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RESILIENCY IMPROVEMENTS AT WATERSHOPS POND DAM DRAWDOWN PERIOD MONITORING REPORT #15

August 25, 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, WPIT

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 fifteenth 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 described 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 2022 spring drawdown, dissolved oxygen monitoring occurred monthly from April to June and will occur between August and November. During the winter drawdown period, dissolved oxygen monitoring occurred at a frequency of once every 2 months. During the 2021 drawdown period, from March through October, dissolved oxygen monitoring occurred monthly. After the pond refilling process began in May 2022, vertical profiles were conducted at four locations and Dissolved Oxygen (DO) and Temperature (°C) were measured at one-foot depth intervals, incorporating one of the pre-drawdown sampling locations, with the other two locations being unavailable due to lack of water depth at those locations. Beginning in June 2022, the two additional pre-drawdown sample profile locations were added as water depths allowed access (**Figure 1C**) for a total of six monitoring locations. Secchi disk depth was 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 most recent water quality monitoring event was conducted on August 24, 2022 (see **Figure 1C** for data collection locations).

RESULTS

During the August 24, 2022 sampling event, the maximum pool depth observed was 15.5 feet, with the pond approaching original (pre-drawdown) pool levels. Approximately one inch of rainfall occurred on August 23, 2022, which may also have contributed to the observed pond levels. Pool depths may also have varied from previous observations due to slight variations in monitoring locations as well as the partial closure of the low-level dam outlet on May 16, 2022, and the subsequent refilling of the pond. 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 151.95± which is approximately 1.75± feet higher than the water surface elevation that was measured in June 2022 and 5.75± feet higher than the May 2022 measurement.

Based upon the Secchi Disk depths which ranged from 2.0 to 4.0 feet, the water was observed to be more turbid than the June 2022 sampling event which recorded Secchi Disk depths of 3.5 to 4.5 feet. The large storm event the day prior which was preceded by a long dry period most likely impacted the turbidity in the water column observed during this event.

Watershops Pond had an average temperature of 23.4° C for locations measured. The measured temperatures ranged from a low of 20.3° C in the West Branch Cove to a high of 25.5° C in the main pool area. The DO levels measured ranged from 0.1 at the pond bottom to a maximum of 8.7 mg/l within the water column (**Table 1**).



Table 1. Watershops Pond Drawdown Pool Dissolved Oxygen, Temperature, and Secchi Depth Measurements
Date of Data Collection: 08/24/2022 9:40 AM – 11:30 AM

Surface Water Elevation: 151.95							
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			
Secchi Depth (ft)	Depth (ft)	DO (mg/l)	Temp °C	Secchi Depth (ft)	Depth (ft)	DO (mg/l)	Temp °C
3	0	6.9	25.3	3	1	6.6	25.5
	1	7.1	25.2		2	6.5	25.2
	2	7.1	24.6		3	6.6	24.9
	3	6.8	24.4		4	6.3	24.5
	4	5.6	24.3		5	5.8	24.4
	5	2.7	24.2		6	4.8	24.2
	6	0.4	23.9		7	1.1	24.0
	7	0.2	23.5		8	0.3	23.6
	8	0.2	23.0		9	0.2	23.1
	9	0.1	22.7		10	0.2	22.5
	10	0.1	22.4		11	0.2	22.2
	11	0.1	22.3				
	12	0.1	22.1				
	13	0.1	21.9				
	14	0.1	21.7				
14.5	0.1	21.7					
Location: Main Body, Near Dam, 100'± West of Steel Bridge; 42°05.848 N; 072°33.735 W				Location: Main Body, Central Pond West of Roosevelt St. Bridge 42°06.212 N; 072°33.061 W			
Secchi Depth (ft)	Depth (ft)	DO (mg/l)	Temp °C	Secchi Depth (ft)	Depth (ft)	DO (mg/l)	Temp °C
3	0	6.4	25.3	3	0	8.7	25.3
	1	6.4	25.1		1	8.5	25.4
	2	6.3	24.6		2	8.5	24.9
	3	6.1	24.5		3	6.2	24.4
	4	6.0	24.4		4	6.2	24.3
	5	2.8	24.2		5	6.1	24.2
	6	0.4	23.9		6	5.9	24.1
	7	0.2	23.4		7	1.1	23.7
	8	0.1	23.0		8	0.9	23
	9	0.1	22.7		8.5	0.6	22.3
	10	0.1	22.4				
	11	0.1	22.3				
	12	0.1	21.9				
	13	0.1	21.9				
	14	0.1	21.8				
15	0.1	21.6					
15.5	0.1	21.5					
Location: West Branch Mill River Cove 42°06.606 N; 072°32.509 W				Location: East Branch Mill River Cove Near Pease Cove 42°06.473 N; 072°32.049 W			
Secchi Depth (ft)	Depth (ft)	DO (mg/l)	Temp °C	Secchi Depth (ft)	Depth (ft)	DO (mg/l)	Temp °C
2.5	0	7.4	25.2	4	0	4.7	24.0
	1	7.3	25.0		1	4.6	23.7
	2	6.7	24.1		2	4.5	23.3
	3	6.5	24.0		3	4.2	22.4
	4	5.2	23.9		4	4.8	21.0
	5	4.5	22.3		5	4.8	21
	5.7	5.3	20.3		5.5	4.7	21



The average DO concentration at each depth range of the water column is shown in **Table 2**. Despite variation in the DO concentration over depth, the weighted average DO value for at least 75% of the pond water volume is 6.2 mg/l, which exceeds 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	135.19	5,675,736.8	17.7	17.7	6.8
1-2	125.46	5,178,393.9	16.1	33.8	6.7
2-3	112.41	4,469,620.2	13.9	47.7	6.6
3-4	93.11	3,593,650.4	11.2	58.9	6.0
4-5	72.33	2,850,450.2	8.9	67.8	5.6
5-6	58.78	2,321,613.8	7.2	75	4.3
6-7	48.00	1,930,250.4	6	81	3.0
7-8	37.88	1,650,247.5	5.1	86.1	0.5
8-9	32.42	1,412,099.0	4.4	90.5	0.4
9-10	26.06	1,135,237.4	3.5	94	0.3
10-11	22.5	860,941.9	2.7	96.7	0.1
11-12	17.2	623,461.9	1.9	98.6	0.1
12-13	11.6	335,447.7	1	99.6	0.1
13-14	4.3	96,265.6	0.3	99.9	0.1
14-15	0.63	11,608.4	0	99.9	0.1
15-16	0.03	435.0	0	99.9	0.1
Total			99.9	99.9	

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

Table 3. Watershops Pond Drawdown Groundwater Monitoring Measurements (inches below ground surface)

Date	Springfield College	Springfield College East Campus		GYSGT J. Sullivan Park		
	Station 1	Station 1	Station 2	Station 1	Station 2	Station 3
7/14/2022	-24+	-24+	-24+	-24+	-15	-8
8/24/2022	-24+	-24+	-24+	-24+	-22	-3

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 August 2022 monitoring event, this action level was met as the average DO concentration exceeded 5 mg/l for 75% of the surface water volume. This result demonstrates somewhat decreased DO levels from June 2022 which suggests that heterotrophic growth in the lake has accelerated and is depleting







oxygen levels, as may be expected in mid- to late-season sampling. There has also been the increasing submergence and die-off of emergent vegetation within the formerly exposed pond basin sediments, which may have contributed to Biochemical Oxygen Demand and some oxygen depletion. The decreased DO may also reflect the nearly 0.9-inch of rainfall reported between August 22 and 23, 2022 (rainfall data obtained from Chicopee Falls / Westover Air Force Base). This rainfall followed a dry summer and may have resulted in the first flush of an urban watershed that increased turbidity and oxygen demand in the pond.

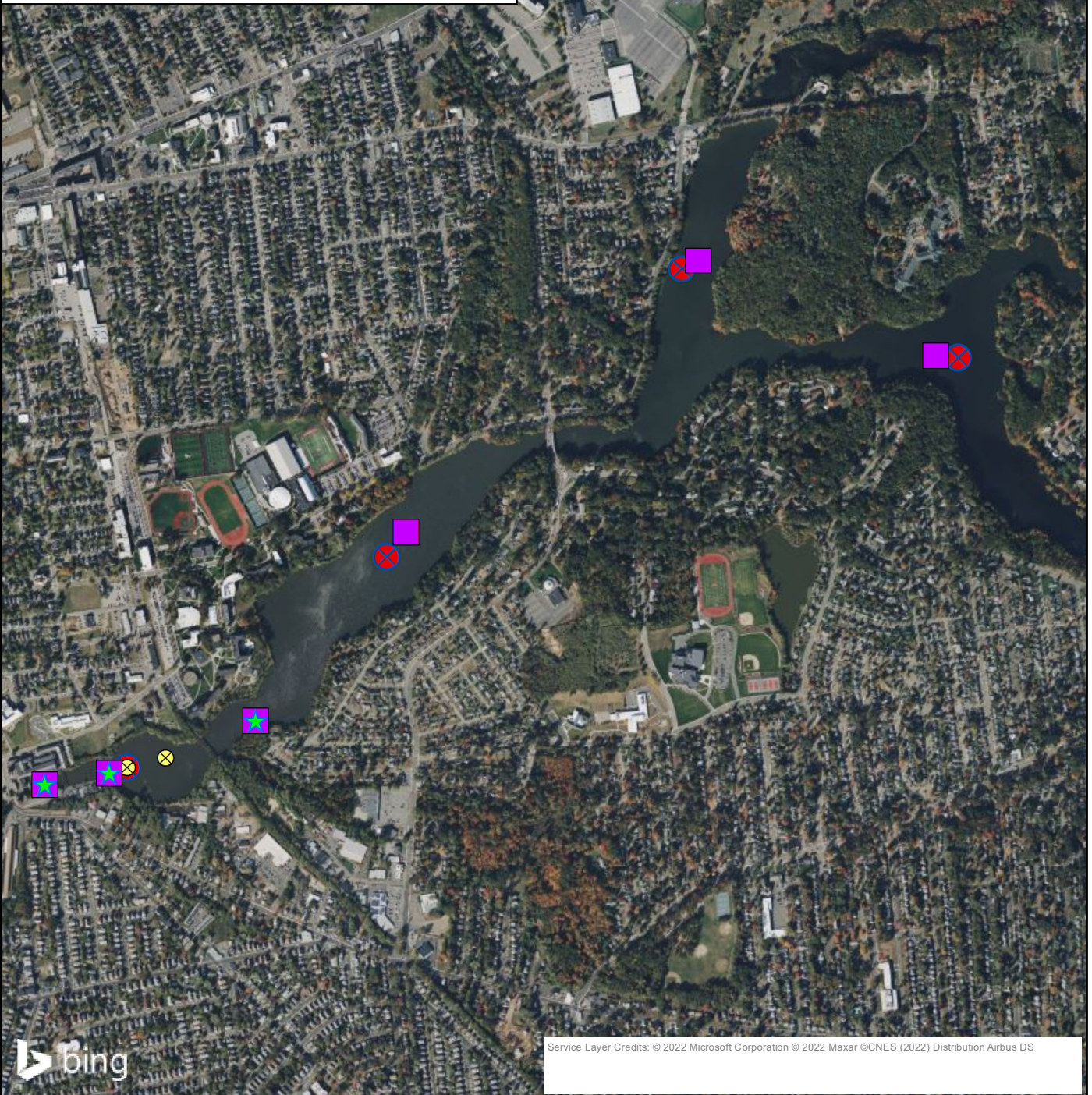
As temperatures remain high through the remainder of the summer season, it is likely that the DO will remain somewhat similar to or slightly lower than August observations. During the ongoing refill period, some areas of vegetation that developed within exposed sediments will be inundated resulting in the death and decay of these plants. Such decomposition could result in localized DO depletion; therefore, continued water quality observations will be useful for the 2022 growing season to determine if DO mitigation is necessary. The areas of vegetation submergence appear relatively small compared to the entirety of Watershops Pond, so we remain optimistic that DO levels should remain above the action thresholds during this refill and post-refill season. Relative to the pond basin refilling efforts, we judge them to have been generally successful and recommend closure of the lower gate valves as soon as practical, since leaving them open at this point achieves little or no ecological value for downgradient wetland resources and may be causing some ecological harm to shallow water pond basin habitats, with the entrenchment of emergent vegetation in what were formerly open water areas.

The groundwater levels in the wetlands were expected to drop with the Watershops Pond drawdown. The groundwater depths remained relatively stable from May 2022 with a fluctuating depth to groundwater at Gunnery Sergeant Park. The 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

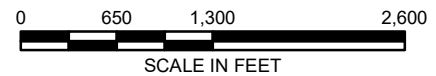
DISSOLVED OXYGEN PROFILE LOCATIONS

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



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 1 ALLEN STREET
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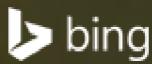
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 CDBG-NDR GRANT#B-13-MS-25-0002

**DISSOLVED OXYGEN PROFILE
 MONITORING LOCATIONS**

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DESIGNED BY: ARD	DRAWN BY: ARD	SCALE: 1 in = 1,300 ft
DATE: 06/30/2022	PROJECT NO: 15.0166625.20	REVISION NO:

FIG.
1C

© 2022 - GZA GeoEnvironmental, Inc. J:\0 166600 - 0 166699\15.0166625.20 Watershops Pond Dam\GIS\mxd\DrawdownMonitoringReport\Fig1C_DO_Monitoring_Location.mxd, June 30, 2022 - 3:58:57 PM, Adrienne.dunk

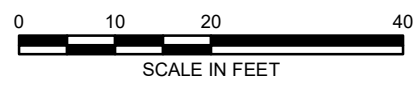


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LEGEND

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



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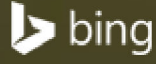
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1 ALLEN STREET
SPRINGFIELD, MASSACHUSETTS**

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SPRINGFIELD COLLEGE BVW

PROJ MGR: TEJ	REVIEWED BY: TEJ	CHECKED BY: SLL	FIG. 2
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DATE: 11/24/2020	PROJECT NO: 15.0166625.20	REVISION NO:	

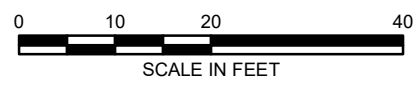


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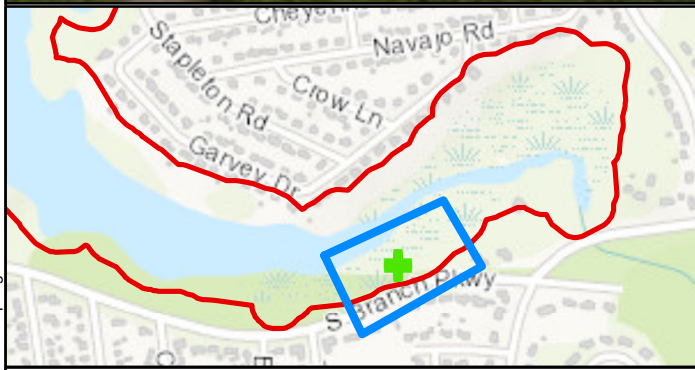
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EAST CAMPUS BVW

PROJ MGR: TEJ	REVIEWED BY: TEJ	CHECKED BY: SLL	FIG. 3
DESIGNED BY: JRB	DRAWN BY: ARD	SCALE: 1 in = 20 ft	
DATE: 11/25/2020	PROJECT NO: 15.0166625.20	REVISION NO:	



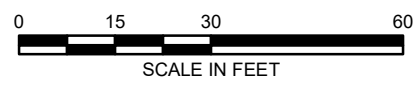
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PROJ MGR: TEJ	REVIEWED BY: TEJ	CHECKED BY: SLL	FIG. 4
DESIGNED BY: JRB	DRAWN BY: ARD	SCALE: 1 in = 30 ft	
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