkosh.wi.us)
Cc: Brian Wayner
Subject: 2014 outfall screening summary
Attachments: 16-1508.pdf

James:

I was able to screen the outfalls that were included in the 2014 screening program on 10/7 and 10/9. I notified you about the potential petroleum at outfall 03-81 on Thursday, since it seemed like a new development, or at least an increase in severity. Below are the other items that I encountered, which consisted of more of an ongoing nature:

- Outfall 16-1508 (N Westfield Dr / Red Arrow Park) had an ammonia concentration of 1-3 mg/L in the upstream manhole, similar to 2012. I did some quick tracking upstream, and as in 2012, there was no ammonia at manhole/inlet 16-430 (upstream of park restroom), but 3 ppm at inlet/manhole 16-1504 (just downstream of the restroom). The restrooms were closed for the season, so they are probably not the source. There are several sanitary manholes near 16-1504, so perhaps there is a leak that is getting into the storm sewer. However, there was no detergent detected, so perhaps it is infiltration from the former landfill, as was previously suggested. I've attached the map from 2012, since the results were essentially the same.
- Outfall 02-184 (Legion Place): The upstream manhole was significantly cleaner than in previous years (no sludge or odor) – I'm assuming it was vacuumed out at some point. The incoming and outgoing pipes could actually be seen. The sample that was collected from the manhole pool did not have an odor. However, it had an ammonia concentration of 3 ppm, a detergent concentration of 0.7 mg/L, and a conductivity of 1030 uS, which could indicate potential sanitary sewage. I know that this branch of storm sewer is on the City's radar from previous years.
- Most of the outfalls that were screened because of gross solids in the upstream manholes still had some degree of gross solids present. In some cases, they seemed similar to previous years, and in other cases, there were less. I'm assuming that some of them were not vacuumed out due to access issues. I will work on putting together a comprehensive list of manholes and photos over the years, so we can determine which manholes appear to have an ongoing issue (to be potentially listed as priority outfalls).
- Outfalls 16-396 and 16-436 were inside a locked gate at a marina. During previous screening events, at least one gate was open, but since it was later in the season this year, I was not able to obtain access. Both of those outfalls had been included because of gross solids in upstream manholes. I recommend skipping those two outfalls for 2014, and addressing them in the revised ongoing screening program.

I will work on getting formal outfall reports put together in the upcoming weeks, as well as the overall summary report. I will also be finishing up the drainage basins and modeling for the revised ongoing screening program, and will likely have some questions about specific drainage areas at some point.

Jason Weis, P.E., GISP, CPESC
Project Manager / GIS Manager
OMNNI Associates, Inc.
(920) 735-6900
(920) 830-6100 FAX
jason.weis@omnni.com

Jason Weis

From:	Brian Wayner
Sent:	Friday, September 06, 2013 11:52 AM
To:	jrabe@ci.oshkosh.wi.us
Cc:	Jason Weis
Subject:	Oshkosh IDDE
Attachments:	13-1716.pdf; Legion.pdf

James,

Jason and I finished up the outfall inspections yesterday. Samples from two of the re-inspections (detections from the previous year) indicated detergent in the stormwater.

The manhole upstream from the pond (13-1716 attachment) had a high detergent detection. We didn't observe water coming from pipe from the carwash. The sample was taken from the water below/adjacent to the carwash pipe discharge. Based on previous inspection work, we assume the detergent came from the carwash even though there was no flow coming from the carwash at the time the sample was collected.

We also had a high detergent detection from a sample collected from the manhole (121206-72) in Legion Place (Legion attachment). There were no notable suds in the lake (this inspection area originated from a lake resident contact last year). The sample collected from the manhole also had a strong septic odor. Our understanding is the storm line in Legion was abandoned, which makes the observed detergent detection and septic odor difficult to explain.

Please note, the attached maps are from last year's inspections. I included them for reference. Jason and I should be in the office on Monday if you want to discuss these finding further.

Have a great weekend!

Brian D. Wayner, P.E.
Environmental Manager

OMNNI Associates, Inc.
One N. Systems Drive, Appleton, WI 54914-1654
800.571.6677, 920.830.6141 (D), 920.830.6100 (F)
bwayner@omnni.com

APPENDIX D-3
03-81 (Pioneer Drive) Investigation

Jason Weis

From: Rabe, James E. <jrabe@ci.oshkosh.wi.us>
Sent: Friday, October 10, 2014 11:07 AM
To: Jason Weis; Brian Wayner
Subject: FW: Outfall 03-81 petroleum

FYI

From: Burns, Todd
Sent: Thursday, October 09, 2014 12:54 PM
To: Rabe, James E.; Hintz, Andrew
Subject: RE: Outfall 03-81 petroleum

Will be done this afternoon. Todd

From: Rabe, James E.
Sent: Thursday, October 09, 2014 11:21 AM
To: Burns, Todd; Hintz, Andrew
Subject: FW: Outfall 03-81 petroleum

Todd / Andy,

Can you have a vac truck clean this manhole so we can check again?

Thank you,

James

From: Jason Weis [mailto:Jason.Weis@omnni.com]
Sent: Thursday, October 09, 2014 10:19 AM
To: Rabe, James E.
Cc: Brian Wayner
Subject: Outfall 03-81 petroleum

James:

While screening the upstream manhole for outfall 03-81 (east end of Pioneer by the RR bridge), I found a fair amount of floatable debris and a petroleum sheen. The petroleum could be residual from the 2009 incident, or it could be a new release.

It's something we'll want to keep an eye on. This outfall will definitely be included in the list of priority outfalls.

I hope to finish the screening today. I'll let you know of any other issues.

Sent from my U.S. Cellular® Smartphone

Project Manager: BDW
Project Engineer: JCW
Drawn By: JCW
Checked By: BDW
Date: 10/23/2014

2014 IDDE ONGOING SCREENING PROGRAM

OUTFALL 03-81 INVESTIGATION (10/22/2014)

CITY OF OSHKOSH

OMNI ASSOCIATES
ONE SYSTEMS DRIVE APPLETON, WI 54914 PHONE (920) 735-6900 FAX (920) 830-6100

SCALE: 1 " = 150 '

PROJECT NO. N2029C14

FIGURE NO. D-3

C:\SyncFolders\IDDE_GIS_Oshkosh\03-81.mxd

APPENDIX D-4
16-1508 (N. Westfield Street) Investigation

Jason Weis

From: Jason Weis
Sent: Friday, October 10, 2014 11:31 AM
To: James Rabe (jrabe@ci.oshkosh.wi.us)
Cc: Brian Wayner
Subject: 2014 outfall screening summary
Attachments: 16-1508.pdf

James:

I was able to screen the outfalls that were included in the 2014 screening program on 10/7 and 10/9. I notified you about the potential petroleum at outfall 03-81 on Thursday, since it seemed like a new development, or at least an increase in severity. Below are the other items that I encountered, which consisted of more of an ongoing nature:

- Outfall 16-1508 (N Westfield Dr / Red Arrow Park) had an ammonia concentration of 1-3 mg/L in the upstream manhole, similar to 2012. I did some quick tracking upstream, and as in 2012, there was no ammonia at manhole/inlet 16-430 (upstream of park restroom), but 3 ppm at inlet/manhole 16-1504 (just downstream of the restroom). The restrooms were closed for the season, so they are probably not the source. There are several sanitary manholes near 16-1504, so perhaps there is a leak that is getting into the storm sewer. However, there was no detergent detected, so perhaps it is infiltration from the former landfill, as was previously suggested. I've attached the map from 2012, since the results were essentially the same.
- Outfall 02-184 (Legion Place): The upstream manhole was significantly cleaner than in previous years (no sludge or odor) – I'm assuming it was vacuumed out at some point. The incoming and outgoing pipes could actually be seen. The sample that was collected from the manhole pool did not have an odor. However, it had an ammonia concentration of 3 ppm, a detergent concentration of 0.7 mg/L, and a conductivity of 1030 uS, which could indicate potential sanitary sewage. I know that this branch of storm sewer is on the City's radar from previous years.
- Most of the outfalls that were screened because of gross solids in the upstream manholes still had some degree of gross solids present. In some cases, they seemed similar to previous years, and in other cases, there were less. I'm assuming that some of them were not vacuumed out due to access issues. I will work on putting together a comprehensive list of manholes and photos over the years, so we can determine which manholes appear to have an ongoing issue (to be potentially listed as priority outfalls).
- Outfalls 16-396 and 16-436 were inside a locked gate at a marina. During previous screening events, at least one gate was open, but since it was later in the season this year, I was not able to obtain access. Both of those outfalls had been included because of gross solids in upstream manholes. I recommend skipping those two outfalls for 2014, and addressing them in the revised ongoing screening program.

I will work on getting formal outfall reports put together in the upcoming weeks, as well as the overall summary report. I will also be finishing up the drainage basins and modeling for the revised ongoing screening program, and will likely have some questions about specific drainage areas at some point.

Jason Weis, P.E., GISP, CPESC
Project Manager / GIS Manager
OMNNI Associates, Inc.
(920) 735-6900
(920) 830-6100 FAX
jason.weis@omnni.com

OMNNI ASSOCIATES

ONE SYSTEMS DRIVE
APPLETON, WI 54914
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N
W E
S

OSHKOSH 2012 IDDE ONGOING SCREENING

MANHOLE 16-487 DETECTION

9/27/2012

CITY OF OSHKOSH
WINNEBAGO COUNTY, WISCONSIN

Project Manager:	BDW
Project Engineer:	JCW
Drawn By:	JCW
Checked By:	BDW
Date:	9/28/2012

SCALE:
1 " = 150 '

PROJECT NO.
N2029B12

FIGURE NO.
A-1

C:\SyncFolders\IDDE_GIS_Oshkosh\16-487.mxd

Jason Weis

From:	Brian Wayner
Sent:	Wednesday, June 06, 2012 1:00 PM
To:	Rabe, James E.
Cc:	Jason Weis
Subject:	RE: Ammonia detection - outfall 16-487

Jason rescreened 16-487. No ammonia detections (or any of the other field parameters detected) this time. The initial ammonia detection was likely from a natural source(s), but we will check it again when we are in the area and update you.

Brian D. Wayner, P.E.
Environmental Manager

OMNNI Associates, Inc.
One N. Systems Drive, Appleton, WI 54914-1654
800.571.6677, 920.830.6141 (D), 920.830.6100 (F)
bwayner@omnni.com

From: Rabe, James E. [mailto:jrabe@ci.oshkosh.wi.us]
Sent: Thursday, May 31, 2012 3:41 PM
To: Jason Weis
Cc: Brian Wayner
Subject: RE: Ammonia detection - outfall 16-487

Jason,

Only the outfall in this location has been recently reconstructed. This outfall was reconstructed with the Westfield Street Bridge project last year. The new storm sewer extends only about 175 feet to the south along Westfield Street. The next upstream manhole now has a new designation (since it was replaced last year). We'll have to get you some new information. We should follow up on this as soon as possible.

James

From: Jason Weis [mailto:Jason.Weis@omnni.com]
Sent: Thursday, May 31, 2012 3:24 PM
To: Rabe, James E.
Cc: Brian Wayner
Subject: Ammonia detection - outfall 16-487

James:

I started screening some of Oshkosh's outfalls on Wednesday. I focused on the outfalls that discharged to Sawyer Creek. Because it had been 72 hours since the previous rainfall, we treated this as a normal outfall screening event, rather than our typical spring "pre-screening." That way, it will not be necessary to revisit these outfalls again in fall, unless manhole cleaning or other maintenance activities are required. We will make sure that all outfalls and upstream manholes are visited before the end of June, in case any manholes need to be cleaned out and rescreened.

One outfall that was inspected on Wednesday had a slightly elevated level of ammonia in the upstream manhole. Outfall 16-487 is located on N Westfield St, and discharges into Sawyer Creek from the south (south of Robin Ave). The outfall pipe was partially submerged, so a sample was collected from the upstream manhole (16-487). The ammonia concentration of this sample was 1 mg/L. No other chemical indicators were out of range, and no physical indicators were observed. (It appeared that the storm sewer had been recently reconstructed, so it appeared fairly clean.)

1 mg/L is what we usually use as the threshold for follow-up investigation, especially if no other indicators are present. Since the sample was collected from a pool sample, natural sources of ammonia (decaying vegetation, etc.) could all cause slightly elevated ammonia levels. However, to be proactive, we will collect an additional sample the next time we are screening in Oshkosh (next week) to determine if the ammonia is still present, and if any additional investigation is warranted.

If you have any questions or concerns about this outfall or the screening program in general, feel free to contact Brian or me.

Jason Weis, P.E., CPESC
GIS Manager / Municipal Project Manager
OMNNI Associates, Inc.
(920) 735-6900
(920) 830-6100 FAX
jason.weis@omnni.com

Jason Weis

From: Jason Weis
Sent: Friday, September 28, 2012 8:40 AM
To: James Rabe (jrabe@ci.oshkosh.wi.us)
Cc: Brian Wayner
Subject: Ammonia in manholes on N Westfield St (Outfall 16-487 / 16-1508)
Attachments: 16-487.pdf

James:

Brian and I finished the outfall inspections in Oshkosh on Thursday. The follow-up inspections consisted mainly of the manholes in which we had previously identified gross solids issues, and outfalls/manholes that had previous chemical indicator parameter detections. One of these was the outfall on N Westfield St, near Red Arrow Park (previously 16-487 before the recent reconstruction).

The upstream manhole (16-1508) had an ammonia detection of 1 ppm during the spring pre-screening. A subsequent inspection showed no ammonia. During Thursday's inspection, the ammonia in this manhole was 3 ppm. Due to construction in the receiving stream and vegetation inside the grate of the outfall pipe, flow was restricted, and the sample was collected from the submerged pool in the upstream manhole.

Because of the elevated ammonia and the previous history of ammonia, we attempted to trace the ammonia upstream. All upstream manholes (up to and including Taft Ave) were partially-submerged, with no free-flowing stormwater. Samples were collected from the pools in several manholes/curb inlets upstream of the outfall. Based on the samples, it appears that the source of the discharge may be between manhole/inlet 16-1504 and 16-430. The ammonia at inlet 16-1504 was approximately 3 ppm, but no ammonia was detected at the next upstream inlet (16-430). It was noted that the restroom facility for Red Arrow Park was located in this stretch of storm sewer, which could be a potential ammonia source.

It should be noted that, since the manholes were partially submerged and the samples were collected from submerged pools, the isolation of the suspect segment is not as precise as in a free-flowing storm sewer, since it is possible for the ammonia to disperse in the pooled stormwater. However, based on the sample results, this would probably be the first segment that should be investigated.

The City may want to televise this segment of storm sewer to determine if there are any cross connections or other sources of ammonia infiltration. If you would like us to conduct any additional testing in the area, please let us know.

I will send you a summary of the gross solids follow-up early next week. Many of the manholes had significantly less gross solids compared to the previous inspection. However, a few appeared to be similar, and may not have been cleaned. I should have the table updated on Monday or Tuesday.

Jason Weis, P.E., CPESC
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jason.weis@omnni.com