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RESILIENCY IMPROVEMENTS AT WATERSHOPS POND DAM DRAWDOWN PERIOD MONITORING REPORT #12

APRIL 26, 2022

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, and Adrienne Dunk

Reviewed by: Guy Dalton, LSP, Associate Principal

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 twelfth 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.

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 spring drawdown and proposed refilling period, dissolved oxygen monitoring occurred monthly from April to June and August to November. During the winter drawdown period, dissolved oxygen monitoring occurred at a frequency of once every 2 months. During the 2021 drawdown, from March through October, during the growing season, dissolved oxygen monitoring occurred monthly. Within the Pond, vertical profiles are conducted at three locations (**Figure 1A**) and Dissolved Oxygen (DO) and Temperature (°C) are measured at one-foot depth intervals. Secchi disk depth is recorded at each monitoring location. During the 2021 and 2022 growing season, April through October, groundwater monitoring occurred monthly at the six stations located within the three bordering vegetated wetlands (BVWs) identified during the pre-drawdown report and depicted on **Figures 2 through 4**. Vegetation community monitoring occurs twice per growing season, in late May and between August 15 and September 15 at the same six stations as the groundwater monitoring.

The February and March 2022 monitoring events were cancelled following correspondence with Kevin Chaffee and approval by the City of Springfield Conservation Commission in early February 2022, because the observed wintery conditions (*i.e.*, ice cover) of the pond made access unsafe at those times. Measured DO levels in February and March 2021 indicated that the high DO levels observed in December 2021 would likely continue throughout the 2022 winter season such that monitoring during this period was not critical.

The most recent water quality monitoring event was conducted on April 18, 2022. 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 38± 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 8.25 feet, with most of the pool area less than 5 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 144.95± which is approximately 4.05± feet higher than the water surface elevation that was measured in December 2021. The increase in surface water elevation is likely due to a combination of spring thaw throughout the watershed combined with spring rain events.

Based upon the Secchi Disk depth, the water within the pool basin was observed to be similarly turbid to the December 2021 sampling event which recorded Secchi Disk depths of 3.50 to 4.50 feet.

Watershops Pond had an average temperature of 10.7° C for locations measured. The measured temperatures ranged from 9.8° C to 12.3° C. The maximum DO observed was 10.6 mg/l (**Table 1**).



Table 1. Watershops Pond Drawdown Pool Dissolved Oxygen, Temperature, and Secchi Depth Measurements
Date of Data Collection: 04/18/2022 11:00 AM – 12:30 PM

Date: 04/18/2022				Time: 12:00 PM				Surface Water Elevation: 144.95 (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
3	0	9.3	12.3	4.5	0	9.8	10.4	5.5	0	10.6	12.1
	1	9.4	11.7		1	9.8	10.1		1	10.4	11.8
	2	9.5	11.5		2	9.9	10		2	10.2	11.4
	3	9.6	11.2		3	9.8	10		3	10.3	10.8
	4	9.5	10.8		4	9.8	9.9		4	10.2	10.6
	5	9.6	10.3		5 – bottom	9.9	9.8		5	10.2	10.5
	6	9.9	10.1						6	10.1	10.4
	7	10	10						7	10.1	10.3
	7.5 - bottom	9.9	10						8	10.1	10.2
									8.25 - bottom	8.2	10.2

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	37.88	1,650,247.5	26.94	26.94	9.9
1-2	32.42	1,412,099.0	23.05	49.99	9.9
2-3	26.06	1,135,237.4	18.53	68.52	9.9
3-4	22.5	860,941.9	14.05	82.57	9.9
4-5	17.2	623,461.9	10.18	92.75	9.8
5-6	11.6	335,447.7	5.48	98.23	9.9
6-7	4.3	96,265.6	1.57	99.8	10.0
7-8	0.63	11,608.4	0.19	99.99	10.1
8-9	0.03	435.0	0.01	100	9.4
Total		6,125,744.4		100	

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: 04/18/2022 1:00 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+	-24	-8	0

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 April 2022 monitoring event, this action level was met as the average DO concentration exceeded 9.4 mg/l at all contour elevations. This result demonstrates a decrease in DO levels from December 2021 which is anticipated given the increasing average temperatures and daylight. As temperatures continue to increase, it is likely that the DO will continue to decrease as the spring and summer seasons progress. Continued water quality observations will determine if aeration will be required during the summer of 2022.

The groundwater levels in the wetlands were expected to drop with the Watershops Pond drawdown. The groundwater depths remained relatively stable from December 2021, with a slight decrease in depth to groundwater at Sergeant Gunnery Park TP-2 and a slight increase at TP-1. The decrease at TP-2 may be a result of the increased surface water elevation within the pond. 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



© 2021 - GZA GeoEnvironmental, Inc. J:\0 166600 - 0 166699\15.0166625.20 Watersheds Pond Dam\GIS\mxd\DrawdownMonitoringReport\Fig1A_DO_Monitoring_Location.mxd, March 25, 2021 - 2:21:13 PM, Adrienne.dunk



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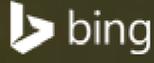
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1 ALLEN STREET
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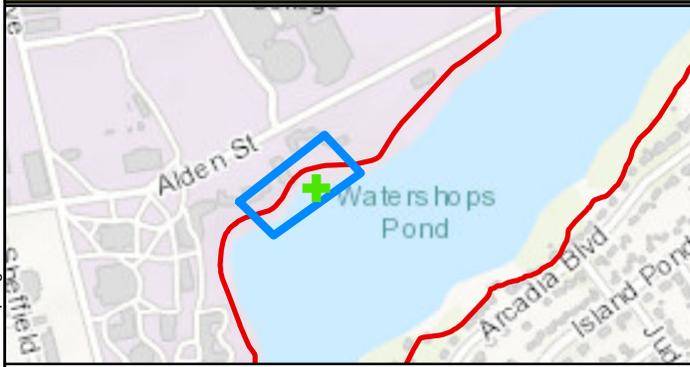
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DISSOLVED OXYGEN PROFILE MONITORING LOCATIONS

PROJ MGR: JRB	REVIEWED BY: TEJ	CHECKED BY: SLL	FIG. 1A
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DATE: 03/25/2021	PROJECT NO: 15.0166625.20	REVISION NO:	



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LEGEND

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



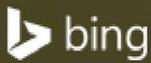
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1 ALLEN STREET
SPRINGFIELD, MASSACHUSETTS

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SPRINGFIELD COLLEGE BVW

PROJ MGR: TEJ	REVIEWED BY: TEJ	CHECKED BY: SLL	FIG. 2
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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LEGEND

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



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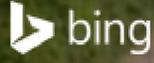
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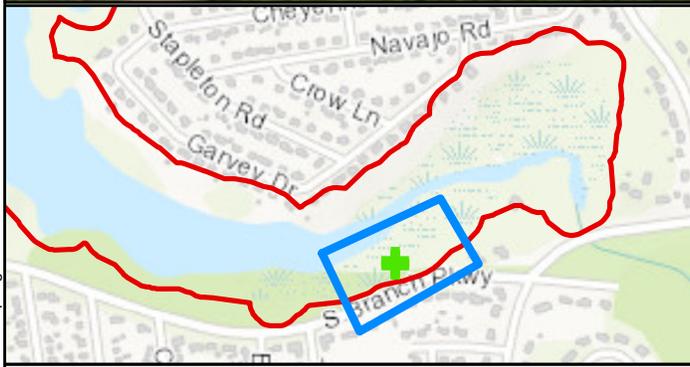
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SPRINGFIELD COLLEGE
EAST CAMPUS BVW

PROJ MGR: TEJ	REVIEWED BY: TEJ	CHECKED BY: SLL	FIG. 3
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- + MONITORING STATION
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PROJ MGR: TEJ	REVIEWED BY: TEJ	CHECKED BY: SLL	FIG. 4
DESIGNED BY: JRB	DRAWN BY: ARD	SCALE: 1 in = 30 ft	
DATE: 11/24/2020	PROJECT NO: 15.0166625.20	REVISION NO:	