White Pine Springs
Aquatic Life and Aquatic Habitat Monitoring Plan and Quality Assurance Project Plan

April 11, 2019

Prepared for:

Nestle Waters of North America

Prepared by:

ADVANCED ECOLOGICAL MANAGEMENT

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1.0 INTRODUCTION

Nestlé Waters North America (NWNA) was issued Water Supply Permit 1701 (Permit 1701); Water Supply Serial Number 2016667 for Production Well PW-101; on April 2, 2018 by the Michigan Department of Environmental Quality (MDEQ). Production Well PW-101 is part of the White Pine Springs (WPS) site located in Osceola Township, Osceola County, Michigan (Figure 1). Permit 1701 was approved under Section 17 of the Michigan Safe Drinking Water Act (1976 Public Act 399 as amended) and allows NWNA to increase the maximum pumping rate at PW-101 from 250 to 400 gallons per minute (gpm).

General Condition #5 of Permit 1701 states that NWNA must, "…submit monitoring plans and Quality Assurance Project Plans (QAPP) to the Department for consideration and approval and required by the special conditions section of this permit." Permit 1701 further states, "The monitoring plans must include the required elements detailed in the special conditions section of this permit. The permit holder [NWNA] may propose equivalent monitoring in place of the special conditions for Department consideration and approval."

This QAPP has been prepared by Advanced Ecological Management, LLC (AEM) on behalf of NWNA to meet the requirements set forth in General Condition #5 of Permit 1701. This QAPP pertains specifically to the aquatic life and habitat monitoring. This QAPP provides procedures for data collection, data evaluation, and administration activities to be performed before, during, and after field monitoring activities at the WPS Site. These procedures are intended to provide methodologies for consistent and accurate data collection including:

- planning,
- survey methodology,
- preventative maintenance, equipment calibration,
- field measurement and monitoring, data management, and
- reporting.

Upon approval of this Monitoring Plan and QAPP by the MDEQ, and prior to implementing the permitted increased withdrawal, aquatic life and habitat monitoring will be conducted to establish baseline data. A baseline data report will be submitted to the MDEQ on February 28 following the baseline year. Subsequently, after implementing the permitted increased withdrawal, aquatic life and habitat monitoring will be conducted to comply with the MDEQ permit. An annual report of Aquatic Life and Aquatic Habitat Monitoring will be submitted to the MDEQ on February 28 following each monitoring year.

2.0 MONITORING PLAN

The MDEQ identified Stations SF-1 and SF-9 of Twin Creek and Stations SF-8 and SF-16 of Chippewa Creek as locations that are to be monitored according to the criteria that have been established in the MDEQ permit number 1701 (Figure 1). In accordance with a subsequent oral request from the Michigan Department of Natural Resources Fisheries Division (Tammy Newcomb, personal communication, June 1, 2018), Nestle Waters North America will include Station SF-5 of Twin Creek. Water temperature for Station SF-5 will be monitored at Station SF-5-6, located approximately 50 feet downstream of Station SF-5, which has historically been used to monitor water temperature at Station SF-5.

Aquatic life and aquatic habitat monitoring procedures are described below and include monitoring procedures for water temperature, dissolved oxygen, aquatic macroinvertebrates, fish community, and aquatic habitat:

2.1 Water temperature monitoring

Water temperature monitoring will be conducted in five locations (SF-1, SF-5-6, SF-9, SF-8 and SF-16), including three locations within Twin Creek (SF-1, SF-5-6, and SF-9) and two locations within Chippewa Creek (SF-8 and SF-16; Figure 1). In accordance with the MDEQ permit requirements, continuous water temperature measurements will be made on an hourly basis from June through September at each of the five locations using an instream temperature logger. Water temperature logger data will be downloaded to a computer data file and compiled at least once every two weeks from June through September.

2.2 Dissolved oxygen monitoring

A two-week continuous dissolved oxygen (DO) study will be conducted at five locations (SF-1, SF-5, SF-9, SF-8, and SF-16). The DO study will begin after July 14th when hot-dry conditions are forecasted, but if such conditions do not occur, monitoring will commence no later than August 13th. Sampling will be conducted using an installed DO meter, with readings recorded hourly. Installation and downloading of data from the DO data loggers will be coordinated with ongoing water temperature monitoring activities.

2.3 Macroinvertebrate (including freshwater mussels) sampling

Aquatic macroinvertebrate sampling will be conducted in July in accordance with the Department's Water Resources Division (WRD) Policy WRD-SWAS-051, Qualitative Biological and Habitat Survey Protocols for Wadeable Streams and Rivers (Procedure-51). The macroinvertebrate survey will be conducted immediately following the fisheries survey of each station as part of the Procedure-51 survey. Aquatic macroinvertebrates will be collected at five locations (SF-1, SF-5, SF-9, SF-8, and SF-16) using D-framed kick nets (Merritt et al., 1996). Stations will be sampled for at least 30 minutes using two kick nets (total sample time = 1 hour/station) and samples will be collected in all habitat types within each station to characterize the macroinvertebrate community. Station lengths will be consistent with previous surveys where all station lengths have been 100 feet except for Station SF-8, which has been 400 feet. Collected specimens will be stored in 250 milliliter (mL) plastic wide-mouth jars containing 70 percent ethanol and will be identified using various taxonomic references (Bright, 2018; Merritt et al., 2008; Pennak, 1990). Aquatic macroinvertebrate sampling will be conducted when stream discharge is low to moderate.

The aquatic macroinvertebrate samples from each station will be identified to the lowest possible taxonomic level and a multi-metric index score will be determined in accordance with Procedure-51 methodology to determine a macroinvertebrate community rating.

Freshwater mussels will be surveyed in accordance with methods described in Hanshue et al. (2018). A reconnaissance survey will be used to confirm the presence or absence of unionid mussels within each station. Beginning at the downstream extent of each station, the stream substrates, stream banks, and gravel bars will be visually searched for evidence of shells, shell fragments, or live mussels. All stream habitats will be visually inspected for the presence of mussels. A glass-bottom bucket may be used during the survey to aid in viewing the substrates. Live mussels may be temporarily removed from the substrate for identification by a surveyor with a valid Scientific Collector's permit. Each station will be searched for at least 60 minutes. If only weathered dead shells or shell fragments are observed, the entire survey time will be used to determine if mussels are still present within the survey area. A species list will be generated from these surveys by a biologist with qualifications to accurately identify mussels to species.

Representative photos of the survey area, the shell material observed and live mussels (in-situ) will be taken. The reconnaissance survey will be documented using the Michigan Mussel Habitat Assessment Form.

2.4 Fish community monitoring

The fish community will be monitored in July at five locations (SF-1, SF-5, SF-9, SF-8, and SF-16). Fish community monitoring will be conducted on the same day as the macroinvertebrate and mussel surveys. Fish community monitoring will be conducted to describe fish community composition, relative abundance, and to determine population estimates for the trout community in each station. Prior to the fish survey, stations will be blocked at the upstream and downstream extents using seines that measure 4 feet by 50 feet, with a 0.19-inch mesh size. A multi-pass removal technique will be used to evaluate fish abundance throughout each station (Van Deventer and Platts, 1983) using a backpack electroshocker. A minimum of three consecutive passes will be conducted, each in an upstream direction. The duration of electroshocking will be recorded for each pass and stunned fish will be placed in a live-well for identification and enumeration. Following the third or final pass and subsequent fish identification, fish will be released within the station.

As part of the enumeration process, the species, length, weight, and number of fish captured in each pass will be recorded. The Michigan County Element List will be reviewed to determine if any threatened, endangered, or special concern aquatic species are identified at the five surveyed locations.

2.5 Aquatic habitat measurements

Water depth and stream width will be measured at five locations (SF-1, SF-5, SF-9, SF-8, and SF-16) as part of the fish and macroinvertebrate surveys during July. Consistent with previous surveys conducted in these stations, wetted stream width will be measured at the lower, middle, and upper extent of each station. Water depth will be measured at 10 percent intervals from five percent to 95 percent of each stream width cross section. Stream width measurement locations will be monumented with a metal fence post located on the stream bank at the lower, middle, and upper extent of each station.

Water depth and stream width will also be measured at six road/stream crossings (T2, T3, T8, T18, C2, and C3) during low-flow conditions typically during July or August (Figure 2). Wetted stream width will be measured at one foot, five feet, and 10 feet upstream and downstream of each culvert, where water is present, and where there is a defined stream channel (does not include bifurcated channel or laminar flow with no defined stream channel). Water depth will be measured at 10 percent intervals from five percent to 95 percent of each stream width cross section at one-foot, five feet, and 10 feet upstream and downstream of each culvert. For locations where the stream channel is bifurcated, undefined, or dry, conditions will be noted, photographed, and the possibility exists that no measurements of water depth and width will be collected for the road/stream crossing (or portion of the crossing) exhibiting those conditions.

3.0 QUALITY ASSURANCE PROJECT PLAN

The following QAPP describes quality assurance and control measures regarding the previously described methods for aquatic life and aquatic habitat. The QAPP includes a description of the equipment to be used to conduct each task, monitoring frequency, equipment calibration, staff qualifications, and document reporting.

3.1 Water temperature monitoring

Continuous water temperature measurements will be made on an hourly basis from June through September at each of the five locations using an instream temperature logger (Onset U22-001 Hobo Pro V2). The reported accuracy for these water temperature sensors is ±0.2°C. The Onset water temperature data loggers are factory calibrated and the logger data will be downloaded from each location to a computer data file via an Onset shuttle, and compiled at least once every two weeks from June through September.

In accordance with permit requirements, data compilation will include an evaluation of the daily water temperature to identify the times when the water temperature exceeded 68 degrees Fahrenheit (permit threshold) from June through August, or times when the water temperature exceeded 63 degrees Fahrenheit (permit threshold) in September, during the previous two-week period. The MDEQ will be notified within 24 hours of compiling the temperature logger data if the water temperature exceeded the permit threshold values at any of the stations. A memorandum assessing the cause of the elevated temperature and any proposed corrective actions will be submitted to MDEQ within seven calendar days of a determination that permit thresholds were exceeded. This memorandum will contain all logger data for each station in the two-week period in which the permitted thresholds were exceeded. Should any water temperature data recorder have been determined to fail, an attempt will be made to remove the failed data recorder and replace it with a functioning recorder within one week or sooner if possible. A data logger that malfunctions is expected to produce no water temperature data or data that is inconsistent with previously observed trends. AEM will coordinate with the water temperature logger manufacturer to confirm the malfunction should a malfunction be suspected.

Water temperature data for each station will be summarized for July through September as the average, maximum and minimum daily water temperature, and included as a section in the annual report on Aquatic Life and Aquatic Habitat Monitoring that will be submitted to MDEQ on February 28 following the baseline year. Water temperature summary data for the average daily water temperature will include the average water temperature, maximum and minimum water temperature, variance, and standard deviation for the July through September monitoring period. A plot of the average daily water temperature for the July through September period will be prepared for each station and the permitted water temperature thresholds will be indicated on each figure that will be included in the annual report along with all logger data.

3.2 Dissolved oxygen monitoring

The two-week continuous DO monitoring will be conducted with an Onset HOBO Dissolved Oxygen Data Logger - U26-001, with readings recorded hourly. The DO meters are factory calibrated and require a fresh sensor cap once every six months. A fresh sensor cap will be installed in each meter prior to deployment. The reported accuracy for these dissolved oxygen loggers is ±0.2 mg/L.

In accordance with permit requirements, the MDEQ will be notified within 24 hours of data compilation if a DO reading of less than seven milligrams per liter (permit threshold) was recorded in any station at any time during the two-week continuous monitoring. A memorandum assessing the cause of the elevated DO and any proposed corrective actions will be submitted to MDEQ within seven calendar days of a determination that the DO permit threshold is exceeded. This memorandum will contain all logger data for each station in the two-week period in which the permitted threshold was exceeded. Should any DO data recorder have been determined to fail, an attempt will be made to replace the failed recorded with a functioning recorder within one week or as soon as possible, and another two-week continuous

DO monitoring event will be conducted. A data logger that malfunctions is expected to produce no dissolved oxygen data or data that is inconsistent with previously observed trends. AEM will coordinate with the dissolved oxygen logger manufacturer to confirm the malfunction should a malfunction be suspected.

DO data for each station will be summarized for the two-week period as the average daily DO and included as part of the annual report on Aquatic Life and Aquatic Habitat Monitoring which will be submitted to MDEQ in December of each year. DO summary data for the average daily DO will include the average DO, maximum and minimum DO, variance, and standard deviation for the two-week monitoring period. A plot of the DO for the two-week period will be prepared for each station and the permitted DO threshold will be indicated on each figure. DO monitoring methods and results will be included with water temperature monitoring and results in the annual report along with all the logger data.

3.3 Macroinvertebrate (including freshwater mussels) sampling

Aquatic macroinvertebrate sampling will be conducted annually in July. In accordance with Procedure-51 methodology, efforts will be made to collect approximately 300 ± 60 specimens in each site within the cumulative one-hour of macroinvertebrate sample time. Collected specimens will be stored in 250 milliliter (mL) plastic wide-mouth jars containing 70 percent ethanol labeled with the sample date and station name, and will be identified using various taxonomic references (Bright, 2018; Merritt et al., 2008; Pennak, 1990). Aquatic macroinvertebrate sampling will be conducted when stream discharge is low to moderate (MDEQ 1990).

The aquatic macroinvertebrate samples from each station will be identified to the lowest possible taxonomic level and a multi-metric index score will be determined in accordance with Procedure-51 methodology to determine a macroinvertebrate community rating. This initial summary index baseline score will be used as a threshold determination for action if a decline of three metric points from the baseline score in any year. Macroinvertebrate surveys and subsequent identification will be conducted by personnel trained in the collection (in accordance with Procedure-51 methodology) and identification of aquatic macroinvertebrates at least to the Family level.

Freshwater mussels will be surveyed in accordance with methods described in Hanshue et al. (2018) to conduct a reconnaissance survey immediately following the Procedure-51 aquatic macroinvertebrate survey. A glass-bottom bucket may be used during the survey to aid in viewing the substrates. Live mussels may be temporarily removed from the substrate for identification by a surveyor with valid permits. All live mussels that may be temporarily handled for identification purposes will be stored in a mesh bag submersed in stream water and will be returned to the substrate following identification and collecting photographs of each specimen. Mussels may be identified using various taxonomic references (Mulcrone and Rathbun, 2018; Cummings and Mayer 1992; Klocek et al.). Mussel species that are not identified in the field will be photographed to be later identified by Michigan Natural Features Inventory personnel or other regional university-based experts.

All biological surveys, including macroinvertebrates, freshwater mussels, and fish will be conducted by an aquatic biologist possessing a valid State of Michigan Scientific Collector's Permit. Although not expected for the freshwater mussel survey (no listed mussel species have been identified in the survey stations to date), should a Federally listed mussel species be encountered, a Federal collector's permit will be obtained for future mussel surveys related to this project. All biological surveys, including macroinvertebrates, freshwater mussels, and fish will be conducted by qualified personnel with at least

one surveyor formally trained in the identification of aquatic macroinvertebrates, freshwater mussels, and fish.

A species list of macroinvertebrates and their relative abundance, and a list of freshwater mussels will be generated from these surveys. The Procedure-51 total macroinvertebrate index score will be presented for each station along with a comparison to the baseline macroinvertebrate survey index score. The macroinvertebrate community rating will also be determined using the total index score for each station. A section in the annual report on Aquatic Life and Aquatic Habitat Monitoring will describe the macroinvertebrate survey methods and results. This report will include all the field data.

3.4 Fish community monitoring

The fish community will be monitored in July. Fish community monitoring will be conducted immediately prior to and on the same day as the macroinvertebrate and mussel surveys. Prior to the fish survey, stations will be blocked at the upstream and downstream extents using seines that measure 4 feet by 50 feet, with a 0.19-inch mesh size. As previously described, the station extents will be monumented and the station lengths for the fish survey will be consistent with the station lengths that have been described for the macroinvertebrate surveys. A multi-pass removal technique will be used to evaluate fish abundance throughout each station (Van Deventer and Platts, 1983) using a Smith-Root LR-24 backpack electroshocker. The intensity of electric current that will be applied to each station will be determined using the "Quick Setup" feature associated with the electroshocker. The Quick Setup routine will be conducted immediately prior to initiating the fish survey.

Fish surveys will be conducted by biologists possessing a valid State of Michigan Collector's permit. The Michigan Department of Natural Resources Regional Fisheries Biologist and Conservation Officer will be notified prior to conducting any fish or macroinvertebrate surveys in accordance with Scientific Collector's Permit requirements. As part of the enumeration process, the species, length, weight, and number of fish captured in each pass, and electrofishing effort (measured in seconds of electricity deployed into the water) will be recorded. Fish length will be measured to the nearest millimeter and fish weight will be measured to the nearest gram using an electronic field balance.

A description of fish community composition and relative abundance will be determined for each station along with a description of the average size (length and weight), minimum and maximum size, variance and standard deviation for the most abundant species found in each station. Similar statistics will be provided for any trout species that are collected from any of the stations. An estimate of trout abundance along with a variance estimate will be determined for each station using MicroFish 3.0 software. The Michigan County Element List will be reviewed to determine if any threatened, endangered, or special concern aquatic species occurred within Twin Creek or Chippewa Creek. A section in the annual report on Aquatic Life and Aquatic Habitat Monitoring will describe fish survey methods and results.

3.5 Aquatic habitat measurements

Water depth and stream width will be measured at five locations (SF-1, SF-5, SF-9, SF-8, and SF-16) as part of the fish and macroinvertebrate surveys. Water depth and wetted width will be measured to the nearest tenth of a foot. Width measurements will be conducted with a measuring tape and water depth measurements will be conducted using a wading rod that is typically used for measuring stream depth. Photographs of the upstream and downstream extent of each station will also be collected to depict survey conditions at the time of the survey. The average depth and average wetted width will be calculated for each station and the results will be compared with the previous year's survey. A table of

average depth and average wetted width data will also be prepared that includes the five previous years of data in the report. A section in the annual report on Aquatic Life and Aquatic Habitat Monitoring will include data from the fish and aquatic macroinvertebrate surveys and the evaluations described above.

Water depth and stream width will also be measured at six road/stream crossings (T2, T3, T8, T18, C2, and C3; Figure 2) in July or August on a day when precipitation in the preceding three days has been less than 0.1 inches. Water depth and wetted width will be measured to the nearest tenth of a foot. Width measurements will be conducted with a measuring tape and water depth measurements will be conducted using a wading rod that is typically used for measuring stream depth. Photographs of the upstream and downstream extent of each road/stream crossing will be collected to depict survey conditions at the time of the survey. The average depth and average wetted width will be calculated for each road/stream crossing. A table of average depth and average wetted width data will also be prepared at least the five previous years of data. A section in the annual report on Aquatic Life and Aquatic Habitat Monitoring will describe survey methods and results.

4.0 REFERENCES

Bailey, R. M., W. C. Latta, and G. R. Smith. 2003. An atlas of Michigan fishes with keys and illustrations for their identification. Miscellaneous Publications, Museum of Zoology, No. 192, University of Michigan, Ann Arbor, MI.

Becker, G. C. 1983. Fishes of Wisconsin. The University of Wisconsin Press, Madison, WI.

Bright, E. 2018. "Aquatic Insects of Michigan." Museum of Zoology Insect Division and School of Natural Resources and Environment. University of Michigan, Ann Arbor, MI. Website, < http://www.aquaticinsects.org/>

Cummings, K., and C. Mayer. 1992. *Field Guide to Freshwater Mussels of the Midwest*. Illinois Natural History Survey.

Hanshue, S., Rathbun, J., Badra, P, Bettaso, J, Hosler, B, Pruden, J, and Grabarkiewicz, J. 2018. Michigan freshwater mussel survey protocols and recocation procedures. February 2018.

Klocek, R., J. Bland, and L. Barghusen. Undated. *A Field Guide to the Freshwater Mussels of Chicago Wilderness*. Available at: http://fm2.fieldmuseum.org/plantguides/guideimages.asp?ID=360

Merritt, R. W., K. W. Cummins, and M. B. Berg. 2008. An Introduction to the Aquatic Insects of North America, Fourth Edition. Kendall/Hunt Publishing Co., Dubuque, Iowa.

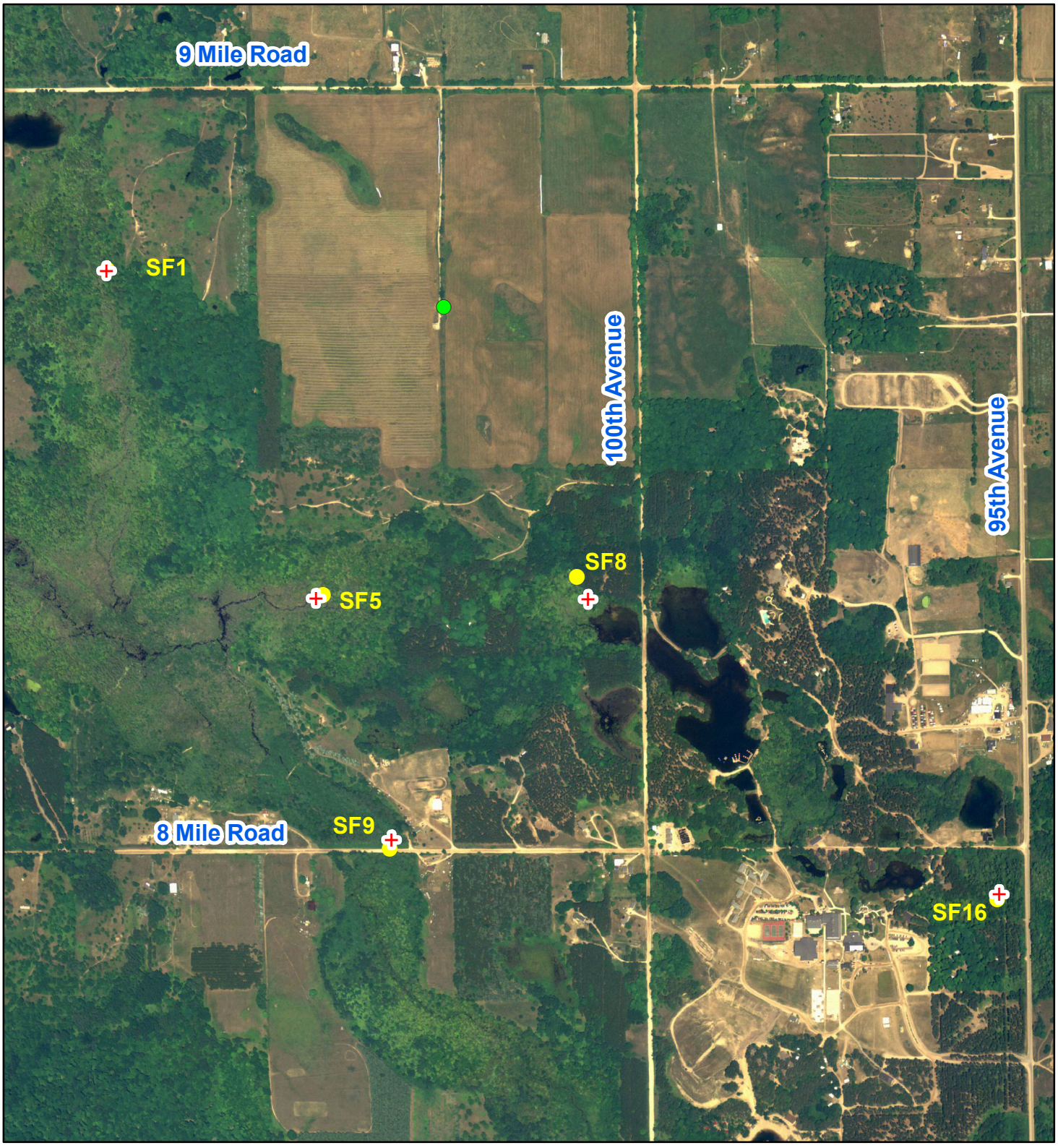
MDEQ (Michigan Department of Environmental Quality). 1990. SWAS Procedure 51 Qualitative Biological and Habitat Survey Protocols for Wadable Streams and Rivers, April 24, 1990. Revised June 1991, August 1996, January 1997, May 2002, and December 2008.

Mulcrone, R. S. and J. E. Rathbun. 2018. Field Guide to the Freshwater Mussels of Michigan. Michigan Department Natural Resources.

Pennak, R. W. 1990. Freshwater invertebrates of the United States: protozoa to mollusca. 4th ed. John Wiley and Sons, Inc. 656 pp.

Van Deventer, J. S., and W. S. Platts. 1983. Sampling and estimating fish populations from streams. Transactions of the North American Wildlife and Natural Resources Conference. 48: 349-354.

5.0 FIGURES



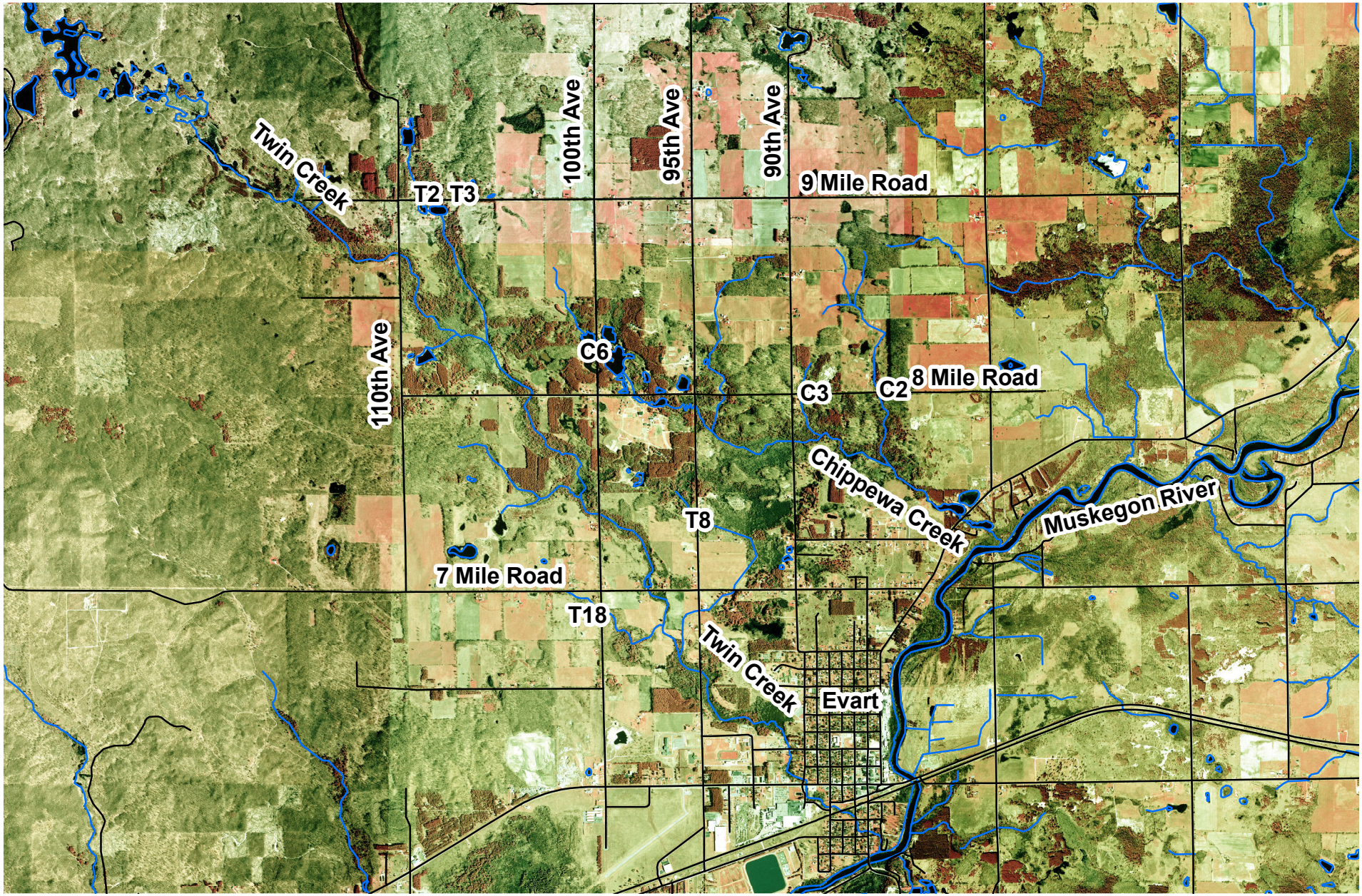
Base map and aerial imagery obtained from Michigan Geographic Data Library

Feet
0 250 500 1,000 1,500 2,000

Legend

- + Water Temperature and DO Monitoring
- Fish and Macroinvertebrate Monitoring
- Approximate Location of Production Well PW-101

PROJECT	NWNA White Pine Springs
TITLE	Sample Station Locations
FIGURE	1



0 0.3 0.6 1.2 1.8 2.4 Miles

N

PROJECT	Stream Crossing Survey
TITLE	Stream Crossing Locations
FIGURE	2

6.0 STAFF QUALIFICATIONS

AeM | ADVANCED ECOLOGICAL MANAGEMENT

R. DOUGLAS WORKMAN, Ph.D.

EDUCATION:

- BS Fisheries and Wildlife, Michigan State University 1991
- MS Biology, Murray State University 1994
- PhD Fisheries Management, Michigan State University 2002

SPECIALIZATION:

- Aquatic Surveys
- Aquatic Habitat Evaluation and Management
- Threatened and Endangered Species Surveys

PROFESSIONAL AFFILIATIONS:

- Adjunct Faculty, Ferris State University
- Member, American Fisheries Society
- Past President, Michigan Chapter of the American Fisheries Society

Dr. Workman is the Vice President of Advanced Ecological Management. He has over 23 years of experience conducting aquatic assessments, environmental impact studies, and aquatic habitat monitoring.

Dr. Workman has also been an adjunct faculty member in the biology department of Ferris State University since 2006, where he has been an instructor of introductory biology courses for non-majors, ecological assessment, environmental regulations, and forensic biology. He has also directed students in undergraduate research projects.

Dr. Workman has conducted comprehensive aquatic surveys throughout Michigan and the Midwest working in lakes, rivers and small streams. The aquatic surveys include population assessments of fish communities, aquatic macroinvertebrate surveys for community composition and relative abundance, quantitative habitat assessments, and mussel surveys. Dr. Workman has typically provided project oversight, data analyses and management recommendations for these projects.

Dr. Workman has conducted impact assessments for large projects such as mines and hydroelectric facilities requiring permit approval and compliance. He has worked cooperatively as part of multi-disciplinarian teams to identify and implement appropriate resource monitoring activities as part of resource impact evaluations.

Dr. Workman has conducted and supervised weekly hydrological monitoring of streamflow and water levels throughout mid-Michigan for over 13 years. He has also coordinated with the State of Michigan personnel to develop a streamflow monitoring protocol that is consistent with state monitoring expectations.

RELEVANT PROFESSIONAL TRAINING

- Fisheries Population Estimation Workshop, American Fisheries Society, 2005
- Mussel Identification/Life History Workshop, American Fisheries Society, 2007
- Smith-Root Electro-Fishing Techniques Workshop, American Fisheries Society, 2008
- Designing for Aquatic Organism Passage at Road-Stream Crossings, USDA Forest Service, May 2015