



December 4, 2015

Project No. 1541147

Mr. James Milne  
Great Lakes Shorelands Unit  
Michigan Department of Environmental Quality  
Constitution Hall  
525 West Allegan  
Lansing, MI 48913

**RE: INFORMATION FOR CONSIDERATION IN SITE-SPECIFIC REVIEW  
WHITE PINE SPRINGS PRODUCTION WELL PW-101  
WSSN #20166-67  
REGISTRATION RECEIPT #4125-201512-31**

Dear Mr. Milne:

Nestle Waters North America Inc. (NWNA) has requested that the Michigan Department of Environmental Quality (MDEQ) conduct a site-specific review of a proposed 150 gallon per minute (GPM) increase in the withdrawal capacity of production well PW-101 at the White Pine Springs site in Osceola County, Michigan. The purpose of this letter is to transmit site-specific information for consideration in the site-specific review.

## 1.0 BACKGROUND

Production well PW-101 is located on NWNA's White Pine Springs property in Osceola Township, Osceola County, Michigan (Attachment 1). The well was constructed in 2001, and later permitted as a Type IIA public water supply well with a withdrawal capacity of 150 GPM. A 100 GPM increase in withdrawal capacity was registered on April 16, 2015 through use of the Water Withdrawal Assessment Tool. The well supplies spring water for bottling at the Ice Mountain facility in Stanwood, Michigan.

The 10-inch diameter well is 181 feet deep, and draws water from the glacial aquifer. The 87-foot long stainless steel screen is located between 94 and 181 feet below grade. The stainless steel well casing extends from 94 feet below grade, to 1.6 feet above grade. The MDEQ water well record is provided as Attachment 2.

On December 4, 2015, NWNA requested a site-specific review through the on-line Water Withdrawal Assessment Tool, to increase the withdrawal capacity of production well PW-101 by 150 GPM (Attachment 3; Receipt ID# 4125-201512-31).

The following are the withdrawal characteristics of the proposed increased capacity:

- Location: NE1/4 of SW/14 of NW1/4, Section 20, T18N, R8W
- Latitude: 43.93961
- Longitude: -85.29194
- Location of discharge: Ice Mountain Bottling Facility, Stanwood, MI
- Rate and amount of withdrawal for new registration: 150 GPM (6,570,000 gallons per month, or 78,840,000 gallons per year)

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- Total permitted withdrawal rate: 400 GPM (17,520,000 per month, or 210,240,000 gallons per year)
- Source of withdrawal: Glacial sand and gravel aquifer
- Type of withdrawal: Continuous

Production well PW-101 is located in the Chippewa Creek watershed, close to the topographic divide between the Chippewa Creek and the Twin Creek surface catchments (Attachment 1). Both Chippewa and Twin Creeks are designated in the Water Withdrawal Assessment Tool as coldwater streams, and both are tributaries of the Muskegon River.

## 2.0 SITE-SPECIFIC INFORMATION

The following data and supporting documentation are provided for consideration.

### 2.1 Geology

Numerous exploratory borings have been drilled by NWNA in the vicinity of production well PW-101, several to more than 200 feet below grade. Observed glacial stratigraphy is consistent with an end moraine of coarse-textured glacial till, undifferentiated coarse-textured glacial till and fine-textured glacial till, which is the depositional interpretation of Farrand and Bell (1982).

The uppermost 200 to 250 feet of the glacial sequence is dominated by a massive sand and gravel deposit, with discontinuous lenses of fine-textured silt and clay. Three cross-sections illustrating glacial stratigraphy in the vicinity of production well PW-101 are provided as Attachments 4A, 4B, and 4C.

Additionally, data from private water well logs in the Chippewa Creek watershed are used to illustrate stratigraphy further east of production well PW-101 in the cross-section provided as Attachment 4D. The private wells tend not to be as deep as the exploratory borings drilled by NWNA, but illustrate that the sand and gravel aquifer is laterally extensive throughout the watershed. The MDEQ Water Well Records for the private wells are provided as Attachment 4E.

### 2.2 Hydrogeology

A nine-day aquifer pumping test was completed in June 2001, a few weeks after PW-101 was constructed. For the first 8 days (192 hours) the well was pumped at a constant rate of 400 GPM, and for the last day (24 hours) the well was pumped at 700 GPM. Aquifer recovery was monitored for an additional three days. Water levels in production well PW-101, nearby observation wells, shallow groundwater drive points, and surface water stilling wells were monitored during the test.

Hydraulic parameters of the aquifer were calculated from the drawdown data as discussed in the November 24, 2015 memorandum from S. S. Papadopoulos & Associates (SSPA), entitled "White Pine Springs – Aquifer Characteristics," provided as Attachment 5. The transmissivity of the aquifer was calculated to be 8,100 ft<sup>2</sup>/d (60,000 gpd/ft), and storativity was calculated to be 0.14 (unitless).

### 2.3 True Location of Chippewa Creek Stream Channel and Headwaters

The actual location of the northernmost headwaters of Chippewa Creek is approximately 1,700 feet southeast of production well PW-101. The Water Withdrawal Assessment Tool, however, incorrectly locates the northernmost headwaters of Chippewa Creek approximately 400 feet southeast of PW-101. Attachment 6 is a map of the area illustrating the location of the Chippewa Creek stream channel as mapped by the Water Withdrawal Assessment Tool and the true location of the Chippewa Creek headwaters.

## 2.4 Stream Flows and Index Flows

NWNA has been gauging stream flow at a number of locations in Twin Creek and Chippewa Creek since 2001. The collected stream flow data are presented in Attachment 7.

With regard to index flows, a February 2015 memorandum calculating index flow based on 13 years of stream flow measurements (2002 to 2014) was prepared by SSPA, and is provided as Attachment 8A. The report describes the stream flow monitoring data and calculation of index flows for Twin Creek and Chippewa Creek from the flow monitoring data.

In August 2015, stream flow was measured weekly by Advanced Ecological Management (AEM) at select locations on Chippewa and Twin Creek, using USGS measurement protocols (Attachment 8B). As discussed in the SSPA Addendum to the February 2015 SSPA memorandum, index flows for both Twin and Chippewa Creeks were subsequently re-evaluated by SSPA based on these August 2015 measurements (Attachment 8C).

The index flow of Twin Creek and Chippewa Creek are summarized as follows:

**Table 1: Index Flows in GPM, Chippewa Creek and Twin Creek**

	<b>Chippewa Creek</b>	<b>Twin Creek</b>
Per SSPA Analysis (based on actual measurements)	2,370	2,948
Per WWAT <sup>1</sup>	887	8,014

## 3.0 CLOSING

Site-specific data collected during the past 15 years of assessment and monitoring at the White Pine Springs site are provided for consideration by MDEQ in the site specific review. Please feel free to contact us if you have any questions regarding these data, desire additional data, or wish to coordinate a visit to the property.

Sincerely,

**GOLDER ASSOCIATES INC.**



Joel C. Henry  
Senior Hydrogeologist



Sean Paulsen  
Associate

cc:

Attachment 1: Site Location Map

Attachment 2: PW-101 Water Well Record

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<sup>1</sup> WWAT – Water Withdrawal Assessment Tool

Attachment 3: Site-Specific Review Receipt

Attachments 4A-E: Stratigraphic Cross-sections and MDEQ Water Well Records

Attachment 5: White Pine Springs Aquifer Characteristics (SSPA)

Attachment 6: Aerial Photograph of Chippewa Creek Headwaters

Attachment 7: Stream Flow Measurement Data Set

Attachments 8A-C: Index Flow Memoranda (SSPA and AEM)

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References:

Farrand W. and D. Bell 1982. Quaternary Geology of Southern Michigan. Department of Geological Sciences, The University of Michigan.