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# RESILIENCY IMPROVEMENTS AT WATERSHOPS POND DAM DRAWDOWN PERIOD MONITORING REPORT #10

**OCTOBER 15, 2021**

**For Compliance with:**

**Order of Conditions, DEP File No. 294-0607, issued 09/17/2020**

**Section 401 Water Quality Certification, BRP WW 08, DEP Transmittal No. X286704, issued 07/23/2021**

**Section 404 Permit, File No. NAE-2020-02301, issued 10/21/2020**

**Certificate on the SEIR, Secretary of Energy and Environmental Affairs, EOEEA No. 16234, issued 07/31/2020**

Prepared by: Paul G. Davis, PhD, Adrienne Dunk

Reviewed by: Tom Jenkins, P.E.

## INTRODUCTION AND METHODOLOGY

In compliance with authorized procedures approved under the above-referenced permits and authorizations, GZA is monitoring dissolved oxygen levels, temperature, and transparency during the period of drawdown associated with the Resiliency Improvements at Watershops Pond Dam Project. This report presents the results of the tenth monitoring event conducted during the period of drawdown, which commenced with the opening of the low-level outlets at the dam on October 26, 2020. During the winter drawdown period, dissolved oxygen monitoring will occur at a frequency of once every 2 months. From March through October, during the growing season, monitoring will occur monthly.

Ecological resource monitoring was initially identified as a means to gauge the environmental impacts associated with a partial or full drawdown of Watershops Pond that may occur during the Project. The monitoring was discussed conceptually in the Alternatives Analysis included in the Expanded Environmental Notification Form (EENF) for the Project (EOEEA No. 16234, EENF dated June 15, 2020). On July 31, 2020, the Secretary of Energy and Environmental Affairs issued the Certificate on the EENF requiring the preparation of a Single Environmental Impact Report (SEIR). In response to comments received on the EENF and in response to the Secretary's Certificate on the EENF, a detailed draft "Aquatic and Wetland Resource Monitoring and Mitigation Plan"; the "Plan") was developed in coordination with regulatory agencies and was submitted as an integral mitigation commitment detailed within the SEIR dated August 28, 2020. The Plan was referenced in the Secretary's Certificate on the SEIR (October 16, 2020) and became a mitigation requirement associated with the City of Springfield's Preferred Alternative of full pond drawdown during the Project. The basic elements of the Plan were developed based upon prior studies of the pond and consultations with the Springfield Conservation Commission and State and Federal regulatory officials.



A copy of the Plan was provided in **Appendix 1** to the “Pre-Drawdown Ecological Monitoring Report,” GZA, September 2020.

During the winter drawdown period, dissolved oxygen monitoring occurred at a frequency of once every 2 months. From March through October, during the growing season, dissolved oxygen and groundwater monitoring occurs monthly. Within the Pond, vertical profiles are being conducted at the three locations and Dissolved Oxygen (DO) and Temperature (°C) are measured at one-foot depth intervals. Secchi disk depth is recorded at each site. Vegetation community monitoring occurs twice per growing season, in late May and between August 15 and September 15. Groundwater and vegetation community monitoring is being conducted at the six stations located at the three BVWs identified during the pre-drawdown report and depicted on **Figures 2 through 4**. This report presents the results of the tenth monitoring event conducted during the period of drawdown, which commenced with the opening of the low-level outlets at the dam on October 26, 2020.

The current water quality monitoring event was conducted on October 15, 2021. Monitoring was repeated at the two locations selected during the first sampling event, conducted December 15, 2020, and at a third sampling location near the dam which was added on March 23, 2021 (see **Figure 1A** for data collection locations).

## RESULTS

The Watershops Pond residual pool encompasses 23± acres upgradient of the dam where the water exits the pond basin through the sluice gates. At low water, the maximum pool depth observed was 4.5 feet, with most of the pool area less than 3 feet deep. However, pool depths tend to vary during monitoring dates due to slight variations in monitoring locations as well as variable head height at the dam outlet due to rainfall and stream flow variation. In addition, it appears there may have been some minor sediment repositioning within the shallower portions of the drawn-down basin presumably due to high-flow rainfall events. The height of the pool was determined by measuring the surface water elevation below the deck of the privately-owned steel bridge located approximately 200 feet upstream of the dam. The measured surface water elevation was at Elevation 140.95± which is approximately 0.45± feet lower than the water surface elevation that was measured in September 2021 and approximately 0.25± feet higher than measured in December 2020.

Based upon the Secchi Disk depth, the water within the pool basin was observed to be similarly turbid to the September sampling event which recorded Secchi Disk depths of 2.25–2.50 feet.

Watershops Pond had an average temperature of 18.5° C for locations measured. The measured temperatures ranged from 17.6° C to 21.7° C. The maximum DO observed was 9.2 mg/l (**Table 1**).



**Table 1. Watershops Pond Drawdown Pool Dissolved Oxygen, Temperature, and Secchi Depth Measurements**  
Date of Data Collection: 10/15/2021 1:00 – 2:00 PM

Date: 10-15-2021				Time: 1:30 PM				Surface Water Elevation: 140.95 (Note: chisel mark on pond side of pier made at 12.00' below bridge deck)			
Location: Main Body, Near Dam, East of Steel Bridge; 42°05.861 N; 072°33.624 W				Location: Main Body, Central Pond, East of RR Bridge; 42°05.940 N; 072°33.345 W*				Location: Main Body, Near Dam, 100'± West of Steel Bridge; 42°05.848 N; 072°33.735 W**			
Secchi Depth (ft)	Depth (ft)	DO (mg/l)	Temp °C	Secchi Depth (ft)	Depth (ft)	DO (mg/l)	Temp °C	Secchi Depth (ft)	Depth (ft)	DO (mg/l)	Temp °C
2.5	0	8.9	18.8	>0.5	0	8.6	21.7	2.5	0	9.2	17.8
	1	9.0	18.4		1	8.2	21.2		1	9.2	17.8
	2	9.0	18.2						2	9.2	17.8
	3	8.9	18.0						3	9.2	17.8
	4	8.9	17.8						4	9.2	17.7
	4.5	8.8	17.8						4.5	9.1	17.6

Note: \* = Bottom sediment roiled by multiple carp at this sampling location; \*\* = Aerator in operation <10' downgradient of sampling point

The average DO concentration at each depth range of the water column is shown in **Table 2**. Because the DO concentration changed little over depth, the average DO within the water column is well above the action level of 5.0 mg/l.

**Table 2. Hypsometric Distribution of Lake Volume and Dissolved Oxygen by Depth**

Depth (ft)	Acres Encompassed by Contour Depth	Water column volume by depth interval (CF)	% vol. of water column within depth interval	Cum. % vol. above interval depth	Average DO (mg/l)
0-1	22.5	860,941.9	44.7	44.7	8.9
1-2	17.2	623,461.9	32.3	77.0	8.8
2-3	11.6	335,447.7	17.4	94.4	9.1
3-4	4.3	96,265.6	4.99	99.39	9.1
4-5	0.63	11,608.4	0.60	99.99	9.1
5-6	0.03	435.0	0.02	100	9.0
Total		1,927,709.6			

Groundwater levels were measured at the six stations by auguring a 3-inch diameter hole to a depth of at least 24 inches and allowing time for equilibration. The observed depths to groundwater are shown in **Table 3**.

**Table 3. Watershops Pond Drawdown Groundwater Monitoring Measurements (inches below ground surface)**  
Date of Data Collection: 10/15/2021 2:00 PM – 3:00 PM

	Springfield College	Springfield College East Campus		GYSGT J. Sullivan Park		
Date	Station 1	Station 1	Station 2	Station 1	Station 2	Station 3
10/15/2021	-24+	-24+	-24+	-18	-13	-1

Note: Depths denoted with a "+" indicate that groundwater was not observed at this depth



## DISCUSSION

The Plan suggested an action level for DO of 5 mg/l for at least 75% of the surface waters in the residual pool, with lesser values potentially triggering mitigation action. During the October 2021 monitoring event, this standard was met as the average DO concentration exceeded 8.8 mg/l at all contour elevations. This result demonstrates an increased DO level from September and may be reflective of decreasing average temperatures and daylight.




As temperatures begin to lower, it is likely that the DO will continue to increase as the fall season progresses. Due to short-term low DO concentrations experienced in May 2021, a fountain aerator was installed in the lower pool area upstream of the dam as a mitigation measure. While mitigation requirements have not been triggered since that time, the aerator has been in near continuous operation except during occasional periods of operational failure to due power outage.

The groundwater levels in the wetlands were expected to drop with the Watershops Pond drawdown. Given the modest rain accumulation in early October, the depths to groundwater increased from September and are similar to the average depths observed throughout the drawdown period. Groundwater depths will continue to be monitored throughout the growing season. These data will be discussed and analyzed further in the annual wetland monitoring report. Following the refilling of the pool, wetland impacts, and potential mitigation measures will be discussed.



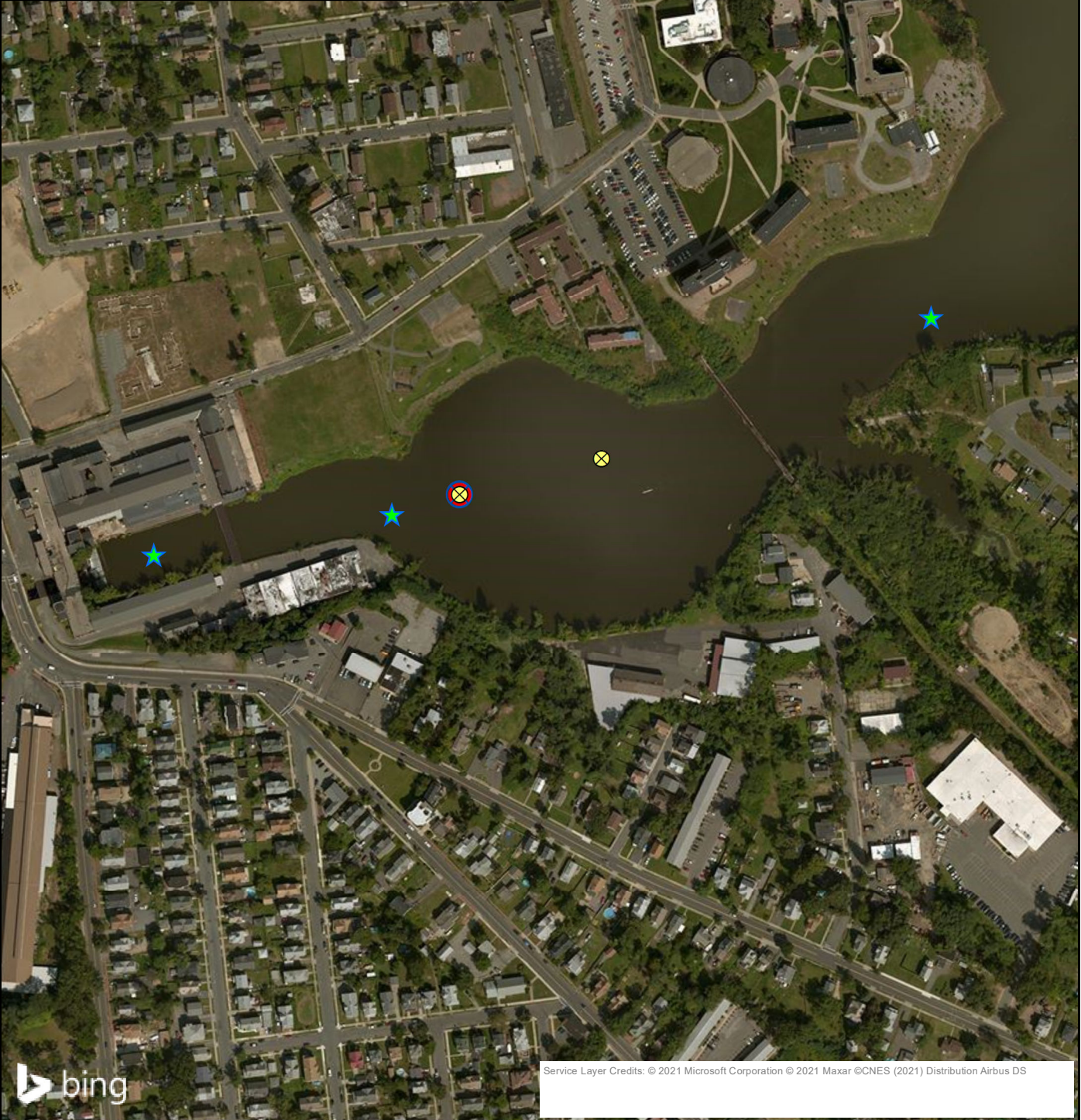
**LEGEND**

**DISSOLVED OXYGEN PROFILE LOCATIONS**

-  ACTUAL POST-DRAWDOWN
-  PROPOSED POST-DRAWDOWN
-  PROPOSED PRE-DRAWDOWN

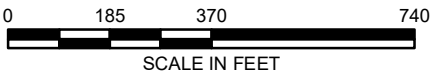


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1 ALLEN STREET  
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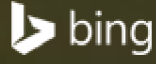
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**DISSOLVED OXYGEN PROFILE MONITORING LOCATIONS**

PROJ MGR: JRB	REVIEWED BY: TEJ	CHECKED BY: SLL
DESIGNED BY: ARD	DRAWN BY: ARD	SCALE: 1 in = 350 ft
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FIG.  
**1A**



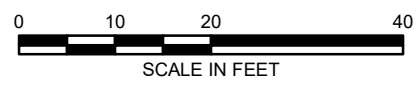


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### LEGEND

- + MONITORING STATION
- WETLAND BOUNDARY POINT
- OBSERVED MEAN HIGH WATER
- WETLAND BOUNDARY
- BVW SURVEY AREAS
- PROJECT AREA



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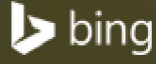
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**SPRINGFIELD COLLEGE BVW**

PROJ MGR: TEJ	REVIEWED BY: TEJ	CHECKED BY: SLL	<b>FIG. 2</b>
DESIGNED BY: JRB	DRAWN BY: ARD	SCALE: 1 in = 20 ft	
DATE: 11/24/2020	PROJECT NO: 15.0166625.20	REVISION NO:	

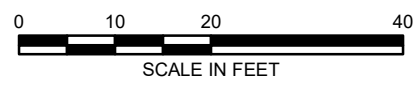


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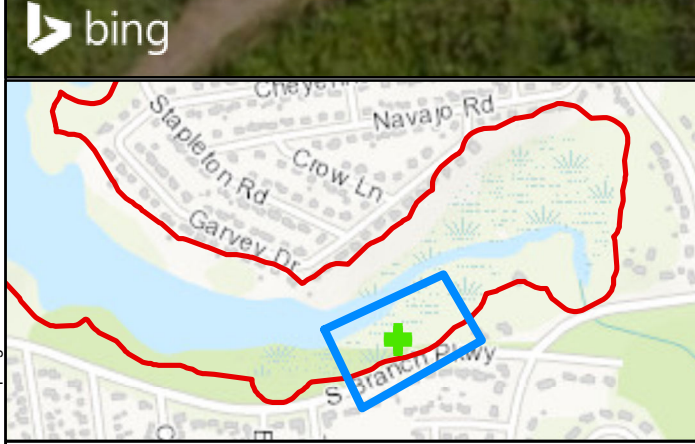
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**SPRINGFIELD COLLEGE**  
**EAST CAMPUS BVW**

PROJ MGR: TEJ	REVIEWED BY: TEJ	CHECKED BY: SLL	<b>FIG.</b> <b>3</b>
DESIGNED BY: JRB	DRAWN BY: ARD	SCALE: 1 in = 20 ft	
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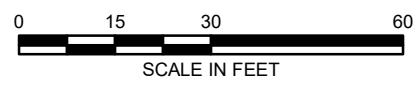
© 2020 - GZA GeoEnvironmental, Inc. \GZA\Springfield\Jobs\0\_166600 - 0\_166699\15.0166625.20 Watersheds Ponds Dam\GIS\mxd\PreDrawDownReport\Fig4\_GYSGT\_PARK\_BVW.mxd, November 24, 2020 - 4:32:45 PM, Adrienne.dunk



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**GYSGT. J. SULLIVAN PARK BVW**

PROJ MGR: TEJ	REVIEWED BY: TEJ	CHECKED BY: SLL	<b>FIG. 4</b>
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