This is Task Order No. 2003-20B, consisting of 2 pages.

Task Order

In accordance with paragraph 1.01 of the Master Agreement between Owner and Engineer for Professional Services dated September 15, 2008 ("Agreement"), Owner and Engineer agree as follows:

Specific Project Data

A. Title: Stream Mixing Zone Study

B. Description: This project includes completion of a stream mixing zone study to field determine the actual mixing characteristics of the City of Oelwein, Iowa wastewater treatment plant discharge flow with the receiving stream (Otter Creek). The following general procedures will be used for this study:

1. It is anticipated that the study will be completed in late summer or fall of 2020 when stream flows are sufficiently low.

2. Visible boundary procedures will be used. FWT red dye tablets manufactured by Kingscote Chemicals will be used to inject the initial plug of dye into the plant's effluent. If necessary, liquid red dye manufactured by Kingscote Chemicals will also be introduced at the edge of the plume if the dye becomes difficult to see. Both of these dyes have been approved in the past by the IDNR for similar stream studies performed by FOX Engineering, and both are labeled as meeting EPA standards, as well as ANSI/NSF Standard 60.

3. Prior to injecting the dye, the total flow of Otter Creek will be measured upstream of the plant discharge. The flow will be calculated by dividing the river width into approximately 10 subsections. The area of each subsection will be calculated and the velocity within each subsection determined. The area and velocity values will be used to calculate flow within each subsection, and then the total flow will be calculated as the sum of the flows for each of the subsections.

4. Prior to injecting the dye, stations will be established downstream of the treatment plant discharge using wooden lathe. It is anticipated that stations will be established as follows: every 20 feet to station 200', then every 100 feet to station 1000', then every 200 feet to station 2000'.

5. Dye tablets will then be added to the wastewater treatment plant effluent and the dye plume will be followed downstream. At each of the stations established under Item 4, a wooden lathe will be staked at the edge of the dye plume. This will be continued downstream until the plume reaches the far bank or until it reaches the end of the Mixing Zone. The maximum Mixing Zone length will be determined in accordance with IAC Chapter 61. This maximum length will be 2000' downstream of the discharge point unless one of the restrictions included in the code is found to apply.

6. The plume width will be measured and recorded at each station.

7. The end of the Zone of Initial Dilution (ZID) will be established at 10% of the length of the field determined mixing zone. Then the flow rate within the plume at this distance downstream of the plant discharge will be determined using the methods indicated under Item 3. above. This will be used to determine the percentage of total stream flow included in the ZID. Calculations will be included in the report documenting the percentage of stream flow mixed with the discharge both within the Mixing Zone and ZID.

8. The plant flow rate at the time of the study will be observed and recorded based on the existing plant flow meter.

9. Still photos will be taken to document the study and a report will be prepared and submitted to IDNR for review.

10. If nearby historical stream flow data is available, historical treatment plant flows will be compared to historical stream flows to document that high plant flows correlate with high stream flows.

11. A revised Waste Load Allocation (WLA) will be requested from IDNR based on the results of the study.

1. **Services of Engineer** - Exhibit A shall not apply to this project. The scope of the project is as follows:

   a. Complete Stream Mixing Study as described above and submit report to the Iowa Department of Natural Resources (IDNR) for their review and comment.

   b. Address any comments and questions provided by the IDNR.

2. **Owner's Responsibilities** - As per Exhibit B.

3. **Times for Rendering Services** - If weather conditions allow, complete study and submit report to the IDNR by December 31, 2020.

4. **Payments to Engineer** - In accordance with Method A in Exhibit C, Owner shall pay Engineer a Lump Amount of $13,500.00 for these services.

5. **Engineer's Consultants** - None.

6. **Other Modifications to Master Agreement** - None

7. **Attachments** - None

8. **Documents Incorporated By Reference** - None

Approval and Acceptance: Approval and Acceptance of this Task Order, including the attachments listed above, shall incorporate this document as part of the Agreement. Engineer is authorized to begin performance upon its receipt of a copy of this Task Order signed by Owner.

The Effective Date of this Task Order is _____, 2020.

Engineer	**Owner**
Signature 4/27/2020 Date	_____ Signature Date
Lance Aldrich, P.E. Name	_____ Name
Project Manager Title	_____ Title
Designated Representative for Task Order:	**Designated Representative for Task Order:**
Lance Aldrich, P.E. Name	_____ Name
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